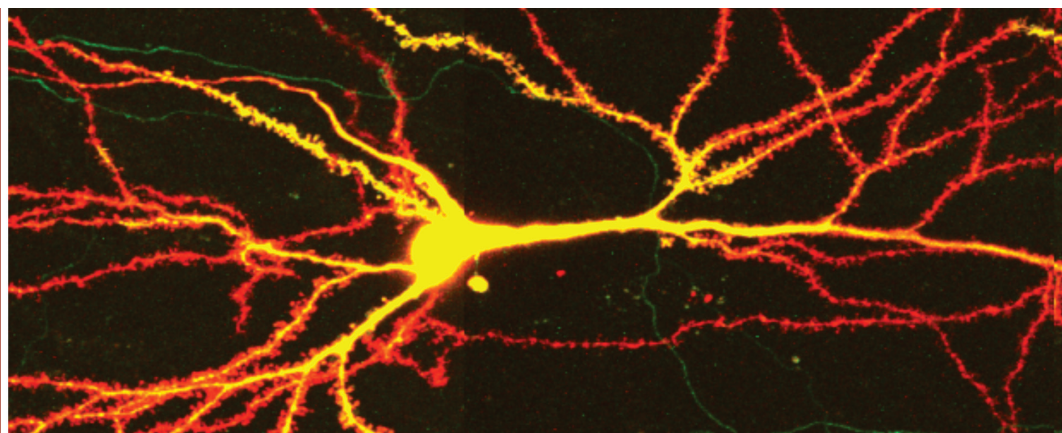


# Imaging at Novartis

Innovation in Novartis R&D



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“By developing the next generation of imaging biomarkers we hope to open up new avenues for drug research.”

–David Tuch

Head of Clinical Imaging

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Imaging techniques provide important new insights into biological processes. The imaging techniques we're familiar with from a hospital setting – such as Magnetic Resonance Imaging, Positron Emission Tomography, Ultrasound, Computerized Tomography – are also used in drug discovery to identify and select targets for drugs and to test whether a drug is hitting its molecular target. Imaging is also used during drug development to test the efficacy and safety of new drug candidates and to determine how a drug is distributed within the body. This work is done by imaging scientists working in collaboration with biologists, chemists, and pharmacologists.

## **Molecular imaging**

Each imaging technique has its advantages and limitations. The task of the imaging scientists at Novartis is to select the best technique for the scientific question at hand or if needed even develop entirely new imaging methods. At Novartis, imaging is applied across all phases of drug discovery and development. The Global Imaging Group (GIG) of the Novartis Institutes for BioMedical Research (NIBR) has at its disposal the necessary resources for molecular imaging, which is used mainly in preclinical investigations. The techniques include optical methods such as live cell imaging and high-resolution confocal microscopy as well as positron emission

tomography (PET), single photon emission computed tomography (SPECT) and magnetic resonance imaging (MRI). Coupled with the chemical expertise to prepare specific samples, these non-invasive techniques make it possible to visualize molecular processes. Disease-specific changes can be located and quantified and their dynamic profile assessed. This enables researchers to identify what is wrong with the intracellular environment in such detail that it is possible to recognize the part of the cell that is triggering the problem.

Molecular imaging makes it possible to follow processes such as the expression of specific genes, interactions between drug candidates and proteins, and the protein-induced activation of signal transduction pathways.

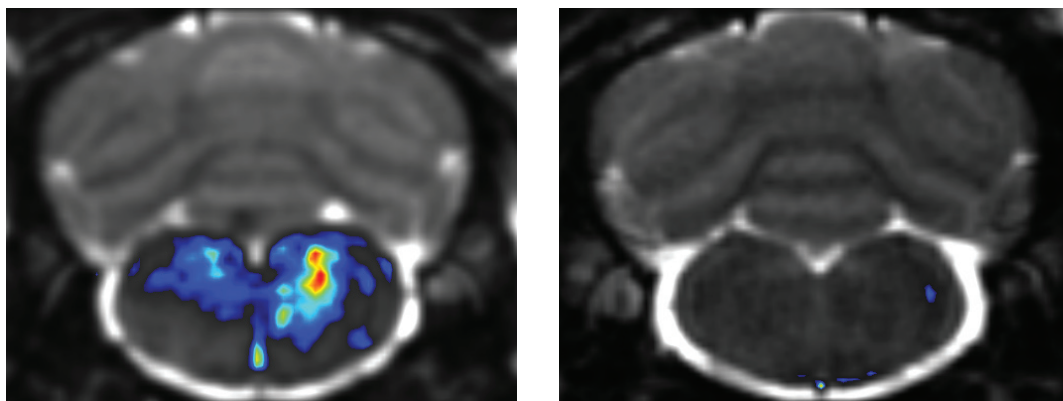
## **Cellular imaging**

NIBR's Preclinical Safety group works in the field of cellular imaging. Here, at the interface between research and development, researchers are visualizing and quantifying the effects of drug candidates at the cellular level. In which types of cell does a drug candidate reside? What changes does it induce? The aim is to clarify a substance's safety as early as possible in the development process and to concentrate further efforts only on the most promising candidates. In addition, in-life imaging using ultrasound and

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Section through the cerebellum and brainstem in a model of multiple sclerosis: A contrast agent clearly shows how the substance fingolimod, which is highlighted in color, inhibits sites of inflammation in the brain (left image before, right image after successful treatment).

optical techniques are also being pursued to annotate and understand safety profiles of promising compounds.

#### **Clinical imaging**

Imaging also plays an important role in Proof-of-Concept (PoC) studies, which precede full clinical development. These are small-scale studies with precisely defined patient groups designed to explore the safety and efficacy

of drugs. Non-invasive measures greatly accelerate this process. Clinical imaging scientists within the Biomarker Development (BMD) group help to design, execute, and interpret clinical trials using imaging techniques. In many cases these techniques – for example PET scans of tumor metabolism or MRI scans of brain damage in multiple sclerosis – give the first indication of whether a drug is working in patients.