ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Physical and Chemical Properties Nano Capsule Losartan Potassium and Resveratrol in Polymeric Nature Shells.

Alexander A Krolevets*, Mikhail V Pokrovskii, Ilya A Bogachev, Mikhail V Korokin, Oleg S Gudyrev, and Tatyana G Pokrovskaia.

308015, Russia, Belgorod State National Research University, 85, Pobedy St.

ABSRACT

The article is devoted to studying the properties of nano capsules substances with endotelioprotektive action using methods of self-organization and analysis of the trajectories of the nanoparticles.

Keywords: nano capsule, self-organization, losartan potassium, resveratrol, NTA-method (the method of analysis of the trajectories of nanoparticles), endothelial dysfunction, the particle size.

Corresponding author

ISSN: 0975-8585

INTRODUCTION

One of the ways to create new methods of targeted delivery is the development of nanoscale enteric dosage forms. Due to the fact that the endothelium - the inner lining of blood vessels, it may be endotelioprotektors main group of drugs for the development of nanoscale enteral forms.

Working hypothesis creation of medicinal forms nanoscale endotelioprotektorov was the idea of the transfer of drugs from two- and three-chamber models of pharmacokinetic distribution of single chamber for targeted delivery to the endothelium [1].

Vascular endothelium of most tissues contains open spaces (fenestration) with a diameter of about 50 nm [2]. Through these gaps water and substances dissolved therein are circulated between the blood and intercellular spaces. After contact with nanoscale formulations endotelioprotektive drugs with dimensions of the order of 100 nm in the blood, they will not go beyond the limits of the circulatory system, and will affect the vascular endothelium. As a result, the volume of distribution would be limited to blood flow, thereby reducing the concentration of the drug in 10 times.

As endotelioprotektive substance were chosen: resveratrol - 3,5,4'-trihydroxy-trans-stilbene - poorly soluble in water, a substance having an ability to activate eNOS (edotelialnuyu NO synthase) and exhibit antioxidant properties, losartan potassium - AT1 receptor blocker. [3]

For nanocapsules resveratrol and losartan potassium we selected physicochemical methods [4].

The aim of this work was the description of the physical and chemical properties of nano capsules losartan potassium and resveratrol.

PROCEDURE

Nanocapsules were obtained by physical and chemical vapor deposition of a non-solvent. It involves dispersing aqueous polymer solution into the solution of the core material in capsules immiscible organic solvents. It is a versatile technique that is applicable for microencapsulation of liquid and solid substances. [5,6,7]

To study the properties of the nanocapsules used the technique of self-organization. Powder nanocapsules dissolved in water is dripped onto a glass slide and evaporated. The dried surface is scanned by confocal microscopy microspectrometers OmegaScope, production of AIST-NT combined with a confocal microscope.

On Multiparameter Analyzer nanoparticles Nanosight LM0 production Nanosight Ltd (UK) configuration HS-BF (high-sensitivity video camera Andor Luca, a semiconductor laser with a wavelength of 405 nm and a power of 45 mW). The device is based on the method of analysis of the trajectories of nanoparticles (Nanoparticle Tracking Analysis, NTA), described in ASTM E2834 [8,9]. The optimal dilution was chosen 1: 100. For the measurement instrument parameters were selected: Camera Level = 16, Detection Threshold = 10 (multi), Min Track Length: Auto, Min Expected Size: Auto. the duration of a single measurement 215s, the use of a syringe pump. [10]

FINDINGS OF THE STUDY

The method was used as a high-quality self-analysis on nanoparticles [11]. 10 samples investigated at concentrations ranging from 1 to 0.0625% of each sample nanocapsules. The results of self-nanocapsules resveratrol and losartan potassium are shown in Figures 1.2.

ISSN: 0975-8585

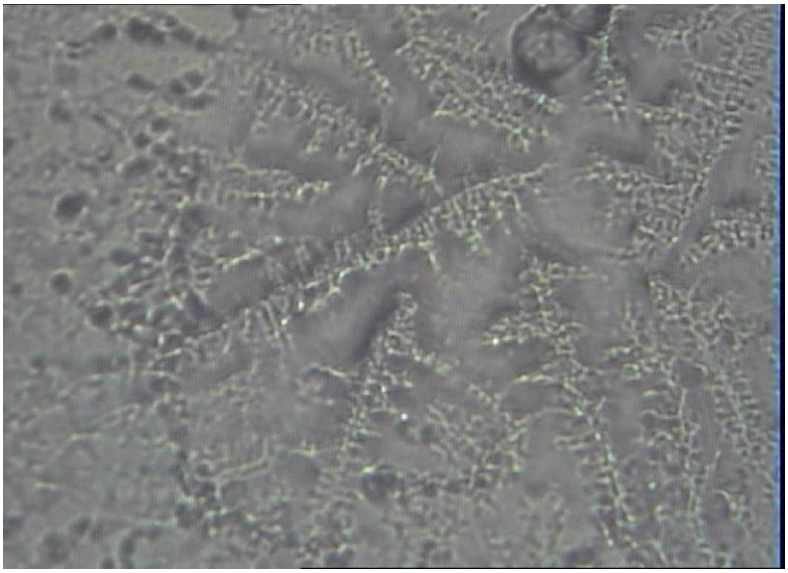

Figure 1: Self-organization of losartan potassium of sodium alginate (0.25%) and a ratio of core: shell 1: 3 at a magnification of 1770 times.

The figure clearly distinguishable fractal composition, representing the needle with side branches. It should be noted that these fractals occupy two-thirds of the surface area.

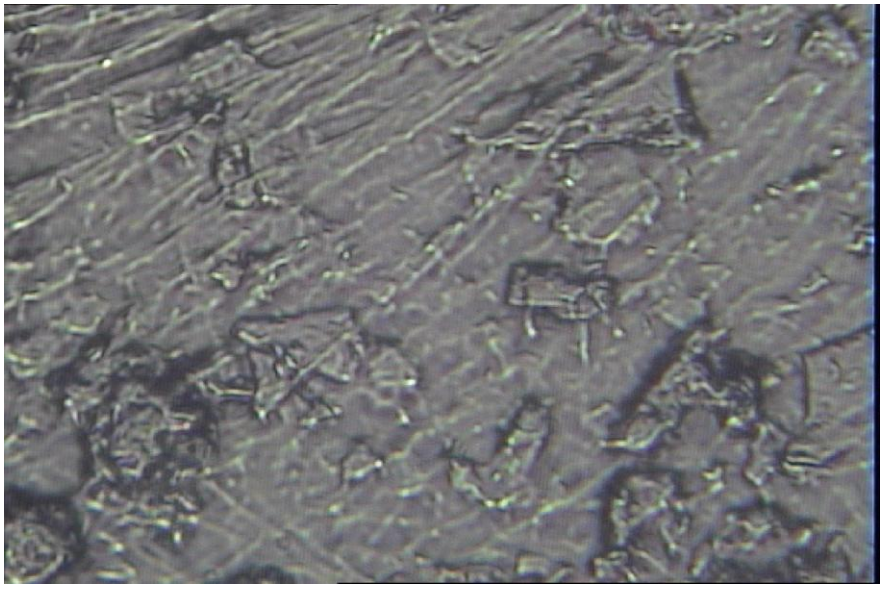

Figure 2: Self-organization of resveratrol in the xanthan gum (0.25%) and a ratio of core: shell 1: 3 at a magnification of 2830 times.

In Figure 2, there are generally not fully dissolved agglomerates nanocapsules, and as long filaments which are germs of fractal compositions, which implies that the process of self-assembly is in its infancy for a given sample.

For samples that showed the best results of self-organization, surveyed the size of nanoparticles in solution. On the selected concentrations of losartan potassium and nanocapsules resveratrol performed in 10 measurements. The results of measurements of particle size of the nanocapsules of resveratrol and losartan potassium are shown in Figures 3-4

ISSN: 0975-8585

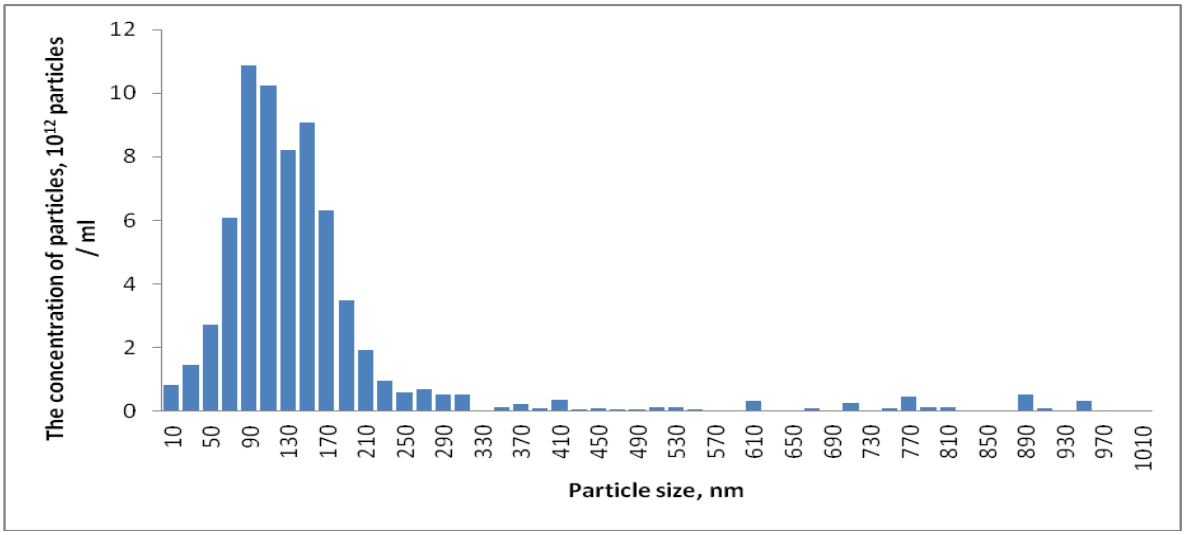

Figure 3: Particle size distribution in a sample of losartan potassium nanocapsules xanthan gum (ratio of core: shell is 5: 1)

Particle distribution for losartan potassium has a narrow particle size distribution, the bulk of them lies in the range from 5 to 300 nm. After analyzing the data distribution average particle size was 168 nm, and a particle size of 90 nm have the maximum concentration.

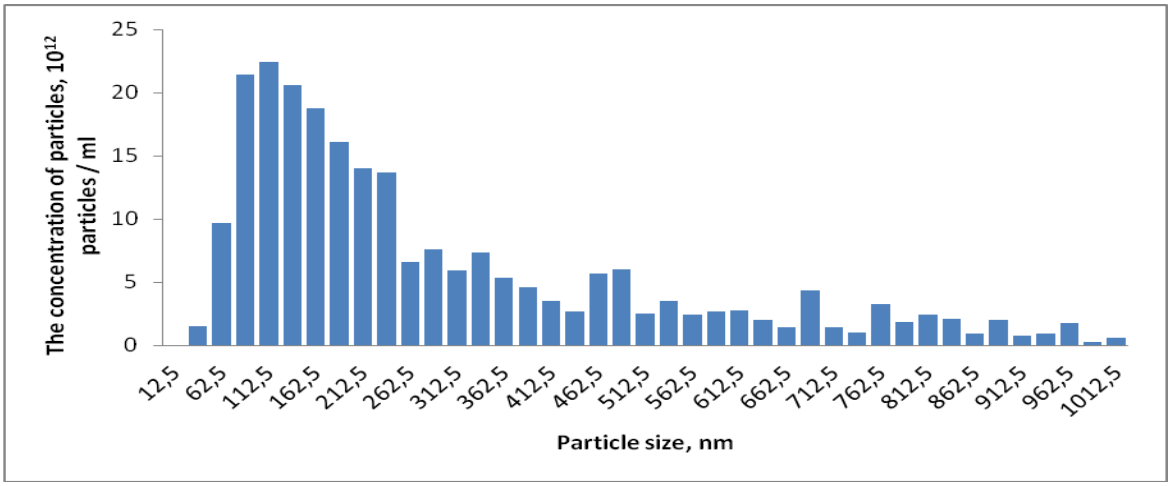

Figure 4: Particle size distribution in a sample of nanocapsules of resveratrol in the xanthan gum (ratio of core: shell is 5: 1)

The particle distribution of resveratrol presented a wide strip in Figure 3, this is due to these nanocapsules sparingly soluble in water. After statistical processing of the results of the distribution of the average particle size was 356 nm, the largest concentration of the particles size of 120 nm.

The data obtained by self-organization show that the shape of the structures under study is not ideal, but in general, they are self-similar, self-image of an ordered set. Consequently, the microcapsules in aqueous solutions with different concentrations endotelioprotektorov have self-organization, which means nanodimension obtained structures.

Values obtained by analyzing the trajectories of the nanoparticles after statistical processing suggests that the average particle size of 356 nm of resveratrol for losartan potassium - 168 nm. The highest concentration of the particles have a size from 50 to 200 nm. As can be noted that the changing nature nanocapsule shell allows to control the particle size of the capsules produced.

Thus, the nanocapsules have the necessary size for the study of their properties within endotelioprotektivnyh single compartment pharmacokinetic model. These physico-chemical methods particles endotelioprotektorov losartan potassium and resveratrol have self-organization in aqueous solutions at concentrations ranging from 1 to 0.0625%. The average particle size of resveratrol is 356 nm, for losartan potassium - 168 nm. The highest concentration of the particles have a size from 50 to 200 nm.

ACKNOWLEDGEMENTS

The research was partially supported by the Ministry of Education and Science of the Russian Federation (grant agreement No. 14.578.21.0012, unique identifier Agreement RFMEFI57814X0012.), grant of the President of the Russian Federation №MD-4711.2015.7

REFERENCES

[1] Belousov YB, Moiseyev VS, Lepahin VK, 1997. The clinical pharmacology and pharmacotherapy. M.: "The Universe Publishing," with 532.
[2] Gayvoronskiy IV, Niporuk GI Gayvoronskiy AI 2011 human anatomy and physiology. M .:. center "Academy", with 496.
[3] State Pharmacopoeia of the USSR: Issue 2. General methods of analysis. Medicinal herbs. USSR Ministry of Health. 11th ed., Ext. 1990. M .: "Medicine", with 400.
[4] Solodovnyk VD, 1980. Microencapsulation. M .: "Chemistry", with 216.
[5] Patent 20110223314 United States, International Class B05D 7/00 20060101 B05D007 / 00. Efficient Microencapsulation. ZHANG; Xiaoxiao; (Honolulu, HI); Garmire; David; (Honolulu, HI); Ohta; Aaron; (Honolulu, HI). Serial No .: 045244. Filed: March 10, 2011
[6] Swapan Kumar Ghosh, 2006. Functional Coatings: by Polymer Microencapsulation. Willey-VCH Verlag Gmbh & CoKGaA, Weinheim, pp: 378.
[7] Afanasyev, A., 1991. Applications and colloidal aspects of microcapsules. Modern technologies in the sector of public services. M .: "Moscow Institute of Technology." with 268.
[8] Filipe V., Hawe A., Jiskoot W., 2009. Critical evaluation of Nanoparticle Tracking Analysis (NTA) by NanoSight for the measurement of nanoparticles and protein aggregates. Technical Brief, 7(Particle sciences). Date Views 19.05.2014 http://www.particlesciences.com/docs/technical_briefs/TB_7.pdf
[9] Third Party Papers Citing NanoSight and NanoSight NTA Results. Date Views 22.05.2014 www.nanosight.com/publications.
[10] Visualization, Sizing and Counting of Fluorescent and Fluorescently-Labeled Nanoparticles Date Views 20.05.2014 www.nanosight.com/technology/fluorescence-capability.
[11] M.Naga Madhu, B.Bindu Madhavi, G.Arjun and etc., 2010. Formulation and Evaluation of Cefotaxime Sodium Microcapsules. International Journal of Pharma Research and Development, 2(12): 80-86.