THE THERMAL STABILITY OF COLLAGEN EXTRACTED FROM THE UMILICAL-PLACENTAL COMPLEX

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Background. Collagen is the most abundant protein in animals. As part of the extracellular matrix it presents a true material for biomedical applications due to its versatility [1, 2]. An essential parameter of collagen sponges obtained for tissue engineering is their thermal stability [4].

Material and methods. The collagen was extracted by the modified enzymatic method according to Jian et all. [3] from the umbilico-placental complex taken from the Human Tissue Bank. In the experimental groups the extracted collagen was purified using the surfactants like 1% EDTA, 0.1% SDS, 1% SDC, and 1% CHAPS. The unpurified extracted collagen served as control. The collagen sponges were obtained by freezing the extracted collagen in Petri dishes at -20°C and lyophilized in the VaCo II system (Zirbus, Germany). The thermal analysis TG-DSC for the precursors was performed with a Netzsch STA 449C Jupiter tool. The samples were placed in an open crucible made of alumina and heated with 10 K min^{-1} from room temperature up to 900°C, under the flow of 50 mL min^{-1} of dried air. An empty alumina crucible was used as reference. Statistical analysis was performed with SPSS Version 23.0 statistic software package. The study was supported from the Project with No 23.70105.8007.01T: ”Obtaining and testing of composite biomaterials based on umbilical – placental collagen and hydroxyapatite for oral-maxillo-facial surgery”.

Results. Based on the thermogram analysis, all samples lost their initial mass up to 150°C, the process being accompanied by an endothermic effect on the DSC curve. Most likely this process was caused by the loss of residual water molecules from the samples. In the range of 150-460°C, an oxidative degradation of the organic material took place, a mass loss being recorded. The process was accompanied by a series of partially overlapping exothermic effects. This indicates that there were several types of partial oxidation reactions of organic compounds, accompanied by the fragmentation of polymer chains. After 460°C, the total oxidation of the carbon residue left from the oxidative degradation of the previous stage, took place. A mass loss was also recorded, the process being accompanied by exothermic effects.

Conclusion. When superimposing the results of the thermal analysis in the control and the experimental groups, the behavior was similar, thus indicating that the surfactants do not influence the thermal stability of the collagen.

Key-words. Thermal stability, collagen, umbilical-placental complex, tissue engineering

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