

## BLOOD BANKS

BY

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### WHAT THEY ARE

**B**LOOD taken from a healthy subject [DONOR]\* with precautions assuring exclusion of germs can be kept from clotting (by addition of 0·3 per cent. sodium citrate) and almost fresh (at 2-8° C.) for at least ten days (longer, if glucose is also added). Institutions keeping a stock of bottles of blood so preserved are known as Blood Banks. This preserved blood can be injected into the veins [TRANSFUSED] of a patient [RECIPIENT] in most cases of disease and injury like freshly drawn blood.

The significance of the term 'bank' lies in the fact that the blood can be deposited for future use by the recipient himself (under certain conditions) or his relations and friends. Usually it is donated by voluntary donors, public spirited or paid. In Russia it has been collected from dead bodies. Placental blood (in child birth) has also been advocated. The last two sources are messy and uncharitable (placental blood is baby's blood) to say the least. Given proper organisation there is no dearth of healthy blood from voluntary donors in any part of the world.

The Blood Banks are of Russian and American origin. Most of them only stock blood which can be given without any tests to recipients of all blood groups [blood from UNIVERSAL DONORS. For the Blood Groups and Blood Types see Table and also a previous article in this *Journal*, included in the list of useful Reference].

The Banks contemplated in England at the beginning of the War were also of this kind. In the Red Cross Blood Bank of Calcutta, started by the writer in 1939, blood of all groups was kept in addition to the blood of universal donors.

The ideal blood to transfuse should be of the same group and the same type as the recipient's blood. The determination of the type, however, is a laborious procedure. For all practical purposes, therefore, the blood of the same group is considered a good substitute. Failing this degree of similarity of blood the red corpuscles of

which are not affected [broken up LYSSED, or stuck together AGGLUTINATED] by the straw coloured watery part of the recipient's blood [PLASMA and SERUM] is considered suitable [COMPATIBLE, though in one aspect only]. The Universal donor's blood is regarded as a blood of this kind for subjects of all other groups. So are the bloods of groups A and B for a recipient of group A B [UNIVERSAL RECIPIENT]. This liberty taken in transfusion occasionally results in serious reaction and even death. These are caused by high potency of the antistances [ISOHÆMAGGLUTININS *a* and *b*, ISUNINS *a* and *b* of the writer] in the in-going plasma of the 'compatible' donor against the group specific substances [ISOHÆMAGGLUTINOGENS A and B, ISOGENS A and B of the writer] in the recipient's red blood corpuscles. Standards of safety have been worked out and should be followed.

### A PLASMA BANK

The preserved blood lying in bank does not clot but separates into a top layer of straw coloured plasma and a bottom layer of granular looking semisolid red blood corpuscles. The corpuscles grow more fragile with storage and can be discarded before they have started to tinge the plasma, when the blood has not been used up within the agreed period (ten days). The plasma is pipetted off (with precautions assuring exclusion of germs) and stored as such. It keeps good for at least two months. The institution storing plasma only is a Plasma Bank.

In cases of sudden bleeding caused by accidents, battles and Air Raids, plasma has its use. In fact in such cases it is preferable to the whole blood. The same applies to cases of extensive burns. In these injuries more plasma is lost from the body than the red blood corpuscles. Giving of whole blood may increase the total volume of the latter to such an extent, as to make the blood in the system sticky and thus impede the circulation.

For stopping bleeding, providing ready-made human material for repair of the system and supplying natural protective substances of the humour against infection, the plasma is as good as whole blood.

\* Technical terms, self-explanatory in the context, are given in CAPITALS in square brackets



The plasma is not kept in a bank group by group. It is made safe for transfusion into recipient of any group by reducing its potency of the antistances. This is done by pooling, absorption (with the group specific substances) or merely by dilution with isotonic solution of sodium nitrate [NORMAL SALINE, the product then is called plasma-saline]. The natural distribution of blood groups in India is such (O A and B are more evenly distributed than in England) that pooling tends to ensure safety. The pooled plasma, however, must be tested. It should conform to the standards laid down for the plasma of the 'safe' universal donor.

For slow loss or deterioration of blood caused by disease, plasma cannot replace whole blood in transfusion.

Plasma banks are also blood banks inasmuch as the plasma is an important and integral part of the blood. They are, however, second best, taken all round.

Antiseptics can be added to preserved plasma. 'Merthiolate' is the antiseptic of choice.

#### A SERUM BANK

Blood to which no sodium citrate (or another chemical with a similar property) has been added clots in a few minutes. Later the clot contracts and from its meshes is squeezed out a straw coloured fluid, the serum. The serum is also stored and used like plasma. The institution storing serum only is a Serum Bank.

A physiological difference between the plasma and the serum is that while the former is capable of clotting like the whole blood, on the addition of calcium salts, the latter is not. The plasma clot of course lacks the red colour due to the lack of red blood corpuscles. A therapeutic and rather important difference is that, in the experience of some workers, human serum is toxic. A physical difference is that the serum is easier to filter through germ-removing filters than plasma. In other respects the plasma and the serum may be taken to be identical.

It will be observed that while a plasma bank can be run as a side-show from a real blood bank, a serum bank takes blood initially for serum and discards useful constituents of it.

Serum banks are also blood banks inasmuch as the serum is an important fraction of blood. Taken all round, however, they can be assigned only the third place.

#### DRIED PLASMA AND SERUM

Both these fractions of blood can be dried, sealed hermetically and stored almost indefinitely. Addition to the dry powder of the calculated quantity of distilled water provides in a few moments liquid plasma or serum ready for transfusion. The drying, unfortunately, is done by the aid of expensive machinery. The fluid must be frozen and dried from the frozen state. Products obtained by other means are inferior, unreliable and dangerous.

#### CONCENTRATED PLASMA (AND SERUM)

The plasma can be concentrated (to a quarter to fifth of its volume), in a sterilized cellophane bag by the simple act of

*A Table explaining the Serological Constitution of Blood Groups and giving Old Equivalents of New Terms*

Substance in red blood corpuscles, isogen (=isohaemagglutinin)	Anti-substance in plasma, isonin (=isohaemagglutinin)	Designation of blood group in International Nomenclature	Designation of blood group in Old Nomenclature
O (= nothing, capital letter)	ab	O*	Jansky I* Moss IV*
A	b	A	II II
B	a	B	III III
AB	o (=nothing small letter)	AB†	IV† It

\* Is "universal donor". Red blood corpuscles cannot be agglutinated by plasma from other groups. But plasma if of high titre can kill recipients of all other groups.

† Is "universal recipient". Plasma cannot agglutinate red blood corpuscles from other groups. But high titre plasma from donors of all other groups can kill the recipient.

exposing the bag to air. The concentrated product keeps for a year or so. It takes up distilled water (four to five times or more of its volume) and provides in a few moments liquid plasma or serum ready for transfusion.

Concentration of plasma (and serum) has not found favour with the workers who have been put in charge of blood banks in India, lately. The experimental work on revival of dogs suffering from loss of blood, however, was carried out exclusively by concentrated dog serum, many years ago, in America.

Division of A into A<sub>1</sub>, A<sub>2</sub> and A<sub>3</sub> provides sub-groups A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, A<sub>1</sub>B, A<sub>2</sub>B and A<sub>3</sub>B.



The sub-groups, however, have no importance in transfusions of blood.

Hæmagglutinin (not isohæmagglutinin) M and N provide further differentiation. Each group and sub-group is of M, N or MN type. The types may have a place in transfusion specially in repeated transfusions.

#### A LIST OF USEFUL REFERENCES

The titles of the following papers, published during the last three years, indicate the subjects investigated and discussed and will provide the necessary details of procedure which have been kept out of the general account given in this communication.

- (1) On M and N in Blood Groups: Technique of Typing, Anti-fluids, Findings in 300 Indians and Associated Considerations. By S. D. S. Greval, S. N. Chandra and L. S. F. Woodhead, *Ind. Journ. Med. Res.*, 26, April 1939.
- (2) The use of Blood Tests in Excluding Paternity and Maternity. By S. D. S. Greval, *Ind. Med. Gaz.*, 75, July 1939.
- (3) Difficulties and Dangers in Providing Donors of Blood. By S. D. S. Greval and S. N. Chandra, *Ind. Med. Gaz.*, 74, August 1939.
- (4) Taking Blood for Transfusion. By S. D. S. Greval and S. N. Chandra, *Ind. Med. Gaz.*, 75, January 1940.
- (5) The Needle in the Vein. By S. D. S. Greval, *Ind. Med. Gaz.*, 75, February 1940.
- (6) Blood Groups of Communities in Calcutta. By S. D. S. Greval and S. N. Chandra, *Ind. Journ. Med. Res.*, 27, April 1940.
- (7) The use of Blood Tests in Excluding Paternity and Maternity (with a note for non-medical readers). By S. D. S. Greval, *Burma Police Journal*, 3, July 1940.
- (8) Taking Blood for Transfusion (in Potain's Aspirator). Further Details including Cold Storage. By S. D. S. Greval, S. N. Chandra and A. B. Roy Chowdhury, *Ind. Med. Gaz.*, 75, September 1940.
- (9) Blood Groups and Blood Types. By S. D. S. Greval, *Current Science*, November 1940.
- (10) Making Plasma Safe for Transfusion. By S. D. S. Greval, *Ind. Med. Gaz.*, 75, December 1940.
- (11) On Isohæmagglutination: Nomenclature, Titration of Isohæmagglutinins, Need for Revision of Technique of Grouping Blood, etc. By S. D. S. Greval, S. N. Chandra and L. S. F. Woodhead, *Ind. Journ. Med. Res.*, 29, January 1941.
- (12) Obtaining Compatible Blood Exchange and Associated Considerations. By S. D. S. Greval, *Cal. Med. Journ.*, 38, 79-83, February 1941.
- (13) Taking Blood for Transfusion: Further Improvisations. By S. D. S. Greval, S. N. Chandra and D. N. Chatterji (in press) *Ind. Med. Gaz.*
- (14) An important Anti-genic Difference between Hæmagglutinogens M and N. By S. D. S. Greval and S. N. Chandra (in press), *Ind. Journ. Med. Res.*
- (15) A Note on Blood Transfusion Services of Calcutta (Organisation, Routine and Research). By S. D. S. Greval, and S. N. Chandra. A Government of Bengal Publication, 1941.

## OBITUARY

### DR. ARNOLD BERLINER (1862-1942)

WE deeply regret to record the death of Dr. Arnold Berliner at the age of eighty. He is well known throughout the world of science as the Founder and until 1935, the Editor of *Naturwissenschaften*. In July 1935, Dr. Berliner, at the special invitation of the Board of Editors, *Current Science*, accepted the position of one of the Corresponding Editors. His association with *Current Science* has been eventful; he was responsible for the suggestion that

*Current Science* should undertake the publication of special supplements dealing with the most outstanding topics of science. The supplements so far issued on Laue Diagrams, Canal Rays, Genetics, and Organisers in Animal Development are largely the direct consequence of his enthusiastic, generous and whole-hearted co-operation.

In his death, *Current Science* loses one of its highly esteemed and valued well-wishers.