NATIONAL INSTITUTE OF TOXICOLOGY AND FORENSIC SCIENCES

GOBIERNO DE ESPAÑA
MINISTERIO DE JUSTICIA

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NATIONAL INSTITUTE OF TOXICOLOGY AND FORENSIC SCIENCES

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Report 2019

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National Institute of Toxicology and Forensic Sciences

Report 2019

GOBIERNO DE ESPAÑA | MINISTERIO DE JUSTICIA

Madrid, 2021

Report presented by Antonio Alonso Alonso
The Director of the National Institute of Toxicology and Forensic Sciences

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1. Letter of Presentation from the Director of the INTCF

On 1 May 2019 I was named Director of the National Institute of Toxicology and Forensic Sciences (INTCF) by the Ministry of Justice. The Minister of Justice, the State Attorney general , and the Secretary of State for Justice presided over my new position for the INTCF. I committed to fully develop the maximum fundamental functions of the INTCF, as stated in Organic law 6/1985, as a technical body attached to the Ministry of Justice. The institution promotes the expert use of forensic sciences to courts of justice and public prosecution, as well as advancing quality assurance and contributing to the unity of scientific criteria. It also serves to reinforce collaboration with universities, medical institutions, national and international organisms in all areas which contribute to the development of toxicology and forensic sciences.

In Annex I, all regulation applicable to the INTCF is collected together, and therein the structure and functions of this center of reference in toxicology and forensic sciences are more extensively defined.

To accomplish the desired scientific development of this institution (which has existed for over hundred and thirty years and which is today a center of reference in the field of forensic sciences, counting close to five hundred professionals), I also committed to strengthen two aspects of its operation: to foster the maximum possible participation of all professionals involved in the scientific activities and policy-making and to facilitate transparency in mi labor as director.

In this spirit of improving participation and transparency, October 2019 saw a questionnaire compromising thirty-six questions being sent to all INTCF departments. This questionnaire was approved by the *INTCF Coordination Commission* and allowed the collection of current information on expert activity, quality assurance, and investigation and training activities made by different INTCF departments (See Annex II). The result of this contribution by INTCF personnel was the drafting of the INTCF Plan of Action and Investigation 2020-2022, which is now our institution´s roadmap for the years ahead.

The INTCF activities report of 2019, which we present, contains various updates compared to previous years.

Firstly, a new section, («The organization at a glance»), is included which gathers together previously unseen information about the INTCF, such as the gender split of INTCF personnel and the budget expenditure for 2019.

This year a new section is included to describe the work done by several units of the INTCF (Sample and Waste Management, Library, Supply Management Unit, Prevention of Occupational Risks Service, Secretarial Team, and IT Systems). They provide diverse support functions to the expert services and whose work is essential to the functioning of different INTCF Departments.

Secondly, new statistical data on the expert activity of various INTCF services is presented. Also as the number of registered cases, the number of requests generated, the number of samples analyzed, the number of reports issued, new information is presented in

all the graphs shown in this report, in the form of the amount of evidence recorded and the number of analyses carried out. This new data is also included in the overall figures for departments and services, as well as in specific data (classified by type of investigation) elaborated by each of the Services of every INTCF branch. Annex III presents the definitions of these parameters and the methodology for obtaining the statistical data presented in the report.

On the other hand, in the current report, greater emphasis is given to different Services from all the branches of the INTCF. To this end, each department´s area will show statistical data on its professional activities and a description of a relevant forensic case which aids the reader in understanding how its work pertains to the case. Apart from the expert activity, investigative work in collaboration with other institutions is presented, as well as training practices occurring in 2019 by the various departments of the different INTCF branches.

The data presented in this report confirm an increase in forensic and scientific work made by the various departments of the INTCF in 2019. Some showing a large surge in forensic caseloads due to a lack of increase in staff over the last 10 years.

I end by drawing attention to the fact that despite the budgetary difficulties experienced over the last few years and the pressing need to increase its workforce, the INTCF has continued to advance and improve thanks to the effort and quality, both scientific and human nature, of its staff.

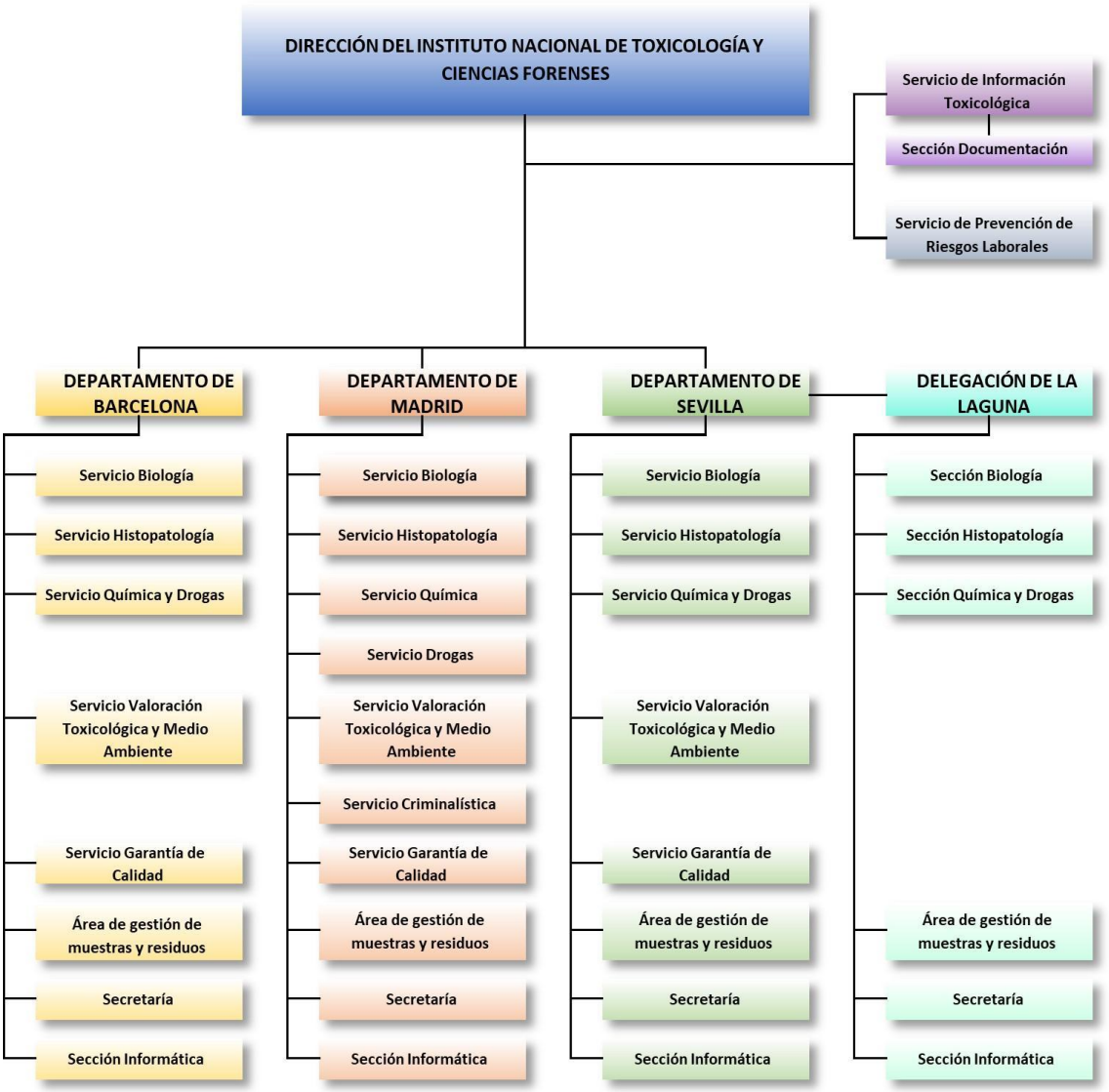
I wish to thank the Directors of the Department and the INTCF Delegation for their dedication and compromise. The Heads of Service and all the specialist teams of the INTCF (doctors, specialist technicians, and laboratory assistants) for their professionalism, and likewise the general bodies of the Administration of Justice assigned to the INTCF..

I would also like to take this opportunity to thank all institutions, universities, national and international organisms, which in 2019, have collaborated with the INTCF, with special mention going to the legal medicine and forensic science institutes with which the INTCF continues to work closely in our common task of giving technical-scientific advice at the service to courts and the Public Prosecutor’s Office.

2. The Organization at a glance

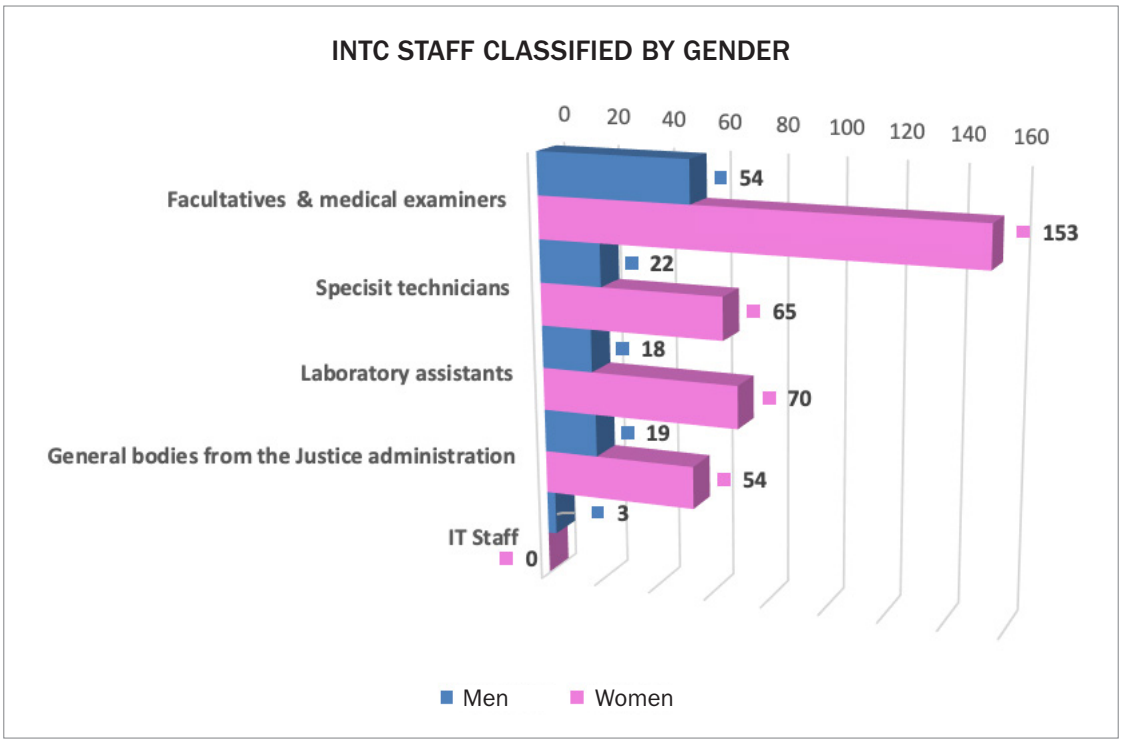
The following graphs show the INTCF chart organization, the territorial scope of action of the four headquarters, the staff distribution by gender and according to the different professional bodies, the budget expenditure during 2019, the overall statistical data of the expert activity, and the distribution of the cases registered by each region of the country.

2.1. INTCF Chart

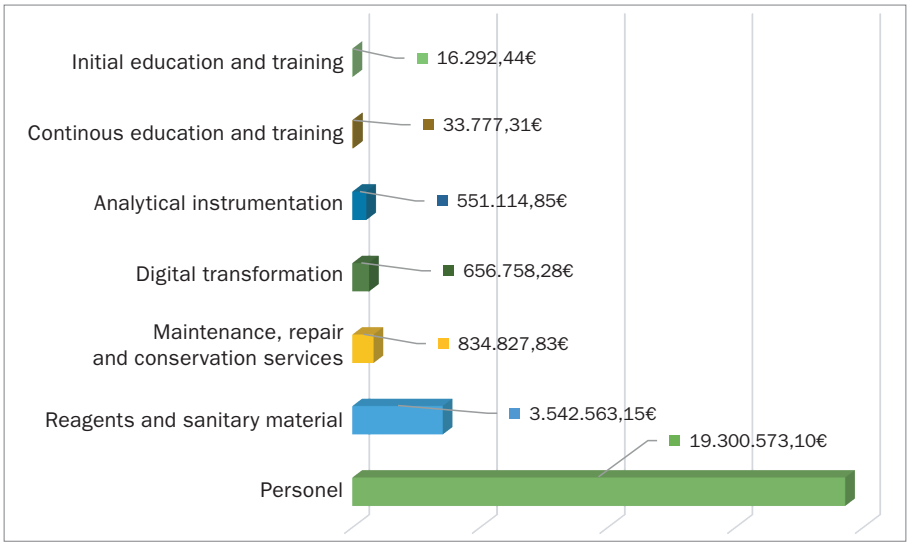


2.2. Scope of action of the various INTCF sites

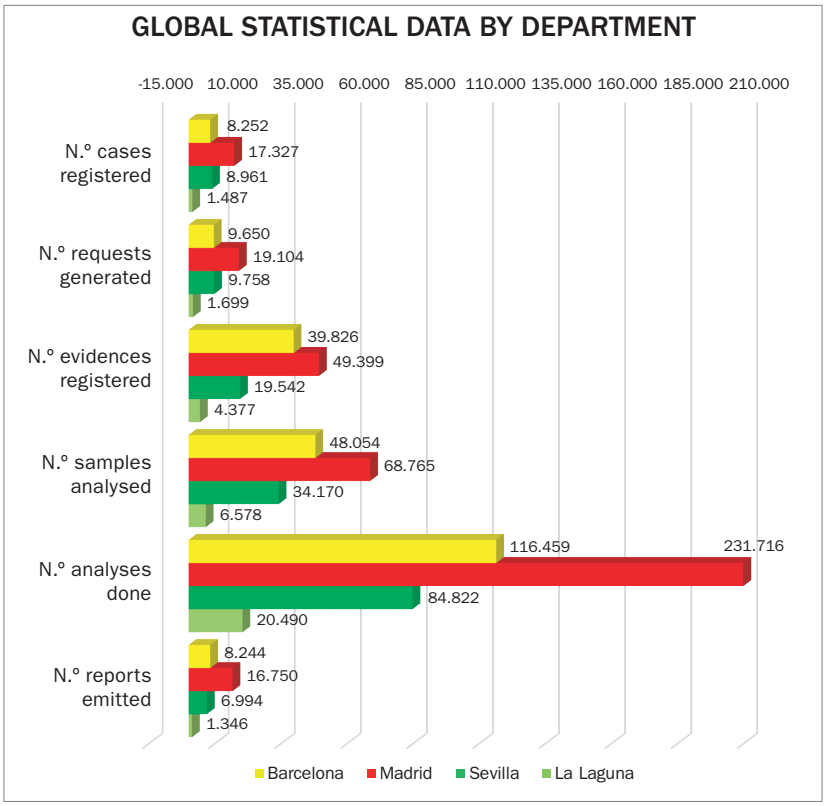
2.3. INTCF Staff



2.4. Expenses incurred by the INTCF in the financial year 2019

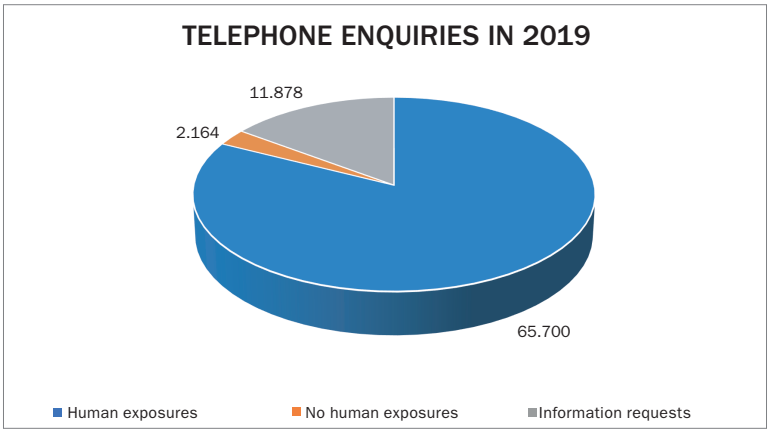


2.5. Summary of the Scientific-Expert Activity

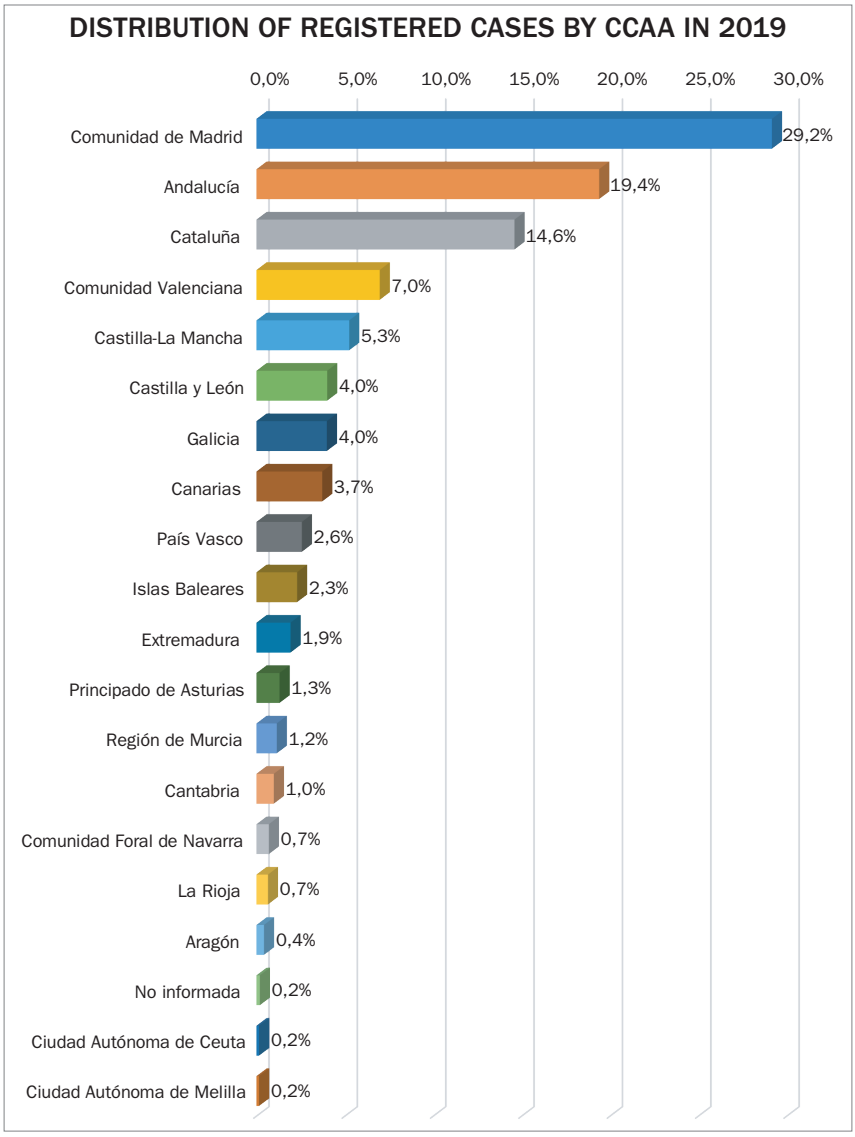


	N.° cases registered	N.° requests generated	N.° evidences registered	N.° samples analysed	N.° analyses done	N.° reports emitted
Barcelona	8.252	9.650	39.826	48.054	116.459	8.244
Madrid	17.327	19.104	49.399	68.765	231.716	16.750
Sevilla	8.961	9.758	19.542	34.170	84.822	6.994
La Laguna	1.487	1.699	4.377	6.578	20.490	1.346
Total	**36.027**	**40.211**	**113.144**	**157.567**	**453.487**	**33.334**

2.6. Telephone enquiries handled by the Toxicology Information Service in 2019



2.7. Distribution of registered Cases by Autonomous Communities



3. Chemistry and Drug Services

Each department counts with a Chemistry and Drugs Service except for the Madrid Department, which has a Chemistry Service and a Drug Service Finally, the Delegation of Laguna counts with a section of Chemistry and Drugs.

The Chemistry and Drugs Services functions are to do expert activities but also develop teaching and investigation functions. The following types of investigations are mainly included in his expert work:

Post-mortem Toxicological Investigation:

- *Deaths by homicide*
- *Deaths by suicide*
- *Deaths by adverse reaction to psychoactive substances*
- *Deaths by car accidents*
- *Deaths by work accident*
- *Deaths related to sport*
- *Deaths by drowning*
- *Deaths by fire*
- *Deaths by malpractice*
- *Deaths of unknown etiology suspected of criminality*
- *Death data (from ions in vitreous humor)*
- *Deaths of unclear etiology: (Sudden adult death, Sudden infant death, Sudden infant death, Sudden death associated with sport and Others).*

Toxicological Investigation in Live Subjects:

- *Offenses against traffic safety*
- *Crimes against sexual liberty, and chemical submission*
- *Crimes against public health*
- *Other types of offenses*
- *Habitual alcohol, drugs, and psychopharmacological use*
- *Clinical samples*
- *Suspect of poisoning*

Chemistry toxicological analysis of non-biological samples from drug seizures (caches)

Chemistry and Drug Services staff who have carried out such investigations during 2019, is shown in Table 3.1.

Table 3.1. Staff of the Chemistry and Drugs Services of the different Departments

	INTCF-MADRID (Chemistry Services)	INTCF-MADRID (Drugs Services)	INTCF-BARCELONA	INTCF-SEVILLA	INTCF-LA LAGUNA
Head of the Department	1	1	1	1	1
Facultatives	14	10	17	17	2
Specialist technicians	12	5	9	6	3
Laboratory assistants	6	12	6	7	1
Administratives	1	2	2	2	-

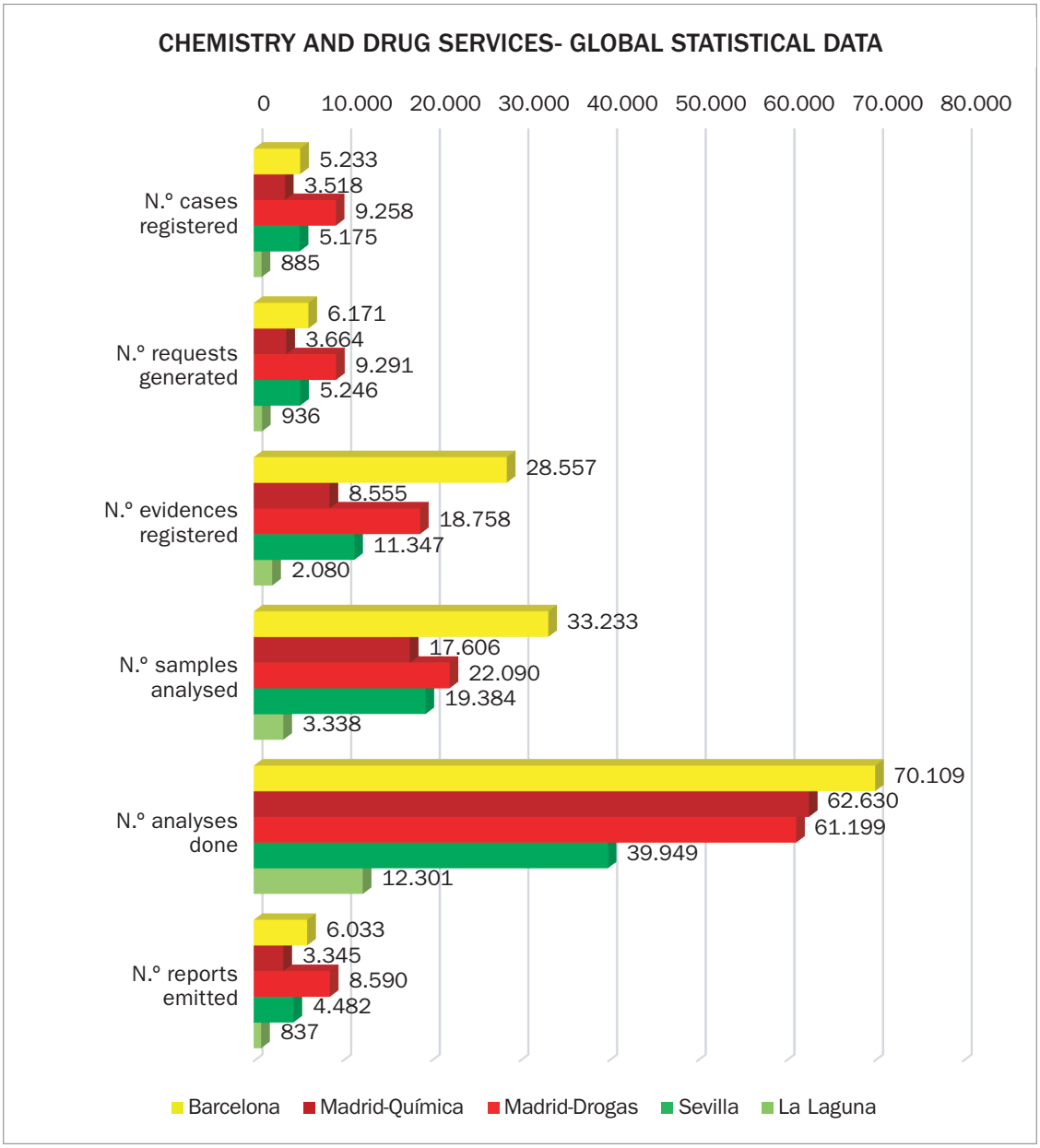
The Chemistry and drugs services from INTCF have registered during 2019 a total of 24,069 expert cases and a total of 69,297 evidences for the analysis, emitting 23,287 expert reports after the analysis of 95,651 samples on which 246,188 analyses were carried out (Figure 3.1).

The data supposes an increase of 2,7% in the number of reports emitted compared to 2018 (22,673 reports).

Special mention to the analyses of traffic accidents associated with the consumption of ethyl alcohol, drugs, and psychotropic drugs. The results of which have been previously published monographically in the 2019 INTCF report about «Hallazgos toxicológicos en víctimas mortales de accidentes de tráfico».

The Chemistry and Drugs Services during 2019 has also acted as reference centers participating in teaching activities apart from the expert activity. Collaborating with the Legal Medicine Institutes and university centers, consulting in actuation protocols with medical-legal repercussion, doing validation studies, and evaluating diverse technologies like acting in reference centers from the *Society of Hair Testing* to analyse drugs in the hair.

Figure 3.1. Overall data of the INTCF Chemistry and Drug Services' Expert Activity in 2019



	N.º cases registered	N.º requests generated	N.º evidences registered	N.º samples analysed	N.º analyses done	N.º reports emitted
Barcelona	5.233	6.171	28.557	33.233	70.109	6.033
Madrid-Química	3.518	3.664	8.555	17.606	62.630	3.345
Madrid-Drogas	9.258	9.291	18.758	22.090	61.199	8.590
Sevilla	5.175	5.246	11.347	19.384	39.949	4.482
La Laguna	885	936	2.080	3.338	12.301	837
Total	**24.069**	**25.308**	**69.297**	**95.651**	**246.188**	**23.287**

Hereunder, the Chemistry and Drugs Services from the different Departments collect the expert and scientific activity and the teaching activities during 2019. A description of a relevant forensic case is also included in each Service to publicise it.

3.1. Chemistry Service Madrid Department

During 2019 the Chemistry Service Madrid Department expert activity had 3,664 requests received with 8,555 evidences, 17,606 samples were analyzed with 62,630 analyses, issuing a total of 3,345 expert reports.

As seen in figure 3.1.1, the majority request for analysis corresponds with a **general toxicology study** (2,350 requests with 5,964 evidences) in dead persons, without a death cause confirmed. Also an analytical systematics aimed at the identification and quantification if proceeds from samples received to help clarify the death cause.

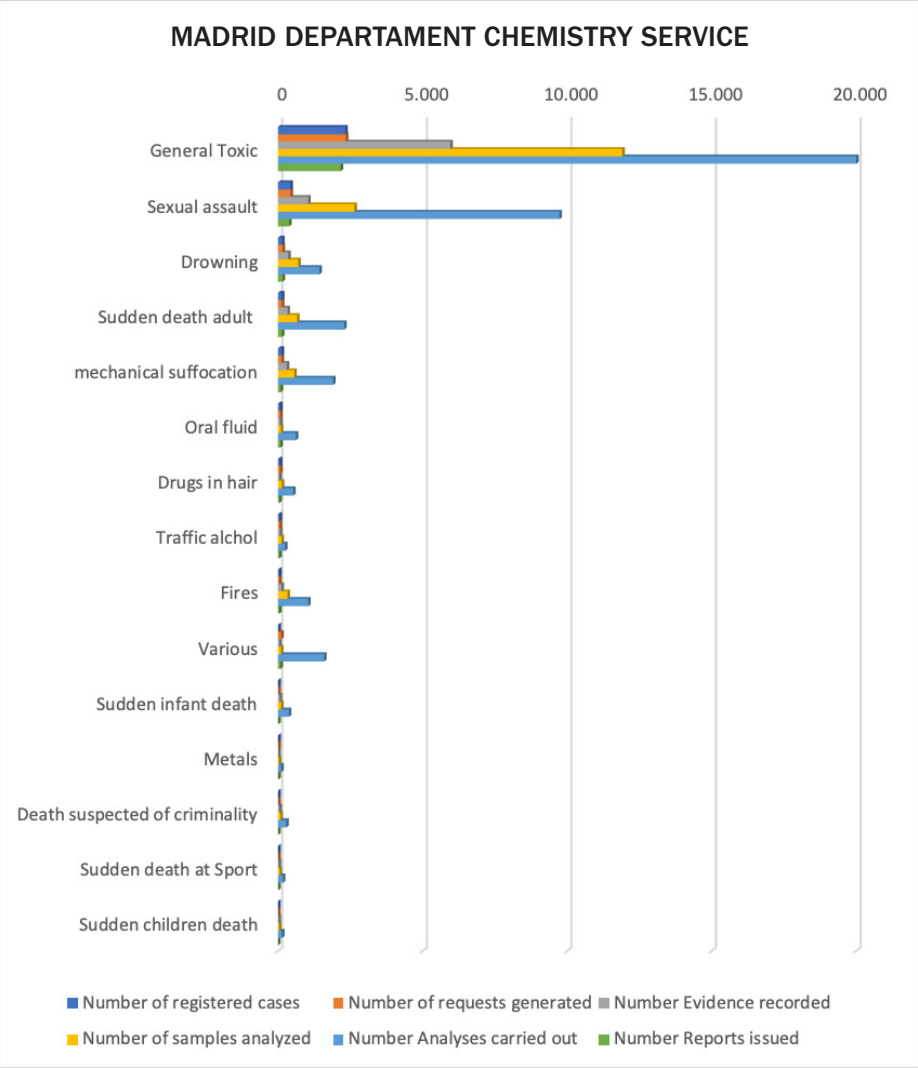
The second most numerous analysis requests correspond to **crimes against sexual liberty** (439 requests with 1,048 evidences). A systematic analytic to identify the possible employment of substances capable of producing chemical submission leads to the use of different analytical techniques and maximum resolution detectors to cover a large number of substances to investigate as well as reaching low detection limits.

In third place, toxicology investigations of the **sudden deaths (adult, children, and infant)** (176 requests with 442 evidences), and **submersion deaths** (163 requests with 358 evidences), and **mechanical asphyxia** (128 requests with 307 evidences).

Other investigations were done in 2019 by the Madrid Department Chemistry Service, with a smaller number of requests that are: **toxicology investigation in fires, study hair detection drugs, metal intoxications, or environmental studies**.

The Chemistry Service Madrid Department, apart from realizing the analysis to answer the requests, also determined alcohol (1,537 analysis) through Enzyme Immunoassay techniques (4,329 analyses) that the Drugs Service receives.

Figure 3.1.1. Casework of the Madrid Department Chemistry Service during 2019 according to the type of report



Type of Report	Number of registered cases	Number of requests generated	Number Evidence recorded	Number of samples analyzed	Number Analyses carried out	Number Reports issued
General Toxic	2.327	2.350	5.964	11.911	42.121	2.175
Sexual assault	435	439	1.048	2.647	9.738	385
Drowning	146	163	358	705	1.433	163
Sudden death adult	137	137	333	661	2.290	139
Mechanical suffocation	128	128	307	567	1.908	95
Oral fluid	76	76	77	101	619	84
Drugs in hair	71	78	55	135	529	53
Traffic alchol	61	61	68	123	246	52
Fires	46	47	125	331	1.048	46

Type of Report (cont.)	Number of registered cases	Number of requests generated	Number Evidence recorded	Number of samples analyzed	Number Analyses carried out	Number Reports issued
Various	21	114	47	107	1.599	89
Sudden infant death	19	19	61	109	379	14
Metals	16	17	14	30	116	16
Death suspected of criminality	15	15	50	84	288	14
Sudden death at Sport	13	13	26	57	174	15
Sudden children death	7	7	22	38	142	5
Total	**3.518**	**3.664**	**8.555**	**17.606**	**62.630**	**3.345**

3.1.1. Interesting forensic case: A suspicious criminal death caused by chronic benzodiazepine use

The following case received in the Chemistry Service during 2019 will be presented. The toxicological study was more than relevant. Not only to establish the cause of death but also to determine medical-legal etiology. What appeared to be a natural death turned out to be a death with suspicion of criminality.

The Chemistry Service received samples taken from a deceased minor which required a general toxicology study to confirm or rule out the presence of any toxic.

The forensic hypothesis for the cause of death was an encephalic or pulmonary infection due to anamnestic data showing that the minor had been ill for several days with symptoms resembling those of influenza and taking paracetamol for fever.

The medical examiner sent blood samples, vitreous body, and gastric content for toxicological testing, samples for the microbiology study (Biology Service), and samples for the Histopathology Service.

On receipt of the samples the Chemistry Service made the following analyses:

In the blood sample:

Ethyl alcohol and other volatiles (methyl alcohol, acetone, and isopropanol) through chromatography.

Presumptive analysis by Enzymeimmunoassay: barbiturates, benzodiazepines, tricyclic, cocaine, amphetamines, methadone, and cannabis.

In the blood samples and gastric:

General organic toxicology research aimed at the detection of drugs of abuse, psychotropic drugs, and frequently used pharmaceuticals mainly: antidepressants, antipsychotic,

antiepileptic, analgesic, antiplatelet antidiabetics sulphonylurea-type, antidiabetics, antihypertensives, non-steroidal anti-inflammatory, antihistamines, antiparkinsonian drugs, barbiturates, benzamides, benzodiazepines, diuretics, methadone, and pyrazolone among others by CG-MS and HPLC.

The toxicological results obtained the presence of two drugs in the blood sample and the gastric contents:

- **Ibuprofen** is a propionic acid derivative with analgesic, anti-inflammatory, and antipyretic properties. Its presence and the level of blood concentration detected would be compatible with its intake for the influenza process listed on the form.

- **Lorazepam** is an orally administered, parenterally active benzodiazepine with anxiolytic, sedative-hypnotic, anticonvulsant, and muscle relaxant properties. Its elimination half-life is much longer in newborns and children (40.2h) than in adults (12.9h) because the metabolic pathway of glucuronidation is not mature yet. The blood concentration detected was 0.2 mg/L. This concentration, which, in adults, could be considered within the therapeutic range, but in children, there is no respective data.

Given the presence of Lorazepam and the absence of any indication on the form about its possible use, for example, in the treatment of seizures (one of the clinical indications in children under 16 years of age), we contacted the doctor to inform him of the results of our report. He confirmed to us that the person who could have this prescription was the deceased mother, and seeing as the corpse had already been buried, an exhumation request was made so that hair samples be taken and a retrospective study is performed that would verify it the Lorazepam in the blood was due to a one-off repeated use.

The hair sample subsequently received, analysis proceeded of the first four centimeters from the cutting zone nearest to the scalp, segmenting it according to distribution starting by the nearest to the cut end:

- Segment 1: from 0 to 2 cm

- Segment 2: from 2 to 4 cm

In the two hair aliquots, investigation was made into presence of benzodiazepines (mainly lorazepam), along with metabolites thereof, and the benzodiazepine analogs zopiclone and zolpidem by UPLC-MS/MS.

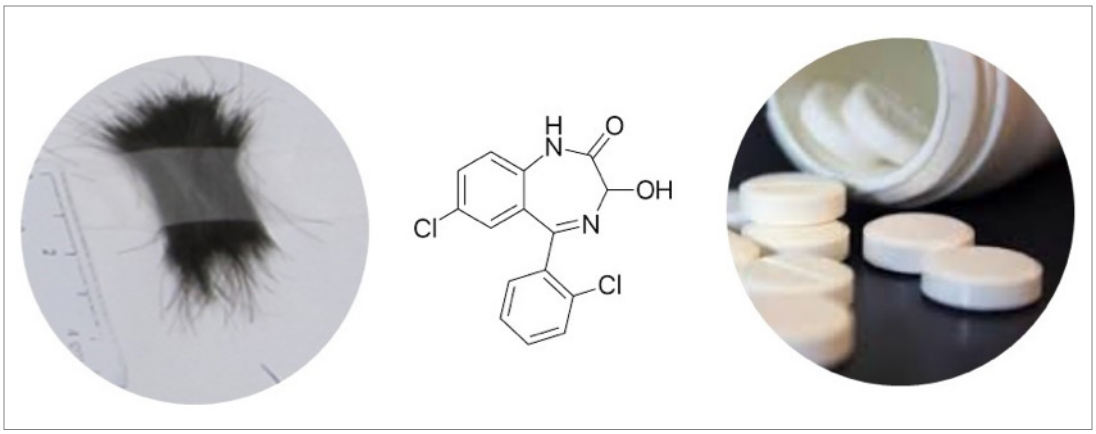
The finding of lorazepam in both segments implied that during this period of hair growth there was a repetitive consumption of the substance.

In the rest of the studies done at the Centre the results were as follows:

- The histological findings were compatible with the flu, but no pathology was observed that could have a casual relationship with sudden death.
- In the nasal swab Influenza A genetic material was identified matching with the diagnosis and histological findings.

Therefore, the presence and hematic concentration of Lorazepam could indicate the cause of death as a consequence of respiratory depression that ended in coma and death.

Figure 3.1.1.1. Hair sample analysed in the case described, Lorazepam formulation and tablet pack



3.1.2. Scientific and Teaching Activity

3.1.2.1 Participation in investigation projects

Title: Evaluation and teaching intervention to prevent drug consumption, and sexual violence in youth. Epidemiological area.

Collaborating and financial entities: Ministry of Health, Social Services and Equality.

Duration: 3 years

Objective resume: Identify the relation between alcohol consumption and sexual violence, using universitary context as a tool for diagnosis and germ for youth participatory actions in environmental, peer-to-peer, drug, and gender-based violence prevention.

Results: pending publication in a scientific journal.

3.1.2.2 Contribution to scientific congresses

B. Bravo; C. Figueroa; P. Prego-Meleiro; G. Montalvo y 15 estudiantes presentando sus acciones de prevención de proyectos Aprendizaje Servicio. Facultad de Farmacia,

Universidad Alcalá de Henares (Madrid, España). Jornadas de prevención sobre abusos sexuales por Sumisión Química. 25/02/2019- 01/03/2019; (5 h). https://www.uah.es/es/agenda/index.html?cevento=15874

Óscar Quintela. «Datos del laboratorio español de referencia». Comunicación oral. XXII Jornadas de la ANMF y II Jornadas de la EML de la UCM. Madrid. 8 de marzo de 2019.

Pilar Pinto, Óscar Quintela, María Andreu. «Suicidio con frutos del tejo. A propósito de un caso». Comunicación tipo poster. XXII Jornadas de la ANMF y II Jornadas de la EML de la UCM. 8 de marzo de 2019. Madrid. España.

G. Montalvo, C. Figueroa Navarro; B. Bravo; P. Prego, F. Ortega-Ojeda; G. Quintanilla; C. García Ruiz; M. R. García Pernía. XI ENCUENTRO DE INNOVACIÓN EN DOCENCIA UNVIERSITARIA: «Dando la vuelta a los procesos de enseñanza y aprendizaje: Aula invertida y otros retos de la educación superior». Sesión AULA INVERTIDA, «Aula invertida como apoyo esencial para el proyecto de Aprendizaje Servicio de intervención educativa frente a la sumisión química» (comunicación oral CO1-NA1). Alcalá de Henares (Madrid, España). 29-31 de mayo 2019. https://www3.uah.es/ice/ID/encuentros/XIencuentro.html

Bravo B, Lanzón S, Ortega A, Acedo C, Andreu MC. «Pentobarbital: medicamento para morir dormido. Incremento de su uso en suicidios, revisión de 2014 a 2018». Comunicación oral. XXIII Congreso Español de Toxicología y VII Iberoamericano celebrado en la Facultad de Derecho de la Universidad de Sevilla (España) del 26 al 28 de junio de 2019.

Valcarce F, Del Valle ME. «Investigación toxicológica forense de intoxicaciones por gas sulfhídrico». Comunicación tipo póster. XXIII Congreso Español de Toxicología y VII Iberoamericano. 26-28 de junio 2019. Sevilla. España.

Quintela O, Ayuso S, Megía C, Bravo B, Gutiérrez D, Santiago A, Fernandez C. «Chemsex y sumisión química: sinergias entre el ámbito clínico y el laboratorio de Toxicología Forense». Comunicación tipo póster. XXIII Congreso Español de Toxicología y VII Iberoamericano. 26-28 de junio 2019. Sevilla. España.

M Zaballos; David Callejo; O Varela; J Almendral; MJ Baselga; I Fernandez; S García Ramos; A Melone; O Quintela; E Vázquez; R Sevilla; L Rodríguez-Rodríguez; S Velázquez. «Sodium bicarbonate vs. intralipid on bupivacaine toxicity». Comunicación tipo póster. 73nd Annual PostGraduate Assembly in Anesthesiology. Entidad organizadora: PostGraduate Assembly in Anesthesiology. 13-17 de diciembre de 2019. Nueva York, Estados Unidos de América

M Zaballos; D Callejo; O Varela; I Fernández; S García; L Rodríguez; O Quintela. «Estudio de la eficacia del tratamiento con bicarbonato sódico *versus* intralipid en un modelo experimental porcino de toxicidad cardíaca inducida por bupivacaína». 25.ª Reunión Anual ESRA España. 2-4 de octubre de 2019. Burgos. España.

3.1.2.3. Scientific publications

Fernández Alonso C, Quintela Jorge O, Bravo Serrano B, Santiago-Sáez AE. La importancia del factor tiempo en el análisis toxicológico de casos de sospecha de sumisión química en un servicio de urgencias. Emergencias. 2019; 31: 65-66.

Fernández Alonso C, Quintela Jorge Ó, Ayuso Tejedor S, Santiago-Sáez AE, González Armengol JJ. Intoxicación aguda por nuevas drogas de abuso en probables casos de sumisión química oportunista o mixta y chemsex en pacientes con VIH atendidos en urgencias. Emergencias. 2019; 31: 289-290.

Zaballos, Matilde MD, PhD; Callejo, David MD; Sevilla, Raul MD, PhD; Quintela, Oscar PhD; López-Menchaca, Ramiro MD; Melone, Arturo MD; Varela, Olalla MD; Anadón Baselga, M.ª José MD, PhD; Almendral, Jesús MD, PhD. Comparative Effects of Sodium Bicarbonate and Intravenous Lipid Emulsions on Reversing Bupivacaine-Induced Electrophysiological Toxicity in a Porcine Experimental Model. Anesthesia & Analgesia. July 2019 – Volume 129 – Issue 1 – pp. 63-72.

De Diego, C., Zaballos, M., Quintela, O. *et al.* Bupivacaine Toxicity Increases Transmural Dispersion of Repolarization, Developing of a Brugada-like Pattern and Ventricular Arrhythmias, Which is Reversed by Lipid Emulsion Administration. Study in an Experimental Porcine Model. *Cardiovasc Toxicol* 19, 432-440 (2019).

Pablo Prego Meleiro, Óscar Quintela Jorge, Gemma Montalvo, Carmen García Ruiz. Multi-target methodology for the screening of blood specimens in drug-facilitated sexual assault cases. *Microchemical Journal.* Volume 150, November 2019, 104204.

3.1.2.4. Relation of teaching and formation activities

Begoña Bravo Serrano. Impartición de conferencia «Detección de alcohol y drogas en la conducción. Aspectos analíticos y toxicológicos» en el ciclo de Lecciones de Química. Universidad de Alcalá. Enero de 2019.

Óscar Quintela Jorge. Profesor invitado en el XVII Curso de cromatografía de líquidos acoplada a la espectrometría de masas como herramienta analítica, impartido en el Centro de Química Aplicada y Biotecnología de la Universidad de Alcalá de Henares, impartiendo la ponencia «Aplicaciones de la LC-MS: una auténtica revolución en la toxicología forense y clínica». Celebrado en Alcalá de Henares el 7 de febrero de 2019.

Begoña Bravo Serrano. Participante en mesa redonda de la actividad formativa XXII Jornadas de la Asociación Nacional de Médicos Forenses y II Jornadas de la Escuela de Medicia Legal de la UCM. Sumisión Química: situación actual celebrada en el Centro de Estudios Jurídicos con la ponencia «Interpretación médico-legal de los resultados analíticos». Centro de Estudios Jurídicos. Madrid. 8 de marzo de 2019.

Óscar Quintela Jorge. Impartición conferencia «Sustancias psicoactivas en el ámbito forense». Curso de Especialista en Psiquiatría y Psicología Forense. Organiza: Instituto de

Postgrado en Salud Mental y la Universidad Pontificia de Comillas. Madrid. España. Junio de 2019.

Begoña Bravo Serrano. Tutor profesional de la asignatura Prácticas en Empresa. Titulación: Grado en Química de la alumna Inés Ramos María, con el proyecto de investigación «Evaluación del screening toxicológico mediante UPLC-QTOF frente a la sistemática analítica convencional». durante el periodo 8 de julio al 30 de septiembre de 2019 (300 horas).

Begoña Bravo Serrano. Ponente en el curso multidisciplinar de agresiones sexuales, papel de los trabajadores del INTCF: recepción de muestras en el laboratorio. Precauciones en el manejo, seguridad del trabajador, cadena de custodia (edición Departamento de Madrid), con la ponencia «Análisis de las muestras para investigación toxicológica. Sumisión química» celebrada en Madrid del 23 al 26 de septiembre de 2019.

Óscar Quintela Jorge. Impartición de conferencia «Aplicaciones de la LC-MS: una auténtica revolución en la Toxicología Forense y Clínica». Organiza: Universidad de Alcalá de Henares. Alcalá de Henares. España. 19 de octubre de 2019.

Óscar Quintela Jorge Dirección de curso del CEJ: «Cromatografía de líquidos acoplada a técnicas de alta resolución». Impartición de diferentes charlas en tres ediciones. Organiza: Centro de Estudios Jurídicos. Madrid, Barcelona y Sevilla. España. De octubre a noviembre de 2019.

Óscar Quintela Jorge. Impartición conferencia «Sumisión química». Curso sobre Protoloco de la Comunidad de Madrid en casos de sumisión química. Organiza: Dirección General de Investigación, Docencia y Documentación, en colaboración con la Comisión Técnica de Acciones en Salud frente a la Violencia de Género. Madrid. España. 11 de noviembre de 2019.

Óscar Quintela Jorge. Impartición conferencia «Aspectos analíticos en el laboratorio de toxicología». Organiza: Departamento de Nutrición, Bromatología y Toxicología, Facultad de Farmacia, Universidad de Alcalá. Alcalá de Henares. Madrid. 14 de noviembre de 2019.

Óscar Quintela Jorge. Impartición conferencia «Aplicaciones de la Toxicología Forense: sumisión química y drogas en el tráfico rodado». Organiza: Departamento de Fisiología y Farmacología. Unidad de Toxicología. Facultad de Farmacia. Universidad de Salamanca. Salamanca. España. 21 de noviembre de 2019.

Begoña Bravo Serrano. Tutor profesional de la asignatura Prácticas en Empresa. Titulación: Grado en Química de la alumna Angela Campos Peña, con el proyecto de investigación «Desarrollo de método analítico para la determinación de antihipertensivos inhibidores de la enzima convertidora de la angiotensina (tipo enalapril)», durante el periodo 7 de octubre al 20 de diciembre de 2019 (300 horas).

Begoña Bravo Serrano. Tutor de la alumna residente de Bioquímica Clínica del Hospital Clínico San Carlos, M.ª Ángeles Palomar Muriel (septiembre, octubre y noviembre 2019).

Begoña Bravo Serrano. Antonio Ortega Ortiz de Apodaca. Tutores en el Curso Selectivo de la 6.ª Promoción de Facultativos del INTCF.

Óscar Quintela Jorge. Profesor asociado del Departamento de Medicina Legal, Psiquiatría y Patología de la UCM durante el curso académico.

Begoña Bravo Serrano. Profesor asociado del Departamento de Química Analítica, Química Física e Ingeniería Química de la UAH durante el curso académico en el Grado de Criminalística: Tecnologías y Ciencias Forenses.

3.2. Madrid Department Drug Service

In the Madrid Drug Service Department, 9,291 requests were received with 18,758 evidences, and 22,090 samples were analyzed through a total of 61,699 analyses, issuing a total of 8,590 expert reports.

In figure 3.2.1, the predominant request for analyses corresponds to toxicological analyses. Mainly aimed at the detection of alcohol, drugs of abuse, and psychotropic drugs of judicial **samples from both live subjects and post-mortem studies**. (4,403 requests with 4,951 evidences), followed by the chemistry analysis requests on judicial samples with no **biological proceeding from drug confiscation (stash)** (2,799 requests with 11,329 evidences). It is interesting the investigation on emergent drugs (NPSs). Unfortunately, many of them are still unmonitored and remain illegal but constitute a serious health hazard for society. Most of them are sold on the Internet, with a false appearance that isn't safe. It is important to highlight the increase of these new drugs (NPS´s) that are long overdue to appear on the illegal market, hence the importance of the laboratory's role in analyzing these new structures and alerting the Spanish Early Warning System (SEAT) to their existence.

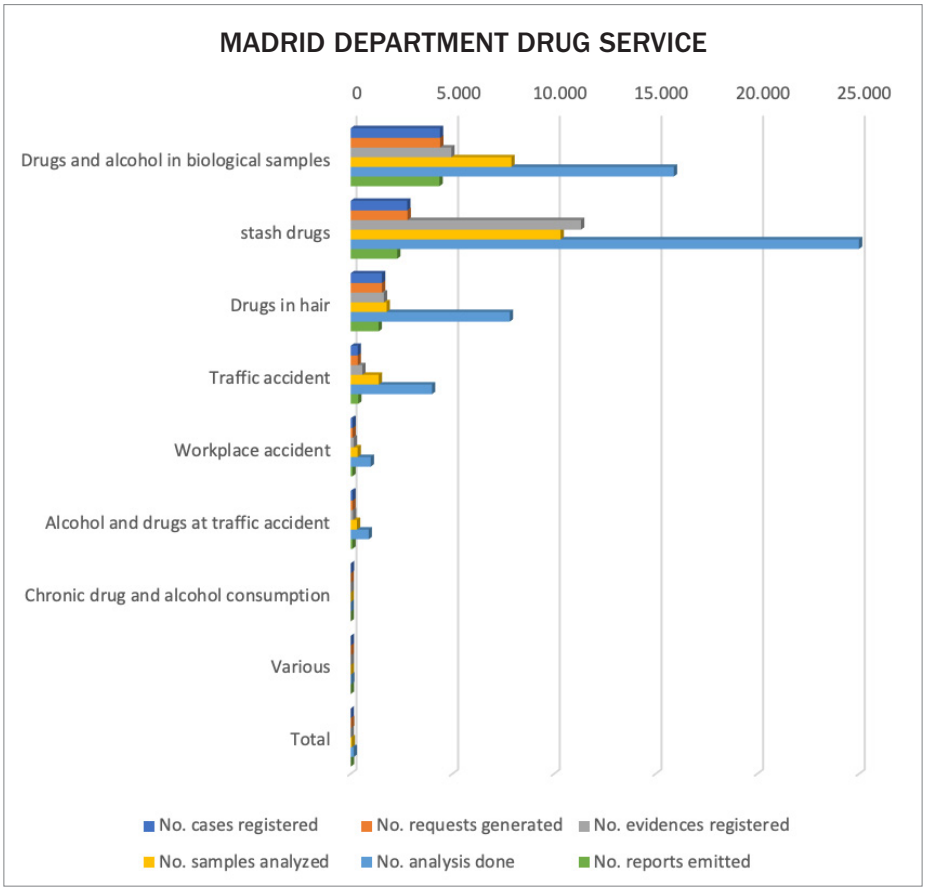
In the toxicological study, the **toxicological studies related to road traffic fatalities stand** out (347 requests with 574 evidences). Global data of these toxicological studies have been previously published monographicaly in the Report 2019 from the INTCF about Toxicological Findings in road traffic fatalities, 2019.

Besides that, **the study of chronic drug use in hair** is another of the most important requests that this service attends (1,541 requests with 1,634 evidences). The investigation of chronic drug use and alcohol through the analysis in the hair provides medical-legal assistance in the diagnosis of drug dependence to cases of criminal liability and to establish the chronological profile of drug use. These analyses were essential to check the end of drug consumption in cases of firm judgments to award custody in divorce proceedings.

The Drug Services during 2019 have done studies in evaluation and validation to consider the implementation convenience of the new technologies of screening in blood and urine by ELISA (RANDOX). The results obtained weren´t satisfactory because they produced false negatives. They couldn´t be implemented following the previous plan.

They have incorporated in the Service laboratories a series of high-resolution analytical equipment like gas chromatography coupled to tandem mass spectrometry (GC-MSMS), high-performance liquid chromatography coupled to tandem mass spectrometry (LC-MSMS), and liquid chromatography coupled to high-resolution mass spectrometry-Orbitrap (LC-HRMS-Orbitrap). Implementing the techniques has improved the identification and quantification of all kinds of substances, including new drugs known as New psychoactive drugs.

Figure 3.2.1. Casework of the Madrid Department Drug Service of during 2019 according to the type of report



Type of Report	No. cases registered	No. requests generated	No. evidences registered	No. samples analyzed	No. analysis done	No. reports emitted
Drugs and alcohol in biological samples	4.393	4.403	4.951	7.905	15.895	4.368
stash drugs	2.783	2.799	11.329	10.324	31.427	2.288
Drugs in hair	1.540	1.541	1.634	1.770	7.825	1.376
Traffic accident	347	347	574	1.382	4.000	372
Workplace accident	93	93	152	344	988	86
Alcohol and drugs at traffic accident	87	88	115	311	886	87
Chronic drug and alcohol consumption	3	3	3	5	24	4
Various	12	17	0	49	154	9
Total	**9.258**	**9.291**	**18.758**	**22.090**	**61.199**	**8.590**

3.2.1. Interesting forensic case: First case of lethal poisoning detected in Spain of a structural analogue of fentanyl (cyclopropyl fentanyl).

There is a case in the Drugs Services. The study established the death cause and warned the Sistema Español de Alerta Temprana (SEAT). A death that occurred in our country about recreation consumption with a fentanyl analog.

Cyclopropyl-fentanyl is a fentanyl analog. It is inside the drug groups known as New Psychoactive Drugs (NPS´s). During 2017 it was under review for possible control. Demonstrated by lethal case intoxications in other countries due to its highly toxic potential.

The information that the doctor gave in the removal of the body. Young male found in his domicile dead due to poly consumption of drugs. They found next to the body diverse blisters, capsules, tablets, and bags with white powder. Everything remained in police custody.

Initially, they just sent to the National Institute of Toxicology and Forensic Sciences (INTCF) the biological samples obtained in the autopsy (blood, vitreous humor, and urine). The no biological samples (paraphernalia) found next to the corpse collected by the Police and taken to the units were claimed to be sent to the Institute by doctor's order because they were crucial for the case.

Following the analytical system established for this type of case, biological samples (blood, vitreous humor, and urine) were investigated for alcohol and other volatile substances, drugs of abuse including NPSs, psychotropic drugs, and organic toxins in general.

The toxicological samples (see table 3.2.1.1.) revealed a poly consumption of several drugs: cocaine, heroin, amphetamine, and cyclopropyl fentanyl.

They used gas chromatography coupled to mass spectrometry (GC-MS) high-performance liquid chromatography coupled to diode array (HPLC-DAD), and high-performance liquid chromatography coupled to tandem mass spectrometry (UPLC-MS/MS) for the instrumental analysis. It is important to count with the high-resolution mass spectrometry (UPLC-HR-MS/MS, Orbitrap), which was crucial for the identification and structural elucidation of cyclopropyl fentanyl and metabolites.

Table 3.2.1.1. Toxicological findings in the forensic cases

Samples	Cyclopropyl fentanyl (mg/L)	Heroin metabolites (mg/L)	Cocaine and metabolites (mg/L)	Amphetamines (mg/L)	Benzodiazepines (mg/L)
Blood	0,02	Morphine: 0,02 Codeine: 0,05	BE: 0,08	0,05	7-amino-Clonazepam Diazepam and their metabolites Alprazolam and their metabolites
Vitreous humor	0,03	Morphine: <0,05 Codeine: < 0,05	BE: 0,09	0,07	
Urine	0,08	Morphine: 0,24 Codeine: < 0,05 6-MAM: 0,18	BE: > 2,00 Cocaine: 0,05	3,03	
Abbreviations: nt: not tested; BE: benzoylecgonine; 6-MAM: 6-monoacetylmorphine; 6-monoacetylmorphine.					

Figure 3.2.1.1. Chemistry structure of cyclopropyl fentanyl

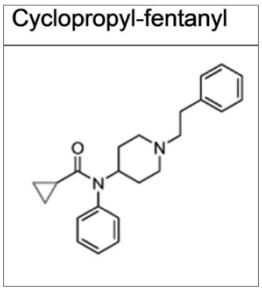


Figure 3.2.1.2. Identification of cyclopropyl fentanyl in the urine sample by high resolution mass spectrometry (UPLC-HR-MS/MS, Orbitrap Exactive Focus)

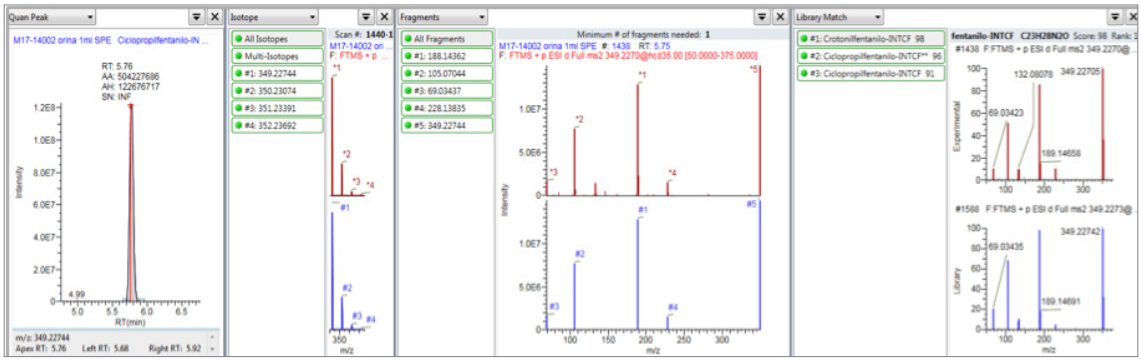
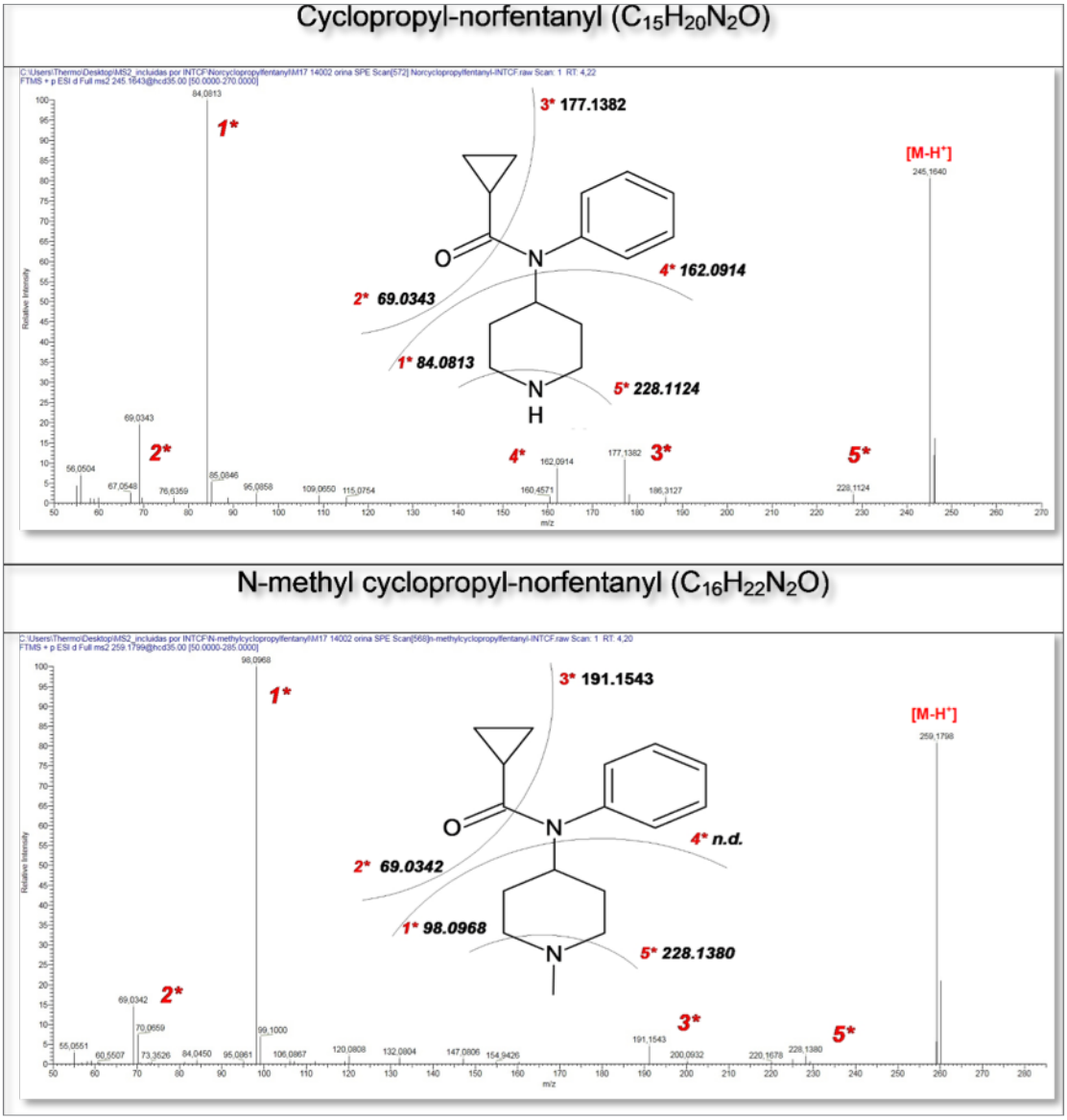


Figure 3.2.1.3. Identification and proposed fragmentation of two cyclopropyl fentanyl metabolites investigated in the urine sample by UPLC-HR-MS/MS, Orbitrap Exactive Focus



The patterns of drug poly consumption are dangerous because the toxic effects can be potentiated. The toxicity increases exponentially when these recreational practices involve fentanyl, 100 times higher than morphine. Severe intoxication cases were characterized by intense sedation with loss of consciousness, respiratory system depression, and fatal outcome. In this case, typical of a poly consumer of drugs, we think that the cyclopropyl fentanyl caused the death. It is necessary to be vigilant and alert society about the severe risk for health that these consumption practices drug cocktails have. Between the ingredients are also present the fentanyl.

INTCF's alert to SEAT and other laboratories to the European group enabled the control of cyclopropyl fentanyl.

This work is currently accepted and pending publication in the Journal Analytical Toxicology:

Jose Manuel Matey, Carmen García Ruíz, Gemma Montalvo García, Juan Carlos Gomez Soro, Daniel Gutiérrez Delicado, Jovita Rodriguez Gallardo, María Martínez, Ultraviolet-Visible and High-Resolution Mass Spectrometry for the Identification of Cyclopropyl-Fentanyl in the First Fatal Case in Spain, Journal of Analytical Toxicology, 2020 in press https://doi.org/10.1093/jat/bkaa081

3.2.2. Scientific and Teaching Activity

3.2.2.1. Participation in investigation projects

Martínez MA. Participante como experta en Química Forense en el proyecto de la Comunidad Económica Europea desarrollado en Ankara (Turquía): TR 16 IPA JH 03 18. «Forensic Trainings Towards Advanced Examination Methods». Activity 1.1 Assesment of the current situation and proposals to address training needs regarding new methodology in Forensic Biology and Chemistry. Ankara, Turquía, 24-28, Junio, 2019.

Burgueño MJ, Crespo I, Gutiérrez D. Expertos a corto plazo en Workshop on Analysis of new psychoactive substances by GC-MS device and interpretation of MS Spectrum. TWINNING PROJECT. República de Turquía, Reino de España, Unión Europea. Ankara, Turquía, 16-20 sept. 2019.

Lapeña S. Twinning TR 16 IPA JH 03 18 Forensic Trainings Towards Advanced Examination Methods. Activity 2.2: Accreditation assistance for analysis of new psychoactive substances by GC-MS at Gendarmerie Forensic Department (JKDB) and National Police Forensic Department (KPL). FIIAPP, Fundación Internacional y para Iberoamérica de Administración y Políticas Públicas. Cooperación Española. Ankara. Turquía, 16-20 dic. 2019.

3.2.2.2. Contribution in scientific congress

Matey JM*, Montalvo G, García C, López A, Martínez MA. Characterization of NPS metabolites through the analysis of hair samples by high-resolution mass spectrometry. A real case of methoxetamine. The 57th Annual Meeting of The International Association of Forensic Toxicologists (TIAFT), Birmingham, R.U., 2-6 sept. 2019 (póster).

Matey JM*, Montalvo G, García C, Gómez JC, Gutiérrez D, Rodríguez R, Martínez MA. The first fatality poly-consumption case involving cyclopropyl-fentanyl reported in Madrid. The 57th Annual Meeting of The International Association of Forensic Toxicologists (TIAFT), Birmingham, R.U., 2-6 sept. 2019 (póster).

Martínez MA*, Ballesteros S. Old Drugs in Modern Times. Opium Poisoning Fatalities in Western Countries. The 57th Annual Meeting of The International Association of Forensic Toxicologists (TIAFT), Birmingham, R.U., 2-6 sept. 2019 (póster).

Martínez MA*, Matey JM, Almarza E, Ortega M, Toledo B, Ballesteros. S. Innocent victims of drug abuser parents: Acute cannabis resin (hashish) intoxication due to accidental ingestion in two toddlers. The Society of Forensic Toxicologists-2019-Annual Meeting, San Antonio, TX, EE.UU. 13-18 oct. 2019 (póster).

Martínez MA*, Ballesteros S. Opium Poisoning in Modern Times. An Overview. The 1st International Forensic Science Congress, Turkish National Police Academy, Marriott JW Hotel, Ankara, Turquía, 2 dic. 2019 (oral). Profesora internacional invitada.

Burgueño MJ*, Sánchez S, Castro MA, Mateos R. Drug testing in hair: a powerful tool to approach the epidemiology of polydrug use. Section: Human Behaviour Toxicology. 57th Annual Meeting of the International Association of Forensic Toxicologists (TIAFT), Birmingham, R.U., sept. 2019 (oral).

Burgueño MJ*, Alonso A, Sánchez S. Do cosmetic treatments increase the incorporation of amphetamines into hair? Joint Meeting Société Française de Toxicologie Analytique (SFTA) - Société de toxicologie clinique (STC) - Society of Hair Testing (SoHT) - Toxicological Society of Belgium and Luxembourg (BLT), Lille (Francia). May. 2019 (póster).

Matey JM*, Moreno MD, Garcia C, Montalvo G. Evaluation of the analytical performance of a HPLC-MS/MS method for determining ketamine and norketamine in real forensic hair samples. Reanalyzing a selection of positive cases with high resolution LC-MS for seeking other arylcyclohexylamines. Joint Meeting Société Française de Toxicologie Analytique (SFTA) - Société de toxicologie clinique (STC) - Society of Hair Testing (SoHT) - Toxicological Society of Belgium and Luxembourg (BLT), Lille (Francia). May. 2019 (póster).

Matey JM*, Gallardo J., Montalvo G., García C., Gómez JC., Gutiérrez D., Martínez MA, Primer caso de intoxicación fatal detectado en España de un análogo estructural de fentanilo (ciclopropil-fentanilo). XXIII Congreso Español de Toxicología y VII Iberoamericano, Sevilla, 26-28 de junio de 2019 (com. oral).

Almarza E*., Martínez MA. El cabello como herramienta de análisis toxicológico en el caso de conducta delictiva de adolescentes y de maltrato infantil. Revisión de casos del Departamento de Madrid del INTCF. XXIII Congreso Español de Toxicología y VII Iberoamericano, Sevilla, 26-28 jun. 2019 (póster).

3.2.2.3. Scientific publications

Martínez MA*, Ballesteros S. Opium poisoning in modern times. An overview. *Forensic Sci Int.* 2019. 302: 109848.

Matey JM*, Moreno de Simon, M.D., García-Ruiz, C. and Montalvo, G. A validated GC-MS method for ketamine and norketamine in hair and its use in authentic cases. *Forensic Sci. Int.* 2019 Jun; 301: 447-454.

Matey JM*, Gallardo J, Montalvo G, García C, Gómez JC, Gutiérrez D, Martínez MA. Primer caso de intoxicación fatal detectado en España de un análogo estructural de fentanilo (ciclopropil-fentanilo). *Rev. Toxicol.* 2019 36(1): 35.

Almarza E*, Martínez M.A. El cabello como herramienta de análisis toxicológico en el caso de conducta delictiva de adolescentes y de maltrato infantil. Revisión de casos del Departamento de Madrid del INTCF. Rev. Toxicol. 2019 36(1): 69-70.

Burgueño MJ*, Sánchez S, Castro MA, Mateos-Campos R. Drogas y consumo de alto riesgo: patrón epidemiológico a partir de análisis de cabello en el contexto forense. *Rev. Española de Salud Pública.* 2019 Nov; 93: e1-16.

3.2.2.4. Relation of teaching and formation activities

Martínez MA. Dirección del Trabajo de Fin de Grado «Aspectos toxicológicos de la sumisión química. Revisión y papel de las fuerzas y Cuerpos de Seguridad del Estado», del CAC. D. Manuel García Villodrés, presentado en el Centro Universitario de la Guardia Civil en Aranjuez (Madrid). 3 jun. 2019.

Martínez MA. Dirección del Trabajo de Fin de Grado «Plantas psicoactivas utilizadas como Herbal Highs. Riesgo social. Papel de las Fuerzas y Cuerpos de Seguridad», del CAC. Dña. Marta Santos Palenzuela, presentado en el Centro Universitario de la Guardia Civil en Aranjuez (Madrid) 3 jun. 2019.

Martínez MA. Miembro del Tribunal en la exposición del Trabajo de Fin de Grado «Seguridad nacional e internacional a través del profiling de cocaína», del CAC. Dña. Mónica Cerdán Gea, presentado en el Centro Universitario de la Guardia Civil en Aranjuez (Madrid). 3 jun. 2019.

Martínez MA. Profesora de la sesión de prácticas del Máster en Ciencia y Tecnología Química (Analítica) de la UNED Madrid impartiendo la conferencia «Toxicología Forense». 11 de febrero de 2019 (2 h).

Martínez MA. Profesora invitada por la Dra. Ana Isabel Morales Martín, profesora titular de Toxicología de la Facultad de Farmacia de la Universidad de Salamanca, para impartir una conferencia sobre «Toxicología Forense», Salamanca, 11 de marzo de 2019 (2 h).

Martínez MA. Tutora responsable de la formación en Toxicología Forense del Dr. Diego Santiago Rinaldi, bioquímico del Poder Judicial de Corrientes, Argentina, desde el 04-03-2019 hasta 15-03-2019, horario continuado todos los días laborables de 7.30 a 14.30 h (70 h).

Martínez MA. Tutora responsable de la formación en Química Forense (prácticas externas) de Lucía del Prado Montero para optar al Grado en Biología, procedente de la

Facultad de Ciencias de la Universidad Autónoma de Madrid, desde el 18-09-2018 hasta el 19-03-2019 en horario continuado los días laborables de 9.00 a 14.00 h (125h).

Martínez MA. Profesora invitada: «Grandes catástrofes tóxicas. Revisión desde el siglo pasado hasta el presente», incluida en el VIII CICLO DE CONFERENCIAS del Instituto de Toxicología de la Defensa. Organizado por el coronel farmacéutico don José Luis López Colón. 14 de junio de 2019 (1 h).

Martínez MA. Profesora invitada: «La importancia de la toxicología forense como disciplina científico-técnica al servicio de la Administración de Justicia. Selección de 10 casos reales». Dentro del simposio «Innovation tour de Agilent». 20 de junio de 2019 (45 min).

Martínez MA. Tutora responsable de la formación en Toxicología Forense de Rubén Martín Pacheco, estudiante de Ciencias Químicas de la Universidad Complutense de Madrid, desde el 01-07-2019 hasta 05-09-2019 en horario continuado todos los días laborables de 7.30 a 14.30 h (300 h).

Martínez MA. Tutora, Prácticas Tuteladas de la 6.ª FX Promoción de Facultativos de Química y Drogas del INTCF. Nov. 2019.

Martínez MA. Tutora responsable de la formación en Toxicología Forense de Verónica Cámara Hernández, especialista en Bioquímica Clínica (R4) del Hospital Universitario de Getafe, desde el 01-10-2019 hasta 31-12-2019, horario continuado de 7.30 a 14.30 h.

Burgueño MJ. Profesora asociada del Departamento de Química Analítica, Facultad de Ciencias Químicas, Universidad Complutense de Madrid.

Matey JM. Director del trabajo Fin de Máster en Química Forense en «Análisis de arilciclohexilaminas y otras drogas en muestras de pelo mediante cromatografía de líquidos acoplada a la espectrometría de masas de alta resolución (LC-HR-MS/MS)». Presentado en la Universidad de Alcalá de Henares (UAH). Alumno: Adrián López Fernández. Año 2019. Jun. 2019.

Matey JM. Tutor en Química Forense del Máster en Ciencias Policiales de la Universidad de Alcalá de Henares (UAH). Alumno: Adrián López Fernández Año 2019. Enero-junio de 2019, 12 créditos.

Perspectiva de género abuso/dependencia de drogas y violencia. Fundación Salud y Comunidad Delegación del Gobierno para el Plan Nacional sobre Drogas. Enero de 2019. Asistente: Burgueño MJ.

Software MassHunter Avanzado: cualitativo y cuantitativo para GCMS y LCMS. Instituto Nacional de Toxicología y Ciencias Forenses. Madrid, Nov. 2019 (6 hr lectivas). Asistentes: Matey JM, Almarza E. Moreno MD, Rodríguez B, Pedregosa A, Alonso A, Montero A, Burgueño MJ, Crespo I, Gutiérrez D, Lapeña S, Juanas T, Rodríguez J. Martínez MA.

Cromatografía líquida de alta resolución (HPLC) y ultrarrápida (UHPLC) acoplada a la espectrometría de masas en tándem (operación y aplicación en QQQ e iniciación en

QTOF), organizado por los Servicios Generales de Investigación, SGIker, de la Universidad del País Vasco y celebrado en Leioa (Vizcaya), 4-8 nov. 2019 (25 hr lectivas). Asistente: Crespo I.

3.3. Barcelona Department Chemistry Service

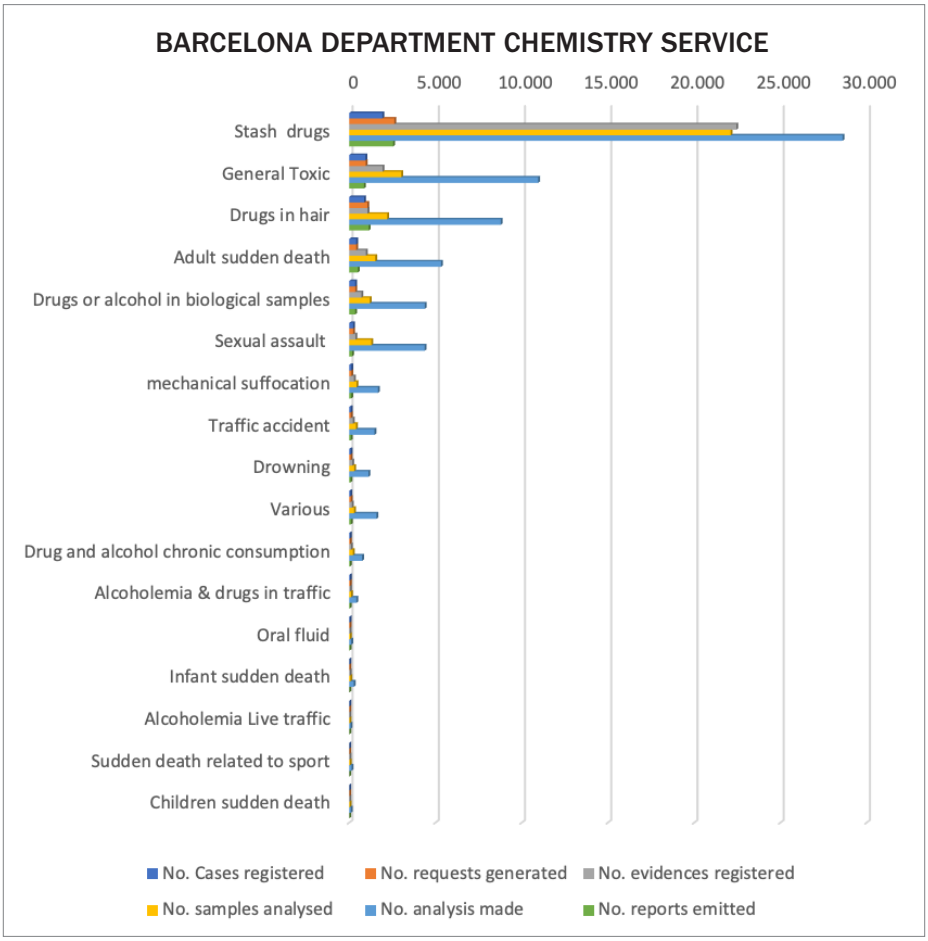
About the expert activity of the Barcelona Chemistry Service Department, during 2019 they received 6,168 requests with 28,557 evidences and analyzed 33,233 samples with a total of 70,101 of analysis, with a total of 6,079 expert reports.

As it can be seen in figure 3.3.1, the predominant analysis request corresponds to **drug analyses in stash** (2,614 requests with 22,447 evidences) followed by **drug analysis in the hair** (1,049 requests with 2,200 evidences).

The second most numerous analysis requests correspond to the **general toxic study** (956 requests with 1,936 evidences). This group has a systematic analytic aimed at the identification and quantification if derived from substances present in the samples received to assist in establishing the cause of death.

In third place by the number of requests received we find the toxicological investigations about **sudden deaths (adult, children, and infant)** (435 requests with 1,037 evidences), chemical submission investigations in cases of **sexual aggression** (228 requests with 363 evidences), and **mechanical suffocation** (125 requests with 270 evidences), and drowning **deaths** (84 requests with 181 evidences).

Figure 3.3.1. Casework of the Barcelona Department Chemistry Service during 2019 according to the type of report



Type of report	No. Cases registered	No. requests generated	No. evidences registered	No. samples analysed	No. analysis made	No. reports emitted
Stash drugs	1.925	2.614	22.447	22.118	28.603	2.548
General Toxic	944	956	1.936	3.020	10.955	853
Drugs in hair	862	1.049	1.064	2.200	8.787	1.134
Adult sudden death	406	406	968	1.512	5.320	501
Drugs or alcohol in biological samples	345	355	703	1.196	4.378	347
Sexual assault	224	228	363	1.283	4.371	171
mechanical suffocation	125	125	270	424	1.667	120
Traffic accident	91	96	209	393	1.465	89
Drowning	84	84	181	287	1.115	74
Various	68	92	154	281	1.581	98
Drug and alcohol chronic consumption	45	48	97	211	749	46
Alcoholemia & drugs in traffic	42	43	52	109	418	36
Oral fluid	30	30	30	46	120	29
Infant sudden death	14	14	34	70	265	10
Alcoholemia Live traffic	13	13	14	20	77	11
Sudden death related to sport	9	9	21	36	137	7
Children sudden death	6	6	14	27	93	5
Total	**5.233**	**6.168**	**28.557**	**33.233**	**70.101**	**6.079**

3.3.1. Forensic interesting case: Azaperone in the victim offense against sexual indemnity

The Legal Medicine Institute of Valencia received blood samples and urine of a Spanish woman. They requested a toxicological investigation about sexual indemnity offense. Medical history data describes that the victim consumed alcohol and marijuana on the dawn of 10 March half-naked in the half-day without reminding anything during that time. They specify to focus the study on the drug analysis and discard azaperone. Azaperone is a neuroleptic medicine and sedative for veterinary use to relax and sedate animals like pork combined with other medications (2). Depending on the dose, the effects change from sedation to immobilization and lack of narcotic effects. The use of azaperone is only for sedate animals. There have been no reports to date of its use in humans for therapeutic purposes or as a recreational drug.

The Barcelona Department Chemistry Service proceeded to do a routinary analysis of biological samples in sexual assault cases:

- The determination of ethyl alcohol in blood and urine by gas chromatography (GC) - headspace - FID.
- The investigation of the presence of opiates, monoacetylmorphine, cocaine, benzodiazepines, barbiturates, methadone, amphetamines, cannabis, tricyclic antidepressants, propoxyphene, and buprenorphine in *blood and urine* by homogeneous enzyme immunoassay - Cedia®/DRI®.
- General investigation of drugs and psychotropic drugs in *blood* by solid-phase extraction, and GC-mass spectrometry (MS) analysis, pre-and post- derivatization.
- General investigation of drugs and psychotropic drugs in *urine* by liquid-liquid extraction, and GC-MS analysis pre-and post- derivatization.
- Investigation of gamma-hydroxybutyrate (GHB) in urine by liquid-liquid extraction, and GC-MS analysis.

The presence of ethyl alcohol was detected neither in blood nor in urine (with a detection limit of 0.02 g/l).

The immunoassay showed a negative result in blood, but positive in cocaine and cannabinoids in urine.

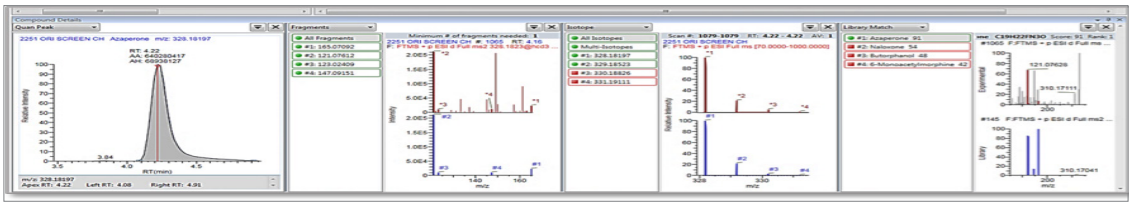
Through CG- EM the antiepileptic drug topiramate and the antipsychotic haloperidol were detected in the blood. Benzoylecgonine (cocaine metabolite), topiramate, haloperidol, the benzodiazepines lorazepam, and lormetazepam, the antidepressant drug trazodone and its metabolite metachlorophenylpiperazine and 11-nor-9-carboxy-delta-9-tetrahydrocannabinol, an inactive metabolite of Δ9-tetrahydrocannabinol, were detected in urine by

CG-EM. The urine result was negative for GHB. Not detected through CG-MS azaperone presence.

Since 2019 the Barcelona Chemistry Service carries out biological samples in sexual assault cases through ultra-high-performance liquid chromatography (UPLC) – orbitrap exactive. The high sensibility of this technique has permitted us the identification of compounds present in the samples that due to their low concentration level, can´t be detected by CG-EM. The search directed in UPLC- orbitrap exactive for compounds for which we do not have a standard, such as azaperone, is based on the screening method using a library of 1670 compounds.

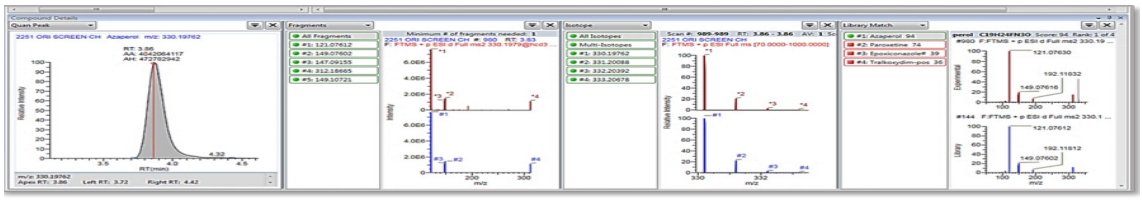
In this case, in both blood and urine samples, they identified azaperone, based that the compound complied with the retention time, with the exact mass, with 4 fragments and isotopes. Also, the extraction blanks were found negative for this compound.

Figure 3.3.1.1. Identification of azaperone in urine sample by UHPLC - Orbitrap Exactive



The presence of azaperone was further confirmed by the identification in both samples of its main active metabolite, azaperol (3).

Figure 3.3.1.2. Identification of azaperol in urine samples by UHPLC - Orbitrap Exactive



With this example, we would like to demonstrate the great advance that the use of the UPLC-Orbitrap Exactive technique has meant for the Barcelona Chemistry Service in the analysis of biological samples in matters of singular relevance, like sexual aggressions.

Bibliography references

(1) Moffat AC et al. Clarke's analysis of drugs and poisons, 3rd edition, Pharmaceutical Press, London. (2004) pp: 935-936.

(2) Carregaro AB et al. Azaperone and xylazine: A pharmacological combination to facilitate captive deer management for red brocket deer (Mazama americana). PLoS One. (2019) 14(8): e0220288.

(3) Rauws AG et al. Azaperol, a new metabolite of the veterinary butyrophenone tranquilizer azaperone. Toxicololy and Applied Pharmacology (1976) 35:2 333-339.

3.3.2 Teaching and scientific activity

3.3.2.1. Formative and teaching activities

Hernando Torrecillas, C. Profesor del curso multidisciplinar de agresiones sexuales, papel de los trabajadores del INTCF: Recepción de muestras en el laboratorio. Precauciones en el manejo. Instituto Nacional de Toxicología y Ciencias Forenses. Análisis de las muestras para investigación toxicológica. Sumisión química. Subdirección General de Medios Personales al servicio de la Admón. de Justicia del Ministerio de Justicia, dentro del Plan de Formación para personal funcionario. Celebrado en el Departamento de Barcelona del INTCF, Barcelona. España. 10 de octubre de 2019.

Mora Font, A, «Refuerzo de las unidades de investigación, institutos forenses, redes y procedimientos de investigación criminal en el Sistema de la Integración Centroamericana». HONDURAS-DPI. Actividad de mejora en el servicio de química y en el sistema de calidad. DROGAS DE ABUSO Y ALCOHOL. Tegucigalpa. Honduras. Del 25 al 29 de noviembre de 2019.

Marín Hernandez, C. y Aguilera Pedrazas, J. Accreditation Assistance for Analysis of Psychoactive Substances by GC-MS. Twinning Proyect. TR 16 IPA JH 03 18. FORENSIC TRAININGS TOWARDS ADVANCED EXAMINATION METHODS. Ankara. Turquía. 16 de diciembre-20 de diciembre de 2019.

Marín Hernández C. «Interpretación de resultados de toxicología forense. Mejora de la utilidad de la prueba». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. 10 horas lectivas. Málaga. España. Celebrado del 30 al 31 de mayo de 2019.

Hernando Torrecilla C. «Interpretación de resultados de toxicología forense. Mejora de la utilidad de la prueba». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. 10 horas lectivas. Málaga. España. Celebrado del 30 al 31 de mayo de 2019.

López Gómez M. L. «Interpretación de resultados de toxicología forense. Mejora de la utilidad de la prueba». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. 10 horas lectivas. Málaga. España. Celebrado del 30 al 31 de mayo de 2019.

Hernández Marín, E.; Hernando Torrecillas, C.; García García, E.; «Tips & Trics in GC and GCMS». Impartida por la Empresa Agilent, Barcelona, España. Celebrado el 17 de octubre de 2019.

Facultativos de los Servicios de Química, Garantía de Calidad y Valoración Toxicológica y Medio Ambiente. «Cromatografía de líquidos acoplada a técnicas de alta resolución».

Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. Barcelona. España. 22 de octubre de 2019.

Facultativos de Química, Garantía de Calidad y VTMA,.«Masshunter cualitativo y cuantitativo para análisis de compuestos conocidos por GCMS y LCMS. Búsqueda de desconocidos por GCMS mediante deconvolución». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. Impartido por expertos de la compañía AGILENT. Barcelona. España. Celebrado del 12 de noviembre de 2019.

Facultativos de los Servicios de Química, Garantía de Calidad y Valoración Toxicológica y Medio Ambiente. «Calidad aplicada al laboratorio. Estándares». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. Madrid. España. Celebrado del 19 al 20 de septiembre de 2019.

Personal del Servicio de Química. «XIV Jornada de actualización en Toxicología Clínica». Organizado por la Societat Catalana de Medicina d'Urgències i Emergències, celebrado en la Acadèmia de Ciències Mèdiques i de la Salut de Catalunya i Balears. Barcelona. España. 8 de febrero de 2019.

3.4. Seville Department Chemistry Service

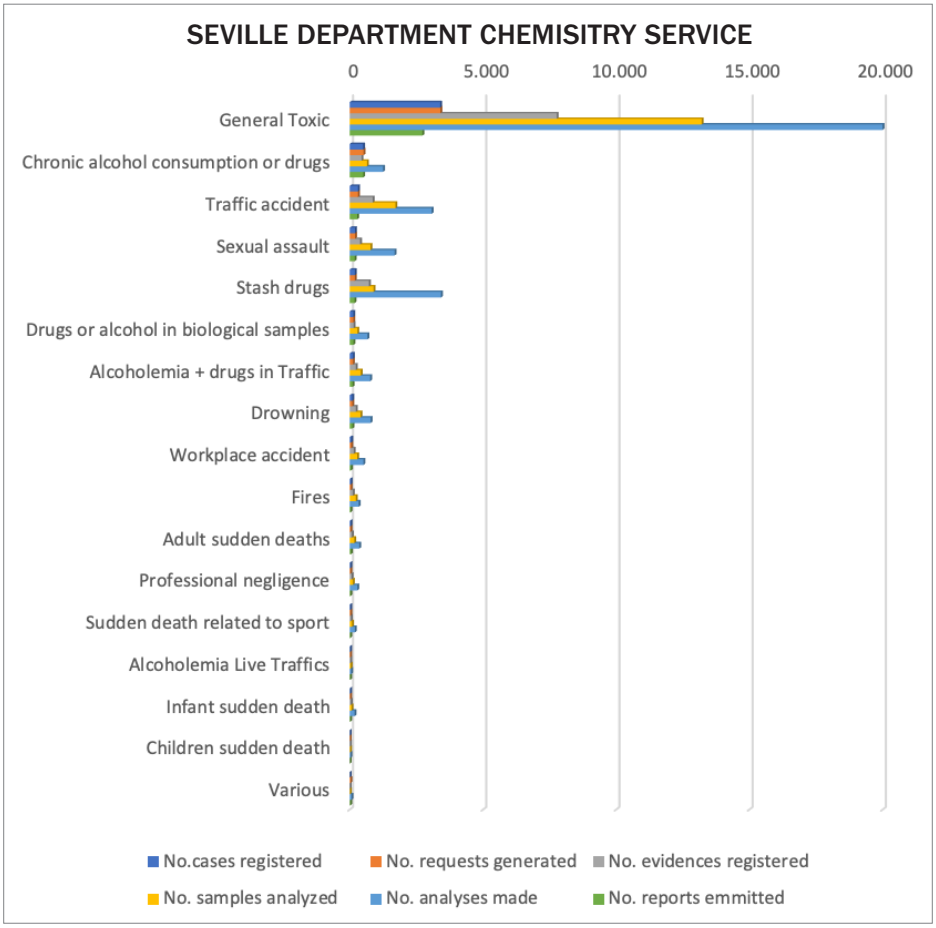
Expert activity is the base of the Seville Department Chemistry Service. The casework are very diverse. During 2019, they received 5,246 requests and registered 11,347 evidences, all of them arising from judicial cases.

As can be seen In figure 3.4.1, the majority request for analysis corresponds to **toxic general studies** in post-mortem studies (3,405 requests with 7,771 evidences received). This group is subjected to a systematic analysis aimed at the identification, confirmation, and quantification. If necessary, of substances present in the samples received to help establish the cause of death.

The second most numerous analysis requests are the **drug and alcohol chronic consumption** (521 requests with 445 evidences) and the toxicology studies in road **traffic accidents** (312 requests with 862 evidences).

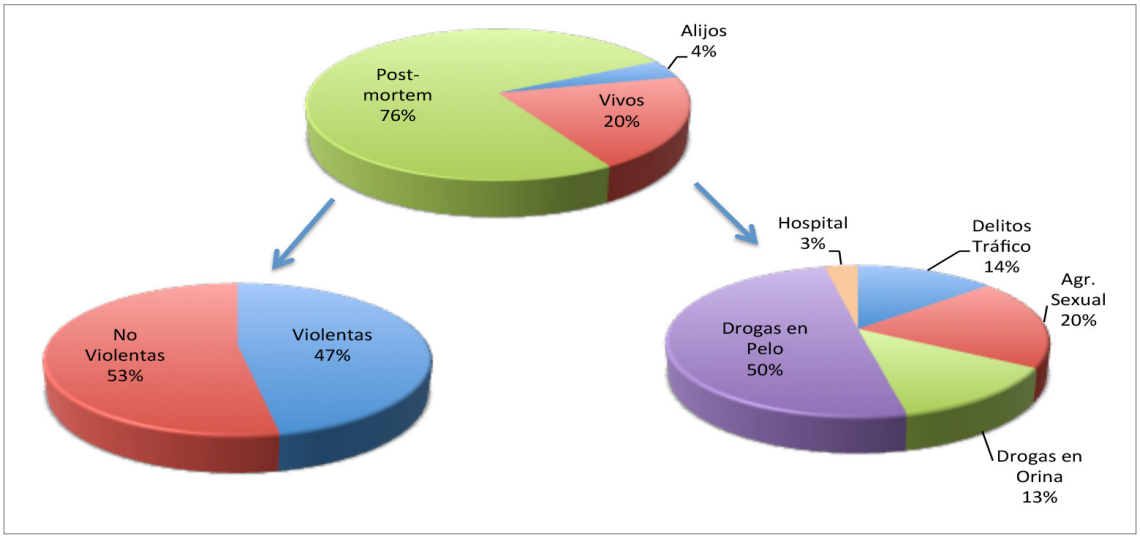
In third place, we have the toxicological investigations on **chemistry submission in sexual assaults** (203 requests with 392 evidences), **stash drugs** (194 requests with 725 evidences), and the **toxicologal studies in drowning cases** (100 requests with 230 evidences). The Seville Department Chemistry Service, apart from giving answers to the requests, also does the ethyl alcohol consumption determination through the analysis of ethyl-glucuronide in hair samples on requests received in all INTCF Departments.

Figure 3.4.1. Casework of the Seville Department Chemistry Service during 2019 according to the type of report



Type of Report	No. cases registered	No. requests generated	No. evidences registered	No. samples analyzed	No. analyses made	No. reports emmitted
General Toxic	3.395	3.405	7.771	13.213	26.261	2.730
Chronic alcohol consumption or drugs	504	521	445	648	1.252	508
Traffic accident	311	312	862	1.717	3.078	281
Sexual assault	197	203	392	780	1.684	188
Stash drugs	192	194	725	897	3.426	181
Drugs or alcohol in biological samples	138	138	148	289	668	143
Alcoholemia + drugs in Traffic	123	123	228	416	770	110
Drowning	100	100	230	407	788	103
Workplace accident	57	58	152	283	515	49
Fires	40	40	121	228	338	34
Adult sudden deaths	32	33	83	171	359	49
Professional negligence	28	28	74	120	286	25
Sudden death related to sport	22	25	45	89	193	23
Alcoholemia Live Traffics	16	18	23	38	54	17
Infant sudden death	15	15	41	71	183	18
Children sudden death	3	3	5	12	25	3
Various	2	30	2	5	69	20
Total	**5.175**	**5.246**	**11.347**	**19.384**	**39.949**	**4.482**

Figure 3.4.2. Classification of the casework of the Seville Department Chemistry Service by type of samples (Postmortem, live and non-biological samples)



The majority of the casework correspond to post-mortem cases (76%); cases in alive persons supposed the 20% and the 4% the cases related with drugs coming from stash. 2019 highlights the high suicide incidence representing 40% of violent deaths that supposes more than double of the road traffic accident deaths. (17%).

The quantity of the cases received at the Service permits the realization of population studies of great interest in forensic toxicology. In 2019 they did two studies about cannabis. The first with stash samples indicated that Tetrahydrocannabinol concentrations (THC) have been duplicated during the last ten years in the resin (hashish), and the plant leaves (marihuana). The other study was done in post-mortem cases. They compared the cannabis consumption incidence in different types of death. The results demonstrated that 7,5% of all the deceased had consumed cannabis. The comparative study revealed that the major incidence in positive cases wasn´t found in drug consumers (24,4%) but deaths without a natural cause (35,1%), showing the high use of cannabis, not only by drug addicts but also by the general population. They also compared the time elapsed between cannabis consumption and death. The results were different. The most recent consumption was identified in road traffic fatalities and the latest in drug users.

One of the objectives of the Service is the quality of expertise. The Service is recognized internationally because it is one of the three reference centers of a «Proficiency Test» for the drug analysis in hair, organized by the Society of Hair Testing, which has a global scope.

This Drug and Chemistry Service is characterized by a good relationship with the medical examiners and Legal Medicine Institutes. To collaborate in courses and other organized activities and not limited to court cases.

3.4.1. Important forensic investigation: Study of the stability of opioid compounds in blood and urine samples after one year post-analysis custody

It is required to maintain the samples in custody after the analysis at the disposal of the investigating judge in the field of toxicology. If they require extension of the judgment through complementary studies, or a request is made for a repetition of the analyses previously carried out.

For this reason, it is very important to know the stability of the analytes during the custody of the samples, since, depending on the time and storage conditions, important changes can be produced in the concentrations.

The possible discrepancies between the initial results and the obtained after a few months of custody can have a wrong interpretation, with the legal consequences that may follow.

Objectives

To study the *in vitro* chemical compound´s stability from the opioids compounds: 6-monoacetylmorphine (MAM), morphine (MOR), and codeine (COD) in blood and urine during the post-analysis and establish suggestions to preserve the biological samples. The evaluated parameters were: custody time, temperature, preservation addition (blood), and pH (urine).

Material and Methods

Blood and urine samples were added to the three analytes with a concentration of 1000 ng/mL for each one. The samples prepared this way were divided into two groups maintained at different temperatures (4 °C and –20 °C). Each of these groups was divided into two other groups: with and without preservative (NaF 1%) in the case of the blood and pH 4 and pH 8 in the urine.

MAM, MOR, and COD were analyzed by GC-MS after solid-phase extraction and derivatization with BSTFA. The analyses were done each 15 days during a year.

Stability was calculated by comparing the initial concentration on day 0 of sample preparation (considered to be 100%) with the concentrations obtained at the different analysis times. It was considered stable when the differences in concentrations were less than ±20%. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 20.0. The custody effect, in each of the conditions, was assessed using a T-test. A probability of less than 5% ($p>0.05$) was considered significant.

Results

In blood samples, MAM is the only compound that degrades. The best storage conditions were at –20 °C and with the addition of preservatives; these conditions are the only ones in which MAM is recovered, even if only 47.1±1.5%, after one year of storage. In other conditions, MAM disappears from the blood after 215 days (at 4 °C with NaF), 45 days (at –20 °C without NaF), and 15 days (at 4 °C without NaF). COD is not degraded and recoveries are above 90% in all conditions; ranging from 89.7±3.6% in samples kept at –20 °C without NaF to 95.9±2.0% in those kept at 4 °C with NaF. MOR recoveries were slightly lower than COD and ranged from 66.9±3.6% in preservative added frozen samples to 78.6±0.5% in refrigerated samples without NaF.

Figure 3.4.1.1. Recoveries of the three opioid compounds, MAM, Morphine and Codeine in blood samples after 365 days of custody

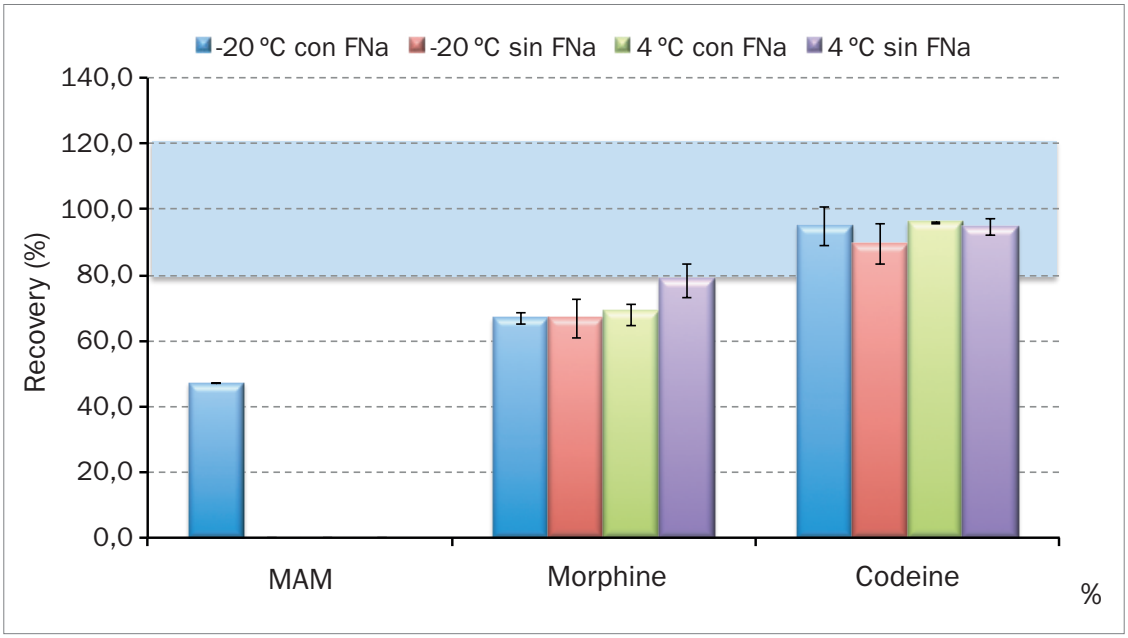
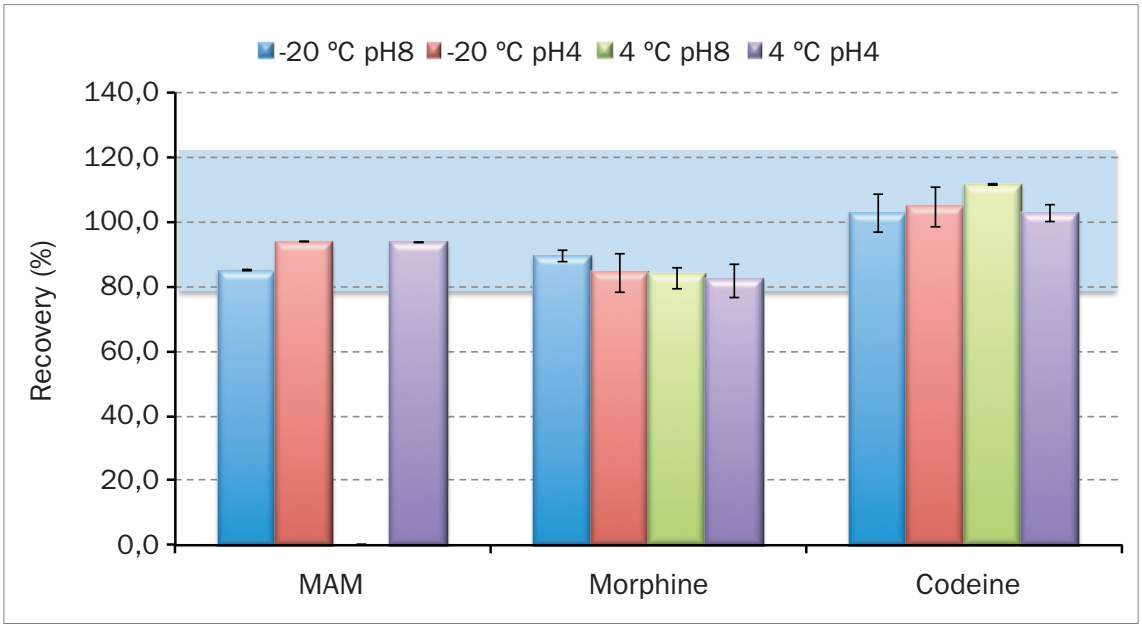


Figure 3.4.1.2. Recoveries of the three opioid compounds, MAM, Morphine and Codeine in blood samples after 365 days of custody



In urine samples, all three compounds were stable under all custody conditions, except for MAM in samples kept at 4 °C and physiological pH (pH 8); under these conditions, MAM disappears before one year of custody, namely at 135 days; while recoveries under the other conditions ranged from 93.7±6.4% at 4 °C and pH 4 to 85.1±2.0% at –20 °C and pH 8. MOR and COD recoveries were similar in the four conditions studied. In the case of MOR, they ranged from 82.1±1.2% at 4 °C and pH 4 to 89.5±6.0% at -20°C and pH 8. In COD, the recoveries ranged from 111.6±5.8% at 4°C and pH 8 to 102.6±1.2% at 4 °C and pH 4.

Conclusión

This study has manifested that the most uncertain opioid is the MAM and that its stability depends on the urine pH or the preservative addition in the blood samples.

The best conditions for the post-analysis custody of the biological fluid samples in heroine consumers are freezing at -20°C. Also, blood samples should have NaF added to them and urine samples should be buffered to pH 4 if kept refrigerated.

Note

This study is part of a doctoral thesis realized at the Seville Department Chemistry and Drugs Service titled «Stability of drugs of abuse and their metabolites in blood and urine samples. Interest in Forensic Toxicology». More detailed information, as well as the graphs showing the development of the stability, can be found in this publication: Huertas T, Jurado C, Salguero M, Soriano T, Gamero J. «Stability studies in biological fluids during

post-analysis custody. Opiate compounds derived from heroin consumption». For. Sci. Int. 2019; 297:326-334

3.4.2. Scientific and teaching activity

3.2.2.1. Participation in investigation projects

González Padrón A. Participación como experto en Toxicología en el Proyecto «Cooperación en investigación criminal en Centroamérica para combatir la delincuencia y el tráfico de drogas a nivel internacional-ICRIME LA/2017/39066». Financiado por la Unión Europea, la Agencia Española de Cooperación Internacional para el Desarrollo (AECID) y el Sistema de la Integración Centroamericana (SICA). Actividad implementada en el laboratorio del Instituto de Medicina Legal Roberto Masferrer. 2 al 6 de diciembre de 2019. San Salvador (El Salvador).

Jurado Montoro C. Miembro del Comité Científico del Observatorio Andaluz sobre Drogas y Adicciones (OASDA).

Moreno Bernal E. y Soriano Ramón T. Miembros del Comité Técnico de Seguimiento del Indicador de Mortalidad RASUPSI.

3.4.2.2. Contribution in scientific congresses

Jurado Montoro C. «Mortalidad por reacción aguda a sustancias psicoactivas. Aspectos toxicológicos». Seminario de Formación en Patología Dual, Sobredosis y Mortalidad por Reacción Aguda a Sustancias Psicoactivas en Centros Penitenciarios. 27 y 28 de marzo de 2019. Madrid.

Jurado Montoro C. «Interpretation challenges of hair analysis». 2019 Symposium on Forensic Theory and Practice & TIAFT Regional Meeting. 22 al 25 de mayo de 2019. Shanghái (China).

Jurado Montoro C. «The role of toxicology in sudden cardiac death». Chinese Institute of Forensic Science (CIFS) Symposium. 27 y 28 de mayo de 2019. Pekín (China).

Jurado Montoro C. «The role of toxicology in homicides», «Applications of hair analysis in forensic toxicology», «Stability studies of drugs of abuse in biological matrices during post-analysis custody». 21st Brazilian Congress of Toxicology (CBTOX) and the 15th TIAFT Latin-American Regional Meeting. 28 al 31 de octubre de 2019. Águas de Lindóia (Brasil).

Jurado Montoro C. «Mortalidad RASUPSI en Centros Penitenciarios. Aspectos toxicológicos». Seminario: Sobredosis: Reacciones adversas a Sustancias Psicoactivas en Centros Penitenciarios. 27 y 28 de noviembre de 2019. Madrid.

Bueno J. «Evolución en alcoholemias en fallecidos en accidente de tráfico versus otras causas». XXIII Congreso Español de Toxicología y VII Iberoamericano. 26 al 28 de junio de 2019. Sevilla.

Huertas Fernández T, Jurado Montoro C, Soriano Ramón T, Salguero Villadiego M. «Stability studies of cocaine compounds in biological fluids during post-analysis custody». 57th Annual Meeting of the International Association of Forensic Toxicologists (TIAFT 2019). 2 al 6 de septiembre de 2019. Birmingham (Reino Unido).

Del Peso Bejarano A, Tejedor Cano J, García Rodríguez S, Jurado Montoro C. «Cambios en la riqueza de cannabis, cocaína y heroína en el período 2000-2018 en el sur de España». XXIII Congreso Español de Toxicología y VII Iberoamericano. 26-28 de junio de 2019. Sevilla.

3.4.2.3. Scientific publications

Huertas Fernández T, Jurado Montoro C, Salguero Villadiego M, Soriano Ramón T, Gamero J. Stability studies in biological fluids during post-analysis custody. Opiate compounds derived from heroin consumption. For. Sci. Int. 2019; 297:326-334.

3.4.2.4. Teaching and formative activities

Bueno Cavanillas J. «Informes periciales ante los tribunales de Justicia». Profesor. Curso Multidisciplinar de agresiones sexuales, papel de los trabajadores del INTCF: recepción de muestras en el laboratorio. Precauciones en el manejo, seguridad del trabajador, cadena de custodia. Centro de Estudios Jurídicos Sevilla. 21 al 25 octubre 2019.

Bueno Cavanillas J. «Evaluación de la calidad. Auditorías. Controles Interlaboratorios». Profesor. Curso selectivo de la 6.ª promoción del Cuerpo Especial de Facultativos del Instituto Nacional de Toxicología y Ciencias Forenses (INTCF). Centro de Estudios Jurídicos Madrid. 24 de septiembre de 2019.

Bueno Cavanillas J. «Validación de métodos». Profesor. Curso selectivo de la 6.ª promoción del Cuerpo Especial de Facultativos del Instituto Nacional de Toxicología y Ciencias Forenses (INTCF). Centro de Estudios Jurídicos Madrid. 24 de septiembre de 2019.

Facultativos Servicio Química y Drogas. Tutores. Curso: Prácticas selectivo de la 6.ª promoción del Cuerpo Especial de Facultativos del Instituto Nacional de Toxicología y Ciencias Forenses (INTCF). Sevilla. Año 2019.

Jurado Montoro C. «Interpretación de resultados toxicológicos. Principales muestras a remitir» y «Mesa Redonda Drogas de abuso en saliva. Implicaciones legales». Profesora. Curso: Interpretación de resultados de toxicología forense. Mejora de la utilidad de la prueba. Centro de Estudios Jurídicos Málaga. 30 y 31 de mayo de 2019.

Jurado Montoro C. «El laboratorio de química-toxicología en la investigación de homicidios en el anciano, el niño y la mujer» y «Mesa Redonda Investigación multidisciplinaria de los homicidios». Profesora. Curso: Investigación científico-técnica de los homicidios en el anciano, el niño y la mujer. Universidad Pablo de Olavide, 17.ª edición de los Cursos de Verano. Carmona. 24 y 25 de junio de 2019.

Jurado Montoro C. «Análisis de las muestras para investigación toxicológica. Sumisión química». Pareja Torres C. «Precauciones en el manejo de las muestras relacionadas con la seguridad del trabajador. Riesgos y medidas de protección». Profesoras. Curso multidisciplinar de agresiones sexuales, papel de los trabajadores del INTCF: recepción de muestras en el laboratorio. Precauciones en el manejo, seguridad del trabajador, cadena de custodia. Centro de Estudios Jurídicos Sevilla. 21 al 25 de octubre de 2019.

Bueno Cavanillas J, Contreras Montero T, Del Peso Bejarano A. XXIII Congreso Español de Toxicología y VII Iberoamericano. Sevilla. 26 al 28 de junio de 2019.

Jurado Montoro C. Seminario de Formación en Patología Dual, Sobredosis y Mortalidad por Reacción Aguda a Sustancias Psicoactivas en Centros Penitenciarios. Ministerio del Interior. Subdirección General de Coordinación de Sanidad Penitenciaria. Madrid. 27 y 28 de marzo de 2019.

Jurado Montoro C. Symposium on Forensic Theory and Practice & TIAFT Regional Meeting. Shanghái (China). 22 al 25 de mayo de 2019.

Jurado Montoro C. Chinese Institute of Forensic Science (CIFS) Symposium. Pekín (China). 27 al 28 de mayo de 2019.

Jurado Montoro C. 57th Annual meeting of the International Association of Forensic Toxicologists (TIAFT 2019). Birmingham (Reino Unido). 2 al 6 de septiembre de 2019.

Jurado Montoro C. 21st Brazilian Congress of Toxicology (CBTOX) and the 15th TIAFT Latin-American Regional Meeting. Águas de Lindóia (Brasil). 28 al 31 de octubre de 2019.

Jurado Montoro C. Seminario sobre Sobredosis: Reacciones adversas a Sustancias Psicoactivas en Centros Penitenciarios. Ministerio del Interior. Subdirección General de Coordinación de Sanidad Penitenciaria. Madrid. 27 y 28 de noviembre de 2019.

Facultativos del Servicio Química y Drogas. V Jornada de estimación del abuso de drogas y análisis de aguas residuales con fines epidemiológicos. Red Española de Análisis de Aguas Residuales con fines epidemiológicos (ESAR-Net). 5 horas. Sevilla 4 de diciembre de 2019.

Huertas Fernández T, Soriano Ramón T. Investigación científico-técnica de los homicidios en el anciano, el niño y la mujer. Universidad Pablo de Olavide. 17.ª edición de los Cursos de Verano. 15 horas. Carmona. 24 y 25 junio 2019.

Técnicos Especialistas de Laboratorio y Auxiliares de Laboratorio. Curso multidisciplinar de agresiones sexuales, papel de los trabajadores del INTCF: recepción de muestras en el laboratorio. Precauciones en el manejo, seguridad del trabajador, cadena de custodia. Centro de Estudios Jurídicos. 25 horas. Sevilla. 21 al 25 de octubre de 2019.

Facultativos del Servicio Química y Drogas. Interpretación de resultados de toxicología forense. Mejora de la utilidad de la prueba. Centro de Estudios Jurídicos. 15 horas. Málaga. 30 y 31 de mayo de 2019.

Facultativos del Servicio Química y Drogas. Calidad aplicada al laboratorio. Estándares. Centro de Estudios Jurídicos. 10 horas. Madrid 19. y 20 de septiembre de 2019.

Facultativos del Servicio Química y Drogas. Actualización en toxicología clínica y forense. Centro de Estudios Jurídicos. 10 horas. Madrid. 17 y 18 de octubre de 2019.

Facultativos del Servicio Química y Drogas. Cromatografía de líquidos acoplada a técnicas de alta resolución (3.ª ed.). Centro de Estudios Jurídicos. 6 horas. Sevilla. 5 de noviembre de 2019.

Participación en el curso selectivo de formación inicial como parte del proceso selectivo de acceso al Cuerpo de Facultativos del INTCF. Centro de Estudios Jurídicos. Madrid. 12 septiembre-8 noviembre de 2019.

Presentaciones eficaces en los tribunales de Justicia. Centro de Estudios Jurídicos. 10 horas. Madrid. 18 y 19 de junio de 2019.

Curso Online ADN Forense 4.ª ed. (B-2 Antropología-ADN). Organizado por el Centro de Estudios Jurídicos. 27 de septiembre al 26 noviembre 2019.

Curso Online Inglés Idiomas 12.ª ed. Centro de Estudios Jurídicos. 30 horas. 25 de abril al 26 noviembre 2019.

Curso Online Muerte Violenta (4.ª edición). Centro de Estudios Jurídicos. 3 de abril al 2 de junio de 2019.

3.4.2.5. Other activities

Jurado Montoro C. Consejo Editorial. *Revista Cuadernos de Medicina Forense.*

Jurado Montoro C. International Editorial Board de Toxicologie Analitique & Clinique.

Jurado Montoro C. Revisora. Revistas: *Forensic Science Internacional, Journal of Chromatography B, International Journal of Legal Medicine, Journal of Analytical Toxicology.*

Jurado Montoro C. Miembro. Advisory Board de la Society of Hair Testing (SoHT).

Jurado Montoro C. Secretaria. The International Association of Forensic Toxicologists (TIAFT).

3.5. La Laguna Delegation Chemistry Section

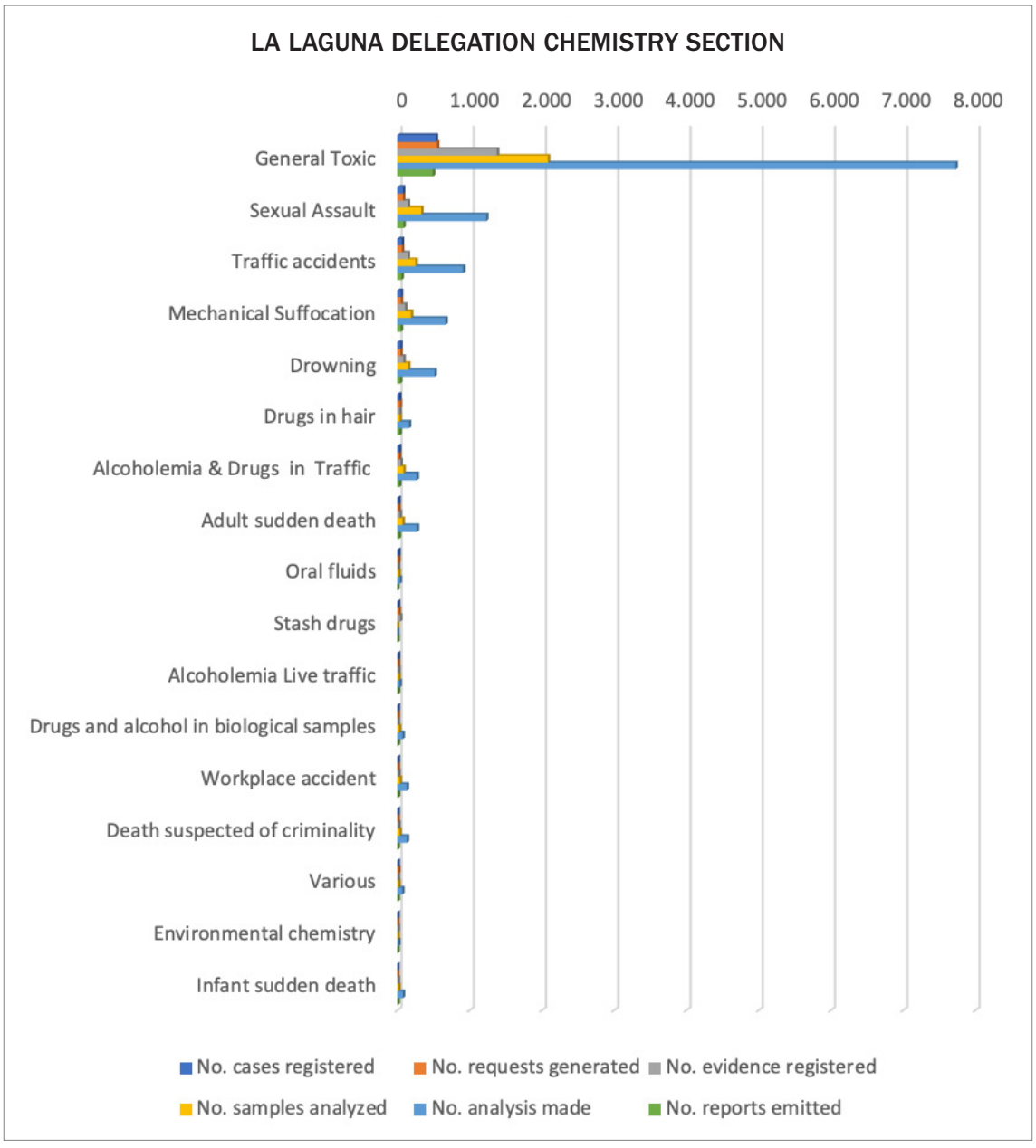
Concerning the expert activity of the Chemistry Section of the La Laguna Delegation, during 2019, 936 requests were received with 2,080 evidences and 3,338 samples were analyzed using a total of 12,301 analyses, through a total of 837 expert reports.

As it can be seen in 3.5.1, the majority of requests for analysis correspond to a **general toxicological study** (550 requests with 1,378 evidences) in dead persons, without a death cause confirmed. An analytical system is applied to this group aimed at the identification and quantification, where appropriate, of substances present in the samples received to help establish the cause of death.

The second most numerous group requesting analysis corresponds to **sexual offenses** (78 requests with 145 evidences). In these cases, they applied a systematic analytic to identify possible substances capable of producing chemical submersion.

The third most numerous group requesting analysis corresponds to the toxicological studies in **traffic accidents** (64 requests with 143 evidences), **asphyxia** (49 requests with 107 evidences), and **drowning deaths** (43 requests with 84 evidences).

Figure 3.5.1. Casework of the Chemistry Section of the La Laguna Delegation during 2019 according to the type of report



Type of report	No. cases registered	No. requests generated	No. evidence registered	No. samples analyzed	No. analysis made	No. reports emitted
General Toxic	532	550	1.378	2.083	7.726	492
Sexual Assault	77	78	145	331	1.230	85
Traffic accidents	61	64	143	251	909	56
Mechanical Suffocation	49	49	107	188	666	48
Drowning	42	43	84	148	515	37
Drugs in hair	27	34	30	32	160	31
Alcoholemia & Drugs in Traffic	25	25	45	83	268	25
Adult sudden death	16	17	33	71	270	21
Oral fluids	14	14	8	17	34	0
Stash drugs	9	20	37	0	0	3
Alcoholemia Live traffic	9	9	15	16	32	8
Drugs and alcohol in biological samples	6	6	7	23	72	6
Workplace accident	6	6	14	33	130	8
Death suspected of criminality	5	5	15	30	132	5
Various	4	13	7	14	68	5
Environmental chemistry	2	2	6	4	13	2
Infant sudden death	1	1	6	14	76	5
Total	**885**	**936**	**2.080**	**3.338**	**12.301**	**837**

3.5.1. Interesting forensic case: Not authorized tattooing inks

Currently, the Chemistry Section of the Delegation is carrying out the analysis of more than 3.000 containers of tattooing inks not authorized. The inks to tattoo fall within the scope of application to the RD 1599/97, 17 October, of cosmetic products, considering the «Personal care and esthetic products». The inks to tattoo in Spain are objects of sanitary authorization for its commerce, all seized trademarks under analysis being unauthorized.

More than 100 different pigments are part of tattoo inks, mainly organic, and more than half of them are azopigments. The azo dyes can degrade to aromatic amines in the skin under the action of sunlight, the latter being potentially carcinogenic. The tattoo inks impounded come from the USA, a country where the FDA (*Food and Drugs Administration*) has never approved a pigment for the intradermal injection. These pigments have not been synthesized at source to fabricate tattoo inks but other industrial applications such as the textile industry, image printing, painting industry, etc.

During the last years, there have existed numerous communications related to tattoo inks in Europe through the RAPEX system (Rapid alert system for dangerous non-food products)

(1). Such communications have been in the vast majority due to the presence of carcinogenic substances in the formulation of these products and for exceeding the maximum concentrations of impurities permitted by the Council of Europe Resolution ResAp (2008) 1 on safety requirements and criteria for tattooing and permanent make-up.

It has been estimated that the amount of tattoo ink administered is around 2.53 mg/cm^2, with an estimated range of 0.6 to 9.42 mg/cm^2. Thus, an average-sized tattoo surface (100 cm^2, about 10 x 10 cm) will require the intradermal administration of 253 mg of ink, which is a considerable amount of ink. (2).

Many of the tattoo inks compounds are sensible and can provoke inflammatory reactions, aggravated by UV radiation (3). Without a doubt, most dangerous risks are carcinogenic, mutagenic, and teratogenic processes (4).

In the present study done inside the Chemistry Study we are identifying qualitatively primary aromatic amines and other substances listed in table 1 of the Council of Europe Resolution ResAP (2008) and which have been classified as category 1, 2 and 3 carcinogens by the European Commission (Directive 1967/548/EEC of 27 June 1967):

4-aminoazobenzene, o-aminoazotoluene, o-anisidine, benzidine, 4-aminobiphenyl, 4-chloroaniline, 4-chloro-o-toluidine, 3,3'-dichlorobenzidine, 3,3'-dimethoxybenzidine, 3,3'-dimethoxybenzidine, 3,3'-dimethoxybenzidine, 3,3'-dimethylbenzidine, 6-methoxy-m-toluidine, 4-methoxy-m-phenylenediamine, 4, 4'-methylenebis (2-chloroaniline), 4,4'-methylenedianiline, 4,4'-methylenedi-o-toluidine, 4-methyl-m-phenylenediamine, 2-naphthylamine, 5-nitro-o-toluidine, 4,4'-oxydianiline, p-phenylenediamine, 4,4'-thiodianiline, o-toluidine, 2,4,5-trimethylaniline, 2,6-xylidine and 2,4-xylidine.

The pigments collected in table 2 are also being analyzed:

Acid red 26, acid violet 17, acid yellow 36, basic blue 7, basic green 1, basic red 1, basic red 9, basic violet 1, basic violet 10, basic violet 3, disperse blue 1, disperse blue 124, disperse blue 3, disperse blue 35, disperse orange 3, disperse red 1, disperse red 17, disperse yellow 3, disperse yellow 9, pigment orange 5, pigment red 53, solvent blue 35, solvent orange 7, solvent red 24, solvent red 49, solvent yellow 1, solvent yellow 2 y solvent yellow 3.

For the analysis they are taking little aliquots of the inks to be analyzed and diluted in a suitable organic solvent. After ultrasound and centrifugation, an aliquot of the supernatant is analyzed by liquid chromatography coupled to high performance mass spectrometry (LC-HRMS) (5). For this they have developed a *screening* with commercial patterns of all aromatic amines and pigments mentioned above, so that their identification is unambiguously performed by an algorithm that compares the exact mass of the quasimolecular ion, exact mass of the fragments, isotopic profile, correlation with library of spectra and retention time.

The results obtained until know is that in some colors of certain brands and not in all manufacturing batches, substances such as 5-nitro-o-toluidine, 4-chloro-o-toluidine, p-phenylenediamine, 3,3'-dichlorobenzidine are appearing and pigments like basic blue 7, crystal violet 3, solvent red 49, disperse blue 1, basic violet 10, etc. all of which are photosensitive substances and in some cases substances classified as carcinogens by the IARC (International Agency for Research on Cancer).

Bibliography references

(1) JRC Science For Policy Report. Safety of Tattoos and PMU. Final Report DG Just. European Commission-2016.

(2) Engel E y col. Modern tattoos cause high concentrations of hazardous pigments in skin. Contact Dermatitis-2008; 58: 228-33.

(3) Tattoo inks contain polycyclic aromatic hydrocarbons that additionally generate deleterious singlet oxygen, Experimental Dermatology 2010;19:e275-e28

(4) Kluger, N y col. Tattoos inks, and cancer. The Lancet Oncology, Vol. 13, issue 4. e161-e168.

(5) «Chemical substances in Tattoo Ink». Survey of chemical substances in consumer products, n.º 116, 2012. Miljøministeriet (Ministerio de medio ambiente de Dinamarca).

3.5.2. Teaching and scientific activities

3.5.2.1. Scientific publications

Ana Isabel Hernández-Guerra, Javier Tapia, Luis Manuel Menéndez-Quintanal & Joaquín S. Lucena (2019). «Sudden cardiac death in anabolic androgenic steroids abuse: case report and literatura review». *Forensic Sci. Res.* 267-273. https://doi.org/10.1080/20961790.2019.1595350.

3.5.2.2. Formative and teaching activities

Se imparte docencia en el área de Toxicología de la Universidad de La Laguna, en el grado de medicina en la asignatura Medicina Legal y en el grado de farmacia en la asignatura de Drogodependencias.

«Cromatografía de líquidos acoplada a técnicas de alta resolución (2.ª ed.)» organizado por el CEJ en el INTCF-Madrid el 29 de octubre de 2019. Ponencia «Aplicación forense de la tecnología Q Exactive Focus Orbitrap en los Departamentos del INTCF».

Curso de especialización «Ciencia forense y arqueología» organizado por el Instituto Canario de Bioantropología, el Organismo Autónomo de Museos y Centros, el

INTCF-Delegación de Canarias, el IML de S/C de Tenerife y el Museo Arqueológico de Tenerife, celebrado durante los días 5, 7, 11, 14, 19, 21, 26 y 28 de febrero y 12, 14, 19, 21, 23, 26 y 28 de marzo de 2019 en el Museo de Naturaleza y Arqueología de S/C de Tenerife. Ponencias:

4. Biology Services

Each Department from the INTCF has a Biology Service, and there is a biology section in the La Laguna Delegation. The Biology Services functions are fundamentally forensic but also teaching and investigating activities. Inside the expertise labor, we include the following principal investigations:

- *Biological research and genetic identification of biological traces of criminal interest in sexual assaults, homicides, and other crimes.*
- *Genetic identification in disappeared and corpse remains*
- *Genetic investigation of kinship relations in parentage proceedings*
- *Genetic identification in irregular adoptions and newborn substractions*
- *Genetic identification of non-human species*
- *Drowning (diatom studies)*
- *Sudden death (biochemical and microbiology analysis) (just in the Madrid Department)*
- *Forensic microbiology (just in the Madrid Department)*
- *Botanical identification (just in the Madrid Department)*

Personal staff and the Biology Section that has participated in this kind of investigation during 2019, is shown in Table 4.1.

Table 4.1. Different Departments staff of the Biology Services

	INTCF-MADRID	INTCF-BARCELONA	INTCF-SEVILLA	INTCF-LA LAGUNA
Head of the Department	1	1	1	1
Facultatives	22	13	10	1
Specialist technicians	7	5	5	2
Laboratory assistants	10	4	1	1
Administratives	2	-	2	-

The INTCF Biology Services registered in 2019 a total of 5,536 expert cases with a total of 25.413 evidences, emitting 5.227 expert reports through the analysis of 36,818 samples on which 164,274 analyses were carried out. (Figure 4.1).

The data supposes an increase of 2,8% in the number of reports issued during 018 (5,082 reports emitted).

Apart from the expert labor from the INTCF Biology Services they also present data and results obtained in the different INTCF DNA databases during 2019.

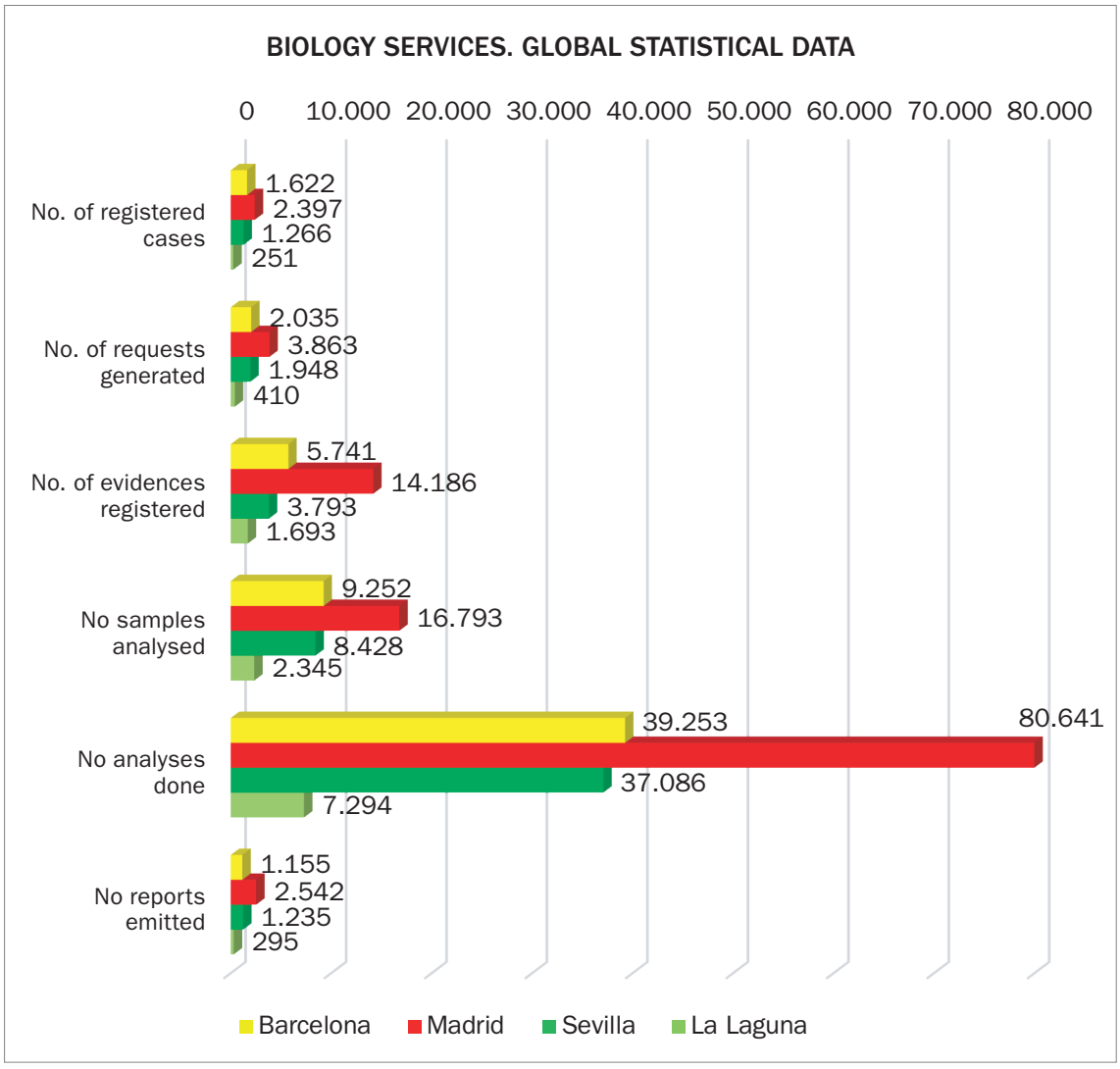
Apart from expert activity, the Biology Services during 2019 have also acted as a reference center in themes proper of the specialty collaborating with other institutions in

different workgroups (National Technical Commission for Multiple Victim Events, National Commission for the Forensic Use of DNA, Spanish- and Portuguese-speaking Group of the International Society for Forensic Genetics [GHEP-ISFG]).

The practitioners from the Biology Services have developed great labor in the validation of diverse application methods in biology and forensic genetics that have left an important number of scientific publications and contributions in national and international forensic congresses, collected in the following sections of this report.

We have to add the training activity developed with the Institutes of Forensic Medicine, with diverse universities, with the legal study centers apart from the scientific investigation activity of forensic sciences.

Figure 4.1. Overall data on the INTCF Biology Services' Expert Activity during 2019



	No. of registered cases	No. of requests generated	No. of evidences registered	No samples analyzed	No analysis done	No reports emitted
Barcelona	1.622	2.035	5.741	9.252	39.253	1.155
Madrid	2.397	3.863	14.186	16.793	80.641	2.542
Sevilla	1.266	1.948	3.793	8.428	37.086	1.235
La Laguna	251	410	1.693	2.345	7.294	295
Total	**5.536**	**8.256**	**25.413**	**36.818**	**164.274**	**5.227**

Hereunder we collect the scientific and expert activities like the teaching and formative activities developed during 2019 for each Biology Services from the different Departments. Each Service includes the description of an interesting forensic case, to public the expert activity.

4.1. Madrid Department Biology Service

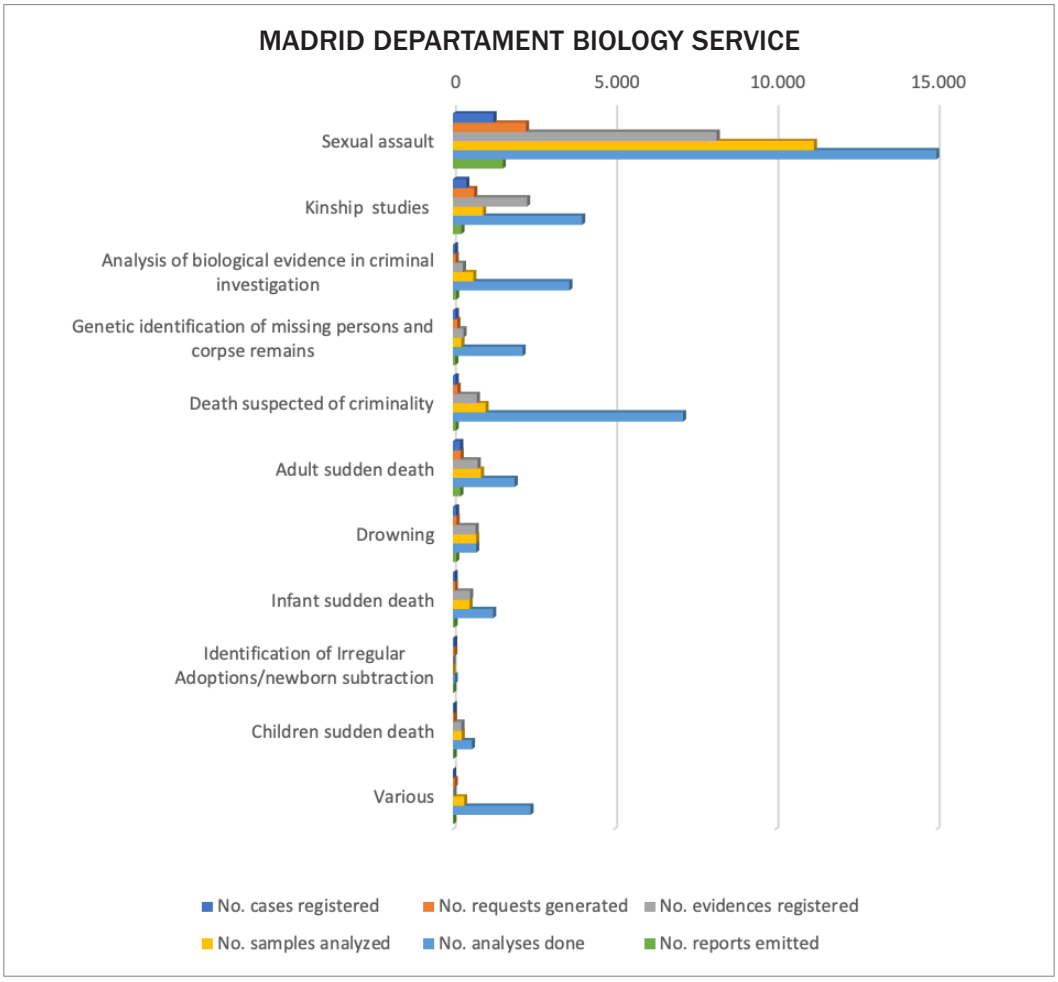
Concerning the expert activity of the Madrid Department Biology Service, during 2019 they received 3,863 requests with 14,186 evidences and they analyzed 16,183 samples through a total of 80,641 analyses, emitting a total of 2,542 expert reports.

In figure 4.1.1, the predominant analysis is the investigation of **sexual assault cases** (2,270 requests with 8,184 evidences). The biological and genetic studies of semen samples are carried out as well as the DNA profiles are obtained from reference samples of the implied persons in the process (defendants, victims, persons to be discarded…).

The second most numerous analysis requests are **Kinship biological studies** (662 requests with 2,302 evidences), followed by **criminality suspect deaths studies** (148 requests with 743 evidences), **identification of missing persons and corpse remains** (138 requests with 332 evidences), and **the analysis of biological evidence of criminal interest** (86 requests with 315 evidences).

The third most numerous analysis requests correspond to **microbiology and biochemical studies in the sudden death in adults, children, and infants** (343 requests with 1.571 evidences), and the **biological analyses of the drowning deaths** (116 requests with 705 evidences).

Figure 4.1.1. Casework of the Madrid Department Biology Service during 2019 according to the type of report



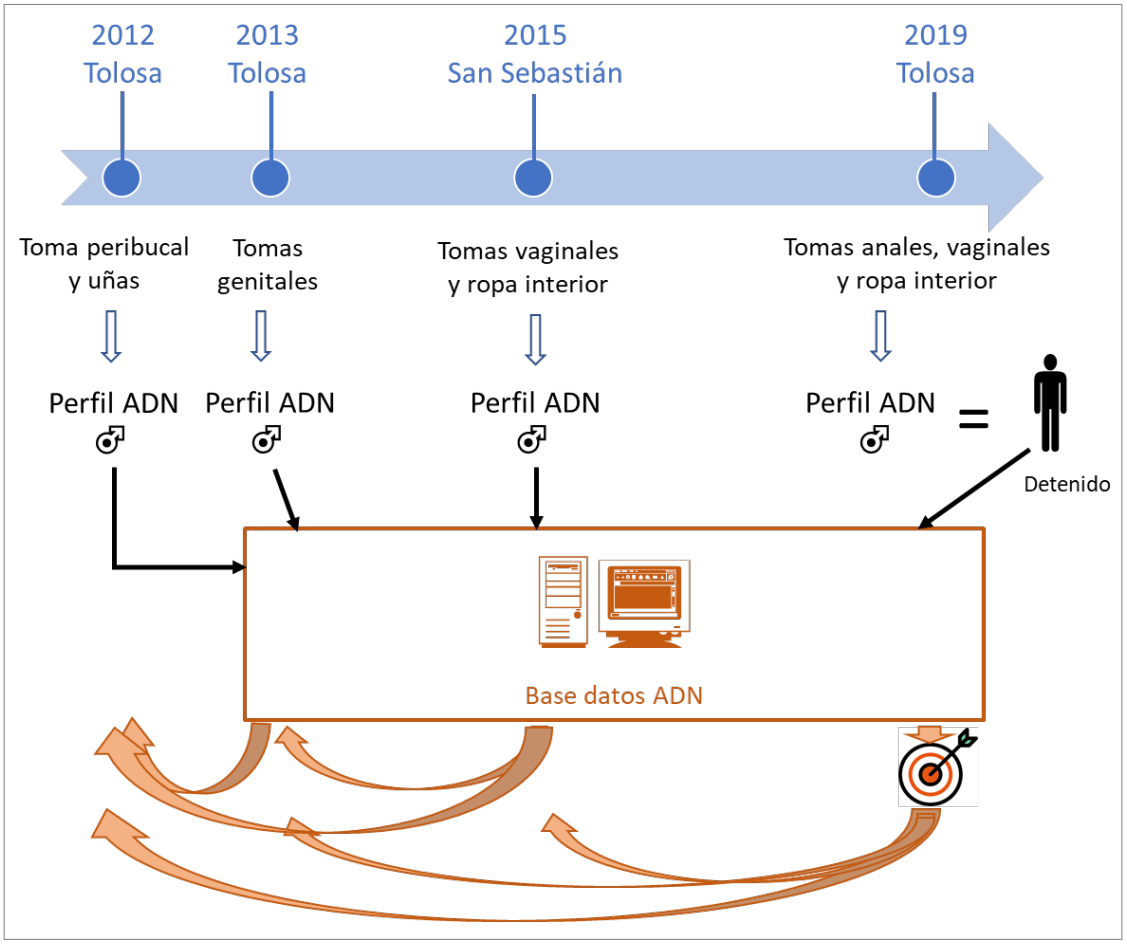
Type of report	No. cases registered	No. requests generated	No. evidences registered	No. samples analyzed	No. analyses done	No. reports emitted
Sexual assault	1.260	2.270	8.184	11.197	56.769	1.549
Kinship studies	418	662	2,302	935	4.008	265
Analysis of biological evidence in criminal investigation	67	86	315	634	3.613	101
Genetic identification of missing persons and corpse remains	93	138	332	268	2.163	73
Death suspected of criminality	89	148	743	1.016	7.137	89
Adult sudden death	230	243	771	874	1.917	233
Drowning	100	116	705	723	724	107
Infant sudden death	52	64	534	517	1.249	54
Identification of Irregular Adoptions/newborn subtraction	43	44	8	4	60	21
Children sudden death	31	36	266	275	592	29
Various	14	56	26	350	2.409	21
Total	**2.397**	**3.863**	**14.186**	**16.793**	**80.641**	**2.542**

4.1.2. Forensic interesting cases

4.1.2.1. Different sexual aggressions committed between 2012-2019 in the province of Gipuzkoa

Diverse sexual aggression studied in the Madrid Department Biology Service, reported between 2012-2019 in the province of Gipuzkoa, whose authorship was unknown, could be clarified after years of investigation thanks to the DNA police database use. The register of the genetic profiles in the database obtained from the samples related to the sexual aggression, and the detention by part of the Ertzaintza, in July 2019, of the alleged offender of 35 years and after genetic profile register of the suspect, allowed to relation the sexual aggressions studied in the Biology service and find out the person identity implied in the investigated facts.

Figure 4.1.2.1. Timeline for complaints and analysis



In September 2012, a woman of 28 years denounced sexual aggression to the court of the first instance No. 1 of Tolosa. They ask epithelial cell study. After the genetic analysis of a buccal facial swab with samples from the nails of the left hand taken to the complainant, they obtain a genetic autosomal STR profile corresponding to a male of unknown identity.

After the register and comparison of this genetic profile in the DNA police database, they detected a coincidence of a genetic-male profile also unknown, obtained based on three cuttings from a dress with seminal remains analyzed by the Scientific Police Unit of the Ertzaintza to a crime of sexual assault committed in the same year.

In September 2013, a young woman of 19 years denounced another sexual aggression at the same court. They ask for a seminal study and epithelial cells in diverse genital samples. After the genetic analysis done from two vaginal swabs and a vaginal wash, they found traces of semen. A mixed genetic profile of autosomal STR markers is obtained from at least two persons, compatible with the presence of cellular remains of the complainant and sperm remains of an unknown male.

Once they register the profile comparison done from the DNA police database, they detected compatibility in the contribution unrelated to the complainant (attributable to the unknown male) with the genetic-male profile found in the sexual aggression committed in 2012.

In January 2015, a woman of 21 years denounced sexual aggression to the court of first instance no. 1 of San Sebastian. They ask for semen remains and epithelial cells in the samples sent. After the genetic analysis is done from the spermatic fractions obtained from two vaginal introitus swabs and a sample taken from the crotch area of the panty, a genetic profile of autosomal STR markers is obtained of an unknown male.

After the register and genetic profile comparison in the police DNA database, they detected compatibility in the profiles obtained in the sexual aggressions from 2012 to 2013.

In contrast to the two previous cases, in 2015 they knew of the aggression circumstances. The complainant is attacked on the back with a rag with a substance in the face losing consciousness. Four years and a half after, in July 2019, a woman of 21 years denounced sexual aggression to the court of first instance no. 4 of Tolosa. Attacked by a man that has been covered with a rag losing consciousness, she doesn't remember anything else.

They took samples of the clothes and the body to the complainant. They started to do the genetic analysis with the semen remains detected in the clothes. In one week, they receive a sample of the alleged aggressor, giving it to the Ertzaintza. In both samples analyzed in our Service, the conclusion is that the male genetic profile detected from the traces of semen present in the anal swabs, in the vaginal wash, and in three samples taken

from the panties which belong to the complainant matches the genetic profile of the investigated person.

However, after the detention of the investigated and the analysis of the samples taken to the investigated, Ertzaintza registered in September 2019 his genetic profile in the DNA police database. The fact allowed us to find genetic coincidences obtained from the samples analyzed in the sexual aggressions in 2012, 2013, and 2015. Having the court order, the Biology Service checked the genetic profile obtained through the sample of the alleged offender. This permitted us to relate this last aggression to the others.

In all the sexual aggressions studied by the Biology Service, they realize orientation and certainty tests to investigate semen, blood, and saliva remains to employ DNA extraction methods (through the different lysis protocol for the rest of samples), and the use of DNA amplification techniques with commercial kits (autosomal STR markers and Y-chromosomal STR markers). In all cases, it was possible to obtain a genetic profile of a male that could be genetically matched, which was determinant to relate the different sexual aggressions committed between 2012-2019 with the alleged aggressor.

4.1.2.2. Episode of multiple food poisoning associated with morels (Morchella spp., Ascomycota): review of its effects

In March 2019, after eating in a restaurant in Valencia there was a food poisoning of more than 30 persons. The clinical result was mild gastroenteritis syndrome with short latency for most commensals, although a person died a few hours after at home. When we find a death like this with legal consequences, we have to evaluate if it has been due to accidental poisoning because of the vegetables. Through analysis of morphological characters and DNAr ITS sequences, fresh and cooked specimens, previously sent to the INTCF from the restaurant, were identified as *Morchella sextelata*, species with a cultivation origin in China and of interest in terms of product traceability. A review of the words related the symptomatology to gastroenteritis. The toxins and other related agents have not been characterized as *Morchella* spp. It is important to do more analysis. The data can be used in forensic medicine and may lead to legal proceedings. It is related to a description of micetisms, apart from food poisoning or accidental ingestion of plant species.

Figure 4.1.2.2. Photograph of Morchella sextellata (Pezizales, Ascomycota). Fresh specimens of grey-brown conical morels with sectioned stipes, as traded for consumption. Morphological and genetic identification of the species confirmed their origin from cultivated fields in China

4.1.2.3. Listeriosis

The following case highlights the utility of forensic microbiology, which apart from providing the infectious cause in sudden death situations in adults, children, professional negligence associated with infections, has social-sanitary connotations, most of the cases with medico-legal consequences.

Listeriosis is an emerging disease which requires prevention and special detection measures. Listeriosis is included among the las Enfermedades de Declaración Obligatoria (EDO) or Notifiable diseases in Spain from Orden Ministerial SSI/445/2015. That's the reason why it must be notified to the National Epidemiological Surveillance Network (RENAVE), coordinated from the Department of Health coordinated by the National Centre of Epidemiology (CNE) from the Health Institute Carlos III (ISCIII). Between August and October 2019, Spain experienced the biggest listeriosis outbreak known to date, with 222 cases related to the outbreak and three confirmed deaths in patients affected by it. Spanish authorities communicated the outbreak to the World Health Organization through the International Food Safety Authorities Network (INFOSAN), the 20 August 2019 1.The strain involved was characterised as: serovar IVb, ST-388, CC388, CT-8466 2.

There is a case soliciting a microbiology study from the First Instance Court no. 1 from Guadix (Granada). The 3 September, in the middle of the listeriosis outbreak, they received at the Microbiology laboratory of the INTCF Madrid Department Biology Service samples of the death of a male of 49 years. The patient, a priori without personal interesting records, was found by his family unconscious and with respiratory depression. He was moved to the hospital, detecting feverishness and skin erythema. There, despite an initial recovery after resuscitation maneuvers, he died on 31 August. The most relevant finding of the autopsy, was the purulent meninges less than 12 hours after death performed at the Institute of Legal Medicine in Granada. Meningitis was considered a possible cause of death. Microbiological samples were taken for the etiological study of the infection: EDTA blood, CSF, two arachnoid swabs, two nasopharyngeal swabs (all in Amies and Stuart bacterial transport medium), and a spleen fragment.

On suspicion of bacterial meningitis, the Forensic Microbiology Laboratory disposes apart of the traditional, various antigenic quick techniques and real time PCR for the diagnosis of the most frequent agents responsible for bacterial meningitis (*Neisseria meningitis* and *Streptococcus pneumonia*, among others). In this case, obtaining a negative result in the latex agglutination antigenic technique *Wellcogen* Bacterial Antigen (Remel, Oxoid), done in LCR and plasma obtained from blood, manifested that the responsibility for the autopsy findings can be different from the most frequent agents. This could be confirmed within 24 hours, obtaining the positive results done receiving them at the INTCF, which allowed the ample insulation, in LCR and an arachnoid swab of a catalase-positive Gram-positive bacillus, identified biochemically (panel MicroScan) like *Listeria monocytogenes* (99,99 %). This microorganism was very sparsely isolated from spleen (pure culture) and together with the usual upper respiratory tract flora in nasopharyngeal swabs. Finally, it was also isolated in pure culture L. *monocytogenes* after 7 days of incubation of the BHI broth from the blood sample. The antigenic test results were performed on the first day and the 24-hour cultures were reported to the forensic scientist via e-mail as it was an EDO. On collecting information about the deceased, a diagnosis of hyperlipaemia in 2001 was found as a background- without prescriptions. The fact that he was a drinker and smoker. The deceased lacked personal hygiene and clothes, he lived alone in a farmhouse and it is unknown if he has domestic animals. The autopsy and the microbiology results determined that the cause of death was due to bacterial meningitis with bacteremia and possible sepsis caused by L. *monocytogenes*. Although this species causes meningitis in old people, alcoholism is a risk factor that could have acted before.

Once identified, the strain was sent to the Neisseria Laboratory of the National Microbiology Centre of the ISCIII to identify the epidemiology. The importance of the latter, in this context, was to determine whether or not it belonged to the strain causing the outbreak. *L. monocytogenes* is a highly heterogeneous species, consisting of 4 evolutionary lineages, 13 serotypes, and 4 serogroups. Multilocus sequence typing further subdivides the

above categories into clones, which are geographically widespread. The typing results obtained in our case showed that it was L. monocytogenes serovar IVb and genomic characterisation ST-1; CC1; CT-8502, and therefore not genomically related to the strain involved in the outbreak. The information was immediately transmitted to the coordinators of the Technical Cabinet for the Follow-up of the outbreak of Listeriosis associated with the consumption of larded meat.

Although meningitis *L. monocytogenes* here described finally corresponds to an isolated case, our data allowed i)to provide useful data to establish the outbreak mortality and ii) define geographically this one, although it started in Seville, it was being extended to other provinces.

Figure 4.1.2.3.1. Purulent appearance of the brain (Dra. Martínez Téllez, IML Granada)

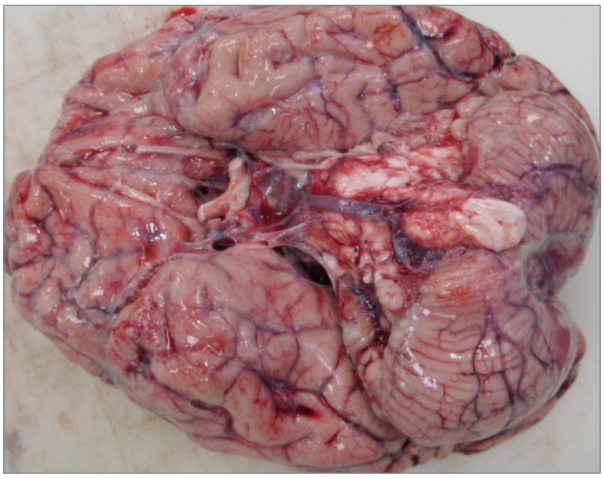


Figure 4.1.2.3.2. Pure culture of Listeria monocytogenes

References

(1) Listeriosis - España. Brotes epidémicos. Organización Mundial de la Salud. 16 de septiembre de 2019.

(2) Informe de fin de seguimiento del brote de listeriosis. 27 de septiembre de 2019. Centro de Coordinación de Alertas y Emergencias Sanitarias.

4.1.3. Teaching and scientific activities

4.1.3.1. Participation in investigation projects and collaboration with other institutions

Colaboración en el Grupo de Trabajo de la Comisión Técnica Nacional para Sucesos con Víctimas Múltiples «Criterios de reparto de las muestras de ADN entre los Laboratorios Forenses» (2018-2019), con la elaboración del Protocolo CODIS-DVI, de las Fichas de Capacidades de los Laboratorios Forenses y del modelo de informe pericial conjunto.

Colaboración con la Comunidad de Madrid en la elaboración e implementación del Protocolo de atención sanitaria del abuso sexual a menores.

Colaboración con la Comunidad de Madrid en la elaboración e implementación del Protocolo de asistencia sanitaria urgente y coordinada a mujeres víctimas de violencia sexual en la Comunidad de Madrid (Código VISEM).

ESFOR collaborative project (2018-2020). A project from the ESCMID (European Society of Clinical Microbiology and Infectious Diseases). Targeted 16S-23S rDNA Next Generation Sequencing: is it a complementary technique in identifying an infectious cause of death?

Grupo de Habla Española y Portuguesa de la International Society for Forensic Genetics (GHEP-ISFG) en la coordinación de dos comisiones de trabajo y en la realización de sus ejercicios colaborativos: Comisión de Trabajo sobre la «Interpretación de Mezclas de Perfiles STR autosómicos» y su ejercicio colaborativo GHEPMIX7 y Comisión de trabajo sobre las «Aplicaciones Forenses de la Secuenciación Masiva» y su ejercicio colaborativo GHEP-MPS01.

4.1.3.2. Contribution in scientific congress

Barrio PA, Martin P, Alonso A, The DNASEQEX Consortium (2019). CE-MPS Discordances in a study of 31 autosomal STR loci from 498 Spanish individuals (Comunicación oral). STR Sequence Nomenclature meeting. Organizado por STRAND Working Group de la International Society for Forensic Genetics (ISFG). Somerset House, Londres (Reino Unido). 11-12/04/2019.

Iaiseca García J, González Bravo L, Martínez-Fernández P, Vallejo de Torres G, Sánchez de León MS, Navarro-Escayola E. *et al.* (2019). Pathologic characteristics of fatal anaphylaxis: A Spanish nationwide 17-year series. EAACI Congress. Lisboa, Portugal. 1-5/06/2019.

Crespillo MC, Barrio PA (2019). Genética Forense, un campo en constante evolución. Presentación del libro: GENÉTICA FORENSE. Del laboratorio a los Tribunales (Comunicación oral). XXI Congreso de la Sociedad Española de Antropología Física (SEAF). Miradas actuales a la Antropología. Organizado por el Laboratorio de Antropología Forense de la Universidad de Granada. Granada. 24/06/2019.

Barrio PA, Martin P, Alonso A, Müller P, Bodner M, Berger B, Parson W, Budowle B, The DNASEQEX Consortium (2019). Estudio Poblacional mediante secuenciación masiva de 31 STR autosómicos en 498 individuos españoles (comunicación oral). XXI Congreso de la Sociedad Española de Antropología Física (SEAF). Miradas actuales a la Antropología. Organizado por el Laboratorio de Antropología Forense de la Universidad de Granada. Granada. 25/06/2019.

Barrio PA, Alonso A, García O, Gusmão L, Phillips C, Prieto L (2019). Comisión de Trabajo de Aplicaciones Forenses de la Secuenciación Masiva. 1.er Ejercicio Colaborativo sobre las Aplicaciones Forenses de la MPS (GHEP-MPS1) (comunicación oral). XXIV Jornadas de Genética Forense del GHEP-ISFG. Organizado por LabGentics y el GHEP-ISFG. Praga (República Checa). 9/09/2019.

Barrio PA, Crespillo M, García O, Baeza C, Gill P, Prieto L (2019). Comisión de Trabajo de Mezclas de perfiles STRs autosómicos. Ejercicio GHEPMIX7. XXIV Jornadas de Genética Forense del GHEP-ISFG. Organizado por LabGentics y el GHEP-ISFG. Praga (República Checa). 10/09/2019.

Fernández A, Alves B, Morentin B, Arrieta J, Mosquera MR, Alcalá B, Abad R, Suárez-Mier MP, Merino I. (2019). Histopathological findings in meningococcal infection as a cause of sudden unexpected death. 31 European Congress of Pathology. 7-11/09/2019.

Gregorio I, García-Ruiz C, Martínez P. (2019). Is it possible to maximize the extraction of the bodily-fluid evidence from superabsorbent materials? (comunicación oral). Forensics 2019. 2nd ed. Caparica. Portugal. 18-20/11/2019.

4.1.3.3. Scientific publications

Barrio PA, Martín P, Alonso A, Müller P, Bodner M, Berger B, Parson W, Budowle B. The DNASEQEX Consortium. Massively parallel sequence data of 31 autosomal STR loci from 496 Spanish individuals revealed concordance with CE-STR technology and enhanced discrimination power. *Forensic Science International: Genetics.* 2019; 42: 49-55.

Francés-Cuesta C, De la Caba I, Idigoras P, Fernández-Rodríguez A, Del Valle Pérez D, Marimón JM, González-Candelas F. Whole-genome sequencing of Neisseria gonorrhoeae in a forensic transmission case. *Forensic Science International: Genetics.* 2019; 42: 141-146.

Gregorio I, García-Ruiz C, Martínez P. Maximizing semen extraction from sanitary pads by chemical and shredding treatments. *Forensic Science International: Genetics* 2019; 42: 198-202.

Marote-González M, Pera Bajo FJ, El Bouayadi Mohamed L, Polaino Jiménez AR. Fiebre de origen desconocido con diagnóstico médico-forense. *Revista Española de Medicina Legal.* 2019; 45: 174-176.

Martínez-Fernández P, Vallejo G, Sánchez de León S, Navarro E, Moro M, Alberti N, Tejedor M. Medical and pathologic characteristics of fatal anaphylaxis: A Spanish nationwide 17-year series. *Forensic Science, Medicine and Pathology* 2019; 15: 369-381.

Tejedor Alonso MA, Vallejo de Torres G, Navarro Escayola E, Martínez Fernández P, Moro Moro M, Alberti Masgrau N. Postmortem tryptase cutoff points and main causes of fatal anaphylaxis. J. *Allergy and Clinical Immunology.* 2019; http://doi.org/10.1016/j.jaip.2019.07.015

Alonso A. Las bases de datos de ADN de interés forense. En: Crespillo M, Barrio PA (eds.). *Genética Forense: del laboratorio a los tribunales.* Ediciones Díaz de Santos, Madrid; 2019. pp. 421-440. ISBN: 978-84-9052-213-4.

Barrio PA, Crespillo M. Informe pericial en materia de genética forense. Requisitos, estructura y ejemplos. En: Crespillo M, Barrio PA (eds.). *Genética Forense: del laboratorio a los tribunales.* Ediciones Díaz de Santos, Madrid; 2019. pp. 471-494. ISBN: 978-84-9052-213-4.

Barrio PA, Martín P, Alonso A, Consorcio DNASeqEx. Nuevas tecnologías de secuenciación masiva en paralelo (MPS) de uso en genética forense. En: Crespillo M, Barrio PA (eds.). *Genética Forense: del laboratorio a los tribunales.* Ediciones Díaz de Santos, Madrid; 2019. pp. 319-350. ISBN: 978-84-9052-213-4.

Fernández de Simón L. Recogida y remisión de muestras para estudios de identificación genética. Caracterización de vestigios biológicos. En: Crespillo M, Barrio PA (eds.). *Genética Forense: del laboratorio a los tribunales.* Ediciones Díaz de Santos, Madrid; 2019. pp. 79-106. ISBN: 978-84-9052-213-4.

Vallejo de Torres G. La prueba biológica en los procesos de Filiación. Cuestionario práctico. Cuaderno de familia AJFV (Asociación Judicial Francisco de Vitoria). Octubre 2019. ISSN: 2605-2687.

Fernández-Rodríguez A, Alberola J. Postmórtem Microbiology: Sampling and Interpretation. Section 5: Autopsy findings. In: Cohen MC, Scheimberg I, Beckwith JB, Hauck FR, Bass SP (eds). *Investigation of Sudden Infant Death Syndrome.* The Paediatric Surgical Pathology Series. Cambridge University Press. DOI: 10.1017/9781108186001, 2019.

4.1.3.4. Education and formative activities

Fernández A. Introducción a la microbiología forense. Máster Universitario en Ciencias Policiales. IUICP. Universidad de Alcalá de Henares. Madrid. 15/01/2019.

Fernández A. Aplicaciones prácticas de la microbiología forense a la resolución de casos de interés judicial. Máster Universitario en Ciencias Policiales. IUICP. Universidad de Alcalá de Henares. Madrid. 15/01/2019.

Barrio PA. Estudios de marcadores STR por MPS para uso forense: Validación de kits y Estudio Poblacional Español. Seminario HID Roadshow 2019. Uncover forensic technologies. Thermo Fisher Scientific. Madrid. 28/05/2019

Alonso A, Martín P, Barrio PA. Iniciación a la Secuenciación Masiva en Paralelo. Aplicaciones en Genética Forense, programada dentro del Plan de Formación Continuada 2019 del Centro de Estudios Jurídicos (CEJ). Instituto Nacional de Toxicología y Ciencias Forenses, Departamento de Madrid. 03/06/2019.

Alonso A, Martín P, Barrio PA. Iniciación a la Secuenciación Masiva en Paralelo. Aplicaciones en Genética Forense, programada dentro del Plan de Formación Continuada 2019 del Centro de Estudios Jurídicos (CEJ). Instituto Nacional de Toxicología y Ciencias Forenses, Departamento de Barcelona. 11/06/2019.

Alonso A, Martín P, Barrio PA. Iniciación a la Secuenciación Masiva en Paralelo. Aplicaciones en Genética Forense, programada dentro del Plan de Formación Continuada 2019 del Centro de Estudios Jurídicos (CEJ). Instituto Nacional de Toxicología y Ciencias Forenses, Departamento de Sevilla. 17/06/2019.

Farfán MJ. Curso selectivo de la 6.ª Promoción del Cpo. Especial de Facultativos del Instituto Nacional de Toxicología y Ciencias Forenses. Centro de Estudios Jurídicos. Madrid. 24/09/2019.

Polaino AR. Actuación médico forense en muertes de riesgo biológico. Recogida de muestras. Instituto Asturiano de Administración Pública Adolfo Posada. Oviedo. 24-25/06/2019.

Fernández de Simón L. Análisis de muestras para la Investigación Genética en las Agresiones Sexuales. Curso multidisciplinar de agresiones sexuales. Centro de Estudios Jurídicos. Instituto Nacional de Toxicología y Ciencias Forenses, Departamento de Madrid. 25/09/2019.

Santiago B. Investigación de Indicios Biológicos en Casos de Agresiones Sexuales. Curso multidisciplinar de agresiones sexuales. Centro de Estudios Jurídicos. Instituto Nacional de Toxicología y Ciencias Forenses, Departamento de Madrid. 25/09/2019.

García-Hirschfeld J. Informes periciales ante los Tribunales de Justicia. Importancia de la cadena de custodia. Defensa ante los tribunales de las distintas pruebas. Curso multidisciplinar de agresiones sexuales. Centro de Estudios Jurídicos. Instituto Nacional de Toxicología y Ciencias Forenses, Departamento de Madrid. 27/09/2019.

Polaino AR. Precauciones en el manejo de muestras relacionadas con la seguridad del trabajador. Riesgos y medidas de protección. Curso multidisciplinar de agresiones sexuales. Centro de Estudios Jurídicos. Instituto Nacional de Toxicología y Ciencias Forenses, Departamento de Madrid. 27/09/2019.

García-Hirschfeld J. Estudio de Agresiones Sexuales en el servicio de Biología: de la recepción de muestras a los perfiles genéticos. Curso realizado en el marco del proyecto

Twinning con Turquía. Instituto Nacional de Toxicología y Ciencias Forenses, Departamento de Madrid. 09/10/2019.

Barrio PA. New Technologies in Forensic Genetics. Massive Parallel Secuencing Applications. Curso realizado en el marco del proyecto Twinning con Turquía. Instituto Nacional de Toxicología y Ciencias Forenses, Departamento de Madrid. 09/10/2019.

Albarrán C. Contaminación de ADN humano en Genética Forense. Seminario sobre Contaminación Humana en Genética Forense. Instituto Nacional de Toxicología y Ciencias Forenses, Departamento de Madrid. 28-29/10/2019.

Martín P. Incidencia de la Contaminación en el Servicio de Biología de Madrid del INTCF. Seminario sobre Contaminación Humana en Genética Forense. Instituto Nacional de Toxicología y Ciencias Forenses, Departamento de Madrid. 28-29/10/2019.

Barrio PA. Plataformas, Químicas y Software de análisis usados en Genética Forense. Curso sobre NGS: Aplicaciones en Genética Forense. Dpto. de medicina Legal, Psiquiatría y Patología. Facultad de Medicina. Universidad Complutense de Madrid. 11/11/2019.

Barrio PA. Flujo de Trabajo e Integración en el laboratorio Forense. Curso sobre NGS: Aplicaciones en Genética Forense. Dpto. de Medicina Legal, Psiquiatría y Patología. Facultad de Medicina. Universidad Complutense de Madrid. 11/11/2019.

Barrio PA. Recomendaciones Internacionales y Avances en Nomenclatura. Curso sobre NGS: Aplicaciones en Genética Forense. Dpto. de Medicina Legal, Psiquiatría y Patología. Facultad de Medicina. Universidad Complutense de Madrid. 11/11/2019.

Barrio PA. Estudios de validación y Poblacionales. Curso sobre NGS: Aplicaciones en Genética Forense. Dpto. de Medicina Legal, Psiquiatría y Patología. Facultad de Medicina. Universidad Complutense de Madrid. 11/11/2019.

Barrio PA. 1.er Ejercicio Colaborativo de MPS de aplicación forense. Curso sobre NGS: Aplicaciones en Genética Forense. Dpto. de Medicina Legal, Psiquiatría y Patología. Facultad de Medicina. Universidad Complutense de Madrid. 11/11/2019.

Fernández A. Aplicaciones de la microbiología forense. Seminario IUICP sobre genética forense no humana de interés criminalístico. Universidad de Alcalá de Henares, Madrid. 27/11/2019.

Espinosa, E. Ciclo Superior de Técnicos de Laboratorio Clínico y Biomédico. Colaboración con los Centros de Formación Profesional Claudio Galeno y la Escuela de Técnicos Especialistas del hospital Puerta de Hierro. 2019.

Martínez, P. Prácticas externas asignatura extracurricular Botánica Medicinal. Convenio INTCF-Universidad Complutense. Febrero a junio de 2019.

Facultativos y Jefe de Servicio (tutor). Prácticas tuteladas de la 6.ª Promoción del Cuerpo Especial de Facultativos del Instituto Nacional de Toxicología y Ciencias Forenses. Centro de Estudios Jurídicos. INTCF. Madrid. 14 de octubre a 8 de noviembre de 2019.

STR Sequence Nomenclature meeting. Organizado por STRAND Working Group de la International Society for Forensic Genetics (ISFG). Somerset House, Londres, Reino Unido. 11-12/04/2019.

15th European CODIS User Conference. Servicio de Criminalística de la Guardia Civil. Madrid, 07/05/2019.

43rd ENFSI DNA EXPERT WORKING GROUP MEETING. Organizado por el Servicio de Criminalística de la Guardia Civil, Madrid (España). 8-10/05/2019.

HID Roadshow: Uncover Forensic Technologies. Thermo Fisher Scientific. Madrid. 28/05/2019.

Iniciación a la secuenciación masiva en paralelo. Aplicaciones en genética forense. Centro de Estudios Jurídicos. Madrid, 03/06/2019.

Intervención en catástrofes o sucesos con víctimas múltiples. Instituto Universitario de Investigación en Ciencias Policiales. Alcalá de Henares, 06/06/2019.

XXI Congreso de la Sociedad Española de Antropología Física (SEAF). Miradas actuales a la Antropología Forense. Organizado por el Laboratorio de Antropología Forense de la Universidad de Granada. Granada. 24-26/06/2019.

XV Congreso Nacional e Internacional de Paleopatología. Rastros de vida y muerte. Organizado por el Laboratorio de Antropología Forense de la Universidad de Granada. Granada. 27-28/06/2019.

XXIV Jornadas de Genética Forense del GHEP-ISFG. Organizado por LabGenetics y el GHEP-ISFG. Praga (República Checa). 9-10/09/2019.

28th Congress of the International Society for Forensic Genetics (ISFG). Organizado por el Prof. Jiří Drábek, Instituto de Medicina Molecular y Traslacional de la Facultad de Medicina de la Universidad de Palacký (Olomouc, Rep. Checa). Praga (República Checa). 9-13/09/2019.

Calidad aplicada al laboratorio. Estándares. Centro de Estudios Jurídicos. Madrid, 19-20/09/2019.

Curso multidisciplinar de agresiones sexuales, papel de los trabajadores del INTCF: recepción de muestras en el laboratorio. Precauciones en el manejo, seguridad del trabajador, cadena de custodia. Centro de Estudios Jurídicos. Madrid, 23-27/09/2019.

Curso sobre la prueba pericial en los delitos contra los recursos naturales y de medio ambiente. Centro de Estudios Jurídicos. Madrid, 24-25/10/2019.

Seminario sobre contaminación humana en genética forense. INTCF. Madrid, 28 y 30/10/2019.

4.2. Barcelona Department Biology Service

Concerning the expert activity of the Barcelona Department Biology Service, during 2019 they received 2,035 requests with 5.741 evidences and they analysed the 9,252 samples through a total of 39,253 analysis, emitting a total of 1,155 expert reports.

As it can be seen in figure 4.2.1, the predominant analysis request correspond to those **sexual aggression cases** (1,433 requests with 4,711 evidences) where they do a biological and genetic study looking for semen or other biological vestiges, and the DNA profile obtention of the samples of the implied persons in the procedure (defendants, victims..).

The second most numerous group of analysis requests corresponds to **kinship biological studies** (325 requests with 564 evidences), followed by **analysis of biological evidence of criminal interest** (197 requests with 412 evidences), and **genetic identification of missing persons and corpse remains** (59 requests with 49 evidences).

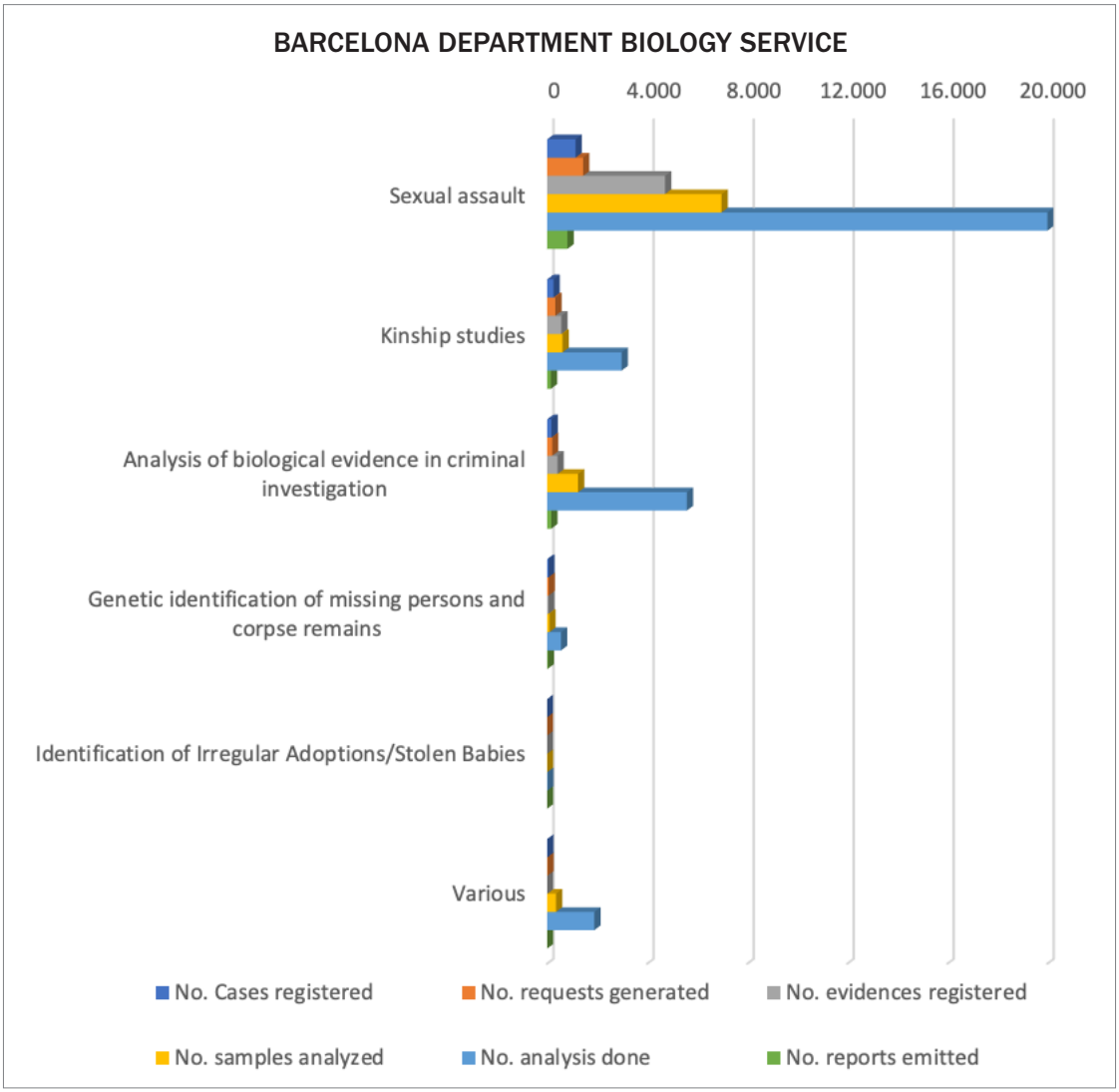
During 2019, there has been realized an important effort in the actualization of the documentation associated to the procedures of work in the Biology Service and to accredit new tests for the future implementation.

In this sense, the collaboration agreement between the INTCF Barcelona Department and University of Pompeu Fabra is noted as a consolidated relation shown as a useful tool for both parts along the years. The stays in our laboratory of students from the biosciences master have permitted certain activities aimed to validate analytical methods of the Service. During 2019, this activity was materialized in the validation of new commercial kits (*VeriFiler™ Plus PCR Amplification Kit*) for its forensic use

Likewise, the Biology Service members have participated continuously in some activities aimed to implement and perfectionate new analysis methods in laboratories of diverse Turkish institutions (Gendarmerie and Institute of Forensic Medicine), which were developed in the European project *TR 16 IPA JH 03 18 - Forensic Training Towards Advanced Examination Methods*.

Besides that, during 2019 members of the service have collaborated in activities directed to the assessment of the accreditation process of certain genetic forensic laboratory tests and in the continuous formation of the staff from different latin american countries (El Salvador and Honduras). This is inside the European project of *Criminal investigative cooperation in Central America to combat international crime and drug trafficking «ICRIME LA/ 2017/39066»*.

Figure 4.2.1. Casework of the Biology Service of the Department of Barcelona during 2019 according to the type of report



Type of report	No. Cases registered	No. requests generated	No. evidences registered	No. samples analyzed	No. analysis done	No. reports emitted
Sexual assault	1.134	1.433	4.711	6.970	28.247	811
Kinship studies	251	325	564	611	2.974	147
Analysis of biological evidence in criminal investigation	173	197	412	1.232	5.583	163
Genetic identification of missing persons and corpse remains	50	59	49	86	551	29
Identification of Irregular Adoptions/Stolen Babies	0	0	0	2	15	1
Various	14	21	5	351	1.883	4
Total	**1.622**	**2.035**	**5.741**	**9.252**	**39.253**	**1.155**

4.2.1. Interesting forensic cases

4.2.1.1. «Sabadell 's Manada rape case»

On 5 February 2019, the Institute received from court the genetic analysis request of the samples about sexual aggression with multiple aggressors (three) to a woman of 18 years. Initially, they receive a total of 15 evidences both the samples taken to the victim's body as the clothes in the moment of the aggression. Between the 6 and 8 February, they received 29 more evidences. Eleven of them are unknown samples (blanket, sweatshirt, t-shirt, used condom, etc.) and 18 are reference samples from other suspects. They request us the genetic study of the unknown samples and comparison with the reference samples

Urgent protocol analysis begins and by order of the court by means of an official letter issued on 13 February the Biology service informed of the state of the analyses and the possibility of inclusion in CODIS of a genetic profile different to that of those under investigation. They emit a first report the 22 February after the analysis of more than 90 samples from evidences and clothing cuttings. This first report demonstrates the implication of two suspects and the presence of DNA of a third suspect. The victim's bra sample doesn't correspond to the other eight investigated. After including it in CODIS does not match any profile registered so far. It is also indicated that analyses are continuing with some of the evidence received.

The 28 February there is a second opinion (ampliation 1) with the condom and cuttings done to the mattress cover analysis. This report demonstrates that the used condom doesn't correspond to the facts since a female DNA is obtained different from the victim and a different male genetic profile from the investigated persons. In addition, in the epithelial fraction of one of the mattress cut-outs, a genetic profile appears in which a majority female component coincides with the victim, and in other cut-outs, the DNA of one of the investigated persons and of the unknown aggressor that appeared in the bra cut-out appears.

On the first of March, they receive 5 more evidences (a handkerchief, some cigarette butts and different clothes), the 29 March the reference samples of another investigated (ninth).

On 11 April there was a third opinion (ampliation 2) with the results of the inclusion in CODIS of the male genetic profile found in the condom not matching any profile so far.

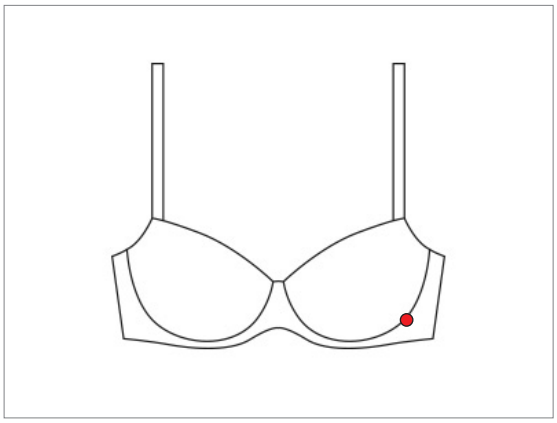
On 7 May there was a fourth opinion (ampliation 3) indicating the results from the analysis of the samples received on 1 and 29 March. This report shows the DNA of the two investigated which appear in the intimate samples from the victim and the third unknown individual that appeared in part of the victim´s bra.

On 27 June they receive the reference samples of a tenth suspect and the 5 September reports the no-compatibility nor coincidence of its genetic profile with the found in unknown forensic samples of the case

In resume, with 53 evidences (unknown and reference samples) and the analysis of more than 130 samples the presence of DNA from two of the suspects and a third unknown suspect has been demonstrated in the samples taken from the victim's body as well as in the clothing and the mattress where the crimes were allegedly committed.

Figure 4.2.1.1.1. Photograph taken of the outside of the bra under high intensity forensic light (Crime-lite ML). A small fluorescent spot can be seen on the elastic under the left breast

Figure 4.2.1.1.2. The location of the stain found on the bra is represented with a red dot



4.2.1.2. Investigation of an alleged sexual aggression to a minor in the family

The 16 April 2019 the Institute receives from court the genetic analysis request of the samples from an alleged sexual aggression to a minor of 4 years by his father.

According to the case history the parents are separated and after the boy comes from a visit with his father in Madrid, the mother observes rectal bleeding. The medical tests are all negative for infectious and/or inflammatory causes. The child has been washed before the sampling. The evidence we received are 2 buccal swabs (reference sample from the victim), 2 anal swabs, 2 perineal swabs, and the pants that the child was wearing when his mother picked him up.

After analyzing the evidence we see that in any of the samples taken to the victim's body is semen or other DNA, but in one of the cuttings from the pants we find little semen remains (4 sperms in lysis). Analysis of the L2 (seminal) fraction of this pants rendered a unique genetic profile in autosomal STR markers that is different from that of the boy and would not correspond to that of his father; genetic profile in haplotypic

STR markers of the Y chromosome is identical to that of the child, so it is initially deduced that a paternal relative of the child could be the donor of the detected DNA. We get in touch with the court to indicate to them the results and the possibility to compare with male family members by father to facilitate the investigation. They indicate to us that the matter was dismissed due to lack of evidence and that it would have to be reopened.

On 10 September, they emit the correspondent opinion indicating that semen remains are confirmed on the pant. A possible genetic profile is suitable to compare it with the investigators. An allusion is made to the genetic finding that points to a patrilineal relationship between the person providing the DNA and the child «...it cannot be ruled out that the person to whom the DNA found on cut Z3 of the pants belongs and the victim are related through the paternal line».

On the 20 November we received the reference samples from four possible suspects including the boy´s father. Analyzing the samples, we found that it was an uncle of the child who had provided the semen found in the child's pants. Finally, on 18 December, the corresponding report was issued.

Figure 4.2.1.2.1. Photograph taken inside briefs under high intensity forensic light (Crime-lite ML). A fluorescent stain is observed in the crotch area of the garment

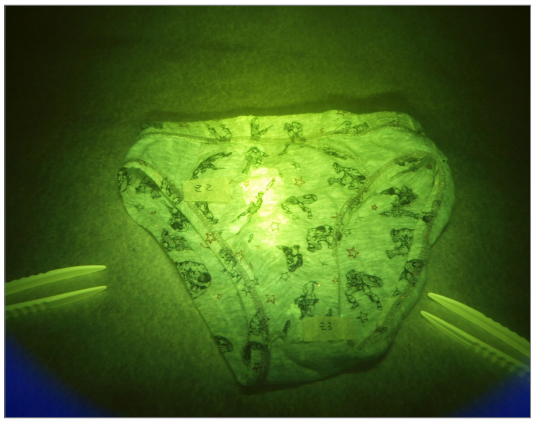
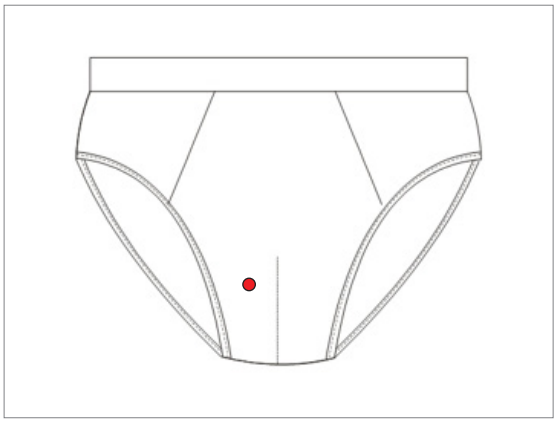


Figure 4.2.1.2.2. The location of the stain found on the underpants is represented with a red dot



4.2.2 Teaching and scientific activity

4.2.2.1. Contribution in scientific congresses

Crespillo Márquez M. Identificación de restos cadavéricos mediante análisis genético. 1.er Congreso Internacional de Criminología y Ciencias Forenses. San Salvador (El Salvador). 15 de marzo de 2019.

Crespillo Márquez M. Las bases de datos de ADN de interés criminal y humanitario. 1.er Congreso Internacional de Criminología y Ciencias Forenses. San Salvador (El Salvador). 16 de marzo de 2019.

Crespillo Márquez M. La transmisión de la prueba en genética forense. XV Reunión del Grupo Iberoamericano de Trabajo en Análisis de ADN (GITAD). São Paulo (Brasil). Del 21 al 24 de mayo de 2019.

Crespillo Márquez M. Ponencia «La transmisión de la prueba genética ante los tribunales de justicia» en la III Jornada de Actualización Científica para Jueces y Fiscales. Organizada por Laboratorio Clínico REFERENCIA. Celebrada en Sto. Domingo (República Dominicana). 27 y 28 de junio de 2019.

Crespillo Márquez M. Estrategias genéticas en la identificación de cadáveres. XXXIII Jornadas Costarricenses de Medicina Legal. XII Encuentro de la Red Iberoamericana de Instituciones de Medicina Legal y Ciencias Forenses. San José (Costa Rica). 23 de agosto de 2019.

Crespillo Márquez M. Ponencia «ADN mitocondrial» desarrollada durante la presentación de los resultados del «Ejercicio de Intercomparación GHEP-ISFG 2019» realizado en el marco de las XXIV Jornadas de Genética Forense del GHEP-ISFG. Celebrada en Praga (República Checa) del 9 al 10 de septiembre de 2019.

Núñez Domingo C, Baeta M, Núñez C, Raffone C, Granizo E, Palencia-Madrid L, Cardoso S, Etxeberria F, Herrasti L, De Pancorbo MM. Update in the genetic identification of skeletal remains from victims of the Spanish Civil War and posterior dictatorship. En: 28th Congress of the International Society for Forensic Genetics. Praga (República Checa). Celebrado del 9 al 13 de septiembre de 2019.

Crespillo Márquez MC. Reunión del Pleno de la Comisión Nacional para el Uso Forense del ADN. Celebrada en el Palacio de Parcent del Ministerio de Justicia. Madrid (España). 24 de octubre de 2019.

Núñez Domingo, C, Baeta B, Raffone C, Núñez C, Granizo E, Palencia-Madrid L, Cardoso S, Herrasti L, Etxeberria F, de Pancorbo MM. Genetic identification of human remains from victims of the Spanish Civil War and posterior dictatorship: the state of the art. En: 1st International Symposium on Humanitarian Forensic Action: Forensic Best Practices and Principles for Preventing and Resolving the Missing. Coimbra (Portugal). Celebrado del 27 al 29 de noviembre de 2019.

Núñez Domingo C, Baeta M, Núñez C, Raffone C, Granizo E, Palencia-Madrid L, Cardoso S, Etxeberria F, Herrasti L, de Pancorbo MM. Update in the genetic identification of skeletal remains from victims of the Spanish Civil War and posterior dictatorship. En: 28th Congress of the International Society for Forensic Genetics. Praga (República Checa). Celebrado del 9 al 13 de septiembre de 2019.

Crespillo Márquez M. Ponencia «Criterios mínimos recomendados para la aceptación y evaluación de perfiles mezcla» realizada en el 18.º Congreso Nacional de Medicina Legal y Ciencias Forenses/3.ª Reunión de Servicios Médico Legal y Forense de lengua portuguesa. Organizado por INMLCF de Portugal. Coimbra (Portugal). Del 21 al 23 de noviembre de 2019.

Crespillo Márquez M. La interpretación de perfiles mezcla: limitaciones y futuro. VIII Congreso Nacional de Medicina Legal y Ciencias Forenses. 21 de noviembre de 2019. Coimbra (Portugal).

Crespillo Márquez M. «Workshop on DNA extraction Methods from Bone» of the EU twinning Project on Forensic Towards Advanced Examination Methods. Celebrado en Ankara (Turquía) del 30 de septiembre al 4 de octubre de 2019.

4.2.2.2. Scientific publications

Crespillo Márquez MC. Efectos de la contaminación, transferencia y persistencia del ADN en la interpretación de la prueba genética. En M. Crespillo y P. Barrio. Genética Forense: del laboratorio a los Tribunales. 1.ª edición. Madrid: Díaz de Santos; 2019. p. 51-77.

Crespillo Márquez, MC. y Barrio P. Informe pericial en materia de genética forense. Requisitos, estructura y ejemplos. En M. Crespillo y P. Barrio. Genética Forense: del laboratorio a los Tribunales. 1.ª edición. Madrid: Díaz de Santos; 2019. p. 467-491.

Núñez Domingo C, Palencia-Madrid L, Baeta M, Villaescusa P, Nuñez C, de Pancorbo MM, Luis JR, Fadhlaoui-Zid K, Somarelli J, Garcia-Bertrand R, Herrera RJ. The Marquesans at the fringes of the Austronesian expansion. Eur J Hum Genet. 2019; 27(5):801-810.

Núñez Domingo C, Messoussi M, Prieto-Fernández E, Baeta M, Núñez C, Gaaied ABA, De Pancorbo MM, Fadhlaoui-Zid K. Genetic variation of 17 X-chromosome STR loci in Tunisian population of Nabeul. *Int J Legal Med.* 2019 Jan.; 133(1): 85-88.

4.2.2.3. Education and teaching activities

Crespillo Márquez M. Estrategias en la identificación genética de restos cadavéricos. Máster de Ciencias Forenses. Módulo de antropología forense. Universidad de Barcelona. Barcelona. España. 28 de marzo de 2019.

Pifarré Rubbel A. Aplicaciones de la genética en el ámbito de la Justicia. Conferencia, Máster de «Derecho Penal y ciencias sociales» Universidad de Barcelona y Universidad Pompeu Fabra. Barcelona. España. 21 de junio de 2019.

Pifarré Rubbel A. Activity 1.1: Assessment of the current situation and proposals to address training needs regarding new methodology in Forensic Biology and Chemistry. Twinning Project TR 16 IPA JH 03 18. FORENSIC TRAININGS TOWARDS ADVANCED EXAMINATION METHODS. Ankara. Turquía. Del 24 al 28 de junio de 2019.

Bofarull i Castro, A. y Pifarré Rubbel, A. Activity 1.2: Workshop on advanced Level DNA Studies on Sexual Assault/Rape Cases. Twinning Project TR 16 IPA JH 03 18. FORENSIC TRAININGS TOWARDS ADVANCED EXAMINATION METHODS. Ankara. Turquía. Del 15 al 19 de julio de 2019.

Crespillo Márquez M. Curso de especialización en genética forense. Universidad de Costa Rica. San José (Costa Rica). 19-20 de agosto de 2019.

Crespillo Márquez M. Interpretación de la prueba genética ante los Tribunales de Justicia. Instituto de Medicina Legal de Costa Rica. San José (Costa Rica). 21 de agosto de 2019.

Crespillo Márquez M, Pifarré Rubbel A. Activity 1.4: Working Group on Interpretation of Results in Low-Level DNA, Degraded DNA and Mixture DNA Profiles. Twinning Project TR 16 IPA JH 03 18. FORENSIC TRAININGS TOWARDS ADVANCED EXAMINATION METHODS. Ankara (Turquía). Del 26 al 29 de agosto de 2019.

Crespillo Márquez M. «Importancia de la calidad en los análisis de genética forense» en el marco de la asignatura Genética Forense del Máster en Genética, Física y Química Forense. 2 horas lectivas. Organizado por la Facultad de Química de Tarragona de la Universidad Rovira i Virgili. Tarragona. España. 1 de octubre de 2019.

Crespillo Márquez M, López M. Métodos y estrategias en la extracción de ADN a partir de restos óseos. Twinning Project TR 16 IPA JH 03 18. FORENSIC TRAININGS TOWARDS ADVANCED EXAMINATION METHODS. Ankara. Turquía. Del 30 de septiembre al 4 de octubre de 2019.

Bofarull Castro A. Profesor del curso multidisciplinar de agresiones sexuales, papel de los trabajadores del INTCF: Recepción de muestras en el laboratorio. Precauciones en el manejo. Instituto Nacional de Toxicología y Ciencias Forenses. Precauciones en el manejo de las muestras relacionadas con la seguridad del trabajador. Riesgos y medidas de protección. Subdirección General de Medios Personales al servicio de la Admón. de Justicia del Ministerio de Justicia, dentro del Plan de Formación para personal funcionario. Celebrado en el Departamento de Barcelona del INTCF. Barcelona. España. 8 de octubre de 2019.

Serrano Sánchez A. Profesor del curso multidisciplinar de agresiones sexuales, papel de los trabajadores del INTCF: Recepción de muestras en el laboratorio. Precauciones en el manejo. Instituto Nacional de Toxicología y Ciencias Forenses. Análisis de las muestras para investigación de vestigios biológicos. Subdirección General de Medios Personales al servicio de la Admón. de Justicia del Ministerio de Justicia, dentro del Plan de Formación para personal funcionario. Celebrado en el Departamento de Barcelona del INTCF. Barcelona. España. 9 de octubre de 2019.

Pifarré Rubbel A. Profesor del curso multidisciplinar de agresiones sexuales, papel de los trabajadores del INTCF: Recepción de muestras en el laboratorio. Precauciones en el manejo. Instituto Nacional de Toxicología y Ciencias Forenses. Análisis de las muestras para investigación genética. Subdirección General de Medios Personales al servicio de la

Admón. de Justicia del Ministerio de Justicia, dentro del Plan de Formación para personal funcionario. Celebrado en el Departamento de Barcelona del INTCF. Barcelona. España. 9 de octubre de 2019.

Crespillo Márquez M. Profesor del curso multidisciplinar de agresiones sexuales, papel de los trabajadores del INTCF: Recepción de muestras en el laboratorio. Precauciones en el manejo. Instituto Nacional de Toxicología y Ciencias Forenses. Informes periciales ante los tribunales de Justicia. Subdirección General de Medios Personales al servicio de la Admón. de Justicia del Ministerio de Justicia, dentro del Plan de Formación para personal funcionario. Celebrado en el Departamento de Barcelona del INTCF. Barcelona. España. 11 de octubre de 2019.

Crespillo Márquez M. Módulo de genética forense. Máster de Laboratorio y Análisis Clínicos. Universidad Pompeu y Fabra. Barcelona. España. 15, 18 y 19 de octubre de 2019.

Crespillo Márquez M. Asesoramiento en el proceso de acreditación del laboratorio de genética del Ministerio Público de Honduras. Proyecto ICRIME-LA/2017/39066. Cooperación en investigación criminal en Centroamérica para combatir la delincuencia y el tráfico de drogas a nivel internacional. Tegucigalpa. Honduras. Del 25 al 29 de noviembre de 2019.

Crespillo Márquez M. Asesoramiento en el proceso de acreditación del laboratorio de genética del Instituto de Medicina Legal de El Salvador. Proyecto ICRIME- LA/2017/39066. Cooperación en investigación criminal en Centroamérica para combatir la delincuencia y el tráfico de drogas a nivel internacional. San Salvador. El Salvador. Del 2 al 6 de diciembre de 2019.

Pifarré Rubbel A. Activity 2.4: Accreditation Assistance for Isolation of DNA with EZ-1 DNA Investigator Kit. Twinning Project TR 16 IPA JH 03 18. FORENSIC TRAININGS TOWARDS ADVANCED EXAMINATION METHODS. Ankara. Turquía. 09 de diciembre-20 de diciembre de 2019.

Horta Márquez MF. Activity 2.4: Accreditation Assistance for Isolation of DNA with EZ-1 DNA Investigator Kit. Twinning Project TR 16 IPA JH 03 18. FORENSIC TRAININGS TOWARDS ADVANCED EXAMINATION METHODS. Ankara. Turquía. 9 de diciembre-13 de diciembre de 2019.

Servicio de Biología. «Iniciación a la secuenciación masiva en paralelo. Aplicaciones en genética forense». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. Departamento de Barcelona del INTCF. Barcelona. España. Celebrado el martes 11 de junio de 2019.

Serrano Sánchez A. «Presentaciones eficaces en los Tribunales». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. 10 horas lectivas. Madrid. España. Celebrado del 18 al 19 de junio de 2019.

Solá Graffigna DM. «Presentaciones eficaces en los Tribunales». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. 10 horas lectivas. Madrid. España. Celebrado del 18 al 19 de junio de 2019.

4.3. Seville Department Biology Service

Concerning the expert activity of the Seville Department Biology Service, during 2019 they received during 2019 1,947 requests with 3,793 evidences and analyzed 8,428 samples from a total of 37,086 analysis, emitting a total of 1,235 expert reports.

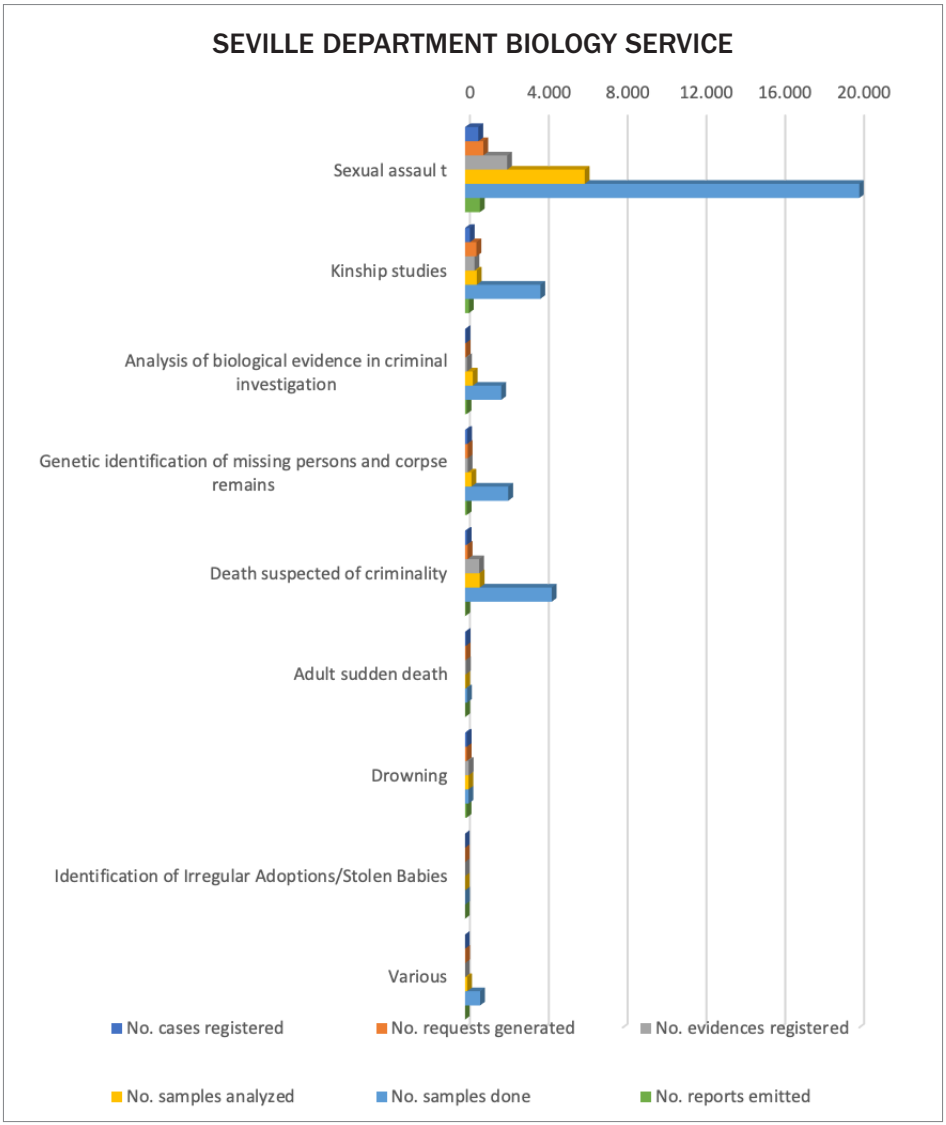
Como puede verse en la figura 4.3.1, the predominant analysis request corresponds to the investigation of **sexual assault cases** (925 requests with 2,133 evidences) realizing a biological and genetic study of semen or other biological remains, as well as a DNA profile obtention of the reference samples implied in the process (defendants, victims)

The second most numerous group of analysis requests corresponds to **kinship biological studies** (577 requests with 481 evidences), followed by **analysis of biological evidence of criminal interest** (40 requests with 96 evidences), and the **genetic identification of missing persons and corpse remains** (135 requests with 131 evidences).

Also, it is important to highlight the **biological investigation of drowning deaths** (82 requests with 185 evidences) and the **sudden adult deaths studies** (39 requests with 46 evidences) .

The facultative staff of the Service has participated as complementary activities to the resolution of court cases, in the publication of various scientific and educational publications. This has been done in courses organized by Legal Study Centers or in Degrees and Masters of the Universidad Pablo de Olavide, among others. Finally, as a highlight in the field of education, there has been intervention in the Workshop on DNA Extraction Methods from Bone incluido in the Twinning Project TR 16 IB JH 03 18 «Forensic Training Towards Advanced Examination Methods», for forensic DNA training for the Turkish police and forensic medical corps.

Figure 4.3.1. Casework of the Biology Service of the Department of Seville during 2019 according to the type of report



Type of report	No. Cases registered	No. requests generated	No. evidences registered	No. samples analyzed	No. analysis done	No. reports emitted
Sexual assaul t	673	925	2.133	6.071	23.798	749
Kinship studies	242	577	481	592	3.820	194
Analysis of biological evidence in criminal investigation	33	40	96	393	1.833	79
Genetic identification of missing persons and corpse remains	107	135	131	321	2.190	85
Death suspected of criminality	86	130	715	745	4.395	30
Adult sudden death	40	39	46	24	98	21
Drowning	82	82	185	174	174	76
Identification of Irregular Adoptions/Stolen Babies	1	3	3	2	13	0
Various	2	16	3	106	765	1
Total	**1.266**	**1.947**	**3.793**	**8.428**	**37.086**	**1.235**

4.3.1. Interesting forensic case: death suspected of criminality

Background

The case describes the violent death of a woman of 26 years that was living temporarily in Huelva. The case became mediatic given the characteristics. The first ocular inspection suspected a sexual mobile in the murder. The case was registered at the Seville´s Department at the end of December 2018, but afterward, the Biology Service extended it until the first weeks of 2019. Initially, medical examiners when the autopsy requested the identification of biological traces from the victim's body and the suspect related with an offense against sexual liberty, apart from other analyses implicating the Chemistry and Histopathology Services.

Evidences

They received 89 evidences taken to the victim including blood, hair, vaginal and anal samples; nails from both hands, wrists, breasts, knees, ankles, abdomen, thighs, etc. apart from different clothes (jacket, bra, sweatshirt, and t-shirt), or various personal objects like wrings, and piercings. Concerning the suspect evidence, only two swabs with cells taken from the buccal epithelium were received. All the evidence generated the analysis of 168 samples giving the result of four expert reports.

Results and Conclusions

Those samples to carry out a preliminary semen investigation gave a negative result. However, after extracting the DNA from the samples and quantifying it was possible to see male DNA in the vaginal douching allowing to obtain a Y Chromosome haplotype. This haplotype matched the one obtained from the suspect samples (LR= 13193).

They weren't other biological remains different from her. Nor in the analysis of the biological remains of the nails, in other parts of the body (neck, breasts, wrists), or in the personal victims objects (rings, piercings). Nevertheless, analysing the swab samples taken from the ankle and bracelet, there are genetic profiles with autosomal markers in which the victim's alleles could not be ruled out and those alleles coming from the researcher (LR= 3.75 x 1018). A result confirmed the data from the investigation, as it was intuited that the corpse, naked from the waist down, was dragged by the ankles. There is no doubt that the finding of this male DNA remains confirmed that the investigation was being in Seville. These results were already in the Investigator Judge power when the first confession of the suspect was obtained, allowing the reconstruction of facts.

Final considerations

When criminal facts acquire a mediatic interest, the public opinion generally and especially the Investigating Judge needs immediate results. In this case, the first expert

report sent to court was done 48 hours after the registration on this Department. All of this was possible thanks to the professionality of the Biology Service staff that was working on this out of their schedule and to PCR in real-time, robotic DNA extraction, or multi-capillary DNA sequencers techniques that allowed them to finish this big amount of work.

4.3.2 Teaching and scientific activities

4.3.2.1. Contribution in scientific congresses

Prieto Ruiz-Canela MV. «Tipos de estudios y muestras en el laboratorio de Biología Forense». Máster en Criminología y Ciencias Forenses. Universidad Pablo de Olavide. 11 de febrero de 2019. Sevilla.

López Soto M. «Actividad 1.3: Workshop on DNA Extraction Methods from Bone incluida en el Twinning Project TR 16 IB JH 03 18». Forensic Training Towards Advanced Examination Methods (para la formación en ADN forense de los cuerpos policiales y médico-legales turcos). 30 de septiembre al 4 de octubre de 2019. Ankara (Turquía).

López Soto M. «Análisis de las muestras para investigación genética». Prieto Ruiz-Canela MV. «Análisis de las muestras para investigación de vestigios biológicos». Curso multidisciplinar de agresiones sexuales». Centro de Estudios Jurídicos. 21 al 25 de octubre de 2019. Sevilla

Baeza Richer CI. «Interpretación estadística de los datos de ADN en paternidad y criminalística». Conferencia en la Academia de Oficiales de la Guardia Civil (en el marco de la asignatura Tratamiento de la Información Policía Científica de 4.º Curso GIS, Grado Ingeniería de la Seguridad. 2018-2019). Aranjuez (Madrid).

4.3.2.2. Scientific publications

Baeza Richer CI *et al.* «Genetic identification of Spanish civil war victims. The state of the art in Catalonia (Northeastern Spain)». *Forensic Science International:* Genetics Supplement Series. 2019; 7(1): 419-421.

Baeza Richer CI *et al.* «Kinship analysis on skeletal ancient remains: The case of «el cerro de la horra» (Burgos, Spain)». *Forensic Science International:* Genetics Supplement Series. 2019; 7 (1): 279-281.

Baeza Richer CI *et al.* «An unusual kinship case from the Spanish Civil War (1936–1939): Ancient versus degraded sample's investigation». *Forensic Science International:* Genetics Supplement Series. 2019; 7(1): 690-691.

Baeza Richer CI *et al.* «X-InDels efficacy evaluation in a critical samples paternity case: A Spanish Civil War case from the memorial of the camposines (Tarragona, Spain)». *Forensic Science International:* Genetics Supplement Series. 2019; 7(1): 494-495.

4.3.2.3. Education and teaching activities

Baeza Richer CI. Profesor. Curso Avanzado en Genética Forense. Grupo Complutense de Genética Forense y Genética de Poblaciones (dirigidas a miembros del departamento de Biología del Servicio de Criminalística de la Guardia Civil). 1 al 11 de abril de 2019. Madrid.

Baeza Richer CI. Profesor. Curso Intermedio en Genética Forense. Grupo Complutense de Genética Forense y Genética de Poblaciones (dirigidas a miembros del departamento de Biología del Servicio de Criminalística de la Guardia Civil). 20 al 30 de mayo de 2019. Madrid.

López Soto M. Profesor asociado del Departamento de Biología Molecular e Ingeniería Bioquímica (Área de Genética). Universidad Pablo de Olavide. 2018-2019 y 2019-2020.

Baeza Richer CI. Profesor. Curso Online Introducción a la Genética Forense (E-LEARNING FACTORY Y GENFOREN).

Luque Gutiérrez JA, López Soto M. XIV Jornadas de Genética Forense. Grupo de Habla Española y Portuguesa de la Sociedad Internacional de Genética Forense. Praga (República Checa). 9 y 10 de septiembre de 2019.

Servicio de Biología. Introducción al Sistema YFiler Plus, nuevo kit de amplificación. Servicio de Biología INTCF-S. Sevilla. 17 de enero al 20 de febrero de 2019.

Servicio de Biología. Iniciación a la secuenciación masiva en paralelo. Aplicaciones en genética forense. Centro de Estudios Jurídicos. 10 horas. Sevilla 17 de junio de 2019.

Capilla San Martin JR. Presentaciones eficaces en los tribunales. Centro de Estudios Jurídicos. 10 horas. Madrid 18 y 19 de junio de 2019.

Servicio de Biología. «Análisis de las muestras para investigación de vestigios biológicos». Curso multidisciplinar de agresiones sexuales. Centro de Estudios Jurídicos. Sevilla. 21 al 25 de octubre de 2019.

4.4. La Laguna Biology Section

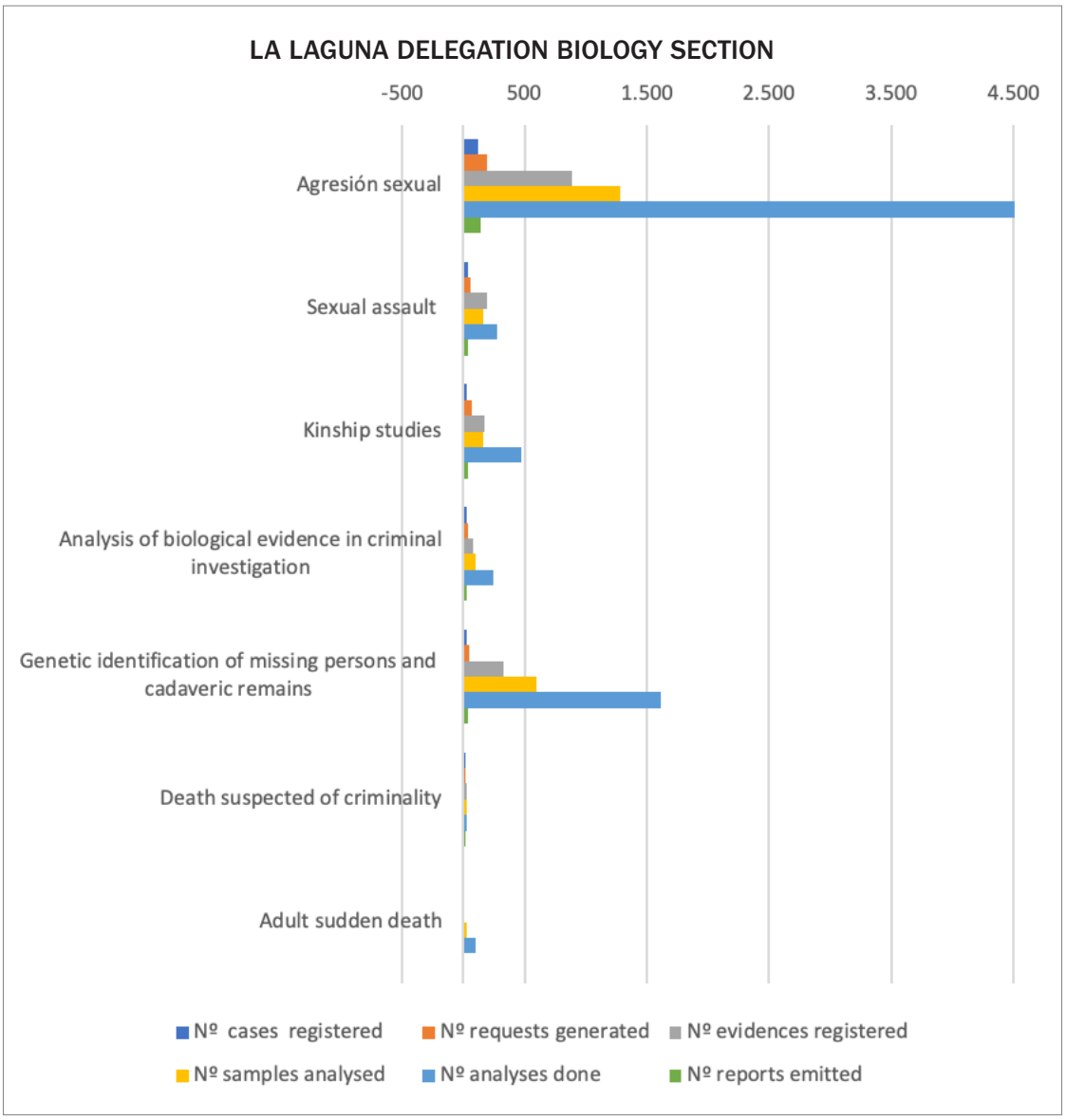
Concerning the expert activity from La Laguna Biology Section, during 2019 they received 410 requests with 1,693 evidences and 2,345 samples were analysed through 7,294 analysis, emitting a total of 295 expert reports.

As it can be seen at figure 4.4.1, the predominant analysis request corresponds to the investigation of **sexual assault cases** (191 requests with 890 evidences) making a biological and genetic study of semen or other biological incidences as well as the DNA profile obtention from samples of the persons implied in the procedure (defendants, victims).

The second most numerous group of analysis requests corresponds to **analysis of biological evidence of criminal interest** (66 requests with 170 evidences) followed by kinship **biological studies** (54 requests with 197 evidences), the investigation of suspicious criminal deaths (45 requests with 329 evidences), and **genetic identification of missing persons and cadaveric remains** (36 requests with 77 evidences).

We must highlight the **adult sudden death studies** (13 requests with 27 evidences).

Figure 4.4.1. Casework of the La Laguna Biology Section during 2019 according to the type of report



Type of report	N.º cases registered	N.º requests generated	N.º evidences registered	N.º samples analysed	N.º analyses done	N.º reports emitted
Sexual assault	116	191	890	1.281	4.556	143
Kinship studies	41	54	197	158	279	39
Analysis of biological evidence in criminal investigation	26	66	170	160	471	35
Genetic identification of missing persons and cadaveric remains	24	36	77	102	240	30
Death suspected of criminality	30	45	329	599	1.617	33
Adult sudden death	13	13	27	22	32	13
Various	1	5	3	23	99	2
Total	**251**	**410**	**1.693**	**2.345**	**7.294**	**295**

4.4.1. Interesting forensic case: identification of a sexual aggressor through the police DNA identification database

La Laguna Delegation INTCF receives samples taken to a woman victim of sexual aggression, requesting to analyse it and to make a report.

According to the documentation, the victim explains being drinking beer with another person that offered her a typical drink from his country. The victim only reminds waking up with vaginal and anal pain.

All vaginal and anal victim samples underwent all the normalized procedures based on the investigation of semen remains or other cellular material that may be of the alleged aggressor.

Semen remains are detected in the vaginal and anal samples from the victim. A male genetic profile appears in the anal douching and vagina from the victim after analysing the semen remains from the samples. They signed up the aggressor´s profile into the National Database of DNA Profiles of criminal interest, regulated by Organic Law 10/2007 that this Delegation has access to it. After the registration, there was a coincidence with the aggressor. The profile of the aggressor was registered into the database requested by the Guardia Civil Criminalistic Laboratory, concerning a supposed sexual aggression offense. They obtained in the statistical evaluation that the genetic profile was sixteen thousand quadrillion times more probable if the semen remains found in the victim's samples proceeded from the alleged aggressor, than if it came from another genetically individual chosen from the population.

The results were collected in a report emitted to court from our Biology Section from La Laguna INTCF.

4.4.2 Teaching and scientific activities

4.4.2.1. Participation in investigation projects

Convenio de colaboración con el Instituto Canario de Bioantropología, del Organismo Autónomo de Museos y Centros del Cabildo Insular de Tenerife, en materia de investigación y docencia.

4.4.2.2. Contribution in scientific congresses

Hernández Luis, A. Título: «Identificación de fluidos». Ponencia oral de presentación de resultados del Ejercicio de Intercomparación «Estudio de polimorfismos de ADN en manchas de sangre y otras muestras biológicas», en las XXIV Jornadas de genética forense del GHEP-ISFG celebradas en Praga (República Checa). 9 de septiembre de 2019.

4.4.2.3. Educative and teaching activities

Hernández Luis, A . Actividad docente en el Curso de Especialización «Ciencia Forense y Arqueología». Organizado por el Instituto Canario de Bioantropología, INTCF-Canarias, Instituto de Medicina Legal de Santa Cruz de Tenerife y Museo Arqueológico de Tenerife Lugar de celebración: Museo de la Naturaleza y el Hombre de Tenerife. Durante los martes y jueves de febrero y marzo de 2019.

Asistencia a dos ediciones del curso del CEJ sobre Secuenciación Masiva en Paralelo con aplicaciones en genética forense para facultativos y técnicos de laboratorio, organizado por el INTCF en Madrid y Sevilla. 2019.

Asistencia al curso multidisciplinar de Agresiones Sexuales, papel de los trabajadores del INTCF: recepción de muestras en el laboratorio. precauciones en el manejo, seguridad del trabajador, cadena de custodia. Organizado por el INTCF y recibido en Tenerife por videoconferencia. 7 al 11 de octubre de 2019.

Asistencia a las I Jornadas TEDAX- NRBQ contra riesgos tecnológicos organizadas por el Cuerpo Nacional de Policía. Centro Internacional de Ferias y Congresos de Tenerife. 8 de octubre de 2019.

4.5. THE INTCF DNA DATABASES

During 2019 a total of **637 genetic profiles** were registered in different DNA files of the INTCF. In cases of criminal investigation and identification of disappeared they signed up

a total of **615 DNA profiles**, registered as well in the national DNA database managed by the State Secretariat for Security from the Interior Department. In the case of genetic profiles obtained about Irregular Adoptions and Newborn Subtractions cases, files managed by the Ministry of Justice, with a total of **22 DNA profiles**.

In the current report, we analyse the results obtained in the different DNA databases of the INTCF during 2019.

4.5.1. Investigación criminal e identificación de desaparecidos

During 2010 the INTCF (*Order JUS/2267/2010, 30 July)*, is the institution responsible of the two DNA profile files:

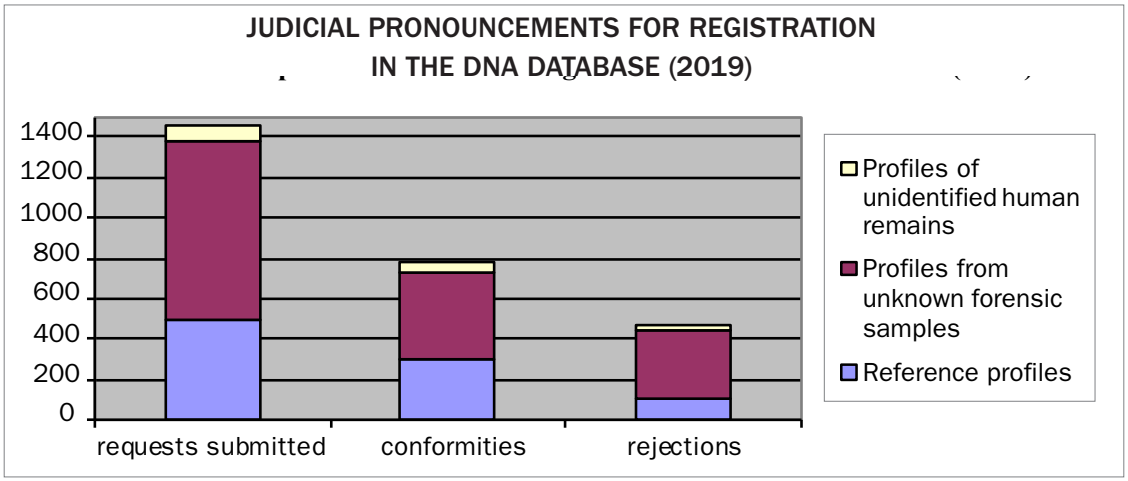
- The INTCF-ADNIC file (Criminal Investigation), whose purpose is the genetic comparison of biological remains from suspects in a criminal procedure, to identify coincidences between the DNA profiles and to provide information in the investigation of offenses without a known perpetrator.
- The INTCF-ADNID file (Disappeared Investigation) to identify the genetic of disappeared persons and corpses without identification in court proceedings through the comparison of genetic profiles obtained from an unknown human with the DNA profiles obtained from the family samples or of DNA profiles obtained from antemortem samples of the missing persons.

Such DNA profiles are compared systematically by using the software CODIS (Combined DNA *Index System* del Federal Bureau of Investigation, Dept. of Justice, EEUU) in the local node of the Department of Justice and also in the national node of the DNA database which is managed by the Secretary of State for Security of the Interior Department in accordance with the provisions to *Organic Law 10/2007, of 8 October, regulating the police database about DNA based-identifiers*. Also, the DNA profiles registered at the national node are regularly checked against the DNA databases of 23 European nations by the Prüm treaty. (Instrument of ratification by Spain of the Convention on the stepping up of cross-border cooperation, particularly in combating terrorism, cross-border crime, and illegal migration, done at Prüm on 27 May 2005).

In 2019, **1455** requests about judicial pronouncements for the genetic profile registers in the DNA databases were sent from the INTCF to court offices (892 [61%] requests in relation to the register of unknown genetic profiles from forensic samples, 488 [34%] with reference genetic profiles, and 75 [5%] in relation to genetic profiles of unidentified human remains or relatives of the disappeared. It is worth mentioning that since February 2018, from the Tenerife Section these judicial pronouncements are not sent. With an informative note, it is indicated that they will be registered unless the judicial authority orders otherwise.

During 2019 a judicial pronouncement was received by direct request to a previous request by this institute, for the register of **1251** profiles, **788** (63%) corresponding to judicial conformities and **463** (37%) to judicial denials. This supposes an increase of 21% in respect to 2018, although the ratio of compliances/denials remains in line with previous years.

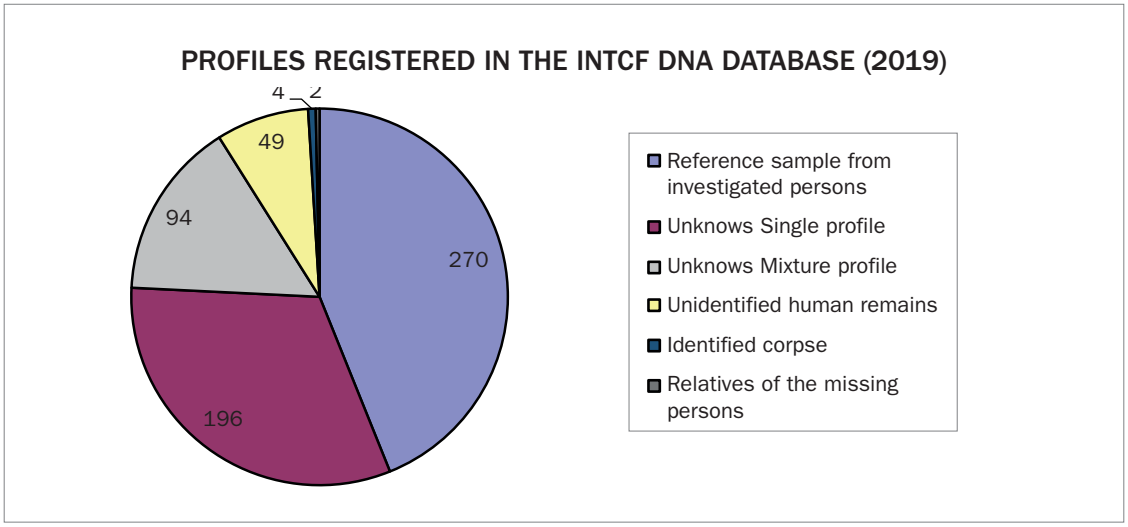
From the different departments there is a follow-up of the request sent to obtain judicial pronouncements. Depending on the actual state of the procedure, type of offense, etc. The genetic profiles are susceptible to be registered into the DNA database because following the guideline from previous years, such registration is ultimately not appropriate, in about one-third of the cases.

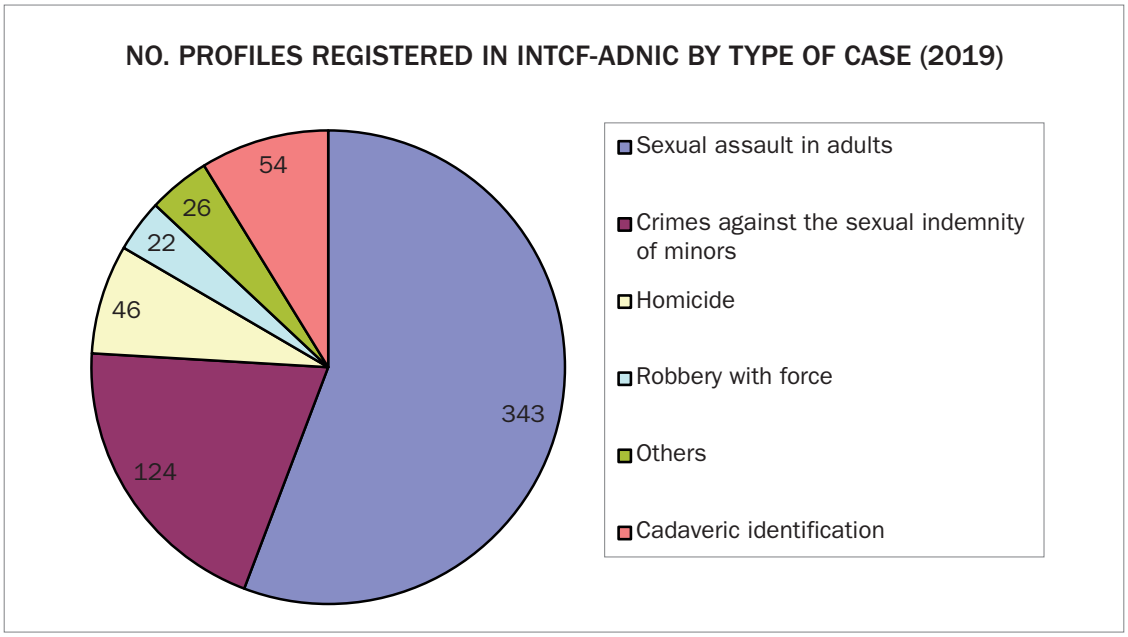


In 2019, there was a register of 615 genetic profiles in the national node of the DNA database from the INTCF, of which 561 profiles (91%) were registered in the INTCF-ADNIC file, and 54 profiles (9%) were registered in the INTCF-ADNID file.

In the field of criminal investigation (INTCF-ADNIC file), 290 (52%) Unknown DNA profiles were registered (unknown, single or mixed profiles by two contributors) coming from forensic samples obtained in the crime scene, the body, or clothes from the victim or from the condemned and 270 (48%) reference DNA profiles of persons investigated in a court procedure. The majority of DNA profiles in the file (61%) correspond to investigations of offenses against sexual liberty against adults, followed to offenses against minor sexual indemnity (22%), to homicides (8%), burglaries (4%), and the rest (5%) to other crimes or matters (gender violence, injuries, crimes against public health, robbery with violence or intimidation, terrorism, and others).

The distribution of DNA profiles registered by the INTCF in the database depending on the type of sample, the number, or type of coincidence between genetic profiles detected during 2019 are collected in the following figures.

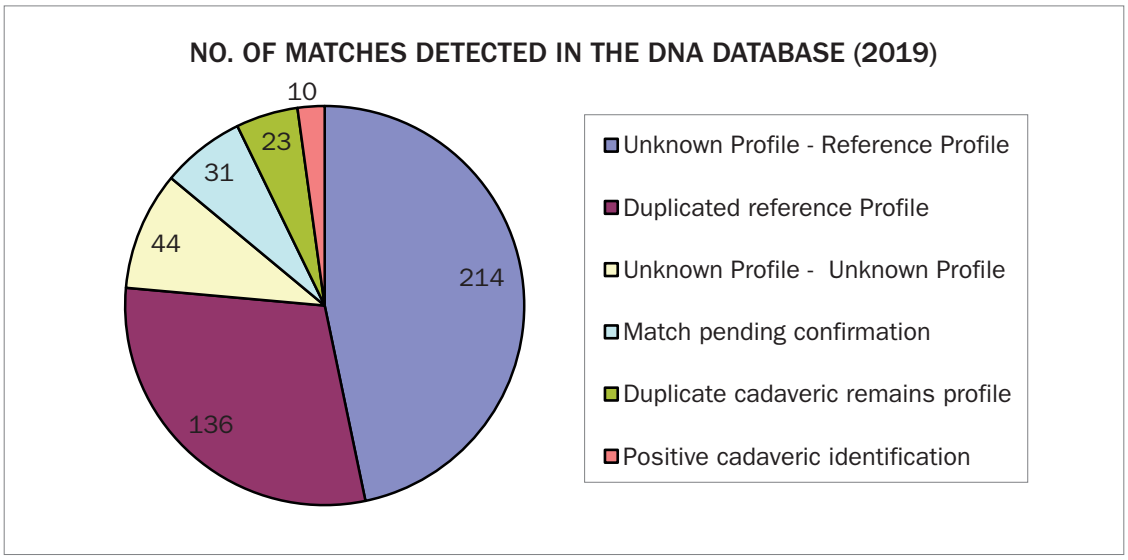




Concerning the number of genetic profile matches among genetic profiles detected during 2019 (**458**), we have to highlight that in the criminal investigation field they have registered **410** matches, of which **214** have been among reference profiles of an investigated person and an unknown forensic sample, which has contributed in the resolution of numerous judicial investigations, and **44** correspond to profile matches among forensic unknown samples. They have seen **136** matches (33% of the total) among DNA reference profiles of the same investigated due to duplications of the same person in the national database, having been registered by other institutions in addition to the INTCF, either for the same or for a different judicial case.

On the other hand, the number of compatibilities detected in 2019 in the field of investigation of missing persons that have helped in corpse identification investigations has

been **10**. In this area, it should be noted that 48% of the matches detected (23 of 48) correspond to duplicate profiles from unidentified corpses that have been analyzed by another institution in addition to the INTCF.



4.5.2. Irregular adoptions and newborn abductions

The *Order JUS/2146/2012,* 1 October established to create the file «DNA profiles from people affected by the newborn subtraction» managed by the INTCF to identify possible kinship genetic relations between persons affected by the possible newborn subtraction always with their consent.

The file intends to avoid the current dispersion of all the DNA data through the genetic profile centralization. (Both the generated in private laboratories and the ones generated in the INTCF in the course of the investigations ordered by magistrates and judges) in a single DNA database to ensure that all cross-referencing between family members of the different indexes is performed to ensure the highest degree of success in the search.

They included **22 DNA profiles** in the register of «DNA profiling of persons affected by newborn abduction.» From them, **21 DNA profiles** (obtained by diverse private DNA laboratories) come from affected requests through the **Information Office for Persons Affected by the Possible Abduction of Newborns** and **1 DNA profile** (obtained by the INTCF Madrid Department) registered by **judicial request**.

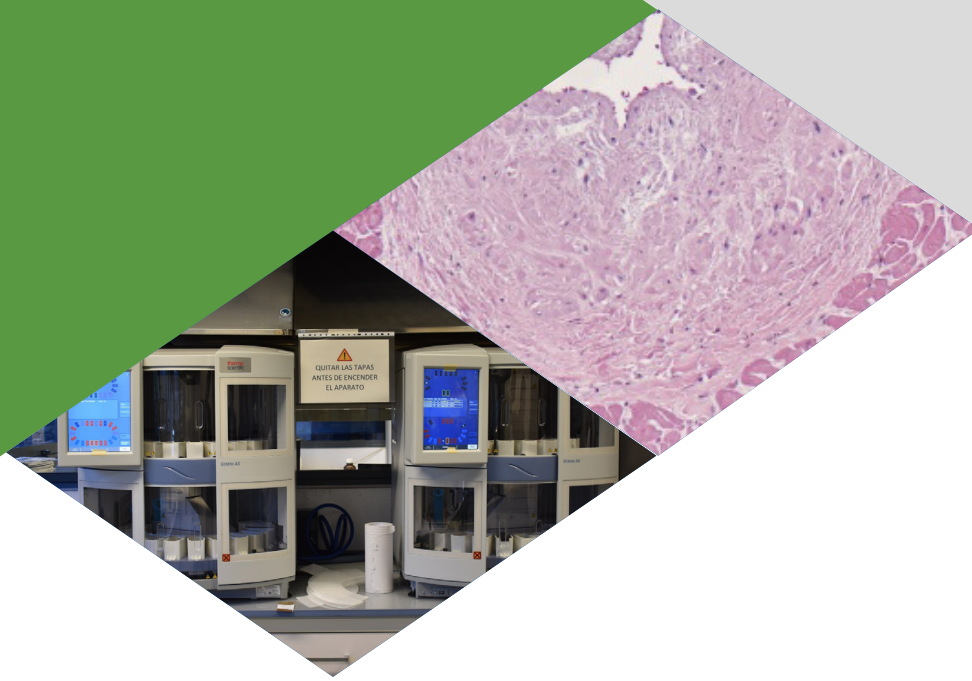
The total number of DNA profiles present in that file at the end of 2019 was **592**, with the following distribution according to the type of family member:

FAMILIAR	No of profiles	%
Biological mothers searching for their children	388	73,8
Biological fathers searching their children	49	
Sisters that search their biological brothers/sisters	39	11,6
Brothers that search their biological brothers/sisters	30	
Adopted daughters that search for their biological parents	55	14,4
Adopted children that search their biological parents	30	
Others	1	0,2
Total	**592**	**100**

In the researches carried out during 2019 in this file the possible compatibilities (with any, one, or up to two genetic inconsistencies) among biological parents searching for children or adopted child that are searching their biological parents resulted to be fortuitous compatibilities following the combined assessment of all available data.

The degree of success in the parentage relation identifications between the affected registered in this DNA file managed by the INTCF will be determined primarily by the degree of involvement of those concerned in this project and will only be guaranteed if they give their consent to the recording of their DNA profile.

5. Histopathology Services



Each INTCF Department has a Histopathology Service, existing a Histopathology Section in the Delegation of La Laguna. The Histopathology Services complies with their entrusted functions, performs expert activities but also teaching and investigative activities. Within its expert work, the following type of investigations are included:

- *Sudden and unexpected death*
- *Sudden death associated with the sport*
- *Infant sudden death*
- *Perinatal death*
- *Violent newborn death*
- *Pregnancy-abortion diagnosis*
- *Death associated with anaphylaxis*
- *Death investigation due to alleged medical malpractice-iatrogenesis*
- *Traumatisms*
- *Vitality and data study*
- *Asphyxia (hanging, strangulation, confinement, suffocation)*
- *Intoxication death*
- *Death associated with Alcohol or drugs*
- *Death due to physical agents: freezing, hypothermia, heat burns, heatstroke, electricity, radiation*
- *Death in fires*
- *Death at institutions*
- *Other histopathological studies*
- *Cytological study of liquids*

The Histopathology Services staff which have participated in this type of investigations during 2019, is shown in Table 5.1.

Table 5.1. Staff of the Histopathology Services of the different Departments

	INTCF-MADRID	INTCF-BARCELONA	INTCF-SEVILLA	INTCF-LA LAGUNA
Head of Department	1	1	1	1*
Facultatives	5*	4	6	1
Specialist technicians	5	3	6	1
Laboratory assistants	2	5	3	-
Administratives	1	-	1	-

* In July 2019, two additional doctors joined the Service as part of the action plan to reduce the backlog in the Histopathology Service of the INTCF Seville Department, approved by the Directorate-General for Relations with the Department of Justice.

The histopathology studies are complementary analyses from court autopsies that the National Institute of Toxicology and Forensic Sciences does. They use techniques proper of pathology anatomy speciality and comprises the macroscopic exam (at a glance) of the organs and several samples obtained by the medical examiners in the autopsy, followed by a microscopic study of the cuttings selected by protocols. We can resume the histopathology studies principle purposes in the following points:

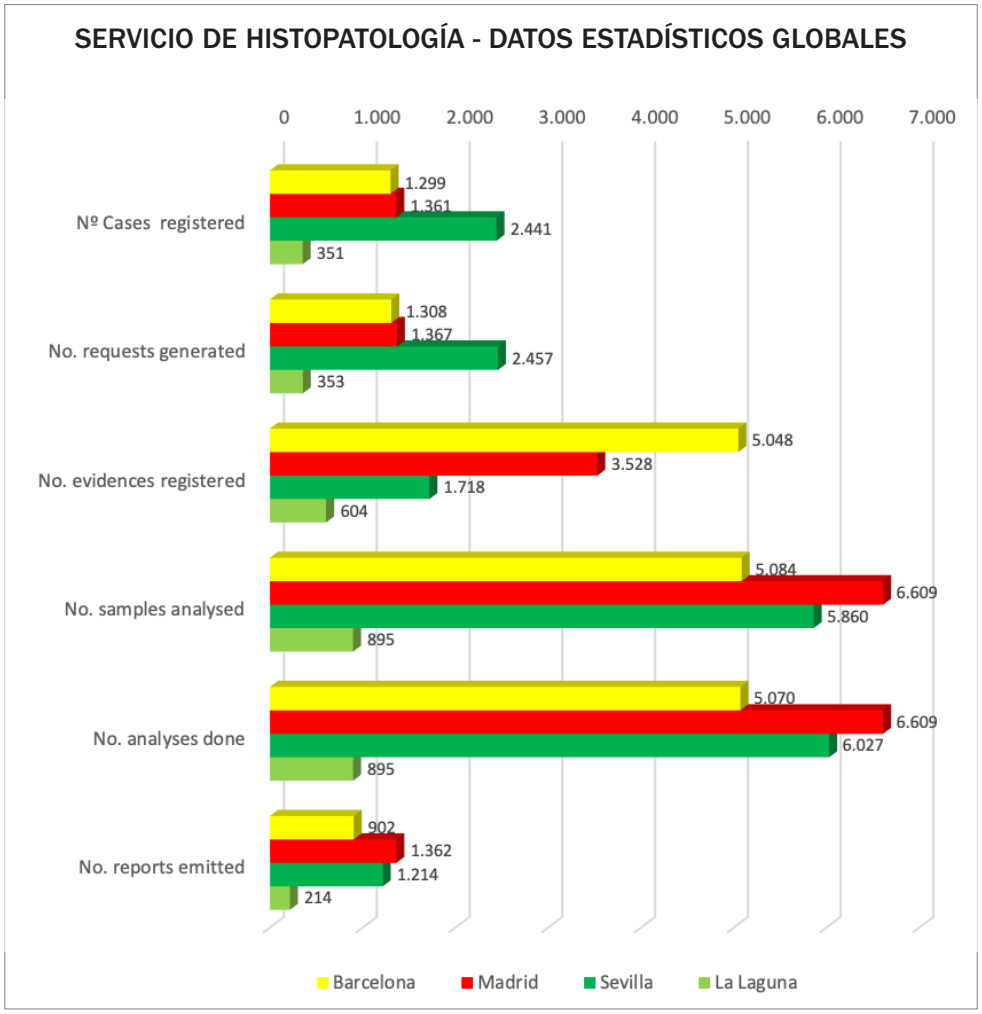
1. To find and confirm the death cause estimated by a medical examiner after realizing the autopsy.
2. To establish the postmortem injuries. If the subject was alive when the injury was provoked (for example, wound) or a pathology (for example, thrombus).
3. To establish as far as possible the approximate date of the injuries to clarify the fact chronology.
4. To establish the concurrence of any disease that may have facilitated a violent death (for example, a cardiac pathology in traffic or workplace accidents).
5. Forms part of the death investigations if there is a mala praxis claim.
6. It is an extraordinary material for investigation and teaching.

The INTCF Histopathology Services registered in 2019 a total of 5,452 forensic matters and a total of 10,898 evidences for their analysis, emitting 3,692 expert reports after the analysis of 8,448 samples with 18,601 analyses carried out (Figure 5.1). This supposes an increase of 2,8% on reports emitted in respect to 2018 (5,082 requests emitted).

The practitioners from the Histopathology Services have developed investigative labor releasing numerous scientific publications and contributions of forensic congresses from other national and international medical specialties. These are collected in the following sections of this report.

Apart from this forensic science scientific investigation, we have to add the teaching activity developed in collaboration with the institutes of Forensic Sciences and Legal medicine with diverse Universities as with the Center of Judicial Studies.

Figure 5.1. Overall data on the INTCF Histopathology Services' Expert Activity during 201



	N.° Cases registered	No. requests generated	No. evidences registered	No. samples analysed	No. analyses done	No. reports emitted
Barcelona	1.299	1.308	5.048	5.084	5.070	902
Madrid	1.361	1.367	3.528	6.609	6.609	1.362
Sevilla	2.441	2.457	1.718	5.860	6.027	1.214
La Laguna	351	353	604	895	895	214
Total	**5.452**	**5.485**	**10.898**	**18.448**	**18.601**	**3.692**

The expert activity and the teaching activities developed during 2019 are collected from these Histopathology Services from each Department. Each Service includes the description of a forensic case to publicize their expert labor.

5.1. Madrid Department Histopathology Service

In 2019 the Histopathology Service emitted **1362** histopathology reports corresponding to the same number of autopsies. Half of the cases correspond to the study of sudden deaths, the majority from adults (62,5%), (828 cases) (13 associated with the sport) but also pediatrics: 13 infant sudden deaths (during the first year of life), and 10 sudden deaths of 1-14 years. The adult sudden death cause was cardiac in 65,4% of the cases and of coronary disease in 70%. In stents cases implemented in the coronaries, to detect the death cause they realize electrolysis techniques to do microscopic cuts to determine the grade of stenosis and possible acute thrombosis. In 2019 they carried out 84 coronary arteries corresponding to 29 cases.

Concerning sudden deaths, when the death cause is a cardiopathy potentially hereditary they noted in the histopathology report. The blood sample is frozen if it can be practical for the genetic study done at specialized laboratories in the medical field. They have conserved the blood from 89 deceased and have done 34 genetic studies outside the INTCF.

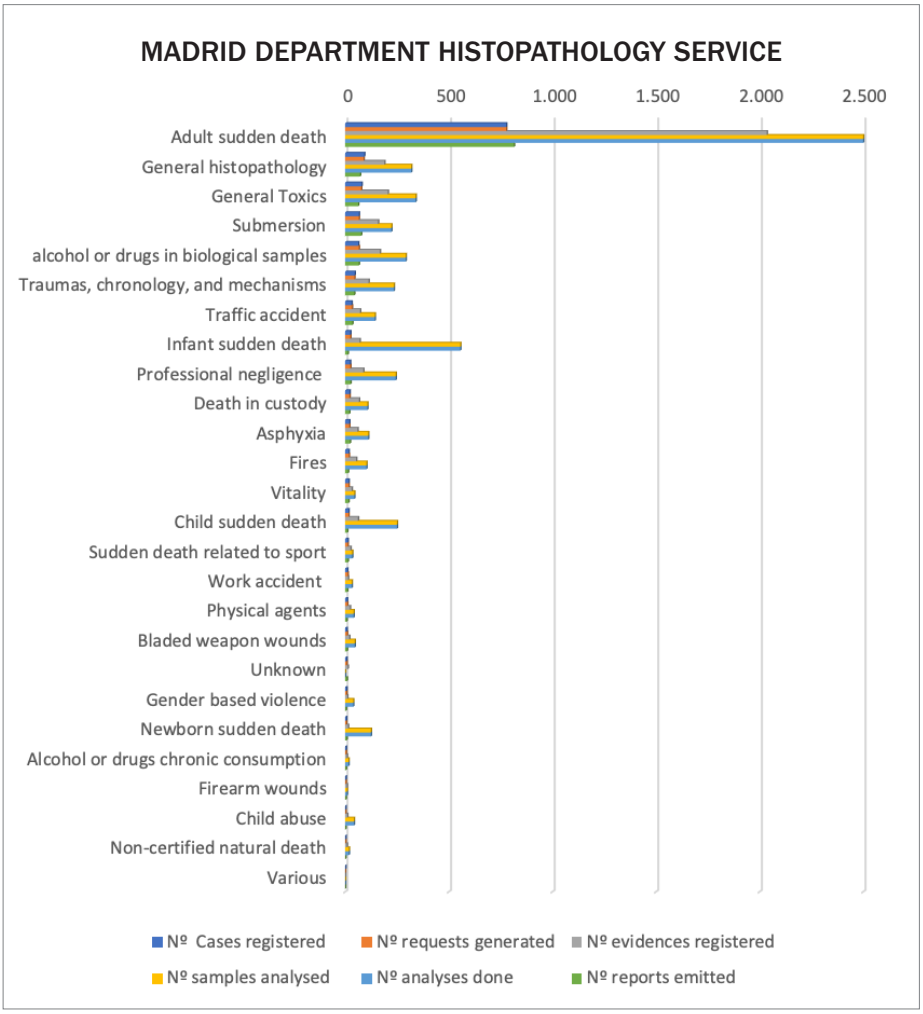
The **vitality studies** are relevant in violent murder deaths and the injury studies (stabbing weapons) as well as all the cervical injuries (skin, muscle, and laryngeal fractures) found in the strangulations., associated frequently with gender-based violence (seven in 2019).

In 63 **deaths related to alcohol or drugs**, they have requested a histopathology study apart from a chemical-toxicological analysis to determine if any previous disease could favor an adverse reaction to the substance consumption.

The **traumatisms** have supposed the 3% (46 cases) in the studies requested in 2019. Cranioencephalic trauma has been the object of study in violent deaths (by aggression) or accidents (falls or traffic/workplace accidents). Their histopathology study in accidental traumatic deaths has been required on 24 occasions to determine if the deceased had any disease (generally cardiac) that may have intervened in the accident.

Deaths in custody (police, in prisons or residences)occurred in 21 cases in 2019. Etiology is undetermined. Histopathology study is important because it contributes to determinate the death cause. In many cases related to medicament or drug use, of accidental or suicidal etiology; or a pathology that causes sudden death is detected, confirming the natural etiology.

Figure 5.1.1. Casework of the Histopathology Service of the Department of Madrid during 2019 according to the type of report



Type of report	N.º Cases registered	N.º requests generated	N.º evidences registered	N.º samples analysed	N.º analyses done	N.º reports emitted
Adult sudden death	777	777	2.035	3.242	3.242	815
General histopathology	92	89	189	319	319	72
General Toxics	79	77	206	340	340	63
Drowning	66	66	159	223	223	77
alcohol or drugs in biological samples	63	66	168	292	292	66
Traumas, chronology, and mechanisms	46	45	113	235	235	44
Traffic accident	31	33	72	143	143	35
Infant sudden death	25	25	70	556	556	13
Professional negligence	24	25	88	244	244	26
Death in custody	21	21	67	107	107	20

Type of report	N.º Cases registered	N.º requests generated	N.º evidences registered	N.º samples analysed	N.º analyses done	N.º reports emitted
Asphyxia	20	20	60	111	111	23
Fires	17	18	53	103	103	14
Vitality	17	17	32	44	44	16
Child sudden death	16	16	62	250	250	10
Sudden death related to sport	12	12	26	34	34	13
Work accident	10	12	14	32	32	10
Physical agents	9	10	23	41	41	7
Bladed weapon wounds	7	9	20	46	46	9
Unknown	6	7	13	0	0	8
Gender based violence	6	6	10	39	39	4
Newborn sudden death	5	5	14	124	124	7
Alcohol or drugs chronic consumption	4	4	8	16	16	4
Firearm wounds	3	3	8	8	8	3
Child abuse	2	2	10	42	42	2
Non-certified natural death	2	2	8	18	18	1
Various	1	0	0	0	0	0
Total	**1.361**	**1.367**	**3.528**	**6.609**	**6.609**	**1.362**

5.1.1. Interesting forensic case: Newborn murder investigation

Facts resume: During the afternoon, a woman of 18 years old goes to emergencies with metrorrhagia requiring her hospitalisation and treatment. The patient aborted 3 days ago. Hours later, the grandparents come with a bag containing the dead fetus and the placenta. The woman lived with her couple in the house of his parents.

Removal of the body data: a female fetus of 2950 g weight with knife injuries in the thorax. With the umbilical cord. In the radiological study done at the hospital, they observe air in the lung cavities and gastric chamber compatible with pulmonary ventilation. The left pneumothorax impresses.

Findings in the forensic autopsy: Normosomic fetus, female sex. In the anterior thoracic region, there are 9 incised-penetrating wounds compatible with a cutting weapon of 1 cm. The other are three no incised-penetrating wounds. Hemorrhagic infiltrated in scalp flaps. Loss of brain mass by liquefaction state. Solutions of continuity in external costal breastplate and hemorrhagic infiltrates in muscular planes and costal cartilages. Left hemothorax. Various solutions of continuity in the left lung, pericardium, heart, and diaphragm. Semi-solid gelatinous content in the stomach. Meconium in the intestinal loops.

Medico-legal provisional conclusions: 1) 2950 grams fetus, female normocytic with external and internal injuries compatible with stabbing weapons. 2) Immediate and fundamental cause of death remains under study. 3) Death for civil registration data purposes compatible with the 72 hours.

Complementary studies requested to INTCF: histopathological, toxicological, skin injury study, paternity test.

Histopathological study: we performed the study of the encephalon, whole visceral block, placenta with membranes, and umbilical cord. The most important results were the following: 1) The visceral development corresponded to a fetus without malformations. 2) The lungs were floated and in the microscopic study, the pulmonary alveoli were distended, suggesting extrauterine respiration. 3) Some of the wounds observed in the macroscopic study were indicating a trajectory from the anterior part of the thorax, passing through the lung, heart, and diaphragm. 4) The microscopic study from the sides of these wounds showed an initial tissular reaction showing that was produced before the death. 5) The placenta was underweight and with little marginal infarctions. 6) All the samples were very autolytical compatible with the death data of 72 hours estimated.

In summary, the histopathological study showed that the baby was born alive when he received the wounds that provoked the death.

The judgment after the court trial: The definitive conclusions formulated together by the Public Prosecutor and Defense Counsel after the trial, qualified the facts constituting a murder offense with kinship aggravating circumstance and incomplete exoneration (due to mental faculties affected partially). For this reason, the woman was condemned as the author of murder with eight years of prison with the right to stand as a candidate during her condemnation. She has to receive medical treatment.

Figure 5.1.1.1. Stab wounds to the anterior aspect of the heart (arrows).

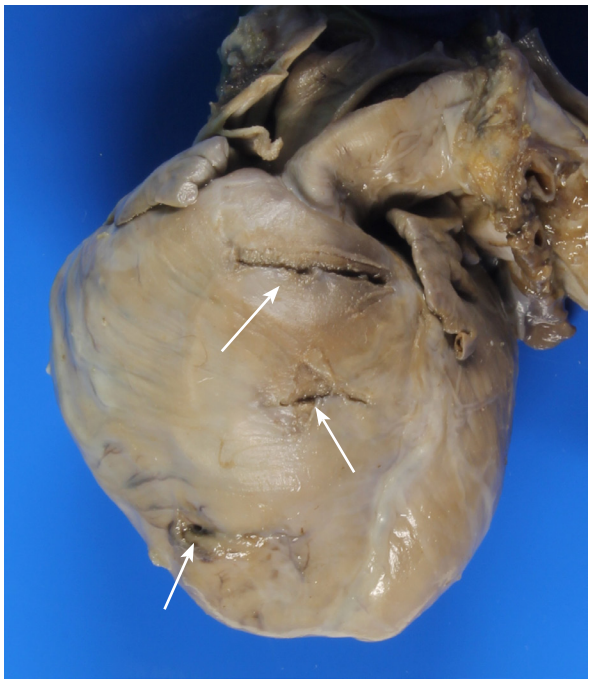
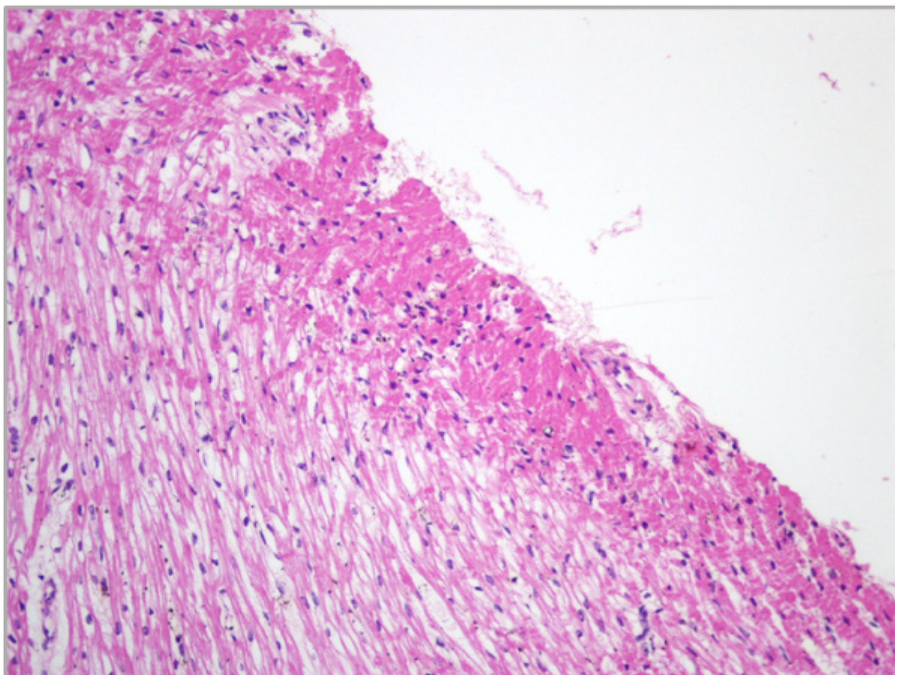


Figure 5.1.1.2. Microscopic image of the side of one of the wounds with shortened myocardial cells and hypereosinophilic indicative of injury



5.1.2 Teaching and scientific activity

5.1.2.1. Contribution in scientific congresses

Suárez Mier MP. Sudden Cardiac Death in the Young. Case 1 (ponencia por invitación). II Iberian meeting of Inherited Cardiovascular Diseases. Hospital Puerta de Hierro, Majadahonda, Madrid. 1 de febrero de 2019.

Suárez Mier MP. Respuestas a preguntas que inquietan a los patólogos en relación a: Manejo de la muerte súbita cardiaca (conferencia por invitación). XLII Reunión anual de la SEAP-IAP. 8 de febrero de 2019.

Sanz Sánchez J, Suárez Mier MP, Aguilera Tapia B, Molina Aguilar P, Domingo Valero D, Climent V, Gimeno Blanes JR, Zorio Grima E. Espectro de la miocardiopatía arritmogénica causante de muerte súbita (comunicación oral). Jornada del Día Mundial de las Enfermedades Raras. Valencia. 28 de febrero de 2019.

Suárez Mier MP. Muerte violenta en la infancia. Presentación de un caso práctico (ponencia por invitación). V Congreso Nacional de la Sociedad Española de Patología Forense (SEPAF), XXIX Congreso Nacional de la SEAP y XXIV Congreso Nacional de la SEC. Granada, 22-24 de mayo de 2019.

Suárez Mier MP, Hernández del Rincón JP. Muerte súbita en embarazada por embolia trofoblástica *vs* tiroiditis *vs* canalopatía. Importancia de un exhaustivo estudio postmórtem (comunicación oral). V Congreso Nacional de la Sociedad Española de Patología Forense (SEPAF), XXIX Congreso Nacional de la SEAP y XXIV Congreso Nacional de la SEC. Granada, 22-24 de mayo de 2019.

López García P, Chaves Portela S, Mosquera Blázquez RM, Sánchez de León Robles MS, Suárez Mier MP. Autopsia molecular: utilidad del estudio genético en muertes súbitas cardiacas (Comunicación oral). V Congreso Nacional de la Sociedad Española de Patología Forense (SEPAF), XXIX Congreso Nacional de la SEAP y XXIV Congreso Nacional de la SEC. Granada, 22-24 de mayo de 2019.

Espárrago A, Revilla E, García Pérez JL, Ballestín C. Cordoma sarcomatoide en el clavus. A propósito de un caso (comunicación oral). V Congreso Nacional de la Sociedad Española de Patología Forense (SEPAF), XXIX Congreso Nacional de la SEAP y XXIV Congreso Nacional de la SEC. Granada, 22-24 de mayo de 2019.

Nevado Polo B, García Pérez JL, Iglesias Puzas A, Collantes Rodríguez C, Fernández Vázquez J, Prieto Barrios M, Velasco Tamariz V, Vico Alonso C, Rodríguez Peralto JL, Garrido Ruiz M. Úlceras perineales: una presentación infrecuente de tuberculosis cutánea (póster). V Congreso Nacional de la Sociedad Española de Patología Forense (SEPAF), XXIX Congreso Nacional de la SEAP y XXIV Congreso Nacional de la SEC. Granada, 22-24 de mayo de 2019.

López García PL. Cardiopatía congénita poco frecuente como hallazgo en el estudio histopatológico de una autopsia médico-legal (póster). V Congreso Nacional de la Sociedad Española de Patología Forense (SEPAF), XXIX Congreso Nacional de la SEAP y XXIV Congreso Nacional de la SEC. Granada, 22-24 de mayo de 2019.

Nevado B, Rodríguez Y, García JL, Salamanca J, Ibarrola C. Biopsias intraoperatorias enviadas como «sospecha de implante peritoneal». Desglose de diagnóstico y estudio de concordancia con diagnóstico definitivo. A propósito de un caso de mesotelioma papilar bien diferenciado (póster). V Congreso Nacional de la Sociedad Española de Patología Forense (SEPAF), XXIX Congreso Nacional de la SEAP y XXIV Congreso Nacional de la SEC. Granada, 22-24 de mayo de 2019.

Fernández-Rodriguez A, Alves B, Morentin B, Arrieta J, Mosquera MR, Alcalá B, Abad R, Suárez-Mier MP, Merino I. Histopathological findings in meningococcal infections as a cause of sudden-unexpected death (póster). 31st European Congress of Pathology. Niza. Francia. 7-11 septiembre de 2019.

5.1.2.2. Scientific publications

Ripoll Vera T, Suárez Mier MP, Martínez Tejedor JA, Borondo Alcázar JC, Álvarez Rubio J. Calcificación miocárdica y muerte súbita. A propósito de dos casos. *Rev Esp Med Legal.* 2019; 45(1): 32-34.

Morentin B, Suárez Mier MP, Monzó A, Molina P, Lucena J. Sports-related sudden cardiac death due to myocardial diseases on a population from 1–35 years: a multicentre forensic study in Spain. *Forensic Sciences Research.* 2019; 4 (3): 257–266. https://doi.org/10.1080/20961790.2019.1633729

Martínez Fernández P, Vallejo de Torres G, Sánchez de León Robles MS, Navarro Escayola E, Moro Moro M, Alberti Masgrau N, Tejedor Alonso M.A. Medical and pathologic characteristics of fatal anaphylaxis: a Spanish nationwide 17-year-series. *Forensic Sci Med Pathol.* 2019; 15: 369-381.

Sanchez de León Robles M. Histopatología forense de las lesiones por arma de fuego. Ciencias Forenses y armas de fuego. Edita Asociación Galega de Médicos Forenses. Dirección Xeral de Xustizia. Xunta de Galicia. Coordinador del texto: Fernando Serrulla. Orense. 2019; P167-182.

García Pérez JL, Nevado Polo B. Biopsia intraoperatoria: concepto y método. En: Yolanda Rodríguez Gil y María del Carmen Calvo Horrillo (Eds.). *Manual de procesamiento y manejo de tejidos en anatomía patológica.* Madrid: Aula Médica. 2019; 19-22. ISBN: 978-84-7885-656-5.

García Pérez JL, Jiménez Almonacid J, Palomino Doza AJ, Delgado Jiménez JF, Enguita Valls AB. Corazón en «asta de ciervo». Estudio anatomopatológico del corazón explantado de una paciente con diagnóstico clínico y variantes genéticas de miocardiopatía no

compactada. *Rev Esp Patol.* Disponible (online): 13 de marzo de 2019. DOI: 10.1016/j.patol.2019.01.005.

5.1.2.3. Education and teaching activities

López García P, Sánchez de León Robles MS, Suárez Mier MP. Profesores Honorificos de Practicum. Universidad de Alcalá. Facultad de Ciencias. Grado en Criminalística: Ciencias y Tecnologías Forenses. Asignatura 2.º cuatrimestre: Histopatología. Curso 2018/2019.

Suárez Mier MP. Profesor asociado del Departamento de Medicina y Especialidades Médicas (Área de Histología). Universidad de Alcalá. Fecha de nombramiento: 01/09/2019.

García Pérez JL. Médico colaborador en Docencia Práctica en el Servicio de Anatomía Patológica en el Hospital 12 de Octubre (Universidad Complutense, Madrid). Curso 2018/2019.

Espárrago A. I curso de Técnicas de Laboratorio y Procesamiento de Tejidos en Anatomía Patológica. Hospital 12 de octubre. Mayo de 2019.

Mosquera Blázquez RM. Visita al INTCF de los alumnos de «Técnico superior de Laboratorio de Anatomía Patológica y Citología» del Hospital Puerta de Hierro. 19 de mayo de 2019.

Mosquera Blázquez RM. Visita al INTCF de los alumnos de «Técnico superior de Laboratorio de Anatomía Patológica y Citología» de la Universidad Francisco de Vitoria. 29 de mayo de 2019.

López García PL. Ponencia: «Cardiopatías estructurales y deporte en MSAJ: Miocardiopatía hipertrófica. Hipertrofia ventricular izquierda idiopática. Informe histopatológico. Casuística comparada de casos del Dpto. de Madrid del INTCF». Curso CEJ: Patología cardiovascular asociada a la muerte súbita del adulto joven. Muerte súbita en el deporte. Barcelona, 9 de septiembre de 2019.

Sánchez de León Robles, MS. Ponencia: «Histopatología forense de las lesiones por arma de fuego». Título del curso: Ciencias Forenses y armas de fuego. Universidad de Santiago de Compostela. Coordinador: Fernando Serrulla. Facultad de Medicina de Santiago de Compostela, 19 y 20 de septiembre de 2019.

Suárez Mier MP. Directora del Curso: «Actualización en patología forense. Patología del encéfalo y raquis». Plan de Formación Continuada 2019 del CEJ. Madrid, Centro de Estudios Jurídicos. 7 y 8 de noviembre de 2019.

Mosquera Blázquez RM, López García, PL, Sánchez de León Robles MS, García Pérez JL, Espárrago de Mingo A. Curso de Actualización en Patología Forense. CEJ. Patología del encéfalo y raquis. Madrid, 7-8 Noviembre 2019.

Tutorías de rotación externa de dos residentes de cuarto año de la especialidad de Anatomía Patológica.

García Pérez JL, Espárrago de Mingo A. XXII Curso teórico-práctico de Dermatopatología, Madrid 2019.

Mosquera Blázquez, RM. Presentaciones eficaces en los tribunales. Plan formación continuada CEJ. Madrid, 18 al 19 de junio de 2019.

Espárrago A, López García P, García Pérez JL, Suárez Mier MP. V Congreso Nacional de la Sociedad Española de Patología Forense (SEPAF), XXIX Congreso Nacional de la SEAP y XXIV Congreso Nacional de la SEC. Granada, 22-24 de mayo de 2019.

García Pérez JL. IV Congreso Nacional contra la muerte súbita. Sociedad Española de Cardiología. Asociación contra la Muerte Súbita José Durán #7. Madrid, 29 de noviembre de 2019.

5.2. Barcelona Department Histopathology Service

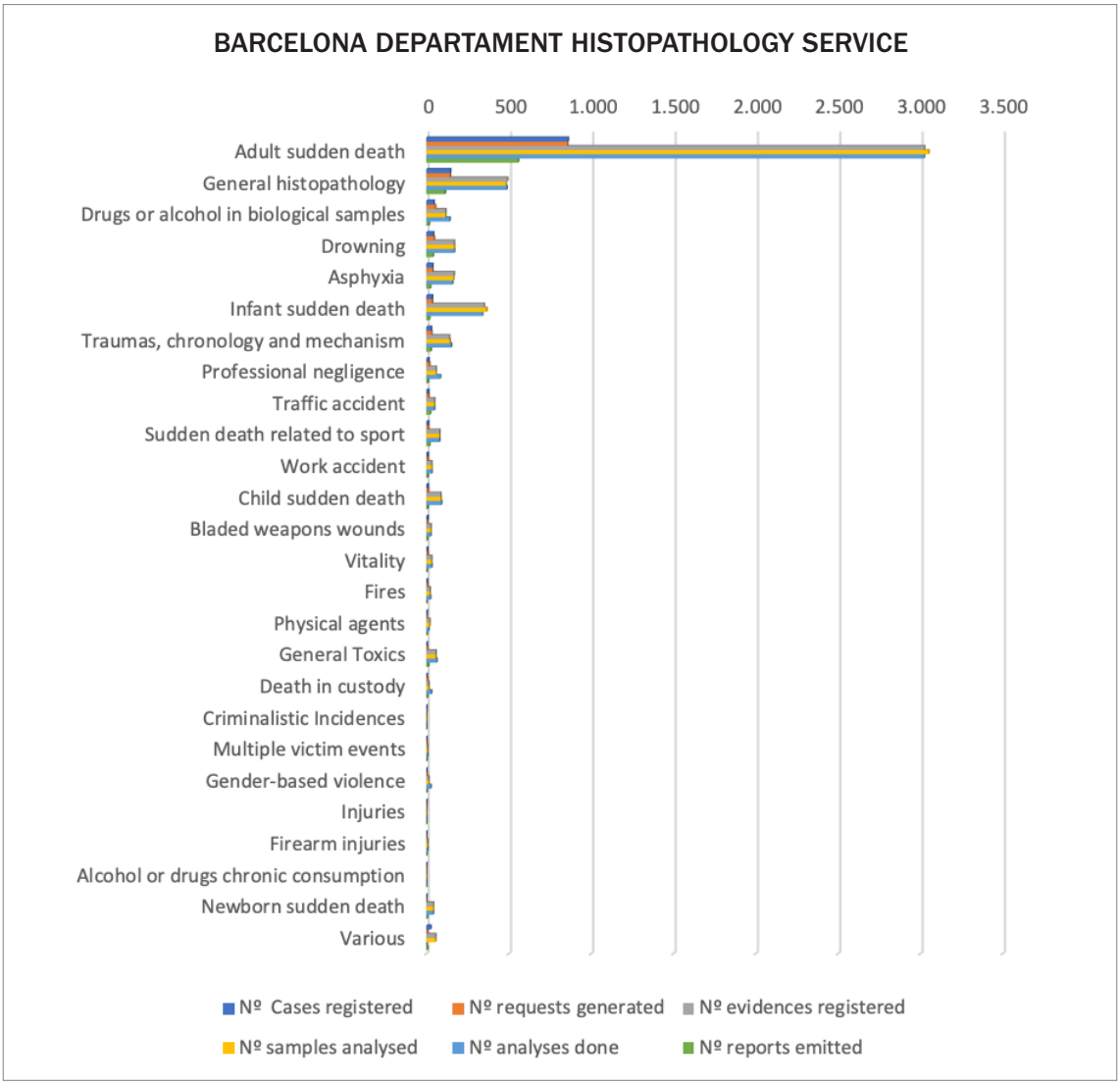
Concerning the expert activity from the Barcelona Department Histopathology Service in 2019, they received 1,308 requests with 5,048 evidences and 5,084 samples with a total of 5,070 analyses, emitting a total of 902 expert reports.

In figure 5.2.1, the predominant analysis request corresponds with the investigation of **adult sudden death** (856 requests with 3,024 evidences) followed by **general histopathology studies** (144 requests with 492 evidences), the study of deaths **related to alcohol and drugs** (53 requests with 116 evidences), and the **death by drowning histopathology studies** (46 requests with 168 evidences).

The casework from 2019 doesn't change much in respect to previous years. To point out the lack of epidemiological value, since they are not consecutive cases and the diversity of entities operating in the case resolutions, even in one case.

However, we intuit a rebound in perinatal mortality and especially in the senescence, in such a way that we are seeing modifications in the presentation pattern of sudden death of ischemic origin (the most frequent), with more specific findings of chronic heart failure secondary to the stabilization of these processes in young adults and increased longevity.. On the other side, death in senile dementia and other neurodegenerative diseases translates into apparently violent deaths is also considerable. Violent death is variated and proportionate to other years.

Figure 5.2.1. Casework of the Histopathology Service of the Department of Barcelona during 2019 according to the type of report



Type of report	N° issues registered	N° requests generated	N° evidences registered	N° samples analysed	N° analyses done	N° reports emitted
Adult sudden death	860	856	3.024	3.050	3.023	557
General histopathology	145	144	492	483	488	113
Drugs or alcohol in biological samples	44	53	116	116	141	16
Drowning	42	46	168	169	169	40
Asphyxia	37	37	167	165	158	24
Infant sudden death	35	35	350	365	340	17
Traumas, chronology and mechanism	29	31	139	142	151	27
Professional negligence	14	18	58	58	84	10
Traffic accident	12	13	48	48	48	23
Sudden death related to sport	11	11	79	79	79	18

Type of report	N° issues registered	N° requests generated	N° evidences registered	N° samples analysed	N° analyses done	N° reports emitted
Work accident	8	8	31	32	32	7
Child sudden death	8	10	86	87	91	7
Bladed weapons wounds	7	6	26	26	25	5
Vitality	6	7	31	31	32	3
Fires	4	6	21	21	24	1
Physical agents	3	3	19	19	14	3
General Toxics	3	5	57	57	62	12
Death in custody	2	6	14	14	30	5
Criminalistic Incidences	1	1	0	0	0	0
Multiple victim events	1	3	6	6	6	2
Gender-based violence	1	3	14	14	26	2
Injuries	1	1	0	0	0	0
Firearm injuries	0	0	6	6	6	1
Alcohol or drugs chronic consumption	0	0	0	0	0	0
Newborn sudden death	0	0	41	41	41	4
Various	25	5	55	55	0	5
Suma total	**1.299**	**1.308**	**5.048**	**5.084**	**5.070**	**902**

5.2.1. Interesting forensic case: a natural sudden death due to the Hallervörden-Spatz disease

Neurodegenerative diseases constitute a wide spectrum of pathologies that can give place to important legal-forensic problems.

BACKGROUND. 43 years old man diagnosed with Hallervörden-Spatz disease with slight mental retardation and severe hetero aggressivity behavior, absconding from home, and refusal to treatment. He evolves towards dependency in daily activities, dysarthria with intelligible speech, dystonia, and rigidity causing difficulty in walking, walks with the help of a walker, but often walks alone causing multiple falls with injuries and contusions that need to be attended to continuously. A soft diet with lots of liquids.

Treatment with diazepam, gabapentin, lormetazepam, nemactil, olanzapine, omeprazole, and rivotril.

CURRENT HISTORY. After having disappeared from the center without being seen, they alert the police and firemen. They find the walker in the center looking for him without results. 24 hours later, a familiar finds him a few meters from the center among the bush. Care services try the resuscitation of the patient without success.

CORPSE REMOVAL. The corpse is found in lateral decubitus previously handled by family members and care services. He was dressed with abrasions on the face and back of the hand. No lividity or stiffness (2 hours).

AUTOPSY. Man corpse of 54 Kg weight and 1.56 m high. Dressed. Corpse phenomenons. Abrasions on right cheekbone (7 x 5 cm), chin (5 x 4 cm), forehead, and back of the right hand. INTERNAL EXAMINATION: There aren't head injuries, encephalon of 1180 g congestive. Low brownish digested gastric contents. No macroscopic or microscopic changes in other visceral and tissue systems.

COMPLEMENTARY EXAMINATIONS:

Encephalon histopathology study: atrophy of globus pallidus and pars reticulata bilaterally of the substantia nigra due to loss of intermediate neurons. With minimal inflammatory reaction and associated gliosis and increased hemosiderin in macrophages and perivascularly (responsible for the ochre coloration). Also areas of poor myelination in the caudate nucleus and globus pallidus with an internal capsule. They also studied the larynx, pulmonary sides, heart, liver, spleen, and kidneys.

Toxicological-chemical investigation of urine, hair, blood (obtained in the subclavian), the stomach, and its content. The rapid test (enzyme-immunoassay) is positive in benzodiazepines. Vitreous humor was obtained for biochemical study. Blood with EDTA for an eventual DNA study.

MEDICAL-LEGAL CONSIDERATIONS: The few injuries aren't because of a fight. Once known the complementary results and the bibliography reviewed, the indeterminate death cause concluded a sudden death due to Hallervörden-Spatz disease anatomopathologically confirmed.

Figure 5.2.1.1. Atrophy and ochre coloration of grey nuclei

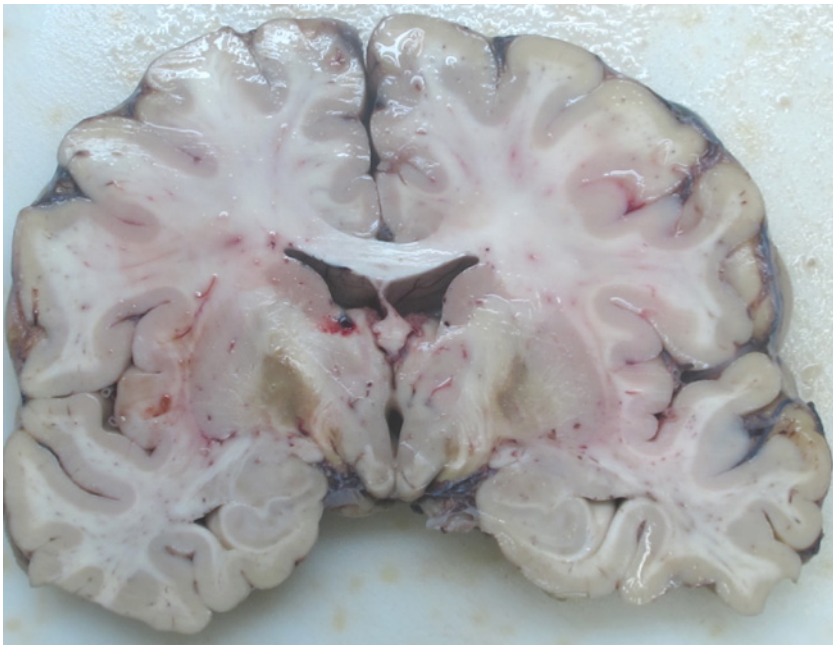
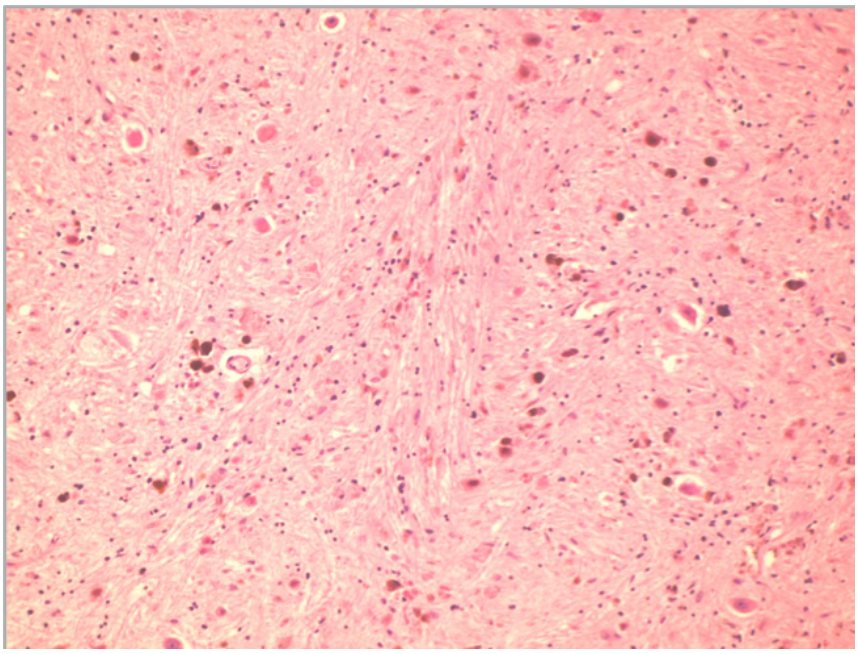


Figure 5.2.1.2. Perls stain for haemosiderin (10x)



5.2.2 Teaching and scientific activity

5.2.2.1. Participation in investigation projects

Factores predictores de fibrilación ventricular y muerte súbita en el infarto agudo de Miocardio. Subestudio, liderado por Pr. Antoni Bayés Genís, del Proyecto Eulalia (Red temática de investigación cooperativa del Instituto de Salud Carlos III (G03-078).

Reuniones sucesivas por videoconferencia desde el Servicio de Patología del IML y CF de Islas Baleares, con el equipo multidisciplinar profesional para la actuación del Protocolo de Muerte Súbita (MUSIB) entre los patólogos del IMLCFIB (Mallorca, Menorca e Ibiza) con el Instituto Nacional de Toxicología y Ciencias Forenses de Barcelona (Servicios de Histopatología y Servicio de Química) y Servicio de Cardiología del Hospital Son Llàtzer (Mallorca). En el contexto del convenio entre ministerio de Justicia y el Servicio de Salud de las Islas Baleares para la implantación y desarrollo del programa de estudio de la muerte súbita cardiaca (MUSIB). Desde 13 de marzo de 2018 hasta la actualidad.

5.2.2.2. Contribution in scientific congresses

Moyano Corvillo S., Inés Landín Roig, Eneko Barbería Marcalain, Francisco García Sayago, Elena Segú Badía. «Muerte súbita cardíaca debida a prolapso mitral» (Comunicación oral). XII Curso de Patología Forense. Universidad de la Rioja, 3-5 octubre de 2019.

5.2.2.3. Scientific publications

Dasí Martínez C. Muerte inesperada debida a granulomatosis eosinofílica con poliangeítis (síndrome de Churg-Strauss). I Landin, E Barberia, C Dasi, J Arimany-Manso. *Anales Sis San Navarra* vol. 42, n.º 1. Pamplona, ene./abr. 2019. Epub 21-oct-2019. http://dx.doi.org/10.23938/assn.0395

Ripoll T, García AB, Gomila I, d. Heine, Poncela J.L, Sánchez N, Pérez C, García E, Hernández E, Barceló A, Busardo FB, Barceló B, MUSIB Research Group. Postmórtem toxicology in the diagnosis of sudden death in young and middle-aged victims. *European Review for Medical and Pharmacological Sciences.* 2019; 23: 9135-9149.

5.2.2.4. Education and teaching activities

Castro Pons, J. Colaboración en la formación práctica de los alumnos del ciclo formativo de grado superior de Anatomía Patológica (200 horas) del Instituto de Educación Secundaria y Superior de Enseñanza Profesional Guineueta (Barcelona). Curso 2018/19.

Castro Pons, J. Colaboración en la formación práctica de los alumnos del ciclo formativo de grado superior de Anatomía Patológica del Instituto de Educación Secundaria y Superior de Enseñanza Profesional I.E.S. Fundación Bonanova. Curso 2018-19.

Castro Pons J. Ponencia «El Instituto Nacional de Toxicología y Ciencias Forenses, investigaciones y muestras». Realizada dentro de los Ciclos Formativos en Laboratorio y Anatomía Patológica, en el Instituto La Guineueta. Barcelona. España. 11 de marzo de 2019.

Borondo Alcázar JC, Dirección de la actividad formativa «Patología cardiovascular asociada a la muerte súbita del adulto joven. Muerte súbita en el Deporte». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. Barcelona. España. Celebrado del 9 al 10 de septiembre de 2019.

Borondo Alcázar JC. Ponencia: MSAJ en el contexto de malformaciones congénitas coronarias, patología aórtica y aterosclerosis coronaria. Histopatología. Informe histopatológico. Curso de patología cardiovascular asociada a la muerte súbita. Muerte súbita en el deporte» CEJ del Ministerio de Justicia. 1 hora lectiva. Ciudad de la Justicia. Barcelona. España. 10 de septiembre de 2019.

Castro Pons J. Seminario «Gestión de muestras del Instituto de Toxicología y Ciencias Forenses». 2 horas lectivas. Organizado por el Instituto Bonanova. Barcelona. España. 28 de octubre de 2019.

Facultativos del Servicio de Histopatología. «Patología cardiovascular asociada a la muerte súbita del adulto joven. Muerte súbita en el deporte». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. 10 horas lectivas. Barcelona. España. Celebrado del 9 al 10 de septiembre de 2019.

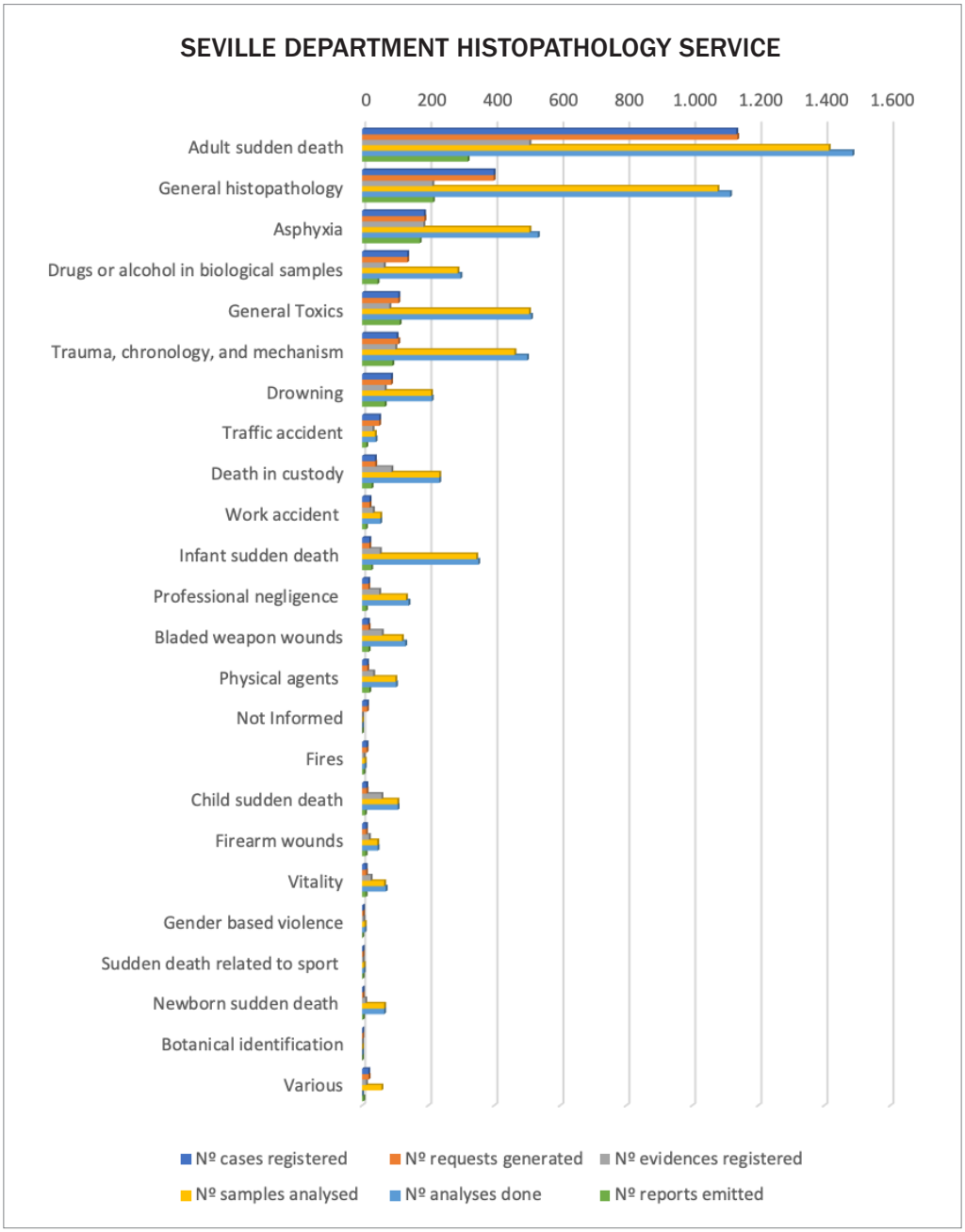
Canós Villena JC, Ladino Orjuela DA, «Actualización en patología forense. Patología del encéfalo y raquis». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. 10 horas lectivas. Madrid. España. Celebrado del 7 al 8 de noviembre de 2019.

5.3. Seville Department Histopathology Service

Concerning the Seville Department Histopathology Service, during 2019 they received 2,457 requests and registered 1,718 evidences and analysed 5,860 samples through a total of 6,027 analysis, emitting a total of 1,214 expert reports.

As it can be seen in figure 5.3.1, the predominant analysis request corresponds to the investigation of **adult sudden deaths** (1.137 requests with 507 evidences), followed by general histopathology studies (399 requests with 213 evidences), **general asphyxia studies** (189 requests with 186 evidences), the study of deaths **related to alcohol and drugs** (137 requests with 66 evidences), and the **histopathology studies in deaths of toxic origin** (110 requests with 83 evidences).

Figure 5.3.1. Casework of the Department of Seville Histopathology Service during 2019 according to the type of report



Type of report	N° cases registered	N° requests generated	N° evidences registered	N° samples analysed	N° analyses done	N° reports emitted
Adult sudden death	1.134	1.137	507	1.414	1.486	320
General histopathology	399	399	213	1.077	1.115	215
Asphyxia	188	189	186	507	533	175
Drugs or alcohol in biological samples	137	137	66	289	298	47

Type of report	N° cases registered	N° requests generated	N° evidences registered	N° samples analysed	N° analyses done	N° reports emitted
General Toxics	110	110	83	506	512	114
Trauma, chronology, and mechanism	105	110	101	462	500	92
Drowning	88	88	69	209	211	69
Traffic accident	52	52	32	39	41	13
Death in custody	39	40	89	234	234	29
Work accident	23	23	33	55	55	12
Infant sudden death	22	22	54	346	352	28
Professional negligence	19	19	52	133	141	12
Bladed weapon wounds	18	20	60	121	131	20
Physical agents	15	16	34	101	103	22
Not Informed	15	15	0	0	0	0
Fires	14	14	5	8	8	5
Child sudden death	13	14	59	107	108	9
Firearm wounds	12	12	21	46	47	11
Vitality	11	12	26	67	72	11
Gender based violence	3	3	4	8	8	1
Sudden death related to sport	2	2	2	5	5	2
Newborn sudden death	2	2	10	67	67	3
Botanical identification	1	1	0	0	0	0
Various	19	20	12	59	0	4
Suma total	**2.441**	**2.457**	**1.718**	**5.860**	**6.027**	**1.214**

5.3.1. Interesting forensic case: Cardiac sudden death associated with cocaine consumption

A 38 years old man, usually a cocaine consumer, was found in the street stopping the traffic and very aggressive. They alert the police trying to stop him. They found a person with a lot of aggressivity. At the detention, he suffers a cardiac arrest not reversed by the emergency services. The family reports aggression during the detention resulting in the man´s death.

They find cardiomegaly with slight arteriosclerosis of the coronary arteries and pulmonary edema. There aren't other injuries that could have a relation with the death of this person. The medical examiners request the National Toxicology Institute and Forensic Sciences a chemical-toxicological analysis and histopathology study.

In the chemical-toxicological analysis, the blood has cocaine and benzoylecgonine, its principal metabolite, in similar concentrations to those other cases of people that have died due to cocaine consumption. Potassium concentrations were high in the vitreous humor.

The heart histopathology study highlights the growth of intramyocardial little arteries that produces a marked decrease in the lumen of the arterioles and thus considerably reduced blood flow through these arterioles (Figure 5.3.1.1.). The result is a significant oxygen and nutrient decrease supply to the myocardiocytes. As a consequence of this lack of blood supply, the areas of fibrosis around the arterioles are observed in the myocardium due to necrosis of myocardial cells caused by this reduced supply of oxygen and nutrients. These myocardium necrotic cells are substituted with connective tissue (Figure 5.3.1.2.).

CLINICAL-PATHOLOGICAL CONSIDERATIONS

Cocaine is a stimulant drug that produces the noradrenaline reuptake blockade in the presynaptic terminals of sympathetic nerve neurons. This blockade of noradrenaline reuptake has two main consequences: there is an increase of the permanence of this neurotransmitter in the presynaptic terminals resulting in hyperadrenergia and, secondly, noradrenaline which is not reuptake by presynaptic neurons, passes into the blood and behaves like a hormone. This state of hyperadrenergia is aggravated by the increased release into the bloodstream of adrenaline produced by cocaine due to its stimulant action on the central nervous system.

One of the first consequences is tachycardia, due to the high sympathetic stimulation, even if resting. The tachycardia gets worse with a physical effort that ends in delirium and passes 150 systoles per minute.

Tachycardia leads to a considerable increase in the myocardiocytes' need for oxygen and nutrients. Cocaine produces vasoconstriction of these pathological arterioles. Chronic consumers of this drug have produced a near-complete occlusion of the vascular lumen and placed the myocardium in an acutely ischaemic state.

The physical effort is accompanied by aggression to people and the proper person producing injured muscle cells leading to hyperkalemia.

Tachycardia is produced by the action of cocaine itself and aggravated by high physical activity. Acute myocardial ischemia coupled with the presence of areas of fibrosis, shown in Figure 5.3.1.3. They act as barriers that prevent normal electrical conduction of the cardiac impulse, hyperkalemia that occurs in these situations of great physical agitation ultimately results in ventricular fibrillation with sudden cardiac death that occurs during the arrest. In this case, or any other circumstance without a stressful situation such as in a place of recreation or the home of the person concerned.

Diagnose: Cardiac sudden death in the context of delirium syndrome associated with cocaine consumption.

Figure 5.3.1.1. Normal intramyocardial arteriole.
There is a normal ratio of vessel wall thickness to lumen diameter

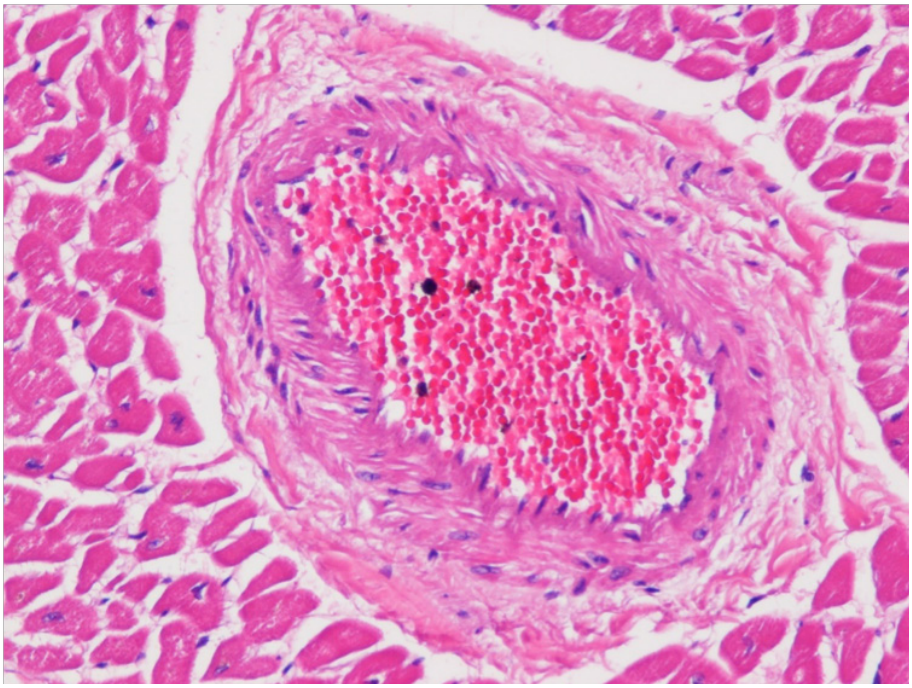


Figure 5.3.1.2. Arteriola of the deceased caused by chronic cocaine use.
Severe thickening of the wall is seen, accompanied by a large decrease in the vascular lumen

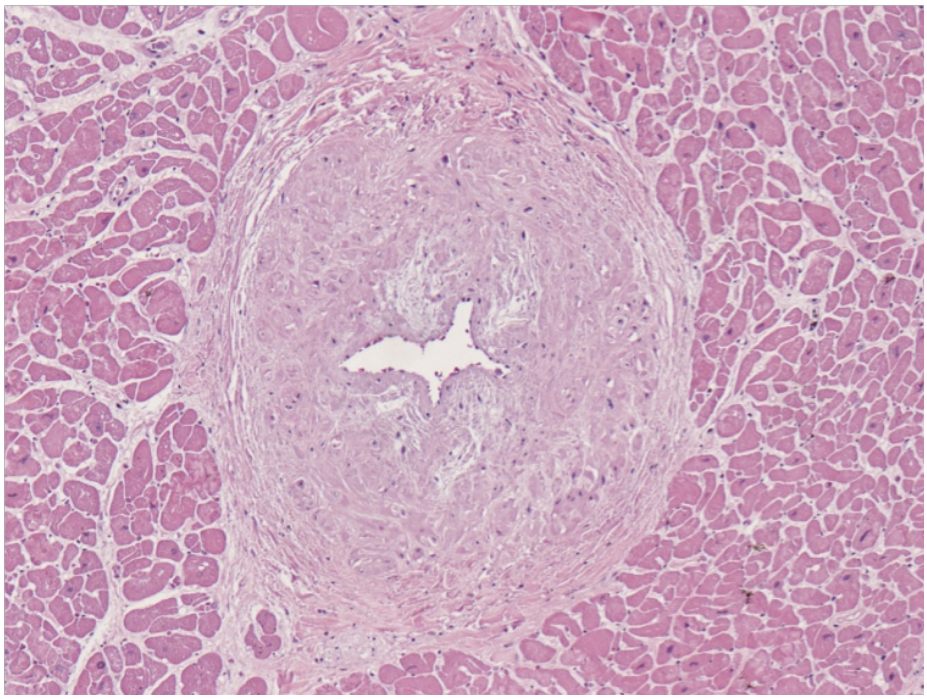
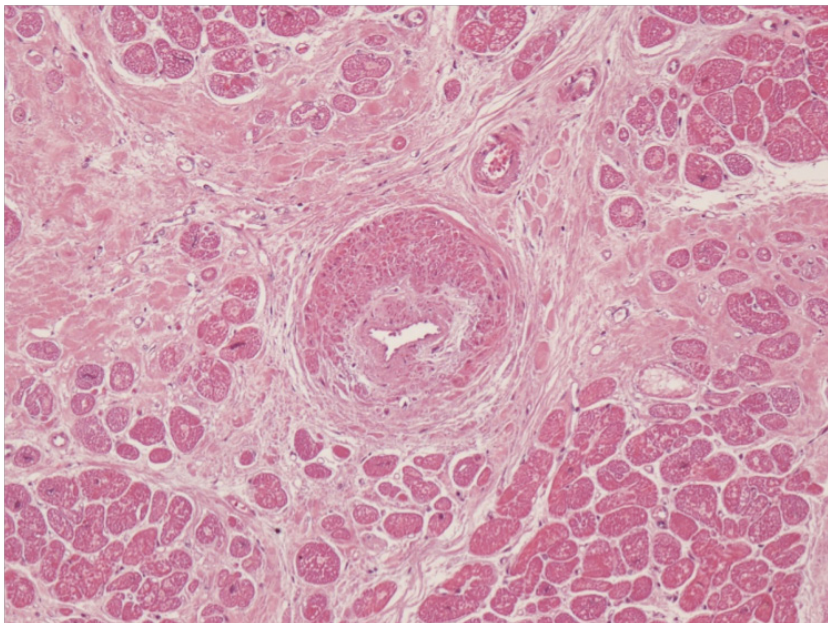


Figure 5.3.1.3. Arteriole with the same characteristics as described in figure 2, accompanied by a replacement of the myocardiocytes around the vascular wall by connective tissue (perivascular fibrosis).



BIBLIOGRAPHY

Di Maio TG, Di Maio V. 2006. *Excited delirium syndrome. Cause of death and prevention*. Boca Ratón: Taylor & Francis.

Salguero M, Blanco J. 2015. *Histopatología Forense*. Madrid: Servicio de Publicaciones del Ministerio de Justicia.

5.3.2 Teaching and scientific activity

5.3.2.1. Contribution in scientific congresses

Moro Cardenas MC. «Muertes anafilácticas» «Transformación nodular angiomatoide esclerosante (SANT) del bazo. Presentación de dos casos incidentales y revisión de la literatura». XXIX Congreso Nacional de la Sociedad Española de Anatomía Patológica, XXIV Congreso Nacional de la Sociedad Española de Citología y V Congreso Nacional de la Sociedad Española de Patología Forense. 22 al 24 de mayo de 2019. Granada.

Moro Cardenas MC. «Muerte en incendios». IV Curso de Histopatología Forense. 19 al 21 de Junio de 2019. Cádiz.

Mateo Vico OM. Póster «Rotura Esplénica Espontánea asociada a Amiloidosis Secundaria Sistémica y Granulomas Sarcoideos». Moro Cardenas MC. Póster «La importancia del estudio histopatológico en la muerte violenta del recién nacido y en el periodo perinatal».

XXIX Congreso Nacional de la Sociedad Española de Anatomía Patológica, XXIV Congreso Nacional de la Sociedad Española de Citología y V Congreso Nacional de la Sociedad Española de Patología Forense. 22 al 24 de mayo de 2019. Granada.

5.3.2.2. Teaching and education activities

Mateo Vico OM. Ronquillo Rubio A XXIX Congreso Nacional de la Sociedad Española de Anatomía Patológica, XXIV Congreso Nacional de la Sociedad Española de Citología y V Congreso Nacional de la Sociedad Española de Patología Forense. SEAP, SEC y SEPAF. Granada, 22 al 24 de mayo de 2019.

Mateo Vico OM. Investigación científico-técnica de los homicidios en el anciano, el niño y la mujer. Universidad Pablo Olavide. 15 horas. Carmona, 22 al 24 de junio de 2019.

Mateo Vico, OM, Moro Cardenas MC. Patología cardiovascular asociada a la muerte súbita del adulto joven. Muerte súbita en el deporte. Centro de Estudios Jurídicos. 10 horas. Barcelona, 9 y 10 de septiembre de 2019.

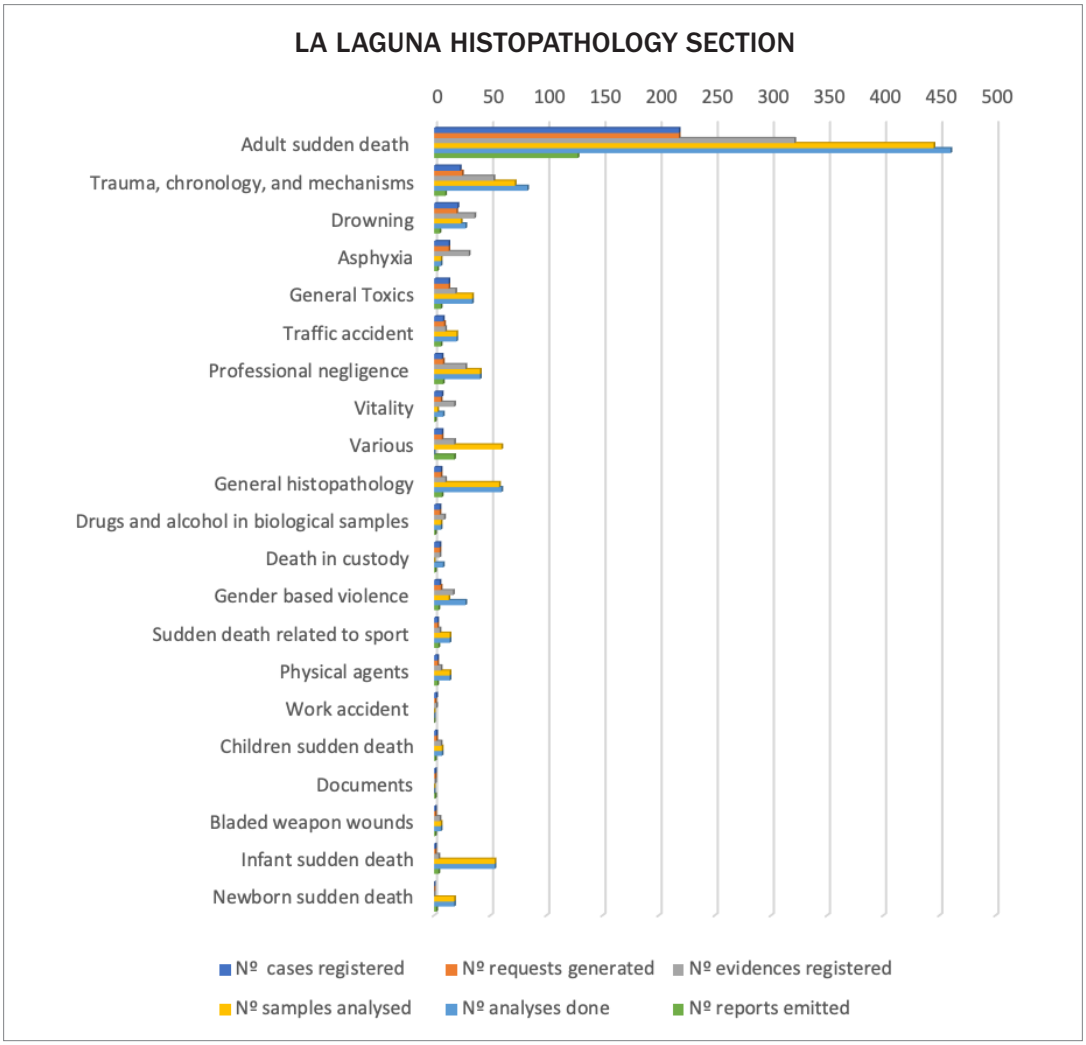
Ronquillo Rubio A. Actualización en patología forense. Patología del encéfalo y raquis. Centro de Estudios Jurídicos. 12 horas. Madrid, 7 y 8 de noviembre de 2019.

5.4. La Laguna Histopathology Section

Concerning the expert activity from La Laguna Histopathology Section during 2019, they received 353 requests, registered 604 evidences, and analysed 895 samples through a total of 895 analysis, emitting a total of 214 expert reports.

As it can be seen in figure 5.4.1, the predominant analysis request corresponds to the investigation of **adult sudden deaths** (218 requests with 321 evidences), followed by **histopathological studies of traumatisms** (25 requests with 53 evidences), the histopathological study of drowining deaths (20 requests with 36 evidences), the **histopathology in asphyxia** (13 requests with 31 evidences), and histopathology studies **in deaths with toxic origin** (13 requests with 19 evidences).

Figure 5.4.1. Casework of the La Laguna Histopathology Section during 2019 according to type of report



Type of report	N° cases registered	N° requests generated	N° evidences registered	N° samples analysed	N° analyses done	N° reports emitted
Adult sudden death	218	218	321	445	460	128
Trauma, chronology, and mechanisms	23	25	53	72	83	10
Drowning	21	20	36	24	28	5
Asphyxia	13	13	31	6	6	3
General Toxics	13	13	19	34	34	6
Traffic accident	8	9	10	20	20	6
Professional negligence	7	8	28	41	41	8
Vitality	7	6	18	3	8	1
Various	7	7	18	60	0	18

Type of report	N° cases registered	N° requests generated	N° evidences registered	N° samples analysed	N° analyses done	N° reports emitted
General histopathology	6	6	10	58	60	7
Drugs and alcohol in biological samples	5	5	9	6	6	1
Death in custody	5	5	5	0	8	1
Gender based violence	5	6	17	13	28	4
Sudden death related to sport	3	3	5	14	14	4
Physical agents	3	3	6	14	14	3
Work accident	2	1	2	0	0	0
Children sudden death	2	2	6	7	7	1
Documents	1	1	1	0	0	1
Bladed weapon wounds	1	1	5	6	6	1
Infant sudden death	1	1	4	54	54	4
Newborn sudden death	0	0	0	18	18	2
Total	**351**	**353**	**604**	**895**	**895**	**214**

During 2019, there is a considerable increase of expert activity in the Laguna Histopathology Section, with an increase of 56, 19 %. The deaths cataloged as suspect-sudden of criminality have increased 41% compared to the previous year being predominant the ischemic cardiopathy. It is important to mention hereditary cardiomyopathies and sudden deaths with a standard heart structure that affects the youngest people (minor of 35 years) and whose diagnosis contemplates to follow anatomic protocols and multidisciplinary collaboration after reviewing the family genetics.

The number of violent deaths has also increased highlighting accidental traumatisms in traffic or workplace accidents apart from homicides, suicides, drowning or asphyxia, intoxications mainly in drug consumers, and gender-based violence, doubling the casework to the previous year. We have to highlight that in these cases, the expert activity concludes with court assistance frequently.

To answer the casework and the rest of the activities, the Services/histopathology Section hired December 2019 a specialist in pathology anatomy, so the section has two specialists in anatomy pathology and an assistant.

5.4.1. Interesting forensic case: Mechanical asphyxia histopathological study

According to witnesses, a homeless man was rooted with a liquid. After, someone set fire on him while he was lying down along the street with his orthopedic legs.

Heart, hyoid-larynx complex with the trachea (Figure 5.4.1.1 Photography 1, 2, and 3), wedges from both lungs and brain was forwaded for histopathological study with the

objective to evidence black smoke in the airways. The work is supervised by the Quality Assurance Unit of the Institute of Toxicology. In the macroscopic study and carving of the submitted viscera, the purpose is to realize examen and sampling homogeneous and systematic, obtaining samples to study them microscopically, which they were stained with hematoxylin-eosin and Masson's trichrome.

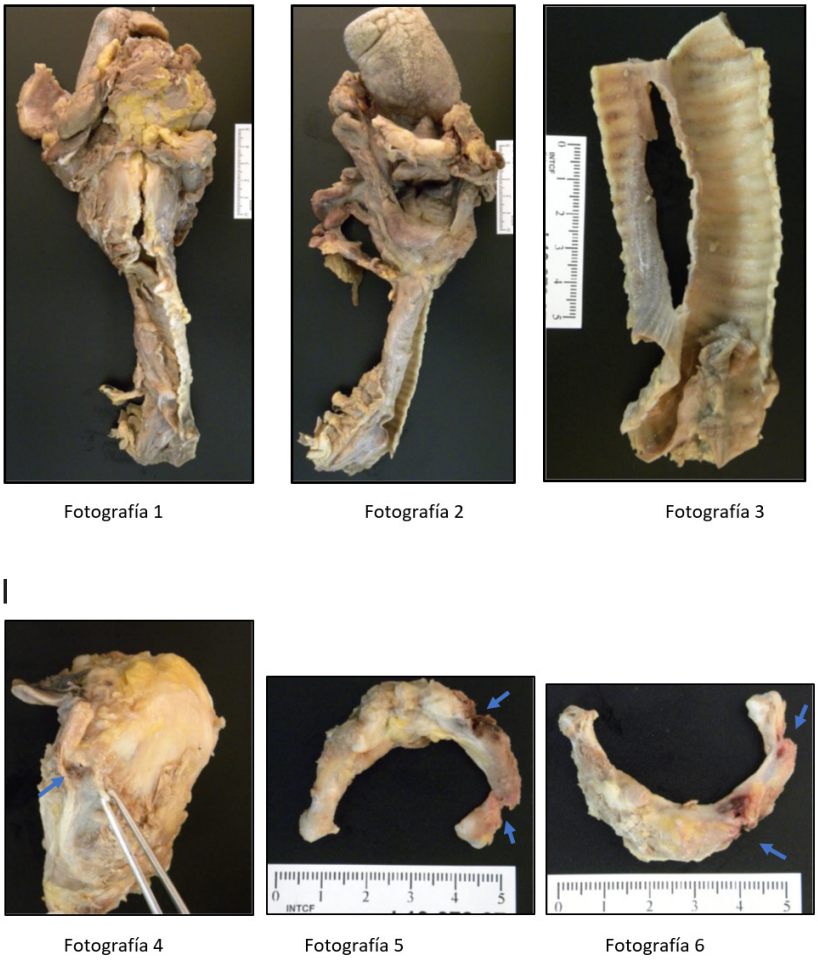
The hyoid-larynx complex study manifested a fracture of the right superior horn of the thyroid and right horn of the hyoid. There's also a hemorrhage and fibrillary degeneration of the adjacent musculature. The heart, encephalon, and lungs also have signs of asphyxia. There isn't black smoke inside the airways superior or inferior, so he hasn't breathed in the middle of the fire. This last fact was corroborated with the determination of a concentration of carboxyhemoglobin in blood located inside the normal chemical-toxicological rank. There isn't any other toxicological substance of interest.

The soft sides showed fractures with hemorrhage associated with the thyroid cartilage and the hyoid bone (Figure 5.4.1.1. Photography 4,5, and 6 arrows). The microscopic study allowed the application of contrasting techniques, to demonstrate markers that enforced the diagnosis of those injuries, allowing classificate them as vital, produced in the time close to death.

The fractures with hemorrhage in the thyroids and hyoid constitute an important finding in the diagnoses of extrinsic cervical violence most likely life-threatening, produced in a near time of death. The fibrillar degeneration of the muscles is considered muscular trauma in a premortal period (vital/agonic).

This case manifests the importance of the histopathological study complementary to the autopsy of the cervical injuries. It proportionates crucial information not done in the autopsy. This study allowed us to clarify the death mechanism, asphyxia (strangulation), and the chronology of the facts. The black smoke in the airways indicates that the death was produced before that the person was rooted with liquid and fired.

Figure 5.4.1.1. Macro photographs of the mechanical asphyxia case described



Fotografía 1 Fotografía 2 Fotografía 3

Fotografía 4 Fotografía 5 Fotografía 6

BIBLIOGRAPHY

Sánchez de León Robles MS. Hallazgos microscópicos en la autopsia del cuello: casuística del Instituto Nacional de Toxicología en casos de ahorcadura, estrangulación y otras lesiones cervicales. *Cuadernos de Medicina Forense* 2006; 12(45-46): 252-256.

Pollanen MS. Pitfalls and Artifacts in the Neck at Autopsy. *Acad Forensic Pathol.* 2016;6(1): 45-62.

5.4.2 Teaching and scientific activity

5.4.2.1. Contribution in scientific congresses

Ana Isabel Hernández Guerra. Miembro del comité organizador y científico del V Congreso Nacional de la Sociedad Española de Patología Forense. Granada. España. 22-24 de mayo de 2019.

Ana Isabel Hernández Guerra. Presentación de Caso en curso corto sobre Muerte en Custodia. Comunicación oral. V Congreso Nacional de la Sociedad Española de Patología Forense. Granada. España. 22-24 de mayo de 2019.

Ana Isabel Hernández Guerra, Abian Vega y Margarita Álvarez. Reunión del grupo de trabajo de autopsias. Curso corto: Controversia en patología autópsica. Presentación de caso anatomoclínico: Interrupción voluntaria del embarazo por agenesia del ductus venoso con vena umbilical aberrante: Hallazgos autópsicos y correlación ecográfica. Comunicación oral. V Congreso Nacional de la Sociedad Española de Patología Forense. Granada. España. 22-24 de mayo de 2019.

Javier Tapia Chinchón y Ana Isabel Hernández Guerra. «Selfie Extremo» en adolescencia causante de electrocución mediante arco voltaico: a propósito de un caso. Póster. V Congreso Nacional de la Sociedad Española de Patología Forense. Granada. España. 22-24 de mayo de 2019.

Ana Isabel Hernández Guerra. Moderadora de la Sección de Póster. V Congreso Nacional de la Sociedad Española de Patología Forense. Granada. España. 22-24 de mayo de 2019.

5.4.2.3. Scientific publications

Hernández-Guerra AI, Tapia J, Menéndez-Quintanal LM, Lucena JS. Sudden cardiac death in anabolic androgenic steroids abuse: Case report and literature review. *Forensic Sci Res*. 2019;4(3): 267-273. Published 2019 Aug 19. doi:10.1080/20961790.2019.1595350

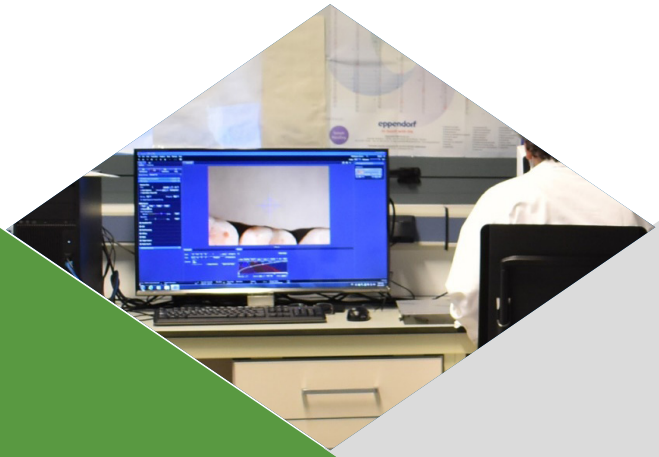
5.4.2.4. Education and teaching activities

Acuerdo de colaboración de la Sección de Histopatología de La Laguna con el Servicio de Anatomía Patológica del Hospital Universitario de Canarias para la formación de los residentes de anatomía patológica en patología fetal y autópsica.

Ana Isabel Hernández Guerra. Protocolo de estudio del corazón en Muerte Súbita del Adulto Joven. Variaciones de la normalidad. Corazón estructuralmente normal. Corazón de atleta. Informe histopatológico. Ponente. Curso: «Patología Cardiovascular Asociada a la Muerte Súbita del Adulto Joven. Muerte Súbita en el Deporte». Instituto de Medicina Legal y Ciencias Forenses de Cataluña (Ciudad Judicial). Barcelona. 9 y 10 de septiembre de 2019.

Ana Isabel Hernández Guerra. «Actualización en patología forense. Patología del encéfalo y raquis». Asistente. Centro de Estudios Jurídicos. Madrid. 7 y 8 de noviembre de 201.

6. Criminalistic Service



There is only one Criminalistic Service inside the INTCF, located in the Madrid Department that attends requests which come from all of Spain concerning the following types of general investigations:

- *Injuries study*
- *Traces study*
- *Anthropology Study*
- *Forensic entomology study*
- *Documentoscopy and Graphs*

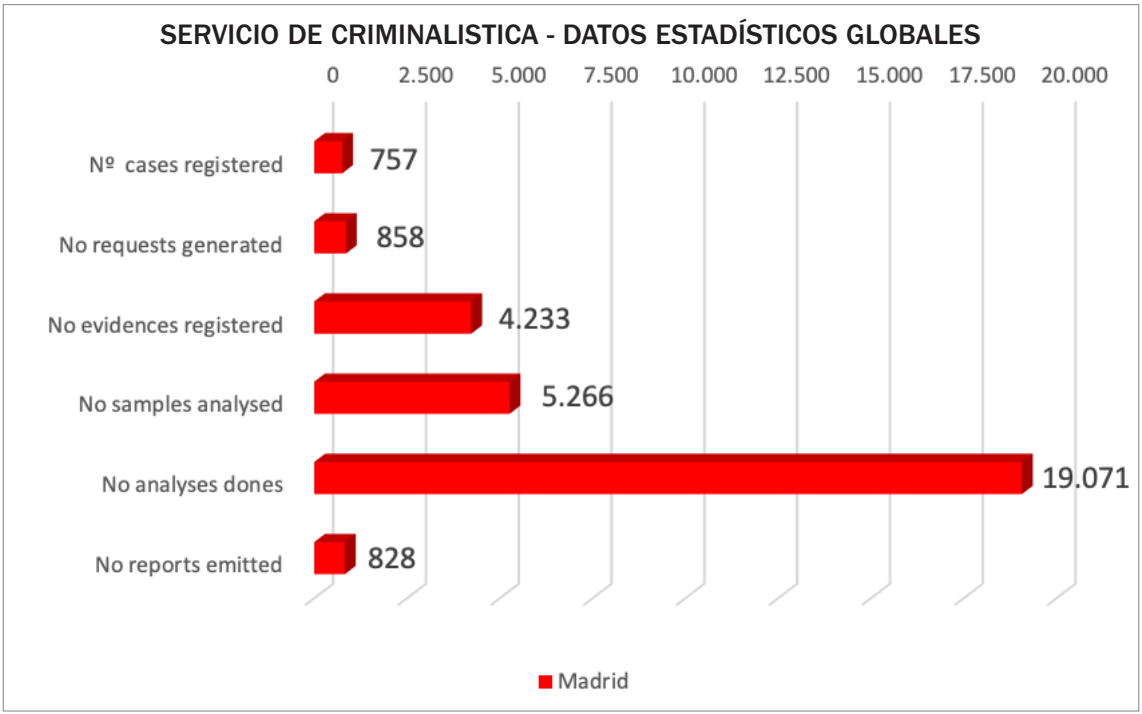
The Criminalistic Service staff that has participated in these investigations during 2019, is shown in Table 6.1.

Table 6.1. Madrid Department Criminalistic Service

	Criminalistic Service INTCF-MADRID
Head of the Department	1
Facultatives	11
Specialist technicians	4
Laboratory assistants	2
Administratives	1

The INTCF Criminalistic Service has registered during 2019 a total of 757 expert cases and a total of 4,233 evidences for their analysis, emitting 828 expert reports after the analysis of 5,266 samples doing 19,071 analysis (Figure 6.1).

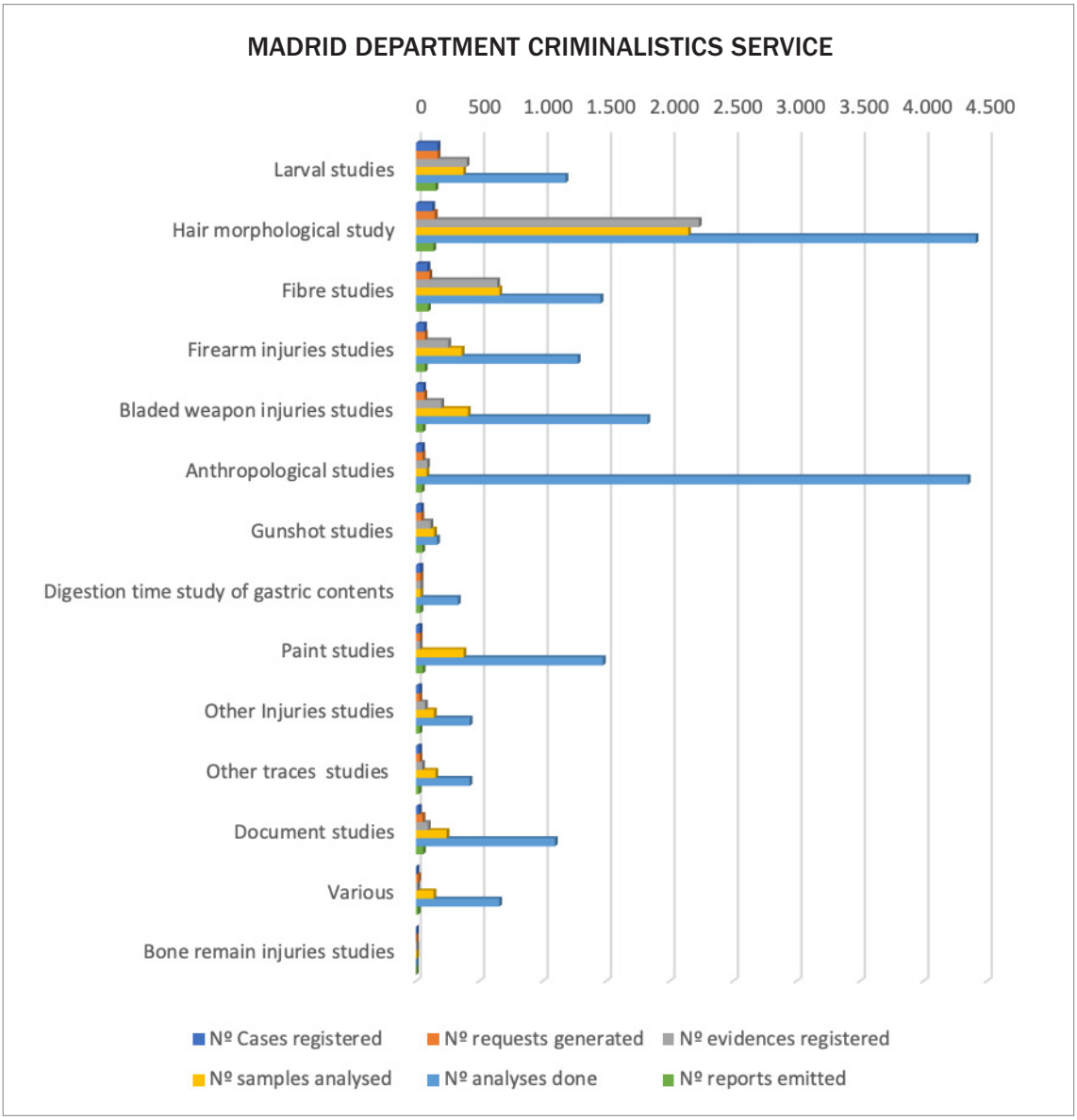
Figure 6.1. Overall data on the INTCF Forensic Science Service's 2019 expert activities



	N° cases registered	No requests generated	No evidences registered	No samples analysed	No analyses dones	No reports emitted
Madrid	757	858	4.233	5.266	19.071	828
Total	**757**	**858**	**4.233**	**5.266**	**19.071**	**828**

In figure 6.2 the Madrid Department Criminalistic Service shows the casework during 2019 classified depending on the type of report.

Figure 6.2. Casework of the Madrid Department Criminalistics Service during 2019 according to the type of report



Type of report	N° Cases registered	N° requests generated	N° evidences registered	N° samples analysed	N° analyses done	N° reports emitted
Larval studies	171	171	401	373	1.179	155
Hair morphological study	129	149	2.230	2.146	4.412	138
Fibre studies	92	107	641	658	1.455	96
Firearm injuries studies	65	71	256	361	1.276	71
Bladed weapon injuries studies	58	67	201	409	1.825	55
Anthropological studies	49	53	89	84	4.350	47

Tipo informe	Número asuntos registrados	Número peticiones generadas	Número evidencias registradas	Número muestras analizadas	Número análisis realizados	Número informes emitidos
Gunshot studies	42	44	117	145	167	51
Digestion time study of gastric contents	36	36	37	36	332	36
Paint studies	31	31	31	376	1.474	54
Other Injuries studies	28	28	72	142	425	29
Other traces studies	27	29	50	154	423	23
Document studies	25	53	95	242	1.096	57
Various	3	19	10	137	657	16
Bone remain injuries studies	1	0	3	3	0	0
Total	**757**	**858**	**4.233**	**5.266**	**19.071**	**828**

The Criminalistic Service is characterized by having different areas frequently interconnected and of being multidisciplinary.

The area of Injuries includes: the study of bladed weapons, injuries of contusion origin, firearm injuries, and other injuries (strangulation, hanging, umbilical cord sections). It is relevant because the Criminalistic Service is the only expert laboratory in Spain that does the study directly to the fresh skin flaps, allowing to have more precise results in determining bladed weapon characteristics that have produced the injury; the search of strange materials in the interior of a contusion injury that allows identifying the weapon, or the differential diagnosis between the inlet and outlet holes in a shot, apart from estimating the distance from which the shot was produced, for example.

Often in blunt force injuries, the request for analysis includes the vitality study, carried out in the Histopathology Department.

Inside this kind of request, there are clothes studies, even if it's for bladed weapons to differentiate characteristics to discern between cuts or tears. On the other side, clothes are necessary to study the distance from which the shot was produced.

On some occasions with the gunshot holes, sample holders are received to study gunshot residues on hands, both on the victim and the suspects. The service has a hand-held waste collection kit, which is sent to the IMLs from all of Spain, with several holders and an instruction manual for sample collection.

According to the number of requests in 2019, there is concordance with the data collected from previous years.

Forensic anthropology received samples that include human remains partially skeletonized and bone remains of apparently ancient date. There are diverse types of studies requested including: bone identification, species determination, the minimum number of individuals, biological profile, injuries study, and estimated death date.

In the injury exam, the analysis is related to the study of soft tissues on some occasions and with the vitality studies done in the Histopathology Service.

The anthropology study of bone remains in requests including the genetic study of those samples.

Forensic Entomology tries to determine the death date based on the cadaveric fauna colonising a corpse, taking into account the circumstances in which the body was found such as: open or close areas, death cause, environmental conditions (temperature, humidity, season of the year), etc.

Most of the petitions requested describe the death of persons inside their houses, being variable the estimated death time.

Regarding the examination of gastric content, it includes the study of food

present in the stomach at the time of autopsy.. Based on the type of food and the digestion degree. They try to identify the food ingested and the estimated time from the intake and time of death.

The study of traces in the Criminalistic Service includes all those which aren´t of biological origin and that can be found in the scene of the crime or on the victim and/or suspect. This study includes: fibers, paintings, plastics, cords, inorganic stains, adhesives, or any indices of interest.

Inside this group there is included the **morphological hair study** that allows a selection previous to the genetic study, saving time and materials.

The samples that have to be analysed can be submitted on the support. It is the laboratory that searches and collects. They can be received individualized. Sometimes the traces can come from an injury, allowing us to identify the surface characteristics that have impacted, either it is an object or a hard surface. It is frequent that in car accidents inside the injury there are painting remains helping identify the car.

In the case of **textile fibers**, the most frequent samples are the nail clippings from which the embedded fibers are extracted. Subsequently, they are identified and compared if undoubted samples are sent for it.In the case of **paintings**, the INTCF Criminalistic Service has participated in the elaboration of the EUCAP database of car paintings from the Working Group Paint and Glass of ENFSI. Thanks to this database, the car model that has participated in a criminal act can be identified if the fabrication is European.

Traces include the samples which are remitted to its identification or those collected in the course of another study, from wounds, textile supports, or any other surface on which their identification is of interest.

The **Documents section** includes the exam of manuscripts and printed documents. The requests during 2019 have been majorly the ones related to the identification of manuscripts, texts, or signatures.

According to **Interlaboratory controls** during 2019 they have participated in 14 studies that come from two international institutions (ENFSI and CTS), and one national (RLFOE). They include the study of: fibres, hairs, paintings, adhesives, rests of the shot, distance of the shot, bone identification, manuscripts, and printing inks.

6.1. Interesting forensic case: Identification of a fetus in a plane

In a plane from Iberia Company from Cuba, they find remains of a mummified fetus in the hygiene paper from the toilet suspecting a primate.

They request the Criminalistic Service to determine the species and any other information of interest.

It was possible to determine that it was a human fetus of 16 weeks of gestation after the anthropology study. They also appreciate bone injuries not being able to exclude that they were associated with late abortion or premature birth.

The free end of the umbilical cord was examined and found to be severed by tearing.

Figure 6.1.1. Fotografía de la muestra de feto momificado

6.2. Teaching and scientific activity

6.2.1. Participation in investigation projects and collaboration with other institutions

In collaboration with the ENFSI Working Group Paint and Glass, the maintenance of the EUCAP automotive paint database has been carried out.

In collaboration with the ENFSI Working Group Paint and Glass, the creation of the adhesive tapes database.

In collaboration with the ENFSI Working Group Firearms/GSR, participation in a study of the prevalence of gunshot residues by occupational activity in the population.

Creation of an internal photographic database of microscopic structures from different foods, to be applied in the study of gastric contents.

Agreement between the Ministry of Justice and the state agency CSIC, M.P. to carry out RAMAN analyses in the Research Group on Optical Spectroscopies in Plasmonic Nano-structures of the Institute for the Structure of Matter.

CSIC Interdisciplinary Platform. Open Heritage Research and Society. Study of pigments.

Participation in the WG4 Working Group of the ISO 272 Committee for the development of ISO 21043 standards: Forensic Sciences.

Collaboration with the Ministry of the Interior to integrate data at the national level on the discovery of unidentified human remains and the identification of missing persons.

6.2.2. Contribution in scientific congresses

Margarita Santamaría. Toma de muestras (estudios criminalísticos). V Congreso Nacional del Sociedad Española de Patología Forense. Granada. 24 de mayo.

6.2.3. P Scientific publications

Perez Cao AM (2019). «Técnicas de análisis de residuos de disparo». En: Serrulla F. *Armas de fuego y Ciencias Forenses.* Orense: AGMF; 2019.

Nogal Ruiz MM, Pérez Cao AM (2019). «Análisis de laboratorio de las lesiones por arma de fuego». En: Serrulla F. *Armas de fuego y Ciencias Forenses.* Orense: AGMF; 2019.

6.2.4. Education and teaching activities

Formación en prácticas de dos alumnas del Grado de Criminología de la Universidad Complutense de Madrid.

Amparo Jiménez, Teresa Cabellos. «Antropología Forense». Profesoras. Curso de Complemento de Formación para la Unificación de las escalas de oficiales de la Guardia Civil. Centro Universitario de la Guardia Civil, Universidad Carlos III, Aranjuez (Madrid), 13 de febrero de 2019.

Maria Luisa Beringola. «Entomología Forense». Profesora. Curso de Complemento de Formación para la Unificación de las escalas de oficiales de la Guardia Civil. Centro Universitario de la Guardia Civil, Universidad Carlos III. Aranjuez (Madrid). 27 de marzo de 2019.

Amparo Jiménez, Teresa Cabellos. «Antropología Forense». Profesoras. Curso de Complemento de Formación para la Unificación de las escalas de oficiales de la Guardia Civil.

Centro Universitario de la Guardia Civil, Universidad Carlos III, Aranjuez (Madrid), 10 de mayo de 2019.

Maria Luisa Beringola. «Entomología Forense». Profesora. Curso de Complemento de Formación para la Unificación de las escalas de oficiales de la Guardia Civil. Centro Universitario de la Guardia Civil. Universidad Carlos III. Aranjuez (Madrid). 12 junio de 2019.

Ana María Pérez Cao. Microscopía electrónica de barrido. Microanálisis de energía dispersiva de rayos X. Profesora. Grado de Criminalística de la Universidad de Alcalá de Henares. 17 de septiembre. Universidad de Alcalá de Henares.

Ana María Pérez Cao. «Técnicas de análisis de residuos de disparo». Ponente. Curso de Ciencias Forenses y Armas de Fuego. Asociación Galega de Médicos Forenses. Instituto de Medicina Legal de Galicia (Xunta de Galicia). Asociación Española de Antropología y Odontología Forense. Santiago de Compostela. 19-20 de septiembre.

Mar Nogal. «Análisis de laboratorio de las lesiones por arma de fuego». Ponente. Curso de Ciencias Forenses y Armas de Fuego. Asociación Galega de Médicos Forenses. Instituto de Medicina Legal de Galicia (Xunta de Galicia). Asociación Española de Antropología y Odontología Forense. Santiago de Compostela. 19-20 de septiembre.

Amalia Pérez. Actualización en investigación Criminalística. Mesa redonda: Actuación conjunta en diligencia de levantamiento de cadáver. Inspección ocular, recomendaciones del grupo de trabajo de ENFSI, normativa de remisión de muestras del INTCF. Centro de Estudios Jurídicos. INTCF. Departamento de Madrid. 3 y 4 de octubre de 2019.

Amparo Jiménez, Teresa Cabellos. «Antropología Forense». Profesoras. Curso de Complemento de Formación para la Unificación de las escalas de oficiales de la Guardia Civil. Centro Universitario de la Guardia Civil, Universidad Carlos III, Aranjuez (Madrid), 23 de octubre de 2019.

Maria Luisa Beringola. «Entomología Forense». Profesora. Curso de Complemento de Formación para la Unificación de las escalas de oficiales de la Guardia Civil. Centro Universitario de la Guardia Civil. Universidad Carlos III. Aranjuez (Madrid). 20 de noviembre 2019.

Rosa Ana Millán. Tutora de alumno en prácticas de la escuela Técnica de Enseñanzas Especializadas. Servicio de Criminalística. 18 de marzo a 14 de junio de 2019.

Teresa Cabellos. Directora del Trabajo Fin de Máster en Criminalística del IUICP, «Contenido gástrico en contexto forense: identificación y data de la muerte. Revisión bibliográfica».

Asistencia al Summer School on Gunshot Residues Analysis. Bundeskriminalamt. Wiesbaden. 19-22 agosto 2019.

Asistencia al Forensic Anthropology Society of Europe Symposium. FASE. 14 septiembre 2019. Bruselas.

Asistencia al curso «Calidad aplicada al laboratorio. Estándares». Centro de Estudios Jurídicos. En el INTCF Departamento de Madrid. 19-20 de septiembre.

Asistencia al Curso de Ciencias Forenses y Armas de Fuego. Asociación Galega de Médicos Forenses. Instituto de Medicina Legal de Galicia (Xunta de Galicia). Asociación Española de Antropología y Odontología Forense. Santiago de Compostela. 19-20 de septiembre.

Curso multidisciplinar de agresiones sexuales: Administraciones públicas. INTCF. 23-27 septiembre.

Asistencia al curso «Actualización en investigación criminalística»: Centro de Estudios Jurídicos. En el INTCF. Departamento de Madrid. 3-4 octubre.

Asistencia al curso «Presente y Futuro de la Identificación en Odontología Forense». IUICP. Universidad de Alcalá de Henares. 5 de noviembre de 2019.

Asistencia a la XI Reunión Científica Internacional de la Asociación Española de Antropología y Odontología Forense. AEAOF. Pastrana. 8-10 de noviembre de 2019.

Asistencia al curso «New methods, instrumentation and ideas for analysis an microscopy in Forensic Science». Organizado por el Instituto de Criminalística de la República Checa. Praga. Noviembre de 2019.

7. Toxicological Assessment and Environmental Services

Each INTCF Departments has a Toxicological Assessment and Environmental Service (VTMA). The VTMA Service has as objective the emission of reports that the Judicial Authorities and the Public Prosecutor's Office requests, also the analyses and investigations practice ordered by Judicial Authorities, Governmental Authorities, and the Public Prosecutor's Office during judicial procedures or in pre-trial proceedings effectuated by the Public Prosecutor Office related with the investigation of alleged offenses against the environment. They concretely realize the following investigations:

- *Environmental investigation of spills: (Urban wastewater spills, Industrial spills, Agricultural and livestock spills, and other spills)*
- *Environmental investigation of residues: (Residues deposited outdoors, Residues deposited in enclosed areas)*
- *Environmental investigation of polluted soils*
- *Environmental investigation of polluted waters*
- *Environmental investigation of atmospheric pollution*
- *Environmental investigation in fires: (Fires in mountain/forest, fires in other environmental important locations)*
- *Environmental investigation of flora and fauna*
- *Scientific-technical and regulatory assessment of applicable environmental reports*

The analysis techniques, studies, and tests carried out for this purpose are:

- Physicochemical Techniques.
- Ecotoxicity bioassays.
- Microbiological Analyses.
- Field work
- Assessment of environmental reports and documents
- Bibliography reviews
- Study of specific legislation

The Environment Service has several of its methods of analysis accredited by ENAC to UNE EN ISO/IEC 17025 (Accreditation files ENAC: 297/LE639, 297/LE1366, 297/LE2239)

In order to respond to the caseload and other activities, the Toxicological Assessment and Environmental Services had the following staff in 2019.

Table 7.1. Staff of the VTMA Services of the different Departments

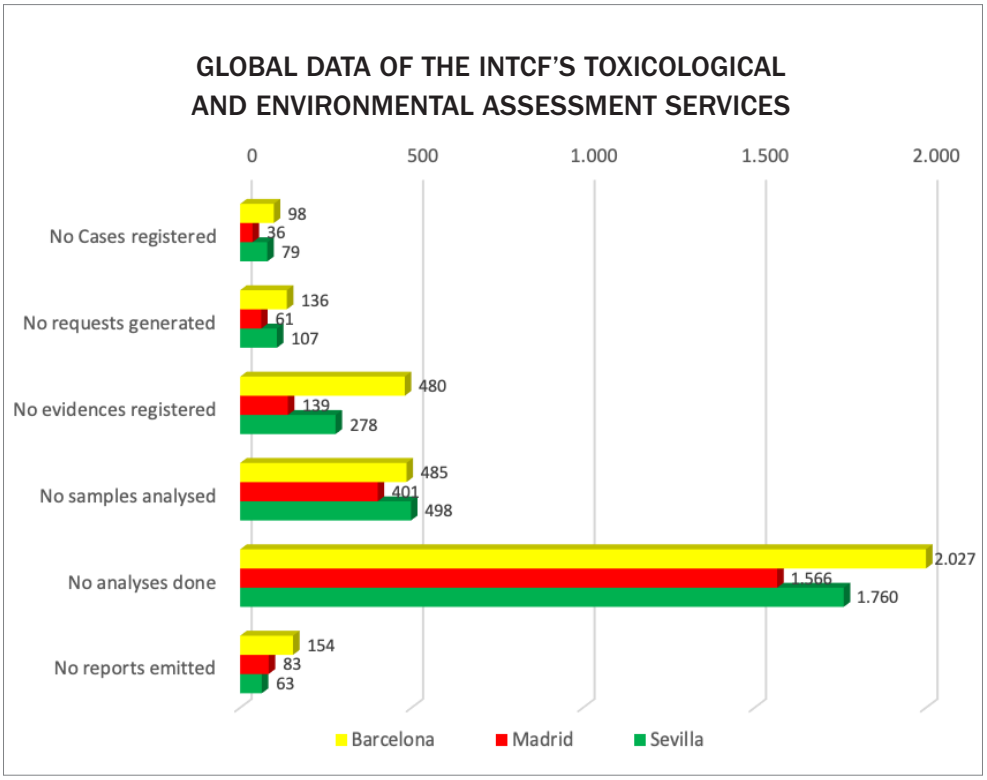
	INTCF-MADRID	INTCF-BARCELONA	INTCF-SEVILLA
Head of the Department	1	1	1
Facultatives	5	1	2
Specialist technicians	2	2	1
Laboratory assistants	2	-	1
Administratives	1	-	-

The VTMA INTCF Services have registered during 2019 a total of 304 expert requests and a total of 897 evidences to analyse them, emitting 300 expert reports after the analysis of 1,384 samples doing 5,353 analyses (Figure 7.1).

The data supposes a 2,4% increase in the number of expert reports emitted compared to 2018 (243 expert reports).

Besides the expert activity, the VTMA Services during 2019 have also acted as reference centers of their labor participating in teaching activities collaborating with diverse universities and legal study centers realising validation and evaluation of several technologies, and participating in intercomparison exercises.

Figure 7.1. Global data of the INTCF's Toxicological and Environmental Assessment Services' Expert Activity during 2019



	No Cases registered	No requests generated	No evidences registered	No samples analysed	No analyses done	No reports emitted
Barcelona	98	136	480	485	2.027	154
Madrid	36	61	139	401	1.566	83
Sevilla	79	107	278	498	1.760	63
Total	**213**	**304**	**897**	**1.384**	**5.353**	**300**

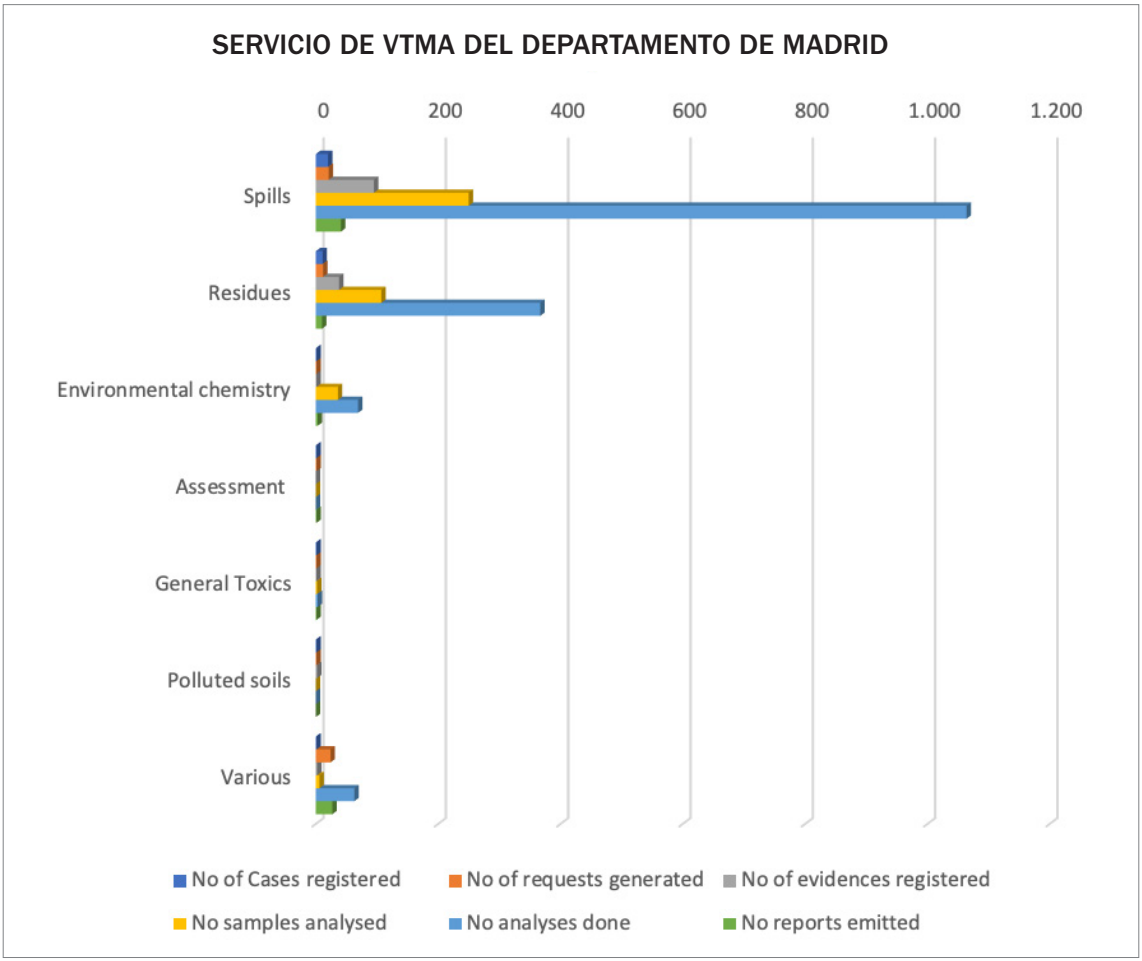
Hereunder, there is the expert and scientific activity as well as the teaching activities developed during 2019 by each VTMA Services of each Department. Each Service has included a forensic interesting case description to publish the expert labor.

7.1. Toxicological and Environmental Assessment Service of the Madrid Department

Concerning the expert activity from the VTMA Service from the Madrid Department, during 2019 they received 61 requests with 139 evidences and analysed 401 samples through a total of 1,566 analyses, emitting a total of 83 expert reports.

As it can be seen in figure 7.1.1, the predominant analysis request corresponds to **spill studies**: urban wastewater discharges, industrial wastewater discharges, agricultural and livestock discharges, and other spills (21 requests with 95 evidences), followed by **residues studies**: residues management, residues deposited outdoors and residues deposited in enclosed areas (12 requests with 38 evidences).

Figure 7.1.1. Casuistry of the VTMA Service of the Madrid Department during 2019 according to the type of report



Type of report	No of Cases registered	No of requests generated	No of evidences registered	No samples analysed	No analyses done	No reports emitted
Spills	20	21	95	250	1.064	41
Residues	11	12	38	107	367	10
Environmental chemistry	1	1	1	36	69	3
Assessment	1	1	0	0	0	1
General Toxics	1	1	1	2	3	1
Polluted soils	1	1	2	0	0	0
Various	1	24	2	6	63	27
Total	**36**	**61**	**139**	**401**	**1566**	**83**

The types of samples analysed during 2019 are shown in Figure 7.1.2.

Figure 7.1.2. Types of samples analysed by the VTMA Service of the Madrid Department during 2019

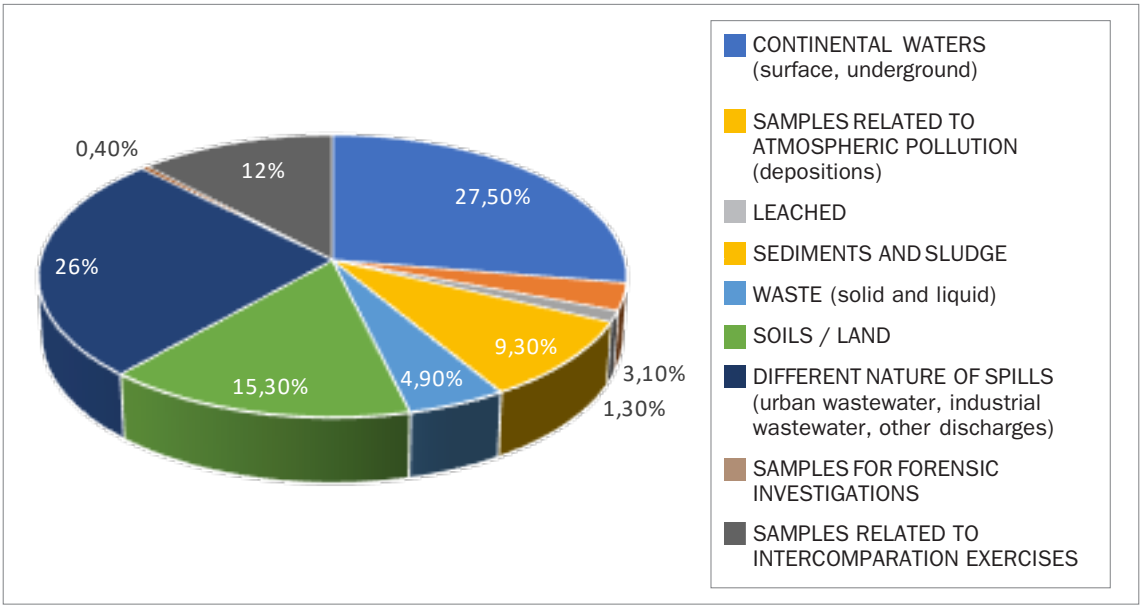
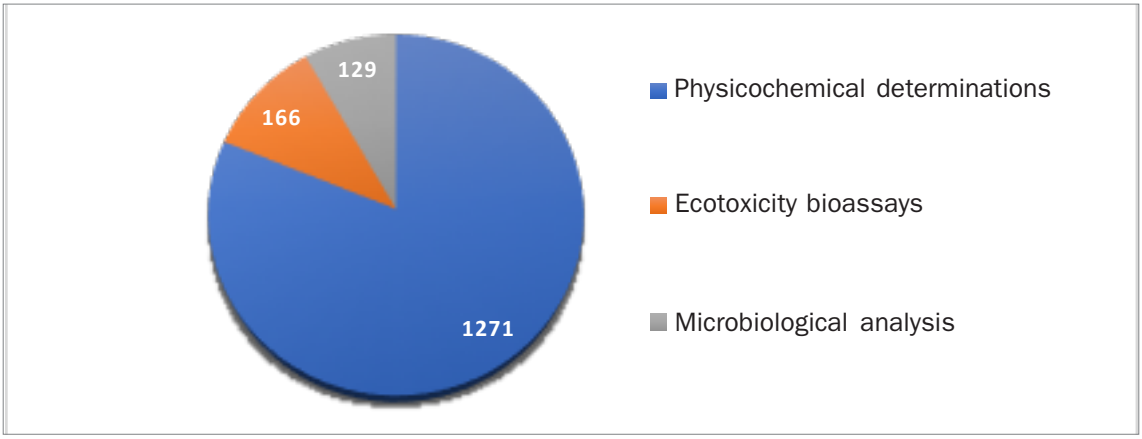


Figure 7.1.3. shows the types of analysis carried out during 2019.

Figure 7.1.3. Types of analysis carried out by the VTMA Service of the Madrid Department during 2019

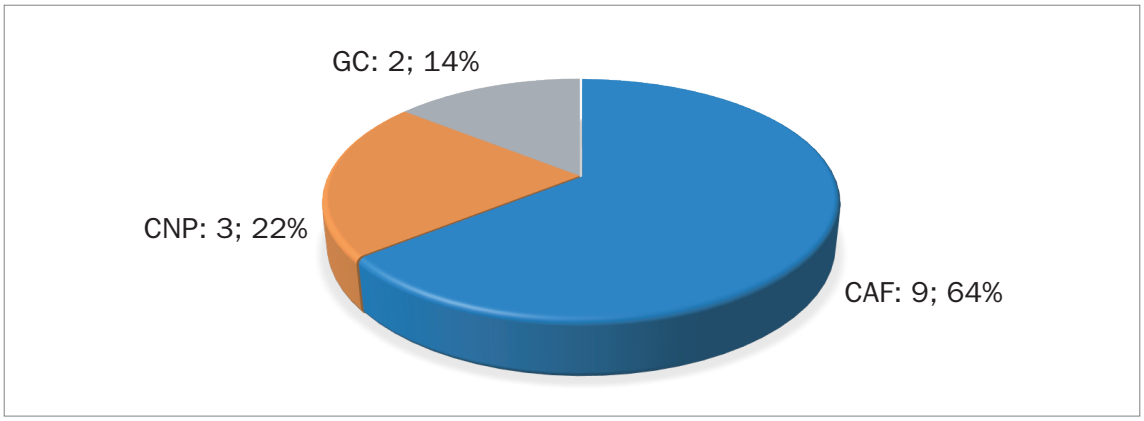


Of the report requests of analysis and report received in 2019, 25 requests come from judicial authorities (Coordinating Prosecutor's Office for the Environment and Urban Planning of the State Attorney General's Office, Provincial Prosecutor's Offices for the Environment, Investigating Courts).

14 analysis requests were also received from the Judicial Police (Figure 7.1.4.), with police investigation diligences, in environmental crime investigations. Three sample analysis

requests with police investigation diligences done by the National Police Environmental Protection Group (PN), two analysis and report requests from the Guardia Civil (GC), and 9 requests demanded by the Corps of Forestry Agents of the Community of Madrid (CAF). (The legal status of the Corps of Forestry Agents of the Community of Madrid gives it the status of Judicial Police).

Figure 7.1.4. Requests for analysis and issuance of reports at the request of the Judicial Police



Adequate quality management allows checking compliance with the requirements that show the laboratory activity exercise capably. One of the fundamental parts of the service practice is focused on the continuous implementation of a quality system, with regular internal and external audits, validation of analytical methods and tests, participation in proficiency testing through inter-laboratory comparisons, and with the scope of ENAC accreditation in the tests specified in this report.

7.1.1. Interesting forensic case: Inadequate residues management investigation

The adequate management of the residues generated and its harnessing through the material and substance recuperation found in them underlines the circular economy philosophy. It is about to guarantee the product life cycle ensuring less residue production and implicating all the actors to intervene in the management of the residues including the general population, consumers, with the modification of consumption attitude. There is no point in implying citizens in the correct classification of residues if the responsible of the later management does not comply with the regulation in force.

There is no point in having regulations when bad practices give place to situations that damage the environment and the people´s health. The residues management involves an economic cost that not all the people are disposed to support, leading to illegal practices controlled via administration but more one leading to criminal investigations with the consequences this entails.

The Madrid Department receives requests for analysis and reports related to inadequate management of residues (spill, abandonment, inadequate dangerousness classification, etc.), which require a different analytical complexity in the function of the nature and number of samples remitted apart from the parameters to be analyzed.

We consider that there isn't a request more relevant than others. All the requests represent an affection possibility to the environment or prejudice for people's health.

The tools with which the SVTMA of Madrid addresses these investigations ,with the peculiarities of each case, are the ones described below as an example of the expert practice of the Service Because an alleged criminal activity originated as a consequence of inadequate waste management through burial and abandonment, INTCF Madrid Department received different types of samples, taken in the area where the waste was being dumped:

- Soil samples affected by the residues, taken from distinct points and with different depths.
- Not affected soil samples («white»).
- Liquid samples generated from the collection and inadequate accumulation of these residues.

The unequivocal residues identification allowed to not proceed to the sample remission to the laboratory, being collected and remitted only samples of the environment affected by the pollutants generated by these wastes.

Before the sampling, both the Judicial Police and the Technical Unit of the Coordinating Prosecutor's Office for the Environment and Urbanism contacted the SVTMA, to inform the investigation´s nature, coordinate the sample transfer to the laboratory and establish the type of samples to take, adequate containers for the collection and quantity of the samples, means of protection required for the agents involved, as well as the necessary and pertinent analyses, regardless of what may occur in taking the samples.

The sampling was done by the Judicial Police. The investigation was done by the Environmental Prosecutor's Office, assuring the media to have the final samples for (means of excavation, sampling points, etc.).

These acts were done in virtue of the Preliminary Diligences of the Investigation Court, Criminal Investigation Diligences of the Provincial Prosecutor's Office, and Governmental File of the Coordinating Prosecutor's Office for Environment and Urbanism of the General State Prosecutor's Office.

All the coordination of the alleged offense against the Environment is crucial to investigate without dispensing resources both technical and human. They guaranteed the chain of custody of the samples taken in this act.

Figure 7.1.1. Samples received

The laboratory investigation after the conversations maintained with the different authorities was orientated to the determination of possible contaminants by the residue nature, in this case, the elements (heavy metals), pH, and conductivity (parameters indicating the presence and availability of elements), as well as the determination of toxicity in the liquid sample received.

They did the sample adequation as preparative techniques (homogenization, sieving, and screening, obtaining the appropriate granulometric fractions for the techniques used) and subsequent «determination of moisture and dry matter in soils, sludge, residues, and sediments. Gravimetric method». (PNT-V-T026) and «destruction of environmental samples by microwave system.» (PNT-V-T043).

After they «determined the electric conductivity in soils» (PNT-V-T041), «determination of electrical conductivity in aqueous samples» (PNT-V-T030), and «analysis of elements (metals) by plasma emission spectrometry». ICP-OES (PNT-V-T026).

The toxicity investigation was done using the following bioassays on the test organisms: determination of Toxicity by inhibition of Bacterial Bioluminescence (effective concentration 50) with Vibrio fischeri (PNT-V-T013) and «Ecotoxicity test» with Daphnia magna (PNT-V-T018).

The investigation Opinion included different reports done by the SVTMA:

- **Physical-Chemical Analysis Report**, with the pH results, conductivity, humidity (% loss of weight), cadmium, iron, manganese, nickel, lead, zinc, silver, plata, and lithium)
- **Ecotoxicity Bioassay Report** *Vibrio fischeri*, and Daphnia magna.
- technical and scientific assessment report of the obtained results, taking into account the autonomic, statal, and European regulation **in residues (waste categories, LER**

codes, hazard characteristics —physical, health, and environmental hazards—, test methods, classification of substances, etc.) and the soil affected characteristics (Generic Reference Levels in the framework for the consideration of contaminated soil characteristics). The environmental qualifications of the area affected by the residues disposal and the existing protection figures have also been taken into account. (ZEPA, ZEC, LIC, locations). Also the content of the hydrologic plan to which the area affected by the possible impact on surface water bodies and groundwater belongs.

They concluded the severe risk exists for the environment and people 's health, the latter depending on the level of exposure.

7.1.2 Scientific and teaching activity

7.1.2.1. Participation in investigation projects and collaboration with other institutions

Colaboración con la Visita de Estudios de la Fiscalía General de Estado de Ghana y la Agencia Estatal de Protección del Medio Ambiente Ghanesa. Proyecto «Apoyo a la transparencia, rendición de cuentas y lucha contra la corrupción en Ghana-ARAP». ARAP-Ghana «*Investigation and prosecution in environmental cases*». Fundación Internacional y para Iberoamérica de Administración y Políticas Públicas (FIIAPP). Semana del 17 al 21 de junio 2019.

7.1.2.2. Teaching and education activities

Colaboración con la Universidad de Alcalá en la impartición de la asignatura «Análisis Instrumental Forense (652010)», del Grado en Criminalística: Ciencias y Tecnologías Forenses.

García de Yébenes Torres, P. *La intervención del INTCF en la investigación de delitos contra los recursos naturales y el medio ambiente*. Sesión de prácticas de la Universidad Nacional de Educación a Distancia (UNED) del Master en Ciencia y Tecnología Química (Analítica). Las Rozas de Madrid. Sede del INTCF. 11 de febrero de 2019.

García de Yébenes Torres, P. (Coordinadora y ponente). Francisco Javier Piga de la Riba (ponente), Jorge Muñoz Conejero (ponente), Pablo Martínez Ardid (ponente). «Jornadas teórico-prácticas sobre introducción a la toma de muestras medioambientales». Dirección General de Función Pública. Consejería de Hacienda y Función Pública. Comunidad de Madrid. Programa de formación de la Comunidad de Madrid. Código: 2019CE121101. Las Rozas de Madrid. Sede del INTCF. 11 y 12 de junio de 2019.

García de Yébenes Torres, P. Universidad de Alcalá. Grado en Criminalística: Ciencias y Tecnologías Forenses. Asignatura Análisis Instrumental Forense. Tema 8. Espectroscopia absorción atómica. Tipos de fuentes de atomización. Espectroscopia de absorción atómica de llama. Espectroscopia de absorción atómica con cámara de grafito. Espectroscopia de absorción atómica con generador de hidruros. Aplicaciones forenses: Determinación

de potasio para establecimiento data muerte, estudio de hidremia, determinación de arsénico. Tema 9. Espectroscopia de emisión atómica. Espectroscopia de fluorescencia de rayos X (XRF): fundamento e instrumentación. Aplicaciones forenses. Espectroscopia de emisión óptica con fuente de plasma acoplado por inducción (ICP): fundamento e instrumentación. Aplicaciones forenses: Análisis químico elemental de muestras de tintas y vidrios. Delitos medioambientales. Contenidos prácticos. Práctica 4: Análisis por espectroscopia de muestras con fines forenses. Curso Académico 2019/20, octubre de 2019.

García de Yébenes Torres, P. La prueba pericial en los delitos contra los recursos naturales y de medio ambiente. Codirección y ponencia oral (Evaluación del curso, conclusiones y preguntas). Actividad formativa del Centro de Estudios Jurídicos (CEJ). Las Rozas de Madrid. Sede del INTCF. 24 y 25 de octubre de 2019.

García de Yébenes Torres, P. (coordinadora y ponente). Francisco Javier Piga de la Riba (ponente), Jorge Muñoz Conejero (ponente), Pablo Martínez Ardid (ponente). «Curso de introducción a la toma de muestras medioambientales». Formación inicial de funcionarios de carrera del Cuerpo de Agentes Forestales, escala operativa, categoría de agente forestal, de Administración Especial, Grupo C, Subgrupo C1, de la Comunidad de Madrid. Dirección General de Función Pública. Consejería de Hacienda y Función Pública. Comunidad de Madrid. Programa de formación de la Comunidad de Madrid. Código: 2019RA101502. Dos ediciones: 8-9 y 10-11 de octubre de 2019.

De Pablo López, M.; García Mínguez, L. Curso multidisciplinar de agresiones sexuales; papel de los trabajadores del INTCF. Precauciones en el manejo, seguridad del trabajador, cadena de custodia. Organizado por la Secretaría de Estado de Justicia, Ministerio de Justicia. Las Rozas de Madrid. Sede del INTCF. 23 al 27 de septiembre de 2019.

De Pablo López, M.; García Mínguez, L. Seminario *online* «Fotometría: Teoría y aplicaciones». Hanna Instruments. 13-03-2019.

García de Yébenes Torres, P. II Jornada sobre Detección y eliminación de contaminantes emergentes. Organizadas por Enviro Networking S.L.U. IFEMA Madrid. 28 de febrero de 2019.

García de Yébenes Torres, P.; García Lojo L. Seminario Espectroscopías ICP-OES y ED-XRF / Preparación de muestras. Últimas tecnologías, aplicaciones innovadoras y análisis fiables. Organizadas por Gomensoro S.A. y CAI de Ciencias de la Tierra y Arqueometría de la Universidad Complutense de Madrid, Facultad de Ciencias Geológicas. Madrid, 28/05/2019.

García de Yébenes Torres, P.; Sánchez Pérez, S. Actividad formativa del Centro de Estudios Jurídicos, «Actualización en Toxicología Clínica y Forense«, programada dentro del Plan de Formación Continuada para 2019 y realizada en Madrid del 17/10/2019 al 18/10/2019.

García de Yébenes Torres, P; Martínez Ardid, P.; Actividad formativa del Centro de Estudios Jurídicos, «Calidad aplicada al laboratorio. Estándares», programada dentro del Plan de Formación Continuada para 2019 y realizada en Madrid del 19/09/2019 al 20/09/2019.

García Mínguez. L., Curso *Operaciones básicas en el laboratorio*. Formación Online. Centro Integral de Formación Permanente Universidad Rey Juan Carlos / Grupo Formación EGS. 25/11/2018 a 25/01/2019.

García Mínguez. L, Curso Planificación y acción preventiva en el laboratorio. Formación *online*. Centro Integral de Formación Permanente Universidad Rey Juan Carlos / Grupo Formación EGS. 25/01/2019 a 25/02/2019.

García Mínguez. L., De Pablo López, M. Seminario *online* «Oxígeno Disuelto. Medida por fluorescencia y métodos tradicionales». Hanna Instruments. 23/01/2019.

Martínez Ardid, P. *Actualización en investigación criminalística*. Las Rozas de Madrid. Sede INTCF. 3 y 4/10/2019.

Martínez Ardid, P.; Sánchez Pérez, S. Conferencia «Estado actual de las armas químicas». Instituto de Toxicología de la Defensa. Ministerio de Defensa. Madrid 15/11/2019.

Muñoz Conejero, J.; Martínez Ardid, P.; Rivero Herrera, J.J.; Piga de la Riba, J.; Sánchez Pérez, S.; De Pablo López, M.; García Mínguez, L. La prueba pericial en los delitos contra los recursos naturales y de medio ambiente. Actividad formativa del Centro de Estudios Jurídicos (CEJ). Las Rozas de Madrid. Sede del INTCF. 24 y 25 de octubre de 2019.

Sánchez Pérez, S. «Jornadas teórico-prácticas sobre introducción a la toma de muestras medioambientales». Dirección General de Función Pública. Consejería de Hacienda y Función Pública. Comunidad de Madrid. Programa de formación de la Comunidad de Madrid. Código: 2019CE121101. Las Rozas de Madrid. Sede del INTCF. 11 y 12 de junio de 2019.

Sánchez Pérez, S. Conferencia «Drogas y conducción: experiencia sobre los controles de drogas en fluido oral». VIII Ciclo de Conferencias. Instituto de Toxicología de la Defensa. Ministerio de Defensa. Madrid. 15 de marzo de 2019.

Sánchez Pérez, S. Conferencia «La epidemia que muta: Chemsex, PrEP salvaje y bugchasing». VIII Ciclo de Conferencias. Instituto de Toxicología de la Defensa. Ministerio de Defensa. Madrid. 17 de mayo de 2019.

7.2. Toxicological and Environmental Assessment Service of the Barcelona Department

Concerning the expert activity from the VTMA of the Barcelona Department, during 2019 they received 136 requests with 480 evidences and analysed 485 samples through a total of 2,027 analysis, emitting a total of 154 expert reports.

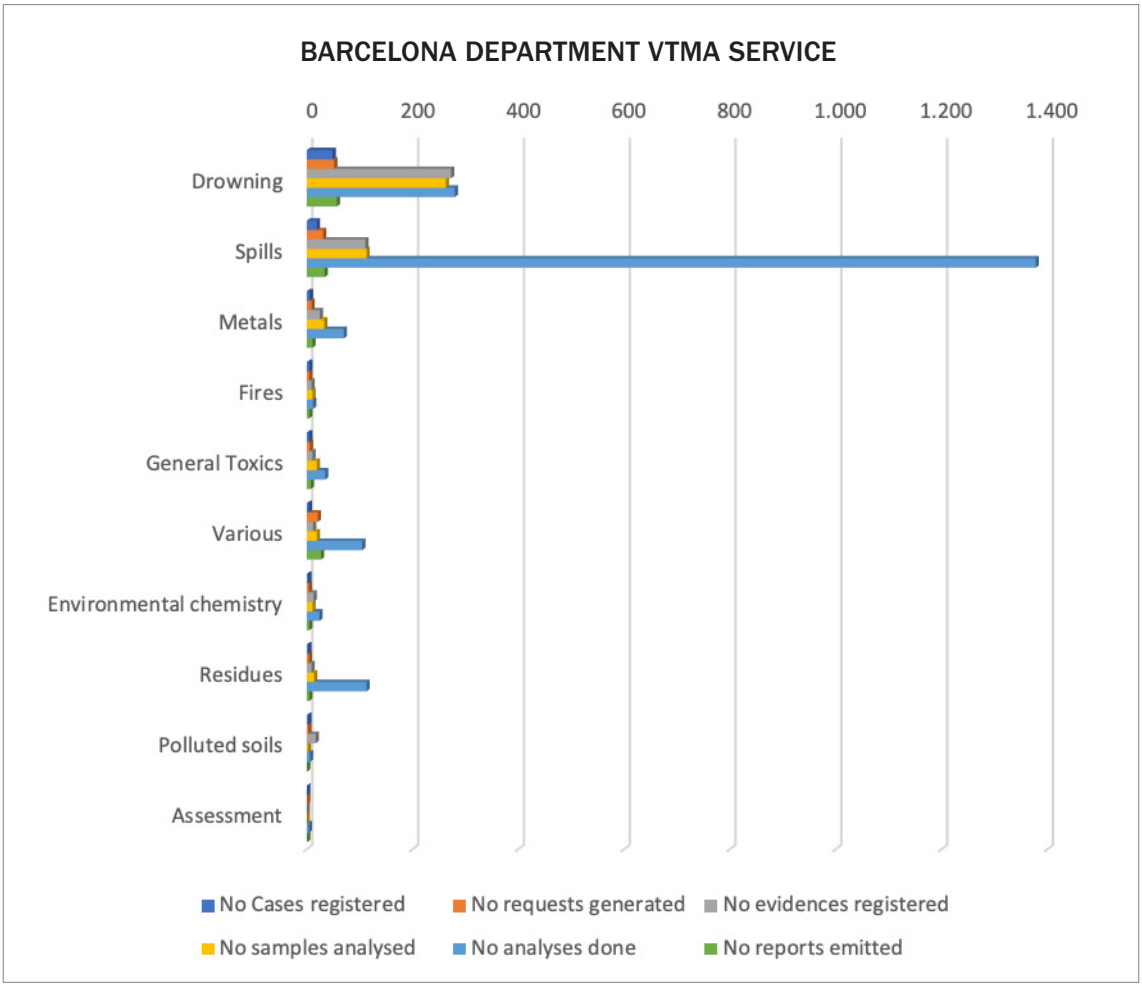
The VTMA Service Barcelona Department attends the requests related to environmental chemistry in the investigation of the offenses against the environment, also other

investigations that, for requiring certain specific analyses, are resolved efficiently from this Service. For this reason; the VTMA Service also does all the analytics of inorganic and organic compound analyses requested in this Department: Heavy metals and anions in biological samples, investigations of combustion accelerants in both forest fire evidence, and biological remains. They also investigate in this Service, deaths related to drowning, including strontium determination, diatom research.

In figure 7.2.1, the predominant analysis request corresponds to **drowning studies** that in the Barcelona Department are doneby the VTMA Service (52 requests and 273 evidences received).

Concerning the toxicology and environmental assessment studies, the predominant analysis request is **spill studies**: urban wastewater spills, industrial wastewater spills, agricultural and livestock spills, and other spills (31 requests with 111 evidences), followed by **metal studies** (9 requests with 111 evidences).

Figure 7.2.1. Casework of the VTMA Service of the Barcelona Department during 2019 according to type of report



Type of report	No Cases registered	No requests generated	No evidences registered	No samples analysed	No analyses done	No reports emitted
Drowning	49	52	273	263	280	57
Spills	19	31	111	113	1.378	34
Metals	6	9	25	33	70	11
Fires	5	5	9	11	12	5
General Toxics	5	6	11	19	35	8
Various	4	21	12	19	105	27
Environmental chemistry	3	4	13	11	24	5
Residues	3	4	9	14	113	5
Polluted soils	3	3	17	2	6	1
Assessment	1	1	0	0	4	1
Total	**98**	**136**	**480**	**485**	**2.027**	**154**

In the field of offense investigations against the environment, during 2019 the casework have increased 46 % in respect to 2018. They have opted to collaborate directly with the judicial police; advising them in the taking of samples in feld studies apart from the analyses.

During 2019 they have visited the countryside 12 times. They have considered it a priority to put all the effort into the clarity and quality of the information attached to the purely analytical data. With explanations of each of the parameters realized, interpretation of the analytical results, and an environmental assessment of all the available data of our analyses, other reports and from our observations «in situ».

To guarantee the quality of our analyses, we continuously participate in inter laboratory exercises that come from diverse organizations that cover a wide range of determinations carried out in this Service: heavy metals, general contamination parameters, toxicity tests, microbiological tests, and determination of combustion accelerants in fire traces.

7.2.1. Forensic interesting case: Investigation of an environmental disaster in the Besós river

Here we have an environmental disaster investigation that the Prosecutor's Office from Barcelona opened proceedings and requested the analytical collaboration from the VTMA Service of the del Barcelona Department and subsequent assessment report.

There is a fire in the interior of a treatment plant and (mainly solvents), located on the side of the Besòs river (Montornés del Valles) on 11 December 2019. The fire was because of the disastrous environmental management of the company. After the firemen actuation and as a consequence of the clogging of the rainwater retention basins, there is a discharge into the Besòs river, which had high solvents concentrations.

Figure 7.2.1.1. Dead carp collected in the Besòs river

Figure 7.2.1.2. Besòs River: The solvent spill can be seen burning after the fire in the company

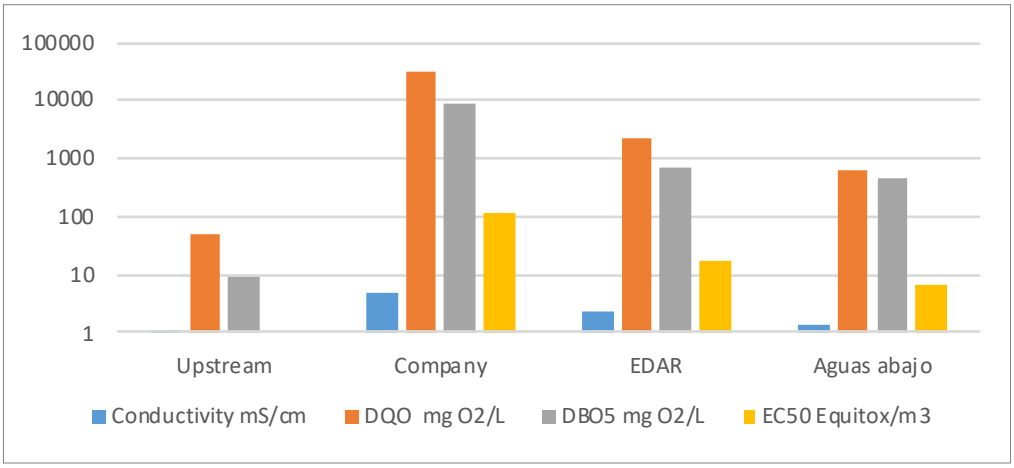
The on-fire spillway waters affected the ecology integrity of this river from Montornés del Valles treatment plant (EDAR) to its mouth in the sea (16,5 km), producing the death of fishes, water under the spills points, and quality degradation of the medium. Both directly through the discharge of liquid waste, and indirectly, through the impact on the EDAR from Montornés del Vallés; that although it's one of the biggest in Barcelona, lost its purification capacity after the entrance of toxic waters which provoked the disablement.

The VTMA laboratory service of Barcelona analysed different water samples. From spills of that company and the treatment plant from the Besòs river. They did pollution parameters, toxic tests, qualitative organic analyses such as solvents and polycyclic aromatic hydrocarbons and metals.

There isn't data about the quantities discharged or the affected residues tons, the duration of the spills. We have pollution signs in the 16 kilometers that divide the spill point from the mouth of the river.

The assessment report has a mission to determine if the facts can constitute an offense against the environment as established in article 325 of the Penal Code. Carried out through the analysis and interpretation of the most relevant tests performed as well as the circumstances assessmentdescribed in the report on the actions of the Rural Agents Corps.

Figure 7.2.1.3. Concentrations of contamination indicator parameters in samples obtained upstream and downstream of the spill



In the graph (figure 7.2.1.3.), there is a substantial difference between the concentrations of the pollution indicator parameters of the samples obtained upstream and downstream of the spill, which answers to the dilution of the pollutants discharged into the river waters. Thus, both the conductivity (proportional to the dissolved salt content) and the chemical and biochemical oxygen demands (COD and BOD) increase due to the mixing

with the spills from the recycling plant and the inputs (somewhat lower in concentration) from the EDAR.

Toxicity is a consequence, previously undetected in the Besós river (Expressed as EC50 in Equitox/m^3).

Quantitative values of volatile organic compounds are shown in Table 7.2.1.

Table 7.2.1. Quantitative values of volatile organic compounds

	mg/l			
	Upriver	**Company spill**	**EDAR**	Downriver
Ethyl alcohol	< 10	698	16	< 10
Methyl alcohol	< 10	4635	359	156
Acetone	< 0,1	1125	156	53
Methyl ethyl ketone	< 1	131	54	33
Toluene	< 1	6,8	7,9	1,2
Ethyl acetate	< 1	172	6,4	5,7
Xylene	< 1	4,0	4,7	1,4

The comparison with the scientific bibliography shows that corresponds to approximately half of the value established in experimental toxicity studies with diverse fish species expressed as LC50 (Concentration capable of killing fifty percent of exposed individuals).

These concentrations indicate that the spills despite the time elapsed continued to be susceptible to generate acute effects in the exposed fish fauna.

Lastly, they proceeded to carry out analysis of certain metals due to the presence among the residues managed by the spill company of galvanic processes and the ineffective purification due to intoxication of the biological digesters of the EDAR, that will have as a result the release into the environment of pollutants contributed with spills from other sources, which may include heavy metals. As a result, they detected low concentrations of nickel and copper in the Besós waters, undetectable elements upstream of the discharge.

7.2.2 Education and teaching activity

7.2.2.1. Contribution in scientific congresses

López Oceja A. Ponencia «Sesión clínica. Estudio biológico en muertes por submersión: Determinación de diatomeas». Celebrado en el Instituto de Medicina Legal y Ciencias Forenses de Cataluña. Barcelona. España. 29 de marzo de 2019.

7.2.2.2. Education and teaching activities

Facultativos de los Servicios de Química, Garantía de Calidad y Valoración Toxicológica y Medio Ambiente. «Calidad aplicada al laboratorio. Estándares». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. Madrid. España. Celebrado del 19 al 20 de septiembre de 2019.

Facultativos de los Servicios de Química, Garantía de Calidad y Valoración Toxicológica y Medio Ambiente. «Cromatografía de líquidos acoplada a técnicas de alta resolución». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. Barcelona. España. 22 de octubre de 2019.

Bueno Cavanillas H. «La prueba pericial en los delitos contra los recursos naturales y de medio ambiente» Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. 10 horas lectivas. Madrid. España. Celebrado del 24 al 25 de octubre de 2019.

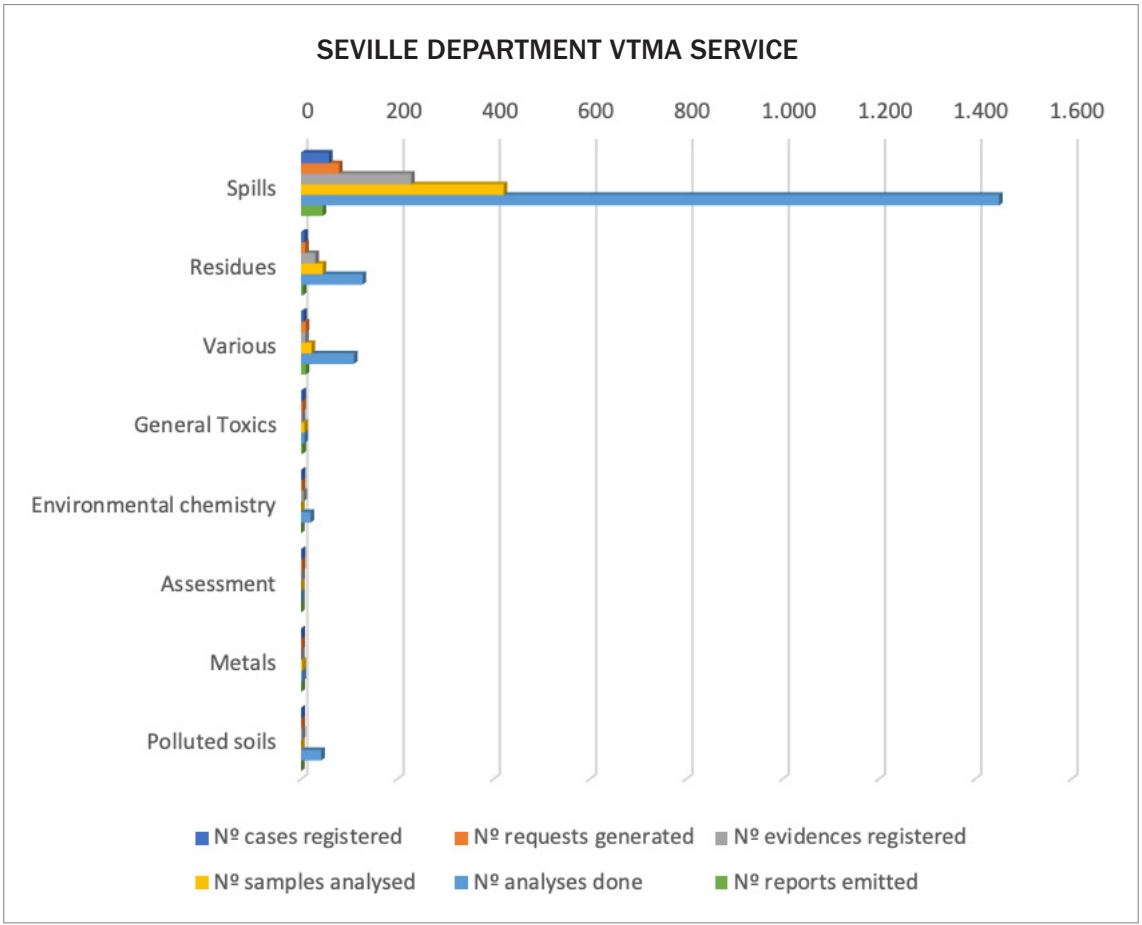
López Oceja A. «La prueba pericial en los delitos contra los recursos naturales y de medio ambiente» Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. 10 horas lectivas. Madrid. España. Celebrado del 24 al 25 de octubre de 2019.

7.3. Toxicological and Environmental Assessment Service of the Seville Department

Concerning the expert activity of the Seville Department VTMA Service, during 2019 they received 107 requests with 278 evidences and analysed 4,498 samples through a total of 1,760 analyses, emitting 63 expert reports.

As it can be seen in figure 7.3.1, the predominant analysis request corresponds to **spill studies**: urban wastewater spills, industrial wastewater spills, agricultural and livestock spills, and other spills (79 requests with 229 evidences), followed by **residues studies**: residues management, residues deposited outdoors and residues deposited in enclosed areas (9 requests with 30 evidences).

Figure 7.3.1. Casework of the VTMA Service of the Seville Department during 2019 according to type of report



Type of report	N° cases registered	N° requests generated	N° evidences registered	N° samples analysed	N° analyses done	N° reports emitted
Spills	58	79	229	421	1.450	45
Residues	7	9	30	45	128	4
Various	5	10	9	22	110	10
General Toxics	3	3	2	7	7	3
Environmental chemistry	2	2	5	0	20	0
Assessment	2	2	1	0	0	0
Metals	1	1	0	3	3	1
Polluted soils	1	1	2	0	42	0
Total	**79**	**107**	**278**	**498**	**1.760**	**63**

7.3.1. Interesting forensic case: Investigation of wastewater spills without purification in Andalusian regions fined by the European Court

In 2019, the VTMA Service Seville Department has participated actively together with the SEPRONA from Guardia Civil from the different Andalusian regions, investigating the spills from the purification plants that have been an object of a million fine that the European Court has imposed on Spain. That has led the Prosecutor's Office of the Attorney General's Office and the various Provincial Prosecutor's Offices to open criminal investigations.

The Court of Justice of the European Union imposed a fine of 12 million to Spain in July 2018 due to the lack of depuration of spill waters in several urban agglomerations. That contemplated a fixed fine and semi-annual penalties while the non-compliances of the community regulation continue. Nine agglomerations continued spilling the wastewaters without treating the sea or rivers of Andalusia when the judgment was passed.

With the defaults withdrawn in 2018, the Action Ecologists reported to the Public Ministry that 227 purification plants did not comply with the law and other municipalities without any type of debugging for which no data was available. Six of the eight Provincial Prosecutors of Andalusia reported environmental offenses, accusing most of the causes to the mayors in their municipalities.

As a consequence of those reports, during 2019 the VTMA service of the Seville Department participated in the countryside inspections, the sample analyses, and emission of the report of the possible damages to the water quality and risks to the exposed ecosystems.

They received 61 analysis requests and report requests grouped in:

Wastewater spills in coast locations:

- Spills in the Almeria coast without sufficient purification through outfalls with influence on protected coastal areas (phanerogam meadows) and bathing water areas.
- Spills in the «Tropical Coast» in Granada, direct or through emissaries with influence in bathing waters and coastal ecosystems.
- Wastewater spills in Malaga coast, direct or through emissaries with influence in bathing waters.
- Wastewater spills in Cadiz, direct spills in locations with special protection places and bathing waters.

Spills in the inside:

- Wastewater spills in the Guadalquivir river with protected spaces influence.
- Spills in the mountain in the «Tropical Coast» from Granada with influence in rivers and streams with possible impact on irrigation water use.

The emissary samples were taken by the Underwater Activities Group of the Guardia Civil. The coast water samples were taken by SEPRONA from the different regions in collaboration with Guardia Civil.

The Oceanographic Institute did biological studies on the seafloor.

From the VTMA service, they participated in the sample planification of all cases. The samples were taken to the emissaries from the sea as a reception way. In the inside spills, they took samples from the spill locations and the reception way in superficial and subterranean water.

From the Service, they did 21 countryside biological indicators studies. They analysed the physical and chemical parameters of the spill samples and in marine and surface water.

Figure 7.3.1.1. Study of biological indicators in the Fahala river, Alhaurín el Grande, Málaga

Figure 7.3.1.2. Discharge of urban wastewater in Playa de los Lances, Tarifa, Cádiz

In the receiving water samples: superficial, coast, and transition waters they analysed the established parameters for the state classification or ecological potential from the *Royal Decree 817/2015, 11 September, where following and evaluation criteria of the surface waters and environmental quality rules are established differentiating physicochemical and biological parameters*.

In the bathing water´s coast locations they did a microbiological analysis to establish the classification in bathing waters depending on the contents of the *E. coli* and intestinal Enterococci as stated in the *ROYAL DECREE 1341/2007, 11 October collects, about the quality management from the bathing waters*.

In most cases, there is important damage in the water quality and a severe risk for the equilibrium of natural systems. In many of the cases, bacteria have been found in coastal waters above the limit marked as sufficient for use as bathing water with the consequent risk created for human health, so the offense is demonstrated.

It is key to mention in these investigations especially in Coín, Alhaurín el Grande, and Nerja, inside the operation «*Vastum*» of the Guardia Civil from Málaga, that has given rise to recognition and congratulations to the performance of the VTMA Service personnel by the Command of the Civil Guard of Malaga.

7.3.2 Education and teaching activities

7.3.2.1. Contribution in scientific congresses

Lhoëst Mathijsen F. «Aspectos técnicos en la toma de muestras y cadena de custodia en los delitos medioambientales.» V Congreso Nacional de Agentes Forestales y Medioambientales. 5 de abril de 2019. Las Palmas de Gran Canaria.

Lhoëst Mathijsen F. «El Servicio de Valoración Toxicológica y Medioambiente: Técnicas analíticas y herramientas para la elaboración del informe pericial». Curso Selectivo de la 6.ª Promoción del Cuerpo Especial de Facultativos del INTCF. 7 de octubre de 2019. Centro de Estudios Jurídicos. Madrid.

Lhoëst Mathijsen F. «Mesa Redonda: Coordinación entre los distintos actores en la investigación de Delitos los Recursos Naturales y el Medio Ambiente». Curso de formación Continua del Centro de Estudios Jurídicos. La prueba pericial en los delitos contra los recursos naturales y de medio ambiente. 24 y 25 de octubre de 2019. Departamento de Madrid del INTCF.

Lhoëst Mathijsen F. «La Importancia del Informe Pericial en la Sustanciación de los Delitos Contra el Medio Ambiente». Jornadas Delitos contra el Medioambiente. 27 de noviembre de 2019. Servicio de Protección de la Naturaleza de la Guardia Civil (SEPRONA) e Instituto de Formación SICURA Madrid.

7.3.2.2. Education and teaching activities

Cano Rodríguez, M. E. Profesora. Curso Laboratorio Criminalístico: El Servicio de Valoración Toxicológica y Medio Ambiente. Máster de Criminología y Ciencias Forenses. Universidad Pablo de Olavide Sevilla. 18 de diciembre de 2018.

Cano Rodríguez, M. E.; Gómez Bujedo, S. Formación en el equipo plasma ICAP 7400. Thermo Fisher Scientific. Sevilla 26 y 28 de marzo de 2019.

Gómez Bujedo, S. Curso investigación Científico-Técnica de los Homicidios en el Anciano, el Niño y la Mujer. Universidad Pablo de Olavide. 15 horas. Carmona 24 y 25 de junio de 2019.

Curso La Prueba Pericial en Los Delitos Contra los Recursos Naturales y el Medio Ambiente. Centro de Estudios Jurídicos. 10 Horas. Departamento de Madrid del INTCF. 24 y 25 de octubre de 2019.

Curso Cromatografía de líquidos acoplada a técnicas de alta resolución (3.ª ed.). Centro de Estudios Jurídicos. 6 horas. Sevilla. 5 de noviembre de 2019.

8. Quality Assurance Services

Each INTCF Department has a Quality Assurance Service. There is no Service like this in the Delegation, so the functions are performed by a Facultative named by the La Laguna Delegation Director.

Although the Quality Assurance Service isn´t an analytical service, they do an important work to ensure the quality of the analyses performed in the rest of the INTCF Services, apart from other national and foreign laboratories. They are, therefore, essential Services to assure two of the INTCF functions defined in article 480 of the Organic law 6/1985, of 1 July, of the Judiciary Power, which are to «*contribute to the scientific criteria unity*» and to the «*analytical expert quality*». These functions are carried out by the Quality Assurance Services through the management and control of all the aspects related to the quality assurance in the analytical Services of the INTCF according to UNE-EN ISO/IEC 17025. And also through the organisation and coordination of Interlaboratory Exercises both nationally and internationally, as a reference center in Toxicology and Forensic Sciences. The Quality Assurance Service functions are the following:

- *Management and control of the quality system documentation*
- *Equipment and reference material management control*
- *Staff education and qualification monitoring*
- *Calibration management and equipment maintenance: balances, pipettes, thermometers…*
- *Evaluation of the validity of the results: control and assessment of the participation in interlaboratory exercises*
- *Control of non-conforming work, corrective actions, improvement actions, and complaints.*
- *Advice and monitoring the validation of methods.*
- *Coordination of the Interlaboratory exercises organised by the INTCF, as a reference center*
- *Management and performance of internal audits*
- *Collaboration with the different INTCF Services in the implementation, maintenance, and improvement of a quality system based on UNE-EN ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories.*
- *Collaboration in the maintenance of the accreditation and in the procedure for new scope.*
- *Elaboration of Management proceedings*

As experts, the Service facultative issue reports related to the quality system and to the chain of custody. These reports can be external or internal, the last is emitted to inform the Department Management of the progress of the implementation and monitoring of the quality system.

In order to address all these subjects, the Quality Assurance Services counted in 2019 with the staff collected in Table 8.1.

Table 8.1. Staff of the Quality Assurance Services of the various Departments

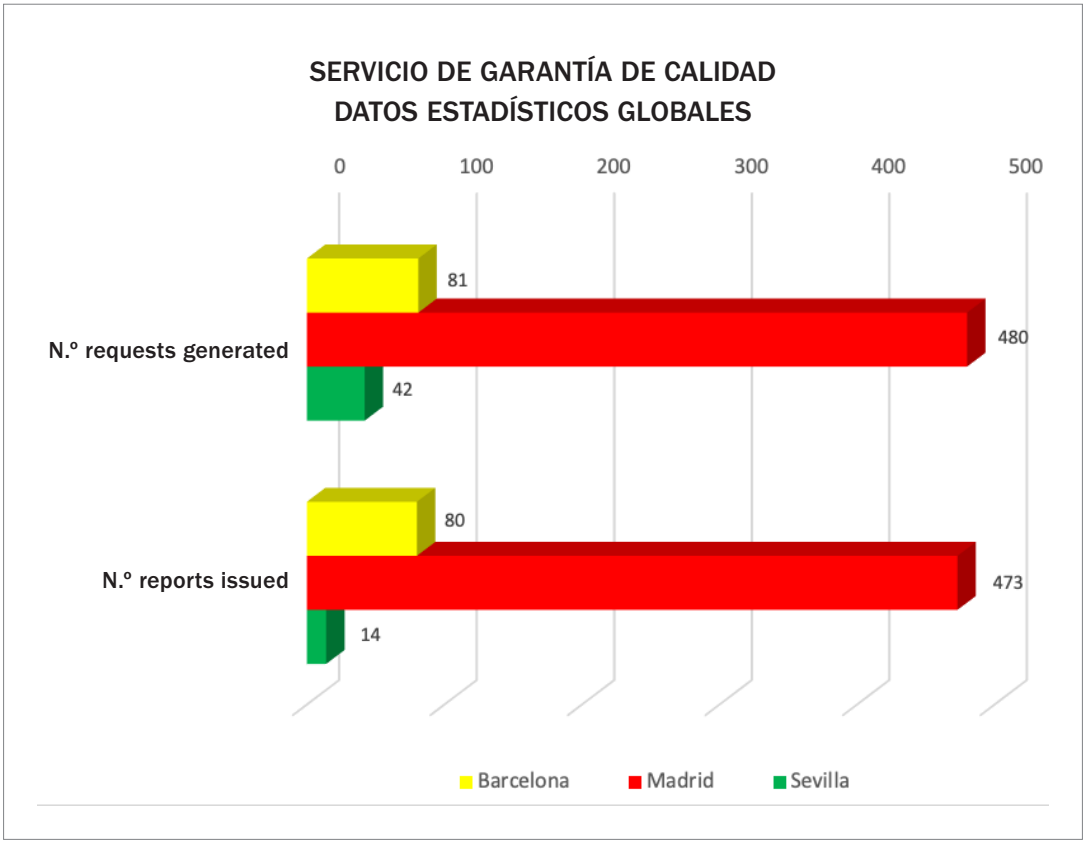
	INTCF-MADRID	INTCF-BARCELONA	INTCF-SEVILLA
Head of the Department	1	1	1
Facultatives	1	1 +1 *	2
Specialist technicians	1	1(**)	-
Laboratory assistants	-	-	-
Administratives	1	-	-

(*) Facultative with parcial dedication in the Service

(**) Specialist technician that does activities related to the management focused on equipment and MRs of the Departament.

Overall data on the number of requests registered and reports issued by the INTCF Quality Assurance Services during 2019 are collected in figure 8.1.

Figure 8.1. Overall data of the number of requests registered and reports issued b y the INTCF Quality Assurance Services during 2019



	N.º requests generated	N.º reports issued
Barcelona	81	80
Madrid	480	473
Sevilla	42	14
Total	**603**	**567**

8.1. Quality Assurance Service of Madrid Department

The Quality assurance of testing performed in the Madrid Department (INTCFM) are based in a quality system that complies with the Standard UNE EN ISO/IEC 17025 requisites. *General requirements for the competence of testing and calibration laboratories.* It is the responsibility of the Quality Assurance Service (SGC) to collaborate with the implementation, maintenance, and improvement of the quality system.

One of the requirements of the the Standard is to assure the quality of the essays by means of having qualified staff. Qualification is reached by education and training of staff personnel for the activities assigned. It is the task of each INTCFM Service, in collaboration with the SGC, to design the adequate training program. In 2019, the SGC supervised all the initial training programs of the new personnel, and the programs aimed at staff already qualified who need to acquire new qualifications Likewise, and as part of the initial training of new facultatives and assistants, the SGC has held seminars to ensure that all personnel are familiar with the Quality System and work under the guidelines of the UNE-EN ISO/IEC 17025 Standard.

The INTCFM Services in order to use the latest techniques or optimize those in use and thus be able to provide increasingly reliable results to its users, have carried out several validations, under the advice of the SGC that allow assessing the suitability of a method or analytical improvement prior to implementation. The implementation of some automated analytical methods like differential extraction analysis or PCR setup, the study of techniques based on new technologies such as the analysis of mitochondrial DNA by massive parallel sequencing, the optimization of implemented techniques already in use such as determination of anions by ion chromatography in aqueous samples or quantification and confirmation of of cannabinoids in blood, serum, and plasma method by GC-MSMS are some of the works that have been developed during 2019.

The National Institute of Toxicology and Forensic Sciences of Madrid contributes actively to the quality of expertise in forensic genetics through the organisation and annual coordination of the Intercomparison Exercise «Analysis of DNA polymorphisms in blood stains and other biological samples.» During 2019 apart from organisingthis exercise, they have collaborated together with the Grupo de Habla Española y Portuguesa, in the performance of the collaborative exercise «Forensic Applications of Massive Sequencing» that will help to unify the scientific criteria in this innovative technique within the forensic field

Finally, the reliability of the tests accredited in the INTCM and the quality of the Inter-laboratory exercises which they organise have been recognised once more this year by the Spanish Accreditation Body (ENAC). This accreditation body has reevaluated and approved the maintenance of the accreditation scopes that recognises the INTCFM as a testing laboratory that works under UNE EN ISO 17025 (LE1367 and LE1366 files) and as a provider of Intercomparison Exercises according to UNE EN ISO 17043 (PPI/016 file).

8.1.1. Activities performed by the Quality Assurance Service

The Quality Assurance Service activities carried out during 2019 are shown in Table 8.1.1.

Table 8.1.1. Activity data corresponding to 2019

Activities	
1. Development of new Standard Operating Procedures (SOPs) and Data Collection Sheets (HRDs). Modification of versions of procedures and sheets	83 (PNT) 49 (HRD)
2. Elaboration of new annexes and modification of existing ones	18
3. Training programs and qualification certificates of the staff	22
4. Initial and ongoing training of personnel in the Quality System	47
5. Management of external equipment calibrations	1
6. Validation studies of analysis methods	5
7. Evaluation of the Participation in intercomparison exercises	106 (108)
8. Conformity assessment of organizers of Intercomparison exercises in which the Department participates	1
9. Evaluation of external participant (reports)	4
10. Evaluation of external participant (certificates)	302
11. Internal audits	3
12. Management review by the Management	2
13. Nonconformities or nonconforming work records	76
14. Corrective actions records	31
15. Preventive or improvement action records	42
16. Claims and complaints management	61

The following is a detailed description of the activities included in the table 8.1.1.

1 and 2 Management of system documents. Standard Operating Procedures (SOPs) are written documents that describe how a certain activity included within the Quality System has to be carried out. The annexes are part of the SOPs and include specific information that, due to its importance, is extracted in an independent document. Data Collection Sheets (HRDs) are used to record a specific activity. Out of a total of 83 standard operating procedures put into effect, 71 existing versions have been modified, both technical and managerial, and 12 new technical procedures have been developed. Of the 49 HRDs that were put into effect, 31 were newly created and the rest were modifications to existing versions. 18 annexes were issued. The SGC reviews the technical preparation as well as the design of all of them before they are put into effect. Once approved, the SGC is in charge of their management and distribution.

3 and 4. Staff training. The staff who work in the different Services need to have the required competence to carry out the assigned laboratory activities., thus they must receive adequate training. The training programs and all the records derived from it until obtaining the qualification certificate are supervised by the SGC During 2020, 47 training programs were reviewed and managed along with their corresponding records, 17 of them were initial training programs and the rest were elaborated for the training of personnel in new techniques.

Likewise, the initial training includes seminars given by the SGC, aimed at providing awareness of the Quality System implemented in the INTCFM, its operation and management. They are also given to staff who request it, even if they are not newly incorporated as a reminder. During 2019, 22 people received training in Quality Assurance (14 Assistants, 6 Facultatives and 2 Specialist laboratory technicians). Throughout the year, all queries made from the Services are attended, especially regarding incidents or doubts related to the management of samples, technical activities and issuance of reports.

5 Management of external equipment calibrations. Each year an external calibration of automatic pipettes whose volume is equal to or less than 10 µl is carried out by a company accredited under ISO 17025 Standard,. The SGC, coordinate the shipments with the Services and monitor the evaluation of the external calibration performed by the Services. In 2019, they led the shipment of 92 pipettes, assessing with the Services the errors detected after calibration and their possible transcendence in the laboratory's analytics.

6 Validation studies. The validation of a test method implicates working out studies to check that the methods are suitable for their intended purpose. Although the Services are responsible for carrying out the validation studies, the role of SGC is to give advice about the parameters to be studied, the substrates to be tested, as well as the evaluation criteria to be applied to evaluate the results. During 2019, 5 validation have been initiated, 2 of them completed during the same year. (see Table 8.1.2.)

Table 8.1.2. Validations in 2019

SERVICE	Technique methods	Estado
BIOLOGY	DNA extraction by differential lysis using AutomateExpressTM automated station, with PrepFiler® Express Forensic DNA Extractionkit (LifeTechnologiesTM)	Finalized
	Validation of PCR set-up of the Quantifiler Trio system using the QIAgility robot.	Finalized
	Validation of mtDNA Control Region analysis by massive parallel sequencing.	In process
DRUGS	Confirmation and Quantification by GC-MS-MS in Blood of: 11-Nor-Δ9-Tetrahydrocannabinol-Carboxylic Acid (THC-COOH), Tetrahydrocannabinol (THC), Hydroxy-Tetrahydrocannabinol (THC-OH), Cannabinol (CBN), Cannabidiol (CBD)	In process
ENVIRONMENTAL AND TOXICOLOGY VALIDATIONS	Validation anion analysis by Ion Chromatography	In process

7-8. Intercomparison exercises in which the INTCFM participates. The INTCFM Services participate in Quality controls, named Intercomparison Exercises, in which samples are received, similar to casework, with which the performance of the laboratory is evaluated, against criteria previously established by their PROVIDERS. . The SGC manages the reception of the samples from these exercises and in some cases is in charged of sending the results after their analysis. Once the provider issues a results report, the SGC evaluates the result o of each Service. During 2019, the Services have participated in 45 exercises, which has led to 108 evaluation reports carried out by SGC, since some exercises consist of two or more annual rounds.

After the first participation in an Intercomparison Exercise, the laboratory must assess whether the program in which participates meets the necessary requirements to be used as quality control. In 2019 there was a new Exercise in which the Criminalistics Service participated on determining the origin of some bone samples, organized by CTS (Collaborative Testing Services). The Service assessed its suitability positively, as an internal quality control, using a questionnaire developed by the SGC.

9 and 10. Intercomparison Exercises that the INTCFM organises. The INTCF in its Regulation recognized its role as a Reference Center. Among its functions as a Reference Center is to organize quality assurance controls that allow self-evaluation of the different laboratories in the different methods. In this regard, the INTCFM, acts as a provider of Intercomparison Exercises and organizes annually, in collaboration with the Spanish and Portuguese Speaking Group of the ISFG, a Quality control aimed at forensic and paternity laboratories called «Analysis of DNA polymorphisms in blood stains and other biological samples». This exercise or control includes two levels of difficulty: basic (kinship and forensic module) and advanced (kinship and forensic module and animal sample).

After evaluating the results submitted by the participants, the SGC issues reports with the results, as well as the individual evaluation certificates for each participant. In 2019, a summary and a final report on participation and results were issued, with the methodologies and results of each laboratory and with the assigned values. Making a report for each level each time.

Regarding the certificates of evaluation, a total of 302 certificates were issued corresponding to 4 types of certificates of evaluation of results: basic level kinship module and forensic module, advanced level forensic module and advanced level animal identification

11. Internal audits. The aim of the audits is to determine the degree of compliance and implementation of the Quality System and detect possible deviations

In 2019, only 3 audits could be carried out (Criminalistics Service, management of the Intercomparison Exercise and an audit prior to the destruction of Drugs), derived from them 6 deviations were detected that have been corrected by the Services.

12. Quality system review. The Quality System is reviewed periodically, in a meeting with the Management, at least once a year to assure its efficiency, and if necessary, initiate improvement measures. In 2019, both the testing activities and the activities as an Intercomparison forensic exercises Provider were reviewed. The revision results were registered in both minutes prepared by the SGC staff.

13 to 15 Non-conforming works, improvement and corrective actions. There´s a Non-Conforming Work (NC) when any aspect of the activities carried out under the Quality system doesn´t meet the requirements established in order to study the the cause of deviation, evaluate the influence that might have had in other fields, and the risk that represents for the laboratory activity. Corrective actions (AC) are needed to correct the causes that have given rise to it and and avoid the same situation. The SGCdocuments all NCs, evaluates the corrective actions proposed by the Service and follows up on them.

In 2019, 76 NCs have been managed, 9 of which were related to some aspect of the coordination of the Intercomparison Exercise organised by the INTCFM “Analysis of DNA polymorphisms in bloodstains and other biological samples”. Corrective actions were established for only thirty-one of the NCs, with four remaining to be implemented.

The main sources of detection of deviations have been the staff of the Services themselves (37%) and the quality assessment activities of the tests (28%).

Likewise, actions are managed from the SGC, either at the proposal of the Service or by the SGC itself, to improve the management system and the laboratory’s activities (holding training seminars, drawing up new procedures, optimisation of methods, etc.). During 2019, 45 actions have been opened of which 13 will be developed throughout 2020.

16- Management of claims and complaints. The SGC is responsible for the initial management of communications (official communications, requests, etc.) in which it is suspected

that a complaint may implicitly exist or which, if the appropriate measures are not taken, may generate a complaint, as well as the management of user complaints in relation to any INTCFM activity. It is also responsible for the management to be carried out when a citizen submits or sends a complaint.

This year, 61 complaints were handled, of which 7 were requests for repeating some analysis or counter-analysis, 2 were complaints related to INTCFM activities and the rest were complaints about delays in the issuing of reports.

No complaints were received from citizens

8.1.2. Inter-comparison exercises in which INTCFM Services participated in 2019

Inter-comparison exercises in which INTCFM Services participated in 2019 are shown in In Table 8.1.3.

Table 8.1.3. Inter-comparison exercises in which INTCFM Services participated in 2019

Intercomparison exercises participation of the Biology Service
Program: analysis DNA polymorphism in blood stains and other biological samples Organiser: INTCF-GHEP-ISFG Periodicity: Annual Parameters: Forensic and kinship genetics, in blood, hair, and other preliminary studies
Program: GEDNAP Proficiency test Organiser: GEDNAP-ENFSI (German Speaking Working Group of the International Society for Forensic Genetics) Periodicity: Annual Parameters: Forensic and kinship genetics in blood stains and other biological fluids
Programa: Vitreous Fluid Postmortem Organizador: College of American Pathologists (CAP) Periodicidad: semestral Parámetros: glucemia en humor vítreo
Program: Vitreous Fluid Postmortem Organiser : College of American Pathologists (CAP) Periodicity: semester Parameters: glycemia in vitreous body
Program: Bacteriology Organiser: Sociedad Española de Enfermedades Infecciosas y Microbiología Clínica (SEIMC) Periodicity: mensual Parameters: cultivation, identification, and resistance to antibiotics

Intercomparison exercises participation of the Biology Service *(cont.)*
Program: Detection of Streptococcus pneumoniae and Legionella sp pyogenes antigens (BAS-B) Organiser: College of American Pathologists (CAP) Periodicity: Biannual Parameters: Streptococcus pneumoniae antigen detection (S-BAS) and Legionella sp. L-BAS in swabs.
Program: Amplification of nucleic acids of respiratory virus (ID-2) Organiser: College of American Pathologists (CAP) Periodicity: Biannual Parameters: Molecular analysis of the following viruses: Adenovirus, Coronavirus/Rhinovirus, Influenza, Parainfluenza, and Respiratory Syncytial in liquid samples.

Intercomparison exercises participation of the Criminalistic Service
Program: Adhesive Tape Analysis Organiser: Collaborative Testing Services (CTS) Periodicity: annual Parameters: adhesive analysis
Program: Questioned Documents Examination- Forensic Testing Program Organiser: Collaborative Testing Services (CTS) Periodicity: anual Parameters: Document analysis
Program: Fibers analysis Organiser: Collaborative Testing Services (CTS) Periodicity: annual Parameters: Fibers analysis
Program: Human vs Non Human Bone Origin Determination Organiser: Collaborative Testing Services (CTS) Periodicity: annual Parameters: Bone origin determination
Programa: Handwriting Examination-Forensic Testing Program Organizador: Collaborative Testing Services (CTS) Periodicidad: anual Parámetros: estudio de escritura y firmas en documentos
Programa: Paint analysis Organizador: Collaborative Testing Services (CTS) Periodicidad: anual
Program: GSR (Gun Shoot Residues) -Distance Determination Organiser: Collaborative Testing Services (CTS) Periodicity: annual Parameters: Shooting distance on clothing samples

Intercomparison exercises participation of the Criminalistic Service *(cont.)*
Program: ENFSI Proficiency test on identification of GSR (Gun Shoot Residues) by SEM/EDX Organiser: ENFSI Firearms/GSR by SEM Working Group Periodicity: annual Parameters: Analysis of gunshot residues in firing kits
Program: Collaborative Exercise Fiber analysis Organiser: ENFSI European Textile & Hair Working Group Periodicity: Annual Parameters: Fibers analysis
Program: Paint test Organiser: ENFSI European paint & glass Working Group Periodicity: annual Parameters: Paint test

Participation in intercomparison exercises from the Drugs Service
Program: Proficiency study AQA. Organiser: National Measurement Institute of Australian Government (NMI) Periodicity: Quarterly Parameters/samples: Heroin, cocaine, amphetamine compounds in powder-solid samples
Program: International Quality Assurance Programme (IQAP) Seized materials Group Organiser: United Nations Office on Drugs and Crime (UNODC) Periodicity: Biannual Parameters/samples: Drugs in powder-solid samples
Program: Interlaboratory Exercise on Habitual Illicit Drugs in Seize Material Organiser: INTCF-Barcelona Periodicity: Annual Parameters/samples: Drugs in powder-solid samples
Program: International Quality Assurance Programme (IQAP-UNODC) Biological Specimens Group. Organiser: United Nations Office on Drugs and Crime (UNODC). Periodicity: biannual. Parameters/samples: Identification and quantification of the most common drugs in urine
Program: Forensic Blood Toxicology Proficiency Testing (Quartz) Organiser: LGC Periodicity: quarterly Parameters/samples: drugs and psychotropic in blood
Program: Drugs in Hair Proficiency Test (DHF) Organiser: Arvecom Gesellschat für Toxikologishe und Forensisde Chemie (GTFCh) Periodicity: quarterly Parameters-samples: drugs and psychotropic in the hair

Participation in intercomparison exercises of the Toxicological and Environmental Assessment Service
Program: Non Specific Determinands. Aquacheck - Grupo 11. Organiser: LGC Standards Periodicity: Semester Parameters-samples: DBO, DQO, MBAS, COD/COT, suspended solids in aqueous matrix
Program: Aquacheck. Grupo 17 D Organiser: LGC Standard Periodicity: once a year Parameters-samples: total phenol, ammonia, total phosphorus, and total nitrogen in wastewater.
Program: Aquacheck. Grupo 17 C Organiser: LGC Standard Periodicity: once a year Parameters-samples: metals in wastewater
Program: Aquacheck. Grupo 12 C Organiser: LGC Standard Periodicity: twice a year Parameters-samples: chromium VI in effluent matrix
Program: Aquacheck. Grupo 12 Organiser: LGC Standard Periodicity: once a year Parameters-samples: metals in effluent matrix
Program: Quality in Water Analysis Scheme (QWAS) Organiser: LGC Standards Periodicity: Semester Parameters-samples: Total coliforms, fecal coliforms, and fecal streptococci in waters
Program: Effluent, waste water, Contaminated Land, and Hazardous waste Organiser: Laboratory Environmental Analysis Proficiency (LEAP) Periodicity: twice a year Parameters-samples: pH and conductivity in aqueous matrix
Program: Effluent, waste water, Contaminated Land, and Hazardous waste. Organiser: Laboratory Environmental Analysis Proficiency (LEAP) Periodicity: twice a year Parameters-samples: Settled solids in aqueous matrix
Program: Effluent, waste water, Contaminated Land, and Hazardous waste. Organiser: Laboratory Environmental Analysis Proficiency (LEAP) Periodicity: twice a year Parameters-samples: nitrate, nitrite, ammonium, chloride, orthophosphate, total phosphorus, total nitrogen in aqueous matrix.

Participation in intercomparison exercises of the Toxicological and Environmental Assessment Service *(cont.)*
Program: Effluent, waste water, Contaminated Land and Hazardous waste. Organiser: Laboratory Environmental Analysis Proficiency (LEAP) Periodicity: twice a year Parameters/samples: Bromide and fluoride in aqueous matrix.
Program: Effluent, waste water, Contaminated Land and Hazardous waste. Organiser: Laboratory Environmental Analysis Proficiency (LEAP) Periodicity: twice a year Parameters/samples: Calcium, magnesium, potassium, sodium, hardness, alkalinity in aqueous matrix
Program: Effluent, waste water, Contaminated Land, and Hazardous waste. Organiser: Laboratory Environmental Analysis Proficiency (LEAP) Periodicity: twice per year Parameters/samples: Oils and fats in aqueous matrix
Program: Wastewater: Toxicity (GSCAR4) Organiser: Quality Services Office (GSC) Periodicity: Annual Parameters/samples: Toxicity (Inhibitory Matter) in wastewater

8.1.3. Accreditation scope

The Madrid Departament has two accreditations, the Accreditation n.º 297/LE1367 and Accreditation n.º 297/LE1366 that brings together testing methods in the forensic and environmental areas respectively.

It is also responsible for the accreditation of the INTCF under ISO 17043, as Intercomparison Program provider Accreditation n.º 8/PPI016.

8.1.3. Case of interest: Intercomparison exercise of «Analysis of DNA polymorphisms in bloodstains and other biological samples»»

The Quality Assurance Service of the Madrid Department coordinates since 1992, a quality control, the intercomparison exercise of “Analysis of DNA polymorphisms in bloodstains and other biological samples”.

It should be noted that the kinship and forensic modules of the basic level of this exercise have been accredited under the criteria set out in the UNE-EN ISO 17043 standard since 2014.

The Intercomparison exercise for the study of DNA polymorphisms in blood stains and other biological samples consists of two levels, basic and advanced, and each of them consists of two modules, kinship and forensic.

The samples and theoretical exercises that make up the different modules are submitted annually. Prior to shipment, homogeneity and contamination control studies are carried out by means of studies of the nature of the fluid and genetic analysis on a set of samples representative of each of the samples to be sent. After evaluating the results, a report is issued and each participant receives an individual certificate for each module in which they have participated.

In 2019, the basic kinship module included two blood stains and saliva stain. The basic forensic module included a stain consisting on a mixture of semen and blood, as well as one hair sampleThe advanced level included a total of four forensic samples: three samples with different biological fluids of human origin, one of them being a mixture of two saliva samples and one sample with blood of animal origin.

The basic level also included a theoretical kinship exercise and a theoretical forensic exercise. The advanced level included a theoretical kinship challenge and a forensic challenge of greater complexity than the basic level.

The following is the general data on the participation of laboratories during 2019.

Figure 8.1.3.1. Distribution of participation in modules and levels. Although 139 laboratories initially registered in the basic level kinship module, 137 laboratories submitted results

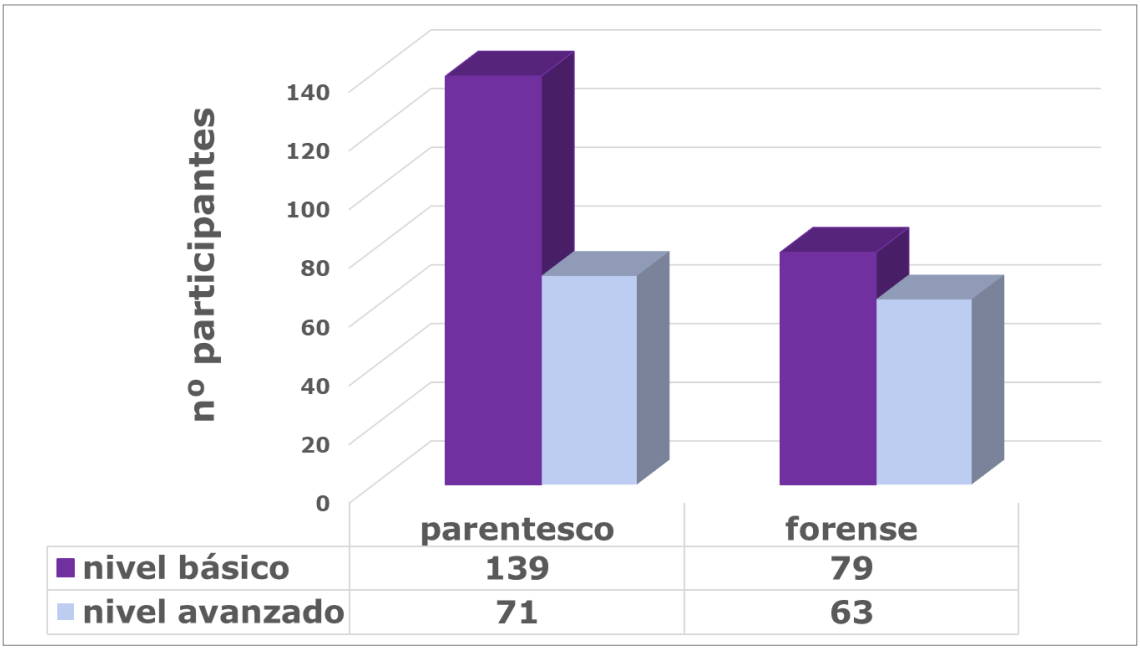


Figure 8.1.3.2. Geographical distribution of participants. Newly incorporated laboratories are shown in red and orange

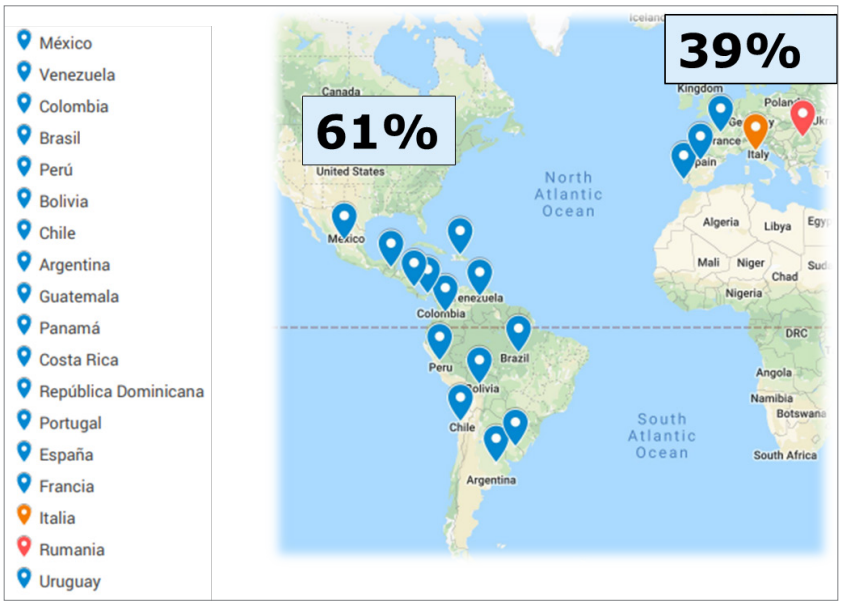
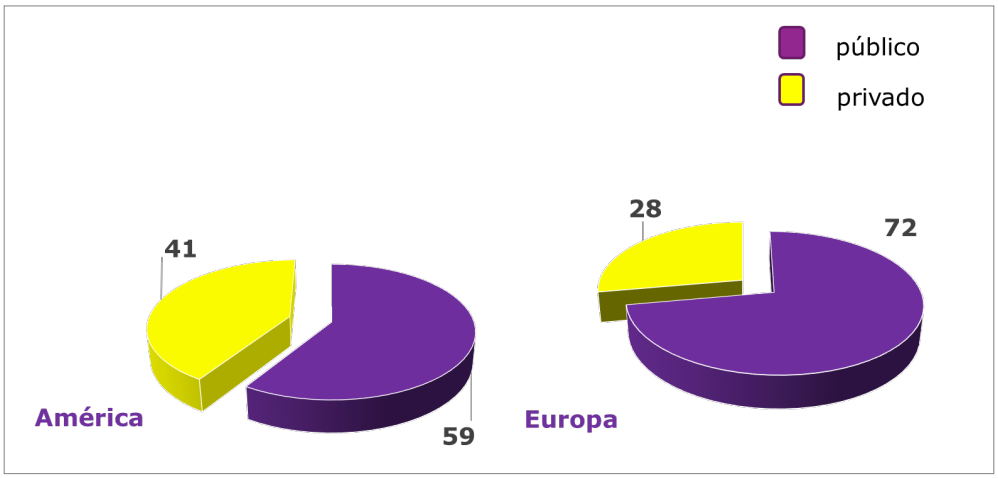


Figure 8.1.3.3. Type of laboratories (%). Public laboratories are mainly linked to Justice/Judiciary and Law Enforcement, to a lesser extent they belong to Hospitals and Research Centers



8.1.4. Scientific and teaching activity

8.1.4.1. Participation in research projects and Collaboration with other institutions

The Quality Assurance Service of the Madrid Department, on behalf of the INTCF, participates as an Expert in one of the ISO/TC 272 Working Groups, specifically in WG5: part 5-Reporting.

8.1.4.2. Contribution to scientific congresses

Fernández Oliva C. García-Hirschfeld J, Luque MG, Carmona A. Five-year evaluation of forensic body fluid identification and DNA mixture analysis from the accredited GHEP-ISFG Proficiency Test. Póster. 28th Congress of the International Society for Forensic Genetics (ISFG). Praga (República Checa). Septiembre 2019.

Fernández Oliva K. Resultados del Ejercicio de Intercomparación «Estudio de polimorfismos de ADN en manchas de sangre y otras muestras biológicas». Presentación. XXIV Reunión de Genética Forense organizado por el Grupo de Habla Española y Portuguesa de la ISFG (GHEP-ISFG). Praga (República Checa). 9-10 de septiembre de 2019.

8.1.4.3. Scientific publications

Fernández Oliva C, García-Hirschfeld J, Luque MG, Carmona A. Five-year evaluation of forensic body fluid identification and DNA mixture analysis from the accredited GHEP-ISFG Proficiency Test. *Forensic Sci. Int. Gene. Suppl.* (2019), 7(1): 375-376. http://dx.doi.org/10.1016/j.fsigss.2019.10.018

Fernández C. La calidad en los laboratorios de genética forense. La implantación de la Norma ISO/IEC 17025:2017, en Crespillo M y Barrio PA editores. Genética forense. Del laboratorio a los tribunales. 1.ª ed. Madrid. Díaz de Santos. 2019.

8.1.4.4. Teaching and training activities

Fernández Oliva K. La calidad en los laboratorios forenses del INTCF: gestión, sistema y control de la calidad. Organizado por la Universidad Nacional de Educación a Distancia. INTCFM MADRID. Febrero 2019.

Fernández Oliva K. Participación, diseño y organización de programas de ensayos de aptitud. Implantación en el INTCF de la Norma UNE-EN ISO/IEC 17043. Particularidades respecto a la norma de calidad UNE EN ISO/IEC 17025. Organizado por el Centro de Estudios Jurídicos (CEJ.) INTCFM INTCFM MADRID. Septiembre 2019.

Fernández Oliva K. Validación de métodos. Investigación y desarrollo de nuevos métodos. Biología. 6.ª Promoción de facultativos. Organizado por el Centro de Estudios Jurídicos (CEJ). INTCFM. Septiembre 2019.

8.2. Quality Assurance Service of Barcelona Department

The Quality Assurance Service of Barcelona Department as well as the other Quality Assurances Services of the INTCF develops functions mainly aimed at the implementation, following, and improvement of the Quality System established under UNE-EN-ISO/IEC 17025 standard, a quality standard based on the international standard ISO/IEC 17025, which recognizes the technical competence and validity of the tests included in the scope of accreditation of laboratories worldwide.

Compliance by Barcelona Department´s laboratories of the with the requirements of the UNE-EN-ISO/IEC 17025 standard allows the accreditation of the tests included in its scope of accreditation, thus obtaining formal recognition, on an international scale, of the competence and technical capacity of these analyses or studies.

For this reason The INTCFB Quality Assurance Service, works to maintain the accreditation of the tests included in the Department scopes (one of the first national scope accredited with tests performed by forensic laboratories), and to prepare and coordinate the Center¨s accreditation process for new tests which, according to the decision of the Department´s Management, should be included in the scopes.

In 2019, the fourth reevaluation audit of the the Department accreditation files LE/639 and LE640 has been successfully passed. The first audit was carried out in accordance with the transition plan to the new version of UNE-EN ISO/IEC 17025:2017 standard. This new version of the standard introduces new requirements to be met by the

organization. Requirements on which the Quality Assurance Service has continued to work during this 2019 to achieve its full implementation on the planned dates.

Since the accreditation of an increasing number of forensic tests is always a goal to achieve for INTCFB laboratories. The Quality Assurance Service of this Department not only watches over the quality system already in place and its adaptation to the new needs and requirements of the moment but also invests work and effort in:

- disseminate and promote the quality standards, guidelines, and actual quality procedures among all the organisation staff (aware that quality is not the exclusive objective of a specific area or Service, but involves involves the entire Department)
- working closely with staff personnel in all services in the implementation of quality requirements, becoming a key pillar of advice and support
- to promote teamwork, a crucial prerequisite For the continuous improvement and optimization of processes necessary to achieve new quality objectives

In compliance with the functions attributes to the INTCF by the Regulations as a reference centre in matters pertaining to is activity, in relation to the Institutes of Forensic Medicine as well as with other national and foreign organizations. The SGC has once again coordinated and organised «Interlaboratory exercise of illicit drugs in seized material (DAHA)». A unique test in Spain, of great utility for the self-assessment of a large number of national public laboratories which analyse toxic drugs, narcotics or psychotropic substances from illicit trafficking (see section **8.2.4. Case of interest: Interlaboratory exercise of «Drugs of abuse in Contraband»**)

8.2.1. Activities carried out by the Quality Assurance Service

The activities carried out by the Quality Assurance Service for the implementation, monitoring and improvement of the quality system in the Barcelona Department during 2019 has consisted in the following actions:

- Elaboration and/or revision of the standard operating procedures (SOPs) from the Quality Manual, those specific to the Quality Assurance Service (e.g. coordination procedure for the EIAS exercise (alcohol in blood), coordination procedures for the interlaboratory DAHA exercise (drugs in seized material, general procedures (applicable to all Services), and calibration procedures (calibration of balances, pipettes, etc). (activity 1. and 2. of table 8.2.1).
- Direct collaboration in the drafting of most of the technical procedures prepared by the Services. (activity 1. and 2. from table 8.2.1).
- Review, distribution, and storage of all the Standard Operating Procedures (SOPs) and their related annexes (related with 1. and 2. table 8.2.1).

- Review of the specific training and teaching programs and their internal registers spending time on advising the staff who must prepare them and on the adequacy to the pre-established requirements of the documents already elaborated. (activity 3. from table 8.2.1).
- Quality training for new staff and trainees. (activity 4. table 8.2.1).
- Management and storage of training records, records of authorized signatures, the rest of the documentation related to the education/training, andqualification of the laboratory staff (related to the activity 3. and 4. from table 8.2.1)
- Management of the documentation generated by the external/internal training activities given at the Barcelona Department (preparation of lists of attendees, preparation, and evaluation of questionnaires for assessing the training activities, etc.).
- Elaboration in collaboration with the staff responsible for the equipment ofthe Annual Equipment Calibration, Verification, and Maintenance Plan (related to the activity 5. from table 8.2.1.).
- Evaluation of the internal calibrations of automatic pipettes (activity 5 of table 8.2.1).
- Evaluation of external calibrations of physical standards and some equipment that can't be calibrated internally (activity 5. from table 8.2.1).
- Direct collaboration with the different Department Services in the validation of analysis methods designing studies to be carried out and collaborating in the data processing and recording (activity 6. from table 8.2.1).
- Updating and Control of the Quality Assessment Activity Plan including internal and external control activities (interlaboratory exercises) (related with the activity 7. from table 8.2.1).
- Conformity assesment of organizers of Intercomparison exercises in which the Department participates for the first time (related to activity 7. from table 8.2.1).
- Evaluation of the participation in intercomparison exercises of the different Services of the Barcelona Department (activity 7. from table 8.2.1).
- Elaboration of the Internal Audit Program (related with activity 8. from table 8.2.1.).
- Acting as auditors in horizontal internal audits of technical activities (schedule established in the Internal Audit Program or needs arising at specific times). (activity 11 from table 8.2.1) (activity 8. from table 8.2.1).
- Elaboration of the minutes of the management review meeting of the quality system Management(activity 9. from table 8.2.1).

- Documentation, control, and follow up of incidents, non-conformities, preventive and improvement actions (activity 10., 11., 12. and 13. from table 8.2.1).
- Study and follow-up of technical user complaints and citizen claims received at the Department (activity 14. of table 8.2.1).
- Participation in surveys related to the Department Quality Management.
- Elaboration of the Evaluation Survey regarding INTCFB Services, sending of messages, management of responses and preparation of the final evaluation reports solicited (ON-LINE survey)
- Preparation of internal reports requested by the Department Management.
- Preparation of reports for the management, information, or assessment of issues related to the SGC.
- Monitoring and maintenance of the Barcelona Department accreditation for the accredited techniques (consult section 8.2.3.)
- Acting as interlocutors and quality managers in the technical audits and responsible for the files of the National Accreditation Body (consult section 8.2.3.)

Table 8.2.1. Activity data corresponding to 2019

1. Development of new standard operating procedures (SOPs) and modification of version of procedures and sheets	22
2. New annexes elaboration and modification of versions of annexes	33
3. Training programs and staff qualification certificates	58
4. Initial and ongoing training of personnel in the Quality System	13
5. Management and evaluation of external and internal calibrations of equipment and physical standards	234
6. Validation studies of analysis methods	11
7. Assesment of participation in intercomparison exercises	42
8. 8. Internal audits	8
9. Management review of the quality system	1
10. Records of nonconformities or non conformity works	21
11. Recording and monitoring of incidences	110
12. Records of corrective actions	12
13. Records of Preventive or improvement action	1
14. Claims and complaints management	15

The SGC staff has also carried out additional activities related to the management for the acquisition of external controls and necessary standards Necessary for testing

- Request for budgets for the Interlaboratory exercises in which the Department participates.
- Request of interlaboratory exercises through the purchasing application, follow-up of the approval of orders, and resolution of incidents.
- Elaboration of the necessary documentation (Customs clearance …) for the external control delivery of external controls and standards in the Department when required.
- Application for management, and filling of Import authorizations for narcotic and psychotropic substances required as external quality controls (interlaboratory exercises) or reference materials for the Chemistry and Drugs Service.

8.2.2. Intercomparison exercises in which the Services participated in 2019

Participation in intercomparison exercises of the Biology Service
Program: Analysis of DNA polymorphisms in bloodstains and other biological samples Organiser: INTCF-GHEP-ISFG Periodicity: Annual Parameters: Forensic and parentage genetics and preliminary studies on blood, hairs, and other matrices
Program: GEDNAP Proficiency test Organiser: GEDNAP-ENFSI (German Speaking Working Group of the International Society for Forensic Genetics) Periodicity: Annual Parameters: Forensic and kinship genetics in bloodstains and other biological fluids

Participation in intercomparison exercises of the Chemical and Drug Services
Program: Proficiency study AQA. Organiser: National Measurement Institute of Australian Government (NMI) Periodicity: quarterly Parameters: Heroine, cocaine, amphetamine compounds in powdered-solid samples
Program: ENFSI Proficiency test Organizador: ENFSI Drugs Working group Periodicity: Annual Parameters: Heroin, cocaine, others in powder-solid samples
Program: International Quality Assurance Programme (IQAP) Seized materials Group Organiser: United Nations Office on Drugs and Crime (UNODC) Periodicity: Biannual Parameters: Drugs of abuse in powder-solid samples

Participation in intercomparison exercises of the Chemical and Drug Services *(cont.)*
Program: Interlaboratory Exercise on Drugs of Abuse Commonly in Contrabands Organiser: INTCF-Barcelona Periodicity: Annual Parameters: Drugs of abuse in powder-solid samples
Program: Blood Ethyl Alcohol Intercomparison Exercise Organiser: INTCF-Barcelona Periodicity: quarterly Parameters: Ethyl alcohol and other volatile compounds in blood and plasma
Program: Whole blood Alcohol/Volatiles Survey (AL1) Organiser: College of American Pathologists Periodicity: quarterly Parameters: Blood ethyl alcohol, volatiles and ethylene glycol
Program: Blood Oximetry Survey (SO) Organiser: College of American Pathologists Periodicity: quarterly Parameters: Carboxyhemoglobin in blood
Program: Forensic Toxicology Criminalistics (FTC) Organiser: College of American Pathologists Periodicity: Semestral Parameters: Drugs in blood and urine
Program: International Quality Assurance Programme (IQAP) Biological Specimens Group. Organiser: United Nations Office on Drugs and Crime (UNODC). Periodicity: Biannual. Parameters: Identification and quantification of the most common drugs of abuse in urine
Program: Drug Facilitated Crime (DFC) Organiser: College of American Pathologists Periodicity: Semestral Parameters: Crime-facilitating drugs and psychotropic drugs in blood and urine
Program: Toxicology (T) Organiser: College of American Pathologists Periodicity: quarterly Parameters: Drugs and psychotropic drugs in serum and urine
Program: Drugs in Hair Proficiency Test (DHF) Organiser: Arvecom Gesellschat für Toxikologishe und Forensisde Chemie (GTFCh) Periodicity: Annual Parameters: Drugs of abuse and psychotropic drugs in hair

Participation in intercomparison exercises of the Chemical and Drug Services *(cont.)*
Program: Ignitable liquid identification Organiser: Collaborative Testing Services (CTS) Periodicity: Annual Parameters: Combustion-accelerating substances in different substrates

Participation in intercomparison exercises of the Toxicological and Environmental Assessment Service
Program: Ecotoxicology. Aquacheck – Grupo 50 Organiser: LGC Standards Periodicity: twice a year Parameters: Toxicity with *Daphnia magna* in effluents
Program: Non Specific Determinands. Aquacheck - Grupo 11. Organiser: LGC Standards Periodicity: twice a year Parameters: DBO, DQO, MBAS, COD/COT, suspended solids in aqueous matrix
Program: High and Low COD – Grupo 29 Organiser: LGC Standards Periodicity: Annual Parameters: DQO in aqueous matrix
Program: Effluent, waste water, Contaminated Land and Hazardous waste – Grupo 3 Organiser: Laboratory Environmental Analysis Proficiency (LEAP) Periodicity: twice a year Parameters: Nitrate/Nitrite, Ammonium, Chloride Sulfate, PO4, Total Phosphorus, Total Nitrogen/ Kjeldahl in aqueous matrix
Program: Wastewater: Toxicity (GSCAR4) Organiser: Quality Services Office (GSC) Periodicity: Annual Parameters: Toxicity (Inhibitory Matter) in wastewater
Program: Aquacheck. Grupo 12 Organiser: LGC Standard Periodicity: twice a year Parameters: Metals in effluent matrix
Program: Quality in Water Analysis Scheme (QWAS) Organiser: LGC Standards Periodicity: Semestral Parameters: Total coliforms, fecal coliforms, and fecal streptococci in waters

Participation in intercomparison exercises of the Toxicological and Environmental Assessment Service *(cont.)*
Program: Aquacheck grupo 17 D
Organiser: LGC Standards
Periodicity: Annual
Parameters: Total Phosphorus, Soluble Phosphorus (PO4), Total Nitrogen, Ammonium in Wastewater

Participation in intercomparison exercises of the Histopathology Department
Program: Forensic Pathology (FR)
Organiser: College of American Pathologists (CAP)
Samples: Histories and images of the scene, external examinations and macroscopic and microscopic images of 6 real cases.
Periodicity: Semestral
Parameters: Final diagnosis

8.2.3. Accreditation scopes

The SGC of each Department acts as the main interlocutor with the National Accreditation Body (ENAC) in all matters related to the accreditation process and to the scope.

The Barcelona Department has two accreditation files opened in accordance with the requirements of UNE-EN ISO/IEC 17025 standards, Accreditation n.º 297/LE640 file, and Accreditation n.º 297/ LE639, which bring together several test methods in the forensic area and in the environmental area respectively.

8.2.4. Case study: Interlaboratory exercise on «Common Drugs in Seize Material»

in 2019 the SGC of the Barcelona Department of has coordinated the Interlaboratory Exercise on Drugs which basically consists of sending several samples of drugs of different nature and/or concentration for its identification and quantification by tthe participating laboratories

The main objectives of this exercise are:

- To provide participating laboratories with a useful a tool for their self-assessment by comparing the results obtained among participating laboratories of the obtained results.
- To Convert the samples left over from the Exercise into reference material by assigning them, at the end of the Exercise, a property value and an associated uncertainty.

Table 8.2.4. Laboratories participating in the Interlaboratory Exercise on Drugs of Abuse. Types and geographical distribution

Participants	
N.º of participant laboratories	25

Type of laboratories	
Public laboratories	25
Public Health	14
Security forces and corps (FFCCS)	5
National Institute of Toxicology and Forensic Sciences	4
Customs	2
Forensic Medicine / Forensic Anatomic Institutes	0
Hospitals	0
Universities	0
Private laboratories	0

Geographical distribution of the participant laboratories																
Andalucía	Madrid	Cataluña	C. Valenciana	Navarra	País Vasco	Aragón	Islas Baleares	Canarias	Castilla–La Mancha	Castilla y León	Galicia	Cantabria	Extremadura	La Rioja	Murcia	Asturias
5	5	3	2	2	2	1	1	1	1	1	1	0	0	0	0	0

8.2.5 Scientific and teaching activity

8.2.5.1. Participation in investigation projects and Collaboration with other

Izquierdo Vigil, R. 11.ª Reunión del Grupo de Trabajo de Gestión de la Calidad de la Red de Laboratorios Forenses Oficiales de España (RLFOE). Madrid. España. Celebrada el 22 de marzo de 2019.

8.2.5.2. Teaching and training activities

Izquierdo Vigil, R. Organización y dirección de la actividad formativa «Calidad aplicada al laboratorio Estándares», programada dentro del Plan de Formación Continuada para 2019 del Centro de Estudios Jurídicos. Ministerio de Justicia. Celebrada en Madrid, 19 y 20 de septiembre de 2019.

Enreig Cabanes, E. Profesor del curso multidisciplinar Agresiones Sexuales, Papel de los Trabajadores del INTCF: Recepción de muestras en el laboratorio. Precauciones en el

manejo. Instituto Nacional de Toxicología y Ciencias Forenses. La calidad en los laboratorios de Genética Forense. Subdirección General de Medios Personales al servicio de la Admón. de Justicia del Ministerio de Justicia, dentro del Plan de Formación para personal funcionario. Celebrado en el Departamento de Barcelona del INTCF, Barcelona. España. 10 de octubre de 2019.

Izquierdo Vigil, R. Ponencia «Garantía de calidad en los laboratorios forenses. Actuación del Instituto Nacional de Toxicología y Ciencias Forenses como centro de referencia», en el marco de la asignatura Genética Forense del Máster en Genética, Física y Química Forense. 2 horas lectivas. Organizado por la Facultad de Química de Tarragona de la Universidad Rovira i Virgili. Tarragona.

Facultativos de los Servicios de Química, Garantía de Calidad y Valoración Toxicológica y Medio Ambiente. «Calidad aplicada al laboratorio. Estándares». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. Madrid. España. Celebrado del 19 al 20 de septiembre de 2019.

Facultativos de los Servicios de Química, Garantía de Calidad y Valoración Toxicológica y Medio Ambiente. «Cromatografía de líquidos acoplada a técnicas de alta resolución». Organizado por el Centro de Estudios Jurídicos. Ministerio de Justicia. Barcelona. España. 22 de octubre de 2019.

8.3. Quality Assurance Service of the Department of Seville

The activities developed by the SGC for the implementation, monitoring, and improvement of the quality system in the Seville Department during 2019 are shown in table 8.3.1.

Table 8.3.1. Activities carried out for the implementation, monitoring and improvement of the Quality System in the Seville Department

Development of new standard operating procedures (SOPs) and modification of version of procedures	16
New annexes elaboration and modification of version of annexes	6
Evaluation of external calibrations of physical standards	12
Evaluation of external equipment calibrations	51
External checks evaluation and equipment management	6
Evaluation of internal equipment calibrations	129
Evaluation of internal equipment checks	94
Analysis methods validation reports*	2
Records of Nonconformities or non-conforming works*	11

Records of Improvement actions	11
Records of Improvement actions	2
Management of complaints	2
Actions to address risks	1
Management review of the quality system*	1
Conformity assessment of intercomparison exercise organizers where the Department participates	16
Intercomparison exercises participation*	27

In more detail activities in 2019 consisted of:

- As a consequence of the entry into force of the new version of the Standard 17025:2017, 3 new general procedures with 4 annexes and 19 data collection sheets have been brought into force . A total of 13 procedures, 2 annexes, and 20 data collection sheets have been updated.
- Management and control of the document inventories, personnel, equipment (calibration, verification, and maintenance), and reference materials. Elaboration in collaboration with the personnel responsible of the Annual Equipment Calibration, Verification, and Maintenance Plan.
- Management and control of nonconformities, corrective actions with the necessary investigation reports (extension analysis) (3), and the opening of two improvement actions and actions to address risks.
- Updating and monitoring of the Quality Assessment Activity Plan including activities of external and internal controls (intercomparison exercises).
- Participation evaluation in the intercomparison exercises of the Services of the Seville Department (27 reports).
- Collaboration with the Biology Service in validating analytical methods.
- Elaboration of the Internal Audit Program.
- Elaboration of the Internal Audit Report.
- Elaboration of the minutes from the Quality System Review t by the Management.
- Management together with the Services, of documentation from the training activitiesand ,from the Center staff qualifications. Control and storage of records from training from authorized signatures, and other documentation related to the training and qualification of staff Training the new personnel and ongoing education for the staff.

- Elaboration of budget request reports of the external calibrations of volumetric material, reference masses, balances, and thermometers and management of shipments of equipment and physical standards (reference masses and probes...) for their calibration.
- Elaboration of the budgets request reports f of the intercomparison exercises in which the Department participates and preparation of the necessary documentation for submission to the Department.
- Evaluation and issuing of reports on participation in the intercomparison exercises of the different Services of the Seville Department.
- Application and management of the Import Authorizations for narcotic and psychotropic substances required as external quality controls (interlaboratory exercises) or reference materials of the Chemistry Service.
- Maintenance of the annual list of suppliers and Issuance of initial and ongoing evaluation reports on them
- Evaluation of internal calibrations of automatic pipettes (94), evaluation of external calibrations of automatic pipettes (4), thermometers (5), balances (11), and physical standards (8 standard weights), verification and maintenance of equipment (15).
- Study and follow-up of communications and complaints from the users (2).
- Participation in the annual surveys ISAM 2019.
- Request and management of the Intercomparison Exercises in which the Services participate for the evaluation of the quality of their analysis.
- Management and evaluation of customer satisfaction survey of the Seville Department.

8.3.1. Intercomparison exercises in which the Seville Department has participated in 2019

Participation in intercomparison exercises of the Biology Service
Program: Study of DNA polymorphisms in blood stains and other biological samples. Basic and advanced levels. Organiser: INTCF-GHEP-ISFG. Samples: blood, hairs, and others Periodicity: annual Parameters: Preliminary biological fluids, identification by DNA techniques
Program: GEDNAP Proficiency test. Organiser: GEDNAP-ENFSI (German Speaking Working Group of the International Society for Forensic Genetics). Samples: blood and other biological fluids Periodicity: annual. Parameters: Preliminary biological fluids, identification by DNA techniques

Participation in intercomparison exercises of the chemistry department
Program: Intercomparison exercise of ethyl alcohol in blood. Organiser: INTCF-Barcelona Samples: blood, plasma Periodicity: quarterly Parameters: ethyl alcohol and other volatile compounds
Program: Proficiency study AQA Organiser: National Measurement Institute of Australian Government (NMI) Samples: 3 powdery-solid samples (contraband) Periodicity: annual Parameters: Quantitative analysis of cocaine present and qualitative analysis of adulterants and diluents
Program: International Quality Assurance Programme (IQAP-UNODC) Biological Specimens Group. Organiser: United Nations Office on Drugs and Crime (UNODC). Samples: 4 urine samples. Periodicity: biannual. Parameters: Identification and quantification of the most common drugs of abuse
Program: International Quality Assurance Programme (IQAP-UNODC) Biological Specimens Group. Organiser: United Nations Office on Drugs and Crime (UNODC). Samples: 4 urine samples. Periodicity: biannual. Parameters: Identification and quantification of the most common drugs
Program: Interlaboratory Exercise on Drugs of Abuse Habitually in Contrabands. Organiser: INTCF-Barcelona. Samples: powdery-solid Periodicity: annual. Parameters: Qualitative and quantitative analysis of drugs of abuse and qualitative analysis of adulterants and diluents
Program: Forensic Blood Toxicology PT-Quartz Scheme. Organiser: LGC Standards. Samples: blood (3 samples by shipment). Periodicidad: bianual. Parameters: Identification and quantification of substances of toxicological interest
Program: Interlaboratory Control of Ethylglucuronide Determination in Hairs Organiser: Society of Hair Testing (SOHT) Samples: hair (three samples by shipment) Periodicity: biannual. Parameters: Identification and quantification of ethylglucuronide.
Program: Programa Toxicology Organiser: LGC Standards. Samples: blood Periodicity: biannual Parameters: Identification and quantification of carboxyhemoglobin

Participation in intercomparison exercises of the chemistry department *(cont.)*
Program: Programa Toxicology Organiser: LGC Standards. Samples: blood Periodicity: biannual. Parameters: Identification and quantification of ethanol in the blood.

Participation in intercomparison exercises of the Toxicological and Environmental Assessment Service
Program: Water microbiology (QWAS) Report Organiser: LGC Samples: Surface water/bath/disposal (supplied as lyophilized vial) Periodicidad: once a year Parameters: Determination of the presence of total coliforms, fecal coliforms Eschericia coli, enterococci, and fecal streptococci.
Program: IELAB Physicochemical parameters. Organiser: IELAB Samples: wastewater Periodicity: twice a year Parameters: aluminum, ammonium, chromium, BOD5, COD, suspended solids, BOD5, fluorides, nitrates, and toxicity (EC50)-Microtox
Program: IELAB Microbiology. Organiser: IELAB Samples: wastewater Periodicity: twice a year Samples: total coliforms, fecal coliforms, Escherichia coli, enterococci, Clostridium perfringens.
Program: Environmental sector exercises: Wastewater Organiser: Quality Services Office Samples: wastewater Periodicity: once a year Parameters: DQO, anionic detergents, BOD5, suspended solids, pH, and conductivity.
Program: Environmental sector exercises: Wastewaters Organiser: Quality Services Office Samples: wastewater Periodicity: once a year Parameters: toxicity

8.3.2. Accreditation Scopes

The SGC acts as the main interlocutor and is responsible for the quality of the Seville Department faced the National Accreditation Body (ENAC).

The Seville Department has two accreditation files opened, Accreditation n.º 297/LE1833 file corresponding to toxicological and forensic testing (Chemistry and Biology Technical Units) and Accreditation n.º: 297/LE2239 file correspondent to the environmental testing (Toxicological and Environmental Assessment Technical Unit).

8.3.3. Interesting forensic case: Intercomparison exercise of Ethyl Alcohol in Blood

In 2019, the Seville Department has organised the intercomparison exercise of ethyl alcohol in blood. which consists of three rounds of analyses with three blood or plasma samples each, where participants identify and quantify the ethyl alcohol in each of the samples.

Table 8.3.3. Participants in the Ethyl Alcohol in Blood Intercomparison Exercise. Geographical distribution and types of laboratories

N.º laboratories participants	58
España	51
Francia	1
Portugal	4
Macedonia	2
Andalucía	9
Aragón	2
Asturias	4
Baleares	2
Canary Islands	2
Castilla-La Mancha	4
Cataluña	13
Comunidad Valenciana	2
Galicia	2
Madrid	5

Murcia	1
Navarra	1
Basque Country	4

National Institute of Toxicology and Forensic Sciences	4
Institutes of Forensic Medicine/Forensic Anatomists	15
Public Health	6
Hospitals	20
University	4
Security forces	3

Figure 8.3.3. Photograph of samples submitted in the Intercomparison exercise of ethyl alcohol in blood

8.3.4. Scientific and Teaching activities

8.3.4.1. Participation in investigation projects and collaboration with other institutions

The SGC of this Department, together with those other Departments participates and collaborates actively within the quality group of the Network of Official State Forensic Laboratories (RLFOE) with attendance at the annual meeting.

The staff of the Quality Assurance Service of this Department has held meetings to agree on the proposal to update INTCF Quality Manual and its adaptation to the requirements of the new version of the UNE-EN ISO/IES 17025: *General requirements for the competence of testing and calibration laboratories.*

On behalf of the INTCF, the SGC participated in the Quality and Competence Liason Group (QCLG) Annual Meeting. That group is constituted by the laboratory representatives from ENFSI members laboratories. It is established to seek the development of quality assessment and competence assurance policies to advice ENFSI Member Expert Groups onquality and to assist ENFSI laboratories in complying with international good practices and standards.

On behalf of the INTCF, the Department's Quality Assurance staff is a member of the CTN197-GT3 working group. Forensic science processes, in the Spanish Standardization Organization (UNE). Among other activities, this group reviews and revisions and provides comments on the documents of the ISO 21043 Forensic sciences, which are being developed by the different ISO/TC 272 working groups. The objective is the development of new international standards that harmonize each of the stages that forensic investigations comprise. The purpose is to facilitate the acceptance and exchange of information obtained from them. Although they are international, in the future, they will be accepted at the national level.

On behalf of the INTCF, the staff of the Department is a member of the CTN197-GT1 group of UNE, which has been reviewing UNE 197001 Standard: General criteria for the preparation of expert reports, published in August 2019.

The SGC staff has collaborated with the INTCF National Management, as requested in order to prepare the Action and Research Plan 2020-2022.

The Service has participated as experts in the European project "Cooperation in the criminal investigation in Central America to combat crime and drug trafficking at the international level «ICRIME- LA/2017/39066», in two on-site missions at the laboratories of the Dirección Policial de Investigaciones, the Laboratory in Tegucigalpa (Honduras), and at the Legal Medicine Roberto Masferreren laboratory in El Salvador.

8.3.4.2. Contribution in scientific congresses

Soria Sánchez ML. Ponente en la Mesa Redonda «Mortalidad relacionada con drogas» con la ponencia: Mortalidad por nuevas drogas psicoactivas. XXII Jornadas de la ANMF y II Jornadas de la EML de la UAM. Madrid. 8 marzo de 2019.

Soria Sánchez ML. El informe pericial químico-toxicológico. Facultad de Criminología. Universidad de Sevilla. 27 de marzo de 2019.

Soria Sánchez ML. Marco Judicial de las Drogas de Abuso. Facultad de Criminología. Universidad de Sevilla. 28 de marzo de 2019.

Soria Sánchez ML. Sumisión Química. Facultad de Criminología. Universidad de Sevilla. 25 de abril de 2019.

Soria Sánchez ML. Casos prácticos. Facultad de Criminología. Universidad de Sevilla. 16 de mayo de 2019.

Soria Sánchez ML. Ponente en la mesa redonda «Sumisión química y Nuevas sustancias Psicoactivas», con la ponencia «Aspectos toxicológicos y forenses de la sumisión química». XXIII Congreso Español de Toxicología y VII Iberoamericano. Sevilla 26-28 de junio de 2019.

Soria Sánchez ML. Ponente en el curso «Comités Técnicos y Grupos de Trabajo en Ciencias Forenses: creación, actividad y trabajos actualmente desarrollados», con la ponencia: Participación del INTCF en los Comités Técnicos de Normalización y grupos de trabajo de ENFSI. CEJ. 20 de septiembre de 2019.

Efectos en células tumorales de mama por la exposición a nanopartículas de ácido tánico. Maisanaba S, Corona-Corrales S, Álvarez-Herrera C, Del Peso A, García Repetto R, Aguilera R, Pinaglia G, Zaderenko P, Repetto G. XXIII Congreso Español de Toxicología y VII Iberoamericano. Sevilla. 26 a 28 de junio de 2019. *Revista de Toxicología* 36: 66.

Nuevas perspectivas en la enseñanza de la toxicología en el grado de criminología mediante el uso de vídeos. Rojas R, Álvarez Herrera C, García-Repetto R, Maisanaba S, Repetto G. XXIII Congreso Español de Toxicología y VII Iberoamericano. Sevilla. 26 a 28 de junio de 2019. *Revista de Toxicología* 36: 52.

8.3.4.3. Education and teaching activities

Soria Sánchez ML. Curso selectivo para la 6.ª promoción del Cuerpo Especial de Facultativos del INTCF, con 6 clases: El Servicio de Garantía de Calidad, El manual de calidad y documentos de calidad, Requisitos de recursos según la ISO/IEC 17025. Septiembre 2019.

Soria Sánchez ML. Tutora de las prácticas de calidad para química y drogas en el Curso selectivo para la 6.ª promoción del Cuerpo Especial de Facultativos del INTCF.

Garcia Repetto R. Profesor asociado en la Universidad Pablo de Olavide de Sevilla en el Grado de Criminología y Doble Grado de Derecho y Criminología en los cursos.

Garcia Repetto R. Profesora del Master Criminología y Ciencias Forenses. Universidad Pablo de Olavide de Sevilla.

Soria Sanchez ML. XXIII Congreso Español de Toxicología y VII Iberoamericano. Sevilla. 26-28 de junio de 2019.

Garcia Repetto R. Asistencia a las V Jornadas de estimación del abuso de drogas y análisis de aguas residuales con fines epidemiológicos. Red Española de Análisis de Aguas Residuales con Fines Epidemiológicos. Sevilla. 4 de diciembre de 2019.

Soria Sánchez ML. Challenging Forensic Science: How Science Should Speak to Court. Online course by University of Laussanne. 5 semanas 2-3 horas por semana. Julio 2019.

Soria Sánchez ML. The Science behind Forensic Science. On line course by King's College London. 4 semanas. 2 horas por semana. Septiembre 2019.

Garcia Repetto R: Requisitos de la norma UNE-EN ISO/IEC 17025:2017. Entidad Nacional de Acreditación (ENAC). Sevilla. 6-7 de marzo de 2019, con una duración de 14 horas lectivas.

Torres Aragón Y. Requisitos de la norma UNE-EN ISO/IEC 17025:2017. Entidad Nacional de Acreditación (ENAC). Sevilla. 6-7 de marzo de 2019, con una duración de 14 horas lectivas.

Garcia Repetto R. Estadística Aplicada con SPSS. Nivel II. Universidad Pablo de Olavide de Sevilla. 21-29 de mayo de 2019.

Soria Sánchez ML: Cromatografía de líquidos acoplada a técnicas de alta resolución (3.ª ed.), programada dentro del Plan de Formación Continuada para 2019 y realizada en Sevilla del 05/11/2019 al 05/11/2019, con una duración de 6 horas lectivas.

Garcia Repetto R. Curso de formación continuada organizado por el Centro de Estudios Jurídicos dentro del Plan de Formación Continuada para 2019 «Calidad aplicada al laboratorio. Estándares» celebrado en Madrid, 19 y 20 de septiembre de 2019. Duración de 10 horas lectivas.

Torres Aragón Y. Curso de formación continuada organizado por el Centro de Estudios Jurídicos dentro del Plan de Formación Continuada para 2019 «Calidad aplicada al laboratorio. Estándares», celebrado en Madrid 19 y 20 de septiembre de 2019. Duración de 10 horas lectivas.

9. Toxicology Information Service

The Toxicology Information Service (SIT), performs the functions of the National Anti-poison Center, which works non-stop to attend to all citizens.

Since February 1971, it is a public service with unique competencies that complies with its institutional role as technical assistant to the Justice Administration at the request of courts, judges, magistrates, legal medicine institutes, and medical examiners in matters within its competence. It also assumes the health function to give immediate answers via telephone to any consultation about poisoning or exposure to toxic compounds.

People consult when it is required. The doctors attend the consultations that supply the relevant toxicological information with the purpose of offering initial medical assessment and advice both to calls from health center staff that require it and from any private person.

The SIT has a Documentation Section apart from the medical and the administrative staff, made up of faculty with academic training in the biosanitary area. They develop the functions to elaborate, review, and maintain the database with the information of compounds, toxicity, and dangerousness of the products commercialized in Spain and previously notified to the INTCF. All in line with the regulation.

The SIT is a unique reference service at the national level. Because its number for Toxicology Emergencies, 915620420, is on the packaging labels of marketed and properly registered products that may generate toxic problems through previous communication to the SIT. The number diffusion facilitates direct and immediate contact of the Service doctors with the poisoned person We highlight diverse activities done in the SIT, during 2019:

1. At the request of the various sectors of the industry, through the Federación Española de la Industria Química (FEIQUE) and more specific sector of paintings (ASEFAPI), cleaning (ADELMA), and cosmetics (STAMPA), the Documentation Section has collaborated through numerous educative activities, having in mind the interest of such industrial sectors, by making them aware of the regulations and the different legislative aspects that were coming from la Comisión Europea (CE) and the European Chemicals Agency (ECHA).

The importance of the SIT in the formation of the chemical industry is acknowledged, by the numerous congratulations and thanks received from its associations 2. The presentation at the Casa de la Ciencia (Valencia) of the study of the casework collected by its staff regarding «Toxic exposures to products purchased over the Internet», through the Journey «Ojo al Clic» organised the 22 November by the Confederation of Consumers and Users (CECU), and in collaboration with the Department of Health and the Business Federation of the Spanish Chemical Industry (FEIQUE). Among the wide variety of products purchased by the networks are certain medications, drugs of abuse, and cleaning products, as well as nutritional supplements, both non-anabolic and anabolic.

The event generated a social impact through the media that assisted that collaborated with the SIT through several interviews and the correspondent diffusion in social media (Twitter, Instagram, (Coordinating Committee of Health, Health, Consumer and Food Users).

The SIT staff is formed by different professional categories that belong to Medical examiners, facultatives, and different administrative scales. Integrated in this Service is the Documentation Section with its corresponding headship.

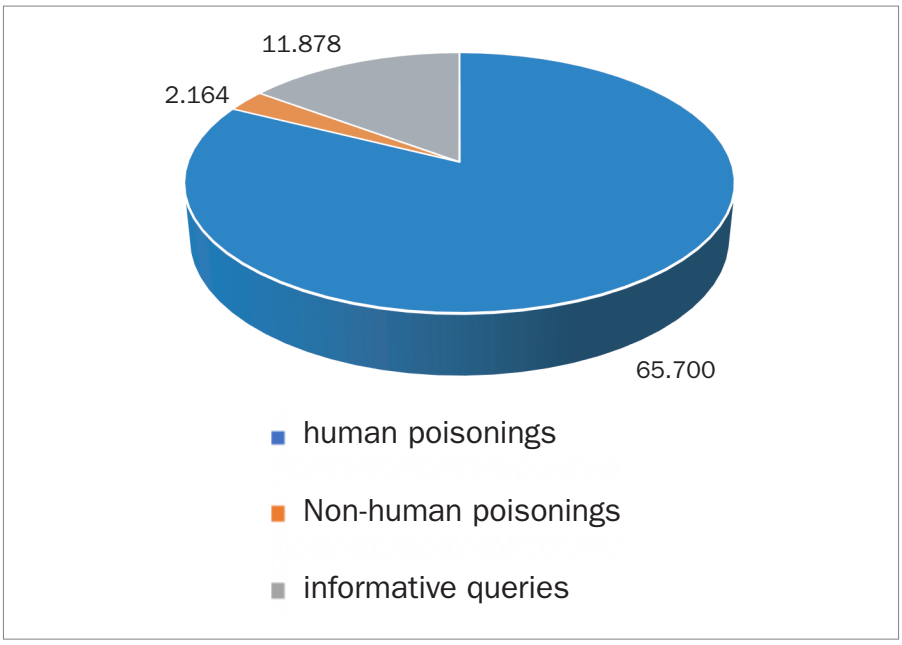
Table 9.1. Toxicology information service staff

	Toxicology Information Service INTCF-MADRID
Head of the Department	1
Documentation Section Head	1
Facultatives	17
Medical examiners	7
Administratives	7

13 Facultatives and 7 medical examiners with a university degree in Medicine and Surgery attend 24 hours telephone service. While 5 facultatives (Head of the section included) with the university degree in Pharmacy, Medicine, Surgery, and Biological Sciences attend the Documentation Service.

The SIT activity of 2019 respect to telephone consultations received is collected in the figures 9.1 and 9.2

Figure 9.1. Telephone queries handled by SIT during 2019

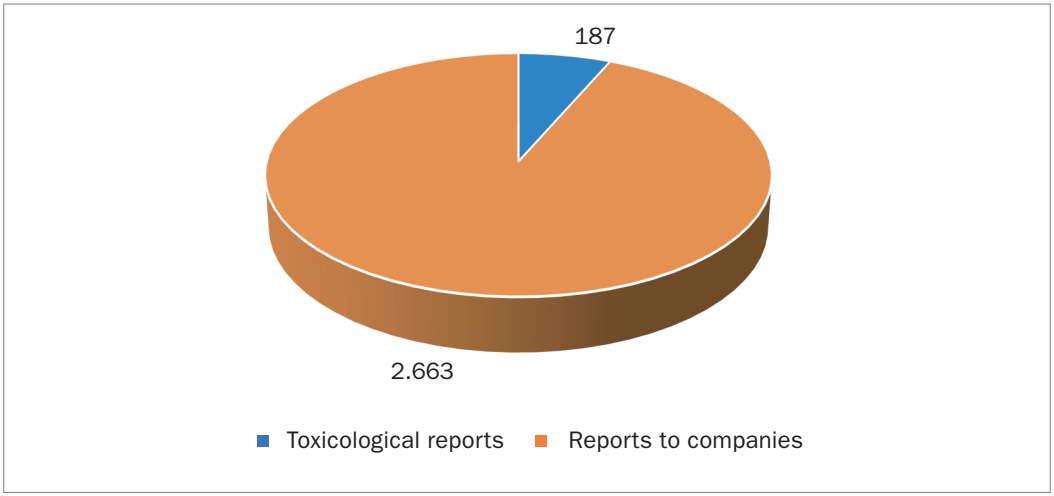


They have solved 79,742 telephone consultations by the medical staff during 2019. Concerning the data by the information requester, there are two groups (figure 9.1):

- «Toxicological consultations» for toxic exposures or intoxications to any potentially toxic substance or product that could potentially cause intoxication. 67,864 intoxications were attended, 65,700 corresponded to intoxications in humans, and 2,164 in animals.
- The «informative consultations», not related to toxic exposures or poisoning per se. They attended 11,878 consultations.

All consultations are attended both to citizens without specific health training (telephone 915620420) and health personnel from Health Centers, Hospitals, and out-of-hospital Emergency Services (telephone 914112676 and exclusively for such personnel).

Figure 9.2. SIT emitted reports during 2019



During 2019, the medical staff has emitted 187 toxicology reports and 2,663 reports done by the documentation section in response to information requests from the chemistry sector companies. (Figure 9.2)

The report classification by the medical staff is determined depending on the request, cataloged as M, ME, or IC reports (figure 9.3)

In the case of «M-19 Reports», they are reports sent after a detailed study of a requested topic, either from the Administration of Justice or from other institutions. 59 reports were emitted and elaborated after requests mostly solicited by the Administration of Justice as an expert request for courts, as well as information from other Administrations, health institutions or individuals. The requests are carried out by the SIT doctors.

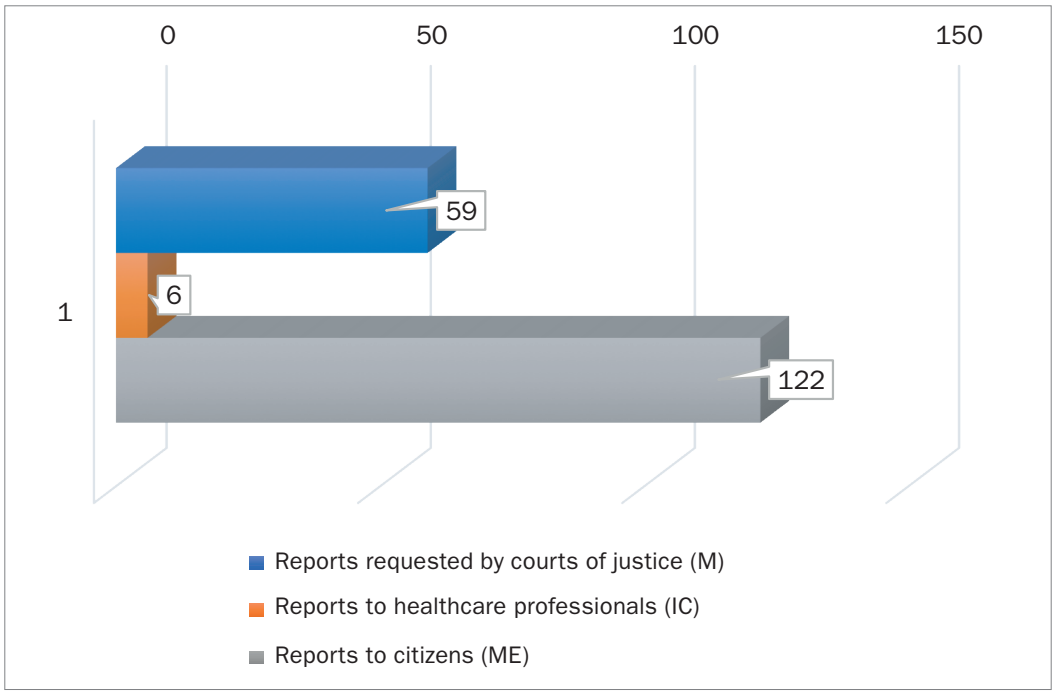
Concerning «*ME-19 Reports*», the information is sent via email early as they are requests from the public and do not require a specific toxicological assessment 122 reports that

were mostly requested by users and individuals were emitted and elaborated where the Head of the Department answers via email the same day of the request from what the citizenship requires.

«*IC Reports*» answer the health professional's requests related to toxicology cases, sending requested complementary information.

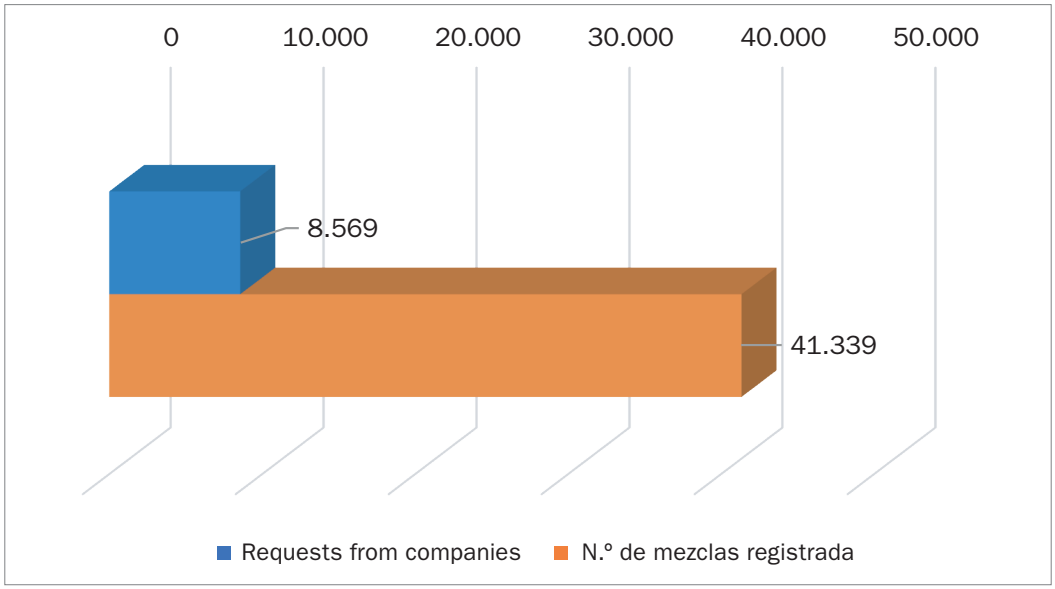
They emitted 6 reports after the requests by part of the health professionals. The information is sent immediately via email related to any toxicology case which requires complementary information to the one previously exchanged by telephone.

Figure 9.3. Types of Reports issued by the medical personnel of the SIT during 2019



The Documentation Section, apart from the 2663 information requests reflected, has registered 8,569 deliveries from companies that commercialize chemical mixtures in the Spanish market. This supposed the register of 41,339 products during 2019. The 48,4% of these mixtures are commercialized by SMEs which constitute a significant volume of the Spanish industrial network (figure 9.4).

Figure 9.4. Records of chemical mixtures made by the Documentation Section in 2019



9.1. SIT databases and European harmonization process

9.1.1. Maintenance of the Fichas SIT databases

The incorporation of 32,530 new products to the SIT database and 7,772 modifications of previous notified products. Among the included records, there are active principles (substances) as well as chemical mixtures. Each product is incorporated in the SIT database, the complete mixture compound, the dangerousness classification, the physical characteristics, the information present in the labeling, and safety data sheets. Apart from other data that allow knowing the product toxicity and providing an immediate medical response to a consultation due to a potentially toxic exposure with any of the products notified to the SIT.

9.1.2. Notification of Chemical Substances and Mixtures to INTCF

The notification to the INTCF by the Documentation Section with the S.D.G. for Organization and Territorial Coordination and New Technologies from the Department of Justice, following with the study of the necessary actualisations in the informatic system allows to include the notifications in the SIT database, later Fichas SIT (FSIT).

The SIT notification system allows the intercommunication between the companies and the INTCF through an information shipment system with an encrypted system with the required information online and complying with the regulation to notify the INTCF to

which they are obliged by Law 8/2010, of March 31. In this way, 63,727 products have been notified through said system throughout 2019, with 535 new companies registering in said system, which means a total of 4,424 companies enabled to send notifications to the Institute.

9.1.3. European harmonization of notifications to Designated Bodies

The participation in the workgroup for the European harmonization process initiated in 2010 will allow the chemistry industry to notify all countries where they commercialize a mixture classified as dangerous with the same electronic format and the same information in all the European Union countries.

The CLP Regulation, article 45, established the necessity to harmonize the information that the chemistry industry must remit to the organisms designated in each State member to proportionate the sanitary response. This need has forced important work from the industry, from the centers (in Spain the INTCF) and the European Commission as moderator and arbitrator of these meetings, to define the essential requirements and the notification procedure.

The harmonization has to end the 1 January 2021, the date where all these necessary tools for the notification of products should be available free of charge for consumer and professional use, collaborating in:

- Development of an informatics program that allows the information including the chemical compound of all mixtures classified as dangerous for health.
- Develop the information information validation standards that the chemistry industry will remit to ECHA
- Development of the European notification site has to be available in January 2021, sharing the INTCF experience in the online notification system (SRE System) already existent in Spain.
- Elaboration of (Guidances), with the participation of groups established in the European Commission to interpret the regulation concerning organism notifications designed by each State member.
- Participation in the «Workability study concerning implementation of Annex VIII of CLP», to study the notification to organisms designated from certain sectors of the chemical industry which represent a special casuistic when implementing the CLP European regulation.
- Toxicovigilance and intoxication prevention continues with the INTCF collaboration in the harmonization of product categories used by all the State members in the notifications to the Anti-toxic centers for toxicological monitoring and prevention of poisoning at the European level.

- The Implementation of a Unique Formula Identifier (UFI), that the companies must include in the product labels they commercialize, through the workgroup «Workshop on the study on analysis, development, and testing of the Unique Formula Identifier (UFI) for information to be submitted to poison centres, according to article 45 (4) of EC Regulation No 1272/2008 (CLP regulation)».
- Report elaboration requested by ECHA, following requests for extraordinary reports requested about certain aspects of the notifications which have been responded to, based on INTCF's experience.
- Reports elaboration requested by the Health Department for European legislation harmonization meetings (CARACAL). Collaborating with numerous reports for the Spanish authorities (Health Department) to document the issues treated in the meetings maintained with the European Commission in Brussels.
- Collaboration with Reports requested by the Health Department for meetings maintained with the European Commission. For the drafting of amendments to Annex VIII of the CLP Regulation (REACH Committee).
- Presence in the Meeting of the REACH CLP, to discuss the consultations that arise from the Regulation implementation of REACH and CLP to the industry sectors regulated representing the Department of Justice.
- Reports development for the group of the **European Association of Poisons Centres and Clinical Toxicologists** (EAPCCT), informing about the criteria and Spanish experience in the notifications process of dangerous chemical mixture to the INTCF.

9.2. Description of an interesting case with media coverage

Following a request from the Provincial Prosecutor's Office of Barcelona, the Special Service for Computer Crime and with DIOP Investigation Diligences No. 547/19, «information is requested from the SIT regarding the characteristics and effects of the product Sodium Chlorite».

That compound has been historically used as a disinfectant and cleaning product, similar to bleach (sodium hypochlorite) as biocide. They detected an increase in its commercialization as 28% concentrated aqueous solution in the social media market and for human consumption, to be a «miracle mineral supplement».

In our M19 – 09344 report, elaborated by the SIT and dated the 23rd August 2019, they informed about the product toxicity, that was sold by different social channels like a home remedy to be mixed with an acidic substance like the lemon juice and give place to chlorine dioxide (ClO2). This chemical compound was promulgated for the treatment of different pathologies such as SIDA, acne, malaria, autism, infections, or cancer diffused by healers encouraging its consumption as a miraculous supplement, although it

was an obscure method of business and with serious health risks, and could even lead to death.

Our report concluded that it isn't indicated for human consumption nor for any disease treatment because there isn't scientific evidence demonstrating curative properties. It is also added that it can cause digestive, metabolic, pulmonary, and cerebral alterations after ingestion. The Food and Drug Administration (FDA) advises the dangerousness of this product and it isn't approved by any organism for any use, not even by the Agencia Española del Medicamento y Productos Sanitarios (AEMPS), dependent from the Health Department.

9.3. Teaching and scientific activity

9.3.1. Participation in investigation projects and collaboration with other institutions

Investigation project:

«Detergent capsules – accidentology project (laundry, dishwasher and others)».

Collaborators: International Association for Soaps, Detergents and Maintenance Products (AISE), SIT, and other European Anti-toxic Centers.

Period: 2012-2020.

Summary of objectives: retrospective (2012-2016) and prospective (2017-2020) study of toxicovigilance to accidental exposures by detergent products in capsule format (laundry, dishwasher, and others), through the referral of the number of cases of patients exposed to such cleaning products in such commercial format.

From the SIT, biannual data are reported to establish improvements in the properties of the packaging and design of marketed containers to make safer use of these products, especially aimed at the child population due to their particularly attractive format. It also includes an estimate of the severity of each toxic exposure.

Collaborations with other institutions:

- Member State Communicators Network meeting. (ECHA) - Helsinki.
- Workshop on the Appointed Bodies and Poison Centres - Use of the Poison Center Notifications database. (ECHA) - Helsinki.
- Confederación Española de Consumidores y Usuarios (CECU).
- Instituto Nacional de Seguridad y Salud en el Trabajo (INSST).

- Instituto de Toxicología de la Defensa. Ministerio de Defensa.
- Departamento de Toxicología Veterinaria. Facultad de Veterinaria. Cáceres.
- Confederación Nacional de Personas Sordas. Plataforma SVisual para la atención telefónica del SIT a personas sordas.
- Comisión Asesora del Organismo Notificado. Agencia Española de Medicamentos y Productos Sanitarios (AEMPS).
- Comité Científico de Productos Sanitarios. Agencia Española de Medicamentos y Productos Sanitarios (AEMPS).
- Departamento de Medicamentos Veterinarios. Agencia Española de Medicamentos y Productos Sanitarios (AEMPS).
- Comisión de implantes mamarios y afines. Agencia Española de Medicamentos y Productos Sanitarios (AEMPS).
- Comisión Nacional para el uso forense del ADN. Ministerio de Justicia.
- Comisión Interministerial para la Ordenación Alimentaria (CIOA). Agencia Española de Seguridad Alimentaria y Nutrición (AESAN).
- Grupo Interministerial de Coordinación de Asuntos REACH.
- Working Group on Poisons Centre Activities & European Regulatory Issues. European Association of Poison Centres and Clinical Toxicologists (EAPCCT)
- Meeting of the CARACAL Sub-group on ATPs to CLP. Comisión Europea, Bruselas.
- Guidance WG on Poison Centres. (ECHA)
- Partner Expert Group (PEG). (ECHA).
- WG IT tools. (ECHA).
- Federación Empresarial de la Industria Química Española (FEIQUE).
- Asociación española de fabricantes de pinturas y tintas de imprimir (ASEFAPI).
- Asociación de Empresas de Detergentes y productos de Limpieza (ADELMA).
- Federación Empresarial Catalana del Sector Químico (FEDEQUIM).
- Instituto Tecnológico del Plástico (AIMPLAS).
- Asociación Nacional de Perfumería y cosmética (STANPA).

9.3.2. Scientific publications

De la Oliva S, Mencías E, Conejo JL. Epidemiología de las intoxicaciones registradas en el Servicio de Información Toxicológica. En: Nogué Xarau S. Toxicología Clínica. Bases para el diagnóstico y tratamiento de las intoxicaciones en los servicios de urgencias, áreas de vigilancia intensiva y unidades de toxicología. 1.ª ed. Barcelona: Elsevier España, S.L.U. 2019. 3-8.

Conejo JL, de la Oliva S, Mencías E. Los Centros Antitóxicos y el Servicio de Información Toxicológica. En: Nogué Xarau, S. Toxicología Clínica. Bases para el diagnóstico y tratamiento de las intoxicaciones en los servicios de urgencias, áreas de vigilancia intensiva y unidades de toxicología. 1.ª ed. Barcelona: Elsevier España, S.L.U. 2019. 303-307.

9.3.3. Teaching and education activities

Conejo JL. Presentación del SIT y su utilidad institucional. Ponente. En: Jornadas para el nuevo personal de la Guardia Civil. INTCF. 11 de enero.

Martínez Arrieta R. Futuro armonizado, Notificación a los PCC. Perspectivas actuales. Ponente. En: Jornada de Comisión Técnica de la Asociación de Empresas de detergentes y Productos de Limpieza, Mantenimiento y Afines (ADELMA). Madrid. 21 de febrero.

Conejo JL. Intoxicaciones por plantas. Casuística recogida. Clínica y tratamiento del intoxicado. Colaborador de prácticas. En: Semana botánica medicinal. Departamento de Botánica. Facultad de Farmacia de la Universidad Complutense de Madrid. INTCF. 18, 19 y 20 de marzo.

Martos C. Consecuencias para la salud por el mal uso de los gases industriales. Ponente. En: El gas, un aliado seguro. Confederación Estatal de Consumidores y Usuarios (CECU). Madrid. 24 de abril.

Martínez Arrieta R. Situación actual y armonización a nivel europeo de las notificaciones a los Poison Center. Ponente. En: Jornada Técnica de Fragancias. Comité Español de la Detergencia Tensioactivos y Afines (CED) y Asociación Española de Fragancias y Aromas Alimentarios (AEFAA). Barcelona. 25 de abril.

De la Oliva S. El Servicio de Información Toxicológica: funciones, características y casuística en Veterinaria. Ponente. En: Jornada de Actualización en Toxicología Clínica y Veterinaria. Departamento de Toxicología. Facultad de Veterinaria. Cáceres. 6 de mayo.

Mencías E. Errores comunes en el paciente intoxicado y otros aspectos médico-legales. Ponente. En: XV Curso de Actualización en Urgencias. Hospital Clínico de Madrid. 29 de mayo.

Martínez Arrieta R. Participación como ponente en tres conferencias: «Principios básicos en la evaluación de riesgos»; «Principales factores en la evaluación de seguridad de los cosméticos de acuerdo con las recomendaciones del SCCSS» y «Toxicidad sistémica de

cosméticos hoy. La visión desde un centro antitóxico». En: IX Edición del Título Propio de Evaluación de la Seguridad y Expediente de Información del Producto Cosmético. Facultad de Farmacia de la Universidad San Pablo CEU. Madrid. 10 de junio.

Martínez Arrieta R. Notificación al INTCF: Artículo 45 del Reglamento CLP. Ponente. En: Jornada informativa sobre el Reglamento de Productos Biocidas. Ministerio de Sanidad, Consumo y Bienestar Social. Madrid. 6 de junio.

Martínez Arrieta R. Notificaciones al INTCF para un futuro armonizado con la Unión Europea». Ponente. En: Jornada Reglamento REACH y CLP. Novedades 2019. Instituto Tecnológico del Plástico (AIMPLAS). Valencia. 18 de septiembre.

Martínez Arrieta R. Armonización de las notificaciones a los centros antiveneno europeos. Situación actual y futuro armonizado. Reglamento CLP. Ponente. En: Jornada informativa sobre notificaciones al INTCF. Asociación Química y Medioambiental del Sector Químico de la Comunidad Valenciana (QUIMACOVA). 19 de Septiembre.

Martínez Arrieta R. Art. 45 del Reglamento CLP: Armonización europea de las notificaciones. Implementación en España. Ponente. En: Jornada informativa sobre la armonización europea de la notificación de fichas toxicológicas. Asociación Española de Fabricantes de Pinturas y Tintas de Imprimir (ASEFAPI). Madrid. 21 de octubre.

Martínez Arrieta R. Notificaciones al INTCF: Art. 45 del Reglamento CLP. Ponente. En: Jornada informativa sobre la armonización europea de la notificación de fichas toxicológicas. Asociación para el Autocuidado de la Salud (ANEFP) al Comité de Productos Biocidas. Madrid. 1 de octubre.

Conejo JL. Curso de Actualización en Toxicología Clínica y Forense. Director y Coordinador. Centro de Estudios Jurídicos (CEJ). Madrid. 17 y 18 de octubre.

Mencías E. Base de datos SIT: Drogas y Estupefacientes. Ponente. En: Curso de Actualización en Toxicología Clínica y Forense. Centro de Estudios Jurídicos (CEJ). Madrid. 17 y 18 de octubre.

Conejero C. Tutor de prácticas tuteladas. 6.ª promoción de Facultativos del INTCF. Centro de Estudios Jurídicos (CEJ). Madrid. 14-18 de octubre.

Ramón F. Tutor de prácticas tuteladas. 6.ª promoción de Facultativos del INTCF. Centro de Estudios Jurídicos (CEJ). Madrid. 21-25 de octubre.

Conejo JL. Tutor de Prácticas tuteladas. 6.ª promoción de Facultativos del INTCF. Centro de Estudios Jurídicos (CEJ). Madrid. 28-31 de octubre.

De Miguel JL. Tutor de prácticas tuteladas. 6.ª promoción de Facultativos del INTCF. Centro de Estudios Jurídicos (CEJ). Madrid. 4-8 de noviembre.

Conejo JL. Exposiciones tóxicas a productos comprados por internet. Ponente. En: Jornada Ojo al Clic. Confederación Estatal de Consumidores y Usuarios (CECU). Valencia. 22 de noviembre.

Mencías E. Tóxicos y Antídotos. Ponente. En: Jornada Riesgos NRBQ: Una estrategia común. Centro Militar de Farmacia de la Defensa. Base Militar de San Pedro. Colmenar Viejo (Madrid). 27 de noviembre.

10. Other INTCF Units in support of Forensic Services

According to article 13 of the INTCF Regulation, this will count for its operation with the necessary support staff that is established in the job relationships of work, to perform technical and administrative functions of economic management, of personnel, works, computer and communication systems and other similar ones.

In the following headings, the technical units are described, which function is essential to the good functioning of the expert Servicesof the INTCF.

10.1. Sample and Waste Management Area

Each INTCF Department counts with a sample management area and wastes. The mission is to manage the samples from their arrival to the Laboratory until their distribution to the Services and to ensure the safekeeping of post-analysis samples.

The staff of these units from the different headquarters of the INTCF during 2019 is shown in table 10.1.

Table 10.1. Sample and waste management staff during 2019

	INTCF-MADRID	INTCF-BARCELONA	INTCF-SEVILLA	INTCF-LA LAGUNA
Facultatives	2	2	1	1
Specialist technicians	6	-	1	1
Laboratory assistants	4	7	7	-
Administratives	5	-	-	-

According to these functions, the work developed in this area consists fundamentally in:

- **Reception of analysis requests and samples in the INTCF.** Upon the arrival of a shipment of samples or a request for analysis they will proceed to the register in the «*Laboratory Information Management System (LIMS)*», collecting all the data including the chain of custody inside the laboratory.
- **Analysis and samples request acceptance.** Each collection of samples corresponding to the same judicial procedure must comply with the collection, transfer, and custody which ensure compliance. The INTCF established them in JUS/1291/2010 Order of 13 May.
- Reasons for rejection of requests for analyses and/or samples by the INTCF must be fully justified.
- **Coolers and packages opening.** Each cooler or package will be opened individually to follow the security rules that guarantee the sample protection and the operator.
- **Cases and Sample identification.** Labeling.

- **Adequacy and storage were previous to the analysis.** These actions mustn't expose in danger the sample integrity, the most common are: (Individualization in separate containers, drying of clothes, the addition of formalin, repackaging of sharp objects or poorly protected weapons, etc.) The previous analysis storage will be done in optimal conditions to the sample type and their preservatives.
- **Assignation and distribution to the Services**. Cases and samples will be assigned and distributed to the different Services taking into account the type of analysis requested. The judicial priority (Cases with Prisoner, Fast Trials...). The priority by type of analysis (Microbiological Studies, Volatiles, Wounds, Biochemical...). The amount of sample sent; the preservatives used; if more than one Service intervenes on the same sample, etc.
- **Post-analysis custody**. Once the analysis is finished, the samples will be maintained, labeled, and classified in a chamber located for that purpose.
- **Return/sample destruction and Center residues management**.

Figure 10.1. Different units of the sample and waste management area of the Madrid Department

10.2. INTCF Library

The main objective of the INTCF library is to meet, manage, diffuse, facilitate, boost, and potentiate the most complete, precise, and useful information related to the current institution´s theme. Directed to the Department of Justice staff with the purpose to publicise the latest investigations and advances in the toxicology and forensic sciences fields, and to attend all the informative needs generated by these activities.

The library pretends to be proactive in the control and diffuse of toxicology information with new technology use of information and communication (TICs), and thus, contribute to the improvement of the quality of its services.

The library is located in the Madrid department of the INTCF and divides its collections into a **reference room**: a space for current monographs and another for periodicals; free access; **deposit**: monographs before 1990; and museum: old collection cataloged by the Collective Catalog of Historical Heritage —CCPB— free of charge, with the application of Law 16/1985 of June 25, 1985, of the Spanish Historical Heritage under the Ministry of Culture and Sports. The institution's collection can be consulted at the following address:

http://catalogos.mecd.es/CCPB/cgi-ccpb/abnetopac/O12268/ID11627788?ACC=101

The consultation of all the funds of the institution can be made in advanced search in the field of copy data with the following word: M-R-INTCF. In the center itself, it is also possible to consult, with previous authorization, the files made by the institution from 1887-1950 of incalculable historical value, distributed in 84 boxes. Through them, a historical view of the Spanish society and of the judicial matters denounced by individuals at the request of the public prosecutor can be made.

The services are:

Selective Information Dissemination (DSI) provides information on the new online contents of publications. They send:

- Alerts adapted to the user's profile of journals subscribed and not subscribed by the institution.
- Periodic compilation lists of articles requested by users from the alerts sent during the current year and adapted to the user's profile. These are in the fields of Biology, Chemistry-Drugs, and Forensic Medicine.
- Bibliographic references about important titles thus by the thematic or by the authorship, highlighting when they are INTCF facultatives.

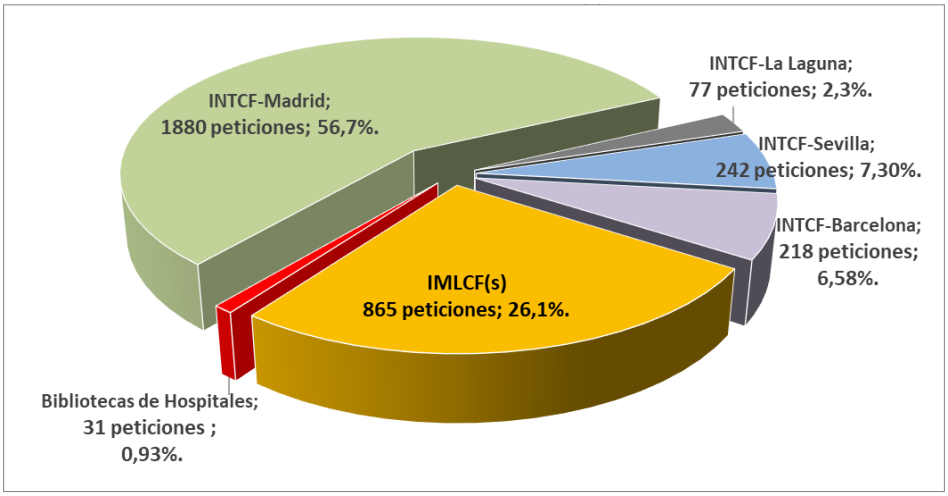
The Document Obtention Service (SOD) is based on the articles obtention, chapters, and external fund books through the interlibrary loan of hospitals and universities.

Also provides

- **Bibliographic training to the facultatives from the Madrid Department which requires it:**
  - Face-to-face and customized. It is required to arrange a meeting.
  - To small groups from the same service to focus on their specific field of knowledge.
- **Update sending material about bibliographic searches and workspace** from the Pubmed and Ebsco Discovery Service search engines to the INTCF facultatives and professionals from the institutes of legal Medicine and Forensic Sciences (IMLCF).
- **Bibliography searches** collaborating with the facultative to redirect the results to the desired side.
- **Ebsco Discovery Service** The Ebsco platform allows direct and immediate access to both contracted journal articles and e-books purchased in perpetuity. This enhancement is of direct benefit not only to INTCF practitioners but also to transferred and non-transferred IMLCFs. The library as an administrator of the platform has the power to control the users who subscribe. In 2019, there is access to 11 journals and 17 e-books have been purchased.

Concerning the developed activity during 2019, they have asked for 3,313 requests. The library received requests from all the Departments of the IMLCF and the libraries of all Spain hospitals. The difference lies in that the first two groups are full-users, that can ask for all they need, and the hospital libraries just from the institution's funds.

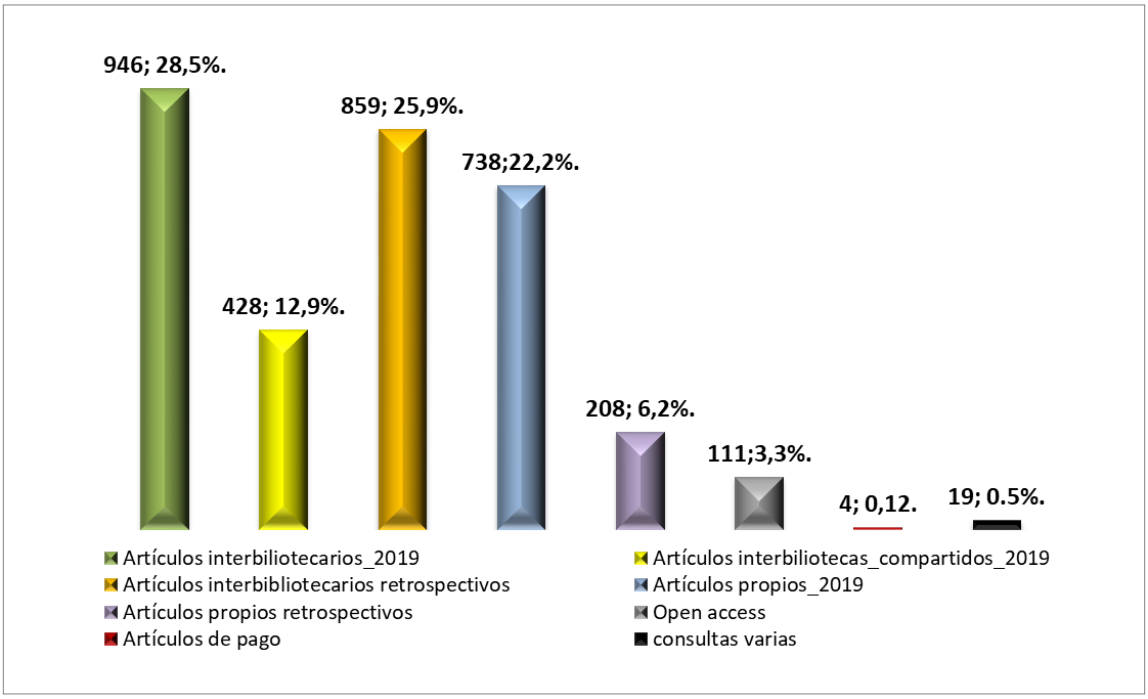
Figure 10.2.1. Distribution of organizations requesting requests to the INTCF Library



As can be seen in Figure 11.2.1. In 2019 the largest number of requests comes from the Madrid Department of the INTCF and the different IMLCFs.

Figure 10.2.2. shows the different types of requests during 2019.

Figure 10.2.2. Typology of requests made to the Library during 2019



10.3. Supply Management Unit

The Supply Management Unit from the (INTCF) generally performs three activities. In the first place, applies the systematic established in the public sector contracts law to dispose of the budgetary credit to the centralised acquisition of the necessary service for the correct execution of the analytical activity in all the INTCF laboratories. In the second place, controls the non-budgetary fund provisions for current services of a periodic or repetitive nature which are made through cash advances from the Territorial Management of Justice of Central Organs. In third place, it controls and processes the INTCF's accrued income for the provision of a non-free analytical service performed in the INTCF laboratories.

The key activity of this Unit is done at the Madrid Department with the support of practitioners in the rest of the sites. These Unit staff on the different INTCF sites during 2019 is shown in table 10.3.

Table 10.3. Supply Management Unit staffing during 2019

	INTCF-MADRID	INTCF-BARCELONA	INTCF-SEVILLA	INTCF-LA LAGUNA
Facultatives	1	-	-	-
Specialist Technicians	1	-	-	-
Laboratory assistants	2	-	-	-
Administratives	1	1	1	1
Laboral	2			

This Unit activity is done respecting the classification collected in the January 20 2014 Resolution, of the General Directorate of Budgets, to be able to:

- Request the service and process the payment order for the invoices of chapter 2 «Current expenses in goods and services». Necessary for the exercise of the INTCF activities and that do not increase in public assets. This refers mainly to recurring expenses that cannot be included in the inventory, such as repairs and preventive maintenance of analytical equipment, calibration of equipment, balances and pipettes, supply of gases, material, and laboratory consumables, services for participation in interlaboratory exercises for quality control, among other unexpected expenses during the budget year.
- To request the investment and process the payment order for the invoices of chapter 6 «Real investments», which comprises the expenses to be incurred in the acquisition of goods of nature necessary for the operational functioning of the services. They include those new investments that increase the public capital stock and those intended to replace deteriorated assets so that they can continue to be used to fulfill the purpose for which they were intended.
- Process and control the payment vouchers Model 069 of judicial proceedings, companies, police stations, penitentiary centers, and INTCF agreements with other agencies, through the computer application SIC3 of the State Budget Administration. With the ultimate aim of requesting the generation of revenue credit according to the economic classification of the revenue budget, chapter 3, «Fees, public prices and other revenues» for the provision of an analytical service not free of charge.

10.4. Prevention of Occupational Hazards Service

The Prevention of Occupational Hazards Service (SPRL) from the INTCF is a technical body whose mission is to proportionate the necessary assessment, support, and

coordination to implement a managing system for the prevention of occupational hazards, complying with the regulation. The aim is none other than the improvement and safeguard of security and health from more than five hundred public employees of the institution who are distributed among the departments of Madrid, Barcelona, Seville, and La Laguna.

Ubicated in the Madrid INTCF site since its implementation, the SPRL has two senior technicians in the prevention of occupational hazards. One of them is the head of the service, as explained before, the service manages the preventive activity according to the attributions given in the art. 37 of the Prevention Services Regulations approved by Royal Decree 39/1997, of January 17. Covering the work security, the industrial hygiene, the ergonomy, the applied psychology, except for the vigilance and health control of the workers and those other preventive activities which, due to their volume or the technical requirements necessary for their execution, have to be outsourced to one or more external prevention services because the company's resources are not sufficient.

Among the SPRL's support, the tasks are the design, implementation, and application of an occupational risk prevention plan that enables the integration of prevention in the organization, the evaluation of risk factors that may affect the employees security, the preventive activity planification, the determination of the priorities in preventive measures, the employees raining, the first aids, the emergency plans, and the health vigilance related to risks derived from work.

The activity developed in the SPRL isn't easily programmable. The same will depend to a great extent on the different needs and vicissitudes of the moment during 2019 the actions carried out can be resumed in:

- Actualisation and review of the prevention plans and their procedures.
- Follow-up of the risk evaluations in the different INTCF sites.
- Execution level control of the preventive activity planification.
- Evaluation of the work conditions and environment.
- Knowledge of the work incidents, investigating the causes, and making subsequent preventive recommendations.
- Overview of the occupational accident rate
- Remission of information cards about the employees´ risks.
- Elaboration of reports destined for the workers´ communication with the SPRL or the personal situations.
- Training for the workers like those destined for emergency action or new workers.

- Employees´ health vigilance: periodical medical examination, initial for incorporation or reincorporation to the job, occupational risk assessment during pregnancy, breast-feeding or for health reasons, and the administration of vaccines to workers exposed to biological risks.
- Concerning the workers especially sensible, their job vacancy adaptation, breast-feeding, or health causes.
- Coordination of business activities as planned in the art. 24 LPRL and the R.D. 171/2004, of 8 November.
- Information to the workers, thus by SPRL initiative or by the request that they do, the service responsible, the Prevention Delegates or union representatives when they are the ones who detect a need in this regard.
- Assessment reports destined to the INTCF Directors and other Administration authorities.
- The advice of installation facilities, equipment acquisition, or protection material.
- Participation in the Security and Health Committees.
- Collaboration with the Labor Inspection and Social Security.
- Elaboration and management of the SPRL documentation.
- Communication with the companies and other institutions, especially with the Coordination of Occupational Risks.

It is necessary to point out that the activity carried out at INTCF has several locations and workers. It would not be possible for only two Prevention Technicians B to perform their work without the collaboration of all the personnel and Prevention Delegates. At the same time, as the regulation indicates, it is necessary to outsource several preventive tasks, mainly health surveillance and those that require the use of extraordinary human or technological resources, which, being of occasional, do not justify their provision or acquisition and maintenance.

10.5. Secretarial staff

The secretarial staff plays a crucial role within the INTCF. It is the unit in charge of the management and administrative processing of the expert reports generated by the INTCF Services and is responsible for the telematic communication (via Lexnet) or sending them by post to the judicial office, as well as managing the INTCF's video conference systems for oral proceedings, among other functions.

The staffing of the secretariat team at the different INTCF sites during 2019 is shown in table 10.5.

Table 10.5. Staff of the INTCF secretariat team during 2019

	INTCF-MADRID	INTCF-BARCELONA	INTCF-SEVILLA	INTCF-LA LAGUNA
Secretariat staff Manager	1	1*	1*	-
Procedure Manager	1	-	-	-
Process Server	2	11	9	3
Judicial Assistance	4	3	3	1
* Procedure Manager				

10.6. Informatics System Section

The Informatics System Section is vital in the INTCF functioning because makes important functions managing the information generated by the analytical services such as: the integration of the various INTCF databases and maintenance of the applications developed, the elaboration of reports and consultations of data, the office-based production of the Institute's annual activity report, and to assure the security of the automatized files from the Institute. Besides that, the INTCF receives support from the Directorate General of Digital Transformation of the Department of Justice, specifically from the LIMS group for all related consultations, incidences, and developments from the LIMS system of the INTCF.

The staffing of the IT systems section at the different INTCF sites during 2019 is shown in table 10.6.

Table 10.6. Personal de la Sección de Sistemas Informáticos durante 2019

	INTCF-MADRID	INTCF- BARCELONA	INTCF- SEVILLA
Head of Information Systems Section	1	1	1

Annex

Annex I: Regulations applicable to the National Institute of Toxicology and Forensic Sciences (chronological order)

Royal Decree 63/2015, of February 6, amending Royal Decree 862/1998, of May 8, approving the Regulations of the Institute of Toxicology, Royal Decree 386/1996, of March 1, approving the Regulations of the Institutes of Forensic Medicine and Royal Decree 1451/2005, of December 7, approving the Regulations for the entry, provision of jobs and professional promotion of civil servants in the service of the Department of Justice.

Order JUS/836/2013, 7 May, regulating the procedure for notification of additions, deletions, and modifications of toxicological data sheets to the registry of chemical products in the SIT of the INTCF.

Order JUS/2267/2010, 30 July, modifying Order JUS/1294/2003, 30 April determining the files with personal data of the department and public organisms. (BOE nº 208 27 August 2010)

Order JUS/1291/2010, 13 May, «Rules for the preparation and submission of samples for analysis by the Institute of Toxicology.». (BOE nº 122 19 May)

Order JUS/215/2010, 27 January, modifying Order 24 February 1999, fixing the amount of the public prices for services provided by the Institute of Toxicology. (BOE nº 33 de 6 February 2010)

Order JUS/3403/2009, 17 November, approving the list of jobs of the INTCF. (BOE nº 304 18 December 2009)

Royal Decree 32/2009, 16 January, approving the National Protocol for Forensic Medical Forensic and Scientific Police action in events with multiple victims. (BOE nº 32 de 6 February 2009)

ROYAL DECREE 1977/2008, 28 November, regulating the composition and functions of the National Commission for the forensic use of DNA.

Royal Decree 1451/2005, 7 December, approving the Rules of Entry, Job Provision, and Professional Promotion of Civil Servants in the Service of the Justice Administration. (BOE núm. 309 27 December 2005)

Royal Decree 862/1998, 8 May, publishes the Organic Regulations of the National Institute of Toxicology and Forensic Sciences. (BOE nº 134 5 June 1998)

Organic law 6/1985, 1 July, of the Judiciary

Annex II: Questionnaire on expert activity, quality assurance, research, training, and proposed regulatory reforms

This questionnaire, directed to the (INTCF), pretends to obtain actualized information about expert activity, quality assurance, and investigation activities done by the INTCF Services to develop the **Actuation Plan** and the **Investigation Plan** of the INTCF according to the established in the INTCF Regulation (Articles 7 and 10).

This questionnaire will also serve to do the **review of the quality system during 2019** and to obtain some interesting data for the **INTCF Report of 2019**.

On the other side, they pretend to gather information about **modification of the job vacancies relations proposals** apart from the INTCF **current regulation modification** that may be of interest to the different INTCF Services in order to improve the efficiency of our organization in the fulfillment of its functions and, if necessary, to submit a joint proposal to the Ministry of Justice to be negotiated with the trade union organizations.

For these purposes, this questionnaire has been divided into the following sections:

PART 1. Expert Activity (types of investigations, analytical techniques, laboratory organization, casuistry, personnel, relationship with IMLs...)

PART 2. Quality Assurance (Participation in proficiency tests and intercomparison exercises, ENAC Accreditation, ...)

PART 3. Investigation and Education (lines of scientific research, subsidized projects and collaborations, scientific publications, initial and continuous training of personnel, teaching to other bodies, etc....)

PART 4. Regulatory reforms proposals (Modification RPT, INTCF regulation modification...)

The deadline to answer the questionnaire is 11 November 2019.

During October, we will hold at least 1 meeting by videoconference with each INTCF Service to resolve doubts in the completion of the questionnaire (with the assistance on each occasion of all the Department Directors with the Heads of Service and physicians designated by them in the different INTCF Departments).

We encourage all the staff to discuss and actively participate in answering the questions of this questionnaire, as your opinion and ideas are essential for the future of our institution.

Service/Section INTCF	
Department/Delegation INTCF	

Part 1. Expert Activity

1.1. Investigation types

Actualise a list of **investigation types** done at your Service (if this list coincides with the list on the INTCF website, copy it here and highlight in bold any updates or clarifications that you consider appropriate)

1.2. Analytical techniques

Actualise a list with the **analytical techniques** that your Service disposes of (if this list coincides with the list on the INTCF website, copy it here and highlight in bold any updates or clarifications that you consider appropriate)

1.3. Personal and expert activity

Fill in the attached table with the **current template data** of your service and include in **observations** all those interesting incidents (Number of staff employed, number of interim staff, secondments, reinforcements, departures). Likewise, if there are **working groups in the service according to the different expert areas, report** the template data for each expert area or working group.

	Titular en activo	Interim because sick leave	Interim because vacancy	Reinforcement	Service commission
Head of Department					
Facultatives					
Medical examiners					
Specialist technicians					
Laboratory assistants					
Administratives (especificar el cuerpo general al que pertenezcan)					

Observations:

Classification of staff in the different expert areas of the Service:

1.4. Casuistry data 2018-2019

Fill in the data of **casuistic global data** of your Service during **2018** and **2019**		
	2018 (01/01/2018-31/12/2018)	**2019** (01/01/2019-01/11/2019)
Requests generated		
Reports emitted		
Samples analyzed		
Analysis done		
Pendency		

Classification of requests according to type of report

Type of report	**2018** (01/01/2018-31/12/2018)	**2019** (01/01/2019-01/11/2019)

1.5. Needs for renewal of technical equipment

Enumerate the possible **needs for renewal of technical equipment** that you consider of interest in the future for your Service and new analytical capacities that allow new equipment

1.6. New analytical techniques or areas of expertise

Indicate possible **new analytical techniques or expertise areas** that you consider of interest in the future for your Service

1.7. Laboratory Information Management System (LIMS)

Indicate possible **LIMS system improvement** that you consider of interest for your Service

1.8. Observations

Include here all the comments and proposals that you consider of interest for the Expert Activity for your Service that hasn't been collected in the previous sections

Part 2. Quality assurance

2.1. Participation in proficiency tests and intercomparison exercises

Comment the relation of **Participation in proficiency tests and intercomparison exercises** that your service has participated in during **2019** (include program name, organiser, and type of analysis)

2.2. Method validation studies

Indicated the relation of the **method validation studies** that your service has done during ha **2019** and its state (started or ended)

2.3. Accredited tests by ENAC

Indicate the relation of **accredited tests by ENAC** in your service currently (copy information Web ENAC)

2.4. Tests to validate or prove in the future

Indicate possible **tests to validate or prove** that you consider of interest in the future for your Service and the deadlines for validation and accreditation.

2.5. Degree of implementation of the quality system

Indicate your opinion on the degree of implementation of the quality system in your Service.

2.6. Observations

Include here all the comments and proposals that you consider of interest to guarantee **the quality** of your Service that haven't been collected in the previous sections

Part 3. Investigation and Education

3.1. Investigation lines

Actualize a list about the **investigation lines** currently carried out in your Service or have been carried out in the last 10 years (if this list coincides with the list on the INTCF website, copy it here and highlight **in bold** any updates or clarifications that you consider appropriate).

3.2. Projects and Collaborations

List the **national and international funded projects and collaborations with other institutions** in which your department has participated within the scope of the research lines reflected in section 3.1. Includes the following information: Name of the project/collaboration/collaborating bodies, duration, and summary.

3.3. Scientific publications

Make a list actualized of **scientific works published** by the staff of the Service in the last 10 years to the lines of research reflected in section 3.1. (Use the **Vancouver reference system and bibliography**, https://en.wikipedia.org/wiki/Vancouver_system)

3.4. Projects and future collaborations

Indicate **future projects and collaborations with other institutions** that are of interest to your Service in the next 2 years and give an explanation of the interest of the project within the objectives of the INTCF.

3.5. Education activity during 2019

Indicate the **education courses and activities** that the staff of your Service has received as **trainees** during 2019 (indicate the following data: Title of the course, organising centre, venue, and date).

3.6. Teaching activity during 2019

Indicate the **teaching courses and activities** attended by staff of your Service as **teachers/trainers** during 2019 (indicate the following details: Title of the course, organising centre, venue, and date).

3.7. Education activity in the future

Indicate the future courses and education activities of interest for your Service in the future 2 years.

3.8. Observations

Include here all the comments or proposals that you consider of interest for **Investigation and education activities** of your Service that haven't been collected in the previous sections

Part 4. Proposals for regulatory reforms

4.1. Relation of work positions (RPT)

Indicate and justify in a reasoned manner the **personal growth needs of your Service for additional staff** compared to the staffing table in section 1.3.

4.2. Job descriptions and specific job requirements

Both the Order JUS/3403/2009 approving the RPT of the INTCF and the order 17/09/2015 amending the RPT of the INTCF, establish almost as the only requirement for access to the various jobs in the different Services of the INTCF to own a specific qualification for each body and/or service. Indicate other requirements and merits to be assessed in each of the special corps (Faculties, TEL, and Assistants) that allow a better adaptation to the real needs of your Service in the selection processes of the staff (job vacancies...).

4.3. INTCF Regulation: Nature, functions and organisation

Include here all the comments and proposals that you consider of interest for the future reform of the INTCF regulation about nature, **functions, and organisations.**

4.4. INTCF Regulation: INTCF's governing bodies and personnel

Include here all the comments and proposals that you consider of interest for the future reform of the INTCF regulation about their **governing bodies and personnel**.

4.5. INTCF Regulation: Operating regime

Include here all the comments and proposals that you consider of interest for the future reform of the INTCF regulation about the **operating regime.**

4.6. INTCF Regulation: Relations with Legal Medicine Institutes (IML)

Include here all the comments and proposals that you consider of interest for the future reform of the INTCF regulation about the **relations with the IML**.

4.7. INTCF Regulation: Other observations

Include here all the comments and proposals that you consider of interest for **the future reform of the INTCF regulation** that hasn't been collected in the previous sections of the questionnaire.

Annex III: Methodology used in obtaining the data and glossary of indicators used in the statistical data

The statistical data of the current report has been extracted from the information management system of the laboratory that the INTCF uses (LIMS system: *Laboratory Information Management System*) and from the databases of the Toxicological Information Service. The global data from the Departments and Services have been extracted with the consultation tool (Dashboard) on a specific date (21/05/2020). There may be variations in data in subsequent queries due to occasional request openings.

Hereunder there is a brief explanation of the indicators used for the elaboration of this report:

Number of registered cases. Relates the cases that the court ordered to send the samples to the INTCF to analyse them after by the correspondent Services.

Number of requests generated. Measures the volume of analyses or study requests which determine the issue of a report.

Number of evidences registered. Counts the objects, substances, samples, or pieces that each Service registers.

Number of samples analyzed. Counts the objects, substances, samples, or pieces that each Service analyses. Generally, the number of samples is superior to the number of evidences. From one evidence (for example, trousers with biological evidence), diverse samples can be obtained (DNA traces in different locations on the trousers), which will be analysed independently.

Number of analyses done. Counts all the analytic tests over the samples of each INTCF Service.

Number of requests emitted. After all the analysis and the register of results, an expert report is emitted to the required institution. This item relates to the number of reports issued by each Department or Service.

Number of company notifications. Relates the amount of received information in the Institute and managed by the SIT, through the Documentation Section, about the composition of toxic products commercialized, through toxicological cards to Law 8/2010, 31 March, laying down the system of penalties provided for in the Regulations (EC) concerning the registration, evaluation, authorization, and restriction of chemical substances and mixtures (REACH) and on the classification, labeling, and packaging of substances and

mixtures (CLP), which amends it. The toxicological data sheet preparation is carried out in compliance with the order JUS/909/2017.

Toxicological consultations by telephone. Relates the number of consultations on poisoning and exposure to toxic substances, made by telephone by citizens and professionals.