

PROTECTING THE POPULATIONS FROM CHEMICALS:

FOCUS ON SANTÉ PUBLIQUE FRANCE'S
EXPERTISE AND ACTIVITIES





Santé publique France's expertise is focused on human and public health. It aims to understand, inform and protect the population.

Regarding chemicals, Santé publique France supports the EU's ambition for Zero Pollution of air, water and soil - building a Healthier Planet for Healthier People.

A high-level of expertise in environmental and occupational health devoted to health protection: for more than 20 years, Santé publique France has been developing original and multidisciplinary approaches, based on a continuum of actions, from epidemiological surveillance to health protection and promotion. Its activities are connected to the priorities of the Ministry of Health and support recommendations to improve health and prevent the population from environmental threats.

Focusing on populations, health inequalities and real-life data: Santé publique France's expertise is based on a population approach and gives special attention to vulnerable populations as well as health inequalities. In addition, in a context in which environmental risks are a growing issue for the population, Santé publique France has also developed several approaches to communicate and explain its expertise to the public using different media outlets (website, social networks, public meetings). Where regulatory chemical risk assessments are mostly based on mathematical modelling or laboratory tests, Santé publique France's innovative approach enables the Agency to estimate real-life levels of chemical exposure and the burden on health.

Santé publique France: a national public health institute dedicated to health protection placing the environmental health in its top priorities

Santé publique France was created on April 27, 2016 as France's national public health agency. It is the result of the merger of three previous agencies, including the 'Institut de veille sanitaire (InVS)'. Santé publique France applies a population-based approach with the objective of reducing the impact of health determinants in all areas of public health including social inequalities, infectious diseases, non-communicable diseases and environmental and occupational health.

Santé publique France,

- > analyses up-to-date knowledge and data on the determinants of health and particularly modifiable risk factors;
- > provides decision makers at all levels with independent evidence-based guidance and recommendations, through expert committees;
- > proposes measures to health authorities to protect the population from health threats;

- > develops evidence-based interventions for health prevention and promotion;
- > contributes to preparedness and management of health crises, and provides support for the implementation of response plans;
- > promotes values openness and dialogue with stakeholders and the civil society which are founding principles of Santé publique France.

In addition to its central office located in a suburb of Paris, Santé publique France has also a representation in each French administrative district, including overseas territories. This wide-spread regional representation enables Santé publique France to carry out its expertise at territorial level.



Environmental and occupational health: more than 20 years' experience focused on the estimation of health impacts of environmental threats and dedication to health protection

Santé publique France inherited from InVS significant experience and expertise in environmental and occupational health, including in HBM. Understanding health impacts and protecting populations from environmental threats, including the occupational environment as one of the top six priorities for Santé publique France. Around 70 health professionals are devoted to this priority at both the national level and regional offices.

PRODUCE FAIR DATA AND PROVIDE PUBLIC INFORMATION

The activities of Santé publique France in the field of environmental health and the health impacts of chemicals rely largely on global population approaches. In complementarity to regulatory risk assessments, Santé publique France develops robust epidemiological surveillance systems that aim to provide scientific evidence on the health impacts of environmental and food threats. The outcomes of its activity are:



- > **introducing and analysing the scientific evidence** to provide recommendations to the national authorities to promote healthy environments, as well as
- > **informing and disseminating individual recommendations to improve health at the individual's level.** In this context, and for more than 20 years, Santé publique France has developed its experience advocating for the implementation of health in all public policies at the local, national and international level. Santé publique France's activities also focus on individual prevention and the Agency develops tools and strategies to inform the population on the best practices to reduce their exposure, taking into consideration the reduction of health, social and environmental inequalities. Santé publique France has also developed numerous alliances and influenced strategies to improve its efficiency regarding the protection of the population. For instance, regarding environmental threats, Santé publique France interacts with the other national institutes such as Anses (French national agency in charge of environmental, food and occupational risk assessment) or Ineris (French public institute in charge of environmental and industrial risk) that are involved in the regulation of toxicological and risk assessment processes.

Santé publique France also developed dialogue fora along with the major national and local NGOs and citizens, for instance during public meetings. For more than 25 years, the active development of a broad field of interdisciplinary expertise in the major environmental public health issues, has allowed major knowledge to emerge regarding the impact of climate change, air and land quality and exposure to chemicals.

KEY EXPERTISE AND SKILLS

Key expertise and skills of Santé publique France include

- > combining environmental and health data;
- > providing recommendations to regulation bodies and public policies based on scientific

evidence to promote health at various intervention levels;

- > informing or developing dialogues with an array of national and international stakeholders and citizens.

Regarding health impact assessments of chemical exposures, Santé publique France's activities are focused on major public health issues, including substances such as endocrine disruptors, pesticides, heavy metals (lead, cadmium, mercury, arsenic) and persistent organic pollutants.

The Occupational and Environmental Health division has developed significant and interdisciplinary expertise that enables the Agency to develop estimates of levels of chemical exposure for humans, combining several approaches such as geographic based indicators, occupational exposure assessments (job exposure matrix) and direct exposure assessments through biomonitoring. The Division is responsible for large surveys at national and regional levels, including in hot-spot areas (former landmines or large industrial areas).

Regarding endocrine disruptors, Santé publique France has initiated an international network, HUman Reproductive health and Global Environment NeTwork (HURGENT) that aims at defining reproductive health indicators based on an international literature reviews¹. From this network; Santé publique France has developed a nationwide surveillance system that enables the Agency to estimate the burden of exposure to endocrine disruptors on reproductive health. Along with the WHO-IARC programme, Santé publique France also recently contributed to estimating the environmental burden of disease for cancer. In the specific area of nanoparticles, at the request of the Ministry of Health, Santé publique France set up a cohort to estimate the health impacts on workers exposed to manufactured nanoparticles. Santé publique France also set up two large cohorts, COSET-RSA (agricultural workers) and COSET-RSI (independent workers) to assess the impact of occupational environment on health, both of them including 30,000 workers.

20 YEARS OF EXPERIENCE IN HUMAN BIOMONITORING

For more than 20 years, Santé publique France has also been leading the national biomonitoring programme, part of the National Environmental and Occupational Health Plans since 2004. Santé publique France was one of the first European institutes to develop major studies that combine exposure and health indicators (ENNS – 2006, 2007^{2,3,4} and Esteban -2014 -2016).

In addition to these studies, Santé publique France has also developed large studies at the population level, including vulnerable populations or territories (and overseas territories):

- > Lead and children: efficiency of French public regulation on lead, combining biomonitoring and saturnism surveillance systems – both in French metropolitan conditions and in French Guyana
- > Waste incinerators and PCDD/F and PCB exposure along with Anses
- > Consumption of freshwater fish and PCB and perfluorinated compounds (ICAR-PCB⁵) along with Anses
- > Chlordcone in French Caribbeans, Kannari⁶ along with Anses
- > Pregnant women and foetal exposure (**Elfe**^{7,8,9}) along with Inserm
- > Studies in the vicinity of former mining sites in France along with Ineris (St Laurent le Minier, Sites miniers du Gard, Neuves-Maisons)¹⁰
- > **PestiRiv**¹¹, along with Anses at the vicinity of vineyards (to be launched in 2021).

Each of these studies provides results combining biomonitoring exposure and environmental and/or food exposure data. These studies have also led to a large number of scientific publications but also institutional reports of recommendations to adapt local policies and promote the best possible individual behaviour practices to decrease exposure to chemicals. Santé publique France establishes alliances with national and regional institutes working on environment and food exposure assessments to provide the best recommendations. In addition, large consultations are set up with authorities and stakeholders such as non-governmental organization or citizens.

SANTÉ PUBLIQUE FRANCE AT THE INTERFACE OF THE STAKEHOLDERS

As the leader of the French biomonitoring programme, Santé publique France has structured the national network of expertise in the field of biomonitoring. In particular, in the field of the biometrology, Santé publique France has recently worked alongside Leres; Inserm and INRAE at the French level and Inspq (Québec) at the international level to develop and support a national analytical platform and the development of innovative methods, such as non-target analyses, new biomarkers of exposure and a biomarker of effects. Santé publique France also promotes the implementation of biomonitoring data in risk assessment and regulation of chemicals as biomonitoring programmes provide information of exposure level to a large range of contaminants, allows for the identification of the determinants of exposure on which environment or food regulation might be recommended. Santé publique France has also recommended and contributed to Anses expertise to develop several health based guidance values. Santé publique France also has significant experience building large biobanks of samples¹².

The data from biomonitoring programmes are also useful to develop information tools based on science to promote information and health. Santé publique France developed in 2019 the website (<https://www.agir-pour-bebe.fr>) which was presented to ECHA as part of the activities of the Communicators' network and contributed to the chlordcone info website (<https://www.chlordecone-infos.fr>)

Santé publique France has developed a comprehensive set of approaches to translate scientific knowledge for decision makers and to inform the

population about their exposure to environmental threats. This includes explaining levels of risk and exposure, preventive measures, participation in public meetings, developing websites and providing information on the social media networks. Santé publique France has also developed the Geodes website (geodes.santepubliquefrance.fr) in which health indicators are mapped. This tool provides the geographical distribution of all health indicators that Santé publique France produces and, as such, contributes to improving transparency and the dialogue with the society.



International leadership and experience



Santé publique France has a strict policy prior to engage in with European and International activities, given its primary role responding to national authorities' requests and its external funding requirements. Nevertheless, Santé publique France has been involved in several European projects and networks in different areas of public health.

INVOLVEMENT OF MAJOR EU PROJECTS AND NETWORKS

Santé publique France, and in particular the Environmental and Occupational Health division, has demonstrated its capacity to coordinate the Aphekomp project (2008-2011) focusing on the health impacts of air quality. The EU commission in 2012 recognized the leadership of Santé publique France. Our capacity to coordinate an EU project was underlined when Aphekomp was

mentioned as one of the best projects funded for the health category since 2003¹³. Moreover, Aphekomp was nominated for the European Health Award from the Gastein Forum in 2013. The Environmental and Occupational Health division was actively involved in the EC-Funded project: Triple S (on real-time surveillance) which was coordinated by InVS/Santé publique France. More recently, Santé publique France has been coordinating the Innovation work package of the Joint Action Infact "Information for action" which aims at developing a European Infrastructure for Health Data to be used by specific national networks and European thematic networks, potentially including Environmental and Occupational Health networks. Santé publique France is also currently engaged in the implementation and analysis of the Global Burden of Diseases (GBD) study based on the experience of the European

GBD network and Infact partners, taking stock of its experience with IARC and with WHO for the Environmental Burden of Disease.

Santé publique France has developed over more than 25 years of experience and expertise in terms of setting up large population surveys, performing quantitative risk assessments at population level, undertaking field investigations in highly polluted areas (hot spots) and in the coordination and implementation of the national HBM programme^{14,15}. This experience and know-how can easily be transferred to other EU Member State. In addition, Santé publique France has developed a set of tools and approaches to assess and understand the social, societal and political contexts in which environmental health concerns are expressed by the populations concerned. This large expertise is built from the work of the ATSDR (Agency for Toxic Substances and Disease Registry, USA) and its own experience, in particular with regards to chemical risks and exposure at local level. We strongly believe that this experience would be an added value to PARC as the communication with populations on health impacts of environmental threats needs to be strengthened by confidence on the basis of transparency.

FOCUS ON THE HBM4EU PROJECT

With regards to Human Biomonitoring, InVS/Santé publique France has been involved in the discussions at the EU level since a very early stage by participating actively in the very first HBM projects originating from the first European Environmental Health Action plan (2004-2010). InVS/Santé publique France took the initiative to organise an international conference on HBM in 2008 under the French Presidency of the European Council, with the support of Belgium (food chain safety and environment Ministry) and Germany (UBA) involving USCDC and Santé Canada at an early stage of the European reflections on HBM. (see http://beh.santepubliquefrance.fr/beh/2009/hs/beh_bs_versiongb_la.pdf)

Santé publique France has contributed to six HBM4EU work packages.

Within WP9, Santé publique France has led the definition of new criteria for the selection of the best biomarkers/matrices couples. Within WP10, Santé publique France belonged to the statistical working group (with UBA, VITO and ISGlobal) and contributed to writing the SAP (Statistical Analysis Plan) with the elaboration of the European strategy to derive new references values. On the statistical analysis tasks, Santé publique France is leading two research protocols on Bisphenol A and Pyrethroïds, which included around 25 European Biomonitoring studies.

Within WP8, Santé publique France has provided Esteban data and new biological samples to the three different age groups of aligned studies. Within WP11, Santé publique France contributed to the elaboration of new health measurements SOPs for children and provided its expertise on the positive aspects of linking health surveys and human biomonitoring studies. Finally, Santé publique France has also supported Anses within WP4 on the prioritization process for the 2nd round of chemicals substances.

Regarding HBM issues, as for any other public health issues, Santé publique France is very attentive to ethical issues related to the study design, the interpretation of data, the personal information of the study participants and of the population concerned and involves this ethical dimension into its expertise. Its experience in addressing those issues will be of particular value for PARC.

In the global public health domain, Santé publique France plays a key role by hosting and contributing to the secretariat of the International Association of National Public Health Institute (IANPHI: www.ianphi.org). This unique platform enables Directors of national public health institutes to discuss strategic issues about global public health and advocate for more funding towards climate change/environmental health/actions at the global level.

Main French projects regarding exposure assessment of chemical

I The French Nutrition and Health Survey (ENNS 2006-2007)^{2,3,4}: the main objectives of ENNS, carried out by the French Institute for Public Health Surveillance (InVS) in 2006–2007, were to describe food consumption, nutritional status, and physical activity in the general population in France (adults and children) and to study nutritional and environmental biomarkers. ENNS design allowed estimating levels of various different metals (including lead, cadmium, mercury and arsenic) and pesticides (organophosphates, organochlorines and pyrethroids) in blood, urine and hair. 3,115 adults (aged 18–74 years) participated in the food consumption survey (participation rate ~ 60%) among 5,217 eligible households contacted, and 2,102 of them were included in the biochemical analyses (participation rate ~ 40%).

Total cost: 3,728,545 €
(biomonitoring component: 916,580 €)

I The perinatal component of the French HBM programme^{7,8,9}, uses data from the **Elfe** cohort study (**2011**) which follows 18,000 children over 20 years in order to characterize the relationship between the environment and the development, health and socialisation of the children. This component is based on a sub-sample of 4,145 pregnant women who gave birth in 2011 in mainland France. A process of prioritisation for biomarkers has been developed for the perinatal component and the Esteban study¹⁶. Biomarkers from this list analysed in the perinatal component of the French HBM programme were both well-known pollutants (e.g. lead, mercury and dioxins) and emerging substances (e.g. phthalates, bisphenol A (BPA), pesticides and perfluorinated compounds).

Biomonitoring component
cost: 1,474,696 €



I Kannari⁶: agricultural activities in the Caribbean, especially banana cropping, are known for their significant use of pesticides. So is chlorddecone, which was used between 1972 and 1993 against the banana root borer. In this context, “Kannari study: Health, Nutrition and Exposure to Chlorddecone in French West Indies” was set up in 2013–2014 to supplement knowledge about the exposure of the population to chlorddecone and other organochlorine pollutants. The data collected comprised a dietary intake description, data from biological samples (blood sample), socioeconomic and demographic information, as well as data from complementary specific items relative to life habits. Overall, 742 individuals (292 in Guadeloupe and 450 in Martinique) were included in the impregnation component of the Kannari study.

Biomonitoring component
cost: 590,000 €

I Esteban (2014–2016) is a cross-sectional study on the Health, Environment, Biomonitoring, Physical Activity and Nutrition. This study meets objectives for monitoring chemical exposures but also for chronic disease surveillance and nutritional surveillance of the general population aged from 6 to 74 years old, and living in continental France during the period 2014–2016. In total, 2,503 adults (18–74 years old) and 1,104 children (6–17 years-old) have been included. The biomarkers analysed and resulting from the prioritisation are phthalates, bisphenols, brominated flame retardants, glycol ethers, parabens, PCBs, per-fluorinated compounds, dioxins, mycotoxins, metals (As, Cu, Hg, Pb, Cd, Cr, Co...), pesticides. A **bio-bank** for long term conservation of samples at -80°C is available.

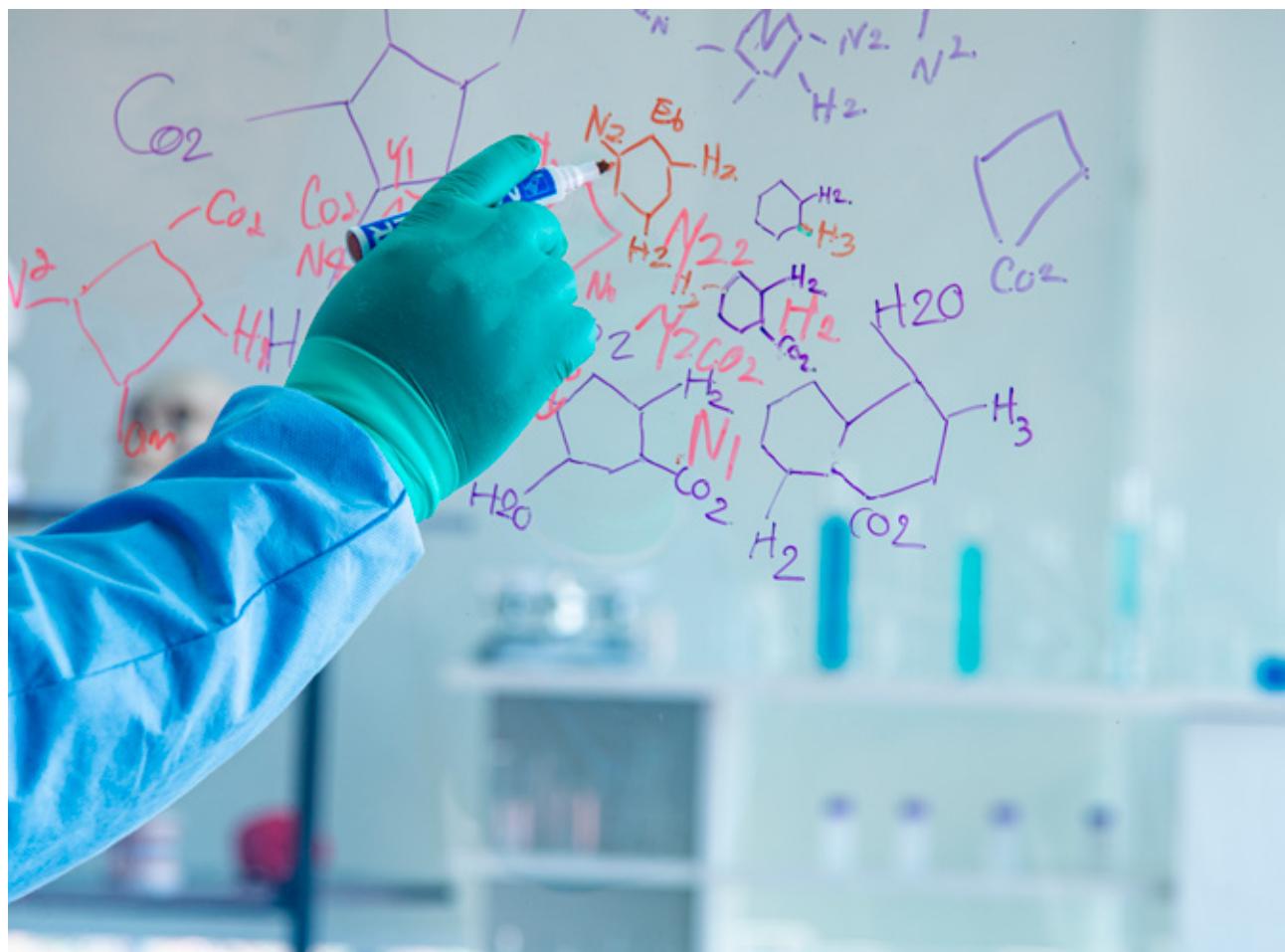
Total cost: 10,887,482 €
(biomonitoring component: 6,150,916 €)

I PestiRiv (2021): this study aims to investigate the human exposure to pesticides used in vineyards. It will be launched in 2021, and will combine environmental air, dust and human biomonitoring data, and metrological developments as dosages of non-target substances.

Total cost: 14,172,820 €

Main European projects regarding exposure assessment of chemical

- | The **ESBIO project** (expert team to support biomonitoring) is funded under the 'Life sciences, genomics and biotechnology for health' priority of the Sixth Framework Programme (FP6). It brings together 22 experts from 18 EU Member States, with the ultimate aim to improving the availability and comparability of HBM data within and between countries in Europe.
- | Organisation of the **European Conference on Human Biomonitoring** (Paris, 4-5 November 2008) under the auspices of the French Presidency of the EU, highlighted demonstrative HBM programmes and activities in the EU and beyond (USA and Canada) and their added value in supporting public health policy, interventions and research.
- | Member of the Consortium to Perform Human Biomonitoring on a European Scale (Cophes) and partner associate in the feasibility study (**Democophes**) 2009-2012.
- | Participation in the second international Conference on Human biomonitoring at Berlin 2016.
- | Linked third party (to Inserm) in **HBM4EU**. HBM4EU is a joint effort of 30 countries, the European Environment Agency and the European Commission, co-funded under Horizon 2020. HBM4EU is coordinating and advancing human biomonitoring in Europe to provide better evidence of the actual exposure of citizens to chemicals¹⁷. (involved in WP7, 8, 9, 10 and 11) 2015-2021.



Professionals involved in the biomonitoring activities



Sébastien Denys (PhD) is the director of the Occupational and Environmental Health division at Santé publique France. He is agronomist and has more than 20 years of scientific experience examining human exposure, risk assessments and environmental epidemiology. His scientific activities focus on the fate of environmental contaminants in agro-ecosystems, subsequent human exposure and health impacts. He has also worked at Ineris and Anses. He has significant experience promoting scientific evidence to advocate for integrating human health protection in public policies. In addition, he has developed a strong expertise in interacting with large panels of stakeholders in different fields of environmental health and particularly environmental chemicals.

Clémence Fillol (PharmD, PhD) is the head of the exposure monitoring unit in the division of Occupational and Environmental health. She has scientific expertise on biomarkers and human exposure. She developed and leads the national biomonitoring programme. This unit is composed of 16 people who lead the French national biomonitoring programme and activities regarding occupational exposures.

Loïc Rambaud is an environmental engineer in the exposure monitoring unit. He is the coordinator of the HBM4EU activities undertaken at Santé publique France since the beginning of the project and more specifically the work on the definition of the new national biomonitoring strategy.

Clémentine Dereumeaux is an environmental engineer in the exposure monitoring unit. She has participated in the analysis and interpreted the perinatal component based on the Elfe cohort. She is preparing and coordinating the PestiRiv study which will be launched in 2021 with various partners.

Morgane Stempflelet is a specialist in geomatics in the exposure monitoring unit. She is responsible for analyzing cross-cutting data on the environment and health in the studies of the division.

Amivi Oleko is a specialist in the implementation of biomonitoring studies and more particularly on aspects of sampling procedures, laboratories and biobank in the exposure monitoring unit.

Romuald Tagne-Fotso (PhD) is epidemiologist and has participated in the various tasks of HBM4EU undertaken by Santé publique France and has contributed to the analysis, interpretation and communication of Esteban results for one year.

Margaux Riou is epidemiologist and participates in the various tasks of HBM4EU in which Santé publique France is involved.

Emmanuelle Szego is a health demographer and specializes in the implementation of population surveys.

Anita Balestier (MD) is a public health physician who is contributing to the analysis, interpretation and communication of Esteban results.

Laëtitia Huiart (MD, PhD) is the Scientific Chief Officer at Santé publique France, and Professor of public health. Previously, Laetitia Huiart led the Health Population Department at the Luxembourg Institute of Health. She has an extensive experience in clinical research and epidemiology with a focus on cancer. She has been particularly involved in developments of methods and digital innovation to support efficient clinical research and epidemiology.

Anne-Catherine Viso (PhD) is the Director of the Scientific and International affairs Department of Santé publique France (staff = 28). She holds a PhD in Toxicology and a master in Technology and Innovation management. She is a fellow by distinction of the UK faculty of Public Health recognizing her international public health experience. The Department is responsible for the organisation of cross – cutting functions to support the scientific strategy of Santé publique France. She is responsible for the documentation and knowledge services that support the Agency's scientific advice. She oversees the activities of the IANPHI secretariat (more than 100 National Public Health Institutes worldwide).

Karine De Proft is the administrative and financial focal point of the division. She has participated in the coordination of the Aphekomp project.

Notes

- 1 Le Moal et al (2016) Toward a multi-country monitoring system of reproductive health in the context of endocrine disrupting chemical exposure. *Eur J Public Health*, 2016 Feb;26(1):76-83.
- 2 Falq G, Zeghnoun A, Pascal M, Vernay M, Le Strat Y, Garnier R, Olichon D, Bretin P, Castetbon K, Fréry N. Blood lead levels in the adult population living in France the French Nutrition and Health Survey [ENNS 2006-2007]. *Environ Int*. 2011 Apr; 37(3):565-71.
- 3 Saoudi A, Fréry N, Zeghnoun A, Bidondo ML, Deschamps V, Göen T, Garnier R, Guldner L. Serum levels of organochlorine pesticides in the French adult population: the French National Nutrition and Health Study [ENNS], 2006-2007. *Sci Total Environ*. 2014 Feb 15;472:1089-99
- 4 Saoudi A, Zeghnoun A, Bidondo ML, Garnier R, Cirimele V, Persoons R, Fréry N. Urinary arsenic levels in the French adult population: the French National Nutrition and Health Study, 2006-2007. *Sci Total Environ*. 2012 Sep 1; 433:206-15.
- 5 Denys S, Fraize-Frontier S, Moussa O, Le Bizec B, Veyrand B, Volatier JL. Is the fresh water fish consumption a significant determinant of the internal exposure to perfluoroalkylated substances (PFAS)? *Toxicol Lett*. 2014 Dec 1;231(2):233-8.
- 6 Dereumeaux C, Saoudi A, Guldner L, Pecheux M, Chesneauau J, Thomé JP, Ledrans M, Tertre AL, Denys S, Fillol C. Chlordecone and organochlorine compound levels in the French West Indies population in 2013-2014. *Environ Sci Pollut Res Int*. 2019 Dec 28.
- 7 Saoudi A, Dereumeaux C, Goria S, Berat B, Brunel S, Pecheux M, de Crouy-Chanel P, Zeghnoun A, Rambaud L, Wagner V, le Tertre A, Fillol C, Vandendorren S, Guldner L. Prenatal exposure to lead in France: Cord-blood levels and associated factors: Results from the perinatal component of the French Longitudinal Study since Childhood (Elfe). *Int J Hyg Environ Health*. 2018 Apr; 221(3):441-450.
- 8 Dereumeaux C, Saoudi A, Goria S, Wagner V, De Crouy-Chanel P, Pecheux M, Berat B, Zaros C, Guldner L. Urinary levels of pyrethroid pesticides and determinants in pregnant French women from the Elfe cohort. *Environ Int*. 2018 Oct;119:89-99.
- 9 Dereumeaux C, Saoudi A, Pecheux M, Berat B, de Crouy-Chanel P, Zaros C, Brunel S, Delamaire C, le Tertre A, Lefranc A, Vandendorren S, Guldner L. Biomarkers of exposure to environmental contaminants in French pregnant women from the Elfe cohort in 2011. *Environ Int*. 2016 Dec; 97: 56-67.
- 10 Fillol C, Dor F, Denys S, Tack K, Labat L, Seta N. Arsenic urinary concentrations in children living in a naturally arsenic contaminated area. *J Expo Sci Environ Epidemiol*. 2013 Mar; 23(2):145-50.
- 11 Dereumeaux C, Fillol C, Denys S, Quenel P. Pesticide exposures for residents living close to agricultural lands: a review. *Environ Int*, 2020 Jan; 134:105210.
- 12 Oleko A, Betsou F, Sarter H, Gerdil C, Desbois I, Charles MA, Leridon H, Vandendorren S. A Pilot Study of the ELFE Longitudinal Cohort: Feasibility and Preliminary Evaluation of Biological Collection. *Biopreserv Biobank*. 2011 Sep;9(3):223-227.
- 13 http://www.sfses.info/IMG/pdf/health_for_the_eu_in_20_success_stories.pdf
- 14 Fréry N, Vandendorren S, Etchevers A, Fillol C. Highlights of recent studies and future plans for the French human biomonitoring (HBM) programme. *Int J Hyg Environ Health*. 2012 Feb; 215(2):127-32.
- 15 Dereumeaux C, Fillol C, Charles MA, Denys S. The French human biomonitoring programme: First lessons from the perinatal component and future needs. *Int J Hyg Environ Health*. 2017 Mar; 220(2 Pt A): 64-70.
- 16 Fillol C, Garnier R, Mullot JU, Boudet C, Momas I, Salmi LR, Vandendorren S. Prioritization of the biomarkers to be analyzed in the French national programme of biomonitoring. *Biomonitoring* 2014; 1: 95-104.
- 17 Fréry N, Santonen T, Porras SP, Fucic A, Leso V, Bousoumah R, Duca RC, El Yamani M, Kolossa-Gehring M, Ndaw S, Viegas S, Iavicoli I. Biomonitoring of occupational exposure to phthalates: A systematic review. *Int J Hyg Environ Health*. 2020 Aug; 229:113548.



Santé
publique

France

Santé publique France
12, rue du Val d'Osne
94415 Saint-Maurice Cedex
Tél. : 01 41 79 67 00
Fax : 01 41 79 67 67

santerepubliquefrance.fr

Follow us on:

