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In vitro evolution to adapt antibodies to technical requirements of biosensors

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The development of biosensors using antibodies for detection of an analyte is frequently hampered by the limited choice of sensor molecules, if antibodies were generated by classical animal immunization. For some antigens or desired fine specificity, no antibodies could be obtained at all. Here, recombinant methods based on a complete in vitro selection pipeline, typically phage display, offer several new opportunities. Antibodies with particular, pre-designed biochemical properties can be selected from the start, as the biochemical milieu during the in vitro selection can be exactly controlled. Further, properties of existing antibodies can be changed or improved in various directions to adapt the sensor molecule to the requirements of a particular biosensor system. We present examples of successful generation of antibodies binding to extremely toxic molecules of antibodies specifically selected to detect very small differences in the antigen structure, matching sandwich pairs, improvement of affinity or stability, and the change of the kinetic binding properties, and successful applications of such recombinant designer antibodies on biosensors.

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Laser-based fabrication of an electro stimulator device for cardiac cells stimulation

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Electro stimulation oriented to medical applications is an electric current induced method used for excitation and activation of certain organs and systems of the human body. Although many organs and systems can be stimulated by electric currents by adequate methods and techniques applied, the most widely practiced application is heart electro stimulation. Aside from this therapy, where the electric pulses are applied directly to the patient, electro stimulators are used in medical investigation as a tool to induce electric signals in cell cultures simulating different body conditions. In this method, electro stimulator must be carefully designed to work in a very specific circumstance. The device usually consists in two electrodes in direct contact with the cell culture, where the electric stimulus is induced by applying a voltage between them. They must be biocompatible to avoid toxic reactions in the culture and they also must efficiently transfer the charge to the medium in order to minimize the electrode degradation. In this work, we present a laser based fabrication process of fabricating an electro stimulator for cardiac cells on a 200 nm aluminum film deposited by physical vapor deposition over a soda-lime glass. By using laser techniques, the aluminum film was selectively removed to obtain a pre-designed electric circuit which is able to apply electric stimulus in an area delimited by a polydimethylsiloxane (PDMS) layer over the circuit. In order to avoid direct contact between the circuit and the cell culture, a 100 µm glass is placed between them. The electro stimulator was then assembled between two polycarbonate layers in order to maintain the device compact.

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