

Skin and immune system influence salt storage and regulate blood pressure

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High blood pressure is responsible for many cardiovascular diseases that are the leading cause of death in industrialized countries. High salt intake has long been considered a risk factor, but not every type of high blood pressure is associated with high salt intake. This has puzzled scientists for a long time. However, new findings by Professor Jens Titze (Vanderbilt University, Nashville, Tennessee, USA and the University of Erlangen) now point to previously unknown mechanisms. Accordingly, the skin and the immune system play an important role in the regulation of the sodium balance and hypertension, as he reported at the 1st ECRC "Franz-Volhard" Symposium of the Max Delbrück Center for Molecular Medicine (MDC) Berlin-Buch and Charité – Universitätsmedizin Berlin on September 7, 2012 in Berlin-Buch.

The water and salt balance of the body is of great importance for blood pressure. The decisive factor is the kidney, which regulates how much water is retained in the body and how much is excreted. In this way it regulates the volume of blood and thus influences blood pressure. However, new findings by Professor Titze, one of the leading experts in the field, show that organs and systems of the body that hitherto were not associated with water and salt balance have an influence on blood pressure: the skin and the immune system.

Professor Titze showed that sodium can be stored in the connective tissue of the skin. "The sodium concentration can be higher in the skin than in blood. This means that not only the kidney regulates sodium balance but that there must be additional mechanisms," the researcher

explained. His research group demonstrated that the immune system plays an important role in this mechanism: A specific type of immune cells, the macrophages – literally "big eaters" in Greek – recognize high [sodium levels](#) in the skin. They subsequently activate a gene that in turn ensures that the [vascular endothelial growth factor](#) (VEGF-C) is released in large amounts into the skin. VEGF-C controls the growth of lymphatic vessels that transport fluid and sodium. If this factor is released in higher amounts, lymphatic vessels grow into the skin and ensure that the stored sodium can be transported away again.

In animal experiments Professor Titze's research team blocked this mechanism. As a result, the rats and mice in the experiment developed high blood pressure. "The [immune cells](#) apparently regulate salt balance and blood pressure," Professor Titze said. "In addition, data from a first clinical study showed that large amounts of salt are stored in the skin of patients with [high blood pressure](#)."

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