intramedullary route. Citrated blood, plasma, 5 per cent glucose and saline solutions were given by this method. The sternum or clavicle is chosen as the site of injection in adults and the tibia or fibula in children. The average rate of infusion is from 0.4 to 9 cc. per minute. Strict asepsis is observed throughout.

This method has proved practicable in 16 out of 17 trials. There have been no local or constitutional reactions as evidenced by clinical or x-ray findings following any of the infusions.

M. H. H.

EDITORIAL: *Dried Plasma.* Lancet **1**: 80–81 (Jan. 18) 1941.

"Plasma is available in large quantities at blood banks where the supernatant fluid is removed from over-age stored blood. This fluid has been widely used in the restoration of the blood volume in shocked patients, and in the larger banks where the turnover is rapid it is still one of the best stock solutions. Its disadvantages are the excessive potassium content, which may be important when large volumes are given, and the precipitation after about a fortnight's storage, of fibrin webs in what then becomes simply diluted serum. Serum has been said to be more liable, as Best and Solandt affirm, that there is a therapeutic or physiological difference between the two when used for transfusion. . . .

"Both serum and plasma are difficult to handle and transport compared with the dried products, which also require extremely careful preparation. . . . With concentrated solutions of plasma and serum we are on less certain ground and their theoretical possibilities, particularly in burn-shock and nephrosis, have yet to be conclusively confirmed in practice. . . . Concentrated serum or plasma is also highly viscous, often requiring to be given under pressure, and is capable of causing venous thrombosis. It is clear, therefore, that concentrated solutions should be used with discretion, and not everyone is convinced that it is good practice to introduce a viscous fluid into the bloodstream of a shocked patient whose circulation may already be seriously embarrassed by haemoconcentration." 5 references.

J. C. M. C.

ELLIOTT, JOHN; TATUM, W. L., AND BUSBY, G. F.: *Blood Plasma.* Mil. Surgeon **88**: 118–125 (Feb.) 1941.

"Transfusion of modified blood was successfully used in the first World War for treating shock and hemorrhage. The use of blood was limited, due to the lack of laboratory and operating room facilities. A substitute for whole blood that eliminates the necessity for special facilities, is now available in blood plasma. It is being successfully used in England. . . . In 1936 we suggested that erythrocytes in a blood transfusion played little part in the treatment of shock and that the benefit was derived from the plasma. . . . We have made an intense study to show that in the treatment of shock in humans, blood plasma is as effective as whole blood. In hemorrhage, if plasma is administered early, it is seldom necessary to transfuse whole blood. The therapeutic effectiveness of plasma in burns and in the hypoproteinemic state cannot be questioned. . . . Blood serum was used for most of the experimental work in animals. We have used human blood plasma exclusively for many reasons; namely, the greater yield, simplicity of preparation, freedom from reaction and because outdated blood from our blood bank is an important source of plasma. The larger yield of plasma and freedom from reaction were important factors in the decision for its use by the British Army and also approval of the American Human Serum Association.

Elimination of typing and cross matching, simplicity of administration, safe long storage period, transportability, and equal effectiveness, make plasma a satisfactory substitute for whole blood. . . . Although donor plasma agglutinates the cells of the recipient when cross matched, there is apparently no destruction of recipient's cells when such plasma is transfused. . . . We have studied the effect of long storage and transportation at room and refrigerator temperature on dilute plasma. Plasma stored at room temperature for periods up to twenty-six months have been administered without reaction and with satisfactory clinical results. Some of this plasma has been transported long distances. . . .

"Our experience, confirmed by many others, indicates that shock from hemorrhage can be effectively treated with blood plasma alone. . . . Whole blood transfusion is the best treatment for severe hemorrhage if administered early. . . . In severe hemorrhage, the preservation of life depends upon the early restoration of blood volume. Restoration of blood volume can be accomplished with blood plasma alone. . . . In the first World War burns, due to their high mortality, assumed a position of severe gravity. This type of injury assumes even greater proportions in the present conflict. Severe and extensive burns present problems requiring not only local surgical care, but also adequate treatment of shock that is present or impending. Later in the illness maintaining blood volume and blood protein is of utmost importance. Many burned patients will have sufficient erythrocytes, and will require only blood plasma. Following surgical treatment, many patients will be unable to take food by mouth or will lose protein through exudative processes. Maintenance of plasma protein is much less difficult than restoration. Blood plasma will be needed for the treatment of both of the above. . . .

"In the event of war, the need for plasma for the treatment of casualties will be enormous. This need cannot be supplied by one center. In the last war, convalescent casualties and soldiers were used as donors. In this war, civilians at home are furnishing the blood. In the United States local voluntary donors can be enlisted through local Red Cross chapters. The machinery has already been set up. Blood can be collected in many hospitals and converted into plasma at central points. We have had several hundred bottles of blood shipped to us by mail, plane, and bus, and have converted it into plasma without the loss of a single bottle. In conclusion, we would like to call your attention to the fact that the use of plasma as a substitute for the whole blood has passed through the experimental stage and is now a recognized therapeutic agent." 5 references.

J. C. M. C.

LUNDY, J. S., AND SELDON, T. H.: *The Blood Bank.* Minnesota Med. **23**: 870 (Dec.) 1940.

"In our mechanized life where war, automobile and industrial accidents occur, and also where burns, operations and states of hypoproteinemia are met with daily, the use of blood plasma is proving of real value. The blood plasma may be obtained from the citrated bloods in the 'blood bank' by siphoning off the supernatant fluid from the cells which have been deposited at the bottom of the container after several days' storage. If fresh blood plasma is preferred, blood is withdrawn from a donor, the cells are separated from the plasma by centrifuging, and in turn the supernatant plasma is siphoned off. The blood plasma from various donors can be pooled irrespective of the donors' groupings. In turn the individual or the pooled plasmas can be administered subcutaneously or intravenously, irrespective of the re-