

# Pharmaceuticals in the environment: secondary poisoning modelling in freshwater and terrestrial compartments

**Level:** MSc Thesis or Internship

**Department:** Environmental Science

**Supervisors:** Prof. Ad Ragas, Prof. Jan Hendriks, Dr. Francesco Bregoli

**Duration:** 6 months

**Starting day:** As soon as possible

**Short description:** In the framework of the European project PREMIER (Prioritisation and Risk Evaluation of Medicines in the EnviRONment, [www.imi-premier.eu](http://www.imi-premier.eu)), we are seeking an MSc student who will support us with the development of a secondary poisoning model for freshwater and terrestrial compartments.

## Background

Pharmaceuticals have indisputably improved human health and life expectancy. However, following human use and excretion, active pharmaceutical ingredients (APIs) can reach the environment, posing a potential risk to biota. The preferential pathway of APIs into the environment is through sewage collection and subsequent treatment in waste water treatment plants resulting in effluents that are eventually being discharged into freshwater systems. Since WWTPs only partially remove APIs, they are regularly detected in surface waters.

In many part of Europe, sludge from wastewater treatment is used to fertilize crops. Additionally, in more arid areas, treated wastewater is used to irrigate crops. Since APIs are also found in sludge and treated wastewater, these are further paths of APIs towards aquatic and terrestrial ecosystems.

Not much is known and only limited data are available on the uptake of APIs into the food chain in both aquatic and terrestrial ecosystems. This exploratory work aims to compile the available knowledge on accumulation of APIs in aquatic and terrestrial food chains (i.e., secondary poisoning) in order to support the development of simple computer models that predict food chain accumulation of APIs. The idea is to apply and validate the novel models based on a number of case studies that will defined based on literature data.

## Objectives

- Gathering existing literature, data and existing models on food chain accumulation of APIs.
- Define models of fish and earthworm uptake with the aim of incorporating them into simple food chain exposure models (water-fish-bird/mammal and soil-earthworm-bird/mammal).

The specific objectives will be discussed during the kick off meeting with student and supervisors, and elaborated in detail during the first month of the MSc project.

## Methods

Literature review, model development, application (case studies) and validation.

## Requirements

Knowledge on environmental toxicology is required.

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