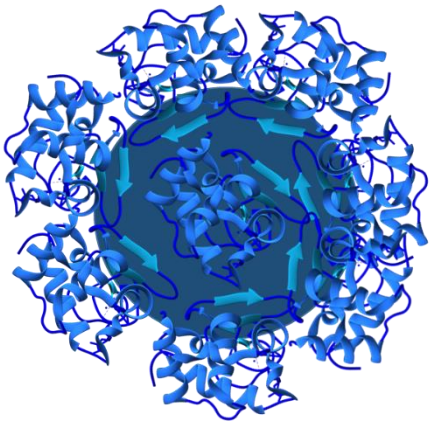
STRUCTURE and FUNCTION of PROTEIN CORONA at the NANOPARTICLES INTERFACE



In the current development of nanomedicine, the problem is not the lack of therapeutic substances but an efficient way of delivering them. On contact with body fluids, nanomaterials are immediately coated with proteins. This rapidly forming protein corona determines the physicochemical properties of nanoparticles. Moreover, the interaction with the cell membrane and the cell absorption mechanism is significantly controlled by the proteins adsorbed on the surface of the carrier. Therefore, the protein corona defines the biological identity of nanoparticles, influencing their cytotoxicity, biodistribution in the body and endocytosis to specific cells. The signature of the protein corona depending on the type of nanocarrier indicates its diversity and complexity and makes it difficult to predict its final action. By defining the role of individual proteins, it is possible to identify specific proteins responsible for the biological pathway of nanocarriers. So far, it has been assumed that predominantly quantitative proteins or proteins with dedicated biological functions have a significant impact on the achievement of the molecular target. Understanding which proteins found in the protein corona define the nanoparticle pathway is critical to the appropriate design of targeted nanocarriers.

Optimizing the properties of nanocarriers by using the protein corona for specific biomedical applications appears to be a promising tool in personalized medicine.

It should be emphasized that the use of nanomaterials in biomedical systems is currently relatively limited (the number of FDA-approved nanosystems is still less than 30). The presently observed difficulties in the development of nanomedicine are related to the response of the immune system resulting, inter alia, from the action of the protein corona. Therefore, there is a need for systematic research aimed at determining the specific role of the protein corona in biological systems. Advances in this field will allow the development of knowledge in the field of nanotoxicology, but also bring closer the compatibility of in vitro and in vivo models, and thus facilitate the achievement of the expected therapeutic effects at the stage of clinical trials.