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Effect of Inositol upon Rat Alopecia.*

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Introduction. Woolley[1] showed that inositol was needed to prevent alopecia in the mouse. Inositol has been reported to give a growth response in the rat by Pavcek and Baum[2] and in the chick by Hegsted *et al.*[3] Engel[4] has shown that inositol in addition to choline was needed by the rat in preventing fatty livers. Climenko and McChesney[5] have reported that inositol was needed for lactation in the rat while Sure[6] has shown that the addition of inositol to a purified diet was detrimental to lactation performance in the rat.

Welch and Wright[7] and Nielsen and Elvehjem[8] have shown that folic acid was needed by the rat for growth when it was fed with some of the sulfonamides.

The above studies were made with rats and mice fed purified diets. While investigating the deficiencies of a natural ration for reproduction in the pig and the rat[9,10] a hair loss was observed in the rat (Fig. 1) which could be cured or prevented by the addition of inositol to the ration.

FIG. 1.
Rat No. 38. Hair loss after 8 weeks on experiment.

Experimental. Pregnant females of Sprague-Dawley breeding were obtained 3-5 days before term. They were put on a basal ration composed of ground yellow corn 75.35, soybean oil meal 17.50, alfalfa meal 5.00, $CaHPO_4$ 1.00, NaCl (iodized) .50, $MnSO_4$ .01, haliver oil 2 drops weekly, and allowed to litter. Three days after the young were born the mother and litter were placed on their experimental rations as indicated below and growth records obtained. The young were weaned when they reached an average weight of 40 g.

Lot 1—Basal only.
Lot 2—Basal + folic acid preparation.
Lot 3—Basal + folic acid preparation + vit. B_6.
Lot 4—Basal + folic acid preparation + vit. B_6 + inositol.
Lot 5—Basal + inositol + vit. B_6.

The folic acid preparation used in these experiments was made according to the method of Hutchings, Bohonos, and Peterson.[11]

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TABLE I.
Growth Performance of Young.

Lot	No. of animals	Ration fed	Avg starting wt	Avg wt at end of 6 wks
1	6	Basal only	36	136
2	3	" + folic acid preparation	44	142
3	5	" + " " " + vit. B_6	38	106
4	5	" + " " " + " " + inositol	38	158
5	4	" + inositol + vit. B_6	40	116

This preparation was added to all the rations in an amount equivalent to 2% of solubilized liver extract. Inositol was fed at .3% of the ration and 60 γ of vitamin B_6 were given *per os* daily to each female. Vitamin B_6 was fed at the rate of 20γ per rat per day for the growth period.

Table I shows the growth performance obtained with these rats. The addition of the folic acid preparation and vitamin B_6 to the basal ration apparently threw the ration out of balance since a loss of hair was observed on the rats in lot III. Since there was no hair loss in the rats in lot IV where inositol was added, this dietary factor was given the rats of lot III to determine what the effect would be on the resumption of hair growth. The data in Table II show that inositol therapy was effective in curing hair loss under these conditions.

TABLE II.
Data on Hair Loss in Lot III.

Rat No.	Days before hair loss appeared	Days before inositol was added	No. of days required for complete furring
35	21	35	27
36	21	35	27
37	21	35	27
34	21	49	23
38	21	56	35

The type of hair loss is shown in Fig. 1. The hair loss starts in the dorsal part of the head and proceeds bilaterally along the sides to the tail region and then downward to the hind legs. With inositol therapy the hair returns inversely to the loss, proceeding from the caudal portions forward (Fig. 2).

In Table I the data for lots III and IV also show that inositol gives a growth response in addition to preventing loss of hair. The results indicate that the folic acid preparation likewise gives a growth response but in order to do so it must have added amounts of inositol and vitamin B_6. These data on growth show that the basal ration was deficient in several factors. The addition of certain factors without certain others seemed to give an imbalance which was detrimental to growth. This may be due to an interaction of the vitamins, to some change in intestinal synthesis, or to other unknown causes.

FIG. 2.
Rat No. 38. 28 days on inositol therapy.

Discussion. Pavcek and Baum[2] were able to cure spectacled eye in the rat by the addition of inositol to their purified diet. Within 3 days after inositol therapy definite signs of hair restoration were evident. Their results agree with this study since hair growth was observed to begin after 2-3 days of inositol therapy.

It would appear that this type of rat alopecia is a strictly inositol deficiency. In these experiments a large amount of inositol was fed and no attempt to purify further or recrystallize the inositol was made and thus the possibility of contaminating substances was not completely eliminated. In view of Woolley's

results with the mouse[1] it would appear that repeated recrystallization of inositol does not materially alter the anti-alopecia properties of inositol.

Summary. In the rat fed a ration of naturally occurring feeds inositol supplementation gave a growth response and it also cured and prevented a widespread loss of hair. When a folic acid preparation, together with inositol and B_6 was fed a better growth rate was obtained than when the folic acid preparation was omitted.

These data clearly show that a natural ration composed of yellow corn, soybean oil meal, $CaHPO_4$, $CaCO_3$, $MnSO_4$, NaCl, and 5% alfalfa hay contains insufficient inositol. folic acid concentrate and B_6 for normal growth and proper hair and fur development in the rat. It would appear that the phytin present in this ration was either inadequate to supply the required inositol or that it was unavailable.

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Heredity and Distribution of the Rh Blood Types.*

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In a preceding paper[1] a theory of 6 allelic genes was proposed to account for the existence of variants within the Rh-positive type of human blood. The present communication is a preliminary report of investigations on the Rh blood types in families, and their distribution in different races, these studies having been carried out in order to test the 6-gene theory.

In Table I is presented, in simplified form, the 8 Rh blood types and their reactions with the 3 sorts of anti-Rh agglutinins, namely, anti-Rh (standard, and agglutinating the bloods of approximately 85% of white individuals), anti-Rh_1 (giving about 70% positive reactions with bloods of white individuals), and anti-Rh_2 (giving about 35% positive reactions). Among white individuals approximately 95% fall into one of the 4 types listed in the left half of the table, while the 4 types in the right half of the table together make up only 5% of the population. For analyzing data, it is sometimes convenient to disregard the reactions of the standard anti-Rh sera, and in that way the two halves of the table are fused, giving rise to 4 classes, comparable serologically and genetically to the 4 blood groups. Obviously, each class consists of 2 distinct Rh types.

In Table II are summarized our findings to date on the heredity of the Rh blood types in 94 families (83 white, 11 negro). It will be seen that among the 274 children there is only a single apparent exception to the theory. In this case (a negro family) the mother was Rh-negative, her husband Rh′, and the child Rh_2. However, it was also found that the supposed father belonged to type N and the child to type M, so that this was evidently an illegitimate child. Of particular interest are the 4 matings Rh-negative $\times$ Rh_1Rh_2 in which there were 8 Rh_1 and 8 Rh_2 children. These findings are entirely comparable to those obtained in the mating O $\times$ AB in studies on the heredity of the Landsteiner blood groups. In addition to the 94 complete families, tests were carried out on mother-child combinations, and among 73 mothers with 123 children, not once were the combinations Rh-negative mother with type Rh_1Rh_2 child or type Rh_1Rh_2 mother with Rh-negative child encountered. The findings will be discussed in greater detail in the full report[2] which will also contain the complete family

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