# 'First aid' for brain cells comes from blood

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In acute ischemic stroke, the blood supply to the brain is restricted. Initially, brain cells die from lack of oxygen. In addition, ischemia activates harmful inflammatory processes in the affected area of the brain. For the first time, scientists at the Neurology Clinic at Heidelberg University Hospital have shown that certain immune cells in the blood inhibit inflammation after a stroke. These cells are known as regulatory T lymphocytes (Treg). The regulator cytokine Interleukin 10 plays an important role in this protection, perhaps offering a new approach to stroke therapy. The study has now been published in *Nature Medicine*.

Every year, some 200,000 people suffer a stroke in Germany. It is still frequently fatal or causes severe disability. The Neurology Clinic in Heidelberg under the direction of its medical director Professor Dr. Werner Hacke is one of the most prestigious centers in the world for developing and testing innovative approaches to stroke treatment.

## Immune cells produce the protective Interleukin 10

The team of researchers headed by Dr. Roland Veltkamp, senior physician at the Neurology Clinic of Heidelberg University Hospital has now shown in stroke models that a stroke in mice with no functioning Treg cells in their blood causes much greater damage to the brain and greater disabilities than in animals with functioning Treg cells. An analysis of the immune system showed that mice without this cellular "First Aid" produce much more inflammatory transmitters in the brain and blood. In addition, immune cells, whose task is to recognize and digest foreign bodies or dead cell material - e.g. microglial cells or

neutrophils - are activated more strongly in the absence of Treg.

Treg cells protect cells by suppressing the harmful activation of the immune system and can thus also prevent autoimmune diseases from developing. It is still unclear how exactly the Treg cells communicate in the damaged brain tissue. Interleukin 10 (IL 10), a transmitter substance that is produced by the Treg cells, seems to play an important role during a stroke. Mice with no functioning Treg cells that were injected with IL 10 on the first day following a stroke had markedly less brain damage than mice that did not receive IL 10. On the other hand, the transfer of genetically modified Treg cells unable to produce IL-10 offered no protection.

The researchers in Heidelberg are now working on different approaches for translating the protective mechanisms of Treg into future treatment for strokes. "We still need to know a lot more about how the immune cells communicate among themselves and with the brain cells after a stroke in order to develop a treatment plan for patients," says Dr. Roland Veltkamp.

More information: Arthur Liesz, Elisabeth Suri-Payer, Claudia Veltkamp, Henrike Doerr, Clemens Sommer, Serge Rivest, Thomas Giese, Roland Veltkamp, Regulatory T cells are key cerebroprotective immunomodulators in acute experimental stroke, *Nature Medicine* 2009, 15, 192 - 199. DOI:10.1038/nm.1927.

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