

Technology breakthrough reveals cellular transcription process

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A new technology that reveals cellular gene transcription in greater detail has been developed by Dr. Daniel Kaufmann of the University of Montreal Hospital Research Centre (CRCHUM) and the research team he directed. "This new research tool offers us a more profound view of the immune responses that are involved in a range of diseases, such as HIV infection. At the level of gene transcription, this had been difficult, complex and costly to do with current technologies, such as microscopy," explained the University of Montreal professor.

The technology is known as the "FISH investigation protocol" (Fluorescent in situ hybridization) - it optimises current flow cytometry processes, resulting in a greater visibility of the transcription of RNA, a key step in the transmission of cellular information. The researchers published their breakthrough in *Nature Communications'* online edition. Flow cytometry itself enables the simultaneous measurement of hundreds of thousands of cells as they quickly pass through laser beams. This technology dates back to 1934, when it was used to count the cells making up organs and blood, before being developed across the decades to enable the analysis of cells' various physical characteristics. Today, flow cyclometers are standard equipment for immunology and cancer research labs.

However, the tool's major barrier was that it could only be used for the study of proteins, as specific antibodies that recognize these molecules make them visible by marking. Unfortunately, there are many proteins for which no specific antibodies are available, and so it has been impossible to study them with flow cytometry. Moreover, cancer, HIV and other diseases are caused by a problem that precedes cells' creation of proteins - the deregulation of the [transcription](#) of DNA information to the RNA messenger. Classic [flow cytometry](#) cannot examine what is happening during this process.

Dr Kaufmann's team worked with Affymetrix, a company, to break through this barrier by applying their technology to a fundamental step in the transmission of genetic information within the cell. The technology, which is now patented, involves carefully mixing chemical reactants by following a two day long handling protocol. Using a standard flow cyclometer, a hybridization oven and a variety of meticulously dosed solutions (which act as microscopic fluorescent probes), the cells can be coaxed to deliver information that has been previously unavailable.

The application of the technology promises to have a huge impact as ultimately it will enable researchers to better understand the mechanisms that cause diseases and to establish the efficacy of the drugs used to treat them. "In principle, our technology can be applied to any species. We can detect a very wide variety of RNA molecules produced by the human body and animals," Dr. Kaufmann explained.

Provided by University of Montreal

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