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INM

BOTTOM-UP ASSEMBLY OF SYNTHETIC CELL-BASED IMMUNE MICROENVIRONMENTS

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Host: Prof. Dr. Aránzazu del Campo

The microenvironment of tumors comprises multiple types of immune cells, rendering the tumor immune-microenvironment (TIME) exceedingly complex in structure and function(1). Although some deceptively simple signaling axis (e.g. PD 1, LAG3 etc) have been pinpointed, empiric investigations of this multipartite system have proven to be ineffective, currently impending improvement of immune-targeted cancer therapies(2). Systematically combining the mosaic of functional immune parts for bottom-up engineering of an artificial TIME (ART-TIME), that exhibits key characteristics of tumor-immune interactions, opens up new perspectives towards rational analysis of TIME and its influence on tumor initiation, progression and treatment(3,4).

I will present how immune cells, the defining elements of a TIME, can be recreated as synthetic cells by bottom-up assembly. The programmable synthetic cells are introduced into tumor organoids to function as lifelike leukocyte mimics inside in vitro tumors. By this, a molecularly defined immune environment is created. I will further present how this technology can be applied to assess and control organoid development as well as immunotherapeutic responses. I will show how this bottom-up approach links TIME architectures to cancer adaptation and therapy resistance as well as how ART-TIMEs strive to de-convolute the dynamic complexity of immune microenvironments towards a rational dissection. Conceptually, ART-TIMEs contribute to the assembly of hybrid biomaterials and insights on tumour immunology using programmable man-made materials. This interdisciplinary approach opens up perspectives for synthetic cells capable of manipulating tissue patterns by creating hybrid materials at the vanishing boarders between the living and non-living world.