SPECIAL ARTICLES

THE EFFECT OF ADRENAL CORTICAL AND PITUITARY ADRENOTROPIC HORMONES ON TRANSPLANTED LEUKEMIA IN RATS

IT has recently been reported that removal of the adrenals greatly increases the susceptibility of rats to a transplanted lymphatic leukemia.[1] This result suggested that adrenal secretions have some inhibitory action on the development of the disease. The present report is based on preliminary tests of adrenal cortical extracts and of pituitary adrenotropic hormone which stimulates the secretion of the adrenal cortex. The experiments were as follows.

Rats from a highly susceptible strain were inoculated intraperitoneally with leukemic cells and some hours later intramuscular injections of a hormone preparation were started.

Desoxycorticosterone acetate.[2] This preparation in oil was given daily in .1 cc doses to 33 rats inoculated with leukemia and to 41 rats in the same dosage 3 times a week. Approximately 20 per cent. of these animals did not develop leukemia, while the rate of survival in the 70 control rats was 5.7 per cent.

Eschatin, a cortical extract[3] administered in .1 to .2 cc amounts twice a day gave from 20 to 37 per cent. protection against the development of leukemia with the controls showing no survivals.

Adrenal cortex hormones in oil (Upjohn[4]). Various doses of this preparation have been tested on 87 inoculated rats. In 3 groups given .05 cc doses (2 rat units) daily the survival rates were 44.4 per cent., 50 per cent. and 60 per cent., while the survival among the controls was less than 5 per cent. There was definite protection when .075 cc was given daily, but larger or smaller doses did not give so definite a result.

Pituitary adrenotropic hormone.[5] These results varied somewhat with different lots of the material. Among the 67 treated rats, one group showed as high as 75 per cent. survival. Over 40 per cent. of the whole treated group remained free of the disease, which is a definite effect when compared with the 10 per cent. survival among the 68 controls.

The above studies were made entirely with transplanted leukemia and the action of the hormone was to prevent the development of the disease. It would be entirely unjustifiable on the basis of these observations to predict that the adrenal hormone would be of value in treating either the transplanted or the spontaneous disease. The results have a certain scientific interest in presenting further evidence of hormonal control of the lymphoid system.

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[1] J. B. Murphy and E. Sturm, SCIENCE, 98: 568–569, 1943.
[2] Schering Corporation.
[3] Parke, Davis and Company.
[4] The Upjohn Company.
[5] We are indebted to Dr. H. O. Singher, of the Memorial Hospital, New York, for this preparation.

ADEQUACY OF THE ESSENTIAL AMINO ACIDS FOR GROWTH OF THE RAT

IN a recent article, Albanese and Irby[1] have reported that rats lost weight rapidly on a diet which contained as the chief source of nitrogen the ten essential amino acids plus cystine. The relative amounts of amino acids were the same as in casein and were fed in quantity equal approximately to 14 per cent. of the total diet. When double the proportion of amino acids was fed, three out of six animals died and the remaining three ate poorly until they were sacrificed three weeks later. Despite the losses in weight, the animals on the 14 per cent. level amino acid diet maintained a positive nitrogen balance. These writers suggested that "the nutritive inadequacy of the essential amino acid diet may be due in part to toxic effects of unnatural forms of certain amino acids that cannot be utilized."

The above findings are not in agreement with results obtained by the present authors who, incidental to some other work, have regularly observed growth on diets containing the ten essential amino acids as the chief source of nitrogen. Also, Rose,[2] without giving the composition of the diets used or growth curves, states that animals fed a simplified diet containing the active amino acids (11.2 per cent.) "gained in weight just as rapidly as when all the protein components were supplied preformed." In view of the desirability of having the issue clarified, we have repeated and amplified our earlier experiments.

It will be noted that Albanese and Irby supplied the B vitamins in the form of yeast. Since the preformed protein components of yeast might alter the amount of growth, we have supplied all the necessary B vitamins in a pure form.

Young, inbred, Sherman strain albino rats were used in all the studies. The diets consisted of the same amino acid-free base[3] and a nitrogenous mixture which was varied in the following manner:

[1] A. H. Albanese and V. Irby, SCIENCE, 98: 286, 1943.
[2] W. C. Rose, *Physiol. Rev.*, 18: 109, 1938.
[3] Amino acid-free base.

Cod liver oil	2 grams
Corn oil	10 grams
Salt mixture	4 grams
Thiamin hydrochloride	224 micrograms
Riboflavin	400 micrograms
Pyridoxine hydrochloride	243 micrograms
Calcium pantothenate	1.5 milligrams
Nicotinic acid	2.5 milligrams
Choline chloride	134 milligrams
Para-aminobenzoic acid	1.0 milligram

Starch varied to make 100 grams of diet in conjunction with the nitrogenous components.