Dendrimers are a fascinating group of spherical polymer. They are characterized by their globular shape, immensely branched structure, monodisperisty and large number of controllable peripheral functional groups. Nowadays, they are very extensively studied in terms of biomedical applications. Dendrimers can be used as drug and gene carriers, proteins biomimics or imaging carriers. This interest is connected with their unique structure and physicochemical properties. The purpose of this research project is to extend the knowledge of poly(amidoamine) (PAMAM) dendrimers as potential pharmacophore nanocarriers. Thus, very important aspects are to be described on the nature of the interactions that occur between PAMAM dendrimers with active agents and plasma proteins. (Fig. 1). The choice of the therapeutic agents used is a key point of designing nanohybrid systems for biomedical applications. Due to the significant development of nanochemistry, this specific group of nano-metric macromolecular compounds, in the future can significantly advance medical technology. Dendrimers will be the basis of nanomedicine replacing many conventional treatments.

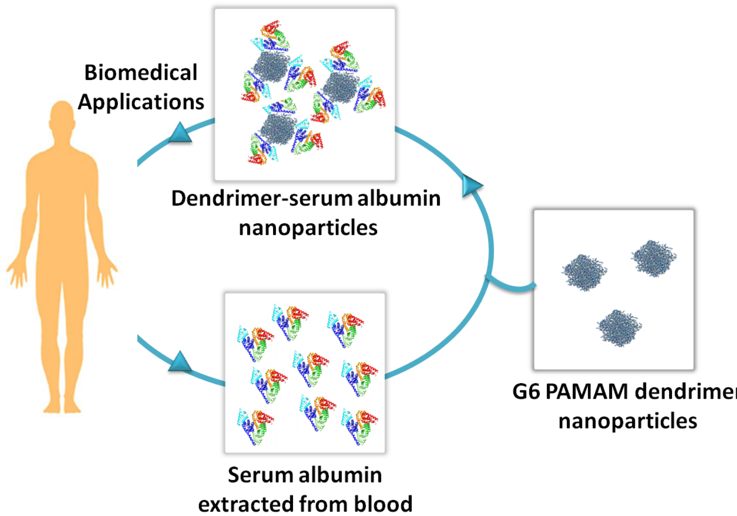

Fig. 1. Functional hybrid nanomaterial for biomedical application.

The success of novel therapeutic strategies relies strongly on the development of a reliable active agent delivery mechanism. Despite the constant development of research in biomedicine, there are still a low number of systematic reviews about hybrid systems from a molecular point of view. The use of precise, analytical techniques proposed in the project will serve us with an analysis of the solubility of the active agent in dendrimer solutions. This will allow insight into the mechanism of drug molecules binding to nanocarriers. We optimize conditions for the dendrimers in complex formations and describe the basic parameters that determine the mechanism of the layers formed on a nanometric scale. An important aspect of this project is to describe the nature of the interactions that occur between PAMAM-drug conjugates and plasma proteins. This will allow the design of effective hybrid systems under body's internal environmental conditions, in which a given therapeutic will perform its functions. Characterization of nanosystems will make it possible to directly determine the physicochemical properties both in bulk and on the surface, for the effectiveness of binding and the release of drugs, which are modulated by selected environmental parameters.

Research focusing on dendrimers is developing very dynamically. According to many opinions, multifunctional nano-sized macromolecules in the nearest future will be the basis of theranostic nanomedicine and in many cases replace currently used drug carriers. The results from this project will help to expand the current knowledge of dendrimers complex formation. They will enhance the capabilities of nanohybrid systems designed with the required physicochemical properties. Expanding knowledge of the interaction between dendrimers with active agents and plasma proteins will contribute to further, more advanced research on PAMAM dendrimers, especially as intelligent pharmacophores nanocarriers.