

**A HAEMATOLOGICAL STUDY IN
RELATION TO ENDOCRINE
DISORDERS IN RATS
AND RABBITS**

THESIS

Presented by

Ebtihag Hassan El-Sayed Ahmed

M.B., B.Ch ; M. Med. Sc.

For the Degree of

Ph.D. (Basic Medical Science)

in

Histology

Under the supervision of

Prof. Dr.

Abdel Latif Saleh

Professor of Histology

Histology Department

Faculty of Medicine

Ain Shams University

1983

TO MY FAMILY
WITH SPECIAL REGARDS TO
MY "MOTHER " AND MY " HUSBAND "



ACKNOWLEDGEMENT

I would like to express my deep gratitude and unlimited appreciation to Professor Dr. A.M. SALEH for suggesting and supervising this work. But for his comments, challenges and continuous everlasting encouragement, the work would have never been presented in this magnitude.

I am also greatly indebted to Dr. S.M.A. TAWAB and Dr. M.E.A. BADAUWY for their sincere help.

I am deeply grateful to all my colleagues and the members of Histology Department staff for their co-operation.

C O N T E N T S

	<u>Page</u>
INTRODUCTION AND AIM OF THE WORK -----	1
REVIEW OF LITERATURE-----	2
* Haematological review -----	2
* The pituitary gland-----	20
* The thyroid gland-----	25
* The suprarenal gland-----	31
MATERIALS AND METHODS-----	43
RESULTS-----	67
A. Haematological results -----	67
* In Rabbits -----	67
* In rats -----	104
B. Histological results -----	153
* The thyroid gland-----	153
* The suprarenal gland-----	174
* The pituitary gland-----	194
DISCUSSION-----	199
A. Haematological study-----	199
B. Histological study -----	217
* The thyroid gland-----	217
* The suprarenal gland-----	224
* The pituitary gland-----	230
CONCLUSION-----	231
SUMMARY-----	233
REFERENCES-----	236
ARABIC SUMMAAY	

TABLES AND FIGURES

	<u>Page</u>
* Tables 1-7 and Fig.(1-A)-(10-A)-----	136
* Fig. (1-B) - (29-B) -----	158
* Fig.(1-C)-(22-C) -----	180
* Fig.(1-D)-(5-D)-----	196

7

INTRODUCTION AND AIM OF THE WORK

١٥

INTRODUCTION AND AIM OF THE WORK

The aim of the present work was to carry out a haematological study in relation to endocrine disorders in rats and rabbits. The blood picture was studied in normal animals and in animals after injection of adrenocorticotrophic hormone (ACTH), hydrocortisone acetate or L-epinephrine hydrochloride in order to find out the haemopoietic effect of these hormones. Also to give an idea about the mechanism of action of these hormones as well as the interrelations between the hormones used in this study.

Many of the available references dealt with the physiological and biochemical mechanisms of action of these hormones. Histological changes by hormonal injection could be correlated with the physiological and biochemical changes produced by these hormones. The effects of injections of ACTH, hydrocortisone acetate and L-epinephrine hydrochloride on the histological picture of the pituitary, the thyroid and the suprarenal glands were also studied to find out the relationship between the actions of the injected hormones.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

1. HAEMATOLOGICAL CHANGES FOLLOWING THE ADMINISTRATION OF ACTH, CORTISONE OR L-EPINEPHRINE :

Haematological changes following the subcutaneous injection of epinephrine were first described by Loeper and Crouzon (1903).

Harvey (1906) observed leucocytosis of varying degrees after the parenteral administration of epinephrine.

Bertelli et al., (1910) demonstrated eosinopenia after 11- and 17- oxysteroids administration in physiological doses.

Benda (1930) used the blood response to epinephrine as a diagnostic test in various haematological disorders and used the test as a measure for bone marrow function.

Corey and Britton (1932) found a decrease in the total leucocytic counts with a pronounced reduction of the neutrophils and an increase of the lymphocytes in adrenalectomized cats. The count returned to normal after the administration of adrenocortical extract or hydrocortisone in such cats.

Lucia et al., (1937) observed an initial eosinophilia occurring half to one hour after epinephrine injection to be followed by an eosinopenia four hours after injection.

Lucia et al., (1937) in another study demonstrated pancytosis following the subcutaneous injection of epinephrine in normal subjects and in splenectomized patients.

Davis and Della (1942) found no significant erythrocytic response to epinephrine administration.

Dougherty et al., (1943) and Reinhardt et al., (1944) found an increase in the circulating neutrophils and a decrease in the circulating lymphocytes after the administration of ACTH in rats.

Dougherty and White (1944) found that a single injection of ACTH or adrenal cortical steroids induced a transitory increase in the red cells count, followed by its decrease to lower than pretreatment levels after twenty four hours.

De et al., (1946) reported the occurrence of granulocytosis with lymphopenia and eosinopenia in patients with Cushing's syndrome.

Dougherty et al., (1946) observed tissue lympholysis in rats after ACTH injection.

Dougherty and White (1947) concluded that the rate of lymphocyte dissolution in the peripheral blood and in the lymphoid tissue was influenced by the degree of adrenocortical activity.

Dougherty et al., (1948) presented evidences that the gonads, thyroid gland, adrenal cortex and pituitary gland had a definite influence on blood formation. They observed a mild polycythaemia in patients of Cushing's syndrome. Deficiency of anterior pituitary secretion produced anaemia of the microcytic hypochromic type with bone marrow hypoplasia in man and animals.

Godlowski (1948) demonstrated marked eosinopenia in eleven allergic and eosinophilic subjects after adrenaline infusions.

Hills et al., (1948) were the first to demonstrate eosinopenia following glucocorticoid or corticotrophic hormone administration in man.

Valentine et al., (1948) demonstrated degenerative changes in the lymphoid organs in rabbits and mice following ACTH injection.

Villassenor et al., (1948) observed lymphocytosis, neutropenia together with normocytic normochromic anaemia in one hundred patients with Addison's disease. Oxysteroid administration to these patients induced neutrophilia and lymphopenia.

Gabrilove et al., (1949) studied the effects of parenteral administration of epinephrine on the leucocytic counts in normal subjects and in patients with Addison's disease. They observed leucocytosis in both, after epinephrine injection.

Herbert and Vries (1949) observed eosinopenia and lymphopenia after the administration of large doses of ACTH.

Hume (1949) produced in dogs hypothalamic lesions, which prevented any fall of eosinophils following the administration of 1 mg epinephrine subcutaneously. Hence, he suggested the possible existence of a chemical mediator for the epinephrine-induced pituitary activation.

Speirs and Meyer (1949) observed eosinopenia in normal mice and not in adrenalectomized mice after epinephrine injection.

Antopol (1950) demonstrated lymphopenia in the peripheral blood of mice following the injection of massive doses of cortisone.

Recant et al., (1950) found that ACTH injection failed to produce eosinopenia in adrenalectomized rats but produced

eosinopenia in adrenal demedullated rats. Injection of epinephrine produced eosinopenia as that of ACTH, but it did not produce a marked rise in the urinary 17-ketosteroids or 11-oxysteroids.

White et al., (1950) injected thirty seven normal subjects subcutaneously with varying doses of 0.25 to 0.5 mg epinephrine. They found that the changes in the leucocytic count produced by epinephrine were similar but not identical with those produced by ACTH injection.

Durgin and Meyer (1951) observed a marked increase in the younger stages of eosinophilic leucocytes in the bone marrow after adrenocortical extract administration, indicating an active production of new cells by the bone marrow.

Godlowski (1951) carried out experiments in man and dogs to elucidate the fate of eosinophils in hormonally induced eosinopenia. They suggested a direct eosinolysis which took place in the blood in hormonally induced eosinopenia.

Gordon et al., (1951) found a significant decrease in the percentage of bone marrow neutrophil granulocytes with an increase in their maturity after chronic administration of cortisone in adrenalectomized rats.

Kellgren and Janus (1951) stated that the eosinopenic response test to 50 mg oral cortisone, added to ACTH eosinopenic response test provided an indication of the state of pituitary adrenal activity.

Quittner et al., (1951) demonstrated no inhibitory effect of massive doses of cortisone on the bone marrow of mice. They observed no change in haemoglobin concentration following cortisone treatment.

Spain and Thalhimer (1951) found that the spleen contained a significant increase in the number of eosinophils eight hours after injection of cortisone acetate in albino mice.

Stein et al., (1951) observed that cortical extract in doses which produced similar or greater decrease in eosinophils of intact mice to epinephrine, did not produce an extreme degree of neutrophilia as epinephrine. They demonstrated marked neutrophilia after epinephrine injection in splenectomized mice. They observed a higher percentage of neutrophilic to eosinophilic cells in the bone marrow of mice after epinephrine injection than that after adrenocortical extract injection. Hence, they suggested a direct effect of epinephrine on the bone marrow.