

## Master project/ Exjobb (45-60 hp) in Environmental Nanotoxicology

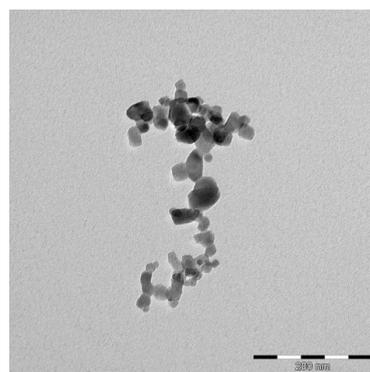
### General background

Titanium dioxide (TiO<sub>2</sub>) nanoparticles (NPs) are among the manufactured nanomaterials with the highest product volume and use in commercial and industrial products (e.g. paints, inks, cleaning agents, cosmetics, sunscreens). TiO<sub>2</sub> NPs can be accidentally released into the environment and are suspected to be the most abundant manufactured nanomaterial in European surface waters. Aquatic organisms are already and will get increasingly exposed to this novel environmental contaminant. During the last years an enormous effort has been undertaken to assess the ecotoxicity of TiO<sub>2</sub> NPs yielding a vast body of literature on their innate (eco-)toxic potential showing that they can be taken up by fish and accumulate in different organs.

**General objective:** The degree project will be part of a larger project, which aims to go beyond classical nano-ecotoxicological studies taking into consideration nanoparticle interactions with traditional, i.e. chemical pollutants that may co-exist in the environment and/or in the body. Since this issue remains hitherto almost completely unaddressed, the degree project bears a great potential to generate new scientific knowledge and contribute to advancing the development of this novel and exciting research area.

### Project overview

The objective of this project will be to find out if, how and to which extent mixtures of TiO<sub>2</sub> NPs and organic chemical pollutants may cause toxicity in fish. The project will focus on determining toxicokinetic and toxicodynamic interactions at the molecular and cellular level by means of the use of conventional and advanced *in vitro* models based on fish cell cultures (e.g. co-culture systems). The experimental work will include the characterisation/further development of the test systems, exposure of the cell cultures to TiO<sub>2</sub> NPs and TiO<sub>2</sub> NP-chemical mixtures under different experimental conditions, and measurement of various biomarker responses (cytochrome P450 1A, antioxidant enzymes) using enzyme activity assays and gene expression analysis (RT-qPCR), amongst others.



### Project start

Fall 2016

### Supervision

The applicant will be supervised by Dr. Tobias Lammel and Assoc. Prof. Joachim Sturve at the Zoological Institute, Department of Biological and Environmental Sciences, University of Gothenburg.

### Requirements

Ideal applicants are MSc level students with a strong background and/or interest in Environmental-, Nano- an *In vitro* Toxicology and a high motivation to conduct scientific research. Previous experience in research, in particular in cell culture, biochemistry and molecular biology techniques is highly appreciated, but not a prerequisite. In addition, she/he should have good organizational and analytical skills, a positive and proactive attitude, and be able to work both independently and in a team. Furthermore, since we are an international research group, the applicant needs to have a high level of English in speaking, reading and writing.

### Interested?

If you are interested and would like to have further information on the project and/or would like to directly apply for the position please send an email to: [tobias.lammel@gu.se](mailto:tobias.lammel@gu.se)