which agglutinates red cells transformed with *M* bacillus, in that the saline extracts agglutinated transformed cells and in that the absorbed sera showed diminished activity. In view of the fact that the serum of Case 2 agglutinated the transformed cells but not the red cells of Case 2 it is not yet possible to show more than a relationship. Shortage of material precluded further investigations. (Case 2 died. The husband of Case 1 did not approve.)

Neither our own cases nor those previously reported by Levine and Katzin, Gaffney and Sachs, and Basil-Jones *et al.* have been as exhaustively investigated as they might have been. One required to know whether the anti-*T* agglutinin or the non-specific cold (auto-) agglutinin of normal sera or both may be responsible for the polyagglutinability of these peculiar cells. Also it is suggestive that all the six cases so far noted have been of group *O*. If they all are instances of the same condition the probability of this occurrence is $< 0{\cdot}01$ (1/120).

K. E. BOORMAN
J. F. LOUTIT
D. B. STEABBEN

South London Blood Supply Depot,
Sutton, Surrey.

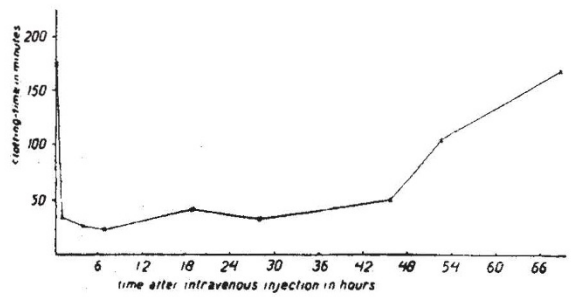
[1] Basil-Jones, B., Sanger, R. A., and Walsh, R. J., *Nature*, **157**, 802 (1946).
[2] Levine, P., and Katzin, E. M., *Proc. Soc. Exp. Biol. and Med.*, **39**, 167 (1938).
[3] Gaffney, J. C., and Sachs, H., *J. Path. and Bact.*, **55**, 489 (1943).
[4] Friedenreich, V., "The Thomsen Hæmagglutination Phenomenon" (Copenhagen, 1930).

Use of Normal Human Plasma Fractions in Hæmophilia

THE availability of separated human plasma proteins resulting from recent advances in fractionation methods[1] has provided the possibility of further investigations into the clotting mechanism in hæmophilia. It is of particular interest to find with which normal plasma fraction is associated the coagulation-promoting substance effective in hæmophilia[2], and to make a closer examination of this material. Important results have already been published on this subject[3].

As Kekwick, Mackay and Record[4] have developed a somewhat modified method of separating protein fractions, involving the use of ether rather than alcohol as in Cohn's method, it seemed desirable to examine the effect of their fibrinogen fraction in cases of hæmophilia. The clinical properties of the electrophoretically homogeneous fibrinogen obtained by these authors have not yet been examined, but we have been able to study the effect, in some hæmophiliac patients, of a product containing 82 per cent fibrinogen, 2·3 per cent albumin, 4·2 per cent γ-globulin, 11·2 per cent 'ill-defined' globulins migrating in the α and β region.

In vitro and *in vivo*, a 2 per cent solution of this 'fibrinogen' appeared to have a marked coagulation-promoting effect on hæmophilic blood. Repeated intravenous injection produced no disagreeable reaction, nor was it followed by a refractory period.



The accompanying graph shows the effect of the intravenous injection of 24 ml. of the fibrinogen solution into a patient with sporadic hæmophilia. To produce a comparable effect, both with regard to the shortening of coagulation time, and the duration of this shortening, would require at least ten times the volume of plasma. In some other cases in which a smaller amount of fibrinogen was injected, the effect lasted for a shorter time, but the antihæmophilic effect was about the same.

S. VAN CREVELD
G. G. A. MASTENBROEK

The Children's Clinic,
Municipal University of Amsterdam.
Sept. 2.

Cohn, E. J., *et al.*, *J. Clin. Invest.*, **23**, No. 4 (1944).
Van Creveld, S., *Maandschr. v. Kindergeneesk.*, **3**, No. 9 (1934). Bendien, W. M., and van Creveld, S., *Acta Brevia Neerl.*, **5**, No. 9 (1935); **7**, No. 1 (1937); **7**, Nos. 6–7 (1937); **8**, No. 7 (1938). *Amer. J. Dis. Childr.*, **54**, 713 (1937). *Acta Medica Scand.*, **99**, No. 1 (1939). Van Creveld, S., and Mastenbroek, G. G. A., *Acta Brevia Neerl.*, **11**, No. 10 (1941). Van Creveld, S., *Acta Paediatr.*, **29**, No. 1 (1941). Patek, A. J., Jr., and Taylor, F. H. L., *J. Clin. Invest.*, **16**, 113 and 741 (1937). Howell, W. H., *Bull. New York Acad. Med.*, **15**, 3 (1939).
[3] See Lewis, J. H., Tagnon, W. J., Davidson, Ch. S., Minot, G. R., and Taylor, F. H. J., *Blood*, **1**, No. 2 (1946).
[4] Kekwick, R. A., Mackay, M. E., and Record, B. R., *Nature*, **157**, 629 (1946).

Loss of Available Phosphate in Soil due to Micro-Organisms

WHILE there is a considerable fund of knowledge on the physical and chemical factors affecting the loss of available phosphate, or 'phosphate fixation', in soils, there is very little published work on the part played by soil micro-organisms in the process. Phosphorus can either be utilized by micro-organisms as cell substance and hence locked up temporarily, or permanently, in much the same way as nitrogen, or according to unconfirmed work by Rudakov[1], phosphate can be reduced to phosphine and lost from the soil as such. In order to assess the importance and magnitude of these possible processes, some preliminary work on the problem has been carried out.

The amounts of phosphate taken up by different soils from solutions of KH_2PO_4 and commercial (19 per cent water-soluble P_2O_5) superphosphate were determined by shaking experiments and by use of a modified Lees and Quastel apparatus[2]. From the results obtained a garden soil with a relatively low uptake of phosphate was chosen for detailed experiments. A large sample of the soil was air-dried, sieved through a No. 6 B.S.S. sieve, thoroughly mixed and stored in cardboard containers. 100 gm. portions of soil were either shaken at intervals with 200 ml. of a solution of KH_2PO_4 or superphosphate containing 150 mgm. P_2O_5, or perfused continuously with a solution of the same concentration, for periods usually not exceeding two weeks. Determinations of P_2O_5 in the filtered solutions were made at various intervals.

The design of the experiments was to modify the microflora of the soil by physical and chemical treatment and to compare the subsequent uptake of P_2O_5 from solution with the microbiological activity, which, in turn, was measured by the carbon dioxide evolved.

(1) Sterilization of soil by heat, formalin, or phenol, or re-wetting air-dried soil, did not significantly alter the amount of phosphorus fixed. The increase in microbial cell substance following the re-wetting was evidently insufficient to affect markedly the amount of phosphorus fixed.

(2) The addition of certain substances such as peptone, urea, blood meal, at amounts calculated to give 0·07 per cent nitrogen and also of dextrose (0·5 per cent), which are easily decomposed by micro-organisms, substantially increased the amount of phosphorus fixed by soil; ammonium sulphate gave no significant increase in perfusion experiments.

The results are shown in the accompanying table.

EFFECT OF ADDITION OF NITROGENOUS COMPOUNDS (0·07 PER CENT N) AND DEXTROSE (0·5 PER CENT) TO SOIL ON THE AMOUNT OF P_2O_5 FIXED AND THE CO_2 EVOLVED

Substance added	Method of treatment	P_2O_5 fixed greater than control (mgm./100 gm. soil)	CO_2 evolved greater than control (mgm./100 gm. soil/100 hr.)
Peptone	Shaking	50	190
	Perfusion	30	
Urea	Shaking	30	68
	Perfusion	19	
Bloodmeal	Shaking	30	35
	Perfusion	13	
Ammonium sulphate	Shaking	11	−2
	Perfusion	3	
Dextrose	Shaking	51	—
	Perfusion	*	

* Soil column became water-logged on every occasion.

Using superphosphate in shaking experiments the amounts of phosphorus fixed were somewhat lower, but the different substances added were similarly effective (peptone 25, urea 15, bloodmeal 15, $(NH_4)_2SO_4$ negligible, and dextrose 22 mgm./100 gm. soil).

Additional proof that the excess phosphorus fixed by treated soils was due to micro-organisms was obtained by carrying out an experiment with sterilized soils and substances, under sterile conditions, the results of which showed that treated soils fixed no more phosphorus than the controls. In addition it was found that in the previously recorded perfusion experiments the additional amount of phosphorus fixed in soil treated with peptone or urea could not be removed by leaching.

From the preliminary work carried out it appears that the addition of phosphates only to the soil is unlikely to stimulate the microflora sufficiently to produce any significant fixation of phosphorus, unless the amount of phosphorus previously present is limiting for growth of micro-organisms. When, however, phosphates are added in conjunction with substances which are easily available as nutrients for growth of micro-organisms the biological fixation may be appreciable. Thus application of phosphatic fertilizers together with any substances which singly or together stimulate the soil microflora will tend to increase the total amount of phosphorus fixed.

All attempts to confirm the work of Rudakov[1] were unsuccessful. Samples of different soils to which 1·0 per cent KH_2PO_4 was added were adjusted to different moisture contents, with and without the addition of different substances such as glucose, and were incubated for long periods. A slow current of air was passed over the soils and into sodium hypochlorite solution. In no case were significant amounts of phosphorus found in the hypochlorite solution, and it is consequently concluded that if phosphate is reduced to phosphine biologically in soils the conditions must be rare and specialized.

C. B. TAYLOR

Imperial Chemical Industries, Ltd.,
Research Department,
Billingham Division,
Billingham, Co. Durham.
Aug. 22.

[1] Rudakov, K. I., *Zbl. Bakt.*, II, **70**, 202 (1927).
[2] Lees, H., and Quastel, J. H., *Chem. and Ind.*, No. 26, 238 (1944).