Immune iMage○

Novel immunotracer platform to image immune cell dynamics

## 1 | The need for customised therapies

Immunotherapies have emerged as effective treatments for cancer or inflammatory diseases. However, these treatments face obstacles that hinder their broad application in the clinic.

The **effectiveness of immunotherapies** depends on factors such as the modulation of the immune system or the patient's specific pathology. Therefore, the patient's response to an immunotherapy **can be very variable**.

As a consequence, **immunotherapies have to be personalised** to improve their outcome. To fulfil this need, practitioners must assess the immune status of the patient **both at the disease sites and at a systemic level**.
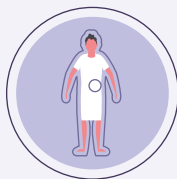
Current diagnosis techniques cannot provide this information at both scales. **Tissue biopsies** do not always shed light on the overall immune status, while **blood-based biomarkers** do not provide spatial information of the disease site. Thus, **personalised dosing and outcome prediction are sub-optimal**.
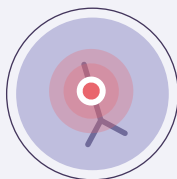
Molecular imaging (PET, MRI and OI) has the potential to overcome this limitation, as it allows to assess the immune status of the patient at both dimensions and in a **non-invasive manner**, but **novel immunotracers are required** to get the most out of these techniques.

2 | Immune-Image at a glance

The Immune-Image project aims to develop and implement a **novel non-invasive molecular imaging platform** for **assessing immune cell activation and dynamics** in oncology and inflammatory diseases, both in animal models and in patients.

The project brings together **22 leading entities across 9 countries** to achieve this goal, including **academic and medical institutions, pharmaceutical companies** and a **patient organisation**.

Our methods

Develop, optimise and validate existing and novel immune cell-specific imaging probes.

Establish imaging protocols, hybrid imaging workflows and imaging software.

Protocol 1 18F
Protocol 2 123I
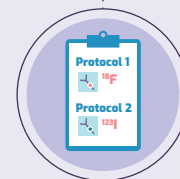
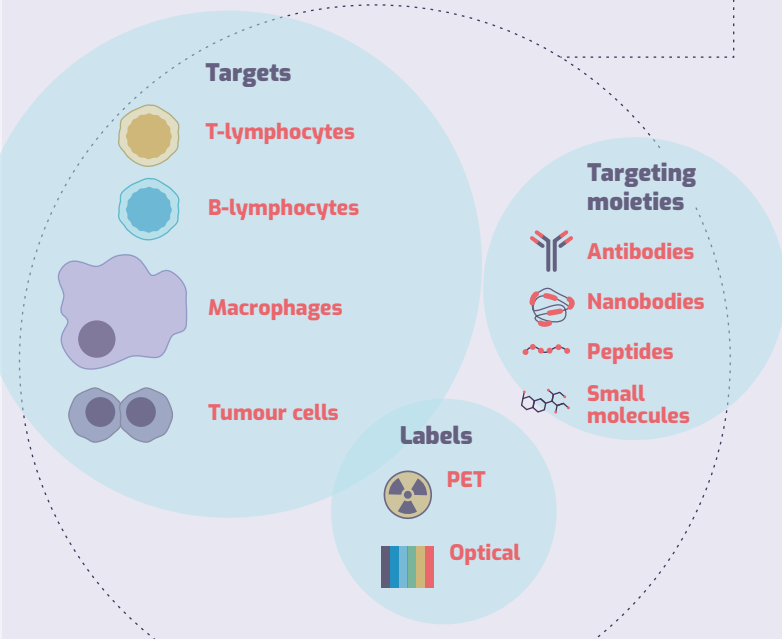**Prepare the regulatory framework** for clinical trials using imaging approaches to manage immunotherapies.

Conduct human clinical trials to confirm the safety and the clinical potential of immunotracers.

3 | Towards a smart monitoring of immunotherapies

Immune-Image will set up a flexible platform for molecular imaging through a **systematic approach to immunotracer selection**. The goal is to obtain clinically validated immunotracers and ready-to-use molecular imaging platforms.

Targets

T-lymphocytes

B-lymphocytes

Macrophages

Tumour cells

Targeting moieties

Antibodies

Nanobodies

Peptides

Small molecules

Labels

PET

Optical

Generation of cell type specific immunotracers

Immune-Image will perform an exhaustive research to identify and describe **cellular membrane receptors**, **targeting moieties** and **labels** that can be exploited and combined to track many cellular subtypes.

Imaging technique development and optimisation

The project will determine the optimal imaging modality for each immunotracer and will develop **quantitative imaging** protocols for them.

In vivo selection, validation and safety

Immunotracers will be evaluated **in vivo** using **rodent models** (including humanised rodents) and **non-human primate** (NHP) models.

Clinical trials

The Immune-Image project will perform **clinical trials** to evaluate the immune system status and to confirm the **safety and efficacy** of the immunotracers. Particularly, immunotracers targeted to **oncologic and inflammatory diseases** will be evaluated.

4 | An approach with many impacts

● Advancing on the field of immune cells imaging

The project will deliver a **systematic immunotracer generation platform** that will be able to produce immunotracers with desired characteristics. This will **boost the customisation** of the imaging diagnosis.

● Improving clinical and healthcare practice

This novel molecular imaging strategy, along with biomarker data, will serve to improve the **prediction of the response** to immunotherapies and will enable the selection of tailored treatments.

● Boost and optimise drug discovery

The selected immunotracers will reduce ambiguity in the evaluation of immunotherapies, thus **cutting down in duration and costs of drug development**. Moreover, it will **facilitate the design of new drugs**.

● Enhancing basic and translational research

The standardised protocols will **improve our understanding of immunotherapies** and the **identification of new molecular pathways**. In addition, Immune-Image will facilitate R&D targeted to many diseases.

5 | Funders & partners

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Consortium

Pfizer — VUB Vrije Universiteit Brussel — VIB — Roche — umcg

BAYER — cea — Antaros Medical — EUROPEAN CANCER PATIENT COALITION

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