

CROSS-DISCIPLINARY CONNECTION

Artificial Blood

A patient lies bleeding on a stretcher. The doctor leans over to check the patient's wounds and barks an order to a nearby nurse: "Get him a unit of artificial blood, stat!" According to Dr. Peter Keipert, Program Director of Oxygen Carriers Development at Alliance Pharmaceutical Corp., this scenario may soon be commonplace thanks to a synthetic mixture that can perform one of the main functions of human blood—transporting oxygen.

The hemoglobin inside red blood cells collects oxygen in our lungs, transports it to all the tissues of the body, and then takes carbon dioxide back to the lungs. Dr. Keipert's blood substitute accomplishes the same task, but it uses nonpolar chemicals called *perfluorocarbons* instead of hemoglobin to transport the oxygen. The perfluorocarbons are carried in a water-based saline solution, but because nonpolar substances and water do not mix well, a bonding

chemical called a *surfactant* is added to hold the mixture together. The perfluorocarbons are sheared into tiny droplets and then coated with the bonding molecules. One end of these molecules attaches to the perfluorocarbon, and the other end attaches to the water, creating a milky emulsion. The blood-substitute mixture, called Oxygent™, is administered to a patient in the same way regular blood is. The perfluorocarbons are eventually exhaled through the lungs.

Oxygent only functions to carry gases to and from tissues; it cannot clot or perform any of the immune-system functions that blood does. Still, the substitute has several advantages over real blood. Oxygent has a shelf life of more than a year. Oxygent also eliminates many of the risks associated with blood transfusions. Because the substitute can dissolve larger amounts of oxygen than real blood can, smaller amounts of

the mixture are needed.

Oxygent is currently being tested in surgical patients.

"Once this product is approved and has been demonstrated to be safe and effective in elective surgery, I think you will see its use spread into the emergency critical-care arena," says Dr. Keipert. "A patient who has lost a lot of blood and who is currently being resuscitated with normal fluids like saline solutions would be given Oxygent as an additional oxygen-delivery agent in the emergency room."

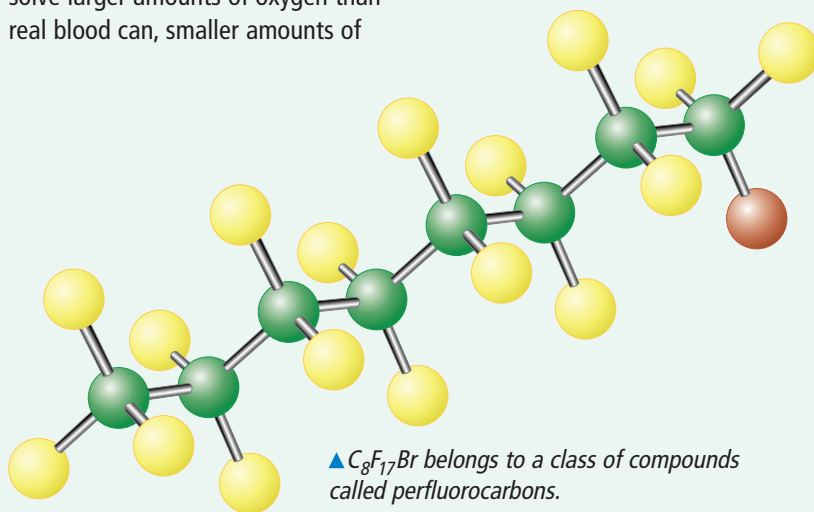
Questions

1. How would the approval of Oxygent benefit the medical community?
2. How do scientists prevent the nonpolar perfluorocarbons in Oxygent from separating from the water?

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▲ $C_8F_{17}Br$ belongs to a class of compounds called perfluorocarbons.