Light Sheet Microscopy: Studying the Immune System in 3D

Scientists from Würzburg have visualized for the first time processes of the immune response in intact tissue samples. The researchers headed by Dr. Andreas Beilhack present their 3D microscopy technique in the current issue of *Journal of Clinical Investigation*.

The so-called **light sheet microscopy** allows researchers to scan whole tissue samples within minutes, without having to first physically slice them. A high-performance computer immediately reassembles the images in three dimensions. With this new method, the resolution is high enough for researchers to study single cells within this overall context. In this specific case, they studied the interactions of immune cells with cancer cells, and also how the immune system rejects foreign tissue after a transplantation.

"Using fluorescent dyes, we can now visualize cells and molecules deep within the tissue of intact mouse organs or in tissue samples from cancer patients", enthuses first author Christian Brede, whose research on the topic is part of his doctoral thesis in the lab of Dr. Andreas Beilhack at the University Clinic.

The senior researcher of the study is fascinated with the new microscopy technique. "The principle behind it has been known for a long time: Maybe you know the effect when in the late afternoon the light falls through the window from the side, how suddenly the finest dust particles in the room become visible." More than 100 years ago, Henry Siedentopf and Richard Zsigmondy built a microscope using this effect for the first time. For his observations with this microscope, Zsigmondy was honored with the nobel prize for chemistry in 1925.

The research groups of Dr. Gregory Harms and his successor Dr. Katrin Heinze at the Rudolf Virchow Center have now radically refined this technique. "Modern laser and computer technology affords us all new technical options", explains Dr. Katrin Heinze. Beilhack sees great potential in the combination of these methods for biomedical research, and possibly also for future clinical diagnostics.
Thus, the next projects are already planned. The researchers now want to study inflammations and infections more closely. Microscopy technician Mike Friedrich is already tinkering with the instrument again, to further improve its function.

**Original publication:**

**More information:**
http://www.rudolf-virchow-zentrum.de/