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APPLICATION OF PROTEIN MEMBRANES WITH MAGNETIC NANOPARTICLES FOR CO-CULTIVATION OF CELL CULTURES BY LEVITATION IN A MAGNETIC FIELD

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Introduction: To date, there are several approaches for the cultivation of cells with magnetic nanoparticles [1–3]. In the traditional approach, magnetic nanoparticles are enclosed in cells and cells levitate. When using the method of magnetic levitation, it is necessary to avoid the penetration of many magnetic nanoparticles into cells, which can disrupt the normal physiological functions of cells. An alternative approach can be the binding of magnetic nanoparticles with components of the extracellular matrix. In this work, the possibility of co-cultivation of cells on protein membranes with their levitation in a constant magnetic field was shown.

Methods: Metal carbon nanoparticles Fe @ C are synthesized by the gas-phase (levitationaljet) method. Iron-carbon magnetic nanoparticles were modified by amino groups. The primary forms were printed on a commercially available FDM 3d printer with a different nozzle diameter (0.4 and 0.2 mm). For the creation of secondary forms used molded silicone [Alcorsil 315], which was poured into primary forms. The microrelief on the primary forms, which is further translated to the protein matrix, is a consequence of the operation of the FDM 3d printer and does not require additional equipment. A mixture of protein (BSA), aminated nanoparticles and glutaraldehyde was placed in a silicone form. Chemical crosslinking of iron oxide nanoparticles to BSA was carried out using glutaraldehyde for 1, 6, 12 hours and BSA for 5, 10, 15 minutes. Glutaraldehyde was inactivated with glutamic acid solution, membranes sterilized in ethanol and washed with sterile water. A magnetic holder was placed on top of a Petri dish with cell cultures. In the experiment, was be used several cell lines (human fibroblast cultures, HEK, H0eLa, rhabdomyosarcoma cultures). Cell culture will be performed according to a standard protocol in a DMEM culture medium supplemented with embryonic serum (Sigma Aldrich).

Results: Were obtained membranes of different thickness (from 50 to 800 μm). To the action of a constant magnetic field, the membranes were levitated in the volume of the culture medium or at the interface of the air-culture medium. A confluent cell monolayer was formed on the protein membranes.

Discussion & Conclusions: Collectively, these data show the potential for cocultivation of cells on levitating microrelief protein membranes to investigate paracrine interaction between cells.

References

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