NANOHYDROGELS BASED ON SELF-ASSEMBLY OF CATIONIC CURDLAN AND ANIONIC HYDROXYPROPYLCELLULOSE DERIVATIVES FOR PIROXICAM DELIVERY

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Introduction
Piroxicam is a nonsteroidal, anti-inflammatory drug (NSAID) belonging to the oxicam group. It shows analgesic properties, as well as the anti-inflammatory and antipyretic activity. Unfortunately, piroxicam is only sparingly soluble in water. We believe that an appropriate nanocarrier can effectively increase its bioavailability. Here, we propose self-organizing, polysaccharide-based, nanoparticulate system designed for piroxicam delivery.

Materials and Methods
^{1}H NMR, XPS and IR spectroscopy were used to characterise polysaccharides modified in order to obtain self-organizing system. The obtained nanoparticles were characterized using dynamic light scattering (DLS) and zeta potential measurements. The structure of the nanoaggregates was studied by SEM and AFM.

Results and Discussion
A nanoparticulate system based on the ionic modifications of natural polymers was obtained. Two derivatives of natural polysaccharides were successfully synthesized and characterized: cationic curdlan (modified with glcydyltrimethylammonium groups) and anionic hydroxypropylcellulose containing styrenesulfonate groups. Due to the polycation-polyanion interactions they spontaneously self-assemble into nanoparticles in water. The size and surface charge of the nanoparticles can be controlled by the polycation/polyanion ratio. The resulting structures are spherical, with diameters in the range of 200 -300 nm, as confirmed by AFM, SEM, and DLS measurements. The size of the nanospheres decreases in elevated temperatures. The binding constant (Ka) of piroxicam to the anionic hydroxypropylcellulose (HPC-SSS) was determined by spectrophotometric measurements. The value of Ka was calculated according to Benesi–Hildebrand equation to be Ka. = (2.6 ± 0.14) × 10^3 M^{-1}. Piroxicam was effectively entrapped inside nanospheres.

Conclusions
In conclusion, we have obtained a novel, self-organizing nanoparticulate system, based on natural polymers – curdlan and hydroxypropylcellulose. We believe it constitutes a promising carrier for piroxicam, as it provides hydrophilicity and protects the drug from the unfavourable conditions. Biological tests are in progress.

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