Cytotoxicity of γ-Aluminum-silica-single-wall Carbon Nanotubes Carriers on Mesenchymal Stem Cells and Endothelial Cell Line EA.hy 926

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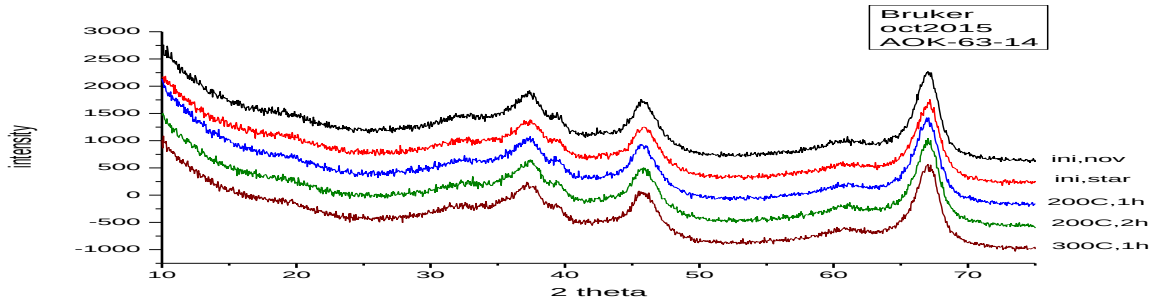
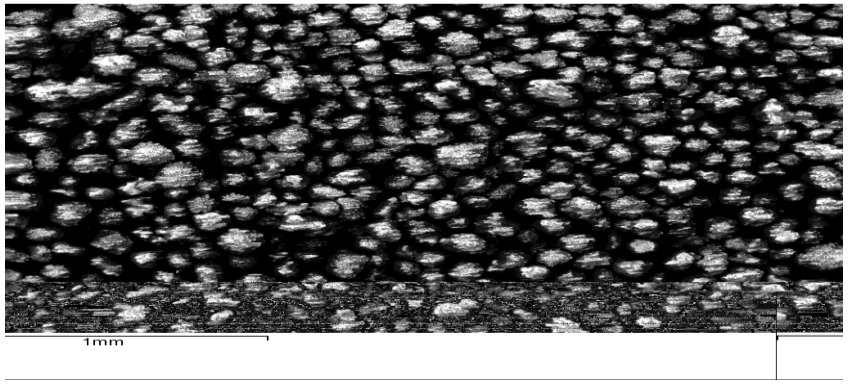
The development of drug carriers with controlled drug yield, allowing to create conditions for achieving optimal concentration of drug substances in therapeutic dosage quickly and long-term without peaks of surge and fall of them in circulating blood remains relevant. Immobilization of medicinal substances on a solid carrier is promising, which will allow to reduce dose, multiplicity of administration and reduction of adverse effect of medicinal substances on human body tissues. Thus, a composition based on the mesoporous and macroporous structure of aluminum oxide and polymethylsiloxane is used as a lithium citrate carrier. Polymethylsiloxane (PMS) synthetic polymer, used as adsorbent of toxins, metabolites, and microorganisms in *per os* application, gamma-modification of aluminum oxide due to high porosity is used to create composite materials with ordered arrangement of nanostructures. It has been shown that a drug based on lithium citrate, polymethylsiloxane and γ-aluminum oxide contributes to better adaptation to physical activity and social adaptation, as well as more pronounced anti-aggressive action, absence of suppression of preliminary research behavior of animals and less effect of immobilization stress on animals in comparison with lithium carbonate. Carbon nanotubes (SWCN, single-wall carbon nanotubes or MWCN, multi-wall carbon nanotubes) may be used as drug carriers. Whereas the safety of carriers on the bases of PMS, γ- aluminum oxide and SWCN remains an open question. The aim of this study is to synthesize drug carriers on the bases of PMS, γ-aluminum oxide, and SWCN.



Diffractograms of a series of samples of gamma-aluminum oxide. On the axis of ordinates – peak of intensity; on the axis of abscissa – angel 2Θ (2 theta); ini. nov and ini. star - two original batches from the manufacturer. Burning batch ini. nov at 200 ^{0}C for 1 and 2 hours, and at 300 ^{0}C for 1 hours, retains the structure of the original sample.

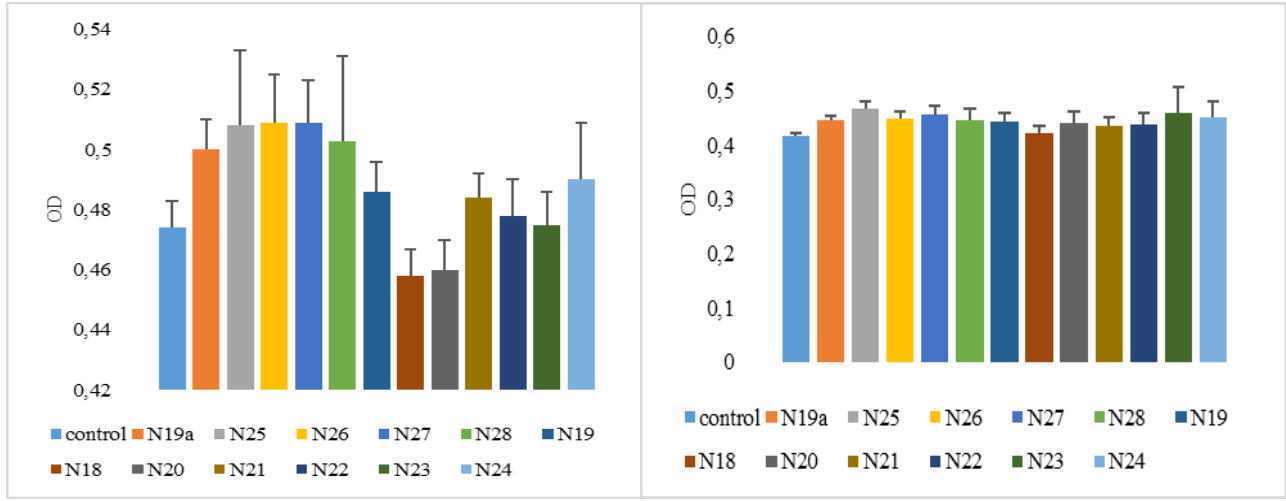


Micrograph of carrier granules with a size of 0.1 mm.

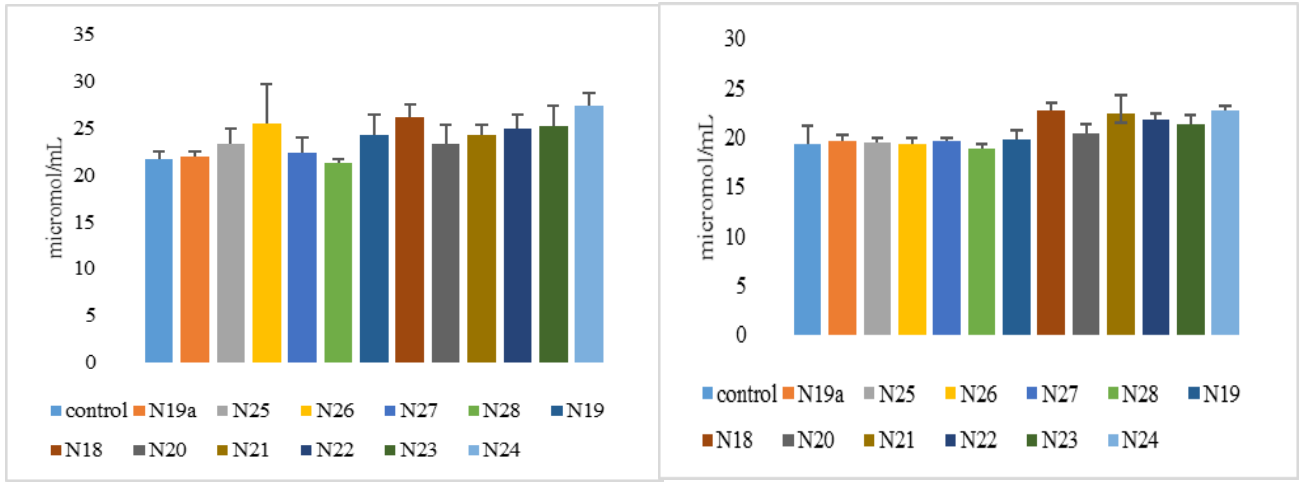
THE PHYSICAL/CHEMICAL CHARACTERISTICS OF SYNTHESIZED DRUG CARRIER

Sample	Size of Al_2O_3/PMS particles (mm)	SWCN (%)	CMC (%)	PVP (%)	Processing temperature (^{0}C)	S (m^2/g)	V (cm^3/g)	MB (mg/g)	B12 (mg/g)
18	0.2-0.8	0.02	-	0.04	150	193.2	0.32	7.1	26.2
19	0.2-0.8	-	-	-	150	193.5	0.32	10.4	0.6
19 a	0.1	-	-	-	150	163.2	0.26	5.5	0.6
20	0.2-0.8	0.04	-	0.08	150	1192.9	0.32	7.1	1.0
21	0.2-0.8	0.08	-	0.16	150	192.8	0.32	7.6	0.7
22	0.2-0.8	0.02	0.03	-	150	180	0.4	9.6	1.9**
23	0.2-0.8	0.04	0.06	-	150	180	0.4	6.8	7.8**
24	0.2-0.8	0.08	0.12	-	150	180	0.4	6.9	8.5**
25	0.1	0.02	0.03	-	150	155	0.3	9.6*	2.7*
26	0.1	0.04	0.06	-	150	155	0.3	10.4*	4.8*
27	0.1	0.02	-	0.04	150	163	0.26	5.9	1.6
28	0.1	0.04	-	0.08	150	162.8	0.26	7.8	1.9

Note. Al_2O_3/PMS, particles of γ-aluminum oxide with a polymethylsiloxane; SWCN, single-wall carbon nanotubes (Tuball OCSiAl, Russia); CMC, Na-carboxymethylcellulose as a dispersant; PVP, Polyvinylpyrrolidone as a dispersant; S, specific surface of the particles; V, pore volume of the particles; MB, methylene blue; B12, vitamin B12. Values are expresses as means (±SD) for three independent experiments (*p<0.05 compared with sample 19a; **p<0.05 compared with sample 19).



Effect of carriers on the bases of γ-aluminum oxide with a polymethylsiloxane and single-wall carbon nanotubes on MSCs (left) and EA.hy 926 (right) on proliferation by MTT assay.



Effect of carriers on the bases of γ-aluminum oxide with a polymethylsiloxane and single-wall carbon nanotubes on MSCs (left) and EA.hy 926 (right) on NO production.