

## The Endocrines Development of Ducks

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**D**EVELOPMENTAL, breed and sex differences were studied in the weights of duck endocrines. Pituitary highest relative weights were observed in the young ages. The Sudani ducks had the heaviest Pituitaries between the breeds studied. Also, thyroid relative weight was high in the young ages which suggests the positive relationship of these two glands along with the thymus, with the rapid growth at the young ages. This is due to that the thymus showed similar trend. However, the adrenals although showing large percentages in the young ducks, yet their relative weights were high in the adults. No noticeable breed differences were observed in the three last endocrines except with respect to high relative Rouen's thymus. Sexes were of almost the same endocrine size except that of the thyroid percentage and-or activity which was greater in ducks than in drakes.

Although avian endocrinology is the most advanced branch of Poultry physiology, yet little is known with respect to the developmental changes in the endocrines of ducks. The higher secretory activity in drakes compared with ducks is suggested to be the cause of the heavier body weight of males than females (Feber, 1955). However, there are no appreciable differences in pituitary weight of males and females of Pekin duck at ten weeks of age (Faber, 1957). Species differences are observed in thyroid weight, as the thyroid weight of ducks was greater in relation to body weight than that in chicken and turkeys (Biellier and Turner, 1950). No sex differences in thyroid gland was observed in ducks at least up to four months of age (Oakberg, 1951). There were no breed differences in the adrenals of ducks up to the twelfth week of age (Oakberg, 1951).

### Material and Method

Five males and five females at hatch and at 1, 2, 3, 4, 5, 6, 9 and 12 months of age of Pekin ducks and five females and five males of 12 months old Rouen and Sudani (Native ducks) were available. They were reared, managed alike and fed on a balanced ration. To eliminate the effect of season, these ducks were hatched at one month interval and at the end of the year all the ages were available. One individual from both sexes from each age group was examined every three days. The one day old ducklings were all slaughtered at the same day. The endocrines were freed from the adjacent ligaments and tissues and weighed directly on appropriate balance. Weights of glands relative to body weight were calculated and the data analyzed for F test.

### Results and Discussion

#### *Age differences*

*Pituitary* : Pituitary **absolute weight** increased steadily until the sixth months of age, Subsequently no appreciable changes occurred onwards (Table 1). At hatch the highest relative weight of the pituitary was observed. A gradual decrease occurred at the subsequent ages until the fourth month of age, then almost constant values were observed. Age differences were highly significant in pituitary relative weight (Table 2). It seems that the anterior pituitary attains its maximum activity at the early ages. Also, it coordinates with the period of rapid body growth as it secretes the growth promoting hormones. However, the pituitary continues its normal function in stimulating the gonad's growth afterwards. It seems that the pituitary exerts its action on gonads at earlier ages before sexual maturity although it has a relatively small size at the time of sexual maturity attainment. Sex differences in pituitary relative weight were not significant (Table 2).

*Thyroid* : The thyroid increased steadily in absolute weight until nine months of age, then it decreased slightly on the twelfth month of age (Table 1). However, the relative weight of the thyroid was very high at the early ages during the period of rapid growth, then decreased steadily until it showed a slight increase on the ninth month. It seems that the thyroid plays an important role in the early active growing period. Age differences were highly significant in thyroid relative weights while sex differences were not significant (Table 2).

*Adrenal* : The adrenal gland increased steadily in weight as age advanced, except for a slight reduction observed on the twelfth month of age (Table 1). The highest relative weight of the adrenals was at hatching then decreased gradually until the fourth month of age, after which no appreciable changes occurred. The increased size and probably the activity in adrenals during the early stages of life may be due to that the rapid growth of the body during this period requires a corresponding high activity in this gland. It seems that the later increase in the proportional weight of the adrenal is associated with the increase in gonads size after the attainment of sexual maturity as the adrenal secretion of androgen like effects. Age difference were highly significant, while sex had no effect on the proportional weight of the adrenal (Table 2).

*Thymus* : The thymus gland increased in absolute weight until the sixth month of age after which an obvious depression was observed. The highest relative weight was that at hatch, then almost constant and low values were observed until the fifth month from hatching. Afterwards, a gradual decrease occurred till the end of the experiment. In general, the thymus reaches its maximum relative weight in the young chick, while it diminishes in size with the advancement of age until in the adult fowl only

vestiges of it remain (Sturkie, 1954). It seems that thymus gland is concerned with growth rate as feeding fresh calf thymus to chicks increased their growth rate (Ross *et al.*, 1955). Age difference in thymus relative weight were highly significant, while sex differences were not significant (Table 2).

TABLE 1. Average absolute and relative weights of the endocrines at different ages (Weight in mg).

Items	Age in months	Males		Females	
		Wt.	Rel. wt.	Wt.	Rel.wt.
Pituitary . . . . .	At hatch	2	5.1	3	7.8
	1	4	2.1	6	1.9
	2	6	1.3	9	1.9
	3	8	0.8	9	0.8
	4	8	0.5	9	0.6
	5	13	0.6	10	0.6
	6	14	0.6	13	0.6
	9	13	0.5	11	0.5
	12	13	0.6	14	0.7
	Thyroid . . . . .	At hatch	14	35.9	9
1		20	10.3	30	9.7
2		29	6.1	36	7.7
3		56	5.1	83	7.3
4		88	5.1	89	5.7
5		120	5.7	84	4.6
6		151	6.3	157	7.5
9		263	11.0	229	19.7
12		157	7.8	146	7.5
Adrenal . . . . .		At hatch	15	38.2	15
	1	73	37.7	93	30.1
	2	111	23.2	100	21.5
	3	242	24.1	164	14.5
	4	188	10.8	162	10.3
	5	255	12.0	149	8.2
	6	272	11.3	216	10.3
	9	308	12.8	306	14.2
	12	248	12.4	231	11.9
	Thymus . . . . .	At hatch	80	205	72
1		132	68	189	61
2		230	48	310	67
3		1110	100	1360	120
4		1840	106	2200	140
5		2850	134	3700	205
6		1700	71	4190	200
9		485	20	426	20
12		462	23	386	20

TABLE 2. Analysis of variance for the effect of age and sex on the relative weight of endocrines.

Item	Source of	d.f.	Mean square	F value
Pituitary . . . . .	Age . . . . .	8	4361	72.13**
	Sex . . . . .	1	173	2.86
	Interaction . .	8	56	0.93
Thyroid . . . . .	Age . . . . .	8	627	36.76**
	Sex . . . . .	1	14	0.82
	Interaction . .	8	36	2.10*
Adrenal . . . . .	Age . . . . .	8	11	37.00**
	Sex . . . . .	1	2	4.87*
	Interactoin . .	8	0.37	0.93
Thymus . . . . .	Age . . . . .	8	391	7.45**
	Sex . . . . .	1	72	1.37
	Interaction	8	78	1.48

\*\* Highly significant

\* Significant.

*Breed differences*

The pituitary absolute and relative weights of the Sudani breed were higher than the Pekin and Rouens (Table 3), and the differences were significant. Different sexes had similar pituitaries. The average absolute and relative thyroid weights were almost the same for the three breeds. The females exceeded relatively the males in thyroid absolute and relative weights. The adrenal weight of Pekin was heavier than the others. However, the relative adrenals weight was the highest for the Rouen. The adrenals size is larger in the light birds than in the heavy ones, which was also found in chickens (Kamar and Mostageer, 1960). Breed differences in adrenal percentage were highly significant, while sex differences were not. The absolute and relative weights of thymus gland of the Rouen were higher than the others (Table 3) and the differences were significant, while sex differences were not.

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TABLE 3. Average absolute and relative weights in endocrines of different breeds and sexes.

Items	Sex	Pekin		Rouen		Sudani	
		Wt.	Rel. Wt.	Wt.	Rel. Wt.	Wt.	Rel. Wt.
Pituitary (1) . . .	Male . . .	13	0.6	12	0.8	25	1.0
	Female . .	14	0.7	13	1.0	29	1.8
Thyroid (2). . . .	Male . . .	157	7.8	90	6.0	136	5.7
	Female . .	146	7.5	115	9.1	132	8.1
Adrenal (3). . . .	Male . . .	248	12.4	221	14.8	240	10.0
	Female . .	231	11.9	181	14.3	160	9.8
Thymus (4). . . .	Male . . .	462	23.0	830	56.0	570	24.0
	Female . .	386	20.0	480	38.0	540	33.0

F value : (1) Between breeds = 4.59\*\* Between sexes = 0.85  
 (2) Between breeds = 1.10 Between sexes = 7.52\*  
 (3) Between breeds = 6.43\*\* Between sexes = 0.07  
 (4) Between breeds = 4.59\* Between sexes = 0.85

References

Biellier, H.V. and C.W. Turner (1950) The thyroxine secretion rate of growing white Pekin ducks. *Poultry Sci.* **29**, 150.  
 Faber, H.V. (1955). Extreme sex dimorphism in the growth of the Muscovy duck, *Cairina moschata* Flem. The endocrine organs. *Compenhagen* **20**, 391.  
 Faber, H.V. (1957) Comparative endocrinological investigations on the domestic duck. *Compenhagen* **20**, 135  
 Kamar, G.A.R. and A. Mostageer (1960) Hybridization effects on the gonads and endocrines of cockerels. *Poultry Sci.*, **39**, 950.  
 Oakberg, E.E. (1951) Genetic differences in quantitative histology of the adrenal organ weights and interorgan correlation in White Leghorn chickens. *Growth* **15**, 57.  
 Ross, E.G., H. Strite and H. Yacowitz (1955) Studies on chick growth factors in calf thymus *Poultry Sci.* **34**, 1219.  
 Sturkie, P.D. (1954) "Avian Physiology", Comstock Pull. Ass. Ithaca, N.Y.

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## نمو الغدد الصماء في البط

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درس تباين النوع والجنس في أوزان الغدد الصماء للبط . ولوحظ أن الغدة النخامية قد أعطت أعلى وزن نسبي في الأعمار المبكرة . وكانت أوزان الغدة النخامية للبط السوداني أثقل من الأنواع الأخرى . كذلك كان وزن الغدة الدرقيّة في الأعمار المبكرة عاليا مما يقترح معه أن هناك علاقة موجبة بين هاتين الغدتين وبين الغدة التيموسية حيث أنها قد أعطت نتيجة مشابهة . ومع ذلك فإن الغدة فوق الكلية قد أعطت وزنا أعلى نسبيا في الأعمار الناضجة رغم أنها قد أعطت وزنا نسبيا عاليا في البط النامي . ولم تعط الأنواع المدروسة فروقا معنوية في أوزان الغدد الأخيرة إلا في حالة الوزن النسبي العالى للغدة التيموسية لنوع الروان . كما كان تأثير الجنس معدوما على أوزان الغدد السابقة إلا في حالة الغدة الدرقيّة حيث كان وزنها النسبي أو نشاطها أعلى في حالة الذكور عنها في حالة الإناث .

ورغم أن علم الغدد الصماء للطيور هو أكثر فروع علوم فسيولوجى الدواجن ، إلا أن ما يعرف عن متغيرات النمو للغدد الصماء في البط يعتبر قليلا حتى الآن . إذ يعتبر زيادة النشاط الإفرازى لغدد الذكور عن الإناث يمكن أن يكون السبب في زيادة وزن هذه الذكور عن الإناث (Feber, 1955) ومع ذلك فإنه لا يوجد اختلاف جوهري في وزن الغدة النخامية بين الذكور والإناث في عمر 10 أسابيع (Feber, 1957) كما لوحظ تباين بين أصناف الطيور وبعضها في وزن الدرقيّة حيث كان وزن هذه الغدة في البط أعلى نسبيا إلى وزن الجسم عنها في حالة الدجاج والرومي - (Biellair and Turner, 1950) - ولم يكن هناك أى تأثير معنوى للجنس على الغدة الدرقيّة للبط على الأقل حتى نهاية الشهر الرابع من العمر (Oakberg, 1951) كما لم يوجد أى تأثير معنوى للنوع على وزن الغدة فوق الكلية للبط حتى الشهر الثانى عشر من العمر. (Oakberg, 1951).