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# THE INFLUENCE OF NANOSTRUCTURES ON THE TRANSPORT PROCESSES IN BIOLOGICAL FLUIDS

The aim of this project is to investigate the influence of nanoparticles on various body fluids. We hypothesize that the nanoparticles, depending on their type (carbon, silver, gold), size, shape and concentration will affect the biological fluids with varying intensity, by changing their rheological properties, causing disturbances in transport processes and potentially leading to disorders in fluids' original functions.

Nanoparticles are and will be used in almost every area of life, so their amount in environment is increasing. We can produce nanoparticles, measure their size, and even observe them using very high resolution microscopes. We are able to determine their deposition areas in bodies of living organisms. However, we still know only a little about the effects that can be caused by nanoparticles present in the body during their translocation and after deposition.

While the toxicologists should be able to indicate the nanoparticle-call interaction, the chemical engineers' task is to describe the rheological changes taking place in biological fluids during nanoparticles' exposition. These changes may affect the transport properties of these fluids and, as a consequence, disrupt their original functions.

The tear fluid, saliva, nasal mucus, bronchial mucus, blood and cerebrospinal fluid were selected to investigation as they often contact the nanoparticles. Selected nanoparticles cover silver, gold and carbon (Graphene oxide) (all commonly used in medicine) as well as soot nanoparticles (from diesel engine) and desert dust (the most numerous particles in environment).

The rheological studies will be conducted to determine the effects of type, size, shape and concentration of nanoparticles on the body fluids viscosity/apparent viscosity in a function of share rate. In addition, as the erythrocytes are responsible for blood rheological properties, we will examine deformation and haemolysis as well as the aggregation process of red blood cells.

Results obtained from experimental studies will be used for the attempt to determine the rheological models of biological fluid. Moreover, obtained results will be for the purposes of modeling the blood and cerebrospinal fluid flow under varying rheological conditions during e.g. meningococcus infection (being danger to health or even life, especially of small children).