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HISTOCHEMICAL SITE AND PATTERN OF DISTRIBUTION OF MONOAMINE OXIDASE ' SUCCINIC DEHYDROGENASE, AND α-GLYCEROPHOSPHATE DEHYDROGENASE IN THE ADRENAL CORTEX AND MEDULLA OF THE FLYING FOX – *PTEROPUS GIGNATEUS* GIGANTEUS BRUNNICH (MEGACHIROPTERA: MAMMALIA)

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Adrenal gland of the flying fox – *Pteropus giganteus giganteus* Brunnich showed a zonated cortex and medulla. Histochemical profile of monoamine oxidase (MAOO, succinic dehydrogenase (SDH), and α-glycero-phosphate dehydrogenase - α-GPDH) displayed positive and uniformly intense reactions in zona – glomerulosa; – fasciculata, and – reticularis; as well as in the medulla. Intense MAO activity was observed in the medullary cells as well as in the steroid secreting cells of the cortical zones. This in-built enzymatic system for degradtion of catecholamines suggests its significant role in adrenal gland physiology. α-GPDH and SDH-activities in the various histological constituents of the adrenal gland showed positive and uniformly intense reaction. This indicates the importance of these enzymes in release of lipids for subsequent glycolysis (α-GDPH); and in sustained turnover of energy by oxidative pathways (SDH).
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The rich repertoire of diverse enzyme mechanisms in the bat adrenal indicates the occurrence of intricate metabolic pathyways which assist in steroidogenesis, degradation of catecholamines and in maintenances of normal basal metabolic rate that facilitates participation of this endocrine gland in the various regulatory and co-ordinating processes.

INTRODUCTION

The adrenal gland of the flying fox – *Pteropus giganteus giganteus* is distinctly zonated into cortex and medulla. The former serves as the site of synthesis and elaboration of wide array of steroids and consists of zona-glo-merulosa, – fasciculate, and – reticularis. The medullary cells are not further regionated and secrete catecholamine [1-3]. This structural organisation of adrenal differs markedly from other bats which lack zona reticularis in their cortex [4-5]. Although *Tachyglossus aculeatus* [6] is the lone mammalian species in which a distinct cortex and medulla is not present, the general histoarchitecture of adrenal gland of *Pteropus giganteus giganteus,* is basically similar to other mammals.

A variety of hydrolases, oxidases and hydydrogenases have been histochemically mapped in the cortical and medullary regions of mammalian adrenal gland under various physiological states and experimental conditions[7]. However, very little is known about the adrenal gland enzymology of bats [4,5,8]. The present studies were undertaken to histochemically map the site and pattern of distribution of monoamine oxidase (MAO), succinic dehydrogenase (SDH), and α-glycerophosphate dehydrogenase (α-GPDH) in the adrenal cortex and medulla of *Pteropus giganteus giganteus.*

METERIAL AND METHODS

Adult males of *P. g. giganteus* were trapped/shot from their roosting sites on mango and guava trees. They were sacrificed by cervical dislocation. Adrenal glands were surgically removed under semi-sterile conditions; freed off of blood clot and adjacent fascia; and washed several times with chilled; deionised water (at 4°C).

Fresh, cryo-cut sections (10μM) *of adrenal gland were* processed according to the method of Gleener *et al.*[9] for MAO; Nachlas *et al*[10] procedures for SDH; and Hess *et al*[11] technique for α-GPDH. Appropriate controls were run simultaneously. Enzyme activity was visually scored in the zona-glomerulosa, – fasciculata, – reticularis; and in the adrenal medullary cells as described earlier[1-2]. Integerated tables were prepared to summarise the various

Text of Illustrations

Histochemical site and pattern of distribution of MAO, SDH and α-GPDH in the adrenal gland of *p. g. giganteus*

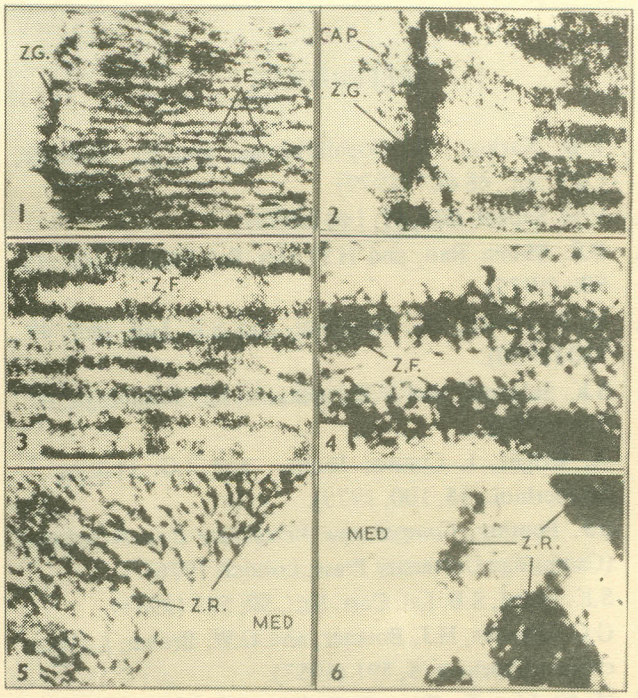

Plate I (Figs. 1-6) MAO activity in the cortical zones and medullary cels.

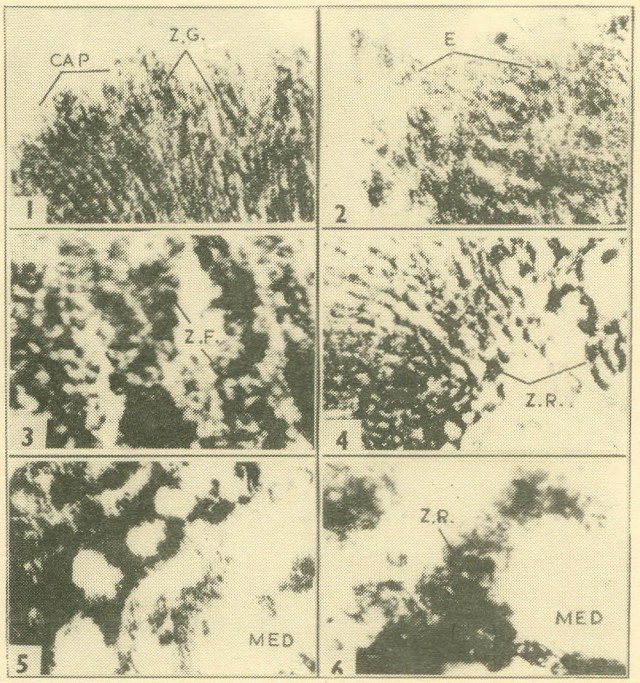

Plate II (Figs. 1-6) SDH profile in zona – glomerulosa, – fasciculata, – reticularis, and medullary cells.

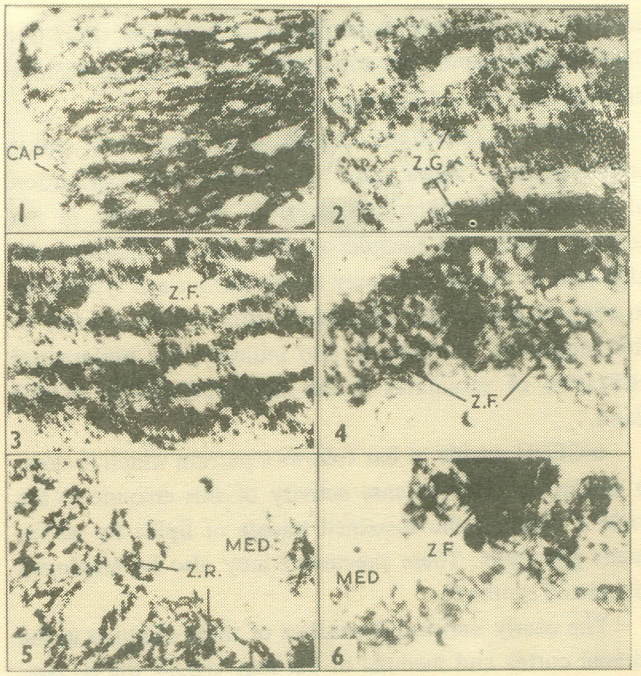

Plate III (Figs. 1-6) α-GPDH patterns in the cortical layers and medulla.

Legend: Cap = Capsule; 2G = Zona glomerulosa; E = Enzyme activity; 2F = Zona fasciculata; 2R = Zona reticularis; MED = Medullary cells.

observations.

RESULTS AND DISCUSSION

Positive and intense staining for MAO, SDH and α-GPDH activity was discerned in the zona-glomerulosa, – fasciculata, – reticularis and medullary cells of the adrenal gland of *p. g. giganteus*. Thus, MAO activity (Plate 1: Figs. 1-6) was richly present not only in the medullary cells but in all cortical zones. Coalesced granules of enzyme activity were observed in the granulosa, fasciculata and glomerulus. SDH staining (Pate II: Fig. 1-6) was uniformly intense and was observed in the form of discrete diformazon granules. Medullary cells displayed weak SDH reaction. α-GPDH profile (Plate III: Figs. 1-6) showed a pattern which was quite similar to SDH. The only difference between the two enzymes was that α-GPDH reaction in the medulla was comparatively stronger than SDH.

The abundant occurrence of MAO , SDH and α-GPDH in the adrenal cortex and medulla of *p. g. giganteus* clearly shows the rich and divrse repertoire of enzyme mechanisms that operate in this organ facilitating degradation of catecholamines, energising of steroidogenic pathways, and in releasing precursors. MAO activity in particular may

account for not only maintaiing catecholamine titers but may also be responsible for servig as deterent against the deleterious action of these stress hormones.

SHD is an important enzyme of the Kreb cycle and is employed as a "finger print" for the site and distribution of mitochondria. Intense activity of this enzyme in the adrenal cortex and medulla of bat clearly manifests the high rate of energy turn over in the various cell types so as to support the various sub-steps in the intricate process of steroidogenesis. Further, it also indicates the preferential utilization of succinates in the metabolic activity of this gland.

α-GPDH profile in bat follows a pattern which is closely similar to SDH. Intense activity of this enzyme in the corte x signifies the sustained release of lipids for subsequent glycolysis. These precursors amy also be employed for steroid synthesis.

The nearly uniform intensities of these enzymes in the adrenal cortex and medulla of bat may signify the (i) considerable utility of MAO, SDH, and α-GPDH in adrenal gland metabolism, (ii) the role of these biocatalysts in releasing chemicals, energy turn overs, that facilitated several regulatory and coordinating functions which are hormone dependent.

No tangible comparison of these findings are feasible with other chiropterans in view of absence of information.

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