PRESS RELEASE

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Immune cells transmit information through a distribution network similar to a 'delivery service'

A properly functioning immune system protects organisms from pathogens, but at the same time does not cause harmful reactions against their own body that can lead to autoimmune diseases. To keep the immune system set up in this way, immune cells called T lymphocytes pass during their development in the thymus through 'schooling'. A team of scientists led by Dominik Filipp from the Institute of Molecular Genetics of the Czech Academy of Sciences has elucidated exactly how the training process of these cells takes place and how the distribution network works, similar to a 'mail order service', by which the cells pass on information in the form of the body's own molecules called antigens.

The training of T lymphocytes is mainly the responsibility of thymic epithelial cells and the so-called dendritic cells (cells of the immune system that present them various molecules, called antigens, on their surface). Scientists have recently discovered a significant diversity of these 'training' cells in terms of their properties and functions. Experts also know that these cells interact with each other and exchange their antigens.

The distribution of these antigens in the thymus can be likened to a mail order service. On the one hand, there are the training cells that possess the antigens and 'send' them; on the other hand, there are the various recipients of these antigens. Dominik Filipp's team from the Institute of Molecular Genetics of the Czech Academy of Sciences has now shown that some cells of the mail order service purposely choose where and to whom they will send the antigens.

"Using mouse models, our team was able to show that preferential pairing occurs between certain thymic cell populations in antigen transfer. At the same time, we have been able to identify a population of so-called activated dendritic cells that are most efficient at receiving antigens from the thymic cells", explains team leader Dominik Filipp.

Dominik Filipp's team were also the first to demonstrate that a single dendritic cell can acquire antigens from two or more thymic epithelial cells and, conversely, that two dendritic cells can be both the distributor and recipient in a single antigen transfer.

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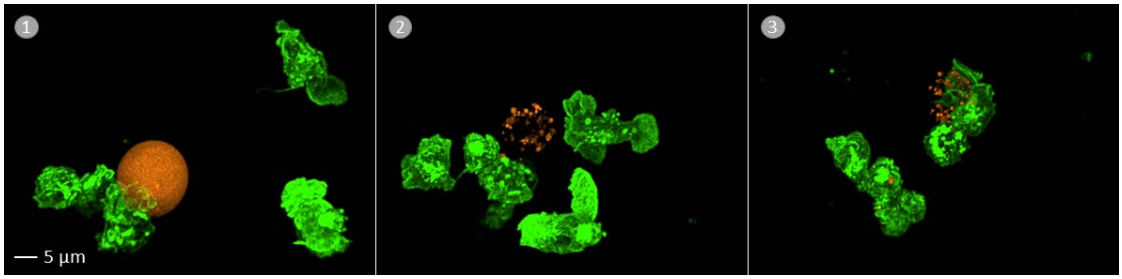
The results of this scientific study leading to understanding the antigen distribution network in the thymus suggest that T cell training, which is directly dependent on the presentation of these antigens, is strongly influenced by which 'training' cells are distributors and which are recipients in a particular case. This study was published in January 2022 in prestigious scientific journal *eLife*.



Time-lapse microscope images show critical moments of antigen distribution from training cells (mTEC, orange) to recipient cells (DC, green). **Figure 1)** captures active communication between the two cell types. In **Figure 2)**, the training cell dies and breaks down into small parts containing antigens that are gradually distributed and engulfed by the recipient cells, as shown in **Figure 3)**. The recipients subsequently present these antigens on their surface, and can thus 'train' maturing T cells in a similar manner to the training mTECs. T lymphocytes that recognize their own antigens are potentially harmful, and are therefore eliminated. This process prevents reactions that lead to autoimmune diseases.

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