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Corticosterone Secretion Induced by Histamine in the "Dabb" *Uromastix aegyptia*

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The secretion rate of corticosterone, the major hormone of the adrenal cortex of the "dabb" (the spiny tailed lizard *Uromastix aegyptia)* was found to be 5.4 ∓1.8 ng/kg/min in intact controls. This is published for the first time in the literature.

Exogenously administered histamine into the systemic circulation of the hypophysectomized "dabb" resulted in a small (but significant) increase in the rate of secretion of corticosterone, compared to the markedly elevated rate in intact normal controls. This finding is postulated to be due to a direct effect of histamine on the adrenal cortex as the plasma ionic concentrations were unaltered.

Dogs and rabbits among laboratory mammals have to cope with their life in captivity and its many stresses. These are reflected by the functional activity of the adrenal cortex, usually with increased hormonal output (Sa'di 1977).

Recent observations have shown that histamine has a direct stimulatory effect on this gland in laboratory mammals (Hirose 1977; Hirose *et al.* 1977; Hirose *et al.* 1978). Histamine is a hormone well known to be secreted locally by injured (*i.e.* stressed) tissues (Turner and Bagnara, 1976).

Such observations raised the following question:

Is the response of the adrenal cortex in the Laboratory mammal to histamine also found in wild animals, and possibly of other classes, like reptiles?

The present work was undertaken to investigate this question using the spiny tailed "dabb", which is a wild species in the desert around Riyadh to represent wild life.

Materials and Methods

A. *Animals*

"Dabbs" weighing 350-1270 g were collected from the desert around Riyad. Animals that were not used immediately upon arrival at the University were kept in the yard in an open shaded area (7x5 m), surrounded by a 1 m high mesh fence and left for one week to acclimatize before use. They were provided with alfalfa, but no water, as they do not drink.

B. *Experimental Groups*

Only male "dabbs" were included in this study.

I. Intact Control "dabbs": n = 9

These were untreated animals used immediately upon arrival at the University.

II. Sham-hypophysectomized "dabbs", n = 9

The procedure for hypophysectomy was performed but their pituitaries were not removed. They were left for 7 days before histamine injections.

III. Hypophysectomized "dabbs": n = 9

Animals were hypophysectomized 7 days before histamine injections.

C. *Surgical Procedures*

a) Hypophysectomy was accomplished parapharyngeally under ether anaesthesia (Sa'di 1977).

b) *Blood Collection*

The left carotid artery and the left inferior vena cava (chosen because it drains the adrenal circulation) were cannulated cephalic to the renal vein, following the procedure for aortic and vena cava cannulation, under pentobarbital anaesthesia, described by Popovic and Popovic (1960). Since the "dabb" was "open up", it was here when the female animals were discarded, and only male "dabbs" were included.

c) Histamine dihydrochloride (0.1 mg/kg) in 0.9% NaCl was injected using a 5 ml hypodermic syringe into a cannula inserted into the carotid artery. Ten and twenty min later venous blood was collected.

d) ACTH (0.1 *i.u.*/kg) was injected as in (c) above.

D. *Analytical Procedures*

a) Heparinized venous blood was centrifuged and plasma was deep frozen for further treatment.

b) Corticosterone was measured fluormetrically (Hirose 1977).

c) Na^+ and K^+ were analyzed using an EEL flame photometer and Cl^- estimated by a chloride meter.

Results

Corticosterone secretion rates of the various groups of the "dabbs" are given in Table (1).

Table 1. Effects of Histamine and ACTH on the secretion rates of Corticosterone (ng/kg/min) by the left adrenal glands of the "Dabb" *Uromastix aegyptia* **(Means ± S.E.M.)**

	Intact "dabbs" (n = 9)	Sham-hypophysectomized "dabbs" (n = 9)	Hypophysectomized "dabbs" (n = 9)
Before injection	5.4± 1.8	4.9± 0.9	1.2± 0.8
10 min after histamine injection	49± 8	40± 7	25± 3
20 min after histamine injection	73± 6	63± 9	21± 4
10 min after start of ACTH injection	118± 13	175± 8	147± 24
20 min after start of ACTH injection	106± 6	198± 10	125± 26

Table 2. Concentrations of Na^+, K^+ and Cl^- ions before and after Histamine injection in meq/l.

Ions measured	Concentration before Histamine injection	Concentration after Histamine injection
Na^+	147± 3.7	148± 2
K^+	4.1± 0.3	4.7± 1
Cl^-	105± 3	103± 2

There is a significant increase of the rate of corticosterone secretion in response to histamine ($P < 0.01$) and ACTH ($P < 0.001$) in all the groups.

The plasma concentrations of the ions measured did not reveal any changes in the levels before and after histamine injection ($p > 0.5$) in normal "dabbs" (Table 2).

Hypophysectomy did not lead to any significant changes (different from the already reported values) in the observed plasma levels of these ions compared with the normal controls.

Discussion

In the "dabb", the secretion rate of corticosterone, which is the major hormone of the adrenal cortex of lizards (Chester Jones and Henderson 1978) was found to be 5.4± 1.8 ng/kg/min in the intact control animal. This is reported for the first time in this species in the literature. It is comparable to corticosterone secretion rates observed in other lizards (Callard and Callard 1978).

Hypophysectomy of the "dabb" not only led to a marked decrease in corticos-

terone secretion, but also it impaired the secretion of this corticoid in response to histamine stimulation. This is in keeping with the findings of Aikawa *et al.* (1979) in the dog. But compared to the intact dog, where the response was an increase of about 17 times, the increase in the intact "dabb" due to histamine was about 9 times (from 5.4 to 49). This means that the extent of the response of the adrenal to histamine in the "dabb" is less than that of the dog. This difference between the wild "dabb" and the laboratory dog is seen in sham treatment and in hypophysectomy as well.

The interactions between histamine and the adrenal cortex point out to a direct stimulatory effect of the former on the latter in *U. aegyptia.* This agrees with the findings of Aikawa *et al.* (1979) who perfused histamine into the adrenal artery and observed an immediate rise of adrenocorticoid secretion in hypophysectomized-nephrectomized dogs, (with the influences of the pituitary and the renin-angiotensin system removed).

Also, the fact that there were no changes in the plasma ionic levels after histamine injection supports the postulation of a direct effect.

Thus the present work proves that even in wild animals histamine does have a direct stimulatory effect on adrenocortical tissue.

The significance of this finding becomes clear when we remember that it is a well-known fact that histamine is produced by all traumatized cells. Putting the pieces together, one is inclined to reflect that histamine, by inducing the adrenal cortex to secrete its corticosteroids (which prepare the body for any emergency) serves an essential role in emergencies.

In the "dabb", the reason for having a lesser response of the adrenal cortex to histamine, is thought to be emanating from the way of life of this animal. It is not as "advanced" in its life as mammals and therefore does not face the challenges faced by the latter and thus does not really need to over-react to stressful stimuli associated with increased histamine (and hence corticosteroid) production.

This, I think, explains why the response in the "dabb" is not as pronounced as it was found in other mammals.

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زيادة إفراز هرمون الكورتيكوستيرون فى الضب نتيجة حقنه بمادة الهستامين

ميسرة نصوح السعدى

قسم علم الحيوان ، كلية العلوم ، جامعة الرياض ، الرياض ، المملكة العربية السعودية ٠

ينشر فى هذا البحث لأول مرة نسبة سرعة إفراز هرمون الكورتيكوستيرون من غدة قشر الكظر لدى الضب والتى وجدت تساوى ٥,٤±١,٨ نانوجرام فى الكيلوجرام من الوزن فى الدقيقة ٠

وقد وجد أن حقن مادة الهستامين يؤدى إلى زيادة إفراز هذا الهرمون فى الضب الطبيعى والضب الذى استؤصلت غدته النخاميه ٠ ويعتقد أن هناك علاقة مباشرة بين الهستامين وإفراز قشر الكظر لإعداد الضب لمواجهة أية مضايقات فى المعيشة ٠