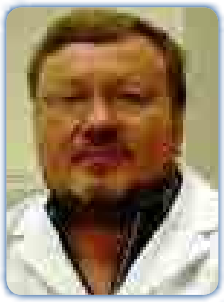
Igor I Katkov, J Tissue Sci Eng 2017, 8:2 (Suppl)
DOI: 10.4172/2157-7552-C1-032



Igor I Katkov

Celltronix, USA

Cryopreservation by vitrification: Basic thermodynamic principals, methods and devices

Cryopreservation (CP) and subsequent long-term storage (cryobanking) are important parts of both life science research and related industries and technologies. As we have stated before, there are 5 basics ways of achieving long-term storage, all essentially lead to vitrification of cells, namely: Slow freezing (SF), Equilibrium vitrification (E-VF) with high concentration of vitrificants ("thickeners") and relatively moderate speed of cooling and rewarming, Kinetic vitrification (K-VF) with very rapid rates of cooling and rewarming and low to none concentration of exogenous vitrificants, Freeze-drying (lyophilization), and Vacuum/air flow drying at temperatures above zero degree Celsius (xeropreservation), which up to now, is the mainstream of the majority of CP technologies. It however requires multi-step protocols, expensive programmable freezers and must be tuned to the particular types of cells, tissues and organs. In this presentation, we will focus on the kinetic vs. equilibrium vitrification. We will compare the mechanisms, analyze phase diagrams, emphasize the role of the Leidenfrost effect (LFE) and ways of reducing up to full eliminating LFE, discuss pros and cons of each methods and present information on basic equipment and accessories for E-KF and K-VF used in different field of biology, reproductive, regenerative and personalized medicine, drug screening, agriculture, conservation of endangered species, medicine and other related disciplines of sciences and industries. And, finally, we will introduce our (solution to hyper-fast cooling and present a short video clip of the novel hyper-fast scalable cooling devices KrioBlast™ and VitriPlunger™ and briefly discuss the promising results on K-VF of human sperm, embryonic stem cells and insulin-producing cells using the KrioBlas™ and VitriPlunger™ systems.

Biography

Igor I Katkov is a trained Biophysicist with more than 30 years of experience in Cryobiology and Cryogenic Engineering. His research has been focused on the fundamental aspects of kinetic vitrification (K-VF) as well as on designing the practical system for K-VF KrioBlast™ in cooperation with V F Bolyukh from Ukraine. He is a Chief Scientific Officer of Celltronix, San Diego, USA and recently accepted a Professor-level position of the Head of the Laboratory of Amorphous State in the Belgorod National Research University, Russia.

prodvincell@hotmail.com

Notes: