



science and policy
for a healthy future

Database of candidate laboratories for the 1st prioritisation round of substances

Deliverable Report

D 9.3

WP 9 - Laboratory analysis and quality assurance

Deadline: September, 2017

Upload by Coordinator: 28 September 2017

Upload of updated version: 14 March 2018

Entity	Name of person responsible	Short name of institution	Received [Date]
Coordinator	Marike Kolossa	UBA	13/09/2017
Grant Signatory	Argelia Castaño	ISCIII	04/09/2017
Pillar Leader	Argelia Castaño Greet Schoeters	ISCIII VITO	13/09/2017
Work Package Leader	Argelia Castaño and Marta Esteban	ISCIII	04/09/2017
Task leader	Marta Esteban	ISCIII	04/09/2017

Responsible author	Octavio Pérez Luzardo	E-mail	octavio.perez@ulpgc.es
Short name of institution	ULPGC	Phone	+ 34 928 451 424
Co-authors	Marta Esteban and Argelia Castaño		

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 2

Table of contents

1	Authors and Acknowledgements.....	3
2	Introduction.....	4
3	Questionnaire design and distribution.....	4
4	Criteria definition.....	6
5	Data collection and evaluation.....	9
6	Results.....	10
7	Lists of candidate laboratories.....	13
7.1	Candidate laboratories to perform the analysis of biomarkers of exposure.....	13
7.1.1	Phthalates.....	14
7.1.2	DINCH.....	15
7.1.3	Bisphenols.....	15
7.1.4	Per and polyfluorinated alkylated substances.....	17
7.1.5	Brominated flame retardants.....	18
7.1.6	Chlorinated flame retardants.....	19
7.1.7	Phosphorus flame retardants.....	19
7.1.8	Polycyclic aromatic hydrocarbons.....	20
7.1.9	Anilines.....	21
7.1.10	Cadmium.....	22
7.1.11	Chromium VI.....	23
7.2	Candidate laboratories to develop new analytical methods.....	25
7.3	Candidate laboratories to support the QA/QC activities in WP9.....	28
7.4	Concluding remarks.....	30
7.5	Annex 1.....	31
7.6	Annex 2.....	38

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 3

1 Authors and Acknowledgements

Lead authors

Octavio Pérez Luzardo, Universidad Las Palmas de Gran Canaria (ULPGC)

Marta Esteban López, Institute of Health Carlos III (ISCIII)

Argelia Castaño Calvo, Institute of Health Carlos III (ISCIII)

Contributors

Pillar 2 leader:

Argelia Castaño. Institute of Health Carlos III (ISCIII)

Partners in task 9.2:

- Juan José Ramos, Silvia Gómez, Susana Pedraza, Sara González, Helena García and Miguel Motas. Institute of Health Carlos III (ISCIII)
- Jean-Philippe Antignac. French National Institute for Agricultural Research (INRA)
- Ovnair Sepai. UK Department of Health - Public Health England (DH)
- Dagnė Janarauskiėnė and Rosita Balėienė. Lithuanian National Public Health Surveillance Laboratory (NPHSL)
- Jana Klanova. Masaryk University (MU)
- Katrin Vorkamp. Aarhus University (AU)

Task leaders in WP9:

- Marta Esteban López. Institute of Health Carlos III (ISCIII)
- Cathrine Thomsen, Norwegian Institute of Public Health (NIPH)
- Holger Koch. Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA)
- Thomas Göen, Friedrich-Alexander-Universität Erlangen-Nürnberg (IPASUM)
- Thomas Lundh. University of Lund (ULUND)
- Jana Hajslova. University of Chemistry and Technology (VSCHT)

Partners in WP9:

- Enrique Cerquier and Line S. Haug. Norwegian Institute of Public Health (NIPH)
- Monika Kasper-Sonnenberg. Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA)
- Adrian Covaci, University of Antwerp (UAntwerp)
- Lőic Rambaud. Santé publique France (ANSP)
- Hans Mol. RIKILT Wageningen UR (RIKILT)

Chemical group leaders (CGLs):

- Marike Kolossa, Ulrike Doyle, Till Weber. Umweltbundesamt (UBA)
- Robert Barouki. Institut National de la Sante et de la Recherche Medicale (INSERM)
- Maria Uhl. Umweltbundesamt GMBH (EAA)
- Jana Klanova. Masaryk University (MU)
- Milena Horvat. Institut Jozef Stefan (JSI)
- Alessandro Alimonti. Istituto Superiore Di Sanita (ISS)
- Greet Schoeters. Vlaamse Instelling Voor Technologisch Onderzoek N.V. (VITO)
- Tiina Santonen. Finnish Institute for Occupational Health (FIOH)
- Lisbeth Knudsen. University of Copenhagen (UCPH)

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 4

2 Introduction

The objective of the task 9.2 was to elaborate a list of candidate laboratories for the substances selected in the 1st HBM4EU round of prioritisation for:

- ▶ Performing chemical analysis of biomarkers
- ▶ Developing new analytical methods
- ▶ Supporting Quality Assurance/Quality Control (QA/QC) program in WP9

These candidate laboratories could take part in the activities of HBM4EU after their subsequent successful participation in the Interlaboratory Comparison Investigations (ICIs) and External Quality Assurance Scheme (EQUAS) (biomarker analysis) or after being selected according to the criteria defined by experts (new analytical methods and QA/QC support).

3 Questionnaire design and distribution

A first draft of the questionnaire was developed by ISCIII team. The questionnaire was organised in three sections. The first section, focused on the analysis of biomarkers, was divided in turn into specific blocks for the substances in the 1st prioritisation round: phthalates, DINCH, bisphenols, fluorinated compounds, flame retardants (brominated, chlorinated and phosphorous), anilines, polycyclic aromatic hydrocarbons, cadmium and chromium VI. The second one was focused on the experience in developing new analytical methods and finally, the third section covered questions related to the experience in the organization of ICIs and EQUAS.

The draft was distributed for revision and discussion among the task 9.2 partners, the Quality Assurance Unit (QAU), the Chemical Group Leaders (GCLs) and WP 16 experts (INRA and UAntwerpen). Comments and suggestions were considered for the elaboration of the second draft that was distributed again among the same groups of experts. The final version was elaborated after a third round of revision/comments (Figure 1).

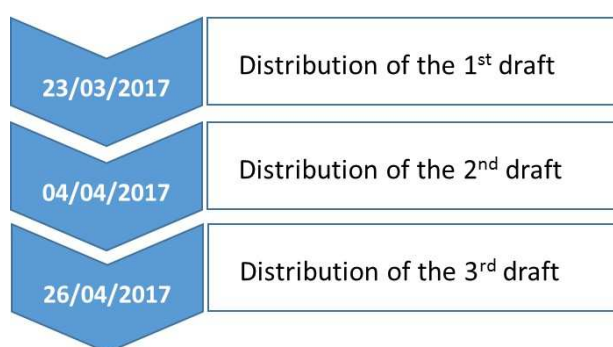


Figure 1: Discussion process of the questionnaire

Once the final draft was accepted internally in WP9, the ISCIII team adapted it to the open source on-line survey application LimeSurvey. At the same time, the task leader contacted to NHC to request the contacts of the laboratories that should receive the questionnaire via the NHCPs. The first contact was done on the 4th of April and two reminders were sent on the 9th and 25th of May 2017. A total of 183 contacts (sometimes different people from the same laboratory) were identified by the NHCPs (see annex). Figure 2 shows the number of contacts received per country.

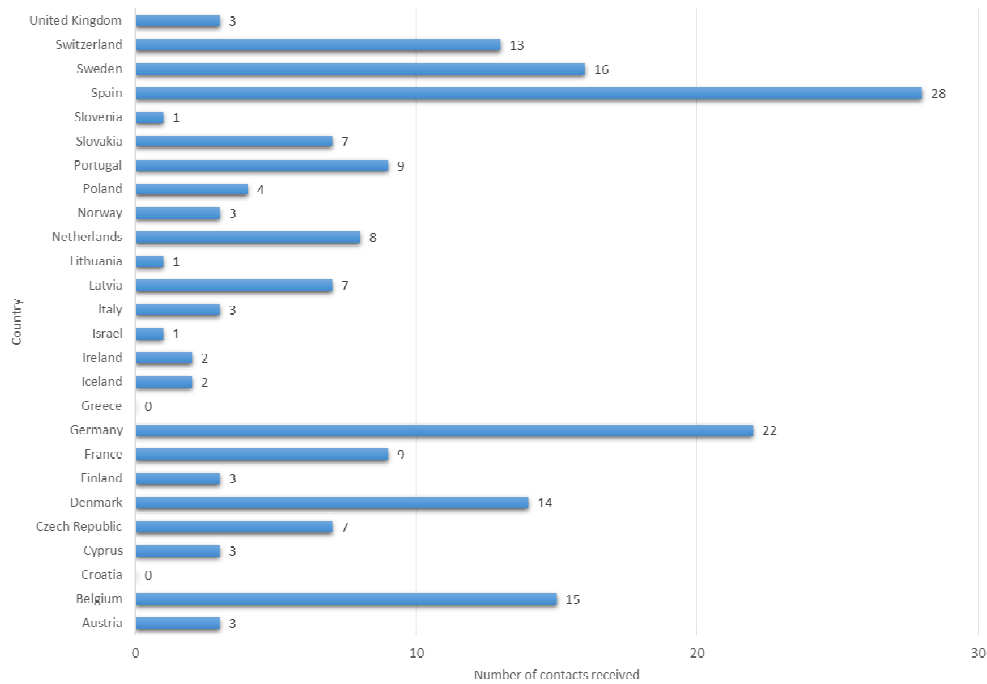


Figure 2: Laboratory contacts received per country

A call to extend participation was done through the HBM4EU website (Figure 3).

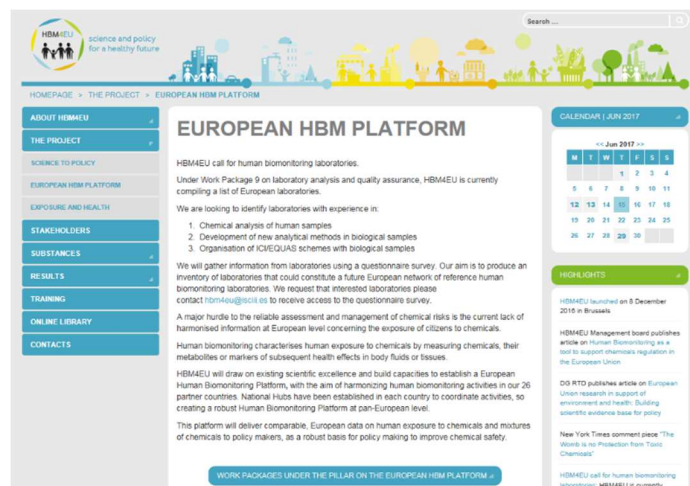
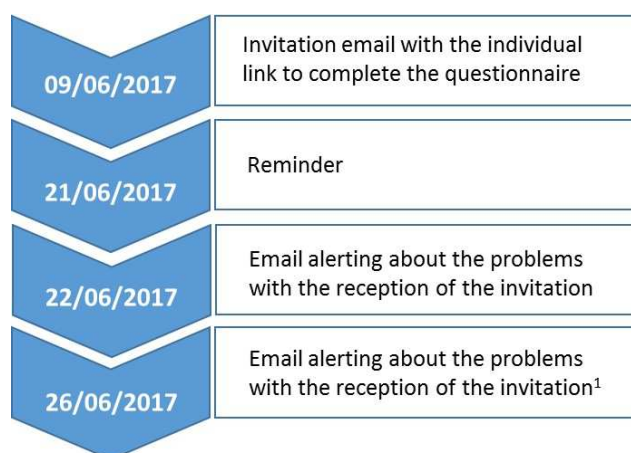


Figure 3: Call to extend the participation uploaded in the HBM4EU website.

An individual link to complete the questionnaire was sent from HBM4EU@isciii.es to all the laboratories identified on 9th June 2017. Some problems were detected with the invitation email. In some cases we received an email alerting about problems with the delivery status and in others, the invitation email went to the spam folder. We contacted the laboratories to inform them about this issue and requested a confirmation of reception. Figure 4 summarises the different contacts to the laboratories to ensure the reception of the invitation.

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 6



¹ Only to those laboratories for which we received an alert about problems with the delivery status

Figure 4: Date and purpose of contact to the laboratories

In order to ensure a fluid communication with the laboratories for solving their problems/doubts during the period defined for filling in the questionnaire, the ISCIII team was continuously checking the incoming emails in HBM4EU@isciii.es.

The period for completing the questionnaire was from 9th-30th of June, but it was extended an additional week and finally closed on the 7th July.

4 Criteria definition

The first draft of the criteria for selecting the candidate laboratories was discussed within the QAU (23/03/2017). After that, the QAU associated members and other WP9 partners were included in the discussions.

The QAU members decided to define a primary criterion for each section as a direct exclusion criterion. This was presented and approved by the Management Board. Then, the data received would be evaluated according to the scoring defined for each of the criteria and consequently, obtaining the final score for each laboratory (Table 1-3). The evaluation of data for each section and group would be evaluated separately. Regarding the section covering analysis of the different biomarkers, data for each group of chemicals would be considered separately.

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 7

Table 1: Criteria for selecting candidate laboratories to analyse HBM4EU samples

KNOW – HOW	Exclusive	1 st level	2 nd level	Scoring system
Experience analysing human samples	X			
Experience in the target matrix/biomarker		x		5: experience in matrix and biomarker 3: experience in matrix or biomarker
Participation in human biomonitoring surveys/studies – sample size ¹		x		5: >1000 participants 3: 250 - 1000 participants 1: <250 participants
Participation in human biomonitoring surveys/studies – target population		x		5: general population, mother/children 3: occupational, highly exposed
QA/QC AND BIOSAFETY				
Successful participation in Interlaboratory Comparison Exercises ² (ICIs) for the target matrix/biomarker		x		5: in the last 3 years 3: in > 3 years
Successful participation in External Quality Assurance Schemes ³ (EQUAS) for the target matrix/biomarker in the last 3 years		x		5: in the 3 years 3: in 2 years
Accreditation by ISO/IEC 17025 norm			x	3: yes in human samples 1: in biological samples or others
Not accredited but there is a QA/QC system in the laboratory covering the: - Control of the instruments, standards, reagents, etc. - Traceability of the samples - Data protection - Biosafety practices and facilities (chemical fume hoods, biological safety cabinets, chemical hygiene plan, SOP for chemical handling, etc.)		x		5: if yes in all options 3: if yes in the 2 first options (control and traceability)
Existence of a SOP for the analysis of the target matrix/biomarker		x		5
CAPACITY				
Analysis capacity per month		x		Taking as 100% the maximum number of samples of the answers received: 5: 100-50% 3: <50%
Storage capacity			x	Taking as 100% the maximum capacity of the answers received: 3: 100-50% 1: <50%
Time required for starting the analysis considering the time for fulfilling the legal and/or the required internal procedures		x		5: ≤ 4 weeks 3: > 4 weeks
Cost of the analysis			x	Taking as 100% the maximum cost of the answers received: 3: <75% 1: 100-75%

¹ This criterion will be only applied in case it is necessary to select laboratories with high capacities with regards to the number of samples to be analysed

² ICIs: is a measure to harmonise analytical methods and their application and in this way improving the comparability of analytical results.

³ EQUAS: is a measure to improve the accuracy of analytical results. For this purpose, control material is analysed in reference laboratories. The accuracy is evaluated by comparing results with the assigned values calculated from the results of the reference laboratories.

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 8

Table 2: Criteria for selecting laboratories to develop new analytical methods according to the needs identified in HBM4EU.

KNOW – HOW	Exclusive	1st level	2nd level	Scoring system
Experience in developing new methods in biological matrices	X			
Relevance of the peer-reviewed publications provided (impact factor and number of citations)		x		Taking as 100% the maximum of the answers received: 5: 100-50% 3: <50%
Experience in developing methods in the target matrix/biomarker		x		5: experience in matrix and biomarker 3: experience in matrix or biomarker
Application of their developed methods at large scale studies		x		5: >1000 samples 3: 250 - 1000 samples 1: <250 samples
QA/QC AND BIOSAFETY				
If not accredited, existence of a QA/QC system in the laboratory covering the control of the equipments, reagents and control material, traceability of the samples, data protection and biosafety practices and facilities (chemical fume hoods, biological safety cabinets, chemical hygiene plan, SOP for chemical handling, etc.)			x	3: if yes in all options 1: if yes in control + other
Existence of a system for method validation		x		5
Number of accredited methods after their development			x	Taking as 100% the maximum of the answers received: 3: 100-50% 1: <50
CAPACITY				
Level of permanent resources dedicated to method development activities (staff, equipments, funding)			x	3: ≥50% permanent 1: <50% permanent
Access to high exposure material		x		5
Capacity for synthesising and labelling molecules (or possible access to) as control material for distribution at low scale			x	3

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 9

Table 3: Criteria for selecting candidate laboratories to support the QA/QC activities implemented in HBM4EU.

KNOW – HOW	Exclusive	1 st level	2 nd level	Scoring system
Experience in organising Interlaboratory Comparison Investigations ¹ (ICIs) with biological matrices	X			
Experience in organising External Quality Assurance Schemes ² (EQUAS) with biological matrices		x		5
Participation as reference laboratory in EQUAS			x	3
Experience in preparation of control material		x		5: at concentration found in lowest exposed subpopulation 3: native or spiked human samples 1: not human samples
QA/QC AND BIOSAFETY				
Accreditation as organiser of proficiency testing (UNE-EN ISO/IEC 17043)		x		5
If not accredited, existence of a QA/QC system in the laboratory covering the preparing control material, organising ICI/EQUAS, managing samples and results and data protection		x		5: if yes in all options 3: if yes in the 2 first options (preparing control material and organising ICI/EQUAS)
CAPACITY				
Capacity to prepare and distribute control material for ≥15 participants		x		5
Capacity for organising ICI/EQUAS during the whole HBM4EU project		x		Taking as 100% the maximum of the answers received: 5: 100-50% 3: <50
Tools for fluid communication with the participants			x	3: if yes in all options 1: if yes in > 2

5 Data collection and evaluation

After closing the online questionnaire the ISCIII team compiled all the answers and accompanying files and forwarded to the partners responsible for the data evaluation.

The evaluation process was done independently by two partners as a quality control measure. ISCIII provided them with the corresponding anonymised databases, the associated files, a codebook for identifying the questions in the database and the questions that were linked to the criteria selection, and a score sheet template. The data evaluation was done separately according to the three different sections of the questionnaire:

- Biomarkers analysis: University Institute for Biomedical and Health Research - ULPGC and the Biomarkers Unit - CNSA, ISCIII.
- New methods development: Laboratoire d'Etude des Résidus et Contaminants dans les Aliments - Oniris, INRA and the Chromatography Laboratory - CNSA, ISCIII.
- Support to the QA/QC program in WP9: Chemical Testing Department - NPHSL and the Quality Assurance Unit - CNSA, ISCIII.

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 10

6 Results

A total of 115 answers were received. After the elimination of double entries due to different problems of the laboratories during the filling in of the questionnaire, the final database included 83 entries.

Half of the participating laboratories reported to be members of the HBM4EU consortium (Figure 5).

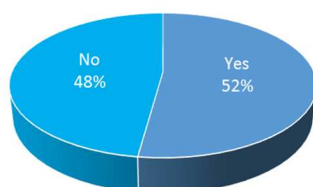


Figure 5: HBM4EU membership

Most of the participating laboratories are linked to the University/University Hospitals (51%), followed by governmental institutions (36%). There is a very low representation of laboratories coming from the industry and others (Figure 6).

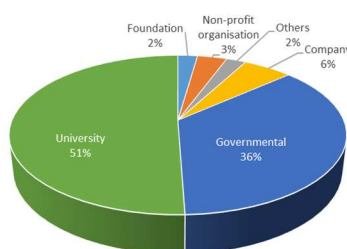


Figure 6: Type of laboratories participating in the survey

The experience in the chemical analysis of human samples was defined as an exclusion criterion (see Table 1) for the selection of laboratories, 80 out of the 83 participating laboratories reported a positive answer. The experience of the participating laboratories in the analysis of the substances included in the first round of prioritisation is shown in Figure 7. There are laboratories with experience in all groups of substances although the number varies from 7 for DINCH or chlorinated flame retardants to 33 in the case of bisphenols or cadmium.

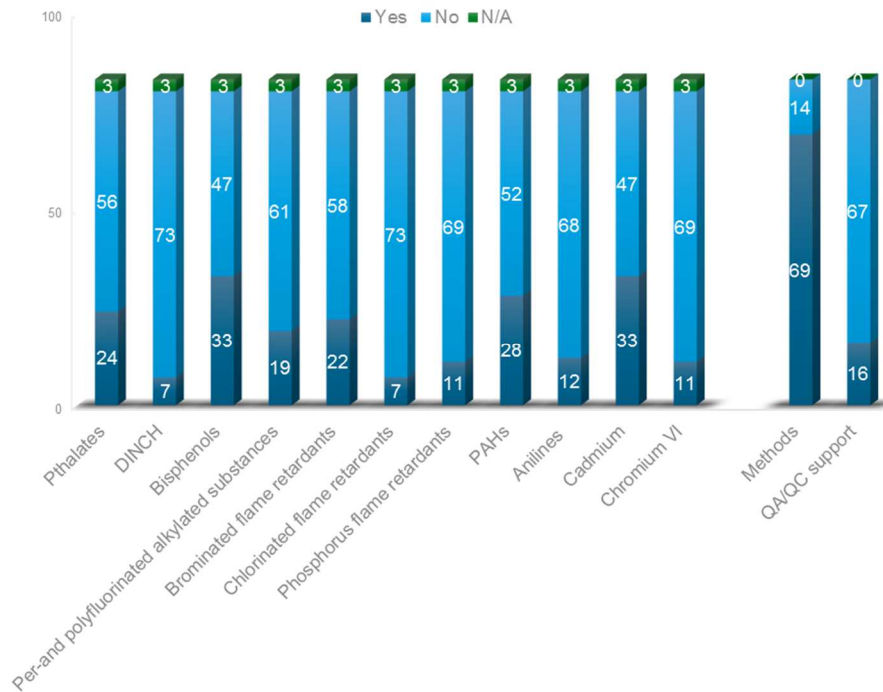


Figure 7: Experience of the laboratories in the analysis of the different prioritised substances, new analytical method development and in organising QA/QC activities

The experience in developing new methods in biological matrices was the exclusion criterion in the section focused on the selection of laboratories for developing new analytical methods (see Table 2). 83% of the participating laboratories reported to have experience in developing new analytical methods in biological matrices. Only 14 did not have experience and therefore they were automatically excluded. Among laboratories with experience, 23 reported experience in developing de novo methods, 21 in the adaptation of existing ones and 25 reported experience in both cases (Figure 8).

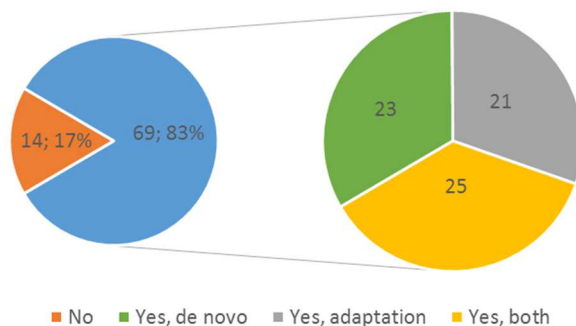


Figure 8: Experience in developing new methods

With respect to the nature of the sample / matrix used, 90% of the laboratories with experience in developing new analytical methods reported experience using human samples, 69% using biological samples, including food stuffs and a total of 59% of the laboratories reported experience in both human samples and biological samples Figure 9.

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 12

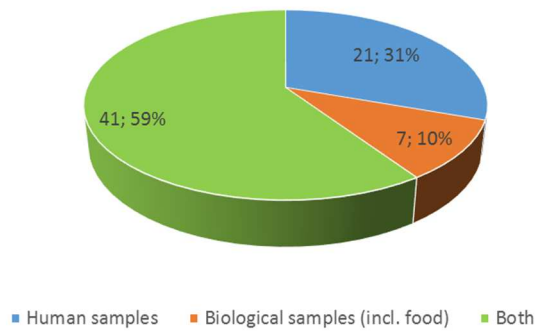


Figure 9: Matrices used in the participating laboratories with experience in developing new methods

According to the information reported, the most of the laboratories that filled in the survey did not have experience in organising Interlaboratory Comparison Investigations (ICIs) (Figure 10). This was the exclusion criterion defined for the section related to the identification of laboratories to support the Quality Assurance and Quality Control activities within HBM4EU (see Table 3). The number of laboratories reporting experience in organising External Quality Assurance Schemes (EQUAS) was even lower (Figure 11).

Regarding the participation as Reference Laboratory in EQUAS involving biological samples, only 27 laboratories reported experience.

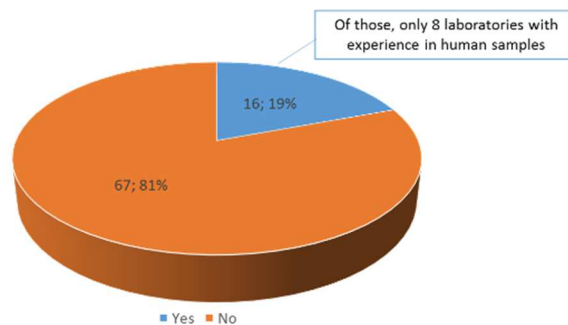


Figure 10: Reported experience in organising ICIs

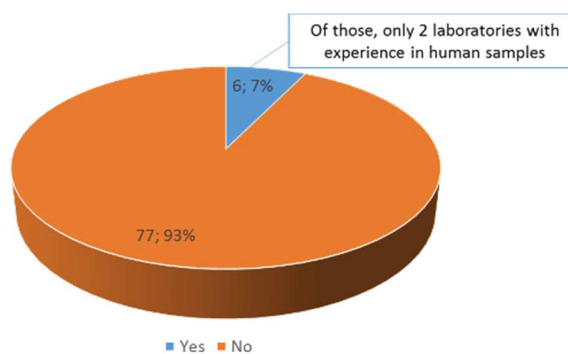


Figure 11: Reported experience in organising EQUAS

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 13

7 Lists of candidate laboratories

7.1 Candidate laboratories to perform the analysis of biomarkers of exposure

For the preparation of the list of candidate laboratories for the analysis of the different substances selected in the 1st round of prioritisation, the results of the surveys completed by 83 European laboratories were blindly evaluated by two independent evaluators: the University Institute for Biomedical and Health Research of the University of Las Palmas de Gran Canaria (ULPGC, Spain) and the the Biomarkers Unit of the National Centre for Environmental Health of the Institute of Health Carlos III (ISCIII, Spain). The evaluation was performed according to the previously established criteria indicated above (Table 1).

Subsequently, the ULPGC calculated the averages of both independent assessments and calculated the coefficient of variation ((standard deviation / mean) x 100). For those laboratories in which the coefficient of variation was higher than 20%, a reevaluation was made and a joint score between the two evaluators was agreed for those criteria in which there was a discrepancy.

The score distribution of the laboratories evaluated for each chemical group was analysed and the 75th, 50th, 25th and 10th percentiles were calculated. Nevertheless, after suggestions received from the Governing Board on the 4th September 2017, it was decided not to apply any cutoff value and exclude only those laboratories who do not accomplished the direct exclusion criterion (i.e. experience in analysing human samples). The scoring obtained will be used after completion of the QA/QC program in case of there would have been more than one laboratory available for a single task.

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 14

7.1.1 Phthalates

Table 4: List of candidate laboratories for the analysis of phthalates

Laboratory/Group	Centre	Country
Testing Laboratory for environmental analysis, GMO and fuel analysis	Umweltbundesamt GmbH	Austria
Department of Pharmaceutical Sciences	University of Antwerpen	Belgium
VITO - goal	VITO	Belgium
Toxicology Lab	CHU-ULg	Belgium
Unit for Chemical Safety of Products	National Institute of Public Health	Czech Republic
Trace Analytical Laboratory	Research Centre for Toxic Compounds in the Environment (RECETOX)	Czech Republic
Department of Food Analysis and Nutrition	University of Chemistry and Technology, Prague	Czech Republic
Chemical Laboratory at Dep. of Growth and Reproduction	Rigshospitalet, Region Hovedstaden (RegionH)	Denmark
Environmental health / Chemical risk team	National institute for health and welfare (THL) / Department of Health Security	Finland
Work Environment Laboratories	Finnish Institute of Occupational Health	Finland
Department Toxicology and Biomonitoring	INRS	France
Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA)	Ruhr-Universität Bochum	Germany
Institute of Biomonitoring	Currenta GmbH&Co.OHG, SEL-SER-GS	Germany
Medizinisches Labor Bremen	Medizinisches Labor Bremen	Germany
Institute and Outpatient Clinic of Occupational, Social and Environmental Medicine (IPASUM)	University of Erlangen-Nuremberg	Germany
Health and Exposome Research Centre (HERACLES)	Aristotle University of Thessaloniki	Greece
Cardiometabolic Risk Unit	Institute of Clinical Physiology CNR	Italy
Dublin Public Analysys Laboratory	HSE	Ireland
Biological Monitoring team	Health & Safety Laboratory	KU
Environmental Exposure and Epidemiology	Norwegian Institute of Public Health	Norway
Physiological Analytical Laboratory	Constantine the Philosopher University in Nitra	Slovakia
Laboratory of Separation Methods	Institute of Chemistry, Faculty of Natural Sciences	Slovakia
Public Health Laboratory of Valencia	Public Health Department	Spain
Occupational and enviromental medicine	Laboratory medicine	Sweden

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 15

Vrije Universiteit Amsterdam	Department Environment & Health	The Netherlands
Environmental Monitoring Sensing and Analyses (EMSA)	the Netherlands Organization for Applied Scientific Research (TNO)	The Netherlands

7.1.2 DINCH

Table 5: List of candidate laboratories for the analysis of DINCH

Laboratory/Group	Centre	Country
Department of Pharmaceutical Sciences	University of Antwerpen	Belgium
VITO - goal	VITO	Belgium
Department of Food Analysis and Nutrition	University of Chemistry and Technology, Prague	Czech Republic
Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA)	Ruhr-Universität Bochum	Germany
Health and Exposome Research Centre (HERACLES)	Aristotle University of Thessaloniki	Greece
Environmental Exposure and Epidemiology	Norwegian Institute of Public Health	Norway
Laboratory of Separation Methods	Institute of Chemistry, Faculty of Natural Sciences	Slovakia
Occupational and environmental medicine	Laboratory medicine	Sweden
IVL Swedish Environmental Research Institute	IVL Swedish Environmental Research Institute	Sweden

7.1.3 Bisphenols

Table 6: List of candidate laboratories for the analysis of bisphenols

Laboratory/Group	Centre	Country
Testing Laboratory for environmental analysis, GMO and fuel analysis	Umweltbundesamt GmbH	Austria
Department of Pharmaceutical Sciences	University of Antwerpen	Belgium
Toxicology Lab	CHU-ULg	Belgium
Laboratory for Occupational and Environmental Hygiene	KU Leuven	Belgium
Water and Health Laboratory	Cyprus International Institute for Environmental and Public Health, Cyprus University of Technology	Cyprus
Unit for Chemical Safety of Products	National Institute of Public Health	Czech Republic
Trace Analytical Laboratory	Research Centre for Toxic Compounds in the Environment (RECETOX)	Czech Republic
Chemical Laboratory at Dep. of Growth and Reproduction	Rigshospitalet, Region Hovedstaden (RegionH)	Denmark
Research Center for Advanced Analytical Chemistry	University of Copenhagen, Faculty of Science, Department of Plant and Environmental Sciences	Denmark

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 16

Laboratory/Group	Centre	Country
Environmental health / Chemical risk team	National institute for health and welfare (THL) / Department of Health Security	Finland
Work Environment Laboratories	Finnish Institute of Occupational Health	Finland
LABERCA	INRA, Oniris	France
INRA Toxalim	INRA	France
Department Toxicology and Biomonitoring	INRS	France
Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA)	Ruhr-Universität Bochum	Germany
HBM Laboratory	BASF SE - Corporate Health Management	Germany
Medizinisches Labor Bremen	Medizinisches Labor Bremen	Germany
Institute of Biomonitoring	Currenta GmbH&Co.OHG, SEL-SER-GS	Germany
Analytical-toxicological laboratory	Institute for Occupational and Social Medicine	Germany
Institute and Outpatient Clinic of Occupational, Social and Environmental Medicine (IPASUM)	University of Erlangen-Nuremberg	Germany
Health and Exposome Research Centre (HERACLES)	Aristotle University of Thessaloniki	Greece
Cardiometabolic Risk Unit	Institute of Clinical Physiology CNR	Italy
Biological Monitoring team	Health & Safety Laboratory	KU
Environmental Exposure and Epidemiology	Norwegian Institute of Public Health	Norway
Laboratory of the Department of Toxicology	Medical University of Gdańsk, Faculty of Pharmacy	Poland
Laboratory of Separation Methods	Institute of Chemistry, Faculty of Natural Sciences	Slovakia
Department of Environmental Sciences	Jozef Stefan Institute	Slovenia
Public Health Laboratory of Valencia	Public Health Department	Spain
Chromatography laboratory - Biomarkers Unit	National Center for Environmental Health Institute of Health Carlos III	Spain
Occupational and environmental medicine	Laboratory medicine	Sweden
IST Laboratory	Work and health Institute	Switzerland
Vrije Universiteit Amsterdam	Department Environment & Health	The Netherlands
Environmental Monitoring Sensing and Analyses (EMSA)	the Netherlands Organization for Applied Scientific Research (TNO)	The Netherlands

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 17

7.1.4 Per and polyfluorinated alkylated substances

Table 7: List of candidate laboratories for the analysis of per and polyfluorinated alkylated substances

Laboratory/Group	Centre	Country
Testing Laboratory for environmental analysis, GMO and fuel analysis	Umweltbundesamt GmbH	Austria
Toxicology Lab	CHU-ULg	Belgium
VITO - goal	VITO	Belgium
Trace Analytical Laboratory	Research Centre for Toxic Compounds in the Environment (RECETOX)	Czech Republic
Department of Food Analysis and Nutrition	University of Chemistry and Technology, Prague	Czech Republic
Environmental Medicine Laboratory, Department of Public Health	University of Southern Denmark	Denmark
Aarhus University	Aarhus University	Denmark
Environmental health / Chemical risk team	National institute for health and welfare (THL) / Department of Health Security	Finland
LABERCA	INRA, Oniris	France
Analytical-toxicological laboratory	Institute for Occupational and Social Medicine	Germany
Laboratory for Water Analysis	Umweltbundesamt (Federal Environment Agency)	Germany
Institute and Outpatient Clinic of Occupational, Social and Environmental Medicine (IPASUM)	University of Erlangen-Nuremberg	Germany
Health and Exposome Research Centre (HERACLES)	Aristotle University of Thessaloniki	Greece
Department of Environment and Health, PAHs and PFAS	Istituto Superiore di Sanità	Italy
Environmental Exposure and Epidemiology	Norwegian Institute of Public Health	Norway
Chromatography laboratory - Biomarkers laboratory	National Center for Environmental Health Institute of Health Carlos III	Spain
Public Health Laboratory of Valencia	Public Health Department	Spain
Occupational and environmental medicine	Laboratory medicine	Sweden
Vrije Universiteit Amsterdam	Department Environment & Health	The Netherlands
Environmental Monitoring Sensing and Analyses (EMSA)	the Netherlands Organization for Applied Scientific Research (TNO)	The Netherlands
RIKILT - Wageningen University and Research	RIKILT - Wageningen University and Research	The Netherlands

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 18

7.1.5 Brominated flame retardants

Table 8: List of candidate laboratories for the analysis of brominated flame retardants

Laboratory/Group	Centre	Country
Testing Laboratory for environmental analysis, GMO and fuel analysis	Umweltbundesamt GmbH	Austria
Department of Pharmaceutical Sciences	University of Antwerpen	Belgium
Organic and Biological Analytical Chemistry (CART)	University of Liege	Belgium
Toxicology Lab	CHU-ULg	Belgium
VITO - goal	VITO	Belgium
Trace Analytical Laboratory	Research Centre for Toxic Compounds in the Environment (RECETOX)	Czech Republic
Department of Food Analysis and Nutrition	University of Chemistry and Technology, Prague	Czech Republic
Aarhus University	Aarhus University	Denmark
Environmental health / Chemical risk team	National institute for health and welfare (THL) / Department of Health Security	Finland
LABERCA	INRA, Oniris	France
Institute of Biomonitoring	Currenta GmbH&Co.OHG, SEL-SER-GS	Germany
Health and Exposome Research Centre (HERACLES)	Aristotle University of Thessaloniki	Greece
Department of Pharmacology and Toxicology	University of Iceland	Iceland
Laboratory of Hygiene and Occupational Diseases	RSU Institute of Occupational and Environmental Health	Latvia
Environmental Exposure and Epidemiology	Norwegian Institute of Public Health	Norway
Department of Toxic Organic Pollutants	Slovenská Zdravotnícka Univerzita v Bratislave	Slovakia
Department of Environmental Sciences	Jozef Stefan Institute	Slovenia
Laboratory of Toxicology	University of Las Palmas de Gran Canaria	Spain
Chromatography laboratory - Biomarkers Unit	National Center for Environmental Health Institute of Health Carlos III	Spain
Public Health Laboratory of Valencia	Public Health Department	Spain
Chemistry Division	National Food Agency	Sweden
Vrije Universiteit Amsterdam	Department Environment & Health	The Netherlands
Environmental Monitoring Sensing and Analyses (EMSA)	the Netherlands Organization for Applied Scientific Research (TNO)	The Netherlands
RIKILT - Wageningen University and Research	RIKILT - Wageningen University and Research	The Netherlands

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 19

7.1.6 Chlorinated flame retardants

Table 9. List of candidate laboratories for the analysis of chlorinated flame retardants

Laboratory/Group	Centre	Country
Department of Pharmaceutical Sciences	University of Antwerpen	Belgium
Organic and Biological Analytical Chemistry (CART)	University of Liege	Belgium
Trace Analytical Laboratory	Research Centre for Toxic Compounds in the Environment (RECETOX)	Czech Republic
Aarhus University	Aarhus University	Denmark
Environmental Exposure and Epidemiology	Norwegian Institute of Public Health	Norway
Laboratory of Toxicology	University of Las Palmas de Gran Canaria	Spain
Vrije Universiteit Amsterdam	Department Environment & Health	The Netherlands

7.1.7 Phosphorus flame retardants

Table 10: List of candidate laboratories for the analysis of phosphorus flame retardants

Laboratory/Group	Centre	Country
Department of Pharmaceutical Sciences	University of Antwerpen	Belgium
VITO - goal	VITO	Belgium
Trace Analytical Laboratory	Research Centre for Toxic Compounds in the Environment (RECETOX)	Czech Republic
Department of Food Analysis and Nutrition	University of Chemistry and Technology, Prague	Czech Republic
Department Toxicology and Biomonitoring	INRS	France
Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA)	Ruhr-Universität Bochum	Germany
Institute and Outpatient Clinic of Occupational, Social and Environmental Medicine (IPASUM)	University of Erlangen-Nuremberg	Germany
Health and Exposome Research Centre (HERACLES)	Aristotle University of Thessaloniki	Greece
Environmental Exposure and Epidemiology	Norwegian Institute of Public Health	Norway
Laboratory of Toxicology	University of Las Palmas de Gran Canaria	Spain
Public Health Laboratory of Valencia	Public Health Department	Spain
Occupational and environmental medicine	Laboratory medicine	Sweden
Vrije Universiteit Amsterdam	Department Environment & Health	The Netherlands

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 20

7.1.8 Polycyclic aromatic hydrocarbons

Table 11. List of candidate laboratories for the analysis of polycyclic aromatic hydrocarbons

Laboratory/Group	Centre	Country
VITO - goal	VITO	Belgium
Laboratory for Occupational and Environmental Hygiene	KU Leuven	Belgium
Laboratory for Food, Medicines and Consumer Safety	Institute for Public Health (WIV-ISP)	Belgium
Trace Analytical Laboratory	Research Centre for Toxic Compounds in the Environment (RECETOX)	Czech Republic
Department of Food Analysis and Nutrition	University of Chemistry and Technology, Prague	Czech Republic
Research Center for Advanced Analytical Chemistry	University of Copenhagen, Faculty of Science, Department of Plant and Environmental Sciences	Denmark
Work Environment Laboratories	Finnish Institute of Occupational Health	Finland
LABERCA	INRA, Oniris	France
Department Toxicology and Biomonitoring	INRS	France
Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA)	Ruhr-Universität Bochum	Germany
ABF Analytisch-Biologisches Labor	ABF GmbH	Germany
Analytical-toxicological laboratory	Institute for Occupational and Social Medicine	Germany
HBM Laboratory	BASF SE - Corporate Health Management	Germany
Medizinisches Labor Bremen	Medizinisches Labor Bremen	Germany
Institute and Outpatient Clinic of Occupational, Social and Environmental Medicine (IPASUM)	University of Erlangen-Nuremberg	Germany
Health and Exposome Research Centre (HERACLES)	Aristotle University of Thessaloniki	Greece
Department of Environment and Health, PAHs and PFAS	Istituto Superiore di Sanità	Italy
Biological Monitoring team	Health & Safety Laboratory	KU
Laboratory of Hygiene and Occupational Diseases	RSU Institute of Occupational and Environmental Health	Latvia
Laboratory of the Department of Toxicology	Medical University of Gdańsk, Faculty of Pharmacy	Poland
Laboratory of Bromatology and Farmacognosy	Faculty of Pharmacy University of Coimbra	Portugal
Food and Nutrition Department	Instituto Nacional de Saúde Dr. Ricardo Jorge, INSA. National Institute of Health	Portugal
Department of chemical analysis	Regional Authority of Public Health	Slovakia
Laboratory of Separation Methods	Institute of Chemistry, Faculty of Natural Sciences	Slovakia

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 21

Laboratory/Group	Centre	Country
Laboratory of Toxicology	University of Las Palmas de Gran Canaria	Spain
Chromatography laboratory - Biomarkers Unit	National Center for Environmental Health, Institute of Health Carlos III	Spain
Instituto de Toxicología de la Defensa	Defense Ministry	Spain
Public Health Laboratory of Valencia	Public Health Department	Spain
Occupational and environmental medicine	Laboratory medicine	Sweden
IST Laboratory	Work and health Institute	Switzerland

7.1.9 Anilines

Table 12: List of candidate laboratories for the analysis of anilines

Laboratory/Group	Centre	Country
Laboratory for Occupational and Environmental Hygiene	KU Leuven	Belgium
Chemical Laboratory at Dep. of Growth and Reproduction	Rigshospitalet, Region Hovedstaden (RegionH)	Denmark
Department Toxicology and Biomonitoring	INRS	France
Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA)	Ruhr-Universität Bochum	Germany
HBM Laboratory	BASF SE - Corporate Health Management	Germany
Institute of Biomonitoring	Currenta GmbH&Co.OHG, SEL-SER-GS	Germany
Analytical-toxicological laboratory	Institute for Occupational and Social Medicine	Germany
ABF Analytisch-Biologisches Labor	ABF GmbH	Germany
Medizinisches Labor Bremen	Medizinisches Labor Bremen	Germany
Institute and Outpatient Clinic of Occupational, Social and Environmental Medicine (IPASUM)	University of Erlangen-Nuremberg	Germany
Health and Exposome Research Centre (HERACLES)	Aristotle University of Thessaloniki	Greece
Biological Monitoring team	Health & Safety Laboratory	KU
Occupational and environmental medicine	Laboratory medicine	Sweden
Alpine Institute of Chemistry and Toxicology	AICT	Switzerland

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 22

7.1.10 Cadmium

Table 13: List of candidate laboratories for the analysis of cadmium

Laboratory/Group	Centre	Country
Testing Laboratory for environmental analysis, GMO and fuel analysis	Umweltbundesamt GmbH	Austria
Toxicology Lab	CHU-ULg	Belgium
AMGC	Vrije Universiteit Brussel	Belgium
Laboratory for Food, Medicines and Consumer Safety	Institute for Public Health (WIV-ISP)	Belgium
Trace elements and nanomaterials	CODA-CERVA	Belgium
Human Biomonitoring and Control of Industrial Products Laboratory	State General Laboratory, Ministry of Health, Republic of Cyprus	Cyprus
Trace Analytical Laboratory	Research Centre for Toxic Compounds in the Environment (RECETOX)	Czech Republic
Aarhus University	Aarhus University	Denmark
Work Environment Laboratories	Finnish Institute of Occupational Health	Finland
Department Toxicology and Biomonitoring	INRS	France
LERES	French School of Public Health - EHESP	France
Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA)	Ruhr-Universität Bochum	Germany
Analytical-toxicological laboratory	Institute for Occupational and Social Medicine	Germany
Institute and Outpatient Clinic of Occupational, Social and Environmental Medicine (IPASUM)	University of Erlangen-Nuremberg	Germany
Health and Exposome Research Centre (HERACLES)	Aristotle University of Thessaloniki	Greece
NPHI - Central Laboratory	National Public Health Institute	Hungary
Dept Environment and Health	Istituto Superiore di Sanità	Italy
Dublin Public Analysys Laboratory	HSE	Ireland
Biological Monitoring team	Health & Safety Laboratory	KU
Laboratory of Hygiene an Occupational Diseases	RSU Institute of Occupational and Environmental Health	Latvia
Laboratory of Analytical Chemistry	University of Latvia Faculty of Chemistry	Latvia
Laboratory of Neurotoxicology, Neuroscience Institute of Lithuanian University of Health Sciences	LSMU Lietuvos sveikatos mokslu universitetas	Lithuania
Metal Analysis Laboratory	Nofer Institute of Occupational Medicine	Poland
Institute for Bioengineering and Biosciences	Instituto Superior Técnico, Universidade de Lisboa	Portugal

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 23

Laboratory/Group	Centre	Country
Food and Nutrition Department	Instituto Nacional de Saúde Dr. Ricardo Jorge, INSA. National Institute of Health	Portugal
Department of metallomics	Slovak Medical University	Slovak Republic
Department of Environmental Sciences	Jozef Stefan Institute	Slovenia
Metals laboratory - Biomarkers Unit	National Center for Environmental Health, Institute of Health Carlos III	Spain
Laboratory of Toxicology	University of Las Palmas de Gran Canaria	Spain
Instituto de Toxicología del a Defensa	Defense Ministry	Spain
Department of Legal Medicine and Toxicology Service	School of Medicine	Spain
Public Health Laboratory of Valencia	Public Health Department	Spain
Redox Biology and Metabolism	Instituto de Investigación Sanitaria del Principado de Asturias (IISPA) - University of Oviedo	Spain
Occupational and enviromental medicine	Laboratory medicine	Sweden
Metals and Health, Institute of Environmental Medicine	Karolinska Institutet	Sweden
IST Laboratory	Work and health Insitute	Switzerland
Environmental Monitoring Sensing and Analyses (EMSA)	the Netherlands Organization for Applied Scientific Research (TNO)	The Netherlands
Inorganic Geochemistry	British Geological Survey	UK

7.1.11 Chromium VI

Table 14: List of candidate laboratories for the analysis of chromium VI

Laboratory/Group	Centre	Country
Laboratory for Occupational and Environmental Hygiene	KU Leuven	Belgium
Work Environment Laboratories	Finnish Institute of Occupational Health	Finland
Department Toxicology and Biomonitoring	INRS	France
Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA)	Ruhr-Universität Bochum	Germany
Institute and Outpatient Clinic of Occupational, Social and Environmental Medicine (IPASUM)	University of Erlangen-Nuremberg	Germany
Health and Exposome Research Centre (HERACLES)	Aristotle University of Thesaloniki	Greece
NPHI - Central Laboratory	National Public Health Institute	Hungary
Dept Environment and Health	Istituto Superiore di Sanità	Italy

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 24

Laboratory of Analytical Chemistry	University of Latvia Faculty of Chemistry	Latvia
Metal Analysis Laboratory	Nofer Institute of Occupational Medicine	Poland
Department of Environmental Sciences	Jozef Stefan Institute	Slovenia
Redox Biology and Metabolism	Instituto de Investigación Sanitaria del Principado de Asturias (IISPA) - University of Oviedo	Spain
Environmental Monitoring Sensing and Analyses (EMSA)	the Netherlands Organization for Applied Scientific Research (TNO)	The Netherlands
Biological Monitoring team	Health & Safety Laboratory	UK
Inorganic Geochemistry	British Geological Survey	UK

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 25

7.2 Candidate laboratories to develop new analytical methods

For the preparation of the list of candidate laboratories for the development of new analytical methods, the results of the surveys completed by 69 European laboratories were blindly evaluated by two independent evaluators: the Laboratoire d'Etude des Résidus et Contaminants dans les Aliments of the French National Institute for Agricultural Research (INRA, France) and the Chromatography Laboratory National Centre for Environmental Health of the Institute of Health Carlos III (ISCIII, Spain). The evaluation was performed according to the established criteria indicated above (Table 2).

Subsequently, the ULPGC calculated the averages of both independent assessments and calculated the coefficient of variation ((standard deviation / mean) x 100). For those laboratories in which the coefficient of variation was higher than 20%, a reevaluation was made and a joint score between the the ULPGC and ISCIII was agreed for those criteria in which there was a discrepancy.

The score distribution of the laboratories evaluated was analysed and the 75th, 50th, 25th and 10th percentiles were calculated. The cutoff value was set at the 10th percentile, and the candidate laboratories are the following:

Table 15: List of candidate laboratories to develop new analytical methods

Laboratory/Group	Centre	Country
Institute of Legal Medicine and Core Facilityx Metabolomics	Medical University of Innsbruck	Austria
Testing Laboratory for environmental analysis, GMO and fuel analysis	Umweltbundesamt GmbH	Austria
VITO - goal	VITO	Belgium
Laboratory of Food Analysis, Department of Bioanalysis	Ghent University	Belgium
Laboratory for Occupational and Environmental Hygiene	KU Leuven	Belgium
Toxins and natural components	CODA-CERVA	Belgium
Trace elements and nanomaterials	CODA-CERVA	Belgium
Organic and Biological Analytical Chemistry (CART)	University of Liege	Belgium
Toxicology Lab	CHU-ULg	Belgium
Laboratory for Food, Medicines and Consumer Safety	Institute for Public Health (WIV-ISP)	Belgium
Department of Pharmaceutical Sciences	University of Antwerpen	Belgium
Centre for Environmental Sciences	Hasselt University	Belgium
AMGC	Vrije Universiteit Brussel	Belgium
Human Biomonitoring and Control of Industrial Products Laboratory	State General Laboratory, Ministry of Health, Republic of Cyprus	Cyprus
Water and Health Laboratory	Cyprus International Institute for Environmental and Public Health, Cyprus University of Technology	Cyprus

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 26

Laboratory/Group	Centre	Country
Trace Analytical Laboratory	Research Centre for Toxic Compounds in the Environment (RECETOX)	Czech Republic
Research Center for Advanced Analytical Chemistry	University of Copenhagen, Faculty of Science, Department of Plant and Environmental Sciences	Denmark
Aarhus University	Aarhus University	Denmark
Chemical Laboratory at Dep. of Growth and Reproduction	Rigshospitalet, Region Hovedstaden (RegionH)	Denmark
Environmental Medicine Laboratory, Department of Public Health	University of Southern Denmark	Denmark
Work Environment Laboratories	Finnish Institute of Occupational Health	Finland
Environmental health / Chemical risk team	National institute for health and welfare (THL) / Department of Health Security	Finland
LABERCA	INRA, Oniris	France
INRA Toxalim	INRA	France
Department Toxicology and Biomonitoring	INRS	France
ABF Analytisch-Biologisches Labor	ABF GmbH	Germany
Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA)	Ruhr-Universität Bochum	Germany
Institute of Biomonitoring	Currenta GmbH&Co.OHG, SEL-SER-GS	Germany
Medizinisches Labor Bremen	Medizinisches Labor Bremen	Germany
Analytical-toxicological laboratory	Institute for Occupational and Social Medicine	Germany
HBM Laboratory	BASF SE - Corporate Health Management	Germany
Department of Environment and Health, PAHs and PFAS	Istituto Superiore di Sanità	Italy
Dept Environment and Health	Istituto Superiore di Sanità	Italy
Cardiometabolic Risk Unit	Institute of Clinical Physiology CNR	Italy
Laboratory of Hygiene and Occupational Diseases	RSU Institute of Occupational and Environmental Health	Latvia
Environmental Exposure and Epidemiology	Norwegian Institute of Public Health	Norway
Laboratory of the Department of Toxicology	Medical University of Gdańsk, Faculty of Pharmacy	Poland
Institute for Bioengineering and Biosciences	Instituto Superior Técnico, Universidade de Lisboa	Portugal
Mass Spectrometry Laboratory	Centro de Química Estrutural, Instituto Superior Técnico	Portugal
Food and Nutrition Department	Instituto Nacional de Saúde Dr. Ricardo Jorge, INSA. National Institute of Health	Portugal

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 27

Laboratory/Group	Centre	Country
Strutural Analysis Laboratory	Pharmacy Faculty of Lisbon	Portugal
Laboratory of Bromatology and Farmacognosy	Faculty of Pharmacy University of Coimbra	Portugal
Grupo ProNutri, Cintesis-NMS	NOVA Medical School Faculdade de Ciências Médicas da Universidade Nova de Lisboa	Portugal
Department of metallomics	Slovak Medical University	Slovak Republic
Department of chemical analysis	Regional Authority of Public Health	Slovakia
Laboratory of Separation Methods	Institute of Chemistry, Faculty of Natural Sciences	Slovakia
Department of Toxic Organic Pollutants	Slovenská Zdravotnícka Univerzita v Bratislave	Slovakia
Laboratory of Multidimensional Gas Chromatography	Faculty of Chemical and Food Technology, STUBA	Slovakia
Department of Environmental Sciences	Jozef Stefan Institute	Slovenia
Public Health Laboratory of Valencia	Public Health Department	Spain
Laboratory of Toxicology	ULPGC	Spain
Chromatography laboratory - Biomarkers Unit	National Center for Environmental Health, Institute of Health Carlos III	Spain
Laboratorio de Salud Pública del Gobierno Vasco	Direccion de Salud del Departamento de Salud del Gobierno Vasco	Spain
Department of Legal Medicine and Toxicology Service	School of Medicine	Spain
Redox Biology and Metabolism	Instituto de Investigación Sanitaria del Principado de Asturias (IISPA) - University of Oviedo	Spain
Chemistry Analytical of Contaminants	University of Almeria	Spain
Occupational and enviromental medicine	Laboratory medicine	Sweden
Metals and Health, Institute of Environmental Medicine	Karolinska Institutet	Sweden
Alpine Institute of Chemistry and Toxicology	AICT	Switzerland
Vrije Universiteit Amsterdam	Department Environment & Health	The Netherlands
Inorganic Geochemistry	British Geological Survey	UK
Biological Monitoring team	Health & Safety Laboratory	UK

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 28

7.3 Candidate laboratories to support the QA/QC activities in WP9

For the preparation of the list of candidate laboratories to support the QA/QC activities, the results of the surveys completed by 16 European laboratories were blindly evaluated by two independent evaluators: the Chemical Testing Department of the National Public Health Surveillance Laboratory (NPHSL, Lithuania) and the Quality Assurance Unit of the National Centre for Environmental Health of the Institute of Health Carlos III (ISCIII, Spain). The evaluation was performed according to the established criteria indicated above (Table 3).

Subsequently, the ULPGC calculated the averages of both independent assessments and calculated the coefficient of variation ((standard deviation / mean) x 100). For those laboratories in which the coefficient of variation was higher than 20%, a reevaluation was made and a joint score between the the ULPGC and ISCIII was agreed for those criteria in which there was a discrepancy.

The score distribution of the laboratories evaluated was analysed and the 75th, 50th, 25th and 10th percentiles were calculated. The cutoff value was set at the 10th percentile, and the candidate laboratories are the following:

Table 16: List of candidate laboratories to support the QA/QC activities

Laboratory/Group	Centre	Country
VITO - goal	VITO	Belgium
Toxins and natural components	CODA-CERVA	Belgium
Organic and Biological Analytical Chemistry (CART)	University of Liege	Belgium
Laboratory for Food, Medicines and Consumer Safety	Institute for Public Health (WIV-ISP)	Belgium
Department of Food Analysis and Nutrition	University of Chemistry and Technology, Prague	Czech Republic
Aarhus University	Aarhus University	Denmark
LABERCA	INRA, Oniris	France
Institute for Prevention and Occupational Medicine of the German Social Accident Insurance (IPA)	Ruhr-Universität Bochum	Germany
ABF Analytisch-Biolotisches Labor	ABF GmbH	Germany
Institute and Outpatient Clinic of Occupational, Social and Environmental Medicine (IPASUM)	University of Erlangen-Nuremberg	Germany
Health and Exposome Research Centre (HERACLES)	Aristotle University of Thessaloniki	Greece
Environmental Exposure and Epidemiology	Norwegian Institute of Public Health	Norway
Food and Nutrition Department	Instituto Nacional de Saúde Dr. Ricardo Jorge, INSA. National Institute of Health	Portugal
Department of Environmental Sciences	Jozef Stefan Institute	Slovenia
Biomarkers Unit	National Center for Environmental Health, Institute of Health Carlos III	Spain
Vrije Universiteit Amsterdam	Department Environment & Health	The Netherlands

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 29

RIKILT - Wageningen University and Research	RIKILT - Wageningen University and Research	The Netherlands
Inorganic Geochemistry	British Geological Survey	UK

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 30

7.4 Concluding remarks

- The evaluation has been done in the required period.
- Three databases were set up as agreed.
- The questionnaire was completed by laboratories from 24 countries. Laboratories from Luxembourg and Hungary are not included in this deliverable because their inclusion in the Consortium was approved after the finalization of the process for elaborating the databases.
- Some problems with the prioritization of the evaluation criteria were detected.
- Based upon the experience, the questionnaires and the evaluation criteria will be updated in the future.

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 31

7.5 Annex 1

Table 17: Laboratories identified by the NHCPs^{1, 2}.

Country	Name of laboratory
Austria	Medical University of Innsbruck, Institute of Legal Medicine and Core Facility Metabolomics
Austria	Medical University of Vienna, Institute of Medical Genetics
Austria	Umweltbundesamt GmbH, Business Development Environmental Analysis
Belgium	Centre for Environment & Health, - Catholic University of Leuven
Belgium	Centre for Environmental Sciences, Hasselt University
Belgium	Chemistry Department, Organic & Biological Analytical Chemistry, University of Liège
Belgium	DEPARTEMENT LEEFMILIEU, Provincial Institute of Hygiene (PIH)
Belgium	Food, Medicines and Consumer Safety, - The Scientific Institute of Public Health
Belgium	Lab. of Chemical Analysis, Dpt. of Veterinary Public Health & Food Safety, Ghent University
Belgium	Laboratory of Clinical, Forensic and Environmental Toxicology, University of Liege - Centre Hospitalier Universitaire de Liège
Belgium	Laboratory of Food Analysis, Faculty of Pharmaceutical Sciences, Ghent University
Belgium	Laboratory of Industrial and Environmental Toxicology , Université catholique de Louvain
Belgium	Toxicological Center, University of Antwerp
Belgium	Veterinary and Agrochemical Research Centre
Belgium	VITO-Unit Environmental Risk and Health, Flemish Institute for Technological Research (VITO)
Belgium	Vrije Universiteit Brussel (VUB), Department of Analytical, Environmental and Geo-Chemistry (AMGC)
Cyprus	Human Biomonitoring and Industrial Products Laboratory, Cyprus State General Laboratory, Ministry of Health
Cyprus	Volatolomics Laboratory, Cyprus University of Technology
Cyprus	Water and Health Lab, Cyprus University of Technology
Czech Republic	Centre for Health and Environment - Unit for element analysis
Czech Republic	Centre of Toxicology and Health Safety - Unit for Chemical Safety of Products
Czech Republic	Czech University of Life Sciences
Czech Republic	Metrological and Testing Laboratory at the Department of Food Analysis and Nutrition
Czech Republic	Research Centre for Toxic Compounds in the Environment (RECETOX)

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 32

Country	Name of laboratory
Denmark	Dept. of Clinical Biochemistry and Pharmacology Odense University Hospital in collaboration with Environmental Medicine, SDU
Denmark	Dept. of Growth and Reproduction, Copenhagen University Hospital (Rigshospitalet)
Denmark	Environmental Chemistry, Aarhus University
Denmark	Environmental Health, Århus University
Denmark	Environmental Health, University of Copenhagen
Denmark	Environmental Medicine, University of Southern Denmark
Denmark	Eurofins
Denmark	Institute of Pharmacy, University of Copenhagen
Denmark	National Food Institute
Denmark	National Research Centre for the Working Environment
Denmark	Research Center for Advanced Analytical Chemistry (RAACE), University of Copenhagen
Finland	National Institute for Health and Welfare (THL)
Finland	Work Environment laboratory of the Finnish Institute of Occupational Health
France	Centre de Biologie et de Recherche en Santé (CBRS)
France	Ecotoxicology unit
France	Institut des sciences analytiques et de physico-chimie pour l'environnement et les matériaux
France	LABERCA
France	LERES
France	Physico et Toxico Chimie de l'environnement
France	Service central d'analyses
France	TOXALIM
France	UMR 0496 Service de Pharmacologie et d'Immunoanalyse (SPI)
Germany	ABF GmbH
Germany	BASF SE Occupational Medicine and Health Protection
Germany	Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit, Umweltmedizin/Biomonitoring
Germany	Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit, Umweltmedizin/Biomonitoring

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 33

Country	Name of laboratory
Germany	Biochemisches Institut für Umweltcarcinogene
Germany	Chemisches und Veterinäruntersuchungsamt Münsterland-Emscher-Lippe
Germany	Cur-SI-GS-Institut für Biomonitoring, Currenta GmbH & Co. OHG
Germany	Eurofins GfA Lab Service GmbH
Germany	Helmholtz Zentrum München, Institut für Ökologische Chemie
Germany	Institut für Arbeitsmedizin und Sozialmedizin, Uniklinik RWTH Aachen
Germany	Institut für Laboratoriumsmedizin, Mikrobiologie und Umwelthygiene, Klinikum Augsburg
Germany	Institut und Poliklinik für Arbeits-, Sozial- und Umweltmedizin der Universität Erlangen-Nürnberg
Germany	IPA Institut für Prävention und Arbeitsmedizin der Deutschen Gesetzlichen Unfallversicherung als Institut der Ruhr-Universität Bochum
Germany	Medizinisches Labor Bremen (MLHB)
Germany	Ruhr-Universität Bochum, Institut für Hygiene, Sozial- und Umweltmedizin
Germany	synlab Medizinisches Versorgungszentrum, Trier GmbH
Germany	Umweltbundesamt, FG II
Iceland	Department of Pharmacology and Toxicology at the University of Iceland
Iceland	Mátis Ltd. - Icelandic Food and Biotech R&D
Ireland	Public Analyst Laboratory, Sir Patrick Dun's Hospita
Ireland	Public Analyst's Laboratory, Chemical testing Laboratory, St Finbarr's Hospital
Israel	National Public Health Laboratory, Public Health National Laboratory at the Israel Ministry of Health
Italy	Istituto Superiore di Sanita
Italy	Centro di Riferimento per la Medicina di Genere
Latvia	Department of Analytical Chemistry of Latvian University
Latvia	Joint Laboratory of Clinical Immunology and Immunogenetics (RSU)
Latvia	Laboratory of Biochemistry of Rīga Stradiņš University
Latvia	Laboratory of Food and Environmental Investigations, Institute of Food Safety, Animal Health and Environment
Latvia	Laboratory of Hygiene and Occupational Diseases of Rīga Stradiņš University
Latvia	Laboratory of Molecular Genetics, Institute of Oncology (RSU)

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 34

Country	Name of laboratory
Latvia	The Scientific Laboratory of Molecular Genetics of Rīga Stradiņš University
Lithuania	Laboratory of Neurotoxicology, Neuroscience Institute, Lithuanian University of Health Sciences (LSMU)
Netherlands	Center for Health Protection
Netherlands	Environment & Health division
Netherlands	IRAS
Netherlands	Research Lab Molecular Epidemiology, Radboud Institute for Health Sciences
Netherlands	RIKILT – Wageningen University & Research
Netherlands	TNO
Norway	Department of Environmental Exposure and Epidemiology at the Norwegian Institute of Public Health
Norway	Norwegian Institute for Air Research, Environmental Chemistry Department
Norway	University Hospital North Norway, Laboratory for Environmental Contaminants
Poland	Gdansk University of Technology, Department of Analytical Chemistry
Poland	Medical University of Gdansk, Department of Toxicology
Poland	National Institute of Public Health – National Institute of Hygiene (NIPH – NIH)
Poland	Nofer Institute of Occupational Medicine (NIOM)
Portugal	Grupo ProNutri, Cintesis, NOVA Medical School Faculdade de Ciências Médicas da Universidade Nova de Lisboa
Portugal	Institute for Bioengineering and Biosciences (IBB), Instituto Superior Técnico
Portugal	Instituto Nacional de Saúde Doutor Ricardo Jorge (INSA): Departamento de Alimentação e Nutrição (DAN)
Portugal	Laboratório de Bromatologia
Portugal	Laboratório de Espectrometria de Massa do Centro de Química Estrutural, IST
Portugal	Nova Medical School Faculdade de Ciências Médicas
Portugal	REQUIMTE-LAQV-ISEP
Portugal	Structural Analysis Laboratory
Slovakia	Department of Metalomic, Medical Faculty, Slovak Medical University
Slovakia	Department of Toxic Organic Pollutants, National Reference Centre for Dioxins and related compounds, Medical Faculty, Slovak Medical University
Slovakia	Slovak University of Technology in Bratislava

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 35

Country	Name of laboratory
Slovakia	Institute of Chemistry - Faculty of Natural Sciences Comenius University in Bratislava:
Slovakia	National reference center for laboratory diagnostics in the field of human monitoring, Regional Public Health Authority in Banská Bystrica
Slovakia	Physiological Analytical Laboratory, Constantine the Philosopher University
Slovakia	Institute of Chemistry - Faculty of Natural Sciences Comenius University in Bratislava
Slovenia	Department of Environmental Sciences, Jozef Stefan Institute
Spain	BIODONOSTIA, instituto de investigación sanitaria
Spain	Centro de instrumentación científica; Servicio de biología fundamental, Unidad de Bioanálisis (Centro de Investigación Biomédica (CIBM), Universidad de Granada)
Spain	Centro de Investigación en Medio Ambiente y Salud (CYSMA) de la Universidad de Huelva
Spain	Centro de Investigaciones Biológicas-CIB, CSIC
Spain	CNSA-ISCIH
Spain	FISABIO (Fundación para el Fomento de la Investigación Sanitaria y Biomédica de la Comunitat Valenciana)
Spain	FISABIO-Salud Pública
Spain	Grupo de investigación "Métodos Instrumentales Aplicados", Departamento de Química Analítica, Facultad de Química, Universidad de Murcia
Spain	Grupo de investigación cromatografía analítica de compuestos de interés ambiental y alimentario, Facultad de Ciencias Químicas, UCM
Spain	Grupo de Investigación de determinación de trazas, especiación y proteómica (TrEP), Facultad de Ciencias Químicas, UCM
Spain	Grupo investigación Química de Plaguicidas, Contaminación Agroalimentaria, Ecoeficiencia y Toxicología, Dpto. Química Agrícola, Geología y Edafología, Facultad de Química, Universidad de Murcia
Spain	IMIM (Instituto Hospital del Mar de Investigaciones Médicas). Grupo de Epidemiología ocupacional y ambiental
Spain	Instituto de Diagnóstico Ambiental y Estudios del Agua (CSIC)
Spain	Instituto de Investigación Biosanitaria -University of Granada
Spain	Instituto de química Orgánica General del CSIC. Análisis Instrumental y Química Ambiental (AIQA). Laboratorio de Química Ambiental (QA)
Spain	Instituto de Toxicología de la Defensa
Spain	Instituto Interuniversitario de Investigación en Bioingeniería y Tecnología Orientada al Ser Humano
Spain	Instituto Nacional de Seguridad e Higiene En El Trabajo
Spain	Laboratorio Analítico Bioclínico S.L.U
Spain	Laboratory de Toxicología y Salud Ambiental, Facultad de Medicina y Ciencias de la Salud, IISPV, Universidad Rovira i Virgili

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 36

Country	Name of laboratory
Spain	Laboratory of Toxicology and Environmental Health
Spain	Metabolomics platform
Spain	ULPGC toxicology group
Spain	Universidad de Almeria
Spain	Universidad de Granada
Spain	Universidad de Oviedo
Sweden	Swedish University of Agricultural Sciences, Department of Aquatic Sciences and Assessment
Sweden	Gothenburg University, Dep of Occupational and Environmental medicine
Sweden	Institute of Environmental Medicine, Karolinska Institutet
Sweden	IVL Swedish Environmental Research Institute
Sweden	Lund University, Occupational and Environmental Medicine
Sweden	National Food Agency
Sweden	Örebro Univeristy
Sweden	Sahlgrenska university Hospital, Department of Clinical Chemistry
Sweden	Stockholm University, Department of Environmental Science and Analytical Chemistry, ACES
Sweden	Umeå University, Department of Chemistry
Sweden	Unit for toxicological sciences, Karolinska Institute (Swetox)
Switzerland	Alpine Institute of Chemistry and Toxicology (AICT)
Switzerland	Bundesamt für Lebensmittelsicherheit und Veterinärwesen
Switzerland	ETH Zurich
Switzerland	Federal Office for the Environment FOEN, Air Pollution Control and Chemicals Division
Switzerland	Institut Universitaire romand de Santé au Travail
Switzerland	Swiss Centre for Applied Human Toxicology
Switzerland	Swiss Federal Institute of Aquatic Science and Technology (EAWAG)
Switzerland	University of Lausanne, Institut universitaire romand de Santé au Travail (IST)
Switzerland	University of Zurich, Institut für Pharmakologie und Toxikologie

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 37

Country	Name of laboratory
Switzerland	Faculty of Medicine
Switzerland	School of Pharmaceutical Sciences
KU	British Geological Survey of Environmental Research Centre
KU	Health and Safety Laboratory

¹ Different departments/units from the same institution are not specified in the table.

² This list comprises the contacts identified by the National Hub Contact Points. Not all laboratories completed the questionnaire and therefore were not included in the evaluation.

D 9.3 - Database of candidate laboratories for the 1 st prioritisation round of substances	Security: Public
WP9 - Laboratory analysis and quality assurance	Version: 2.0
Authors: Octavio Pérez, Marta Esteban and Argelia Castaño	Page: 38

7.6 Annex 2

Table 18: Laboratories identified by the NHCPs in the extraordinary round 2018^{1, 2}.

Country	Name of laboratory
Croatia	Croatian National Institute of Public Health
Czech Republic	Department of Food Analysis and Nutrition. University of Chemistry and Technology, Prague
Germany	Institute and Outpatient Clinic of Occupational, Social and Environmental Medicine (IPASUM) . University of Erlangen-Nuremberg
Greece	Health and Exposome Research Centre (HERACLES) . Aristotle University of Thessaloniki
Hungary	Central Laboratory. National Public Health Institute
Ireland	Dublin Public Analysys Laboratory, HSE
Iceland	Department of Pharmacology and Toxicology. University of Iceland
Latvia	Laboratory of Analytical Chemistry. University of Latvia Faculty of Chemistry
Luxembourg	Laboratoire National de la Santé du Luxembourg (LNS)
Netherlands	RIKILT - Wageningen University and Research