Table 1

	Folate activity		B_{12} activity	
	Serum (μμg/ml.)	Liver (μg/g)	Serum (μμg/ml.)	Liver (μg/g)
(1) Control	35·5	5·7	185	0·105
(2) Control	27	5·3	110	0·182
(3) Control	31	5·7	115	0·194
(4) Cyanide	19	4·8	95	0·188
(5) Cyanide	37·5	5·7	130	0·073
(6) Cyanide	21·7	4·8	125	0·143

unable to confirm conclusively the observation[12] that cyanide intoxication probably produces depletion of liver hydroxocobalamin, although with the extremely small numbers used in this experiment it is impossible to make a valid comparison. Nevertheless, the average B_{12} activity of the livers in the cyanide treated rats is lower than that of the control animals (Table 1).

Further work requires the experiment to be repeated with the addition of cyanocobalamin and hydroxocobalamin to two groups subjected to a similar cyanide intake. If the latter confers protection to the central nervous system as opposed to the former then even greater questions of fundamental interest will be revealed.

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HÆMATOLOGY

Use of Ion Exchange Resins to alter the Concentrations of Individual Inorganic Ions in Blood *in vivo*

As yet no simple method is available to alter selectively the concentration of any ion in blood perfusing an isolated organ. Such a method would be of considerable value, and we report on the development of a suitable procedure.

The method depends on the fact that an ion-exchange resin equilibrated with a known electrolyte solution will approximately reproduce the original ionic concentrations in a small volume of a second solution replacing the first. The technique described here has been developed to study the effect of varying calcium and magnesium concentrations in the arterial blood supplying the parathyroid glands.

The cation exchange resin 'Dowex-50' (a cross-linked polystyrene sulphonic acid resin containing 8 per cent divinyl benzene, 20–50 mesh size) is purified by repeatedly washing with 5 N hydrochloric acid and 5 N sodium carbonate alternately. The final sodium form is then washed with distilled water and air-dried at room temperature. A column containing 15 g (wet weight) of this resin is washed with about 10 l. of a solution containing 140 m.equiv. sodium/l. (as sodium chloride and bicarbonate), 3·8 m.equiv. potassium/l. (as potassium chloride), varying amounts of calcium chloride and magnesium chloride and bubbled with 5 per cent carbon dioxide in oxygen so as to give a *p*H of 7·4. The resin is then poured into a conical flask and swirled with the same fluid. It is finally transferred to a thick polyvinyl chloride tubing column (15 cm × 1·6 cm) with inlet and outlet tubes (0·4 cm diam.) guarded by fine stainless steel mesh. The column is rid of all air bubbles by running in the equilibrating fluid from below; it is used once only.

A suitable artery in a heparinized (4,000 units/kg) animal is tied off distally and secured proximally to the afferent tube of the column. The effluent blood is pumped directly into the desired vascular bed. By adjusting the calcium and magnesium concentrations in the equilibrating fluid it is possible to obtain with reasonable accuracy any concentrations of these cations in the blood coming off the resin column. The concentrations of sodium, potassium and hydrogen in the blood plasma are not affected significantly. Other workers have noted absence of changes in various chemical and cellular components of blood following its passage through the resin[1–3].

Table 1. Cation Concentrations in Resin Equilibrating Fluid Systemic Blood and Effluent Blood in Dogs

(the last-named values are representative of levels obtained with perfusion for more than 3 h)

Exp. No.	Specimen	Ca	Mg	Na	K	*p*H
		(m. equiv./l.)				
1	Equilibrating fluid	3·2	0·4	145	3·8	—
	Systemic plasma	5·8	1·2	151	3·7	—
	Effluent plasma	5·9	0·7	150	3·7	—
2	Equilibrating fluid	3·6	2·7	141	3·7	7·40
	Systemic plasma	5·9	1·5	151	4·1	7·39
	Effluent plasma	6·2	3·7	146	3·9	7·41
3	Equilibrating fluid	2·0	1·3	140	3·8	—
	Systemic plasma	5·5	1·9	—	—	—
	Effluent plasma	4·1	1·9	—	—	—
4	Equilibrating fluid	4·6	1·4	140	3·8	—
	Systemic plasma	5·6	1·9	—	—	—
	Effluent plasma	7·0	1·9	—	—	—
5	Equilibrating fluid	3·0	1·2	137	3·9	7·40
	Systemic plasma	4·6	1·4	147	4·4	7·38
	Effluent plasma	4·6	1·7	143	4·0	7·36

Cation concentrations were estimated by flame spectrophotometer (Zeiss *PMM* 12) and *p*H was measured anaerobically in a blood *p*H apparatus (radiometer *pHM4* with macro-Astrup assembly electrode). Table 1 shows the concentrations of cations in the equilibrating fluid, systemic blood plasma and resin-treated blood plasma in dogs. It will be noted that the levels of calcium and magnesium in the equilibrating fluid produce different plasma-levels in the effluent blood because these elements are partly protein-bound. With the resin column described, it is possible to produce almost constant cation concentrations for more than 5 h with flow rates up to 5 ml. blood/min. Larger columns may be used for greater flow rates or longer perfusion periods.

It appears that similar methods could be used to alter the levels of other inorganic ions in blood using suitably pre-treated cation or anion exchange resins. Besides the perfusion of organs and glands, this selective addition or removal of various electrolytes in blood may have therapeutic possibilities.

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