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The investigation of biomaterials and products of nanotechnology with the use of a model multicellular organism - *Caenorhabditis elegans*

The huge development of Materials Engineering contributed to the creation and modification of new materials. The definition of new materials consists of both materials which have very rare chemical composition and internal structure, as well as materials which are well-proven in existing applications, but of modified surface and a new quality in applications with specific needs. Products of nanotechnology constitute the latest group of new materials.

For such a rapidly growing field, it is important to take into account the potential influence of applied biomaterials over the biosphere, especially over human health. All materials, which start to be use, undergo gradual degradation and the products of this process can be found in our environment. It is very often the case that the surface of non-degraded material exerts a negative influence on living organisms.

Investigation of the effect of contact between material and biological objects are relatively new subject discussed by scientists. The following thesis was formulated on the basis of the reported attempts to use the model organisms to investigate the negative impact of biomaterials and products of nanotechnology

To monitor the risks posed by new products of materials engineering, including nanotechnology, can be applied multicellular organism *Caenorhabditis elegans*.

The following aim was formulated to prove the truth of this thesis:

The aim of this work was to show the possibilities of the application of the nematode *C. elegans* as a biosensor responding to the presence of selected products of nanotechnology

The obtained results allowed for the verification this hypothesis and drawing the following conclusion:

1. All of investigated nanoparticles showed toxic effect in relation to nematode *C. elegans* displaying in restriction of population's development this organism.
2. Population studies on the nematode *C. elegans* are not a sufficiently sensitive method of testing to assess the toxicity of carbon nanotubes, silver nanoparticles and dendrimers.
3. Changes noticed in the transcriptom of the nematode *C. elegans* enable the application of the above mentioned model multicellular organism in monitoring the threats posed by the new products of Materials Engineering, including nanotechnology.
4. Visible differences in gene expression in specific metabolic pathways show that nematodes respond differently to stress resulting from the presence of different nanoparticles.