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Miniaturizing the test tube with lipid nanotechnology

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Miniaturization of laboratory procedures is opening new possibilities in medicine by allowing point of care diagnostics, precision medicine, novel therapeutics, reliable manufacturing of biologics, as well as applications that are likely unpredictable a priori. A fundamental challenge, however, is in the miniaturization of the test-tube. As compartments get smaller, surface effects begin to dominate over gravity and handling of fluids requires new strategies that take advantage of nanoscale effects. Biological systems provide an inspiration for solving this problem through the formation of fluid cellular and sub-cellular compartments defined by lipid bilayers as the boundaries. With this in mind, we have been fabricating arrays of lipid multilayers on surfaces such that they can contain a volume of encapsulated materials such as drugs or other reagents and be externally addressed and analyzed by knowing their position on the microarray. This approach is particularly interesting for

miniaturized high throughput screening, where there is potential to test 50,000 drug candidates for efficacy in cell culture on the area of a single microtiter plate. Furthermore, as the lipid multilayers decrease in size novel properties can be exploited, for instance by using optical interference for rapid and label free readout.

Speaker Biography

Steve Lenhart is an Associate Professor in the department of Biological Science and faculty member in the Molecular Biophysics and Materials Science and Engineering programs at the Florida State University. His doctoral degree is in Biology from the University of Muenster. He did postdoctoral research at Karlsruhe Institute of Technology in Germany and Northwestern University in the USA performing research in nanobiotechnology. He has published more than thirty peer reviewed publications on this subject, and in his tenure at FSU has pioneered the use of arrays of micro- and nanoscopic lipid droplets for miniaturized high throughput screening and biosensor arrays.

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