XXXVII. THE PRODUCTION OF ACIDOSIS BY INGESTION OF MAGNESIUM CHLORIDE AND STRONTIUM CHLORIDE.

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HALDANE, HILL and LUCK [1923] put down the acidosis caused by the ingestion of CaCl_2 to a precipitation of CaCO_3 in the intestine. If this is correct, similar effects are to be expected on taking MgCl_2 and SrCl_2 . In the former case the reaction occurring in the gut would be:

in the latter:

the insoluble hydroxide or carbonate being excreted rectally, the NaCl re-absorbed. The net effect would be the substitution of NaHCO_3 by NaCl in the blood and tissues, just as if an equivalent of HCl had been taken. A certain amount of the bivalent metal would also be precipitated and excreted as soap, with the same effect on the reaction of the tissues.

On two occasions J. B. S. H. drank a litre of water in which 25 g. MgCl_2 were dissolved. The alveolar CO_2 pressure, estimated by the method of Haldane and Priestley [1905], fell from 39.3 to 32.8 mm. and from 37.2 to 31.9 mm. This fall was completed within 5 hours of taking the salt, but the pressure had not returned to normal on the subsequent mornings. The increased breathing might conceivably have been due to a stimulation of the respiratory centre by Mg ; however, an analysis of the urine secreted during the 24 hours after taking the salt left no doubt of the presence of a true acidosis. While on four normal days the acid titrated to phenolphthalein varied between 57 and 61 millimols, 76 were excreted after taking MgCl_2 . The ammonia, estimated by Malfatti's [1908] method, which had varied between 69 and 75 millimols, rose to 107. The salt caused intense diarrhoea, continuing for more than 24 hours. A sample of faeces was analysed qualitatively. The filtrate was alkaline to litmus and contained Mg and Cl . The residue, insoluble in water, was almost wholly soluble in dilute HCl . It gave no reactions for Ca or carbonate but contained much Mg . It therefore probably consisted largely of MgO_2H_2 . An analysis kindly performed by Miss Watchorn showed that 0.514 g. of Mg as against about 0.14 g. on normal days had been excreted in the urine within 24 hours. The total was only 8 % of that ingested.

60 g. of $\text{SrCl}_2 \cdot 6\text{H}_2\text{O}$ were drunk in a litre of water. The alveolar CO_2 pressure fell from 40.3 to 33.1 mm. and was still low next morning. The urine excreted within 24 hours after taking the salt contained 68 millimols of acid and 102 of NH_3 . There was therefore an acidosis. Besides diarrhoea, a slight headache, and malaise lasting for several days were experienced. The filtrate from a sample of faeces was neutral to litmus and contained much chloride, but only traces of alkaline earths. The residue insoluble in water was partly soluble in dilute HCl with effervescence. The alkaline earth metals were precipitated as oxalate and converted to nitrate. Only a trace of this was soluble in amyl alcohol. The residue gave a brilliant Sr spectrum. The insoluble part of the faeces therefore contained SrCO_3 and perhaps strontium soaps, but very little Ca . The alkaline earths of the urine were precipitated as oxalates, ashed, converted to nitrate, separated by extracting the $\text{Ca}(\text{NO}_3)_2$ with amyl alcohol, and estimated volumetrically as oxalate. The day's urine contained 1.46 g. of Sr , or 7.4 % of the total taken, and 288 mg. of Ca , as against a normal of 127–178. The excess is fully accounted for by the acidosis [Stewart and Haldane, 1924] and there is no evidence of a displacement of Ca by Sr .

There was a possibility that any violent diarrhoea might cause an acidosis through loss of bicarbonate. So, as a control, 40 g. $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ were drunk in 800 cc. water. This produced copious diarrhoea of a p_{H} about 7.5, but no change in the alveolar CO_2 pressure.

SUMMARY.

Ingestion of MgCl_2 or SrCl_2 causes acidosis in man.

REFERENCES.

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