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Variations in the distribution of carbon dioxide and chlorides in the cells and plasma of blood in tetany following thyroparathyroidectomy in dogs.

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MacCallum and co-workers have drawn attention to the fact that there is a decided loss of chlorides from the blood in gastric tetany, while Tisdall has demonstrated a similar loss in parathyroid tetany. It is known that the chloride content of the blood, small though it is, does not readily suffer change and it seemed to us that while there is no marked loss of chloride from the whole blood in parathyroid tetany there may be, in the acute condition which has been so marked a feature of our thyroparathyroidectomized animals, some definite alteration in the distribution of the chlorides in the plasma and cells of the blood. To determine this, and if possible relate it to changes in a similar carbon dioxide distribution, we have undertaken the present investigation.

It should be noted that by mild tetany we mean that condition of the animal immediately following operation, in which there may be no manifest signs of tetany or at most fine muscular tremor, felt most easily over the shoulder girdle of the animal. By acute tetany on the other hand is meant the severe and at times distressful condition which usually commences the second day following operation and is marked by severe spasmodic twitching of the supra-orbital and masseter muscles, spasticity of the legs, rapid respiration and profuse salivation, as described in a previous paper by one of us (E. W. H. C.).

Estimations of carbon dioxide were made by the Van Slyke method, of chlorides by the Van Slyke-Donleavy method. The results upon four dogs are reported; the normal results being compared with those obtained upon the four dogs 24 hours after operation, at which time all were in a stage of mild tetany; upon three of the dogs 48 hours after operation, and upon one dog 72 hours after operation; these latter were all cases of acute tetany.

Results: It will be seen from the table here given that the CO_2 content of the plasma and cells forms 74.2 and 25.6 per

cent of the total CO_2 content of the whole blood. In mild tetany, while there is a slight increase in the plasma CO_2, there is a

	Whole Blood			Plasma			Cells		
	Volume per cent	Per cent of whole blood	Percentage change in whole blood	Volume per cent	Per cent of whole blood	Percentage change in plasma	Volume per cent	Per cent of whole blood	Percentage change in cells
Normal	43.47	100	——	32.28	74.2	——	11.13	25.6	——
Mild tetany	43.61	100.3	+ 0.3	34.86	80.2	+ 8.0	8.75	20.1	—21.4
Acute tetany	35.11	80.8	—19.2	28.65	65.9	—11.2	6.41	14.7	—42.4

BLOOD CHLORIDES

	Whole Blood			Plasma			Cells		
	Gm. per 100 cc. of blood	Per cent of whole blood	Percentage change in whole blood	Gm. per 100 cc. of blood	Per cent of whole blood	Percentage change in plasma	Gm. per 100 cc. of blood	Per cent of whole blood	Percentage change in cells
Normal	0.599	100	——	0.422	73.9	——	0.156	26.1	——
Mild tetany	0.580	96.8	— 3.2	0.453	75.7	+ 2.6	0.126	21.1	—19.9
Acute tetany	0.584	97.5	— 2.5	0.469	78.2	+ 6.1	0.114	19.1	—26.9

definite loss of the cell CO_2, there being no change in the total amount. In acute tetany, however, there is a definite loss of CO_2 from the blood amounting to a loss of some 20 per cent. The point of note here is that the cell loses a much greater percentage of its normal content than does the plasma.

With regard to chlorides it is evident that they undergo little change in the whole blood or plasma while from the cells there is a definite loss of chlorides even in mild tetany. That some toxin is at work destroying cellular function is indicated. As to the nature of the mechanism involved we can at present offer no explanation.

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A method for maintaining stability in reaction of solutions during sterilization.

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Of the various means employed to prevent the marked changes in H-ion concentration which solutions undergo during sterilization, the use of relatively large quantities of Na or K phosphate has proved the most satisfactory. While this method may be suitable for certain types of solutions, the presence of large quantities of phosphate in solutions used for intravenous injection, and serological procedures, is undesirable. A very much smaller quantity of phosphate added to an adjusted solution after sterilization will maintain a stable reaction satisfactorily, but the disadvantage of adjustment after sterilization is obvious.

An attempt to adjust and buffer certain solutions before sterilization with an amount of phosphate as low as that found in the circulatory blood plasma, led to recognition of the fact that the chief variable in the solutions tested was their CO_2 content. The degree of CO_2 exchange between fluid and surrounding air during heating determined the reaction of the solution afterwards. Elimination of this variable by the use of CO_2 free