factor in production of spontaneous hypertension.

Eleven of the 50 normal appearing kidneys were examined microscopically. One of these had a focal glomerulitis and came from a normotensive animal. The other 10 were normal microscopically and were from hypertensive animals.

Calcification of large and medium size arteries was found in the first family of rabbits raised in our colony, but this condition died out the following generation and has only shown up occasionally in other animals. Enlarged hearts have not been found at autopsies. One probable reason is that spontaneous hypertension is a relatively mild labile type of hypertension and, in addition, autopsies have been done in the early part of the animal's life span.

Summary. (1) Two new generations of spontaneously hypertensive rabbits showed about the same incidence of elevated systolic pressures as their progenitors at 6 and 8 months of age, 58 and 71% respectively. At 4 months, mean systolic pressure in the 2 new generations was significantly higher than in their progenitors at same age. (2) Male rabbits of the new generations in all 3 age groups had higher mean systolic values than females and than their male or female progenitors. (3) Direct arterial pressure measurements in a group of spontaneously hypertensive rabbits showed average diastolic pressure to be 10 mm Hg higher and systolic pressure 30 mm Hg higher than in normotensive stock rabbits. (4) Direct arterial recordings from unanesthetized animals demonstrated spontaneously hypertensive rabbits to have larger Traube-Hering waves than normotensives. (5) The presence of interstitial nephritis in normotensive as well as spontaneously hypertensive animals precludes it as an etiological factor in the development of spontaneous hypertension.

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Effects of Corticosterone, Cortisone and Hydrocortisone on Fat Metabolism in the Chick. (22444)

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The influence of glucocorticoids on fat metabolism is well documented in many species(1-5). There are, however, several published reports which indicate that there are some qualitative differences exhibited by these hormones on lipid metabolism(3,6). This is particularly interesting since these steroids are considered to be qualitatively similar to their physiological effects and any differences are primarily quantitative(7).

It was therefore of interest to determine the effects of crystalline adrenal cortical hormones on fat metabolism in the chick. Accordingly, the ability of corticosterone (compound B), cortisone (compound E), and hydrocortisone (compound F) to produce changes in fat deposition in the chick was studied.

Materials and methods. Single-comb white leghorn cockerels were used throughout these

TABLE I. Effects of Compounds B, E and F on Body Weight Gain, Adrenal Weight, and Liver Weight and Lipid Content in the Chick.

No.	Treatment	Body wt gain (g)	Adrenal wt Actual (mg)	Adrenal wt mg %	Liver wt Actual (mg)	Liver wt % body wt	% liver lipids	Liver color
			Exp. 1					
8	Controls	155	60.0	14.1	9.4	2.30	1.90	Red
9	1.5 mg cortisone	133	53.1	13.2	9.9	2.58	2.11	"
10	1.5 corticosterone	58	44.8	14.0	15.9	5.01	17.40	Yellow
8	1 hydrocortisone	36	39.1	13.7	17.1	5.79	19.96	"
			Exp. 2					
10	Controls	111			10.2	2.40	2.31	Red
10	10 mg cortisone*	30			7.9	2.30	2.60	"

* Acetate.

experiments and allowed to eat (Vitality chick grower) and drink (tap water) *ad libitum* during the course of treatment. The animals were 28 days of age at the beginning of the experiment. On the day of the first injection all birds were leg-banded, weighed and placed into groups of equal average body weight. The steroids used were suspended in a vehicle consisting of 0.5% carboxymethyl cellulose, 0.4% Tween 80, 1.5% benzyl alcohol and 0.9% sodium chloride. All injections were made subcutaneously in the volume of 0.2 cc once a day for 10 days. Animals were sacrificed approximately 24 hours following the last injection. At autopsy the body, adrenal and liver weights were determined. The livers were frozen immediately after removal and stored in a deepfreeze until fat determinations could be made. The fat content was determined by the method of Horwitz(8). Two livers from each group were fixed in 10% neutral formalin for histochemical studies on fat content. Frozen sections were stained with Sudan 4 and Harris' hematoxylin in order to determine the distribution and quantity of fat present. The birds were also examined grossly for changes in distribution of body fat.

Results. The effects of cortisone, corticosterone and hydrocortisone on body growth, adrenal weight and liver weight and liver fat content are shown in Table I. It is seen from these data that corticosterone at 1.5 mg per day and hydrocortisone at 1 mg per day produced a marked increase in liver weights and liver fat content. Cortisone, however, did not influence the weight or fat content of the liver at a dosage as high as 10 mg per day (Exp. 2).

It was also observed that compounds B and F caused considerable subcutaneous fat deposition and an increase in fat around the viscera. The most obvious foci of increased fat deposition was around the auricles of the heart, in the cloacal region, the strip of fat along the sternum, and the fat depot of the neck area. In contrast to these effects, cortisone produced no noticeable changes in fat deposition at either dosage level used.

The body growth of the B (1.5 mg) and F (1.0 mg) treated animals was considerably inhibited, whereas in the cortisone treated birds body growth was suppressed only slightly at 1.5 mg per day while at 10 mg per day there was a considerable inhibition of body weight. The adrenal weights, as related to body weights, were not inhibited by any of the treatments, whereas the actual adrenal weights, if not corrected for change in body weight, were decreased in the steroid treated animals.

Frozen liver sections stained with Sudan 4 confirmed the results obtained by extraction of liver fat. In general these slides showed essentially no sudanophilic material in the livers of the control or cortisone treated animals, whereas the livers of the F and B treated birds possess large quantities of sudanophilic substances. It is noteworthy that the fat was accumulated around the blood vessels in the B and F treated animals and that there was no apparent degeneration of the liver cells.

Discussion. The results reported in this

paper extend and confirm those reported by Stamler(3) who recently found that hydrocortisone but not cortisone influenced lipid metabolism in the chick. Stamler did not mention, however, whether or not there was any increase in carcass, visceral or liver fat in the hydrocortisone treated animals. The fact that hydrocortisone and corticosterone produced considerable fat deposition in the liver and on the carcass and viscera, while cortisone did not affect fat deposition, was somewhat surprising. In the mammal, compounds E and F are qualitatively alike as to their effects on fat metabolism. It has been reported that both E and F produce lipemia in the rabbit(9) and an increase in total body fat and lipemia in the human(10). The results reported here, therefore, show that a striking species difference exists between the mammal and the bird as to the activities of compounds B, E, and F on fat metabolism.

The catabolic effect of the glucocorticoids as shown by negative nitrogen balance and inhibition of body growth is well known(7). The relative effectiveness of these three steroids on protein metabolism in mammals in descending order of potency is as follows: hydrocortisone, cortisone, and corticosterone(7). It is noteworthy that in the chick hydrocortisone and corticosterone are considerably more effective in inhibiting body growth than cortisone. The fact that cortisone inhibited body growth at the higher dose indicates that its failure to induce changes in fat distribution was not due to a complete lack of physiological effects. The fact that hydrocortisone inhibited body growth as well as producing changes in fat metabolism while cortisone only inhibited growth suggests that a qualitative difference exists between these two hormones in their effects on fat metabolism in the chick.

The evidence that hydrocortisone, corticosterone and cortisone did not influence the relative adrenal weights of the chick is of interest and in agreement with earlier reports(3,11). In the rat these 3 compounds inhibit the pituitary-adrenal axis as indicated by a decrease in adrenal weight(7). The reason for this apparent functional discrepancy in the pituitary-adrenal axis between birds and mammals is not clear at this time but it has been suggested by earlier workers(11,12) that the bird adrenal may exhibit some activity independent of the pituitary.

Summary. (1) Hydrocortisone and corticosterone caused an increase in liver, visceral and carcass fat in the chick while cortisone was without effect. (2) The relative effectiveness of these 3 steroids on body growth inhibition in the growing chick is in the following order: hydrocortisone, corticosterone and cortisone. (3) None of these 3 hormones caused an inhibition of relative adrenal weights.

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