Pyridoxylated Hemoglobin Solution as an Oxygen Carrier

The manuscript by Gould and his colleagues describes selective hemodynamic and physiologic effects of total-exchange transfusion with polymerized pyridoxylated hemoglobin solution (Poly SFH-P) in six normal baboons. Their results, while limited in scope, were impressive. At a hematocrit level of less than 2, all six animals survived the exchange transfusion with maintenance of mean arterial pressure, heart rate, oxygen consumption, and cardiac output. In contrast to previous preparations (SFH), the final plasma hemoglobin was higher and the effects presumably better maintained because the half-life of Poly SFH-P is considerably longer. If safe and effective alternatives for red cell transfusion can be found, the risk of transfusion-related diseases could be reduced, if not eliminated, and thus their findings could represent a major contribution to clinical care because the risk of transfusion reactions, AIDS, hepatitis, and other transmissible diseases could be eliminated. However there are several major questions that must be addressed before using this or similar solutions for the treatment of human disease. First is it absolutely certain that the preparation is totally incapable of transmission of viral diseases? This question must be rigidly tested in primate models before consideration for human experiments. Perhaps almost as important, what are the long-term consequences of total replacement of red cells with Poly SFH-P? In the current experiments, the animals were killed at the end of the experiment, thus prohibiting follow-up observations. In addition to potential renal failure and dilutional coagulopathies and opsoninopathies, surely there must be major effects on the immune system, particularly macrophage function. Presumably the material is cleared by the reticuloendothelial system, with the hemoglobin ultimately being converted to bilirubin, and the long-term consequences of this are of more than a little interest. While cautious optimism and judicious exploration of this material for supporting the oxygen-carrying capacity of the blood in humans are warranted, many serious questions remain and the benefits and risks must always be compared to the gold standard of human blood. Whether its potential for therapeutic application in humans comes to fruition remains to be determined.

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