The comparative analysis of the methods for keratin extraction from sheep wool and human hair

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Nowadays, biopolymers such as keratins are widely used in biomedicine due to their low toxicity, biocompatibility, and biodegradability. At the molecular level, keratins differ from other structural proteins by a high content of disulfide bonds, which provide the formation of a compact three-dimensional structure resistant to biological and chemical degradation. Native keratins are highly ordered, whereas, recovered keratins are characterized by a flexible structure with more accessible functional groups. A characteristic feature of solubilized keratins is their ability to polymerize; therefore, they are widely used to create biomaterials. The extraction of keratins from natural fibers is an important step to the development of functional biomaterials. However, it is complicated by the presence of a large number of intramolecular and intermolecular disulfide bonds in keratins. That is why keratin extraction by breaking the intermolecular disulfide bonds while preserving the covalent bonds of the polypeptide chain is necessary.

The goal of our study was to estimate the different methods of solubilized keratin obtaining. In the experiments, samples of different types of wool and human hair were used.

Various methods of keratin extraction were applied. The yield of solubilized keratin (%) was calculated from the ratio of the weight of the lyophilized keratin extract and the initial weight of fibers. The molecular mass of recovered keratins was evaluated by SDS-PAAG electrophoresis in the Laemmli buffer system.

An analysis of the efficiency of keratin extraction has shown that solubilized keratin yield ranged from 32% to 51% and depended on the composition of the extraction mixture. Electrophoretic analysis of all keratin extracts obtained by various methods confirmed the presence of two bands, which according to the molecular weight corresponding to I and II types of proteins of intermediate filaments. The presence of these proteins provides self-assembly into complex structures.

The solution of keratins obtained by various methods contains microfibrillar proteins which can be used for development of biofunctional materials.