NEW COMPOSITES BASED ON BACTERIAL NANOCELLULOSE AND COLLAGEN

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Introduction
Bacterial nanocellulose (BNC), also defined as microbial cellulose, is produced by bacteria. The valuable properties of BNC include, in particular, unique biological, physicochemical and mechanical properties. An example of exceptional properties are high crystallinity, high water-holding capacity, excellent tensile strength and also Young's modulus. BC is used in medicine as wound dressings, drug carriers, medical implants and in cosmetology. It also has a significant role in various industries, i.e. food, paper, textile, chemical industries. Collagen is widely used for production of 3D sponges, wound dressings and scaffolds for biomedical applications (1). It is also widely used in cosmetic preparations (2). Due to several requirements in biomaterials field there is a need to modify natural polymers for preparation of new materials and/or composites. Binary blends of two natural polymers can lead to preparation of new materials suitable for biomedical applications (1,3). In this work the composites based on bacterial nanocellulose and collagen were prepared and its properties were studied.

Materials and Methods
Bacterial nanocellulose was obtained from Center of Polymer System Tomas Bata University in Zlin, Czech Republic. Collagen (Coll) was obtained in our laboratory from tail tendons of young rats.
Bacterial nanocellulose was covered by collagen solution and after solvent evaporation the composite was obtained. For comparison also gelatin was used to prepare the composite. The structure of the composite was evaluated by attenuated total reflection infrared spectroscopy and Scanning Electron Microscope (SEM) pictures. Surface properties of thin films were analyzed by AFM and contact angle measurements.

Results and Discussion
After solvent evaporation from collagen and gelatin solutions poured onto a bacterial nanocellulose films the composites made from bacterial nanocellulose and collagen/gelatin were obtained. IR spectroscopy showed that between components of the composite there are interactions. According to the structure of single biopolymers the interactions are due to hydrogen bonds formed between chemical moieties of polymers. After solvent evaporation from the soluble polymer thin films were obtained, which covered the nanocellulose surface forming new composite.

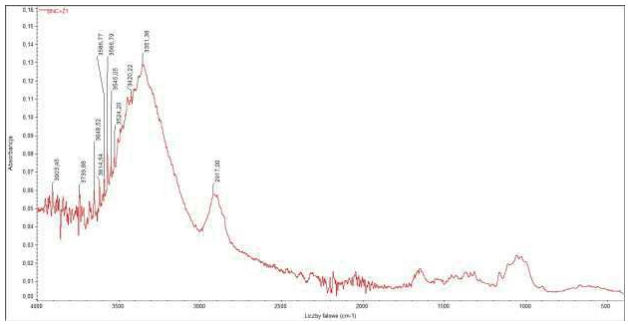

FIG. 1. IR spectra of BNC covered with gelatin.

Film-forming properties and good adhesion of collagen and gelatine lead to the formation of bilayer composites with BNC.

Conclusions
Strong interactions between bacterial nanocellulose and collagen and/or gelatin can lead to new composite material. The modification of material properties is a consequence of the strong interaction between the polymeric components and the chemical structure of single biopolymers. Biological properties of new materials should be studied. New material can be considered as wound dressing material.

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