BOTM: October, 2010

Cardiac Pacemaker

Artificial cardiac pacing is a therapy to restore the rhythm functions of a diseased heart through electrical stimulation. This therapy is generated by a cardiac pacemaker and delivered to the heart through an electrode that is permanently implanted in the heart. The interface between the electrode and the tissue is responsible for transferring electron current from the pacemaker into electrolyte current in the tissue. The electrode must have acceptable biocompatibility, biostability, and mechanical strength. It also is easy to imagine that the electrode should have good electrical conductivity for efficient pacing therapy delivery. There are also subtle requirements for electrodes that are critical for the function. An electrode should have adequate capacitance such that it can deliver enough current before significant electrochemical reaction occurs. An electrode should also be able to drain its surface charge quickly so that shortly after pacing, it can change its job to sense the rhythm of the heart. This enables the pacemaker to decide what to do next. Smooth electrodes made of stainless steel, platinum, platinum/iridium alloy were used previously. The state of the art electrodes, instead, have porous surfaces that are made of titanium nitride, platinum black, iridium oxide, or activated carbon. Images of a pacemaker and of the surface of a titanium nitride electrode are shown (courtesy of Medtronic).

This month's biomaterial was provided by the Proteins Cells and Interfaces Special Interest Group.

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