STUDY OF NEUTROPHIL FUNCTIONS IN PYOGENIC INFECTIONS OF THE SKIN

THESIS

Submitted in Partial Fulfillment of the requirements
for the Degree of
M. D.(Dermatology and Venereology)

By

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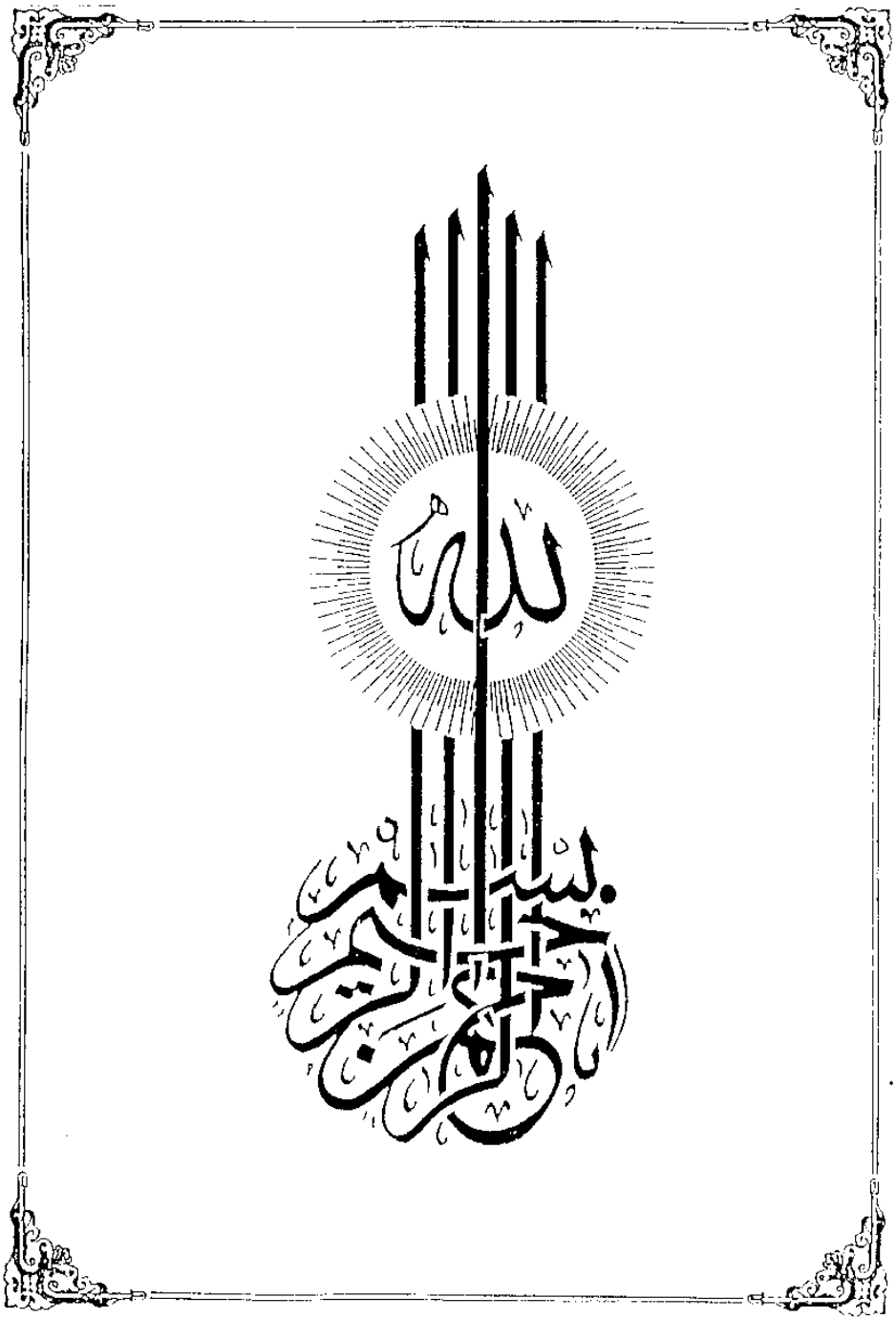
1989

بسم الله الرحمن الرحيم

﴿ لا يكلف الله نفسا إلا وسعها لها ما كسبت وعليها ما اكتسبت ، ربنا لا تؤاخذنا إن نسينا أو أخطأنا ، ربنا ولا تحمل علينا إصرا كما حملته على الذين من قبلنا ، ربنا ولا تحملنا ما لا طاقة لنا به ، واعف عنا واغفر لنا وارحمنا أنت مولانا فانصرنا على القوم الكافرين ﴾

صدق الله العظيم

سورة البقرة آية ٢٨٦



ACKNOWLEDGEMENT

It is rather a hard task to express in few words my feelings towards my eminent Professors under whose supervision I was honoured to conduct this study.

Throughout preparation of this thesis I have had the constant support, advise and encouragement of Professor Dr. Hoda Rifat EL MAZNY, Head of Dermatology and Venereology Department, Faculty of Medicine, Ain Shams University. She devoted much of her precious time to supervise all the details of this work and to revise with endless patience the manuscript. No word can express how much I am grateful and thankful to her.

I would like to express my thanks and gratitude to Professor Dr. Mona EL OKBY, Professor of Dermatology and Venereology, Faculty of Medicine, Ain Shams University for her overwhelming kindness. She closely supervised the steps of this study and never failed to give me valuable advise during conducting this work.

To Professor Dr. Nehayat Mahmoud AZMY, Professor of Clinical Pathology, Faculty of Medicine, Ain Shams University, I am very much indebted for her patience, inventiveness and continuous guidance. She taught me how to adhere to the laws of scientific research and was always available to solve any problem I faced during this study.

My thanks are also due to Professor Dr. Mohamed Abd El Rahim ABDULLAH, Professor of Dermatology and Venereology, Faculty of Medicine, Ain Shams University, for his encouragement and valuable suggestions.

I am extremely grateful to Professor Dr. Tarek Hamza SALLAM, Professor of Medical Parasitology, Faculty of Medicine, Ain Shams University. His sustained moral help and advice from the beginning of this study and he generously supplied me with materials and references.

I would like to extend my thanks to Dr. Hussein Abd El Datem, Dr. Magdi El Dessouky, Mr. Samy Doghaim, Dr. Manal Abd El Hamed and Mr. Osama Fikry for their invaluable cooperation in photographing the cases.

To

My Parents and Wife

List of Abbreviations

CFU - S	Colony forming unit - Stem cell.
CFU	Hemopoietic colony forming unit.
BFU - E	Burst forming unit.
CFU - GM	Colony forming unit - granulocyte / macrophage.
CSF - GM	Colony stimulating factor - granulocyte / macrophage.
CSF	Colony stimulating factor (s).
NIF - T	Neutrophil migration inhibitor factor.
LIF	Leucocyte inhibitory factor.
NIF	Neutrophil immobilizing factor.
PG	Prostaglandin.
MGR	Marrow granulocyte reserve.
µm	micrometer.
nm	nanometer.
M_r	molecular range.
CF	Chemotactic factor(s).
NCF	Neutrophil chemotactic factor.
FMLP	Formyl - methionyl - leucyl - phenylalanine.
MO1 or Mac1	glycoprotein CD 11 a / CD 18
LFA - 1	glycoprotein CD 11 b / CD 18
P 150. 95	glycoprotein CD 11 c / CD 18
LTB4	Leukotriene B4
Ig	Immunoglobulin.
C	Complement.
CFI	Complement factor inhibitors.
C1 - INH	C1 inhibitor.
ATP	Adenosine triphosphate.
AMP	Adenosine monophosphate.
cGMP	cyclic guanosine monophosphate.
NADH	reduced nicotinamide adenine dinucleotide.
NADPH	reduced nicotinamide adenine dinucleotide phosphate.
DNA	Desoxy ribonucleic acid.

Ca^{2+}	Calcium.
PIP_2	phosphatidyl inositol biphosphate.
IL - 1	interleukin - 1
B	C3 proactivator.
D	Precursor of C3 proactivator.
P	Properdin.
Lps	Lipopolysaccharide.
CoVF	Cobra venom factor.
BPI	Bactericidal / Permeability increasing factor.
Fe^{+++}	Ferric
Fe^{++}	Ferrous
O_2^-	superoxide
OH^-	hydroxyl radical
H_2O_2	Hydrogen peroxide.
$HOCl^-$	Hypochlorite ion.
G6PD	glucose - 6 - phosphate dehydrogenase.
6 PGD	6 phospho gluconate dehydrogenase.
MPO	myeloperoxidase.
S.aureus	Staphylococcus aureus.
S. epidermidis	Staphylococcus epidermidis.
Strept pyogenes	Streptococcus pyogenes.
Ps. aeruginosa	Pseudomonas aeruginosa.
E.coli	Escherichia coli.
LAD	Leucocyte adherence deficiency.
CGD	Chronic granulomatous disease.
EAS	endotoxin activated serum.
NBT	Nitroblue tetrazolium dye.
HPF	High power field.
psi	Pound / square inch.
NH_4Cl	ammonium chloride.
HBSS	Hanks balanced salts solution.

CONTENTS

AIM OF THE WORK

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This work aims at the evaluation of different neutrophil functions in recurrent bacterial infections of the skin to clarify the effectiveness of different steps in the process of combating infection by the neutrophils. However, compensatory increase in some of the neutrophil functions may happen along the course of infection and it is important to discover such reactions if present and to be considered in the interpretation of any results.

REVIEW OF LITERATURE

The Neutrophil

Origin and development

Blood is a fluid containing various chemicals in solution and a variety of cells in suspension.It circulates throughout all the blood vessels of the body and participates in all organ activities. It provides the means for respiration, nutrition and for the control of infection and of haemorrhage (Jandl, 1987).

Blood comprises about 8% of the total body weight (Lewis, 1982). In health the cellular component is approximately 45% and the fluid compartment 55%. The cells are derived from haemopoietic organs, namely bone marrow, spleen, liver and lymph nodes; the process by which cells proliferate, mature and ultimately reach the circulating blood is termed "haemopoiesis" (Nicola and Johnson, 1982).

Analysis of haemopoietic cells by culture, cytochemistry, immunology and the more refined techniques of electron microscopy has thrown much light on the origins, development and interrelationship of the various haemopoietic cells (Lewis, 1982). It is now clear that there are multipotential haemopoietic stem cell: the colony forming unit-stem cell (CFU-S) present in marrow and spleen (Mamlock et al., 1987). A pluripotent stem cell can differentiate along one of a series of pathways and produce either mature neutrophils, erythrocytes, lymphocytes, monocytes, eosinophils or platelets (Tubiana and Frindel, 1982). In contrast a committed stem cell is genetically programmed to manufacture irreversibly differentiated cells (Nicola and Johnson, 1982).

Figure (1) illustrates the different pathways for a multipotential haemopoietic stem cell.

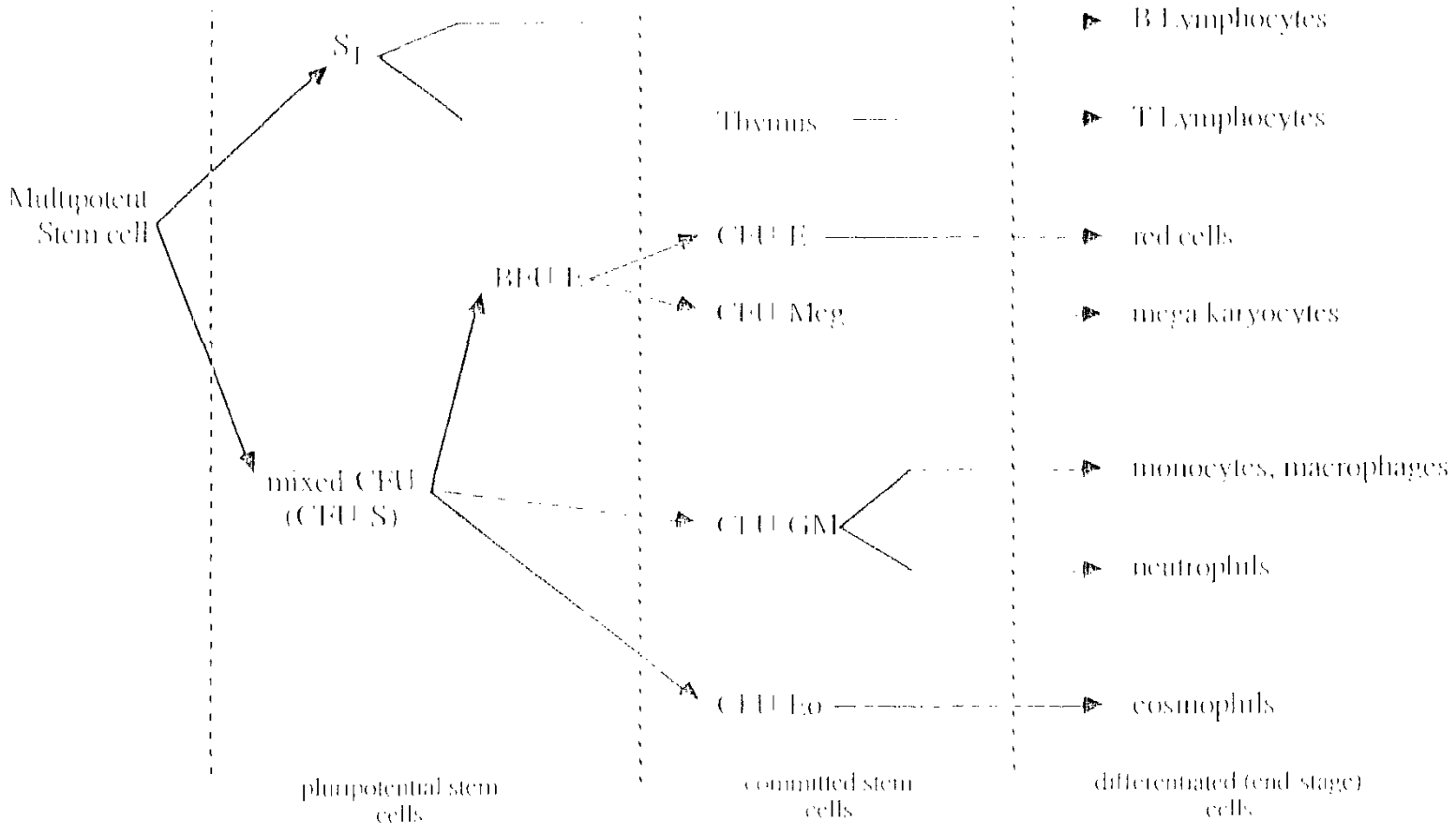

Fig. (1). Adapted from Keller and Phillips (1982)
Proposed genealogy of blood cells.
SL (pluripotent forebear of all lymphocyte subsets), mixed CFU (haemopoietic colony forming units), BFU-E (burst forming units created when mixed CFU are exposed to high concentrations of erythropoietin), CFU GM (encompasses Several committed lineages, including neutrophils, basophils, monocytes and macrophages but not eosinophils).