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Award Number: DAMD17-00-1-0708

TITLE: Conference Eighth International Symposium on Blood Substitutes

PRINCIPAL INVESTIGATOR: Robert M. Winslow, M.D.

CONTRACTING ORGANIZATION: Complete Conference Management
San Diego, California 92108-2802

REPORT DATE: April 2001

TYPE OF REPORT: Final Proceedings

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

DISTRIBUTION STATEMENT: Approved for Public Release;
Distribution Unlimited

• VIII ISBS •

Eighth International Symposium on Blood Substitutes

November 9-11, 2000

San Diego, California, USA

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Program and Abstracts

PO-43. INTRAVASCULAR PERFLUOROCARBON-STABILIZED MICRO-BUBBLES FOR TREATMENT OF HYPOXEMIA DUE TO AN EXPERIMENTAL INTRAPULMONARY SHUNT

Tyssebotn I., Bergoe G., and Lundgren C. Center for Res. and Ed. in Spec. Environments, and Department of Physiology and Biophysics, State University of NY at Buffalo

Circulatory right-to-left shunts present an intriguing treatment problem because O_2 breathing will not substantially increase the O_2 content of the unshunted blood or the total O_2 delivery. Volume-stabilized microbubbles generated by a 2% dodecafluoropentane emulsion (DDFPe) can transport sufficient amounts of O_2 to sustain life in severely anemic O_2-breathing rats (1). Hence, we reasoned that, while increasing the O_2 carrying capacity of the blood by infusion of DDFPe would only marginally increase PaO_2, the total amount of O_2 transported would increase and be reflected in the mixed $P\nu O_2$. Three levels of shunting were induced in anesthetized pigs by blocking the airways with steel beads. Group 1 (n=6) shunt fraction was <0.3; Group 2 (n=8) was 0.3-0.5; Group 3 (n=9) >0.5 during O_2 breathing. Treatment was 2% DDFPe, 0.1 ml/kg b.w., in 1-3 i.v. infusions 3-5 hrs apart. Minutes after the infusions started, a rise in PaO_2 was observed in all animals in all groups from 205 to 328 mmHg in Group 1, from 73 to 114 mmHg in Group 2, and from 55 to 69 mmHg in Group 3. The $P\nu O_2$ also rose in all three groups and increased on average in all animals by 19±3% ($p<0.001$) within the first 20 min. $PaCO_2$ was high and pH was low after shunt application, but gradually normalized after DDFPe infusion. The second and third DDFPe doses induced essentially similar results, but the improvements were more marked and lasted longer (up to 5 hrs). At the end of the experiments, the shunt fractions were unchanged from the air-breathing control values. These results suggest that DDFPe infusion in combination with O_2 breathing could be a valuable treatment to mitigate hypoxemia in right-to-left circulatory shunts of different etiologies.

(1) I. Tyssebotn, C. Lundgren, G. Bergoe, H. Van Liew, and J. Goldinger. Undersea Hyperbar Med. 26 (suppl):abstr. 96, 1999.

This work was supported, in part, by Sonus Pharmaceuticals Inc.