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PHYSIKALISCHES KOLLOQUIUM

UNIVERSITÄT DES SAARLANDES

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„Synthetic Immunology – Immunizing the Future“

Mittwoch, 30. Juli 2025, 10:30–12:00 Uhr s. t.
Gebäude E2 6, Raum E.04 und über MS Teams:
https://short-link.me/18Q0M

The immune system is one of the most intricate biological networks known, integrating complex biophysical and biochemical signaling across multiple spatial and temporal scales. In my research, I combine synthetic biology with immuno-biophysics to gain deeper insight into immune system dynamics. By constructing synthetic cell models and fully artificial replicas of immune microenvironments, I apply an “understand-by-design” strategy to address key challenges in cancer and immunological diseases. In this talk, I will present our work focused on the bottom-up assembly of synthetic lymphatic tissues.

Lymph nodes are central hubs for T cell priming and adaptive immune responses, but existing *in vitro* systems fail to recapitulate the dynamic biophysical and biochemical cues that govern T cell activation. To overcome this limitation, my research group is developing synthetic lymphatic tissues with programmable microenvironments that closely mimic the architecture and functionality of natural lymph nodes. These systems support ex vivo expansion of human T cells within a tunable setting where we can independently control properties such as synthetic cell stiffness, membrane receptor mobility, and mechanical confinement. This platform enables us to dissect the individual contributions of biomechanical and biochemical signals during T cell activation. Notably, we found that controlling the degree of cellular confinement induces a T cell phenotype that is less susceptible to immunosuppression—a mechanism mediated by the mechanosensitive co-receptors CD5 and CD6. These findings have direct implications for the development of next-generation adoptive T cell therapies.

Der Gast wird betreut von Prof. Dr. Christian Wagner.

Interessierte sind herzlich eingeladen.

Naturwissenschaftlich – Technische Fakultät

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