Sub-department of Environmental Technology

Exposure and effects of persistent organic pollutants from sediment dwelling eel on human consumers

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Motivation

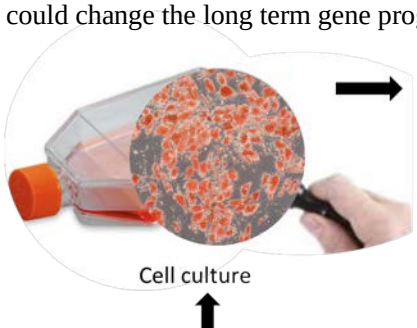
Contaminated sediments give rise to serious concern. A relationship exists between persistent organic pollutants (POPs) in sediments and those in eel. Currently the consumption of eel from the Dutch Biesbosch area is prohibited because their high POP levels are expected to be a health risk. In general, however, fatty fish is considered to be beneficial for human health because of its high content in omega-3 fatty acids. High exposure to POPs, on the other hand, has been related to adverse health effects, like disrupted hormone levels, immune toxicity, attention deficit and cancer. POPs degrade only very slowly, with a half-life for e.g. dioxins of 10 years in humans. Some POPs were shown to exert health effects later in life or even in the next generation, but an explanation for these delayed adverse health effects have not yet been found. Recently, epigenetic mechanisms have been revealed for certain compounds, explaining disorders such as obesity and cancer later in life. Epigenetic effects change gene activity in the cells without changing the DNA itself. The effects can be life-long and might even be transferred to the next generation.

Research challenge

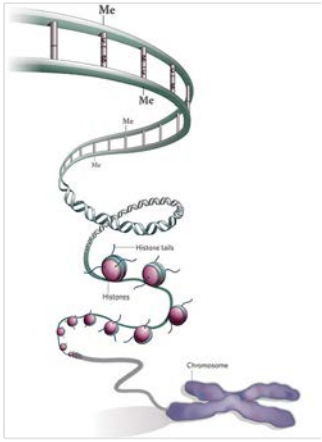
This project aims to gain insight in the human exposure to POPs and both positive and negative health effects of consumption of eel from the Netherlands compared to that of less fatty white fish from the Dutch North Sea. The positive effects studied are related to higher intake of 'good' fatty acids, the studied toxic effects concern blood biomarkers and epigenetic mechanisms. So far, no studies have investigated consequences of eel consumption from polluted areas for internal human POP levels and possible consequences for human health markers and especially not epigenetic effects.

The first step in this research is to try to elucidate the molecular mechanism of action of these POPs with human adrenal cortex, breast cancer and adipose cells. The next step is to investigate internal POP levels, health effects and DNA methylation status in blood of fishermen that are relatively higher or lower exposed to these pollutants.

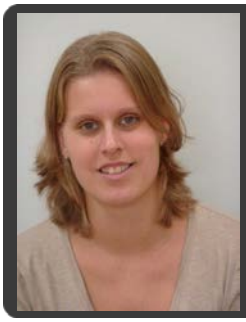
The combination of the studies will reveal to which extend the consumption of polluted eel can induce toxic effects in humans, as is expected based on extrapolation from the effects in animal studies. Studying the epigenetic effects of the ubiquitous POPs in human cells and blood is new, but very relevant as it could change the long term gene programming.



Pollutants from eel can have adverse health effects



Epigenetic effects



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