SCIENCES & BIOENGINEERING SCIENCES
The Research Group

Analytical, Environmental and Geo-Chemistry

has the honor to invite you to the public defense of the PhD thesis of

Imke Boonen

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:
Optimization and implementation of the CALUX bioassay for the determination of endocrine active substances present in dental materials and food

Promotor:
Prof. dr. Marc Elskens (VUB)

The defense will take place on
Thursday, December 1, 2022 at 17h in auditorium D.2.01

Members of the jury

Prof. dr. Frederik Tielens (VUB, chair)
Prof. dr. Yue Gao (VUB, secretary)
Prof. dr. Luc Leyns (VUB)
Prof. dr. Tamara Vanhaecke (VUB)
Prof. dr. Kirsten Van Landuyt (KU Leuven)
Dr. Birgit Mertens (Sciensano)
Dr. Ria Nouwens (FPS Health)

Curriculum vitae

Imke Boonen obtained her Master's degree in Environmental Chemistry with great distinction form the Vrije Universiteit Brussel (VUB) in 2016. Immediately after, she started her doctoral research at the Analytical and Environmental Chemistry research group under the supervision of prof. dr. ir. Marc Elskens. She was furthermore enrolled as a teaching assistant starting from 2018 within the same department, teaching lab sessions to 2nd and 3rd bachelor chemistry students. Imke has participated in and presented her work at multiple international conferences and was involved in the publication of 14 peer-reviewed articles, of which 2 as a first author. She also successfully supervised 5 bachelor's theses and 3 master's theses during the course of her PhD.

Abstract of the PhD research

Endocrine disrupting chemicals (EDCs) are a heterogenous group of compounds that can interfere with the endocrine system, resulting in adverse health effects. This interference can occur through the interaction with hormonal receptors. A technique that can be used to determine receptor-mediated endocrine activities is the CALUX bioassay, which was used in this thesis to investigate potential EDCs or Endocrine Active Substances (EAS) in dental materials and food (packaging materials). In a first project discussed in this thesis, the CALUX bioassay was used to determine the presence of EAS in dental materials. Mainly the presence of BPA (a well-known estrogenic EDC) and related compounds has been a point of concern. BPA is used in the synthesis of certain monomers used in dental composites, and thus can be present as an impurity in the final composite. Furthermore, other compounds showing structural relationship to BPA (monomers, initiators, stabilizers), were analyzed for their potential estrogenic activity, as well as leachates of cured commercially available composites. Moreover, since the main exposure route for EAS is food, this was also examined focusing on different potential contaminants. One important group are the mineral oil hydrocarbons (MOH), which can be added deliberately as an additive, but can also enter the food chain as contamination during processing or through migration from packaging material. Since MOH has been linked to a number of negative health effects, including carcinogenicity and endocrine disruption, this is an area of concern. Also other important groups of possible endocrine disruptors related to food, such as phytoestrogens, pesticides, biocides and food additives were analyzed. A current problem regarding the testing and regulating of EDCs is that they are being evaluated on an individual basis, whilst we are simultaneously being exposed to multiple compounds, due the widespread use of potential EDCs. Mixture effects can occur, however, altering the overall activity of compounds when they are present in a mixture. Therefore, there is a need to broaden the current toxicological assessment methods, taking mixtures into account, which is explored in this thesis. Finally, a look into possible safe(r) alternatives for certain well-known and widely used EDCs is taken. The estrogenic activity if bio-based alternatives for nonylphenols and bisphenols is determined to see if they can be used as safe(r), renewable substitutes.