Секция «Тезисы на английском языке»

The study of bio-comparability and cytotoxicity of amylose-based biopolymers in vivo et in vitro

Научный руководитель – Melnikov Vladimir A.

Buklesheva D.A.[1], *Perepelitza D.I.*[2], *Tyumin I.V.*[2]

1 - Московский государственный университет имени М.В.Ломоносова, Факультет фундаментальной медицины, Кафедра фармакологии, Москва, Россия; 2 - Самарский государственный медицинский университет, Самара, Россия

The current issue: nowadays there is no kind of bioplastic industrial production established in Russia. More than 90% of Russian biopolymers market is occupied by foreign supplies. Nevertheless, the demand on new innovative materials and made of them medical items continues to increase constantly [2]. Given these conditions, the most much-in-demand biodegradable materials are required for such medical fields as cardiovascular surgery (stents, esthetic heart valves), orthopedics (endoprostheses), odontology and drug design [1].

The primary aim of the study is to determine the bio-comparability, cytotoxicity and biodegradation time of amylose-based biopolymers of two types: 1) polyglucoside; 2) copolymer (polylactide + polyglucoside).

Research tasks: 1) to evaluate the possibility of biopolymers disintegration after its subcutaneous administration into the rat organism; 2) to examine the cytotoxicity of biopolymers using the culture of human mesenchymal stem cells(MSC) in Petri dish.

Objects of study: a) polyglucoside biopolymer; b) copolymer (polylactide + polyglucoside). The studied biopolymers were synthesized by science squad and then sterilized with radiation.

1. The research on decomposing of biopolymers in a rat organism.

Two trial rats № 180 and № 181 were taking part in 7 days long investigation. The biopolymers were induced into rats' subcutaneous excavations. 2 samples of copolymer were administered into the subcutaneous excavation of the rat № 180 and 2 samples of polyglucoside were administered into the rat's № 181 subcutaneous excavation.

1.2. The results.

The full resorption of polyglucoside biopolymer took 7 days. The copolymer did not resorb completely during established timeframe. However, the resorption process was fairly intensive, including a moderate inflammation. In general, the examined materials are biologically-compatible and do not induce any severe inflammatory reactions. Taking into consideration these facts, both biopolymers could be recommended for conducting further experiments aimed at the development of medical supplies out of them.

2. The research on cytotoxicity and bio-compatibility of biopolymers with the use of mesenchymal stem cells (MSC) cultures.

For further investigations two replications of both biopolymers - 1A, 1B, 2A, 2B - were put in 4 Petri dishes, each filled with human mesenchymal stem cells (MSC) cultures. One of the Petri dishes with MSC was chosen as a control sample (C). The cultivation process lasted 3 days. After the experiment was ended, all MSC in each of 5 cultures were counted (fig.1) in order to estimate their viability (table 1). In addition, on the first and on the last day of the trial all samples were put under microscopic examination.

2.2. The results.

The results obtained proved that the polyglucoside biopolymer has no negative effect on viability of MSC cultures and is not cytotoxic at all. All in all, polyglucoside could be involved into the sequent extended experiments without any composition or structure changes in contrast to copolymer, which has significant negative influence on viability of MSC. Nevertheless, in

perspective it is planned to modify the copolymer structure with an eye on repeating the experiment and proving its non-cytotoxicity.

References

1) Волова Т.Г. Электронный учебно-методический комплекс по дисциплине «Материалы для медицины, клеточной и тканевой инженерии» // Сибирский федеральный университет, 2009, С. 16-23.
2) Московская биржа, РИИ, РВК. Обзор рынка биотехнологий в России и перспектив его развития // Frost & Sullivan, 2014.

Illustrations

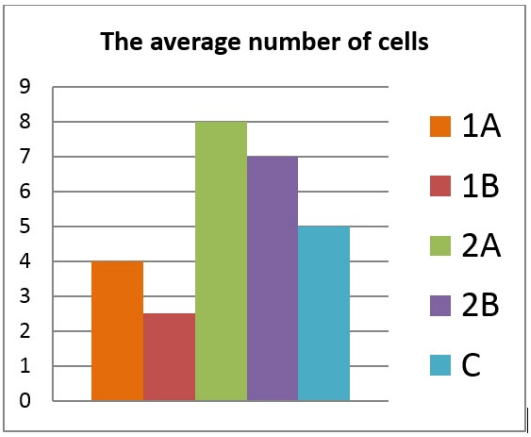

Рис. 1. The average number of MSC in the analyzed samples on the last day of cultivation

	1A	1B	2A	2B	K
Cultures' viability, %	37,9	23,5	63,6	54,5	80

Рис. 2. The percent of MSC viability in the analyzed samples on the last day of cultivation