Postdoctoral position in Analytical & Environmental Chemistry

UMR 5805 EPOC – University of Bordeaux / CNRS

Determination of PFAS in seabirds from overseas and metropolitan France

In the context of global change, environmental pollution is a major threat to biodiversity, along with climate change, habitat loss, over-exploitation, and invasive species. Numerous ecotoxicological studies addressing the impact of synthetic chemicals on wildlife have focused on legacy persistent organic pollutants (POPs), including legacy chemicals like organochlorine pesticides (OCPs) and polychlorinated biphenyls (PCBs). Poly- and perfluoroalkyl substances (PFAS) constitute a vast family of organohalogens of emerging concern that has received considerable attention over the last decades. A number of non-polymeric PFAS are highly stable and do not readily degrade in the environment, earning them the label “forever chemicals”. They may bioaccumulate, primarily in protein-rich tissues (e.g. liver) and blood, and are found in wildlife globally. So far, the Stockholm Convention on Persistent Organic Pollutants regulates a few PFAS only, but it is estimated that over 5,000 substances belonging to this group remain unregulated. A wide array of novel PFAS, not necessarily identified, are used as alternatives to legacy PFAS; this clearly warrant further investigation to better understand the occurrence fate and impacts of PFAS.

Seabirds are often long-lived apex predators that make relevant sentinel organisms for assessing PFAS contamination in marine environments. They integrate the contamination of their food web, accumulate contaminants over time. In addition, they often breed in large colonies, which provides access to numerous individuals at a single location. Seabirds have already been used for the biomonitoring purposes environmental contaminants, including PFAS. Associations between PFAS burden and ecotoxicological or ecophysiological alterations have been reported. So far, comprehensive multi-species studies across a broad geographic scale remain scarce, with most knowledge concentrated in northern latitudes, particularly the Arctic.

This postdoctoral position will be working on the ANR-funded ToxSeaBird project, which first aim is to obtain an unprecedented characterization of PFAS contamination (i.e. levels and patterns) in 40 species of seabird species distributed along a large latitudinal gradient encompassing Antarctic, subantarctic, subtropical, tropical, temperate and subarctic areas from overseas and metropolitan France. Our results will definitely provide significant insights into the exposome of these sentinel indicators.

More specifically, the postdoctoral fellow will develop innovative analytical methods for extensive characterization of PFAS burden in seabirds. First, quantitative methods will be optimized for the determination of legacy and emerging PFAS in seabird plasma and eggs, i.e. using approaches such as, for instance, on-line Solid Phase Extraction, Matrix solid phase dispersion, QuEChERS associated with liquid chromatography hyphenated with tandem mass spectrometry (LC-MS/MS). Besides, non-target screening of PFAS will be performed, based on High Resolution Mass Spectrometry (HRMS) performed

with a Q-ToF mass spectrometer. This technique is a powerful tool to investigate the exposome of the aquatic fauna (i.e. xenometabolomics) and it will considerably improve our knowledge of PFAS molecular pattern in seabirds. Finally, the postdoctoral fellow will use a complementary approach to further characterize this contamination and allow for mass balance calculations: the total oxidisable precursors assay (TOPA). This is a semi-destructive indirect method used to estimate the amount of perfluoroalkyl moieties in a sample by the oxidative conversion of precursors. Existing methods will be optimized for their application to challenging matrices such as egg yolk or red blood cells.

The optimized and validated methods will subsequently be applied to selected samples to address various scientific questions. For instance, we will test whether PFAS occurrence and patterns can be explained on the basis of the seabirds' distribution and related to potential sources (i.e. long-range transport vs local point sources). The investigation of time trends or maternal transfer will also be included in this work.

Keywords:

Analytical Chemistry, Environmental Chemistry, Per- and polyfluoroalkyl compounds, Seabirds

Skills:

The candidate will ideally have a background in Analytical Chemistry or Environmental Chemistry. In addition, he or she will demonstrate his/her autonomy but also his/her motivation for team work. He/she will have to lead analytical developments, data acquisition and exploitation. Good proficiency in English is mandatory and basic knowledge of French would be appreciated.

Duration: 24 months, as from February 2024

Net Salary: 2200–2400 €/month

Location: UMR 5805 EPOC, CNRS/Université de Bordeaux, Talence; https://www.epoc.u-bordeaux.fr/

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Application deadline: 15th December 2023