

Effect of Diet on Anaphylaxis in the White Rat.

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Parker* and Parker¹ reported that they were able to produce anaphylaxis in the white rat, but were unable to explain their success when preceding workers had reported failures.² The following year Wedgewood and Grant³ reported that they were unable to sensitize normal rats to foreign proteins when fed the regular diet, but succeeded when the animals were fed on a diet deficient in vitamin B. These observations were confirmed by Seegal and Khorazo.⁴

In view of the contradictory results obtained we wish at this time to report the results of some investigations planned to learn more about the influence of certain dietary deficiencies on the production of anaphylaxis in the white rat.

Experimental. In their early work Parker and Parker were unable to sensitize young rats weighing 50-75 g, so in the present study we used rats which at the beginning of the experiments were approximately 7 weeks of age and weighed from 130-160 g. Thus at the time the intravenous shocking doses were given the rats were 10 or 11 weeks old. They were placed in cages, 5 in each, and were fed 5 weeks on the diets described in Table I. In each cage there was one control on the same diet which did not receive the sensitizing dose of antigen.

Three sensitizing inoculations of either horse serum or sheep serum[†] were given intraperitoneally with intervals of one week between. Then one or two shocking doses of the specific antigen were injected intravenously in a tail vein one week and 2 weeks after the last intraperitoneal inoculation. In the table the results are given for only the final intravenous inoculation. In the beginning 1 cc of serum was given both for the sensitizing and the shocking

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¹ Parker, J. T., and Parker, F., *J. Med. Research*, 1924, **44**, 263.

² Trommsdorf, R., *Arch. a. d. k. Gendhtsamte*, 1909, **32**, 560; Novy, G. G., and DeKruif, P. H., *J. Infect. Dis.*, 1917, **20**, 776; Longcope, W. T., *J. Exp. Med.*, 1922, **36**, 627.

³ Wedgewood, P. E., and Grant, H. H., *M. Bull. Univ. of Cincinnati*, 1924, **2**, 172.

⁴ Seegal, B. C., and Khorazo, *Arch. Path.*, 1929, **7**, 827.

[†] Sheep serum was used as sensitizing agent in only the first few experiments.

doses, but later the sensitizing and the shocking doses were respectively 1 and 1½% of the body weight of the animal. Thus an animal weighing 180 g would receive 1.8 cc serum as a sensitizing dose, and 2.7 cc as a shocking dose. Male rats were used in all experiments except one, in which 20 female rats were used.

Diets. Since we had shown in 1924 that rats on a bread and water diet can be made sensitive to anaphylactic shock, our basic diet in these experiments was composed of the ingredients contained in bread prepared at that time.

A diet made of bread and water is deficient not only in vitamins, but also in some of the essential amino acids and certain minerals; so in these experiments various food substances were substituted for all or part of the flour in the basic diet to see if they would alter the susceptibility of the rats to sensitization. For this purpose there were added to different diets a yeast preparation containing relatively large amounts of the components of the vitamin B complex; carotene in oil to supply vitamin A; casein, to supply the essential amino acids and certain mineral salts to supply those missing from the white flour.

For conciseness we have condensed the data of the various experiments in Table I. The table shows: first, the components of the diets used; second, the number of rats on each diet; third, the average gain or loss in weight; fourth, the degree of shock; and finally, the average degree of shock. The average degree of shock was determined by combining all the plus (+) marks for the rats on one diet and dividing this total by the number of rats inoculated. No distinction is made between the rats shocked with horse serum and those shocked with sheep serum, as the results were similar.

The table shows that the animals will develop anaphylactic reactions if they are in a fair state of nutrition and not losing weight, and that under these conditions the dietary deficiencies studied are unimportant. Apparently the most important factor in sensitizing rats to foreign proteins is age. When rats 11 to 12 weeks of age and of fair nutrition are used, uniformly successful results were obtained. This may explain the failures of others, as we were unsuccessful in producing shock with rats 7 to 8 weeks old.

Summary. It has been found that the addition to the bread diet of yeast, vitamin A, large amounts of casein, or CaCO₃ and KH₂PO₄, will not appreciably modify the anaphylactic response in white rats. Apparently rats must be at least 10 weeks of age before they can be used successfully for anaphylactic experiments. Rats poorly nourished to the point where they are losing weight cannot be sensitized to anaphylactic shock.