

INFLUENCE OF HYPERBRANCHED MALTOSE FUNCTIONALIZED POLY(ETHYLENE IMINE)S ON RED BLOOD CELLS AND THEIR INTERACTION WITH PROTEINS

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Abstract

Interactions between maltose functionalized hyperbranched poly(ethylene imine)s (PEI)s (structure A - 100% and structure B - 33 % modification, PEI-25K-Mal-A / PEI-25K-Mal-B) and red blood cells (RBCs) were studied. We have monitored the degree of haemolysis and the change of cell shape. First significant lysis of RBCs was observed after 6 hours of incubation and the prolongation of incubation time increased the number of destroyed cells. PEI-25K-Mal-B was more toxic than PEI-25K-Mal-A in buffer solution. Contrary, an incubation of RBCs with PEIs in human plasma significantly decreased the haemolysis process and showed higher toxicity of PEI-25K-Mal-A. There were not many changes in shape of the RBCs after incubation with PEIs. The conclusions are that both types of hyperbranched poly(ethylene imine)s are practically non-toxic. Due to differences in PEIs toxicity in a buffer and plasma the hypothesis has been formulated that PEIs interacted with proteins present in a plasma solution. Based on that, the protein-PEIs interactions were further investigated. Albumin and lysozym have been chosen for interaction studies because of their presence in a plasma solution. Results showed that both hyperbranched polymers interacted with proteins but the interaction is weak. Moreover, PEI-25K-Mal-B interacted stronger with proteins compared to PEI-25K-Mal-A so the influence of plasma proteins on cytotoxicity has been confirmed. The overall low affinity to proteins and negligible cytotoxicity observed make maltose modified PEIs promising molecules in the area of drug delivery systems.

Keywords: Hyperbranched polymers, proteins, erythrocytes, cytotoxicity

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