

FUNDING PROGRAM FOR NEXT GENERATION WORLD-LEADING RESEARCHERS

Project Title: Development of ecotoxicological assessment tools to evaluate genotoxicity in mixed contaminant environments by using microbial functional genomics and DNA adductomics

Name: Natsuko HAMAMURA

Institution: Ehime University

1. Background of research

Due to rapid industrial development, discharge of a wide range of chemicals into the environment has increased dramatically in recent years. The complexity of mixed chemical contaminants in the environment poses serious risks to ecosystem and human health due to the potential synergetic toxic effects of diverse chemical interactions, including long-term genotoxic effects. It is necessary to develop new assessment tools to adequately evaluate the overall toxic effects on ecosystems and predict the risks associated with mixed-chemical contaminated environments.

2. Research objectives

The aim of this research is to develop ecotoxicological assessment tools to evaluate long-term genotoxicity by utilizing rapid microbial responses to perturbations detected by functional metagenomic and DNA adductomic approaches. Especially we will focus on polluted environments impacted by mixed contaminants (organics, toxic elements, heavy metals) in the Asian region.

3. Research characteristics (incl. originality and creativity)

Microbial community responses and DNA adduct formation upon contaminant exposure will be directly examined using advanced omics approaches; specifically, we will utilize advanced tools in microbial ecology to assess community-level responses to environmental perturbation by analyzing metagenomic and meta-transcriptomic data generated by modern pyrosequencing technology. At the same time, we will apply DNA adductomics approaches to microbial communities for the first time, to detect genotoxicity caused by mixed contaminant exposures.

4. Anticipated effects and future applications of research

The data obtained from contaminant monitoring, microbial functional genomics, and DNA adductomics will be used to develop predictive models for genotoxic effects caused by exposure to mixed contaminants. Outcomes of this research shall provide ecotoxicological base-line information for more holistic environmental management and also strengthen the network of environmental scientists in the Asian region through research collaborations.