4. The addition of both casein and yeast greatly improved the growth and nutrition of the rats. As was to be expected from the results with the addition of yeast alone, there was complete protection afforded.

The experiments here reported must be regarded as preliminary to more detailed studies. The ease and certainty with which the disease can be produced in rats cannot but make its experimental study profitable, although it would be obviously premature to apply the data already obtained to the problem of human rickets.

137 (1719)

Diffusible calcium in normal, rachitic, and experimental tetany blood.

By L. VON MEYSENBUG.

[*From the Department of Pathology, College of Physicians and Surgeons, Columbia University, New York.*]

In 1911, Rona and Takahashi[1] reported their work on the diffusible Ca of horse, ox, and pig serum, finding an average of 65 per cent. of the total serum Ca to be diffusible. No work was done with human blood. MacCallum, Lambert and Vogel[2] in 1914 made the following statement: "If tetany blood be dialyzed under exactly the same conditions as normal blood, it still loses a proportionate amount of its Ca, which would perhaps show that it is not especially the loss of a diffusible Ca as contrasted with a non-diffusible form—which is important in producing tetany." Brinkman[3] in 1919 advanced the hypothesis that the calcium-ion concentration is dependent on the CO_2 tension of the blood. In view of the altered blood CO_2 combining power found in tetany by some workers, we have endeavored to correlate Brinkman's hypothesis with the low Ca content of the blood in tetany. During

[1] Rona and Takahashi, *Biochem. Ztschr.*, 1911, xxxi, 336.

[2] MacCallum, Lambert and Vogel, *Jour. Exp. Med.*, 1914, xx, 149.

[3] Brinkman, *Biochem. Ztschr.*, 1919, xlv, 101.

the past year, we have worked with human blood and experimental tetany dog blood.

The method of dialysis is an important factor in the results obtained. In the first place, collodion sacs are unsatisfactory, because they do not hold back protein for a sufficient length of time and because there is a progressive passage of fluid into the sac. We have used parchment paper thimbles, which obviate these objections. It was found that when serum was dialyzed against a Ca-free Ringer solution, there appeared to be a progressive dissociation of Ca, so that, at the end of 5–7 days' dialysis, 90 per cent. of the total Ca had diffused out. Where, however, compensation dialysis is employed, *i.e.*, known amounts of Ca are added to the dialyzing fluid outside the sac, equilibrium is obtained in 24 hours, at ice box temperature, and the diffusible Ca is found to be between 60–70 per cent. In all of our work, the serum and dialyzing fluid were saturated with 6 per cent. CO_2-air mixture, and the buffer of the dialyzing fluid was such that when so saturated, it had a p_H of 7.4.

The calculation of the diffusible Ca is simple and may be expressed in this formula:

$$\text{Diffusible Ca} = \frac{(\text{Ca in dialysate} \times 2) - \text{Ca added to dialysate}}{\text{Serum Ca}}$$

In the two tables our results are summarized.

The calcium determinations were done by Lyman's method.

DUPLICATE ANALYSES—EXPERIMENTAL TETANY, DOG NO. 6.

Series NN.	Ca in Serum at Start, mg. in 4 c.c.	Ca in Serum at End, mg. in 4 c.c.	Ca in Dialysate at Start, mg. in 4 c.c.	Ca in Dialysate at End, mg. in 4 c.c.	Serum Ca, mg. in 100 c.c.	Total Ca in System.			Per Cent. Dialyzable Ca. %
						Before mg. in 8 c.c.	After mg. in 8 c.c.	Diff. mg.	
NN 1	0.248	0.274	0.210	0.184	6.1	0.458	0.458	0	60
NN 2	0.248	0.274	0.210	0.180	"	0.458	0.454	0.004	63
NN 3	0.248	0.218	0.105	0.128	"	0.353	0.346	0.007	61
NN 4	0.248	0.232	0.105	0.124	"	0.353	0.356	0.003	58

SUMMARY OF RESULTS.
Ca Expressed as mg. per 100 c.c.

Normal Human.		Normal Dog.		Human Rickets.		Dog Tetany.	
Serum Ca.	Per Cent. Diffusible Ca, %.	Serum Ca.	Per Cent. Diffusible Ca, %.	Serum Ca.	Per Cent. Diffusible Ca, %.	Serum Ca.	Per Cent. Diffusible Ca, %.
10.5	65	10.9	68	9.0	68	6.3	62
11.1	67	11.1	69	7.6	63	6.1	63
10.5	67	10.7	60			6.7	66
10.3	68	10.6	61				
11.0	72	10.2	69				
10.4	70						

These observations indicate that there is no change in the proportion of diffusible serum calcium in human rickets, or in experimental dog tetany.

138 (1720)

The relation of acid base equilibrium in the body to excretion of phosphorus and calcium.

By T. F. ZUCKER.

[*From the Department of Pathology, College of Physicians and Surgeons, Columbia University.*]

The relation of the acid base equilibrium in the animal body to calcium and phosphorus metabolism has been studied by a number of workers.[1] The significance of variation in the acid base equilibrium is undoubted, but considerable confusion is encountered, when an attempt is made to correlate the available results. A good many of the experiments have been done on small

[1] Gerhard and Schlesinger, *Arch. exp. Path. u. Pharm.*, 1899, xlii, 83.
Fitz, Alsberg and Henderson, *Am. Jour. Phys.*, 1907, xviii, 113.
Schabod, *Arch. f. Kinderh.*, 1909, lii, 47; 1910, liii, 381; 1911, liv, 83.
Grauström, *Ztschr. f. physiol. Chemie*, 1908, lviii, 195.
Goto, *Jour. Biol. Chem.*, 1918, xxxvi, 355.
Givens, *Jour. Biol. Chem.*, 1917, xxxi, 421.
Ruedel, *Arch. f. exp. Path. u. Pharm.*, 1894, xxxiii, 79.
Dubois and Stolte, *Jahrb. Kinderh.*, 1913, xxxiii, 21.
Nelson and Williams, *Jour. Biol. Chem.*, 1917, xxviii, 231.