CONFIDENTIAL

THE HAEMOPHILIA SOCIETY

BLOOD PRODUCTS SUB-COMMITTEE

Future plasma supplies in the U.K.

1. The report of the Blood Products Sub-Committee produced in January 1981 explored some aspects of plasma supply and their effect on Factor VIII supply, but the question was to some extent academic in the absence of adequate plasma fractionation capacity. Now that greatly increased capacity is to be provided, it seems appropriate to consider again the problems of supplying plasma for fractionation at the Blood Products Laboratory, Elstree. This paper concentrates on meeting the requirements for Factor VIII. Factor IX is not in short supply, and will be produced in large surplus when Elstree is fully re-developed. Much of the information for this paper has been obtained from a "Report on evaluation of plasma procurement and use" produced by the Health Economics Research Unit of the University of Aberdeen for the West Midlands Regional Blood Transfusion Service. A copy of the report has been made available to us through the generosity of the Director of the West Midlands B.T.S., Dr Fereydoun Ala.

2. The U.K.Haemophilia Centre Directors have concluded that demand for Factor VIII in the U.K. will reach about 100 million units per year by about 1986. B.P.L. is being redeveloped to increase its fractionation capacity from 150,000L. of plasma to about 450,000L. The Increased capacity should enable it to increase Factor VIII production from 30 million to over 90 million units, and to produce about 10,000 kg of Albumin, per year. So as to avoid the problems of a very rapid increase in the amount of plasma sent to B.P.L. when the new plant becomes operational, B.P.L. are asking that plasma supplies be gradually increased from now on, excess plasma being stockpiled.

3. The West Midlands B.T.S. at present handles about 195000 blood donations from a population of about 5.2.million (both figures being about 10% of the national total). Socially and geographically the region is typical of Britain as a whole, including both large city and rural areas. About 230 Haemophilia A patients were treated in the region in 1983 (also about 10% of the national total), using about 6 million units of Factor VIII.

4. Usage of Factor VIII in the West Midlands is at present equivalent to approximately 30,000 L. of plasma. Usage is expected to rise to approximately 9 million units per year, equivalent to approximately 45,000 L. of plasma. At present only about 14,300 L. are sent to B.P.L. for fractionation, but B.P.L. have set a "target" for the region of more than 47000L. from 1987-8 onwards. B.P.L. issues blood products to regions in direct proportion to the amount of plasma sent for fractionation. This system may create difficulties for Haemophilia Centres in B.T.S. regions, which will find it difficult to increase plasma production, as such regions will receive a decreasing proportion of Factor VIII issued from Elstree.

5. Nationally, somewhat less than 40% of blood donations are processed and the resulting plasma sent to B.P.L. (yielding about 150,000 L. of plasma). In order to make plasma available for fractionation there has to be a demand for the red cell concentrate (R.C.C.) also obtained. British clinicians have had a traditional preference for the use of whole blood for transfusion, over 60% of donations being so employed at present. If the demand for R.C.C. could be increased more plasma could be made available for fractionation. Other countries have achieved much higher usage of R.C.C., e.g. Canada (72% of total donations) and W.Germany (65%).

6. A related aspect of plasma supply is the amount of plasma removed from each donation. At present, using CPD-A additive, only about 200ml of plasma can be removed. Removing larger volumes of plasma gives R.C.C which is too viscous to be easily transfused. However, it is possible now to collect blood in "SAG.M" bags, the "SAG.M" being an additive solution in which red cells can be re-suspended after removal of plasma. The SAG.M technique enables more plasma to be removed from each donation (about 290 ml) and gives a superior quality R.C.C of viscosity equivalent to whole blood.

7. The improved R.C.C. obtained using SAG.M should help to overcome clinical resistance to use of R.C.C., and it is thought that 70% of donations could be processed, and possibly even as much as 85%. In West Midlands, processing 70% of donations, all in SAG.M.bags, would yield approximately 33,600 L. of plasma (if 85% could be achieved, 41, 000 L. of plasma would be made available - however, 70% is regarded as a more realistic target). The approximate cost to West Midlands B.T.S. of increasing donations processed to 70% and switching to SAG.M.collection is estimated as:-

Capital	£78,000
Recurring	£430,000

8. In order to increase plasma supply beyond the above presumed limit of approximately 33,600 L., other techniques have to be considered. The first possibility is simply to collect more blood (so called "over bleeding"). This option is used in Switzerland, where enough plasma to meet the needs of Factor VIII and Albumin production is thereby obtained. The problem with this option, however, is that red cells in quantities far in excess of what are required are obtained. In Switzerland about 60% of red cells donated are surplus to Swiss requirements. These red cells have either to be discarded or sold. Switzerland exports substantial quantities of R.C.C. to the United States. It is widely thought that it would be unacceptable in Britain to discard or sell voluntarily donated blood components in this way. In financial terms, moreover, it is a relatively expensive way of obtaining extra plasma unless a demand exists for the extra red cells generated. The West Midlands study suggests that the cost of providing a further approx. 10,400 L.of plasma (beyond the approx. 33,600 L. obtained by changing collection techniques) would be:-

With 70% of present donations processed and "overbleeding" £440,000
With 80% of present donations processed and "overbleeding" £340,000

8. If 80% of present donations could be processed and an increased demand created for R.C.C., then the cost of providing this additional plasma would be £250,000. A further difficulty of "overbleeding" would be that nearly 40,000 new donors in West Midlands would have to be found.

9. The second possibility is to establish a plasmapheresis programme employing manual plasmapheresis (in which blood is collected from a donor, plasma manually seperated and the red cells then returned to the donor). Because red cells are not lost in plasmapheresis, donors can donate more often (e.g. monthly) and in greater amounts (typically 500 ml.) Although manual plasmapheresis is employed by commercial companies (being the cheaper form of plasmapheresis), it is thought that the risk of returning red cells to the wrong donor makes this option unacceptable in Britain. In any case, manual plasmapheresis takes about 90 minutes compared with about 40 minutes for machine plasmapheresis. This time difference would cause difficulties for volunteer donors which it presumably does not for paid donors.

10. The most likely option for collecting further plasma seems to be machine plasmapheresis (in which blood is drawn from a donor into a machine in which plasma is separated and red cells returned to the donor in a continuous operation). A plasmapheresis centre with 8 machines could collect 12-16000 plasma donations per year (6-8000 litres). To enable West Midlands to reach "self-sufficiency" in Factor VIII two such centres would be needed. The costs of producing 11,000 L. of plasma by machine plasmapheresis are estimated as:

Capital	approx £470,000
Recurring	approx.£480,000

Further, it would be necessary to recruit and maintain a special panel of additional donors. If each donor attended 4-5 times a year a panel of about 6000 donors would be needed.

11. The West Midlands study indicated that the costs of producing additional plasma by the main options are as given in the Table. Also shown in the Table are the potential savings consequent on increasing NHS production instead of purchasing commercial material. It is emphasised that these figures relate only to Regional budgets,and do not include the cost of fractionation at B.P.L. Figures are given based on the current commercial price for Factor VIII of 8p per unit, and also on a price of 14p per unit (to which the price of Factor VIII is expected by some observers to rise over the next few years). The savings indicated for Albumin production are the maximum that could be achieved if a demand exists for all Albumin produced (the future demand for Albumin is much more uncertain than that for Factor VIII). The approximate costs of increasing plasma supplies in West Midlands to 44,000 L. are thus:-

	CAPITAL	RECURRING
(a) By "overbleeding"	£78,000	£760,000
(b) By plasmapheresis	£550,000	£910,000

12. The tentative conclusion of the West Midlands study is that plasma supplies should initially be increased by increasing R.C.C. usage to about 70% of donations, progressively switching from CPD-A to SAG.M collection, until the maximum of about 34 000 L. of plasma is reached. No definite recommendations have been made about increasing plasma suppy above that level, further study being recommended when future demand for blood products is clearer.

13. If one multiplies the West Midlands figures by 10 to try to obtain a national figure, it can be seen that to increase plasma supplies (by plasmapheresis) to 450 000 L. per year a capital expenditure of about £5.5 million and a recurring expenditure of about £9. million per year would be necessary. No great reliance can be placed on these figures, as the extrapolation could be grossly inaccurate and misleading. They may, however, indicate the order of magnitude of the expenditure needed. Clearly it will be necessary for us to press the D.H.S.S., through the Minister, to ensure that adequate funding is made available to Regional Blood Transfusion Centres as well as to B.P.L.

K.E. Milne
October, 1984

ANNEX

Table

Method	(1)	(2)	(3)
Plasma produced (L.)	33600	44000	44000
Cost of increasing producation from 14300 L. :-			
Capital	£78,000	£78,000?(4)	£550,000
Recurring	£430,000	£760,000 (5)	£910,000
Products obtained:-			
Factor VIII	3957000 i.u.	6089000 i.u.	6089000 i.u.
Albumin	386 kg	594 kg	594 kg
Equivalent commercial cost:-			
Factor VIII (8p/i.u.)	£316,600	£487,100	£487,100
Factor VIII (14p/i.u.)	£554,000	£852,500	£852,500
Albumin (£25/400ml)	£536,100	£825,000	£825,000
Potential saving on NHS production:-			
Factor VIII (8p)	-£113,400	-£272,900	-£422,900
Factor VIII (14p)	£124,000	£92,500	£57,500
Net potential saving if demand exists for Albumin:-			
Factor VIII at 8p	£422,700	£552,100	£402,100
Factor VIII at 14p	£660,100	£917,500	£882,500

NOTES

(1) Increase in R.C.C. usage to 70% ; change in collection method
(2) As(1), + "overbleeding"
(3) As(1), + machine phasmapheresis
(4) No capital expenditure figures given for this option
(5) This is a crude estimate based on assumed demand for R.C.C.