

crease in both fatty acid and sterol as ester. Littermates fed vitamin B complex + cholesterol at the 10% fat level showed 16.6% fatty acid and 6.0% cholesterol as ester for the males, 23.2% fatty acid and 6.6% cholesterol as ester for females. Those deprived of the yeast extract showed 11.9% fatty acid for males, 13.9% for females and 4.5% for males and 2.5% for females cholesterol as ester, respectively. However the figures for the animals receiving no cholesterol showed about the same proportionate decrease in fatty acids, 8.5% to 5.4% for males and 10.5 to 5.6% for females. Cholesterol as ester in both was negligible in amount.

Further data will be necessary to determine whether this is a result of lowered food absorption alone, but some as yet incomplete studies indicate that the effect is specific for vitamin deficiency.

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On the State of Calcium and Phosphate of the Blood.

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The report by Smith and Sternberger¹ that in many of their ultrafiltration experiments the sum of the ultrafiltrate and concentrate calcium fell very considerably short of the serum calcium and that the difference was due to an adsorption of calcium by the collodion membranes, led us to undertake an investigation of the phenomenon. This loss is important in relation to the differentiation of the blood calcium into a diffusible and non-diffusible fraction by procedures such as the one of Greenberg and Gunther.²

It was found that the loss from serum with only normal amounts of calcium is negligible and only when the serum calcium is very considerably augmented, either by "*in vitro*" or "*in vivo*" measures, does the amount of calcium taken up by the membrane become of importance. The significance of diffusible and non-diffusible calcium determined under the usual circumstances on fresh blood serum is in no way vitiated by this finding.

This is borne out by the experiment given in Table I, which is representative of our results. The table shows the changes produced

¹ Smith, R. G., and Sternberger, H. R., *J. Biol. Chem.*, 1932, **96**, 245.

² Greenberg, D. M., and Gunther, L., *J. Biol. Chem.*, 1929, **85**, 491.

TABLE I.
Effect of CaCl_2 Injection on Calcium and Phosphate Diffusibility.*
Dog St. Wt. 20 kilos. Injected arterially with 20 ml. 0.25 M CaCl_2 .

Time hr.	Serum Ca	Diffusible Ca	Serum Ca Calc.	Loss	Serum Phosphate	Diffusible Phosphate	Loss
Control	11.15	7.25	11.45	0	4.60	4.80	0
0.25	16.20	8.90	13.50	2.70	4.30	3.10	1.20
1.3	13.75	8.00	11.65	2.40	5.70	4.60	1.10
3	12.45	6.65	12.30	0.15	5.10	5.05	0.05
5.5	12.05	6.25	12.25	0	4.40	4.15	0.25

* All blood chemistry values in mg. per 100 ml.

in the blood of a dog injected arterially with 0.5 gm. CaCl_2 . In the original control blood sample and after the calcium has dropped back to the range of the usual serum values, the calculated serum content from the ultrafiltrate and the concentrate analysis agrees as well with the determined values as could be expected. In the samples with high calcium the loss is considerable.

It was found, moreover, that under these conditions not only the calcium but phosphate also is taken up by the membranes, and what is of greater significance, *the phosphate which normally is completely diffusible becomes in very considerable part non-diffusible*. This effect can be more strikingly shown "*in vitro*" by augmenting serum with calcium. An experiment of this kind in which beef serum has been augmented with calcium chloride is shown in Table II. With increasing calcium content the diffusibility of the phosphate becomes progressively less.

TABLE II.
Beef Serum Augmented with CaCl_2 .

No.	Total Ca	Diffusible Ca	Total Ca Calc.	Loss	Total Phosphate	Diffusible Phosphate	Loss
1	9.30	3.95	8.35	0.95	7.70	6.35	0.65
2	14.10	5.10	10.50	3.60	7.70	5.20	2.50
3	17.90	6.60	12.55	5.35	7.70	4.20	3.50
4	22.25	7.80	18.30	5.95	7.70	3.15	4.55
5	26.60	10.70	23.95	2.65	7.70	2.65	5.05

Our experiments have led us to the hypothesis that the phenomenon is the result of the formation in sera high in calcium of a colloidal material composed of calcium, phosphate and probably carbonate which is stabilized and prevented from precipitating by the protective action of the serum proteins. We believe that this hypothetical colloidal substance is what is taken up by the collodion membranes. Actually, the action is not an adsorption in the usual sense but instead is the result of an impregnation of the pores of the membrane produced by the ultrafiltration. Collodion membranes cut up

into shreds and shaken with calcium augmented serum did not take up any calcium or phosphate whatsoever.

Another reason for believing that it is a colloidal form of calcium and phosphate which is impregnated on the membrane and not calcium and phosphate ion as such is given by the experimental findings with magnesium. When the magnesium in the blood is augmented by injection there is no such loss on the filtration membrane as is found with calcium. A typical experiment is given in Table III. The agreement between the serum magnesium and the

TABLE III.
Effect of MgSO₄ Injection on Magnesium Diffusibility.
Dog Fl. Wt. 14 kilos. Injected subcutaneously with 10 cc. of 20% MgSO₄.

Time, hr.	Total Mg.	Diffusible Mg.	Total Mg. calculated
Control	2.15	1.90	2.15
0.25	5.10	4.10	4.50
1.3	5.25	4.05	5.20
4.5	2.35	2.05	2.20

values calculated from the ultrafiltrate and concentrate magnesium here is gratifying. Because of the close chemical relationship of calcium and magnesium, if adsorption of the cations were involved, both elements would be expected to show a similar behavior.

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Effect of Infra-Red Light on Subsequent Fertilization of the Eggs of Certain Marine Invertebrates.*

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A study has been made of the effect of near infra-red radiation on the subsequent fertilization of the eggs of some marine invertebrates. The species studied were 2 sea urchins (*Strongylocentrotus purpuratus* and *S. franciscanus*) and a worm (*Urechis caupo*). Light from a Mazda standard projection lamp (gas filled, 30 volts, 30 amperes, with the tungsten filament radiating at about 3200°K) was passed through a slit 1x18 mm., 10 cm. from the filament, and

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