# Safety Of Stored Blood A Chief Concern For Transfusions

In light of recent studies that suggest the use of stored blood during transfusions may cause adverse effects in patients, the National Heart, Lung, and Blood Institute (NHLBI) funded a number of research projects to examine the safety of transfusing older red cells and the impact of stored blood on respiratory gases. These papers discussing potential adverse effects of stored blood and related concerns for oxygen delivery by transfusion are now available online in TRANSFUSION, a journal published by Wiley-Blackwell on behalf of AABB.

Blood banks are responsible for the collection, testing, and storage of blood to be used by the nearly 5 million Americans who receive blood transfusions annually. When patients experience a loss of blood due to illness or trauma, transfusions of whole blood or individual components (red cells, white cells, platelets, and plasma) are administered to restore blood volume to adequate levels. According to the 2007 National Blood Collection and Utilization Survey (NBCUS) Report, 14.7 million units of blood were administered in the U.S., with a total of 72,000 transfusion-related adverse reactions in the prior year.

"The most critical issue facing transfusion medicine is whether or not stored (older) blood is less safe than fresher blood," explains Paul M. Ness, M.D., Director of Transfusion Medicine at Johns Hopkins Medical Institute in Baltimore, MD, and Editor-in-Chief of TRANSFUSION. "Although emerging infectious disease risks and transfusion reactions are important concerns, there is nothing more imperative to our patients than making sure the methods we use to collect and store red cells do not impair their transport of vital respiratory gases."

Current Food and Drug Administration (FDA) standards state that red cells may be stored under refrigeration for a maximum of 42 days, or frozen for up to ten years. NBCUS 2007 data reported the mean age of stored red cells at the time of transfusion was 16 days. Medical evidence, however, has not been able to conclusively determine if stored blood adversely affects patients' health. In one prior study, trauma patients who received red cells stored beyond two weeks had a significantly increased risk of mortality compared to those transfused with fresher blood (Weinberg et al., 2010). Conversely, a study by Edgren et al., analyzed close to 405,000 transfusions between 1995 and 2002 and found no significant association between age of blood and seven-day mortality.

Controlled clinical trials in cardiac surgery and intensive care units are under way, and are expected to provide the transfusion community with critical data regarding the adverse effects of stored blood use. "Findings from these trials will not be reported for several years," said Dr. Ness. "Our early publication of the NHLBI grant program studies provides the transfusion community with a head start in learning

more about what makes stored blood old, and provides advance opportunity for commercial industry to develop improved methods of blood storage that will mitigate adverse effects in patients."

***Full Citations*** Editorial: "Does Transfusion of Stored Red Cells Cause Clinically Important Adverse Effects? A Critical Question in Search of an Answer and a Plan." Paul Ness. TRANSFUSION; Published Online: (DOI: 10.1111/j.1537-2995.2011.03121.x); Print Issue Date: April 2011. http://doi.wiley.com/10.1111/j.1537-2995.2011.03121.x [1]

Editorial: "The 2010 Tibor Greenwalt Lecture The Air We Breathe--Three Vital Respiratory Gases and The Red Cell: Oxygen, Nitric Oxide, and Carbon Dioxide." Walter H. Dzik. TRANSFUSION; Published Online: (DOI: 10.1111/j.1537-2995.2011.03114.x); Print Issue Date: April 2011. http://doi.wiley.com/10.1111/j.1537-2995.2011.03114.x [2]

Article: "Red Blood Cell Age and Potentiation of Transfusion-Related Pathology in Trauma Patients." Jordan A. Weinberg, Scott R. Barnum, and Rakesh P. Patel. TRANSFUSION; Published Online: (DOI: 10.1111/j.1537-2995.2011.03098.x); Print Issue Date: April 2011. http://doi.wiley.com/10.1111/j.1537-2995.2011.03098.x [3]

Article: "New Frontiers in Transfusion Biology: Identification and Significance of Mediators of Morbidity and Mortality in Stored Red Blood Cells." Katie Grimshaw, Julie Sahler, Sherry L. Spinelli, Richard P. Phipps and Neil Blumberg.TRANSFUSION; Published Online: (DOI: 10.1111/j.1537-2995.2011.03095.x); Print Issue Date: April 2011. http://doi.wiley.com/10.1111/j.1537-2995.2011.03095.x [4]

Article: "Microparticles in Stored Red Blood Cells as Potential Mediators of Transfusion Complications." Wenche Jy, Marco Ricci, Sherry Shariatmadar, Orlando Gomez- Marin, Lawrence H. Horstman,and Yeon S. Ahn. TRANSFUSION; Published Online: (DOI: 10.1111/j.1537-2995.2011.03099.x); Print Issue Date: April 2011. http://doi.wiley.com/10.1111/j.1537-2995.2011.03099.x [5]

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Article: "Properties of Stored RBCs: Understanding Immune and Vascular Reactivity." Philip C. Spinella, Rosemary L. Sparrow, John R. Hess, Philip J. Norris. TRANSFUSION; Published Online: (DOI: 10.1111/j.1537-2995.2011.03103.x); Print Issue Date: April 2011. http://doi.wiley.com/10.1111/j.1537-2995.2011.03103.x [7]

Article: "Insufficient Nitric Oxide Bioavailability: A Hypothesis to Explain Adverse Effects of Red Blood Cell Transfusion." John D. Roback, Robert Neuman, Arshed Quyyumi, and Roy Sutliff. TRANSFUSION; Published Online: (DOI: 10.1111/j.1537-2995.2011.03094.x); Print Issue Date: April 2011. http://doi.wiley.com/10.1111/j.1537-2995.2011.03094.x [8]

Article: "Harmful Effects of Transfusion of Older Stored Red Blood Cells: Iron And Inflammation." Eldad A. Hod and Steven L. Spitalnik. TRANSFUSION; Published Online: (DOI: 10.1111/j.1537-2995.2011.03096.x); Print Issue Date: April 2011. http://doi.wiley.com/10.1111/j.1537-2995.2011.03096.x [9]

Article: "The Transfusion Problem: Role of Aberrant S-Nitrosylation." James D. Reynolds, Douglas T. Hess, and Jonathan S. Stamler. TRANSFUSION; Published Online: April 15, 2011 (DOI: 10.1111/j.1537-2995.2011.03097.x); Print Issue Date: April 2011. http://doi.wiley.com/10.1111/j.1537-2995.2011.03097.x [10]

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