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New junior research group investigates immune response to stress and its potential impact on cardiovascular health

At the LMU University Hospital in Munich, Dr Kami Alexander Pekayvaz is launching a new junior research group. His research focuses on the connection between stress, the immune system (specifically neutrophil granulocytes), and cardiovascular diseases. The German Centre for Cardiovascular Research (DZHK) is funding the project for the next six years with €1.65 million.

Stress has played a crucial role in survival throughout evolution. However, what was once life-saving may now be life-threatening. In prehistoric humans, the immune system might have been activated by stress in response to injuries - such as a bite from a saber-toothed tiger - to form microthrombi (small blood clots) to trap pathogens. Stress hormones like adrenaline might have helped to facilitate this process.

Today, Dr Kami Pekayvaz, head of a new DZHK junior research group, is investigating whether and how stress promotes thrombosis — the formation of harmful blood clots — and thereby increases the risk of cardiovascular diseases such as heart attacks, strokes, and pulmonary embolisms.

As a physician at LMU University Hospital in Munich, Dr Pekayvaz treats patients while conducting research in parallel. "I frequently see patients with heart attacks or other thrombotic diseases who have recently experienced acute psychological stress. We know that stress and its associated hormones, like adrenaline, increase the risk of these conditions. However, it remains unclear how exactly these hormones influence the immune system and contribute to thrombosis. "Together with my research group I now have the opportunity to investigate what I observe during my daily clinical routine," says Pekayvaz. The DZHK is funding the junior research group to explore the adrenaline-neutrophil axis over the next six years with €1.65 million.

Understanding the role of the immune system in stress-related thrombotic cardiovascular disease

Neutrophils are essential immune cells that rapidly respond to infections, sterile inflammation, or environmental stress. At the same time, the body releases acute stress hormones like adrenaline, which belong to the group of catecholamine.

"An evolutionary catecholamine-neutrophil axis may have been crucial in containing bacterial infections by forming small thrombi in microvessels. However, under modern environmental stress, this mechanism might also lead to harmful blood clots in large vessels — so-called macrovascular thrombosis," explains Pekayvaz. "This project provides an opportunity to better understand how stress hormones and the immune system interact in the development of thrombotic cardiovascular diseases."

Dr Kami Pekayvaz studied medicine in Munich, with additional training at the University of Oxford. He earned his doctorate with research on atherosclerosis and has been investigating the intersection of inflammation and cardiovascular diseases using cutting-edge translational analytical methods at LMU University Hospital for several

years.

Bridging the gap between laboratory and clinical practice

"We are conducting both in vitro and in vivo experiments - that is, studying the interaction between neutrophils and adrenaline in test tubes and animal models. Additionally, we examine what happens when neutrophils are unable to respond to adrenaline because we block the receptors for these stress hormones," explains Pekayvaz. "We are particularly interested in how harmful vascular occlusions - such as venous or arterial thrombosis - develop under these conditions. Moreover, we are investigating the consequences for bacterial sepsis, where the immune defense uses microthrombi to contain pathogens."

To conduct this research, Pekayvaz and his team - comprising physicians, biologists, and bioinformaticians - utilise cutting-edge single-cell analysis and microscopy techniques, as well as newly developed genetic mouse models at LMU University Hospital. They also analyse blood samples from patients with cardiovascular diseases, effectively bridging the gap between laboratory research and clinical practice.

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URL zur Pressemitteilung: https://dzhk.de/en/research/scientific-groups/junior-research-groups/dr-kami-pekayvaz
Profile of Dr. Kami Alexander Pekayvaz

Dr Kami Pekayvaz provides patient care and simultaneously performs translational cardiovascular research – his DZHK-funded junior research group is now starting in Munich to better understand the role of the immune system in thrombotic diseases.
LMU Klinikum