

PERSONALISED PHENOTYPIC DIAGNOSTICS TO BENEFIT LUNG CANCER PATIENTS



Principal Investigator: Emmy Verschuren, FIMM, HiLIFE, University of Helsinki

Each person is born with a unique genetic makeup which defines their heritable cancer risk. Thankfully, the chance that an individual develops malignant cancer cells, relative to the number of healthy cells divisions over a body's lifetime, is quite rare. This is because a range of cell repair and immune resilience factors work together to prevent the division and spread of cancerous cells. These natural cancer resistance processes are challenged when exposed to harmful environments, such as products in tobacco or pollutants in the air that damage DNA or cause inflammation. As a consequence, each case of cancer has a history and biological form that is highly specific to a particular individual. The challenge now is to understand how such differences in biological function affect how cancers respond to treatment, and whether we can reliably predict these responses using diagnostic models of an individual's own cancer cells.

Over the last years, our team has studied how each cancer becomes unique in rodent models of lung cancer. By expressing the same cancer genes in different lung stem cells, we revealed the diversity between types of lung cancer, and explored how the eventual functions of a tumour are

shaped by the precise cells in which cancer growth begins. This opened the door to understanding how cancer evolves to avoid the immune system, right down to the mechanisms each individual tumour develops to survive and spread. We also developed a series of diagnostic methods to dissect the intricate protein networks that underpin the formation of different types of lung cancer. We used these methods to identify drug combinations able to block the growth of these cancer types, and validated select treatment responses in rodents, demonstrating that our approach can be extended to humans.

This R'Life project will identify and dissect the protein networks that make clinical lung tumours unique. Cancerous cells will be isolated from lung tumours, the tissue to which lung tumour cells have spread, or the fluid surrounding the lungs. These cells will be profiled to identify the pharmaceutical compounds to which a particular tumour responds. Through close collaboration between surgeons, oncologists, pathologists, and biomedical researchers, this project aims to understand how, and whether, we can tailor treatments to the unique tumours of locally-treated lung cancer patients.



RESEARCH GROUP:

*Principal Investigator:
Emmy W. Verschuren, PhD*

*Members of the research team:
Iris Lähdeniemi, PhD;
Sarang Talwelkar, MSc;
Jie Bao, MSc,
Nora Linnavirta.*

*Collaborators:
thoracic surgeon Jari Räsänen, MD;
clinical oncologist Aija Knuutila, MD;
pathologist Mikko Mäyränpää, MD, PhD;
pathologist Kaisa Salmenkivi, MD, PhD.
FIMM HTB unit and ISM grand
challenge network*

CONTACT:

*Dr. Emmy Verschuren;
emmy.verschuren@helsinki.fi; +358-50-4154703.*

Lab website: <https://www.fimm.fi/en/research/groups/verschuren>