Lung Research Projects
Plastic Health Coalition

ZonMw, a Dutch organisation that finances health research, has given the green light to 15 short-term research projects. These pilot projects focus on the effects of micro- and nanoplastics on human health. They are divided into four topics: the digestive system, the lungs, immunology, and the spread of micro-and nanoplastics to other parts of the human body.

Three studies on the repercussions of the inhalation of micro-and nanoplastics have been approved by ZonMw, and each has a unique research question:

Barbro Melgert
What is the impact of microplastic fibers on our lungs?
Indoor dust contains vast amounts of small plastic fibers. These microfibers are small enough to be inhaled and plastic fibers have been detected in all samples of lung tissue of patients investigated for lung cancer. Owing to their size, shape and resistance to biological degradation, these microfibers have the potential to cause respiratory disease. Other types of air pollution (diesel exhaust, cigarette smoke) can adhere to microfibers and these chemicals may cause additional stress or toxicity to lung cells, making it harder for these patients to fight respiratory infections. At present, no studies have explored whether microfibers can affect cells in lung tissue. In this project, we aim to investigate the effects of microfibers, with and without adhered pollutants, on the cells that line the airways, because these are the first to come into contact with inhaled microfibers.

Keywords: indoor air pollution, macrophages, epithelial cells, microfibers, respiratory diseases
Partners: Groningen University, Plymouth Marine Laboratory (UK)

Ingeborg Kooter
Effect of eXposure of environmental weathered microPLAstIcs on LuNg epithelial cells – EXPLAIN
Humans are likely to be exposed to environmental plastic particles via the air they breathe, water they drink and food they eat. Information on the presence of these plastic particles in the air (emissions, transformation, concentration) is currently very limited. As a result the inhalation exposure route as potential health effect route for plastic particles has not been studied in much detail either. In spite of that, fortunately there is a lot of information available about the toxicological effects of other particles that exist in the air, i.e. particulate matter and (asbestos) fibers. Our project aims to deliver comprehensive data for the prediction of the impact of environmentally weathered microplastic on human health using the inhalation route. To this aim, we will study the hazard of pristine and environmentally

weathered microplastics using realistic in vitro lung epithelial cell models to mimic the inhalation route and a suit of exposure variables.

Keywords: Microplastics, inhalation, in vitro, air-liquid interface, toxicity
Consortium: TNO (the Dutch Institute for Applied Scientific Research)

Bastien Venzac

Microfluidics-based alveolar barrier model to evaluate nanoplastic translocation.

Representing over 150 million tonnes, plastic pollution in oceans is acknowledged as a serious threat for the sea fauna and flora. Plastic debris' exist as micro and nanoparticles, which are either generated through the decomposition of larger plastic pieces, or already present in consumers' products like cosmetics, food packaging and clothes. These plastic particles can be harmful for human beings, in particular through their ingestion and inhalation, although little is known about their effects on human health and whether they can reach more sensitive organs via the blood stream. With our expertise in building organ models and inhalation nanotoxicology, we will develop a miniaturized artificial human lung, which recapitulates the architecture of the organ and includes breathing-like motions. The passage of model and real-life nanoplastics through this artificial lung barrier will be evaluated, avoiding thereby the use of animal testing.

Keywords: Organ-on-chip, Nanoparticles, Lung, Microfluidics, In-vitro model
Consortium: Twente University, RIVM (National Institute for Public Health and the Environment)