Research Topic for the ParisTech/CSC PhD Program

1. ***Field (cf. List of fields below):*** Life Science and Engineering for Agriculture, Food and the Environment, Chemistry

Subfield: Analytical Chemistry and Food Safety

Title: Quest of Pesticides in Foodstuff by using High Resolution Mass Spectrometry: targeted and untargeted approach

ParisTech School: ED ABIES/AgroParisTech/ANSES

Advisor(s) Name: PARINET Julien, GUERIN Thierry
Advisor(s) Email: julien.parinet@anses.fr ; thierry.guerin@anses.fr
(Lab, website): https://www.anses.fr/en/content/laboratory-food-safety-maisons-alfort-and-boulogne-sur-mer

Short description of possible research topics for a PhD: (10-15 lines in English + optional figure)

Pesticides help to produce crops, but not without consequences for health of human beings. For this reason, regulations involving maximum residue limits (MRLs) have been implemented. It is accompanied by monitoring and control plans (PSPC) to ensure compliance with legislation by farmers and intermediates. Nevertheless, recent news alerts us on the fact that no system is perfect, explained by various reasons where the regulations are not respected. Recently, a number of high resolution mass spectrometry (HRMS) devices appeared on the market. These devices allow the detection of a large number of small molecules by exploiting the monoisotopic mass of the molecules and generating chemical fingerprints that require the use of bioinformatic tools. This type of approach makes it possible to respond to the lack of comprehensiveness of conventional analyzes through the so-called "untargeted" approaches. We propose to develop an analytical method on LC-HRMS and to add quantification to the latter on a pool of pesticides as wide as possible. It will be also essential to carry out the development of the extraction methods necessary for various food matrices. Finally, a sampling plan will be drawn and will be an opportunity to investigate through it the possible presence of contaminants not sought by conventional PSPCs. This work should demonstrate the versatility of the approach and thus improve the safety and the health of consumers.

Required background of the student: analytical chemistry, data mining, bioinformatic

A list of 5(max.) representative publications of the group:

- Validation of analytical methods for chlordecone and its metabolites in the urine and feces of ewes. Saint-Hilaire, M., Bertin, T., Inthavong, C., (...), Rychen, G., **Parinet, J**. Journal of Chromatography B: Analytical Technologies in the Biomedical and Life Sciences 1093-1094, pp. 66-76. **2018**
- Development and validation of an HPLC-MS/MS method with QuEChERS extraction using isotopic dilution to simultaneously analyze chlordecone and chlordecol in animal livers. Saint-Hilaire, M., Inthavong, C., Bertin, T., (...), Rychen, G., **Parinet, J.** Food Chemistry 252, pp. 147-153. **2018**
- Untargeted screening approach for low-level food contamination by pesticides using liquid chromatography coupled with high-resolution mass spectrometry: how to choose the best reference sample for an efficient pairwise comparison. **Parinet J., Guérin T.** Lavison-Bompard G. Submitted to Analytica Chimica Acta.
- Dom I., Biré R., Hort V., Lavison-Bompard G., Nicolas M., **Guérin T.** Extended Targeted and Non-Targeted Strategies for the Analysis of Marine Toxins in Mussels and Oysters by (LC-HRMS). Toxins, 10, 375, 1-22. **2018**