Researchers at the University of South Florida have developed a method for development and characterization of a perfused-tumoroid system that is responsive to real-time non-invasive monitoring of the cell proliferation, viability and multiplexed detection of key physiologic and clinical biomarkers.

The ability to translate fundamental findings in cancer biology and genetics into anti-cancer drug discovery has led researchers to develop suitable 3D culture systems instead of the traditional monolayer (2D) cultures. These 3D in vitro tumor model systems have the capability to replicate the structure, physiology and function of tissues as well as recreate the in vivo morphology and arrangement of individual cells through a variety of approaches such as hydrogels and spinner flask. However, most of these approaches fail to fully recapitulate in vivo tumors because they suffer from challenges such as long cultivation time, formation of unequal-sized spheroids and difficult mechanical accessibility. As a result there is a significant need for a simple, rapid, scalable and inexpensive 3D-tumor model that recapitulate in vivo tumorigenesis.

USF Inventors have pioneered a novel 3D polymeric nanofiber scaffold (3PNS) on which cancer cells form tight, irregular aggregates known as tumoroids which reveal epithelial-mesenchymal transition (EMT) and drug responsiveness that resemble in vivo tumors. The static culture conditions posed by 3PNS are addressed by integrating the 3PNS culture with a perfusion microfluidic system coupled to acoustic and impedimetric biosensing of metabolic markers.

**ADVANTAGES:**
- Simple, precise, stable and well-defined culture environment for cellular assays
- Real-time monitoring of tumorigenesis
- Potential miniaturization and integration of complex functions into “multi-cell tumoroids on chip”

**Simple, precise, stable and well-defined culture environment for cellular assays**

**Overall concept - single unit cell in the microfluidic chip proposed on an interfacing electronic board to investigate physiological changes in tumors. Arrows indicate fluid flow direction. Drawing is not to scale**