Debugging Blood

Protecting people from tainted blood

By TINA ADLER

Sally, the mother of a friend of mine, refused a transfusion after surgery. "I just don't trust the blood supply," she says. Sally felt weaker and her recovery took longer than if she had accepted fresh blood. But she says her peace of mind made the struggle worthwhile.

In increasing numbers, patients are avoiding the blood of strangers. They bank their own, ask friends to donate for them, or do without. Must they really go to such lengths, or has AIDS made them unduly afraid?

In spite of screening, about 1 in 225,000 units of blood reaching patients may harbor HIV, the AIDS-causing virus; 1 in 250,000 the hepatitis B virus; and 1 in 3,300 the hepatitis C virus, according to studies funded by the Food and Drug Administration. Those figures might provide some comfort if the diseases weren't so dreaded — AIDS has no cure, and hepatitis B and C can destroy the liver, causing death.

About 3.6 million people get transfusions of whole blood or blood products, such as platelets, each year; most require more than one unit, about a pint.

Last month, the National Institutes of Health in Bethesda, Md., asked a panel made up primarily of physicians to answer two questions: Should blood banks continue using three blood tests that screen for syphilis, non-A, non-B hepatitis, and — indirectly — AIDS? How can health officials improve their response to new organisms that may threaten the blood supply?

The panel's answers may well change the way blood banks do business.

The three tests the NIH panel reviewed prevent few cases of disease not prevented by other means, and they yield many false positive results — forcing blood banks to dump hundreds of thousands of units of good blood, the panel members assert.

False positives "not only contribute to the present blood shortage but also result in emotional, psychological, and financial costs to the donor," the panel explains in its report.

Donors who test positive for an infectious disease often undergo costly and complicated follow-up tests. Some repeatedly test positive, yet have no illness. And if their results reach their insurance companies, the insurers may try to deny benefits, panel members say.

To protect the public adequately, the group concludes, health officials must do much more than improve blood screening. No one agency or group has responsibility for telling blood banks how to respond to a new disease, such as Chagas' disease (see sidebar). And no plan exists for preventing new diseases from threatening the blood supply.

People in the United States donate 12 million units of blood annually. The American Red Cross runs about half of the U.S. blood banks; hospitals and clinics — most affiliated with the American Association of Blood Banks (AABB) — operate the others. They all must screen blood donations for syphilis, hepatitis B and C, two types of HIV, two types of human T cell leukemia virus, and other infectious agents.

Most HIV-contaminated blood that reaches tranfusion recipients comes from recently infected people who have not yet developed antibodies to the virus. HIV tests now in use detect only antibodies, which may take 25 days or more to show up, researchers say. Moreover, newly infected individuals are far more infectious than previously suspected (SN: 1/14/95, p.22).

Scientists have yet to find ways to kill or eradicate viruses and bacteria found in donated blood without also destroying the blood itself. So testing donated blood before giving it to patients remains the only protection available.

HIV researchers have developed tests that detect the virus at an earlier stage of infection than those the blood banks now use. But these more sensitive screens might not prove cost-effective if used widely, several investigators told panel members at a conference held last month at NIH.

In response to the dilemmas facing blood banks, the panel recommended nixing a test that measures the activity of the enzyme alanine aminotransferase (ALT) in the blood. It favored the continued use of the syphilis and the hepatitis B core antibody (anti-HBc) tests, which researchers developed to detect non-A, non-B hepatitis virus.

The FDA, which regulates blood collection, supports the NIH group's recommendations concerning the tests, an agency spokeswoman says. Officials of the AABB and the Red Cross are still reviewing the report.

ALT, a component of liver cells, enters the bloodstream in response to liver damage, such as that caused by hepatitis. However, heavy alcohol consumption, obesity, and, possibly, strenuous exercise — factors that do not make people unsuitable donors — also increase ALT activity, studies suggest.

Indeed, no clinical studies show that ALT screening improves the safety of blood transfusions, panel members conclude. Blood collection staffs now rely on more recently developed tests to detect hepatitis. The FDA does not require blood banks to use ALT, although all Red Cross centers still do and AABB recommends its use.

ALT tests cost little to manufacture but prove costly in other ways. Every year, blood banks discard roughly 200,000 units and turn away 150,000 potential donors because of elevated ALT readings. But few of those units actually pose a health risk, the panel asserts. In addition, physicians often recommend that their ALT-positive patients undergo further, more expensive liver tests, the panel reports.

Blood bankers discard about 20,000 units of blood each year as a result of false positives from the anti-HBc test, also commonly used in screening, says panel member Theresa L. Wright of the University of California, San Francisco. False positive anti-HBc results have caused health officials to reject "tens of thousands" of donors, the panel says.

Nonetheless, the test spots a small number of units infected with hepatitis B. People infected with hepatitis B may also have HIV, since both diseases can be spread through sexual contact or shared needles. So the anti-HBc indirectly spots HIV-tainted blood that would otherwise go undetected. These finds make up for the test's high false positive rate — at least until better HIV detectors come along, the panel concluded.

The test may catch, albeit indirectly, as many as one-third of the HIV-contaminated units that other screens miss, preventing roughly six cases of transfusion-transmitted HIV annually, according to panel member Jeffrey McCullough of the University of Minnesota Hospital in Minneapolis. However, the value of the anti-HBc test "is likely to decline with expanding HBV [hepatitis B virus] immunization," the NIH report warns.

American Red Cross

American Red Cross technician reading blood test results.

Blood banks have tested blood for syphilis for more than 50 years, and transfusion-transmitted syphilis has become extremely rare. Whether the test deserves credit for that low infection rate remains uncertain, however.

It's unclear whether the syphilis test actually detects *Treponema pallidum,* the syphilis-causing bacterium, during its infectious stage, says McCullough. People who test positive for other diseases may also have syphilis, so other tests may deserve the credit for removing syphilis-infected blood, McCullough says.

Also, blood often gets refrigerated for more than 3 days, which destroys *T. pallidum.*

Syphilis screening excludes less than one HIV-positive donor annually whom other tests would have missed. Nevertheless, the panel concludes, blood bank staffs should continue to use the test until researchers determine exactly what role it plays in preventing transfusion-transmitted syphilis.

Tests now used only for research can spot HIV earlier than any of the antibody-based methods available to blood banks. For example, one screen that looks for the p24 antigen, a protein on the surface of HIV, detects the virus 6 days sooner than the HIV tests blood banks use, Guillermo A. Herrera of the Centers for Disease Control and Prevention (CDC) in Atlanta told the conference. Yet blood banks may never use the p24 antigen test because it would cost a lot, yet save few additional lives, he and others assert.

If widely employed, the p24 screen could detect up to one-half of HIV-infected units of blood now going to patients from donors who haven't yet developed antibodies to HIV, says CDC's Lyle R. Petersen. Statistical modeling using the HIV test results of repeat donors indicates that roughly 35 such people donate each year, and existing tests pick up about one-fifth of them, he says.

What's more, half the patients who get transfusions die within a year from problems unrelated to their new blood. So the p24 test would help very few patients, Petersen points out. In addition, if clinics test for p24, more people at risk for HIV may donate blood to find out their HIV status, researchers say.

The NIH panel did not discuss p24 in its report because it didn't receive adequate information about the test, panel member Karen L. Lindsay of the University of Southern California in Los Angeles says.

Scientists can detect HIV's DNA and RNA in blood more quickly than they can find antibodies to HIV, Herrera says. However, these tests may not be cost-effective for blood banks either.

Someday, blood screening in general may prove less important. The federal government and biotechnology companies are spending hundreds of millions of dollars to find ways to eliminate or inactivate infectious agents in the blood, as well as to make artificial blood.

Baxter Healthcare Corp. in Round Lake, Ill., plans to seek permission from FDA this year to use an intravenous solution that can temporarily take on blood's oxygen-carrying responsibilities, Martha C. Farmer, director of product management for blood substitutes at Baxter, told SCIENCE NEWS. She thinks the new solution may replace blood in 15 to 20 percent of transfusions.

However, the technology for purifying the red blood cells, which most transfusion patients receive, "is nowhere near [human] trials," she says.

The guardians of the public's blood supply need to develop a strategy for protecting it from new infectious agents, panel members assert.

Part of that strategy should include getting more accurate medical histories from donors. That may serve as one of the best ways to keep bad blood from patients, they contend. Studies show that improvements made in the early 1980s to the questionnaires used by blood bank staff have helped reduce the transmission of HIV, hepatitis B, and hepatitis C.

Federal regulations require physicians to report cases of transfusion-transmitted diseases to CDC. However, no early warning system exists to alert blood banks to possible threats, says McCullough. No one group or agency has responsibility for monitoring what new agents may lurk in donors' blood or for determining what blood bank staff should do to keep such poisons out of their supplies, panel members say.

"There's no clear-cut communication system" for use by blood bankers and federal agencies responsible for protecting the public health, Lindsay says.

When a new organism appears, "the response isn't as coordinated as it could be. . . . The federal system works slowly," Wright says. Adds Lindsay, "there's not an organized surveillance system."

These are discouraging words for anyone who may someday require someone else's blood — although they won't surprise my friend's mother or anyone else trying to get by without donor blood.

But health officials continue their campaign to convert the worrywarts: The risk of transfusion-contracted disease remains exceedingly low, they assert. □

The danger of Chagas' disease

Chagas' disease, a potentially deadly infection common in Latin America, may pose a new threat to the U.S. blood supply. It already infects 50,000 to 100,000 U.S. residents, physician Ira A. Shulman of the University of Southern California in Los Angeles told an NIH panel reviewing blood donor tests.

It's difficult to determine the exact number of people infected, however. Few U.S. physicians recognize this disease, says Roger Y. Dodd of the American Red Cross in Rockville, Md.

After several reports of transfusion-transmitted Chagas', some blood banks began testing for the protozoan that causes the illness; others are considering doing so. The Red Cross has a study under way to calculate the prevalence of the disease among blood donors.

Early Chagas' symptoms — including a high fever, facial swelling, and an enlarged liver and spleen — can turn deadly. Some people suffer no immediate symptoms but develop heart and gastrointestinal illnesses years later. *Trypanosoma cruzi*, the parasite that causes Chagas', can survive refrigeration.

Contamination of donor blood by bacteria and parasites "is not a rare complication," says NIH panel chairwoman Jane F. Desforges of the New England Medical Center in Boston. Moreover, more and more people are traveling to foreign countries, which only boosts the risk of unfriendly foreign agents tainting the blood supply, warns Jeffrey McCullough of the University of Minnesota Hospital in Minneapolis. — *T. Adler*