ENZYMATIC DEGRADATION OF CHITOSAN MEMBRANES WITH DIFFERENT SYNTHESIS CONDITIONS

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Chitin and its derivatives – chitosan – are widely used in various fields, including biomedicine, biotechnology , food , cosmetics and agriculture. The most common areas of application of chitosan in medicine is the creation of medical supplies to treat deep wounds , including burns , dental and orthopedic implants, the use of chitosan derivatives as a «drug delivery systems», as well as a basis for tissue engineering products .

One of the essential qualities of the materials to treat skin blemishes is their gradual degradation , which promotes the release of active monomers of chitosan , which are able to stimulate the migration of effector cells in the center of regeneration and enhance the synthesis of glycosaminoglycans - a mandatory component of the intercellular matrix of the skin. Despite the absence of chitin and chitosan in mammals , these macromolecules are capable of biodegradation using enzymes such as lysozyme, trypsin, papain and pepsin to form non-toxic oligosaccharides with different length molecules that can form the basis of glycosaminoglycans and glycoproteins . The rate of biodegradation is an important value of the production of materials for application to the skin surface to determine the frequency of dressing changes and scope.

The purpose of this work was to study the rate and extent of degradation of chitosan membranes in a solution of trypsin .

The study used a membrane that was made of chitosan molecular weight (200 kDa) and (500 kDa), with the addition of chitin, and various ways of handling 5 and 0,5 % NaOH.

Number 1. Chitin - chitosan (50:50) 500kDa
Number 2. Chitin - chitosan (50:50) 200kDa
Number 3. Chitosan 200kDa 5 % NaOH
Number 4. Chitosan 200kDa 0,5% NaOH

The studied samples weighing 100 mg, were placed in a Petri dish with saline solution in which the concentration of trypsin was 25 mg/l.

Investigation of the degree of degradation of the membranes was carried out by weighing on an analytical balance after 3, 6, 12 , 24, 36 , 60, 84, 96, hours after the dive.

In the study it was found that the samples number 2 and number 3 have a greater capacity for degradation. The beginning of mass loss observed after 3 hours of the experiment at 20 % and 25 % respectively. Up to 12 h for number 3 and up to 24 hours for number 2 weight reduction is gradual, but after 24 h for number 3 and 36 h for number 2 there is a sharp decrease in weight by 43% and 37% for the respective samples. For further mass decreases gradually, reaching to the end of the experiment 44 % for number 2 and 45 % for number 3.

Sample number 1 and number 4 for 3 h experiment with a smaller percentage of weight loss , which is 17 % and 13 %, respectively, of their weight during the experiment decreases gradually with no sudden changes. At 96 h experimental mass loss is 29 % for the number 1, and 23 % for the number 4.

Based on these results it is possible to make conclusion that the addition of chitin and processing films 0,5% NaOH reduces the degree of degradation by almost 2 times.

Based on the results it can be concluded that the addition of chitin and processing membrane 5 % NaOH increases the degradation by almost 2-fold, while the volume of material 0,5 % NaOH and increasing molecular weight to 500kDa reduce the degree of degradation. Therefore, the use of membranes of chitin – chitosan (50:50) 200kDa and 200kDa chitosan 5 % NaOH is more appropriate, since the decay of the polymer chains of chitosan molecules released by more active monomers which have a positive effect on reparative processes regeneration of damaged skin .

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