Prolactin in the Cowbird's Pituitary in Relation to Avian Brood Parasitism

THE European cuckoo provides a familiar example of complete brood parasitism, that is, failure to build nests, coupled with the habit of laying eggs in the nest of other birds which generally take over incubation and hatching of the foreign eggs. This habit is also shown by the North American brown-headed cowbird (*Molothrus ater*) as well as other species. Birds showing brood parasitism do not develop brood patches. Bailey[1] has shown that brood patch development in passerines requires the action of an œstrogen and of prolactin. Prolactin can also induce broodiness in pigeons and poultry.

It has therefore occurred to me, and independently to others, that failure to produce prolactin might be a basic factor in the development of brood parasitism. Hence a comparison of the prolactin content of the pituitaries of female cowbirds in breeding condition, with that of pituitaries of breeding females of the closely related red-winged blackbird (*Agelaius phoeniceus*) which has normal breeding habits, was made. Birds of both species were shot in the field and their heads were frozen within a few minutes of death by placing them in a vacuum flask containing dry ice. On return to the laboratory the heads were kept at $-20°$ C. in a deep-freeze refrigerator. The bodies of the birds were dissected for examination of the ovaries and oviducts. The pituitaries were then dissected out and implanted on the external surface of one side of the crop sac of anæsthetized homing pigeons. After 5 days the pigeons were killed and the implanted crop sac area, as well as a control section from the opposite side of the sac were removed. Stretched-out pieces of crop sac were first examined macroscopically for evidence of epithelial proliferation and then fixed in 10 per cent formol saline. Paraffin sections were made and stained with hæmatoxylon eosin and with Giemsa. The results obtained are shown in Table 1.

Table 1. EPITHELIAL PROLIFERATION OF PIGEON CROP SACS PRODUCED BY 5-DAY IMPLANTS OF PITUITARIES OF FEMALE RED-WINGED BLACKBIRDS AND FEMALE BROWN-HEADED COWBIRDS

Red-winged Blackbirds				Cowbirds			
Exp. No.	Implant	Epithelial proliferation		Exp. No.	Implant	Epithelial proliferation	
		Macroscopic	Microscopic			Macroscopic	Microscopic
R.W. 1	8 pituitaries (June 8)	+	1 1/2	*C.B.* 1	12 pituitaries (June 5, 9, 12)	–	1/2
	Control : muscle	–	–		Control : no implant	–	–
R.W. 2	10 pituitaries (June 9, 11)	+	2	*C.B.* 2	12 pituitaries (June 14, 16)	–	–
	Control : no implant	–	–		Control : muscle	–	–
R.W. 3	9 pituitaries (June 11, 16, 18)	–	–	*C.B.* 3	14 pituitaries (June 16, 18)	+	2
	Control : no implant	–	–		Control : no implant	–	–
R.W. 4	14 pituitaries (June 29, July 2)	–	1/2	*C.B.* 4	15 pituitaries (June 29, July 2)	–	1/2
	Control : muscle	–	1/2		Control : liver	–	–

Dates in brackets indicate dates of collection of the birds used. Local crop sac response to total dose of 4 μgm. prolactin, 15 units/mgm. injected intradermally daily for four days rated as: macroscopic: + ; microscopic: –.

Table 2. DATA ON THE OVARIES AND OVIDUCTS OF RED-WINGED BLACKBIRDS AND COWBIRDS, PITUITARIES OF WHICH WERE USED FOR THE EXPERIMENTS SHOWN IN TABLE 1

Red-winged Blackbirds				Cowbirds			
Exp. No.	No. with eggs in oviduct	Diam. of largest ovarian follicle, mean and range (mm.)	Oviducts	Exp. No.	No. with eggs in oviduct	Diam. of largest Ovarian follicle, mean and range (mm.)	Oviducts
R.W. 1	—	3·9, 1·5–10	All large	*C.B.* 1	7/12	7·3, 2–10	All large
R.W. 2	—	2·7, 1–8	All large	*C.B.* 2	3/12	7·0, 3–8	All large
R.W. 3	1	2·7, 1–8	All large	*C.B.* 3	8/14	5·5, 2–8	All large
R.W. 4	—	1·3, ·5–3	Small in 7/14	*C.B.* 4	4/15	3·8, 1–8	All large

All the red-winged blackbirds had well-developed brood patches; data on the ovaries and oviducts of all birds used are given in Table 2.

These results demonstrate the presence of prolactin in the pituitaries of ovulating cowbirds. Moreover, judging from the number of pituitaries of the two species needed for a definite crop sac response, the prolactin content of cowbirds and red-winged blackbirds pituitaries is fairly similar. It may be noted that the two species are of fairly similar body-weight; averages for three females of each species were, red-winged blackbirds 47 gm. and cowbirds 43 gm. The above experiments suggest that failure to respond to prolactin rather than lack of prolactin production is involved in the failure of female cowbirds to form brood patches. Dr. R. K. Selander, University of Texas, has informed me of some unpublished findings which confirm this view; he found that cowbirds of either sex treated with œstrogen and prolactin did not develope brood patches.

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[1] Bailey, R. E., *Condor*, **54**, 121 (1952).

Captive Marine Birds Possessing a Functional Lateral Nasal Gland (Salt Gland)

DURING July, 1959, several species of marine birds were examined at the San Diego Zoo in California to determine whether they possess a functional lateral nasal gland (salt gland). This study was prompted by the observation that captive gulls may die unless given salt water to drink[1] and by the practice of many