MaP Doctoral School | Lecture

Controlling the release of large molecules from biomaterials: How overcoming skepticism led to new medical treatments and ways to tackle a global health challenge

Prof. Robert S. Langer, MIT

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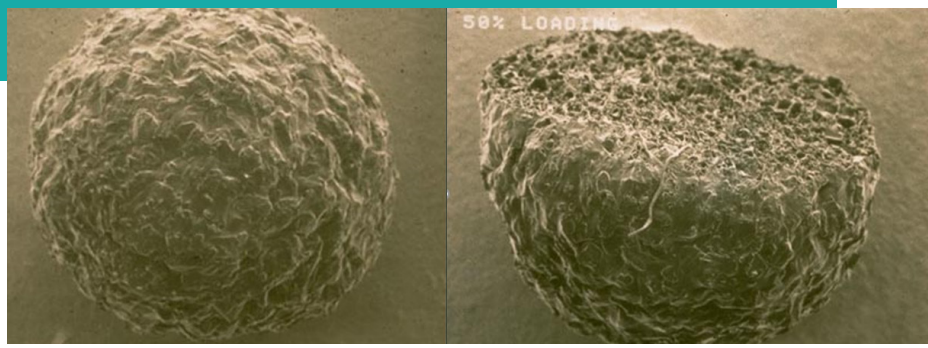

Advanced drug delivery systems are having an enormous impact on human health. We start by discussing our early research on developing the first controlled release systems for macromolecules and the isolation of angiogenesis inhibitors and how these led to numerous new therapies. This early research then led to new drug delivery technologies including nanoparticles and nanotechnology that are now being studied for use treating cancer, other illnesses, and in vaccine delivery (including the Covid-19 vaccine). We are also developing drug delivery microchips and robotic pills. Finally, by combining mammalian cells, including stem cells, with synthetic polymers, new approaches for engineering tissues are being developed that may someday help in various diseases. These can also serve as a basis for tissues on a chip which can potentially reduce animal and human testing. Examples in the areas of cartilage, skin, blood vessels, GI tract and heart tissue are discussed.

Robert Langer is one of 9 Institute Professors at the Massachusetts Institute of Technology (MIT); being an Institute Professor is the highest honor that can be awarded to a faculty member. He has written over 1,500 articles, which have been cited over 388,000 times; his h-index of 309 is the highest of any engineer in history and the 2nd highest of any individual in any field. His patents have licensed or sublicensed to over 400 companies; he is a cofounder of a number of companies including Moderna. Dr Langer served as Chairman of the FDA's Science Board (its highest advisory board) from 1999-2002. His over 220 awards include both the United States National Medal of Science and the United States National Medal of Technology and Innovation (he is one of 3 living individuals to have received both these honors), the Charles Stark Draper Prize (often called the Engineering Nobel Prize), Queen Elizabeth Prize for Engineering, Albany Medical Center Prize, Breakthrough Prize in Life Sciences, Kyoto Prize, Wolf Prize for Chemistry, Millennium Technology Prize, Priestley Medal (highest award of the American Chemical Society), Gairdner Prize, Hoover Medal, Dreyfus Prize in Chemical Sciences, BBVA Frontiers of Knowledge Award in Biomedicine, and the Balzan Prize. He holds 41 honorary doctorates, including Harvard, Yale, Columbia, and Northwestern, and has been elected to the National Academy of Medicine, the National Academy of Engineering, the National Academy of Sciences and the National Academy of Inventors.