Post Doctoral position in cyto- genotoxicity of tritiated and untritiated particles

Offer type: Job
Contract: temporary – POST-DOC – 18 months
Salary: Salary range: ≥ 27,000 and < 33,000€ annual gross
Employer: Aix-Marseille Université
Workplace: Marseille for the first 6-12 months , then CEA SACLAY in Gif sur Yvette for the rest of the contract
Research areas: Biology, **Genetic toxicology**, human health **– Molecular and cellular biology**
Application deadline: January 1st, 2023

Mission:
This is an 18-month post-doctoral contract starting on **March 1, 2023**. The candidate will be in charge of the study of cytotoxicity/genotoxicity of cement and tritiated steel particles on a human lung model in the framework of the European TITANS project.
This project is collaborative and multidisciplinary. It includes physicists, chemists and biologists.
The candidate will be based in Marseille and Saclay and will be in charge of a collaborative work between the CEA and the Biomarkers, Environment, Health team **(https://www.imbe.fr/biomarqueurs-environnement-sante.html)** of the IMBE (Mediterranean Institute of Biodiversity and Marine and Continental Ecology - UMR Aix Marseille Univ / CNRS / IRD / Avignon University).

Project content:
The mission entrusted to the candidate is part of the work package 3 of the European project TITANS (Tritium Impact and Transfer in Advanced Nuclear reactorS - WP 3: dosimetry, risk assessment and radiation protection following accidental exposure to tritiated dust).
This project follows the European project TRANSAT **http://transat-h2020.eu/**.
Launched in September 2022, the TITANS project will last 36 months with a total budget of nearly 3 million euros. Coordinated by the CEA, it brings together 21 partners (research organizations and universities) from 8 European countries.

In the nuclear field, tritium can be released into the atmosphere in the form of tritium gas or tritiated water. Part of the released tritium can then be transformed into organically bound tritium (OBT). The radiotoxicological consequences of tritiated water or organically bound tritium contamination in animals or cells have only been identified at high tritium concentrations.
In addition, epidemiological studies on workers exposed to ionizing radiation have assess the hazards and health risks specifically induced by tritium. As a result, these studies provide only a weak indication of the health risks associated with tritium exposure.
During the decommissioning of nuclear facilities, operations are carried out to remove or dispose of any tritiated material. These operations generate airborne fine dust, including aerosols. It is proposed here to study the consequences of a release of these tritiated particles in terms of radiotoxicology and ecotoxicology. The cross-sectional materials will be stainless steel and cement.

The main results obtained in the genotoxicology task during the TRANSAT project showed that
- Particles are deposited on human lung cells but are not internalized in bronchial epithelial cells (1).
- Increased DNA damage and chromosomal breaks are observed after exposure to hydrogenated (non-radioactive control) and tritiated steel and cement particles (1).
- Reconstructed doses to cell nuclei from tritiated steel particles are low in these biological models in which there is no internalization (~cGy) (2).
(1) Lamartiniere, Y, et al. Cyto-Genotoxicity of Tritiated Stainless Steel and Cement Particles in Human Lung Cell Models. Int. J. Mol. Sci. 2022, 23, 10398. ***https://doi.org/10.3390/ijms231810398***
(2) Mentana, A, et al. Dosimetry and investigation on the possible biological damage induced by radiation emitted by tritiated steel particles at the cellular level. Radiation research, in revision.

In this new project, we will study the *in vitro* genotoxic effects of tritiated particles on human lung macrophages.
The primary damage to DNA and/or chromosomes could be induced by tritium radiation, by the particles (tritiated or not), or by a metabolite (hydroxyl radicals for example) induced by tritium radiation. By evaluating the contribution of these different mechanisms in the induction of primary DNA and/or chromosome lesions, we wish to discriminate the genetic and/or chromosomal mutations that are or are not directly caused by tritium radiation after exposure to tritiated particles. In parallel, thanks to the collaboration with the University of Pavia, a dosimetry study will be carried out aiming at the reconstruction of the dose at the cellular and subcellular level and the prediction of DNA damage correlated to the experimental quantification of DNA breaks. This information would be useful to regulatory authorities responsible for establishing thresholds below which there is no significant increase in the incidence of delayed pathologies such as cancers.

In this context, the candidate will be in charge of the following tasks:
1/ Study of particle internalization in a macrophage model (differentiated THP-1 cells or equivalent);
2/ Quantification of DNA breaks (gamma-H2aX foci) and chromosomal damage (micronuclei);
3/ Quantification of cellular antioxidant defense;
4/ Technical management of the project (planning, organization and realization of experiments, synthesis of results, missions to partners);
5/ Presentation of the results (working meetings, project meetings, congress);
6/ Drafting of the deliverable and publications.

Candidates profile:
Knowledge of cell toxicology, genetic toxicology, and cell biology - very good experience in cell culture. Knowledge of genetic toxicology would be appreciated.
Experience in handling particles and exposing cells to particles.
Experience in writing publications.
Desired qualities: autonomy, scientific rigor, teamwork and communication skills, taste for multidisciplinary programs, fluency in English and willingness to work in two different laboratories.

To apply to this position:
Please send your application by mail only (CV, cover letter and two letters of recommendation) to T. Orsière and V. Malard.
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Keywords: particles, toxicology, genotoxicity, cell culture,