kali. After repeated precipitations and thorough washing the dissolved material is passed through a Berkefeld filter and reprecipitated. The final precipitate is washed rapidly with acetone and ether and dried *in vacuo*. The preparation so obtained is a whitish powder, readily soluble in faintly alkaline solution, possessing the properties of a mixture of nucleoprotein and mucoid. It contains about 16 per cent. of nitrogen and 0.5 per cent. phosphorus.

Solutions of nucleoprotein prepared from one type of pneumococcus (Type II) react in about equal degree with all three types of antipneumococcus serum, and not with antityphoid or normal horse serum. This fact, if confirmed by subsequent investigation of the protein from pneumococci of other types, would indicate, on the basis of specific precipitin reactions, that all pneumococci possess in part at least a common specific protein. The protein of pneumococcus, as contrasted with the non-protein fraction or soluble specific substance is not type specific, but reacts with antipneumococcus serum regardless of type derivation. It is therefore species specific, not type specific.

218 (2178)

Gastric antacids which cannot act as systemic alkalies.

By ISIDOR GREENWALD.

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The antacid most frequently used in the treatment of hyperchlorhydria is sodium bicarbonate. But this is not only an antacid but an alkali, so that the contents of the stomach occasionally become alkaline. Moreover, the amount required to control the gastric symptoms is frequently sufficient to make the urine alkaline. Both these alkalinizations are regarded as unphysiological. Direct evidence of the occasional toxic action of therapeutic doses of sodium bicarbonate has recently become available.[1, 2]

[1] C. A. L. Binger, A. B. Hastings and J. M. Neill, *Arch. Intern. Med.*, 1923, xxxi, 45.

[2] Leo L. Hardt and Andrew B. Rivers, *Arch. Intern. Med.*, 1923, xxxi, 171.

The ideal gastric antacid would appear to be a substance which can neutralize hydrochloric acid but cannot make the stomach alkaline and which is excreted, unchanged, in the intestine and not in the urine. Such substances are found in the secondary and tertiary phosphates of calcium and magnesium. They are neutral substances, which dissolve in the hydrochloric acid of the stomach with the formation of the corresponding acid phosphates. An excess cannot quite alkalinize the stomach. The tertiary phosphates, as was shown by the work of Steel and Gies[1] and of Lothrop[2] for bone-ash, which is very nearly pure $Ca_3(PO_4)_2$, and by experiments of the author (see Table I) for $Mg_3(PO_4)_2$, are precipitated in the intestine and eliminated in the stool. Dogs have received bone-ash, in many times the therapeutic dose, for years without apparent ill effect.

TABLE I.

Effect of ingestion of magnesium phosphate on urinary excretion. Subject G., weight 71 kilos; constant diet, including 1000 c.c. milk daily.

N grams.	P grams.	Ca grams.	Mg grams.	
13.50	1.28	0.253	0.121	
11.20	1.00	0.326	0.156	
13.44	1.25	0.264	0.131	5 grams $Mg_3(PO_4)_2$
12.03	1.40	0.159	0.161	$\simeq$ 0.88 gm. Mg)
12.68	1.25	0.182	0.187	with each of 3 meals.

TABLE II.

Neutralizing action of several antacids as determined by adding the amounts shown to 100 c.c. of 0.555 N HCl at 37°, stirring while at 37° for 10 minutes and filtering, if any remained undissolved. The filtrates were used for colorimetric determination of hydrogen ion concentration and for titration with Toepfer's reagent and phenolphthalein as indicators. The results are expressed in c.c. of 0.1 N NaOH required per 100 c.c and as negative logarithms of hydrogen ion concentration.

	$Bi_2(OH)_4CO_3$			"Neutralon"		
Amount grams.	Toepfer.	Phenol-phthalein.	P_H	Toepfer.	Phenol-phthalein.	P_H
0.100	53.0	54.6	1.30	54.3	56.1	1.25
0.200	51.8	52.9	1.30	54.0	56.6	1.25
0.400	50.5	52.2	1.35	51.8	55.9	1.30
1.000	47.2	47.9	1.40	47.2	56.7	1.70
4.000	.....	.....	.....	20.9	53.2	2.00

[1] M. Steel and W. J. Gies, *Amer. Jr. Physiol.*, 1908, xx, 343.

[2] A. P. Lothrop, *Amer. Jr. Physiol.*, 1909, xxiv, 297.

$Ca_3(PO_4)_2$				$Mg_3(PO_4)_2$		
Amount grams.	Toepfer.	Phenol-phthalein.	P_H	Toepfer.	Phenol-phthalein.	P_H
0.100	44.2	55.4	1.30	45.0	50.6	1.40
0.200	36.4	55.2	1.60	35.0	45.5	1.70
0.400	30.5	54.8	1.80	15.4	37.5	2.30
1.000	9.2	52.6	2.60	—9.1	23.5	6.0
4.000	2.3	51.3	3.30	—16.0	6.0	6.7

$NaHCO_3$			
Amount grams	Toepfer	Phenol-phthalein	P_H
0.100	44.8	46.1	1.43
0.200	32.6	35.6	1.51
0.400	7.8	14.8	1.95
1.000	—65.0	—2.9	8.4

$CaCO_3$			
0.100	36.2	37.4	1.45
0.200	16.4	19.0	1.65
0.400	—6.1	0.4	7.0
1.000	—7.6	—0.4	7.0

MgO			
0.100	13.0	14.3	1.9
0.200	—2.4	—0.4	8.0
0.500	—4.3	—2.3	9.1

Calcium phosphate is slightly constipating and magnesium phosphate is slightly laxative. The tendency of the patient to constipation or to diarrhea determines the nature of the compound to be used. The dose required is from one to three grams.

The use of calcium carbonate and of magnesium oxide probably tends to a slight alkanization of the system, the degree depending upon the nature of the diet. As against $CaCO_3$, the use of the phosphate has the added advantage of avoiding belching and as against MgO, of avoiding alkalinization of the stomach, for MgO may produce a reaction as alkaline as P_H 9°.

Bismuth subcarbonate and "neutralon" have comparatively little power to neutralize hydrochloric acid in the concentration found in the stomach. Their therapeutic action probably depends upon other factors.

Calcium and magnesium phosphates have been used by several physicians for from a few months to more than two years, with favorable results in most cases. Some patients do not obtain relief. In these, it is probable that a systemic alkanization,

the liberation of a large quantity of gas or some other effect is required.

I am indebted to Dr. John L. Kantor for his assistance in obtaining clinical material and for his careful observation of the patients. He is preparing a clinical report.

219 (2179)

Factors involved in blood volume regulation.

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That the volume of the blood is not normally constant is shown by distinct diurnal variations in this value as determined by the hemoglobin percentage when the animal (dog) is in complete muscular rest and unanesthetized. Administration of ether is immediately followed by a decrease in the relative blood volume which condition persists not only throughout the period of anesthesia but for some time afterward.

When isotonic saline is injected intraperitoneally the diluting effect on the blood volume is not observed until several hours later. The oral administration of saline dilutes the blood to a greater degree in similar time than similar doses of water. As might be expected, intravenous injection of saline show the most pronounced degree of dilution. Usually, however, the normal relative blood volume is attained after approximately two hours following the intravenous injection (100 c.c. per Rg. body wt.). At this time, when large volumes of fluid are unaccounted for, neither the muscles nor the liver show a detectable increase in fluid-not-blood. Renal activity is not essential for this prompt adjustment of blood volume for the urine volume does not account for the "lost" fluid.