

When streptococci which had not been animal-passed were grown in flasks of these media so that comparisons of growth and hemolysin could be made, the growth was more luxuriant, the lag shorter and the hemolysin stronger in the peptone which had been only partially hydrolyzed. This suggests that causes for variations in growth are to be sought in the partially split proteins of the blood serum.

119 (1866)

The bicarbonate and chloride content of the blood in certain cases of persistent vomiting.

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These researches were instigated by an interest in the phenomenon of tetany, particularly in that form known as gastric tetany. Very little work has been done in this field on human subjects, none recently; and it seems that no blood analyses have been published. Whatever work was done was not convincing and the old hypotheses such as the dehydration and mechanical theories once offered as a result of clinical studies to explain the condition must be discarded as untenable.

There has been some successful experimental work on dogs, however, in which tetany was produced by obstructing the pylorus and in which various disturbances in the salts of the blood were recorded.

To summarize: McCann¹ (1918) was the one to discover that after pyloric closure there was a rise in the combined carbon dioxide. This was confirmed by MacCallum² (1920) and in the surgical laboratories of this college (Hastings³ and Murray 1921). MacCallum and ourselves also found a markedly diminished chloride content with normal values for calcium. In our laboratory, contrary to expectations, it was found that the H-ion

¹ McCann, W. S. *J. Biol. Chem.*, 1918, xxxv, 553.

² MacCallum, W. G., Lintz, J., Vermilye, H. N., Leggett, T. H., and Boas, E. *Bull. Johns Hopkins Hosp.*, 1920, xxxi, 1.

³ Hastings, A. B., Murray, C. D., and Murray, H. A. *J. Biol. Chem.*, 1921, xlv, 223.

concentration was only slightly and what we considered insignificantly raised. Finally, Dr. Greenwald, who was good enough to analyze specimens from three of our dogs, showed that there was no consistent change in the percentage of sodium.

The analyses to be reported, indicate that the changes noted in dogs may occur in humans as well.

Subjects with a carbon-dioxide tension of 70 vols. per cent. or over were considered abnormal and included in the group. In the chloride estimations anything below 5.5 grams per liter for plasma or 4.3 grams per liter for whole blood was deemed pathological.

In all, we studied seven cases; three of them had obstructions at or near the pylorus from ulcer, and two from cancer; one man had subacute gastric dilatation following appendectomy, and the seventh member of the group had an annular carcinoma of the lower jejunum. All cases were associated with inordinate vomiting, four days to two months in duration. In a few cases gastric lavage was practised, a procedure which probably aggravated the condition.

The abnormal values varied from 70 to 107 vols. per cent. In the three cases which showed tetany, the highest figures were respectively 103, 104 and 107 vols. per cent. The chloride values varied from 4.5 to 2.2 for whole blood and 5.1 to 3.7 for plasma. In several cases there was an accompanying rise of urea.

In two cases, dilute solutions of hydrochloric acid were given intravenously with a resultant decrease in the CO_2 tension. In the last case, 500 c.c. of 0.1 *N* HCl was combined with 500 c.c. of physiological salt solution as an infusion without apparent deleterious effects.

These findings indicate then that persistent vomiting, in all our cases the result of high obstruction of the alimentary canal, will result in an increased bicarbonate and decreased chloride content of the blood. This is undoubtedly due to the loss of hydrochloric acid from the stomach.

The cause of the tetany is not known definitely. Dr. Van Slyke⁴ in a recent article stated that uncompensated alkalosis was a cause of tetany. Some of our findings suggest that this is

⁴Van Slyke, D. D. *J. Biol. Chem.*, 1921, xlviii, 153.

correct. For instance, it was observed that tetany occurred in the three cases in which the CO_2 tension was highest. However, our results with dogs do not confirm this hypothesis. Dr. Hastings made the P_{H} determinations by the gas chain method, using all the accepted refinements. He found that it was normal until just before death, when the usual sudden ante-mortem drop occurred, proving that in this condition, death at least, is not due to an intoxication by hydroxyl ions. Moreover, as far as I know, there are no fundamental experiments to prove that nerve tissue is hyperirritable in the more alkaline solutions. Thus, since we have no direct proof we are not prepared, yet, to say that alkalosis per se, is the cause. There are other ions to be considered besides the hydrogen ion, which may affect nerve irritability. Dr. Loeb⁵ has pointed out the importance of the monovalent/divalent cation ratio or more specifically the Na/Ca ratio, and has shown differences in the anions as well. In this case, the sodium-calcium ratio seems to be normal but there is a marked disturbance in the anions which may be the important factor.

We are investigating further into the problem, and hope to be able to determine by estimating the hydrogen-ion concentration and the carbon dioxide content in the same sample of blood whether we are dealing with a condition of compensated or uncompensated alkalosis.

120 (1867)

Hen-feathering induced in the male fowl by feeding thyroid.

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It is already well known to the members of this Society that the males of certain breed of fowls—notably Sebright bantams and Campines—are feathered so like the females as to be in this respect practically indistinguishable from them; and that such hen-feathered males, following castration (especially in early life), develop plumage of the usual male type.

⁵Loeb, J., and Ewald, W. F. *J. Biol. Chem.*, 1916, xxv, 377.