

## 'Shelf life' of blood? Shorter than we think

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A small study from Johns Hopkins adds to the growing body of evidence that red blood cells stored longer than three weeks begin to lose the capacity to deliver oxygen-rich cells where they may be most needed.

In a report published online in the journal [Anesthesia & Analgesia](#), the Johns Hopkins investigators say red cells in blood stored that long gradually lose the flexibility required to squeeze through the body's smallest capillaries to deliver [oxygen](#) to tissue. Moreover, they say, that capacity is not regained after transfusion into [patients](#) during or after surgery.

"There's more and more information telling us that the shelf life of blood may not be six weeks, which is what the blood banks consider standard," says study leader Steven M. Frank, M.D., an associate professor of anesthesiology and critical care medicine at the Johns Hopkins University School of Medicine. "If I were having surgery tomorrow, I'd want the freshest blood they could find."

Frank acknowledges that blood banks do not have enough fresh blood for everybody, and that shorter storage periods would result in diminished inventory. But he says that the current practice of transfusing blood stored up to six weeks may need to be reconsidered.

One previous, large study published in the *New England Journal of Medicine* has already shown that cardiac surgery patients who received blood stored longer than three weeks were almost twice as likely to die as patients who got blood that had been stored for just 10 days.

For the new study, Frank and his colleagues enrolled 16 patients scheduled to have spinal fusion surgery, a type of operation that typically requires blood transfusions. Six of the patients received five or more units of blood, while 10 needed three or fewer units. The researchers drew samples from every bag of blood used—53 in total—and measured the flexibility of the [red blood cells](#). What they found is that blood older than 3 weeks was more likely to have less flexible red blood cell membranes, a condition that may make it more difficult for blood to deliver oxygen, Frank says.

The team also took blood samples from patients in the three days following surgery. Even though the [blood cells](#) were out of storage and back in biological environments with proper pH (acidity), electrolytes and oxygen levels, the injury to the red cells was not reversible and appeared to be permanent. The damaged blood cells would likely remain dysfunctional for their life cycle limit, which is up to 120 days, Frank says.

Frank also noted that patients in the study who got fewer units of blood had healthier red cells overall, even though the blood was just as old and showed cell damage. He says it is likely that a small amount of these problem cells make less of a difference than when a large number of damaged cells are present.

According to the research report, the average age of the blood given in the study was more than 3 weeks. Only three samples in the study were 2 weeks old or less. One reason for the lack of availability of fresher bloods for adults, Frank says, is the routine practice of giving pediatric patients priority for the freshest units.

In fact, he notes, blood banks dispense the oldest blood first so that it doesn't exceed its shelf life before it can be used. "As a colleague said, it's like how they sell milk in the grocery store—they put the oldest

cartons out front so they can sell them before they expire," Frank says.

Two large randomized controlled studies, one at many centers across the United States, including Johns Hopkins, and one in Canada, are under way to determine the relative safety of older versus newer blood, and the results are expected next year. Frank says blood banks need to be prepared to change practice if those studies show that a six-week [shelf life](#) for [blood](#) is just too long.

Provided by Johns Hopkins University School of Medicine

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