DESCRIPTION OF THE KINETICS OF RELEASE OF AMIKACIN FROM THE POLYMER MATRIX

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At present the attention of researchers is devoted to the study of polymer systems for controlled release of medicinal substance (MS). For the description of kinetics of release of MS from polymeric systems there is a set of models. Among them it is possible to note the equation of Ritger and Peppas which can be used for the characteristic of release of medicine both from swelling up, and from not swelling up polymeric matrixes. Analysis of the kinetics release of MS from the chitosan films in the conditions of interface of processes of diffusion and dissolution of a polymeric matrix became the purpose of this work.

We used the sample of a chitosan (ChT) of production of Bioprogress (Russia) received by an alkaline deacetylation of crab chitin (deacetylation degree ~ 84 %) with M_{sd}=113000 (ChT1) and 334000 (ChT2). As the medicinal substance (MS) an antibiotic amikacin (AM) was used. Film samples were prepared similarly. The content of MS in a film was 0.1 mol/mol of ChT. The kinetics of release of MS was described, using Ritger – Peppas's equation: $^{G_s}/_{G_\infty} = Kt^m$, where G_s is quantity of MS released from a polymeric matrix by the time of t; G_∞ is equilibrium quantity of the released MS; K is the kinetic constant characterizing the rate of release of MS from a polymeric matrix; M is the exponential parameter connected with the mechanism of release of MS.

The films received from a high-molecular sample of ChT2 were dissolved in water rather slowly and during the experiment they changed the initial weight no more than to 3–5 %. At immersion in water chitosan films formed from samples of ChT1, they lose weight quickly enough, owing to dissolution. Distinction in solubility of films of different samples of ChT finds the reflection in kinetics of release of MS from films. In the case of insoluble matrix, it is possible to speak about the prolonged release of MS from a film, in the case of soluble, - no, as all MS completely releases during the time comparable to time of dissolution of a film. According to it, application by the equation of Ritger – Peppas for the description of kinetic regularities of release of AM in case of an insoluble and soluble polymeric matrix give various results (table).

Time of annealing, min	K, min^{-1}		Coefficient of correlation	
	ChT1	ChT2	ChT1	ChT2
0	0.021	0.045	0.93	0.98
30	0.062	0.041	0.93	0.98
60	0.028	0.040	0.94	0.99
120	0.070	0.039	0.95	0.99

From data of the table it is visible that the correlation coefficient in case of use of the dissolved ChT1 is less, than when using ChT2, almost not dissolved during the experiment. But it's not in numerical values of coefficient of correlation, and in that Ritger-Peppas's equation accurately reflects the regularities which are observed in experimental conditions only for ChT2. In this case the values of kinetic constants K determined by the equation for the films subjected to isothermal annealing accurately reflect the regularities observed in the experiment, namely – the increase in the time of isothermal annealing which is followed by the decrease of solubility of a polymeric matrix in water leads to the decrease of the rate of release of MS. When using ChT1 Ritger-Peppas's equation practically doesn't work. Thus, the equation of Ritger-Peppas works correctly only in the case of the insoluble matrix.