R.B.C. counts approaching 3,000,000. Coincidentally with the change in his blood picture, the patient was subjectively and objectively improved.

Verification of these results in additional and more suitable pernicious anemia patients with lower blood findings will be attempted as soon as they are available. Arrangements have also been made for trial of the extract in two clinical laboratories. The preliminary data presented, however, suggest that the anti-pernicious anemia principle is present in normal human urine, apparently in sufficient amounts to warrant consideration of the latter as a commercial source for the principle.

8198 C

Absence of Follicle-Stimulating Hormone in Pituitaries of Young Pigeons.

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Earlier studies of Riddle^{1, 2} showed that in young pigeons and doves the growth rate of testes is very low during a period of several weeks after hatching; and that during this period of slow testis growth a very rapid body growth is almost completed. Reckoning age from the beginning of embryonic development the curves obtained for testis growth² showed that in common pigeons the testes begin a marked increase in growth rate at 2.3 months (1.7 mo. after hatching); in ring doves this spurt in testis growth occurs at about 3.0 months (2.5 months after hatching). The slow growth of testes during the period of rapid body growth was interpreted as evidence that dove and pigeon pituitaries-unlike those of mammals-do not release the gonad-stimulating hormone until the more advanced ages mentioned above; also that the more advanced age at which the testes begin their spurt of growth probably coincides with the initiation of F.S.H. secretion in the bird's pituitary. This interpretation seems to be further supported by the unmatched sensitivity of the immature dove testis to true follicle-stimulating hormone (F.S.H.) administered to these birds. In other words, the great sensitivity of

¹ Riddle, O., Am. J. Physiol., 1928, 86, 248.

² Riddle, O., Endocrinology, 1931, 15, 307.

these immature testes suggests that they have not previously been subjected even to traces of F.S.H. derived from their own pituitaries. Direct tests, by the implant method, for the presence or absence of F.S.H. in the pituitaries of immature and mature pigeons were needed to settle this question and such tests are reported here.

Immature male ring doves, aged 2.2 to 2.7 mo., with average body weight of 156 gm., were used as hosts for the implants. The weight of untreated testes of these dove hosts, at the age at which they were sacrificed, can be known to be approximately the same as the average testis weight obtained for a series of control birds of exactly the same age and race; in our dove races the individual deviations from such an average weight only slightly exceed one-half of the average value. The donor pituitaries were obtained from the much larger common pigeons, immature birds in some tests, mature birds in others. In 2 tests, made for an interesting comparison, the donors were either immature or young adult white rats. All results are given in Table I.

It will be noted that one rat pituitary per day for 10 days, or for 9 days, produced significant testis growth, 100% and 300%, respectively. Also one adult pigeon pituitary, from males or from females, for only 5 days gave increases of 100% and 200%; the data suggest a greater potency of the female pituitary. On a 10-day basis-with a relatively much greater response expected from prolonged dosage-an increase of 800% was obtained from one adult female pigeon (or from 2 adult ring doves) pituitary implanted daily. In the 2 tests of immature pigeon pituitaries, these donors having almost attained adult body size, the resulting testis size in the recipient is within or almost within the variable limits of normal unstimulated testis size. Both, however, are near the upper limit and it is entirely probable that one or more of the older of the 60 donors for these 2 tests had already made their first beginnings of F.S.H. secretion. The data obtained on the gonad weights of certain of these donors confirm this suspicion. In order to obtain 60 immature donors slightly above 1.8 months old, it was necessary to use 4 such donors of border-line age (2.5-2.6 mo.) among the group of 30 supplying implants for dove No. VII, and the gonad weights of 2 of these 4 donors indicate some F.S.H stimulation from their own pituitaries (i. e., their gonads had started their spurt of growth); among the group of 30 donors for No. VIII there were 7 birds of this border-line age, and the gonad weights of 4 of these indicate that they had already entered into their period of rapid growth. Despite the presence of these few slightly older donors

pt Those		sight	Actually	found	(mg.)	17.3	27.4	15.9	21.4	60.2	66.2	9.2	13.6	of this	olactin in and (No.		
TABLE I. anted with Pituitaries from Rats and Pigeons; F.S.H. Detectable (Increased Testis Weight) in All Implants Exce from Immature Pigeons.		Testis we	crop-gland Expected if	ntreated	(mg.)	8.4	8.2	7.8	7.4	6.8	7.4	7.0	8.2	e experience	ssence of pro ed a crop-gli	נו גר גר גר גר גר	
		Recipient -		weight 1	(mg.)	450	335	290*	270	365	395	390	455*	the extensiv	the present of the pr	es also yield	
		Total	pituitary	weights	(mg.)	22.5	40.0	21.0	23.4	34.6	128.4	122.0	108.9	In view of	strong eviden rat pituitari		
		Total	$\mathbf{bod}\mathbf{y}$	weight	(kilos)	0.53	1.19	2.33	2.17	3.44	13.15	11.22	10.82	implanted.	ken as very s 10 immature		re pigeon.
					nd condition	29-44 days	60-110 V	đ, mature	ę', ',	"		L.8-2.5 mo.	1.8-2.6 mo.	n crop-gland size parallel with number of pituitaries ulated crop-gland weights this parallelism may be ta geon-including that of the immature pigeon. The	elism may be ta	re pigeon. The stimulation.	ad of one mat
					Kind a	Rats, A.		Pigeons,		"	"				this parall	e prolactin s	re ⁻ used inste
		SS SC	Days No. of	pituitaries	implanted	10	6	5	5	17†	30	30	30		-gland weights	indicate some	ing doves we
		cipient dove		implants	given	10	6	5 L	ວ	10	10	10	10		appearance	s 2 mature	
		Data on re-		Age	(mo.)	2.7	2.5	2.4	2.3	2.2	2.5	2.3	2.5	un increase i	with unstim	weight and	ch of 7 day
Doves Impl.					No.	I	II	III	ΔI	Δ	١٨	LIΛ	VIII	* Note 5	laboratory	I), whose v	t On ea

1612

(whose gonads were just beginning to show an accelerated rate of growth) both of the values obtained from hosts given a group of 30 implants are such as to show that F.S.H. is not detectable in the pituitaries of 30 common pigeons aged 1.8 to 2.3 months. By the same method of testing—and despite the relatively slighter effect of short-term dosage—F.S.H. is detectable in fewer than 5 implants of adult pituitaries.

The small total amounts of immature rat pituitary tissue which were found effective may be compared in Table I with the large amounts of immature pigeon pituitary tissue which were ineffective. Total body weights are also given for all groups of donors. Of the 60 immature pigeon pituitaries transplanted 31 were from males and 29 were from females.

The results obtained from implants of pigeon pituitaries thus confirms the conclusion earlier drawn from curves describing testis growth in common pigeons; the similar conclusion drawn from the growth curve of the dove testis therefore receives indirect experimental support. This experimental evidence is important in current studies of the anterior pituitary. Until or unless 2 available kinds of evidence are overthrown it must be granted that doves and pigeons of a defined stage of immaturity are "without a pituitary" in so far as the F.S.H. is concerned. In these birds no pituitary hormone or extract now known may be expected either to decrease or to increase an output of F.S.H. from pituitary cells which have not yet started their production of F.S.H. Incidentally this latter circumstance provides the probable explanation of the inability of some Prolan, P.U. and A.P.L. preparations to affect the immature bird testis. By using these intact animals-and avoiding hypophysectomy with its heavy assault upon the whole organism-one can yet study the action of all A.P. hormones in the absence of endogenous follicle-stimulating hormone.

Summary. The testes of immature ring doves are measurably stimulated by implants of 1 immature (29-44 days) rat pituitary daily for 10 days; one adult common pigeon pituitary daily for 10 days gives much greater stimulation; stimulation can be obtained from fewer than 5 adult pigeon pituitaries; 30 pituitaries of immature but nearly full grown pigeons (1.8 to 2.3 months from beginning development) implanted in groups of 3 daily for 10 days give no detectable stimulation. These results confirm an earlier indication from growth rate of testes in these birds: Pigeons less than 2.3 months old (1.8 months after hatching) and ring doves of less than 3.0 months (2.5 months after hatching) are to be considered as animals in which the production of F.S.H. has not yet been initiated. When anterior pituitary hormones, or extracts of this tissue, are injected into these birds it must be granted that their action is obtained on an intact organism free from follicle-stimulating hormone, and that the injected material serves neither to reduce nor to induce an output of F.S.H. from the bird's own pituitary.

8199 C

Effects of Complete and Incomplete Hypophysectomy on Basal Metabolism of Pigeons.*

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The use of pigeons in the assay of anterior pituitary hormones makes it desirable to measure and record the effect of hypophysectomy upon the basal heat production of these animals. Earlier data for the dog, recently reviewed by Houssay,¹ indicate an average decrease of 16% as a result of this operation; in the rat -35% is reported by Foster and Smith,² and -26 by Collip.³ The present measurements were made at 2 environmental temperatures-one series being done at the critical temperature for the pigeon (30°C.), the other at 20°C. The data obtained show that the percentage change in B.M.R. following complete hypophysectomy in the pigeon is much influenced by the environmental temperature at which the measurements (pre- and post-operative) are made. Measured at 30° such pigeons show a 33% decrease; at 20° the decrease is only half that amount, or 17%. That these differences are not chance and spurious resultants of few measurements made on variable material is further attested by much unpublished data dealing with the capacity of individual anterior lobe hormones to affect the B.M.R. of hypophysectomized pigeons at these 2 temperatures.

Adult pigeons of various races were used. At 10-20 days after operation the completely hypophysectomized pigeons had lost about 25% of their previous body weight. The post-operative metabolism measurements were made 10-20 days after the operation, in a mul-

^{*} Aided by a grant from the Carnegie Corporation of New York.

¹ Houssay, B. A., Endocrinology, 1934, 18, 409.

² Foster, G. L., and Smith, P. E., J. A. M. A., 1926, 87, 2151.

³ Collip, J. B., J. Mt. Sinai Hosp., 1934, 1, 28.