DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Nanotechnology is the science dealing with the production and design of materials < 100 nm. Nanoparticles, due to their very small size, can easily penetrate natural barriers such as bio-membranes. Their ability of easy penetration into cells makes them a very useful analytical tool in medicine or life sciences. However, modern literature confirms the negative impact of nanoparticles on living organisms.

The most common nanomaterial used in many industries is silver, which proved to be a good antibacterial agent and disinfectant. Its easy incorporation into other substances or its use for coating makes silver very helpful for medicine. Nanosilver is used in the production of dressings, surgical instruments or implants.

It is also applicable in environmental engineering in, for example, water treatment and purification processes. It finds its application in the production of textiles, underwear, cosmetics or bottles and dummies for babies.

In the context of the wide use of Ag-NPs, human exposure to these materials increases significantly.

In the production of Ag-NPs two basic processes of synthesis can be distinguished: chemical and biological. In most cases the chemically synthesized Ag-NPs are used. The first scientific papers on the biological synthesis have appeared only recently, and their biological and physico-chemical properties are now widely studied. Most studies focus on the impact of Ag-NPs on microorganisms. As far as cells of higher organisms are concerned, the number of scientific publications is unknown.

The aim of this project is to investigate the effect of silver nanoparticles (Ag-NPs), synthesized biologically, on mammalian cells. This may be the first project in which BIOLOG® PM-M plates will be used for this purpose. These plates allow phenotyping of mammalian cells and assessment of their sensitivity to various ions, hormones, and other metabolic factors or anticarcinogenic compounds. BIOLOG® PM-M plates can also be used for comparing the level of sensitivity in the case of cells treated with biologically synthesized Ag-NPs and Ag-NPs synthesized chemically.

Analyses such as measuring the size of nanoparticles using Zeta potential and DLS (dynamic light scattering) will allow the characterization of Ag-NPs in terms of physico-chemical properties. The negative effect of silver nanoparticles consists in the induction of oxidative stress and, therefore, antioxidant properties of silver nanoparticles will be examined here. To evaluate the viability of human cells (human fibroblasts) MTT assay will be used. It is based on the assessment of cell viability by measuring mitochondrial energy conversion using the fluorescence microscope.

Study of the effects of silver nanoparticles on human cells is an important step towards obtaining information on the safety of Ag-NPs. Most of the studies investigate the impact of silver nanoparticles on living organisms, including microorganisms, but focus only on those synthesized chemically. The number of papers concerning the impact of biologically synthesized Ag-NPs on living organisms, including mammalian cells, is rather scarce.