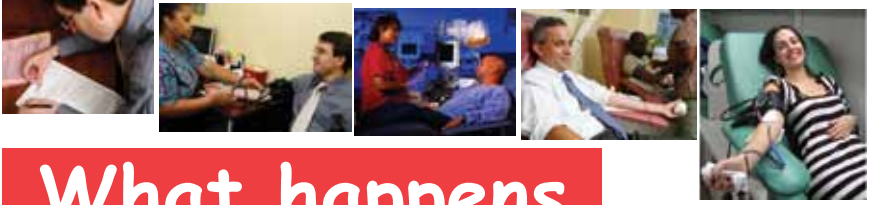


Bloodology III



What happens
to your blood
after you
donate?

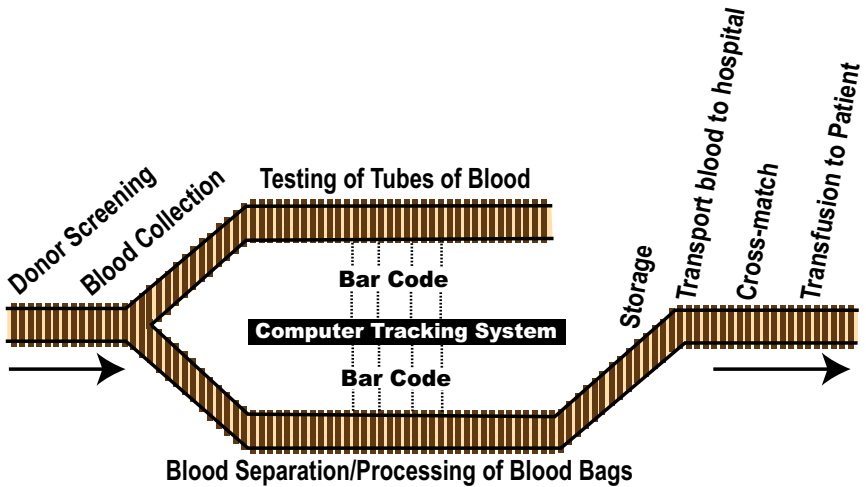


Tracing the
path of blood
donations



Beyond the view of most blood donors and blood recipients is a complex network involving many people at many different facilities: recruiting potential donors, screening, testing and processing of blood, matching of suitable blood for specific patients, and much more. All this involves the work of physicians, medical and technical staff at hospitals, and the expertise of many different blood center staff.

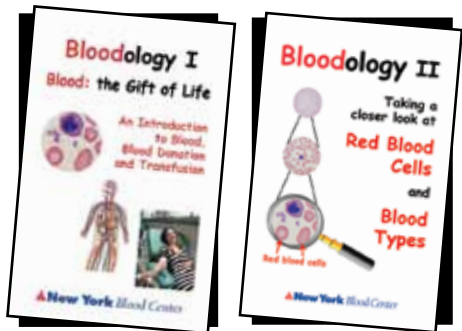
This pamphlet explores these pathways and introduces you to some of those involved along the way.



The *Bloodology* blood education pamphlet series

Created by Robert Ratner
and Marion Reid
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We thank numerous colleagues for
their suggestions.

For more information and/or for
additional copies of this or other
pamphlets in the *Bloodology*
series, contact: 212-570-3037 or
rratner@nybloodcenter.org
or visit www.nybloodcenter.org



Step 1: At the donor site, Before blood donation is made

Answer blood bank questionnaire

Before donating, every prospective blood donor is asked a series of questions, to make sure that the donor is in good health and can safely donate and to ensure the safety of the blood product(s) to be donated.

What kind of donation are you preparing to make?

When did you last donate? Different types of blood donations have different limitations concerning how frequently one can donate:

- **Whole blood**
You can donate again in 56 days.
- **Double red cells**
You can donate again in 112 days.
- **Platelets**
You can donate every three days or up to 24 times a year.
- **Plasma**
You can donate again in 28 days.

Different parts of your blood; Different ways to donate

When you see blood, it appears as a red liquid, but it is actually made up of billions of cells suspended in **plasma** (mostly water, with clotting factors and nutrients). The different components of blood can be seen when blood is spun in a centrifuge (photo on page 9). There are three main types of cells in your blood:

platelets, white blood cells and red blood cells.

The red blood cells give blood its red color.

There are a number of forms of blood donations. In addition to whole blood donations – where all three types of blood cells are collected at once – there are more specialized blood donations, where blood is drawn, the part to be donated is filtered and separated out and the rest of the donor's blood is put back into the donor's blood stream. Ask your donor specialist about which form of donation you could make.



Age and weight requirements

The questionnaire will ask your age and weight. Nearly anyone age 17 (16 in New York and New Jersey with parents' written permission) to 75, who weighs a minimum of 110 pounds and is in good health can safely donate blood. People age 76 and older can donate if they meet all other donor eligibility requirements and they present a physician's written permission note.



The questionnaire asks questions concerning the health of the donor

Questions are asked concerning your life experiences, such as whether you have travelled to a country that might result in exposure to blood-borne disease. Truthfully answering questions about sexual contact and exposure to sexually-transmitted diseases is vital to ensure that the blood donated can be safely transfused to a patient. **Answers are kept confidential** (see below for details on how this confidentiality is strictly enforced throughout). The U.S. Food & Drug Administration determines the questions required to be asked of all prospective donors, as well as restrictions on who is not eligible to donate based on their answers.

Prospective donors receive a mini-physical

Your blood pressure and pulse will be taken and a few drops of blood



tested for sufficient iron in your blood to ensure that you can safely donate blood.

Bar code labels generated to strictly protect donor privacy

Your actual name or other personal information is *not* on the labels of the tubes or blood bags. Instead, bar code labels, with a unique code number for every blood donation, are generated, and placed on every tube and bag.

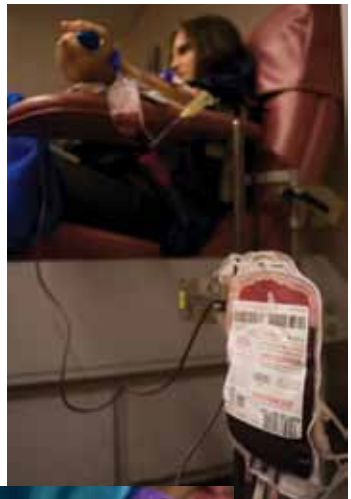
Using a bar code reader, these bar code labels enable every tube and bag to be identified and tracked through all steps of testing, processing and distribution.



Staff involved in these steps

have no access to the computer “decoding” of these bar code numbers. They cannot access the names or personal and health history information of the donors which was provided at the preliminary stage of the blood donation process.

Therefore, donor privacy is strictly protected. Only in special circumstances, and according to strict procedures, when donor or patient safety is at risk, can selected personnel view confidential information.



Step 2: Blood is taken from donor

Attention to the comfort and well-being of donor

A trained phlebotomist will take personal care of the donor before, during and after the drawing of blood.

A small portion of the blood is put in test tubes, and the rest is collected in a blood bag. During collection, the bar code labels are attached to the tubes and blood bag.

After the actual collection of blood is completed, juices and other refreshments are provided,

so that the donor can promptly consume plenty of liquids to replace fluids removed from the body by blood donation.

Staff will confirm that the donor shows no signs of weakness or dizziness before he/she leaves the donation collection site.

The tubes and bag of blood are then carefully transported in temperature-controlled containers to our laboratories.

Step 3: Testing & Processing



Two-track process begins

At this point, a two-track process begins. The labeled tubes are dispatched for **testing**, while the labeled blood bag is sent for **processing**. What is done in each “track” is described below.

While the testing of the tubes and the processing of the blood into different blood components in preparation for patient use are done separately, often at different locations and at different times, their paths are linked by their unique

bar code labels. At each point in the process, bar code “readers” identify the blood and data entered into a large main frame computer to monitor the path of every part of every blood donation.



Track 1: Testing

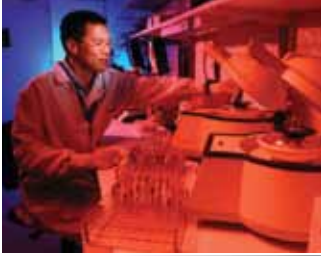
A small amount of blood in tubes is tested.

Track 2: Processing

Most of blood donation is stored in bags and processed.



Track 1: Testing of the tubes from the blood donation



Identification/confirmation of ABO and Rh blood type. Based on the outcome of these tests, each blood bag is labelled: A+, A-, B+, B-, AB+, AB-, O+ or O-.

Additional, **more specialized, testing is done for other blood group characteristics** in the cases of special needs and for a precise match.



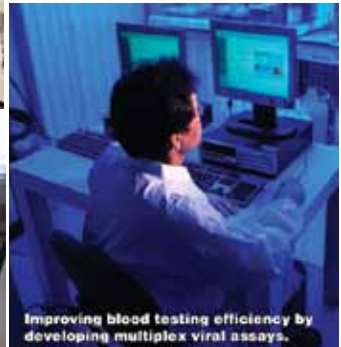
Blood is tested for transmissible diseases including the presence of viruses, such as HIV/AIDS, hepatitis B and C, and the West Nile virus.



It generally takes 12 to 16 hours for all the tests to be conducted and the results received.



The results of these tests will determine what happens next with the blood products processed in “Track 2.”



Track 2: Blood processing

The blood bag undergoes a process using a centrifuge, resulting in the separation of red blood cells, platelets and plasma, each of which is then stored in a separate bag.



Testing results determine further steps:

If the results show no problems and no viruses are detected, processing continues of all blood and blood products from that donation. The resulting products are labeled to indicate blood type, released for distribution, and stored until used. (see page 10)

If viruses are found, or if for any other reason the blood donation is not acceptable for transfusion to a patient, the blood and all products derived from that donation are destroyed, following special guidelines for safe disposal.

Through the confidential tracking procedure, specially trained, designated personnel are able to access the donor's contact information, and the donor is informed of the nature of the disease detected in his/her blood. Most are informed by mail. In the event of unusual test results, the donor will be contacted and offered a personal interview and **confidential counseling**.



Step 3: Storage of blood

Most blood donations are stored, either at a blood donor center or in a hospital transfusion service, to be on hand when a patient needs a blood product of a specific type.

Red blood cells are stored at 4°C for use up to 42 days after collection.



One of New York Blood Center's refrigerated rooms for storage of red blood cells.

In the case of "rare blood", red blood cells are frozen in special very cold freezers at -80°C (-112°F). Samples for use in special testing are frozen and stored in a vessel of liquid nitrogen (extremely low temperature: -196°C (-320°F)). Frozen blood is stored until needed for up to 10 years.

Plasma can be frozen for use for up to 12 months.



Liquid nitrogen storage at extremely low temperature



Platelets are the most "perishable" and can only be used within five days. Left, platelets stored in special machine that "agitates" the platelets frequently to prevent clotting, as part of their special storage requirements.

Steps to a Transfusion:

The RECIPIENT's Perspective

How is the **need** for a blood transfusion identified, and then how is the blood obtained and transfused to the patient?

Step 1: Determine need

A physician determines that a patient needs a blood transfusion.

Written request is made, specifying the type and quantity of blood product needed.

Some are emergency needs where life-saving blood is needed within a matter of hours, while others are for longer-term needs or in preparation for a planned medical procedure.

Who needs your blood?



Accident victims and patients having major surgery

They may lose so much blood that their body cannot replace it quickly enough. Dangerously low levels of blood can cause serious harm if lost blood is not quickly replaced.



Cancer patients

Cancer treatments often not only kill the harmful cancer cells, but also lots of normal blood cells.



People with blood diseases

People with sickle cell disease need healthy red blood cells to replace their "sickled" ones. Many other diseases are treated with transfusions.

... and many other needs

For example, **severe burn patients** need blood plasma to quickly add blood fluids.

Graphic courtesy of St. Louis Children's Hospital

Precise Match determination

In the cases of rare blood types, or a patient who receives repeated blood transfusions, the attending physician in close cooperation with blood donor center personnel determine what sort of "precise match", beyond the basic matching for A+, A-, B+, B-, AB+, AB-, O+ or O- types, is required for safe transfusion to the patient. In some cases, there may be only a few locations in the entire world where such blood can be found, and arrangements are made to have this blood transported to where it is needed.

















See *Bloodology II* for more information on blood groups.

Are You My Type?

Matching blood type of donor blood and patient's blood

While a patient does not generally need to receive blood identical to his/her own – the blood must be of a compatible type – blood that when mixed with a patient's blood will not generate a reaction.

Years of scientific research have produced extensive knowledge of this. Below is a chart for the most common blood types.

		Blood type of PATIENT			
		O	A	B	AB
Blood type of DONOR	O	 Identical	 Compatible	 Compatible	 Compatible
	A	 Incompatible	 Identical	 Incompatible	 Compatible
	B	 Incompatible	 Incompatible	 Identical	 Compatible
	AB	 Incompatible	 Incompatible	 Incompatible	 Identical

Step 2: Ordering

If the specific blood needed is not on hand at the hospital, a request from the hospital's transfusion service is made to the nearest or most appropriate blood donor center.



Step 3: Transport

Blood is transported from the blood center to the local hospital transfusion service. Rare blood may be rushed by air to distant parts of the world.



Step 4: Cross-match

While both the donor's and recipient's blood have now been tested and the blood type of each has been determined, before actually transfusing the donor blood into the patient, hospital laboratory personnel conduct a "test run" - known as a "cross-match": a small amount of the donor's blood is mixed with a small amount of the patient's blood in a test tube, and the outcome examined to make sure that no adverse response (known as an **agglutination reaction**) results from mixing the two.

If no clumps are observed in the test tube of mixed blood (see photo on right), that indicates that no agglutination reaction has occurred, and the blood can now be transfused to the patient.



No agglutination

However, if clumps of red cells *are* observed (right photo), an adverse agglutination reaction has occurred between the donor and patient blood. The patient's physician will be informed of the need for a delay so that the patient's blood can be further tested for unusual blood characteristics, requiring specialized investigation to determine what type of blood can be safely transfused to that patient.



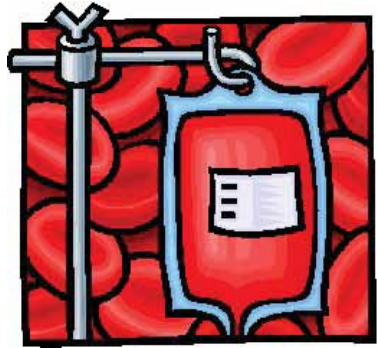
Agglutination

Step 5: The actual blood transfusion to patient

The actual blood transfusion to the patient is done by a licensed health care professional (such as a nurse or physician).

Medical personnel observe the response of the patient for any signs of an adverse reaction to the blood transfusion.

The “gift of life,” having passed through a complex path of processes and testing, has now been successfully received by the patient!



Conclusions:

Blood donations, regardless of a person's blood type, are vitally needed on an on-going basis.

Many think of donating blood at the time of a disaster, but without a daily, sustaining supply, surgeries and intensive, life-saving treatments would be impossible. The complex process of testing and processing blood donations and preparing blood for transfusion takes time. It is essential that sufficient supplies of blood are on hand, already donated, tested and processed and ready for use, not only for “normal” or daily needs, but to meet the sudden needs of an emergency.



Lines of potential blood donors surround New York Blood Center on September 12, 2001

Donating blood is safe, information provided and gathered is kept strictly confidential, and the process is *not* traumatic.

There is a special need for donations from those with rare blood types. A donor of a rare blood type may be one of very few in the world whose blood can safely be transfused to a particular patient. As described in more detail in **Bloodology II**, especially in cases where patients have received many transfusions, even patients who were born with a common blood type can acquire additional antibodies, preventing them from safely receiving all but a very rare type of blood. Thus, the **need for rare blood is not rare.**



The blood collection and transfusion process involves a complex network, conducted at all times by trained personnel.

We welcome and depend on your support and contributions to this life-saving process.



Donate Blood - Give the Gift of Life!

New York *Blood Center*

To donate, you should:

- Be between the ages of 16 and 76,
- Be in good health, and
- Weigh at least 110 lbs.

For more information or to make an appointment, we invite you to call **1-800-933-BLOOD** or go to our website: **WWW.NYBLOODCENTER.ORG**.