High-Throughput Drug Testing Using 3-D Cell Culture

Historically, general cell culture has been performed on flat, tissue culture polystyrene (TCPS) because it is cheap, optically clear, and many cells grow well on it. In reality, however, living organisms are made up of an extracellular matrix (ECM) that often provides both aligned physical structure and mechanical support to the cells. Adherent cells are complex, self-sustaining units that require ECM anchorage to proliferate and undergo normal differential function. TCPS lacks this aligned three-dimensional (3-D) component and cells behave very differently on this flat, smooth substrate than they do in true biological settings. Not surprisingly, drugs developed using TCPS as an *in vitro* substrate experience a >99% failure rate in clinical studies. This is why *in vitro* drug discovery, drug development, and toxicology studies need to be performed on a biomimetic 3-D scaffold, but until now there has been no viable option that satisfies the high-throughput requirements of pharmaceutical labs. Nanofiber Solutions has developed 3-D nanofiber substrates for cell culture and drug development applications in standard multiwell plates and it can be scaled for larger commercial-scale bioreactor configurations. These 3-D cell culture plates easily allow for live cell imaging and are completely compatible with fluorescence, absorbance and bioluminescence based measurements using automated plate readers.
Automated neurosphere migration analysis on aligned nanofibers using an IncuCyte plate reader.
Automated image acquisition of HeLa cells on aligned nanofibers imaged using a GE INCell Analyzer.
Increased drug sensitivity of human A549 lung cancer cells when grown on random nanofibers or aligned nanofibers when compared to flat tissue culture plastic (TCP).
Primary kidney derived stem cells analyzed for high content screening (HCS) using an automated plate reader for drug interactions with normal cellular behavior. Cells are cultured on aligned nanofibers.