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Innovations in Regenerative Medicine

Monday, March 29th, 13:00 – 14:00

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COMPUTATIONAL MODELING FOR ADVANCING CARDIOVASCULAR TISSUE ENGINEERING

Like many other living tissues, engineered cardiovascular tissues have the intrinsic ability to grow and adapt to changes in their environment. This fascinating adaptive capacity gives engineered cardiovascular tissues the potential to overcome the limitations of the current cardiovascular replacements that are unable to accommodate changes in the recipient's demands. For cardiovascular tissue engineering to be successful, however, we need to (1) thoroughly understand the responsible growth and remodeling mechanisms of (engineered) cardiovascular tissues, and (2) be able to steer tissue development towards establishing a physiological tissue organization that ensures long-term tissue functionality.

In this talk, I will discuss how computational modeling, particularly when integrated with experimental research, can aid in addressing both challenges. I will give a conceptual overview of the computational models that we developed to analyze the growth and remodeling of cardiovascular tissues, with a primary focus on heart valves. Specifically, I will show how we used our models to (1) increase our understanding of postnatal human heart valve development, (2) understand adaptive and maladaptive remodeling of tissue-engineered heart valves *in vivo*, and (3) computationally optimize the design of tissue-engineered heart valves to induce functional remodeling.
Next to these specific research examples, I will also discuss the current and future global developments concerning the use of computational modeling for advancing regenerative medicine in general, and facilitating its clinical translation.

Chair: Melanie Generali, melanie.generali@uzh.ch