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Poly(2-ethyl-2-oxazoline)-Conjugated Hemoglobins as a Red Blood Cell Substitute

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Abstract

Hemoglobin wrapped covalently with poly(2-ethyl-2-oxazoline)s (POx-Hb) is characterized physicochemically and physiologically as an artificial O₂ carrier for use as a red blood cell (RBC) substitute. The POx-Hb is generated by linkage of porcine Hb surface-lysines to a sulfhydryl terminus of the POx derivative, with the average binding number of the polymers ascertained as six. The POx-Hb shows moderately higher colloid osmotic activity and O₂ affinity than the naked Hb. Human adult HbA conjugated with POx also possesses equivalent features and O₂ binding property. The POx-Hb solution exhibits good hemocompatibility, with no influence on the functions of platelets, granulocytes, and monocytes. Its circulation half-life in rats is 14 times longer than that of naked Hb. Hemorrhagic shock in rats is relieved sufficiently by infusion of the POx-Hb solution, as revealed by improvements of circulatory parameters. Serum biochemistry tests and histopathological observations indicate no acute toxicity or abnormality in the related organs. All results indicate that POx-Hb represents an attractive alternative for RBC and a useful O₂ therapeutic reagent in transfusion medicine.

■理工学研究所との関連

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