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Combo method reveals cells' signal systems

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Our understanding of what differentiates cancer cells from normal cells is limited by a lack of methods for studying the complex signal systems of individual cells. By combing two different methods, a team of Uppsala researchers have now provided the research world with a tool for studying signal paths on several levels at the same time. Their article is being published today in *PLoS One*.

"We also show that the method can be used to determine the molecular effect of drugs or pharmaceuticals," says Ola Söderberg, who directed the study at the Department of Immunology, Genetics, and Pathology, Uppsala University.

Interaction between separate cells is crucial for the body to function. Cells communicate with each other through direct contact and through soluble substances/molecules that are sent out as a "signal" to surrounding cells. When they bind to a receptor molecule on another cell, the signal is further transmitted into that cell by a relay of protein interactions, thereby regulating mRNA expression. Signaling between and within cells is a highly complex process that is regulated on several different levels in the signal pathways.

"What's more, signaling can differ considerably between one cell and a neighbor cell, so the possibility of studying the signaling of individual cells is extremely important for us to understand various pathological conditions, such as cancer," says Ola Söderberg.

It is the lack of methods for doing so that has limited our understanding

of what differentiates cancer cells from normal cells. The new method combines two different methods that reveal protein activity and mRNA expression, respectively. This makes it possible to determine the direction of signal, that is, what the effect of signaling is. The two methods that are now being combined were developed over the last few years by this same research team.

"The possibility of now combining them will yield a clearer picture of what went wrong in cancer cells, and it will lead to greater insight into how cancer cells work together with and exploit normal cells."

In the article, the methods are used to see how quickly signals are transmitted, from the surface of cells to the nucleus, and to determine how many of the cells respond to the signals. Further, the methods can be used to understand how various drugs function and where they disrupt signaling, and will facilitate the discovery of new targeted pharmaceuticals to treat cancer.

Provided by Uppsala University