



Master 2 internship topic

***In vitro* toxicity of a mixture of air pollutants in a complex model of human respiratory cells**

Keywords: toxicology, proteomics, *in vitro*, lung cells, organotypic model, air/liquid interface (ALI)

Context: Among the pollutants found both in ambient and indoor air, volatile organic compounds (VOCs) are consistently present. These VOCs form families of pollutants, including the series of higher aromatic hydrocarbons of benzene, known as BTEX (Benzene, Toluene, Ethylbenzene, and m/p/o-Xylene). The BTEX mixture represents a class of pollutants of interest due to the abundance of its components in the ambient atmosphere and their deleterious effects on public health. Sources are numerous and include combustion processes (automobile fuels, wood), industrial activities, landfills and waste treatment facilities, as well as various consumer products (paints, varnishes, solvents, etc.). Several studies in France and abroad have measured BTEX concentration levels in workplaces and public-access buildings that are below the individual health reference values for each component of BTEX. However, the occurrence of asthma has been associated with exposure to BTEX both individually and in mixtures. Nevertheless, understanding of the underlying mechanisms of action remains incomplete.

Objectives: Through an experimental approach, the following questions will be addressed:

- What is the pulmonary toxicity of BTEX both alone and in mixture?
- What are the mechanisms of action involved, and do they contribute to the pathophysiology of asthma?

Methodologies: To investigate these questions, a 3D human respiratory organotypic model (MucilAir) will be implemented and exposed at the air/liquid interface (ALI) to BTEX both alone and in mixture through acute and repeated exposures. The respiratory system is a major target organ for atmospheric pollutants. *In vitro* studies of the toxicity of these pollutants to the human respiratory system indeed require a biological model that accurately represents the airways, as well as a relevant exposure method.

The measured parameters will focus on the phenotype of the exposed tissues (barrier properties, ciliary beating, mucus production) and cellular activity using a proteomic approach by high-resolution mass spectrometry coupled with liquid chromatography (LC-MSMS Orbitrap Q-Exactive Plus).

Location: UR4492 - Unité de Chimie Environnementale et Interactions sur le Vivant (UCEiV) Maison de la Recherche en Environnement Industriel, Université du Littoral-Côte d'Opale, 189A Avenue Maurice Schumann, Dunkerque, France.

Internship gratification: 650€/month

Recommended duration: 6 months, preferably starting in January/February 2025

Contact: send CV and covering letter to: [sylvain.billet \[at\] univ-littoral.fr](mailto:sylvain.billet@univ-littoral.fr) before December 15th.