goes into the vein of the patient. This is put into a container filled with water at 37°–38°, and that warms the passing blood to 36°–37°. The container with the water is placed a short distance (20–25 cm.) from the lower end of the rubber tube, close to the needle. The water can be kept warm by adding hot water from time to time.

The blood is transfused slowly (40–50 drops per minute). When blood transfusions in large quantities are desired, it is recommended to oxidize the blood in the container to prevent precipitation of erythrocytes.

The method described above proved to be very simple and very advantageous in preventing complications during or after blood transfusion.

V. K.

NORCROSS, J. W.: *Transfusions.* S. Clin. North America **20**: 875–882 (June) 1940.

"The use of transfusions in the treatment of both surgical and medical conditions is becoming more widespread year by year. Whole blood or blood slightly modified by citrate is now recognized as perhaps the best treatment in a great number of varied disease states. . . . The only indication for a transfusion is the need of the recipient for one or more of the elements contained in whole blood. There are six main types of deficiency which are often best treated by a blood transfusion: A deficiency of whole blood. . . . A deficiency in red blood cells. . . . A deficiency in available hemoglobin without change in the number of red blood cells. . . . A deficiency of white blood cells. . . . A deficiency in platelets. . . . [and] A deficiency of substances contained in plasma. . . . Within the past few years there has been a tendency to discard the use of whole blood in favor of citrated blood. . . . The indirect citrate method has been used exclusively at the Lahey Clinic since 1932. This method is easy and convenient, does not require cutting down on the veins of either the donor or recipient; nor does it need the services of a full surgical team. If necessary, the citrated blood may be stored in the refrigerator for as long as a week before using. . . .

"A recent United States transfusion survey showed that, of 60 severe transfusion reactions, 36 were due to incompatibility, and of these, 6 were fatal. The majority of the 40 hospitals studied used the confusing Moss or Jansky classifications instead of the international classification. . . . In many cases poorly trained technicians did the tests, and in 10 per cent. of the hospitals studied either the grouping or direct compatibility test was omitted. In a group of 600 blood transfusions studied by the Blood Transfusion Betterment Association, 14 per cent. of patients had reactions, 3.5 per cent. urticaria, 8 per cent. fever alone, and 2.3 per cent. fever and chills. Other careful studies of transfusion reactions have given a varying incidence of from 1.2 per cent. to 12 per cent. Lewisohn and Rosenthal clearly demonstrated the importance of using freshly distilled water in the preparation of the citrate solution in order to avoid reactions to the protein of dead bacteria. Apparatus improperly cleaned will allow small particles of old blood to enter the recipient and thus cause a reaction. These reactions fall under the classification of faulty administration. Under this same heading so-called speed shock may take place if the blood is given too rapidly. In this case there is acute dilatation of the heart, and pulmonary edema, and death may occur. The improper straining of the blood may let tiny clots enter the circulation and cause a reaction. Reactions may also result from hemolysis secondary to improper handling of the blood before it reaches the patient.

"The transmission of disease by means of transfusion must be considered as a type of transfusion reaction. . . . Every attempt to rule out the presence of syphilis, malaria, and marked degrees of allergy in the donor, must be made. Severe hemolytic reactions are practically always caused by errors in the technic of grouping or cross matching. . . . Fever reactions with or without chills are fairly common. The importance of strict cleanliness and of freshly distilled water has already been stressed. Allergic reactions occur in 3 to 5 per cent. of all transfusions. Anaphylactic shock may prove fatal, and several deaths have been reported following the use of the same donor on repeated occasions. It is wise to use fasting donors to prevent the transfer of certain proteins to which the recipient may be sensitive. It is dangerous to use autotransfusions, such as from a ruptured liver or spleen, and this is particularly true in the case of the spleen. Defibrinated blood is very toxic and should not be used."

J. C. M. C.

BULL, DAVID, AND DREW, CHARLES R.: *Preservation of Blood.* Ann. Surg. **112**: 498–501 (Oct.) 1940.

A summary of recent laboratory studies on preserved blood.

1. Red cell count remained unchanged for 30 days with heparin or anticoagulant; and 15 days with 0.3 per cent. sodium citrate.

2. Red cell diameter decreased after 35 days.

3. Survival of red cells after transfusion: studied by means of specific M and N factors which showed that cells of fresh blood survived 95 days in recipient; 3 day old blood, 80 days; 10 day old, 60 days; 14 day old, 20 days.

4. White cell count dropped 50 per cent. in 24 hours.

5. Thrombocytes fell rapidly.

6. R.B.C. Fragility Tests gave poor end points but it was apparent that the cells were less resistant on the 10th day than on the first.

7. Prothrombin showed a prompt initial fall to 50 (by the Quick Test) and then remained almost constant at this level over a long period.

8. Electrolyte — potassium diffuses rapidly from R.B.C. into serum for first few days and then more slowly to equilibrium. This diffusion is increased (1) by shaking, particularly of old blood (transportation should therefore be done while fresh), (2) by increasing the area of interspace between cells and supernatent serum, and (3) by ammonia concentration. This latter rises rapidly, within the first few minutes as the blood is exposed to air and then remains constant until after the 4th day. It is believed to increase cell permeability and thereby diffusion of potassium. If the blood is drawn bellow CO_2 ammonia nitrogen concentration is left low and diffusion of sodium and potassium is retarded.

Tolerance for potassium is increased when given slowly and decreased when given rapidly. Therefore, in shock and hemorrhage where large amounts of blood must be given rapidly, fresh blood should be used, especially if excretion is poor, or serum potassium already high.

Cadaver blood is not suitable for preservation because of much higher concentration of ammonia nitrogen and consequent rapid diffusion of Na and K ions.

Placental blood behaves much as does adult blood and appears to be a suitable source.

The outstanding changes of clinical interest taking place in stored blood are the loss of white cells and platelets, increase in plasma potassium and decrease in prothrombin. For most purposes it should give results comparable to fresh blood; for infection, prothrom-