Synthetic *Ex Utero* Embryogenesis: from Naive Stem Cells to Complete Embryo Models

Speaker:
Jacob H. Hanna M.D. Ph.D.
Associate Professor, Department of Molecular Genetics
Weizmann Institute of Science | 234 Herzl St, Rehovot 7610001, Israel

The identity of somatic and pluripotent cells can be epigenetically reprogrammed and forced to adapt a new functional cell state by different methods and distinct combinations of exogenous factors. The aspiration to utilize such *in vitro* reprogrammed pluripotent and somatic cells for therapeutic purposes necessitates understanding of the mechanisms of reprogramming and differentiation and elucidating the extent of equivalence of the *in vitro* derived cells to their *in vivo* counterparts. In my presentation, I will present my group's recent advances toward understanding these fundamental questions and further detail our ongoing efforts to generate developmentally unrestricted human naive pluripotent cells with embryonic and extra-embryonic developmental potential. I will expand on new avenues for utilizing custom made electronically controlled *ex utero* platforms and optimized conditions for growing natural mammalian embryos *ex utero* for extended periods capturing development from pre-gastrulation until advanced organogenesis, for better studying of stem cell transitions during embryogenesis and organogenesis. I will detail how the latter platforms offered an exclusive technical platform to demonstrate and unleash the self-organizing capacity of mouse naïve PSCs to generate post-gastrulation synthetic *Bona Fide* and organ-filled, synthetic embryo models with both embryonic and extraembryonic compartment *ex utero*, as well as our ability to extend these findings with naïve human PSCs and generate complete structured day 14 human embryo models. Collectively, I will be highlighting prospects for new platforms for advancing human disease and developmental modelling.