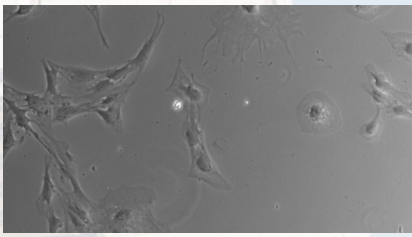
LABORATORY OF CELL-BIOMATERIAL INTERACTIONS

BIOMEDICAL CENTER



ABOUT US

The research of the group is mainly focused on interactions between human cells (osteoblastic cell line, primary fibroblasts, mesenchymal stem cells, etc.) and surfaces or nanoparticles prepared from different biocompatible materials with controlled properties.

Materials studied by our research group are of different chemistry – carbon (nanocrystalline diamond and graphene), titanium (nanostructured and ultra fine titanium), biodegradable nanocomposites (based on aliphatic polyester nanofibers with collagen, calcium phosphate nanoparticles and sodium hyaluronan), silicon (silicon nanoparticles doped with boron and phosphorus) and hyaluronic acid (hydrogels, complexes with surfactants). Used materials are tested as solid surfaces for interaction with adherent cells (implantology, sensing, etc.) and as nanoparticles for sensing, imaging and drug delivery.

The aim of projects concerned on solid surfaces is to describe the influence of the material properties on the cell survival, adhesion, growth and differentiation. Knowledge gained from our research can be utilized in fabrication of coatings for bone implants improving the healing process and also, thanks to controllable electrical conductivity of these materials, in construction of bio-electronic devices and biosensors.

The aim of projects concerned on nanoparticles is to study the influence of nanodiamond, silicon nanoparticles and hyaluronan complexes on human cells regarding their utilization as markers in fluorescence microscopy and as the vehicles for drug delivery. Thus their biocompatibility, their entry and release of the cell, cellular localization, specific cell targeting are deeply studied.

MEMBERS

- Assoc. Prof. Marie Hubálek Kalbáčová, Ph.D., M.Sc. – Research Group Leader
- Lucie Ostrovská, M.Sc.
- Pavla Sauerová, M.Sc.
- Lucie Vištejnová, Ph.D., M.Sc.

WE OFFER

- Evaluation of material biocompatibility.
- Cytotoxicity measurement.
- Evaluation of cell adhesion and migration on bio-materials.
- Cell viability measurement.
- Cultivation of commercial available cell lines.

- Fluorescent and confocal microscopy, including real-time monitoring.
- Measurement of protein expression by ELISA and Luminex techniques.
- Eukaryotic cells transformation – transfection, electroporation.
- Image analysis (e.g. objects counts, lengths, areas or angels, image stitching, picture thresholding).
- Consultation and advisory during study design.
- Cooperation with data interpretation.

SELECTED PUBLICATIONS

- Hubalek Kalbacova M., Verdanova M., Broz A., Vetushka A, Fejfar A., Kalbac M.: Modulated surface of single-layer graphene controls cell behaviour, Carbon, 72: 207-214, 2014 – IF 5,868
- Kalbacova M, Broz A, Kong J, Kalbac M, Graphene substrates promote adherence of human osteolbasts and mesenchymal stromal cells, Carbon, 48: 4323-4329, 2010 – IF 4,504
- Jin H, Heller DA, Kalbacova M, Kim J-H, Zhang J, Boghossian AA, Maheshri N, Strano MS, Detection of single-molecule H2O2 singaling from epidermal growth factor receptor using fluorescent single-walled carbon nanotubes, Nature Nanotechnology, 5: 302-309, 2010 – IF 30,306
- Pytlik R, Stehlik D, Soukup T, Kalbacova M, Rypacek F, Trc T, Mulinkova K, Michnova P, Kideryova L, Zivny J, et al., The cultivation of human multipotent mesenchymal stromal cells in clinical grade medium for bone tissue engineering, Biomaterials 30 : 3415-3427, 2009 – IF 7,365
- Kalbacova M, Rezek B, Baresova V, Wolf-Brandstetter C, Kromka A, Nanoscale topography of nanocrystalline diamonds promotes differentiation of osteoblasts, Acta Biomaterialia 5:3076-3085, 2009 - IF 3,975

PATENT

- Patent EU – EP 2 288 699: Method of making arranged cell structures.

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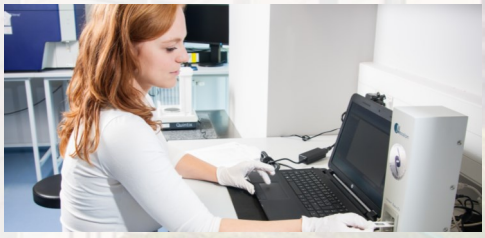

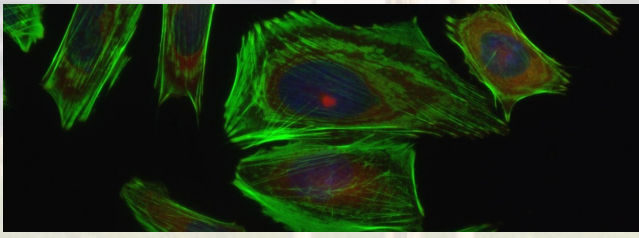

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