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BLOOD TRANSFUSION IN THE U.S.S.R.

BY

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Blood transfusion cannot to-day be regarded merely as a substitute method of medical treatment. It should really be designated by the term "haemotherapy"—i.e., treatment with blood—as, in addition to the infusion of fresh blood, elements which stimulate and alter its reactions, mainly in a beneficial direction, are likewise introduced into the organism. This is usually followed by restoration of the functions of various diseased organs.

Blood is distinguished from all the tissues and organs by virtue of its extraordinarily wide range of functions. Besides its own life, it reflects in itself that of all the organs and systems. Not only does the blood distribute the oxygen it obtains from the lungs but it also serves as a universal medium in metabolism and carries within itself the products of nutrition and disassimilation. The chemical stimulators of vital processes, fragments of hormones, as well as catalysers—ferments and protective substances—are all concentrated in the blood. These factors are no doubt of fundamental significance in rendering blood transfusion one of the most effective measures known in medical practice.

Its Wide Application

The wide application of blood transfusion in the U.S.S.R. was preceded by research work by a number of Soviet scientists (among them, Academician A. A. Bogomoletz and Academician S. I. Spasokukotsky), who sought to establish the mechanical basis of the effect of blood transfusion and to determine indications and contraindications in applying this means of treatment.

The application of blood transfusion has greatly developed since 1926, when a special institution was founded in Moscow—the Central Institute for Blood Transfusion (I.P.K.)—under the auspices of the People's Commissariat for Health of the U.S.S.R. (Narkomzdrav); and parallel with this development there proceeded research work which resulted in the scientific establishment of several points touching upon this method. Blood transfusion is to-day performed in all medical institutions throughout the U.S.S.R., and the number of such transfusions has grown rapidly year by year. Whereas in 1935 the officially registered cases of blood transfusion numbered 22,000, by 1940 this figure had mounted to 200,000, excluding transfusions given on the Finnish front in that year.

With us, blood transfusion always had a definite ultimate aim—the utmost possible use of this prepotent medical treatment in wartime. And this urged us to solve the problem of organization, to train all physicians in the giving of blood transfusions, and to set up special institutes and stations—future blood-purveying depots—in all regional centres and large towns. This work has made great progress during recent years. Whereas in 1932 there were only about 80 such institutions in the U.S.S.R., by 1941 their number had reached 1,500; and, of course, there has been a corresponding growth in the number of donors. Soviet scientists, too, demonstrated their theoretical and practical achievements in the sphere of blood transfusion at the 1935 and 1937 International Congresses on Blood Transfusion.

Blood Conservation

At the outset blood transfusion in general practice was resorted to mainly as an emergency measure. There then arose

the task of finding preservative agents which would allow blood to be conserved and retain its biological qualities for considerable periods of time. The solution of this problem facilitated the urgent transfusion of blood in times of peace, and particularly so in wartime. Nowadays we consider it an ordinary matter to ship conserved blood by aeroplane over distances of hundreds and even thousands of miles into the most distant corners of the tundra and taiga, and into the steppes and deserts of the south-east regions of the Soviet Union. No small number of human lives have already been saved, thanks to the speedy transportation of conserved blood by aeroplane to the front lines from far inland. And in this connexion the utility of various isothermic containers for shipping blood over long distances is worthy of special attention.

Hundreds of thousands of transfusions of conserved donors' blood have been made in the U.S.S.R., and this source ranks first among all sources of blood for transfusion. Only a few years ago conserved blood could be stored for not longer than 15 days, and under conditions of transportation, when the blood was subject to being shaken and jolted, this was reduced to 10 days. In recent years, however, great success has been attained in lengthening the period over which conserved blood can be kept: the addition of a small quantity of glucose to the sodium citrate solution substantially improves the storage properties. Blood conserved with a glucose-citrate solution can be successfully kept in a condition suitable for transfusion for 25 days, and for 20 days when transported. Experience in the war has shown transport by aeroplane to be the main, and the most preferable, method of shipping conserved blood to the front, even from distances of thousands of miles.

Soviet physicians have paid particular attention to designing appliances for taking blood and for the transfusion, storage, and shipping of conserved blood. Practice has shown that standard rectangular jars which fit into an isothermic container best answer the purpose of uniting in one vessel both the taking and the transfusion of blood; they are also very convenient for transport. These jars, which are produced on a mass scale, are placed inside the insulated containers, in which the blood keeps irrespective of external heat or cold. The ampoule type of appliance for blood transfusion is also eminently suited to the purpose, being easily portable and simple in use.

Utilization of the blood of "universal" donors acquires great significance under wartime conditions. Soviet scientists have accomplished a great deal of work in solving this problem. Without any complications whatever, massive doses of group O (IV) blood are now transfused to recipients of other groups who have lost a great deal of blood. And this is done actually at the front. Here the blood of universal donors is of particular value to active service medical stations, for there is often no opportunity for blood grouping.

Another matter of much importance for ensuring supplies of conserved blood at the front, and for its transfusion, is the efficient organization of stores of blood and their shipment. Our main supply base for conserved blood is the network of blood transfusion institutes and stations of the Narkomzdrav which have been established all over the country. When war broke out, many of these institutes and stations swiftly and efficiently readapted their work and became main bases for the mass purveyance of conserved donors' blood for dispatch

to the front and to hospitals in the rear. During twelve months of war literally hundreds of tons of blood have been thus applied to wounded men in all stages of evacuation, and with truly tremendous success.

Narkomzdrav regularly sends out groups of experienced specialists—scientific collaborators from the institutes and stations—who give practical assistance in ensuring the adequate supply of conserved blood at the front. Thus, thanks to timely blood transfusion, we can indeed say that hundreds of thousands of human lives have been saved.

The Plasma Method

The most diverse methods of haemotherapy have been extensively used—the drip method of blood transfusion, the transfusion of plasma and serum, immunotransfusion, the injection of small doses of blood of incompatible groups, and heterohaemotherapy. Among these the plasma method has a particularly wide scope in present wartime conditions. It is known that blood plasma is the main substratum of metabolism; and its most striking feature is that, despite the constant inflow of matter and energy, its composition remains unaltered. Soviet scientists are in complete accord with the conclusions of British and American scientists that, as a medium impregnated with plastic substances and containing a large quantity of ferments exerting a haemostatic action on the organism, as well as a medium in which viscosity and osmotic pressure are almost at the same level as in whole blood, plasma beyond a doubt possesses unqualified advantages as a blood substitute.

With the object of establishing the most favourable conditions for preserving plasma over long periods we have had recourse to freezing it. As did M. Struma and S. McGraw in their investigations, the Central Institute for Blood Transfusion has found that when plasma is frozen and afterwards quickly thawed at a temperature of 37° C.—immediately preceding transfusion or a short while before—it preserves intact such labile elements as prothrombin, fibrinogen, and complement. Recently we have introduced into practice desiccated plasma and serum preparations. Under front-line conditions plasma finds wide scope as a highly active haemostatic agent in cases of protracted loss of blood in which the transfusion of massive doses of blood is contraindicated. As a substitute for blood, plasma is employed in cases of shock accompanied by a moderate blood loss, when the organism still retains an adequate reserve of erythrocytes. In cases of burns we have found plasma of great service. When introduced in large volume, following heavy loss of blood, it usually has a most striking detoxicating effect. We employ various balanced physiological solutions for preserving the erythrocyte mass remaining after the plasma has been separated.* We have recently been using the following solution: MgSO₄, 0.04 gr.; KCl, 0.2 gr.; NaCl, 8.5 gr. per litre of double-distilled water. It has been termed the modified I.P.K. fluid.* This fluid is mixed with the erythrocyte mass in different ratios. After the plasma has been separated from them and replaced with the modified I.P.K. fluid, the conserved blood erythrocytes are preserved in an external temperature of 4° to 6° C. Under these conditions they show no marked change up to 12 days, including the day the blood was taken from the donor. The transfusion of conserved blood erythrocytes containing this plasma substitute was found most effective in those cases of anaemia in which the aim of medical treatment is preferably to obtain a substitutive effect—that is, cases of much loss of blood, regenerative forms of post-haemorrhagic anaemia, etc. Naturally, the erythrocyte mass method is of service mainly in hospitals situated not far from the institute or station preparing these erythrocytes.

Plasma Substitutes.—The wide application of blood transfusion in the U.S.S.R. and the generous manner in which donors give blood for the needs of the Army and civil medical institutions have not relegated the question of blood substitutes, or, rather, plasma substitutes, that can be employed in all cases in which the main object is that of augmenting the volume of circulating blood. From our point of view, any physiological solution containing only salt ingredients, without colloids to maintain the viscosity and osmotic pressure of the solution on a level approaching that of plasma, is useless as such a

substitute. Balanced solutions containing a small volume of blood or plasma have recently been finding a practical use as isotonic fluids with a natural colloid. Other solutions also serving this end are those in which the colloidal properties are ensured by adding casein that has been specially processed, with the object of eliminating the antigenic properties inherent in this preparation. The complicated circumstances existing in the front line sometimes preclude the possibility of utilizing conserved blood within its period of serviceability, and these are the conditions under which plasma, as well as synthesized substitutes for the latter, is of chief use. From a fairly wide experience we may draw the conclusion that in cases of acute loss of blood and shock, when infusion of plasma substitutes is carried out in conjunction with haemotherapy, a favourable influence on the condition of the patients' haemodynamics is usually obtained by the use of small doses of blood or plasma.

Side by side with colloidal substitutes for plasma we have recently introduced on a wide scale so-called physiological balanced solutions containing alcohol and glucose. These solutions, which mainly reinforce the vital processes, are administered in cases in which the wounded patient suffers from disturbed haemodynamics not associated with heavy blood loss, and also in septic cases.

It is no matter for surprise that since the outbreak of war a tremendous number of Soviet patriots have streamed into the numerous blood transfusion institutes and stations. From early morning till late at night these institutions seethe with activity. New donors undergo medical examination, their blood groups are checked, blood is taken and conserved, and jars and ampoules are packed for urgent dispatch to the front. And these donors are not only the donors—so to say, "cadre" donors—who used to give blood for transfusion before the war. They largely consist of the huge number of those who declared their desire to give blood for transfusion to the wounded when necessity arose. This great army is held in reserve, and at the very first call they flock to the transfusion centres to give their blood. And this reserve army has been augmented to-day by a great number of people in all walks of life. Even the briefest of informative talks on the important part which blood transfusion and the donor play in the Soviet army medical services suffices to bring to the institutes and stations groups of workers, students, militiamen, housewives, and the wives of those on active service, expressly to join the ranks of donors.

COMMENTS ON AN EPIDEMIC OF HEPATITIS

BY

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The hospital in which the epidemic occurred was formed in Sept., 1939, and has catered for up to 120 children at a time, as well as for a variable number of adults. The children have been nursed mainly by children's nurses in training, and these young women have been chiefly affected.

History of the Outbreak

In March, 1940, a nurse became jaundiced (Table I), and a second case occurred 35 days later. Shortly afterwards 2 nurses were transferred from another hospital, where the infection was rife, and they soon developed the illness. In August another nurse was affected, and in October another. Thus in 7 months 4 nurses probably acquired the disease in the hospital, and this epidemic period was followed by an outbreak in one ward affecting in a month 5 children and 5 nurses who worked in that ward, while 2 nurses and a ward-maid were probably infected in the nurses' sick-rooms. The outbreak later declined, but during the final 17 months' observation a further 8 children and 30 nurses became jaundiced. Ten children who had acquired the disease elsewhere were also admitted during this time.

* I.P.K.—initial letters of the Russian for "Blood Transfusion Institute."