SWISS **LUNG** ASSOCIATION

Lay Summary

Micro/Nanoplastics in the respiratory tract – a human in vitro inhalation model

Research management

1. *Main applicant:*
   PD. Dr. phil. Nat. Fabian Blank, Lung Precision Medicine Program, Department of BioMedical Research, Pulmonary Medicine Adults, Bern University Hospital, Bern, Switzerland
2. *Co-applicants:*
   Dr. phil. Nat. Emilie Seydoux & PD. Dr. phil. Nat. Fabian Blank, Lung Precision Medicine Program, Department of BioMedical Research, Division of Pediatric Respiratory Medicine and Allergology, Bern University Hospital, Bern, Switzerland
   Prof. Dr. med. Thomas Geiser, Lung Precision Medicine Program, Department of BioMedical Research, Pulmonary Medicine Adults, Bern University Hospital, Bern, Switzerland
3. *Partner institutions involved in the research project*
   Prof. Alke Fink and Prof. Barbara Rothen-Rutishauser, BioNanomaterials Research Group, Adolphe Merkle Institute, University of Fribourg, Fribourg.

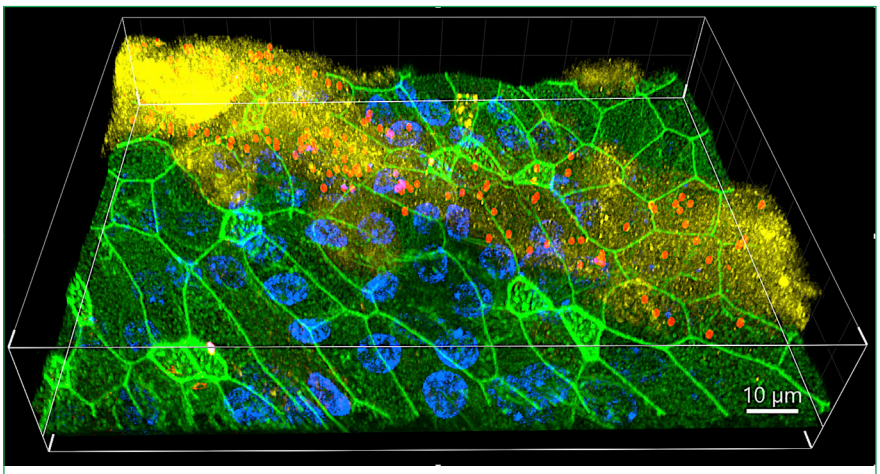
Short title

Airborne environmental plastic tested in vitro

Synopsis

We aim to establish a relevant human in vitro airway inhalation model to study potential adverse effects of airborne plastic particles

SWISS **LUNG** ASSOCIATION



In vitro differentiated human nasal epithelial cells exposed to 1µm polystyrene particle aerosolized at the air-liquid interface following visualization with a laser scanning microscope (Carl Zeiss LSM980). The micrograph shows a 3D projection (maximum intensity projection) of epithelial cells (green), cell nuclei (blue), and particles (red) trapped inside mucus (yellow).

Project description

- **Context / background**
  Microscopic particles from different plastic materials (micro- / nanoplastic; MnP) continue to accumulate in our environment. They mainly originate from plastic waste (e.g. land filling), which slowly degrades in the environment, while dispersing to and polluting most areas on our planet, such as land (soil), water (rivers, lakes, oceans) and even the air. The current research project is addressing MnP, which can become airborne and can be inhaled and deposited in the human lung. Upon inhalation, such particles may become a considerable health risk in a similar way as it has been known for decades in the context of other ambient pollutants like e.g. diesel exhaust particles. For this purpose, we aim to establish an advanced in vitro model consisting of nasal epithelial cells macrophages (phagocytic immune cells) and dendritic cells (antigen presenting immune cells) mimicking the human airway, where a considerable fraction of inhaled MnP is depositing in the human lung. Cell cultures from several individual donors will be exposed to plastic particles, which are directly nebulised at the surface of each cell culture which is exposed to air, in the same way as it happens in the human body. Upon exposure, we aim to analyse, how those MnP are interacting with the epithelial cells and the immune cells looking for potential cell-cell interactions.

  between macrophages, dendritic cells and epithelial cells and for possible adverse effects and mechanisms induced by MnP. With this project, we aim to fill a gap of knowledge regarding potential health risks of airborne environmental MnP, which have not been studied in detail yet. Since we are able to collect different cells from the same person (autologous) for co-culture, this approach will open the door to a personalized system to assess and study adverse effects of MnP in people suffering from respiratory disease, such as allergic asthma.

- **Start and duration**
  06.01.2025, duration of the project: 36 months

- **Amount of funding**
  The SLA makes available a total amount of **80 000 CHF**