calculation of the molecular weight using our values for the sedimentation and diffusion constants gives a molecular weight for the USG component of about 5000. This low value of the molecular weight fits in with the fact that biologically active material is readily introduced into the skin by electrophoresis.[3]

The low value of the molecular weight suggests that it may belong to a special group of allergenic substances of low molecular weight found in the pollens. The USG component gives a white precipitate with phosphotungstic acid, a Biuret reaction, and a Millon test. It is not coagulated by boiling. There was no precipitate with trichloracetic acid, nitric acid, or sulphosalicylic acid. (The Molisch test was negative.) The USG component is, therefore, not a protein. It is possible that its properties correspond with a very high molecular weight polypeptide or peptone. The solution tested contained 0.24 mg of nitrogen per cc.

The fast moving pigment and the pigment mixtures have not been investigated in detail but skin reactivity has been found in solutions of pigments presumably free of the USG and USD components. Passive transfer experiments are in progress.

Summary. Ultracentrifugal and diffusion studies of the major colorless components of both giant and dwarf ragweed extracts indicate that these major components are of fairly low molecular weight and do not have the ordinary chemical reactions of proteins. The low molecular weight which fits in with the high biological activity is in accord with the ability of these molecules to enter the mucous membranes, produce hay fever, and be transported into the skin by electrophoresis.

11920 P

Effects of Choline, Gelatin and Creatine on Perosis in Chicks.

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A basal diet consisting principally of glucose, casein and yeast was used[1, 2] for the production of choline deficiency in turkeys. The

[3] Abramson, H. A., *Science*, 1938, **87**, 299; Abramson, H. A., *N. Y. State J. Med.*, 1939, **39**, 1611; Abramson, H. A., and Gorin, M. H., *Cold Spring Harbor Symposia*, 1940, in press.

[1] Jukes, T. H., *J. Biol. Chem.*, 1940, **134**, 789.

[2] Jukes, T. H., *J. Nutrition*, 1940, **20**, 445.

deficiency was characterized by perosis and slow growth. It was later found that when such a diet was fed to chicks, perosis did not develop, and little or no increased growth was produced by adding choline to the diet. However, when part of the casein and glucose in the basal diet was replaced by gelatin and gum arabic to supply the "rice factor",[3] perosis was produced. If choline was supplied in addition to the "rice factor," perosis was prevented and growth was greatly stimulated. Thus it appeared that some component of the "rice factor" was necessary for the production of perosis in chicks and also for the growth-promoting effect of choline to be exerted.

Gelatin and gum arabic, supplying the two components of the "rice factor", were then fed separately and in combination, and the effects described above were found to be due to gelatin and not to gum arabic, although gum arabic was necessary for maximum growth. Furthermore, the growth-promoting effect of gelatin was greatly reduced unless choline was present in the diet. The following basal diet was then used to study the relation between gelatin and choline: glucose ("Cerelose"), 53 parts; washed casein, 18; brewers' dried yeast (Anheuser-Busch, Strain G), 6; gum arabic, 5; salt mixture,[4] 5; crude soybean oil, 5; fish oil concentrate (3000-A, 400-D), 0.3. Eight chicks were used in each group. The feathers of the chicks not receiving gelatin were rough and staring. The findings are illustrated in Table I.

The work of Almquist and Mecchi[5] suggested that creatine could replace gelatin. When creatine was added to the above basal diet, the results obtained were similar to those described with gelatin in

TABLE I.
Effects of Gelatin and Choline on Growth and Perosis in Chicks.

Addition to 92 g of basal diet	No. of chicks showing perosis at 21 days	25 days	Gain in g during first 25 days
8 g casein	1*	0	57
" " + 0.1 g choline chloride	0	0	78
" gelatin	7	7	76
" " + 0.02 g choline chloride	4	3	110
" " + 0.04 " " "	4	3	133
" " + 0.07 " " "	1*	0	134
" " + 0.1 " " "	0	0	144

*Mild.

[3] Stokstad, E. L. R., and Manning, P. D. V., *Poul. Sci.*, 1939, **18**, 413; Almquist, H. J., Stokstad, E. L. R., Mecchi, E., and Manning, P. D. V., *J. Biol. Chem.*, 1940, **134**, 213.

[4] Jukes, T. H., PROC. SOC. EXP. BIOL. AND MED., 1939, **42**, 180.

[5] Almquist, H. J., and Mecchi, E., *J. Biol. Chem.*, 1940, **135**, 355.

Table I. Creatine produced perosis, which was prevented when choline was also added. Almquist and Mecchi[5] showed that a dietary deficiency of creatine or its precursors results in muscular dystrophy in chicks. It may be speculated that the tension exerted on the bones by the muscles plays a part in causing the distortion of the bones which characterizes perosis. If the tension is reduced by muscular dystrophy as in creatine deficiency, the tendency towards perosis may be lessened.

Summary. In contrast to turkeys, chicks on a simplified diet, deficient in choline, did not develop perosis unless gelatin or creatine was added. Choline prevented the perosis at a level of 0.1%, but lower levels were only partially effective. A possible explanation for the perosis-producing effect of gelatin or creatine is advanced.

11921

Vago-Insulin and Sympathetico-Adrenal Systems, Their Mutual Relationship. II. Reaction to Cocaine and Bulbocapnine.*

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For over 60 years (Von Anrep[1]) the action of cocaine on the sympathetic nervous system has been known. Several studies (Bömer,[2] Oelkers and Schutze[3]) have shown that in normal animals subcutaneous injection of cocaine produces hyperglycemia. The reactions of bulbocapnine, on the other hand, suggest marked parasympathetic stimulation (Molitor,[4] Kolb and Langworthy[5]) yet here also hyperglycemia is produced in normal animals (Sarno[6]).

In the first paper of this series (Feldman, Cortell and Gellhorn[7]) we have shown that under the influence of anoxia and metrazol both sympathetic and parasympathetic centers are stimulated. It seemed

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1 Von Anrep, B., *Pflug. Arch. ges. Physiol.*, 1880, **21**, 38.

2 Bömer, M., *Arch. exp. Path. Pharmak.*, 1930, **149**, 247.

3 Oelkers, H. A., and Schutze, G., *Klin. Wschr.*, 1938, **17**, 871.

4 Molitor, H., *J. Pharm.*, 1938, **62**, 16.

5 Kolb, L. C., and Langworthy, O. R., *J. Pharm.*, 1938, **63**, 108.

6 Sarno, D., *Bull. Soc. Ital. Biol. Sper.*, 1931, **6**, 714.

7 Feldman, J., Cortell, R., and Gellhorn, E., *Am. J. Physiol.*, 1940, **131**, 281.