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Novel cell-based assays to monitor immune gene responses during bacterial infections via innovative fluorescence imaging

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Cell-based assays have become an important tool for screening with the aim to identify novel chemical compounds as potential drugs, or to find new cellular drug targets. The profiling of gene expression patterns yields very important information how cells respond to specific stimuli, or how they adapt to a changing environment.

Even if some molecules, such as organic drug components, surface molecules of different organisms like bacteria or hormones don't target directly cellular gene expressions, their interference with signaling pathways alter the reorganization of gene expression patterns. So far, the methodologies for gene profiling require the disruption of the investigated cells (gene chips), or they yield only very poor time resolution due to the reporters used (GFP or luciferase). To overcome these problems, we have developed a novel imaging-based technology to profile gene expression on the transcriptional level in single cells and in real time.

Particularly, we are taking advantage of a novel class of fluorescent sensor molecules that can capture alterations in the expression of specific genes with very high temporal resolution. Using our novel technology, we are able to determine the precise time point when human cells are capable to detect foreign stimuli, such as pathogens.
Our approach has the potential to be very valuable for the screening of novel anti-inflammatory drugs and for the development of novel tools to fight against microbial pathogens.