TRACE ELEMENTS IN LIVER IN CASE OF CHRONIC CALCULAR CHOLYCYSTITIS

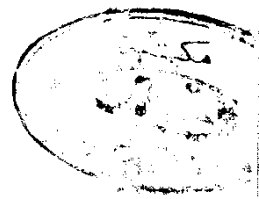
A THESIS

Presented to the Faculty of Medicine
Ain Shams University, Cairo - Egypt
In Partial Fulfillment for Master Degree
of General Surgry

By

MOHAMED EZZAT M. EL-HENNAWAY

M. B., B. Ch.



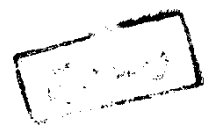
Under Supervision of

Professor Doctor : MOHAMED RAGHEB

Ass. Professor of Surgry
Faculty of Medicine, Ain Shams University

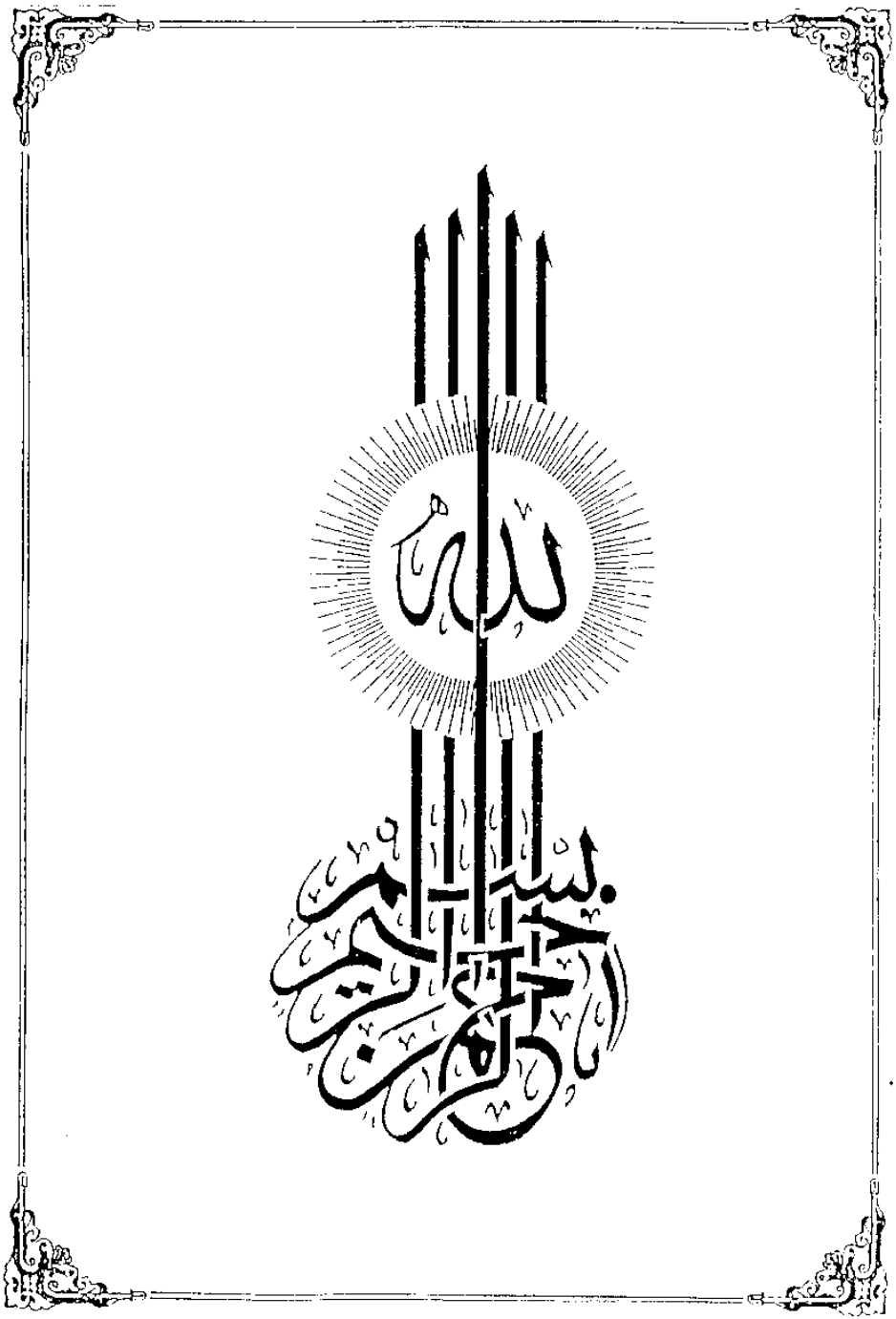
Professor Doctor : AHMED HUSSEIN ABD EL-KARIM

Ass. Professor of Occup. Health
National Research Center



1984

ACKNOWLEDGEMENT



ACKNOWLEDGEMENT

I am grateful to Ass. Prof. Dr. Mohamed Rahgeb for his direction in measurment of trace elements in liver tissue in case of chr. calcular cholycystitis and for his care and supervision during all steps of my work.

I thank Ass. Prof. Ahmed Hussein Abd El-Karim for his help in the laboratory part of my work.

--oooOooo--

CONTENTS

CONTENTS

INTRODUCTION

INTRODUCTION

Trace metals are mineral elements utilized in trace quantities by body e.g. magnesium, copper, mangnese, zinc, and they are essential to many vital process.

The liver contain the highest concentration of these elements and there is considerable secretion of magnesium, copper, manganese, zinc into intestinal tract from bile.

The field of trace elements metabolism has grown rapidly over the past few years.

Studies of trace elements have particularly aided by the recent development of the techniques e.g. flameless atomic absorption spectrometery which allowed the reliable measurement of several trace metals in different tissue,

CHAPTER I

PHYSOLOGY OF THE LIVER

The liver is the center of metabolism in the body. The synthesis, modification storage, breakdown and excretion of many substance upon which life depends occur in liver.

The function of liver exceed those of all other organs in number and complexity. Although much remains to be learned about the many vital activities of liver.

The known function can be divided into:

1. Bile formation and excretion.
2. Metabolism.
3. Storage.
4. Synthesis.
5. Formation and destruction of red cells.
6. Detoxicating function.

Carbohydrate Metabolism

Hepatic synthesis, transformation and breakdown of carbohydrates, fats and proteins are so intimately related that the liver has been referred as a metabolic pool.

Dietary carbohydrates are for the most part polymers of hexoses of which the most important are galactose, fractose and glucose. The principal product of carbohydrates digestion and the principal circulating sugar is glucose. (William F. Ganong 1981)

Once it enters liver cells, glucose is normally phosphorylated to form glucose -6- phosphate. The enzyme that catalyzes this reaction is glucokinase which has greater specificity for glucose and which is increased by insulin and decreased in starvation and diabetes. (William F. Ganong 1981)

The glucose 6-phosphate is either polymerized into glycogen or catabolized, the process of glycogen formation is called glycogenesis and glycogen breakdown is called glycogenolysis. Glycogen is the storage form of glucose.

Glucose catabolism proceeds in two ways via cleavge to triose or via oxidation and decarboxylation to pentoses, which have several uses. They are used in the blosynthesis of nucleotides, nucleic acids and adnosine triphosphate. They are used to produce 3-carbon organic compounds, such as pyrvic acid, which serve as precursors for active acetate, a

a compound that forms a link between carbohydrate, fat and protein metabolism and plays a central role in tricarboxylic acid cycle. (William F. Ganong 1981)

The hepatic Glucostate:

There is a net uptake of glucose by liver when the blood glucose is high and a net discharge when it is low. The liver thus functions as a sort of glucostat, maintaining a constant circulating glucose level. (Willian F. Ganong 1981)

Fat Metabolism

In addition to manufacturing bile acids, which aid in the absorption of fat, the liver plays a central role in lipid metabolism. After digested fat is absorbed, it is converted in the intestinal mucosa to chylomicrons, consisting largely of triglyceride and small amount of cholesterol ester. phospholipid, and specific lipoprotein. These are taken up by liver, where they are hydrolyzed to glycerol and fatty acids.

The liver also takes up fatty acids from fat depots, the mobilization on of which depends on both anterior pituitary and adrenal cortical activity.

The liver synthesizes fatty acids from amino acids, carbohydrates, and other metabolites; this is related to utilization of carbohydrate and requires insuline.

In the liver, fatty acids are resynthesized to form triglycerides, esterified to phospholipid, or combine with cholesterol to form cholesterol esters. The triglyceride molecules are converted to low density lipo protein, which enter the circulation and are available either to adipose tissue or for uptake by the liver. In common with other tissue, the liver oxidizes fatty acids completely to carbon dioxide and water. (Abram - Bogach, 1973).

Keton bodies:

Keton bodies are formed by oxidation of fatty acids, which in turn undergo oxidation; over production of keton bodies from excessively rapid fatty acid breakdown results in ketosis. This may occur in case of impairment of enterance of acety CoA into the citric acid cycle in case of intercellular carbohydrate starvation. (Review of Medical Physiology by William F. Ganong 1981.)

There are 3 condition that lead to deficient intra cellular glucose supplies: starvation; diabetes mellitus and a high fat, low carbohydrate diet.

In diabetes, glucose entry into cells is impaired, when most of the caloric intake is supplied by fat, carbohydrate deficiency develops because there is no major pathway converting fat to carbohydrate: The liver cells become filled with fat, which damages them and displaces any glycogen that is formed.

F

Free fatty acid metabolism :

Fatty acids are synthesized from glucose in the liver and adipose tissue, stored in fat depots, and returned to the liver, where they are metabolized to keton bodies for utilization by tissue.

Cholesterol metabolism (Disease of metabolism by Gafield G. Duncan M.D. 1964). The liver is capable of condensing acetoacetate with acetate to form a branched chain containing 6-carbon atoms (B-hydroxy-B-methyl glutaric). This acid can reduced to mevalonic acid which change to squalene, this step needs ATP, Mg^{++}. The conversion of cholesterol to bile acids appears to be a major catabolic pathway for cholesterol.