PULMONARY EOSINOPHILIA

THESIS

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AHMED M. EL-SAWY
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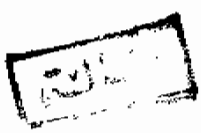

SUPERVISED BY

PROF DR
MOHAMED MONIR EL-MOHAIRY
(M. R. C. P, PHD F. R. C. P.)

PROF DR
MOHAMED DIAA ELDIN SOLIMAN
(M. D.)

FACULTY OF MEDICINE
AIN SHAMS UNIVERSITY
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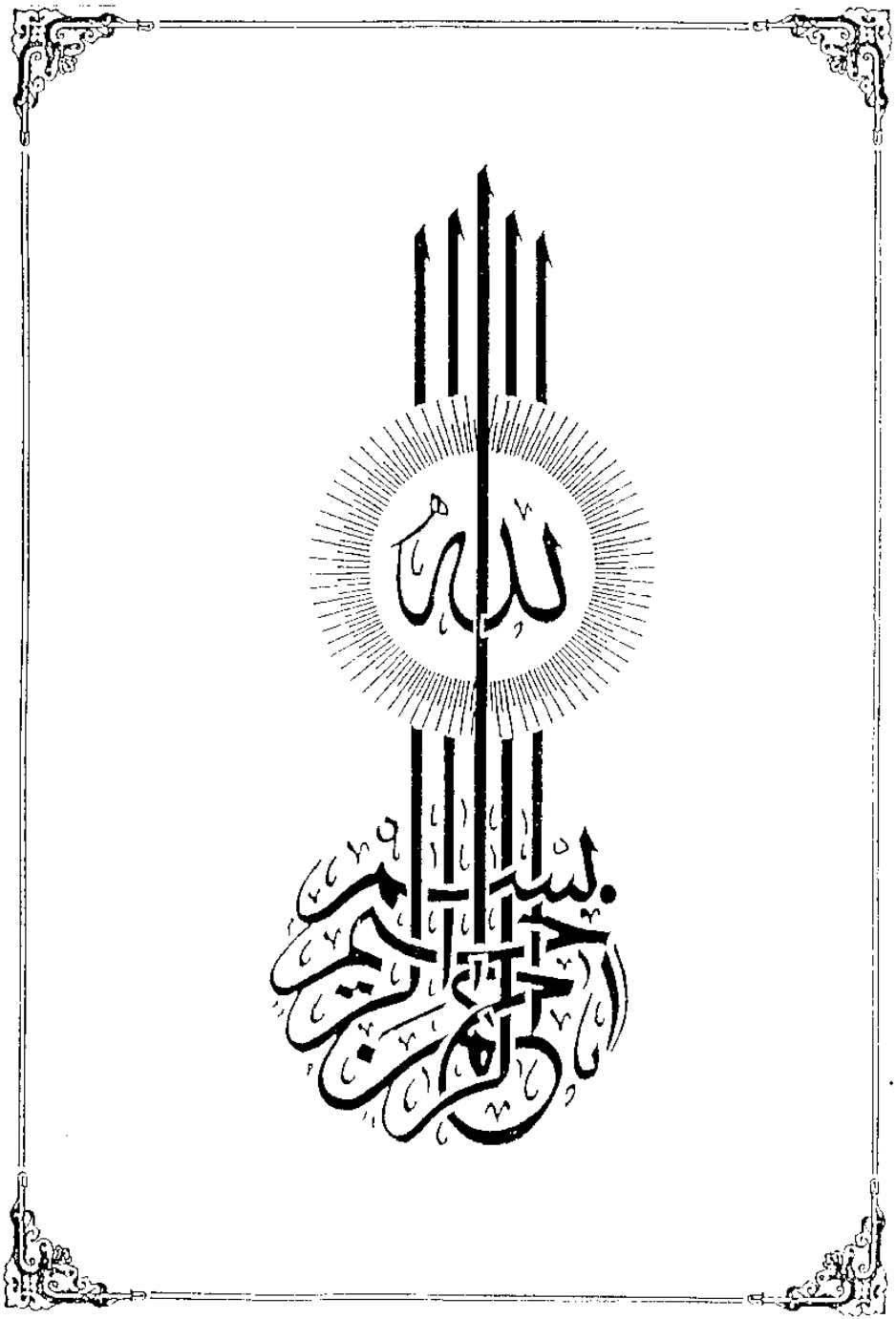

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INTRODUCTION

Pulmonary eosinophilia is a disease have multieotiological factor varies between drugs such as nitrofurantion, PAS, isoniazid, pencillin etc. Parasites such as Ascaris toxocara schistosoma and Microfilaria which are associated with tropical pulmonary eosinophilia polyarteritis nodosa which in addition to increasing number of eosinophils other organs may involved, and fungi in particular Aspergillus fumigatus. These conditions are associated with appearance of pulmonary shadows on the X-ray as will as pathological changes in the lung and other organs. Treatment of these conditions is varies from case to other and the aetiology should be known to give the specific remedy which is arsenicals compound and Diethylcarbamazine in tropical eosinophilia, anti helminths in parasetic in infection, corticosteroids in Aspergillosis while withdrawing the offending drug in others.

The aim of this study is to review recent developments in the aetiology pathogesis, prognosis and treatment.

The Eosinophil Leucocyte

Morphology: (Fig.I)

A meeting held at Brook Lodge last year in celebration of the 100th anniversary of Paul Ehrlich's description of eosinophil, revealed a recent upsurge of interest in the functional properties of this cell (Anthony et al 1981 sameter 1980).

Eosinophil is polymorphous in shape and has maximal diameter of 10 to 15 u, the nucleus of mature human eosinophils is bilobed (average 2-3 lobes) (Gross 1962). Under electron microscopic studies mature circulating eosinophil contain few cytoplasmic organelles, they have more mitochondria, endoplasmic reticulum and Golgi lamellae (Morris et al 1975).

Granules: human eosinophil contain about 200 granules per cell and these are oval with long diameters of 0.9 to 1.3 u (Gross 1962 and Morris et al 1975).

In the mature circulating human eosinophil one type of granule predominates and its developmental stages in the marraw have been well characterized morphologically. These granules are unit membrane-bound vacules with an electron-dense, osmophilic crystalloid core surrounded by a less dense homogeneous matrix (Hardin et al 1970 and Morris et al 1975). Electron microscopically the core is a lamellate structure with repeating units every 40Å, and biochemically it is composed primarily of basic protein

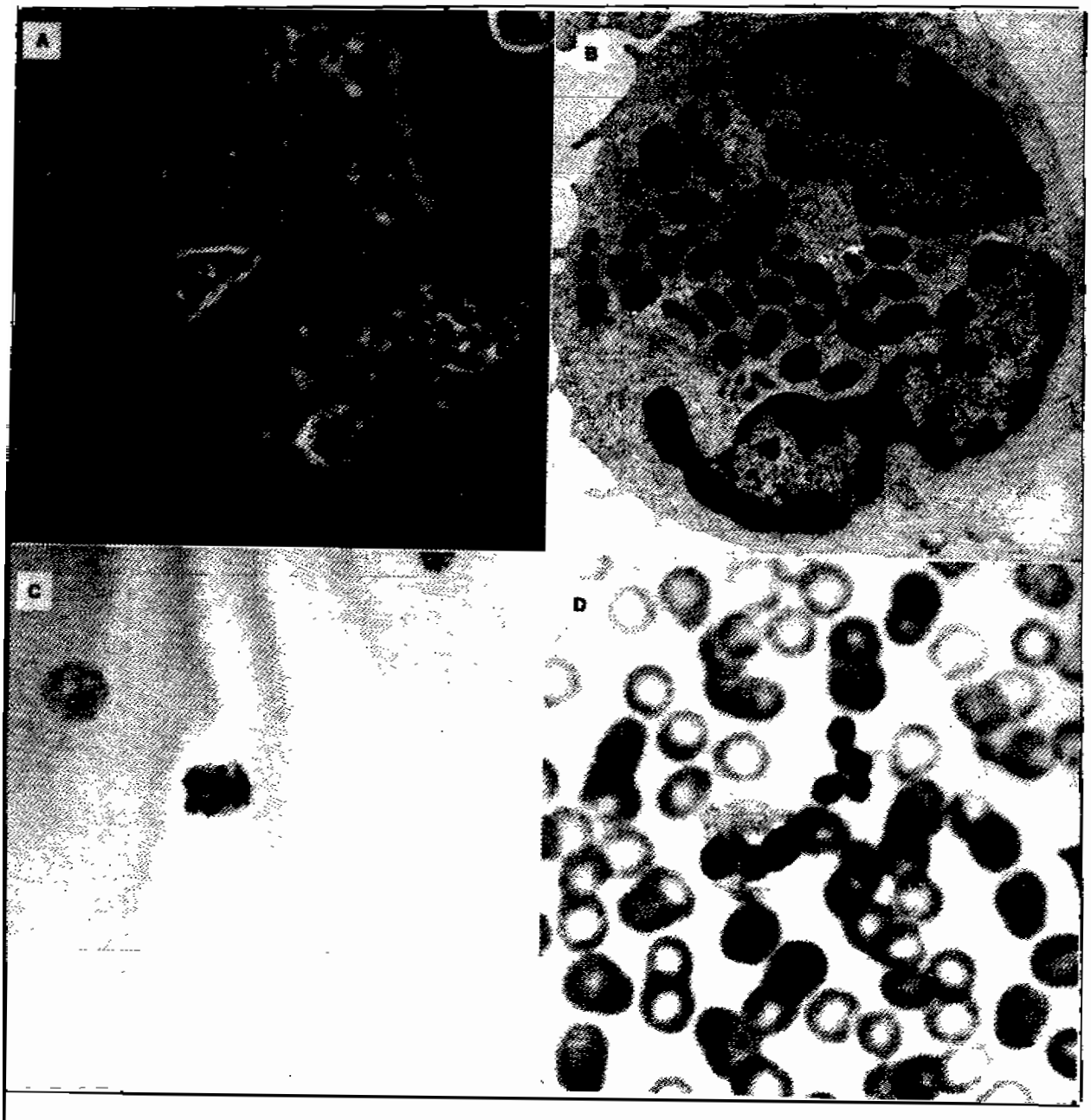


Fig . I : Different pictures of eosinophil .
A- Motile eosinophil-extending pseudopod phase optics .
B- Electron micrograph of human eosinophil with its characteristic granules compared to dense crystalline core and less dense homogenous matrix .
C- Darkly stained eosinophils can be distinguished from lightly stained neutrophil .
D- Reddish granules distinguishing eosinophil from neutrophil .
(Elliot . et al . I978) .

(Miller et al 1966 and vercauteren 1953).

Although perhaps recognized earlier a second type of eosinophil granule has been recently characterized primarily in the late or tissue phases of the cell's life cycle (Archer 1959, Ross et al 1968 and tchernitchin 1973). This granule is of variable but significantly smaller size (0.05 to 0.5u) than the characteristic eosinophil granule just described does not have a crystalloid core and is of low buoyant density (Parmly et al 1974).

Enzymes:

Enzymatic activities in the eosinophil are abundant and may be associated with membranes cytoplasm, or granules. Peroxidase, the most studied of the enzymes, is far more abundant in the eosinophil than it is in the neutrophil, all the granules from mature eosinophils stain strongly for peroxidase whereas in the neutrophil only the early azurophilic granules are peroxidase positive and the secondary or specific granules, which out number the others 2:1, are negative for peroxidase (Morris et al 1975). Biochemical techniques have generally localized the following enzymes either within or associated with the granular cell functions cathepasin, ribonuclease, arylsulfataze, beta-glucuronidase, acid phosphatase, alkaline phosphatase, peroxidase, phospholipase B, histaminase and coenzyme Q (Archer et al 1963, Archer 1959, Ottolenghi 1970 and Zeiger et al 1976). With similar techniques, catalase, amylase, trypsin, and succinic dehydrogenase (Gross 1962) lactic dehydrogenase, glucose 6-phosphate

dehydrognase and phosphogluconate dehydrogenase and phospho lipase D have been found associated with the cytoplasmic fraction (Gross 1962, Archer 1968 and Kater et al 1976).

Cell membrane:

As yet little has been written specifically about the eosinophil's cell membrane. It appears as the unit membrane structure common to most cell types and is capable of appropriate configurational changes to permit functions of cellular motility, phagocytosis, pinocytosis and micropinocytosis (Elliot et al 1978). Recent studies have discribed the presence of receptors for complement fragments, of the Fc portion IgG on 10% to 35% of eosinophils from normal individulas (Gupta et al 1976, spry et al 1976 and tai 1976). These studies also suggest that in individulas stimulated to eosinophilia either normally or as part of the hypereosinophilic syndrome the percentage of eosinophils with IgG receptors increases (tai et al 1976). Other recent studies have demonestrated IgE bound to the cell surface of 25% to 30% of human eosinophil derived from an asthmatic individual (Hubscher 1975). Athird type of receptor on the eosinophil surface has been described that seems to be specific for the hormone estrogen, this receptor is thought to play a role in the pronounced eosinophilic infiltration of the uterus seen during estrus (Techernitchin 1973 and Ross et al 1968). Some insight to the characteristics of the eosinophil cell surface may be gained from the results of efforts by several workers to

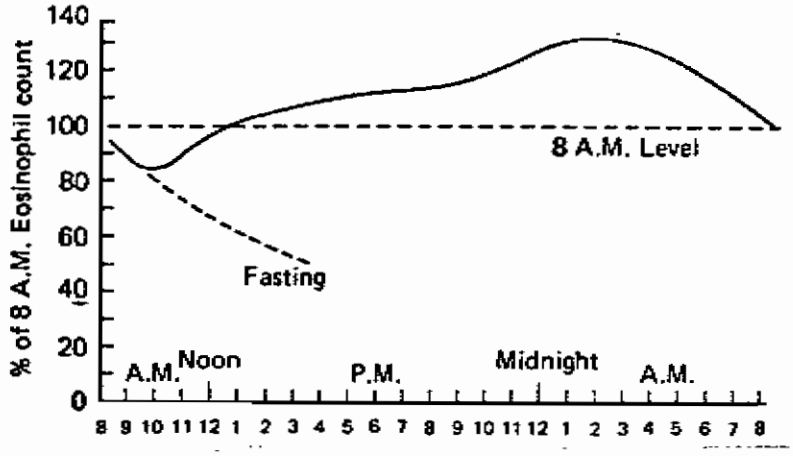
produce specific anti eosinophilic sera (Elliot et al 1978). Antisera to mouse eosinophils raised in rabbits can be made entirely specific for action against eosinophils by appropriate absorption techniques (Mahmoud et al 1973).

Life cysle:

The life cycle of the eosinophil is divided into 3 phases: marrow, blood and tissue, although the eosinophil is a blood element the blood harbars fewer than marrow or tissues (Hudson 1968, Rytomoa 1960, spry 1971) three functional eosinophil compartements distinguished within marrow: a dividing pool consisting of the youngest cells, the promyelocytes and myelocytes a second pool composed of cells that are more mature but still capable of dividing the metamylocytes, and a third compartment made up of maturing non dividing cells, constituting the marrow reserve of eosinophils (Hudson 1964). The cell cycle time for eosinophil within the marrow in human is about 60 hours, the half life of these cells in the blood is between 6 and 12 hours (spry 1971).

Peripheral blood eosinophilia and diurnal rhythm: (Fig.2) 2

Normal eosinophil count ranges from 50-250 cells per c.mm., absolute count yeilds avalue up to 550 cells per c.mm. there is diurnal variation with adecrease in number in the morning (Uhrband 1958). There is no pattern common to all subjects and the same subject may show day



(Fig .2) Due to the diurnal variation in the number of blood eosino phils the upper limit for normal is400 eosinophil per ul in the morning and 450 in the afternoon;
there is no pattern common to all subjects and the same subject may show day to day variations (Niels et.al. I978) .

to day variations (Acland and Gould 1956). Exercise can be responsible for transient elevations, whereas emotional stress, Fasting more than 15-17 hours, physical abuse, beta adrenergic agents (e.g., adrenalin), and hormonal influences of the menstrual cycle can serve as lowering influences (Rud 1947 and Kerr 1956).

Tissue Eosinophil

Blood eosinophils travel to submucosa of the bronchial tree, nasopharyngeal area and intestinal tract from where they are either excreted or taken up by lymphatics to be destroyed in the spleen. Increased number of eosinophils in bronchial secretions following a high blood eosinophil level tend addional support to this expermintal evidence (vaughn 1961). Rise of eosinophil count after splenectomy is possibly due to the removal of the disposal centre, mature eosinophil may live for 3-4 days (chalmers 1956).

Function of Eosinophil

As phagocyte: Bacteria, mycoplasma, yeast as well as inert particles and antigen-antibody complexes can be ingested by the eosinophil(Ishikawa et al 1972 and Kostage et al 1967).

In addition it has been recognized for several years that eosinophils respond selectively to chemotactic agents released from degranulating mast cells (Kay 1971). The earliest group of chemotactic mediators to be clearly identified were the tetrapeptides Ala-Gly-Ser-Glu and Val-Gly-Ser-Glu, and more recently a wide range of mediators with a more or less selective effect on eosinophil have been described. These substances include histamine, imidazoleacetic acid, a group of peptides of intermediate molecular weight, and a group of hydroxy-eicosatetraenoic acid of arachidonic acid.
In adition, eosinophils may respond chemotactically to mediators released as a result of other immunologic reactions; among these mediators are split products of Complement (C567 and C5a) and products of activated lymphocytes (eosinophil-stimulation promotor and eosinophil chemotactic factor). (Anthony et al 1981).

Once it has arrived at the site of an immediate hypersensitivity reaction, the eosinophil, by virtue of its unusual enzyme content, may serve to dampen down the response that elicited its arrival, several enzymes selectively present in the eosinophil may have this sort of regulatory function. First of all the eosinophil contains probably within its small specific microgranules 10 to 20 times

as much arylsulfatase B as does the neutrophil. This enzyme has the capucity to inactivate the sulfur-containing slow-reacting substances of anaphylaxis (SRS-A) that is generated in immediate Hypersensitivity reactions, Although the mechanism by which it does so is still obscure. Secondly, the eosinophil is one of the few Known mammalian sources of phospholipase D. This enzyme whose subcellular localization in the eosinophil is unknown, inactivates platelet activating factors, in particular the platelet lytic component of this mediator. Thirdly eosinophils contain approximately eight times more lysophospholipase activity than do neutrophils, and this activity is probably localized in the eosinophil plasma membrane. This enzyme may protect the eosinophil fromendogenous lysophospholipids and may alter the activity of lysophospholipids on surrounding cells. Finally both neutrophils and eosinophils contain histaminase and the extracellular release of this enzyme from the eosinophil may lead to inactivation of released histamine. (Anthony et al 1981, Zeiger and Colten 1976).