in duration, it was evident that these slow waves were summed potentials.

The smooth, rhythmic waves infrequently showed disintegration and reconstruction periods. Figure 2 is illustrative of these transitions, and suggests that the waves are sustained in their various forms when these summing potentials are repeatedly synchronized and combined in their various complex forms according to their own shifting phase relations.

Summary. 1. Rhythmic electrical potentials of from 10 to 180 μv. have been recorded from the isolated olfactory and cerebral lobes of the forebrain of catfish. The "spontaneous" potentials from the 2 different regions differ in form. 2. The smooth wave contours of the central nervous system are apparently complex summed potentials of many smaller oscillations.

8983 C

Higher Resistance of Rats Fed Casein Than Those Fed Vegetable Proteins.

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(Introduced by F. F. Tisdall.)

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Although it has been well established that rats fed a vegetarian diet are inferior to those fed an omnivorous diet both as regards body weight and lactation,[1] little is known as to their relative resistance to infection. Chen and Li[2] found that when rats fed a vegetarian diet made up of wheat, millet, soy bean and peas, and others fed an omnivorous diet of wheat, milk powder and fresh vegetables were infected with hog cholera bacilli I.P., 84% of the former and 42% of the latter died. When pneumococci (Type I) were injected subcutaneously, more of the omnivorous (77%) than of the vegetarians (56%) died, but according to these authors this difference is not great enough to be significant statistically. We thought it of interest to test the resistance of rats fed diets varying only in the types of protein which they contained. The diets were constituted as follows:

[1] Editorial *J. Am. Med. Assn.*, 1935, 105, 488.

[2] Chen, T. T., and Li, C. P., *Chinese J. Physiol.*, 1930, 4, 59.

	Gluten Diet %	Soy Bean Diet %	Casein Diet %
Wheat Gluten	17	—	—
Soy bean flour	—	21	—
Casein	—	—	17
Cornstarch	56.5	53.5	56.5
Crisco	10	9	10
Cod liver oil	2	2	2
Wheat germ	10	10	10
F.R.L.[3] Salt Mixture	4.5	4.5	4.5

All 3 diets contain 13.6 to 13.9% of protein and as the fat content in the soy bean flour was 4% instead of 0.7 to 0.3% as in the other proteins, the fat in the former diet was reduced a little.

Litters of 4-weeks-old rats were divided into lots of 3 and fed the above diets for 4 weeks, when their average weights were, gluten diet 96, soy bean diet 86, and casein diet 123 gm. respectively. We had planned to feed broth cultures of *B. enteritidis*, but the strain had lost its feeding pathogenicity and would not kill when given by mouth. The rats were therefore given intraperitoneal injections of an 18 hours' broth culture of *S. enteritidis*. As shown in Table I, quite a large number of the rats died, and with 3 exceptions all of the deaths occurred within 2 weeks after infection. The dead rats all showed diarrhea, bloody nasal discharge and blood about the eyes, and the organism was always recovered from the heart's blood and identified by agglutination.

In the first experiment, all of the rats were given the same dose, but in the second, they were given doses proportional to their weights, *i. e.*, .007 cc. of a 1 in 50 dilution of the broth culture per gram of body weight (Table I).

TABLE I.

	Dose cc.	Gluten Diet No. of rats	Gluten Diet No. dead	Gluten Diet % alive	Soy Bean Diet No. of rats	Soy Bean Diet No. dead	Soy Bean Diet % alive	Casein Diet No. of rats	Casein Diet No. dead	Casein Diet % alive
Exp. 1	.0066	19	13	31	18	11	39	22	3	86
" 2	prop. to weight	22	17	23	20	17	15	20	7	65

In both the experiments there was no difference between the survival rate of the rats fed the gluten diet and of those fed the soy bean ration. There was, however, a definite difference between the high resistance of the casein-fed rats and the low resistance of those fed either the gluten or soy bean diet. In Exp. 1, the chances are 300 to 1 that the difference is statistically significant[4]; and in Exp. 2, they are 800 to 1.

[3] Hawk, P. B., and Oser, B. L., *Science*, 1931, **74**, 369.

[4] Topley, W. W. C., *An Outline of Immunity*, Arnold, London, 1933, p. 18.

Conclusion. Rats fed a diet containing casein have a considerably higher resistance to enteritidis infections (I.P.) than controls fed either wheat gluten or soy bean flour.

8984 C

A Biochemical Effect of Ether on the Gut.

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Physiological techniques have demonstrated[1] a marked inhibition of the gut during ether anesthesia and for a short time during recovery. In other cases of reduced motility of the gut, as in atonic constipation, complementary regular changes in putrefaction have been noted. Difficulty has been encountered in showing any such regular changes in the excretion of putrefactive bodies in the urine of anesthetized subjects.[2] It was felt that more distinct changes could be noted by examining the fecal material directly.

Bergeim[3] introduced a technique for determining the putrescibility of proteins *in vivo*, which depends essentially on observation of the stronger reduction processes occurring in the gut contents. This test may equally well be used to note changes in putrefaction of a single protein due to physiological factors such as motility of the gut. When so used, it is not subject to certain criticisms[4] of the original method, since the diet is constant. Two of Bergeim's[3] protein diets* were used in the following experiments: casein, a protein of low putrescibility, and egg albumin, which is more highly putrescible. Because of the extended period the rats were fed these diets, 2% of Wesson's[5] salt mixture were added.

Reduction processes in the gut associated with putrefaction[3] may be estimated by noting the per cent reduction of ingested ferric oxide incorporated in the Bergeim diets. Feces containing the Fe^{++}-Fe^{+++} mixture are heated at 100°C. for 10 minutes with dilute HCl, and a

1 Miller, G. H., *J. Pharm. Exp. Therap.*, 1926, **27**, 41.

2 Killian, H., *Narkose zu operativen Zwecken*, Berlin, 1934.

3 Bergeim, O., *J. Biol. Chem.*, 1924, **62**, 45, 49.

4 Hoelzel, F., *J. Biol. Chem.*, 1929, **83**, 331.

* White dextrin, 800 gm.; casein or egg albumin, 200 gm.; granulated agar, 10 gm.; ferric oxide, finely powdered, 10 gm.; salt mixture, 20 gm.

5 Wesson, L. G., *Science*, 1932, **75**, 339.