Even single cells are able to remember information if they receive the order from their proteins

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Even single cells are able to remember information if they receive the order from their proteins. Researchers at the University of Basel's Biozentrum have discovered that proteins form pairs to give the signal for storing information in the cell's memory. The results of the study have now been published in *Cell Reports*.

Like our brains, individual cells also have a kind of memory, which enables them to store information. To make this possible, the cells require positive feedback from their proteins. The research group led by Prof. Attila Becskei at the Biozentrum of the University of Basel in Switzerland has now discovered that the proteins need to form pairs in these feedback loops to store information.

Cellular memory works only with protein pairs

The feedback by protein pairs works properly under specific conditions: "For dimerization the proteins must be present in the right concentration," says Attila Becskei. If there are too few proteins, no pairs form and the cell does not store information. But when the protein concentration is too high, coupling does not work either. "It's similar to us humans. In large cities, packed with people, dating is difficult. But living alone in the countryside does not make it easier to find a partner. So we also need to be at the right place at the right time," illustrates Becskei.

Once the protein pairs are formed they give the cell the signal to store information in its memory. This makes the cell more sensitive to remark environmental stimuli and to respond to these more quickly in the future.

Paired protein also essential for cell differentiation

The cell not only requires the appropriate feedback from protein pairs in order to remember information but also for cell division and cell differentiation - the development of specialized cells. The understanding of the functioning of such feedback loops can reveal how to erase the cell's memory. This is necessary, for example, for being able to turn a specialized cell, such as a skin cell, back into an unspecialized stem cell.

"For cellular reprogramming the cell must first forget that is was a skin cell," says Becskei. "Using mathematical models we have developed, we now want to investigate, which other feedback loops contribute to cellular memory."

Provided by University of Basel

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