Abstract

The thesis deals with the testing of amyloidogenicity of various carbon nanoparticles and polymers. The first part of the thesis provides the theoretical background of amyloidoses, a group of diseases in which proteins are stored in the insoluble form of amyloid. In addition, the theoretical part also deals with a general overview of nanomaterials and the most important methods.

Several types of nanomaterials were tested within the thesis, so the part Results and Discussion was divided into two subchapters: 1) Carbon nanospecies and amyloid fibril formation, and 2) Polysaccharides, glycogen modifications and amyloid fibril formation. The first subchapter concerns the testing of four types of carbon nanoparticles (single-walled carbon nanotubes (SWNT), fullerenes (C_{60}), carbon quantum dots (CDs) and nanodiamonds (NDs)). These materials were tested on a model system hen egg white lysozyme (HEWL). Using fluorescence measurements and transmission electron microscopy (TEM), the nanoparticles were ranked from the most to the least amyloidogenic as follows: NDs> control> C_{60}> CDs> SWNT.

The second subchapter deals with the effect of selected polysaccharides (glycogen (GG), mannan (MAN), phytoglycogen (PG)) and modified GG on amyloid fibril formation. These materials were tested on the HEWL model system, as well as the amyloid beta (1-42) ($A\beta_{1-42}$) model system. The fluorescence of thioflavin T (ThT) and TEM were used to detect the growth of amyloid fibrils. In addition, fluorescence data were fitted to obtain the lag phase of the process of amyloid fibril formation. All polysaccharides accelerated the process of amyloid fibril formation from both HEWL and $A\beta_{1-42}$. In the case of modified GG, it has been shown that a small change in the structure may lead to a large change in the process of amyloid fibril formation. Almost all GG modifications accelerated the process of amyloid fibril

formation in both HEWL and $A\beta_{1-42}$, except for GG-Ph1 (1.6 mol. % phenylacetyl groups per D-glucose unit), which rather slowed down the process.

Keywords: amyloid fibrils, amyloid beta, lysozyme, polysaccharides, carbon nanoparticles