

female, sometimes to the male. A study of the history of the patients from whom uterine strips were obtained throws an interesting light on our experiments. The uteri from the patients who give a history of successful pregnancy responded to fresh semen by relaxation, while uteri from women who gave a history of complete or long-standing sterility were always stimulated by semen. A tentative deduction is permissible: Uteri are of 2 kinds, receptive and rejective; semina are also of 2 kinds, stimulant and depressant. A large series of carefully selected cases will be studied, with the purpose of criticising these deductions.

We wish to thank Professor Benjamin P. Watson for putting at our disposal the large clinical facilities of the Sloane Hospital and Vanderbilt Clinic.

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Induction of Tetany in Rachitic Rats by Means of a Normal Diet.

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In the study of experimental tetany, removal of the parathyroid glands has generally been resorted to. Following this procedure the calcium concentration of the blood promptly falls and the animal develops tremor or convulsions. Dogs have commonly been used and the thyroid as well as the parathyroids have been extirpated. It is evident that, from a pathogenetic standpoint, this procedure can not be compared with the mechanism of infantile tetany. Another method is to induce tetany by giving large amounts of the phosphates. This procedure likewise can not be considered satisfactory, as it does not reproduce or simulate conditions associated with the development of tetany in human beings. Since infantile tetany comes about almost invariably as a sequel to rickets, it is remarkable that investigators have not more often attempted to induce tetany as a complication of a previously existing rickets. Shohl¹ has clearly recognized the importance of bringing about tetany in rachitic animals and has reported a number of investigations in which this disorder was occasioned by giving phosphates to rachitic rats. More recently Hamilton² and his coworkers have induced tetany in rabbits which previously had been rendered rachitic.

¹ Shohl, A. T., and Brown, H. B., 1929, **84**, 501.

² Hamilton, B., Kajdi, L., Meeker, D., *J. Biol. Chem.*, 1930, **86**, 331.

Our object was to ascertain whether tetany could be induced in a rachitic animal by means of a ration which more nearly approached the dietary of the infant. The first step was to bring about rickets in young rats in the usual way by feeding them a high calcium, low phosphorus diet. The McCollum ration was used, which has a Ca:P ratio of about 4:1. This ration was fed for about 21 days with the induction of typical rickets. For the development of tetany the Sherman B normal diet was used. This is composed of one-third dry milk, two-thirds whole wheat, with the addition of NaCl; its Ca:P ratio is about 0.67:1 and it is stated to be adequate for growth and nutrition. After a period of 1, 2 or 4 days it was found that the calcium concentration of the blood of the rachitic rats had fallen from about 10 mg. to about 6 mg. per 100 cc., and in turn that the inorganic phosphate had risen from the rachitic level of about 3 mg. to 8 or 10 mg. Some of the animals showed definite tremor on etherization, which in some instances developed into convulsive seizures. The chemical change in the blood was noted even after this normal diet had been given for a period of only 8 hours; after this interval, although no fall in calcium may have resulted, there was a rise in the phosphate concentration. If this dietary was continued for a period of a week or 8 days the calcium rose to normal, the phosphate receding to its previous level more slowly. The animals did not lose any weight so that the manifestations could not be interpreted as being the result of starvation. Radiographs of the bones showed definite healing, even after an interval of but 2 days or less.

The same phenomena could be induced in rachitic rats by means of a ration which contained two-thirds dry milk and one-third whole wheat and in which the Ca:P ratio was about 1:1 or even on a ration of whole dry milk which had an excess of calcium over phosphorus (1.3:1). In order to ascertain whether the fall in calcium could be brought about by having a still greater excess of calcium, calcium lactate to the amount of 2.9% was added to the two-thirds milk ration; this addition rendered the calcium approximately equivalent to the calcium content of whole milk, making the ratio 1.7:1. Tetany was irregular on this diet. It was evident that in spite of the fact that the ration contained considerably more calcium than phosphorus, the calcium concentration in the blood rapidly fell below the normal level.

Experiments were next carried out to ascertain whether the changes were the result of an increase in absolute amount of the

phosphorus rather than in the ratio of Ca:P. 3.3 gm. of KH_2PO_4 was added to the McCollum diet, rendering the phosphorus equivalent to the content of calcium in the McCollum diet, and the ratio of Ca:P was made about 4:4. On this ration the calcium in the blood fell as with the previous rations. We next made up a diet similar to the McCollum ration with the exception that 2.36% less of CaCO_3 was incorporated; the standard amount of CaCO_3 is 3%. By this means a ratio of Ca:P of 1:1 was brought about and the ration did not contain any more phosphorus than the rickets-producing McCollum ration (0.302 gm.). Nevertheless the calcium concentration in the blood fell after a period of 2 to 4 days, and the phosphorus rose.

It was evident that the tetany did not result from giving a ration in which phosphorus was relatively high compared to calcium nor in which it was greater in absolute amount than in the McCollum ration. The sudden fall of calcium in the blood with the accompanying symptoms seemed rather to be the reaction to the sudden change of the Ca:P ratio as compared to the high ratio of (4:1) which characterized the rickets-producing diet. This sudden change, associated with healing of the rickets, evidently so disturbed the Ca:P balance in the body that the calcium concentration in the blood could no longer maintain its level and hyper-irritability of the nervous system followed.

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**Fate of Orally Administered Specific Polysaccharide of
Pneumococcus.**

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The author reported that, following the ingestion of Type I pneumococcus polysaccharide, white rats possess an increased resistance to the homologous organism.¹ It consequently became of interest

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¹ Ross, Victor, *PROC. SOC. EXP. BIOL. AND MED.*, 1930, **27**, 658.