EFFECT OF WHOLE BODY IRRADIATION ON SERUM AMYLASE AND SERUM LIPASE LEVEL IN RAT

THESIS

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By

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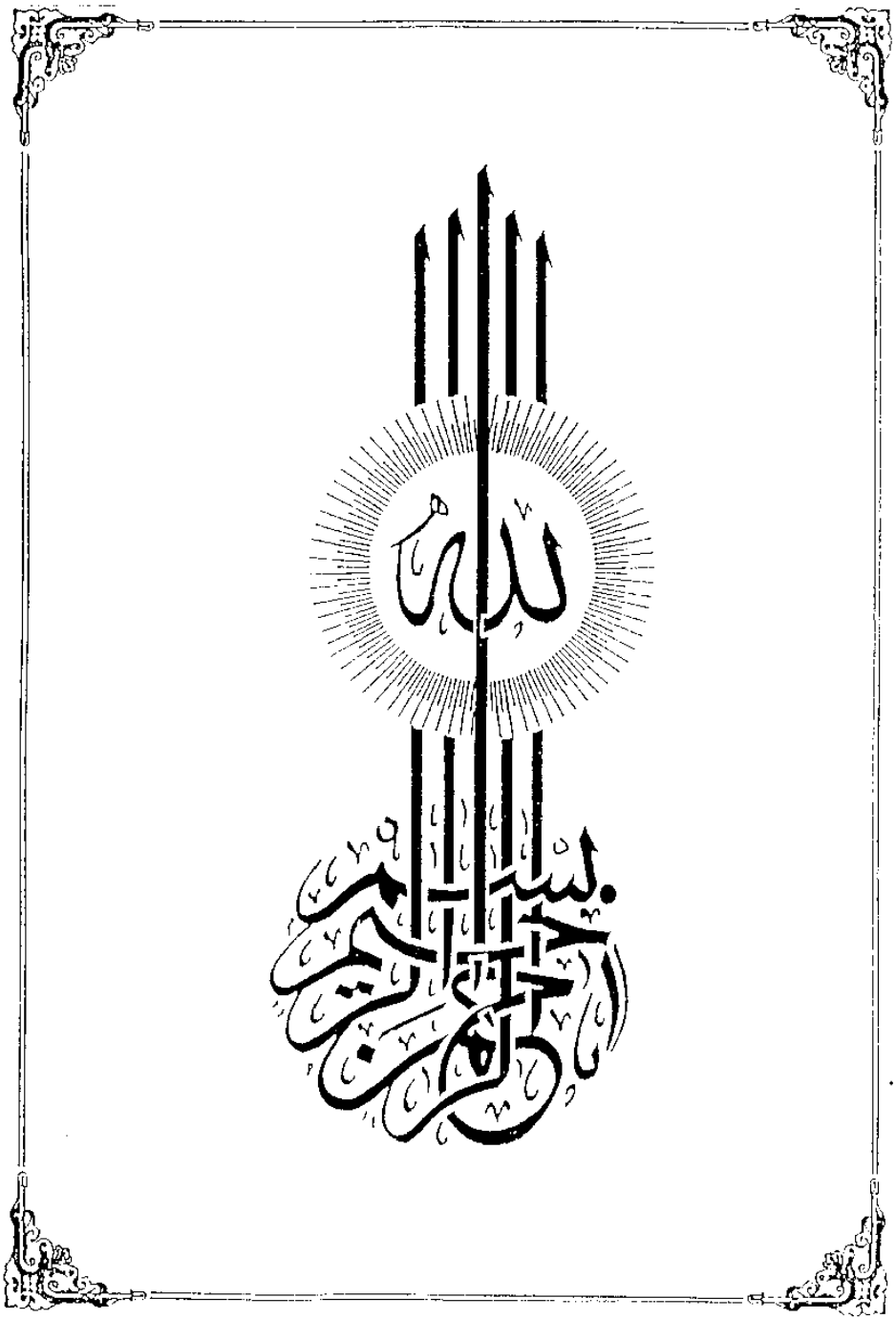
بسم الله الرحمن الرحيم

« قالوا سبحانك لا علم لنا إلا ما علمتنا

إنك أنت العليم الحكيم »

صدق الله العظيم

(سورة البقرة ، آية ٣٢)



This work is dedicated to ...

My parents,

my husband

and my daughter

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INTRODUCTION

Recently, ionizing radiation is progressively being introduced in different fields of human activity. Simultaneously, attention is continuously being paid to the hazards which are liable to occur as a result of exposure to ionizing radiation. However, since the pioneer era of radiology, numerous studies have been published on the effect of irradiation on various organs of man and animals (*Volk et al.*, 1966).

In spite of the recent great progress of the scientific knowledge, early diagnosis of radiation damage remains one of the unsolved problems. Research workers and clinicians both make every effort to find a specific biological or biochemical change which could be early observed "24–72 hours" after the exposure and reflect the dose of irradiation (*Schweitzer et al.*, 1986).

In view of frequent use of radiation treatment nowadays, it must be emphasized that biochemical analyses are essential for diagnosis, treatment as well as prognosis in the patients receiving irradiation (*Ohyama*, 1989).

Investigating the changes in serum amylase and serum lipase level after exposure of the whole body of an experimental rat to gamma irradiation, may be useful in diagnosing the effect of irradiation on the organs producing these enzymes. Pancreas and the salivary glands are the main source for secretion of amylase enzyme, meanwhile, pancreas is the main source also for secretion of lipase (*Junglee et al.*, 1986).

AIM OF THE WORK

The aim of this work is to study the effect of whole body gamma irradiation on serum amylase and serum lipase level in experimental albino rat on different post-irradiation days. Using two different doses 3 Gray and 6 Gray; 3 Gray as a minimal dose to produce changes in the enzyme level and 6 Gray as a sublethal dose to the rat.

Review of Literature

AMYLASE

Introduction

The term amylase derives from the Greek word "amylon" meaning starch. In 1833, Payen and Persoz first precipitated a starch splitting product from malt which they named diastase, from the Greek word "diastasis," meaning separation (*Lewison*, 1941).

Amylase was found in blood by Magendie in 1846, and was first measured quantitavely in animals by Foster in 1867. In 1916, Stocks suggested that amylase activity in blood and urine was a sensitive and reliable test for various pancreatic disorders. Hyperamylasemia in acute pancreatitis was reported in 1929 (*Salt and Schenker*, 1976).

Definition and Action

Amylases (EC 3.2.1.1; 1,4-α-D-Glucan Glucanohydrolase) are a group of hydrolases that split complex carbohydrates constituted of α-D-glucose units linked through carbon atoms "1" and "4" located on adjacent glucose residues. Both straight-chain (linear) polyglucans such as amylose, and branched polyglucans such as amylopectin and glycogen are hydrolyzed although at different rates.

In the case of amylose, the enzyme splits the chains at alternate α-1,4-hemiacetal (-C-O-C-) links, forming maltose and some residual glucose; maltose, glucose and a residue of limit dextrins are formed if branched-chain polyglucans are used as substrate (*Tietz*, 1987).

Chemistry

Amylase in human serum has moderately sharp pH optimum 6.9–7. The enzyme has a molecular weight varying from 40,000 to 50,000 (*Davidson and Henry*, 1974). The enzyme is thus small enough to pass through the glomeruli of the kidney, and amylase is the only plasma enzyme normally found in urine.

Alpha amylases are calcium metalloenzymes, and calcium is absolutely required for functional integrity. Full activity is displayed only in the presence of anions such as chloride and bromide (*Tietz*, 1987).

Types of Amylase

Two types of amylase are recognized. Beta-amylase (e.g., plant and bacterial exoamylase) acts only on the terminal reducing end of polyglucan chain; it splits off two glucose units (maltose) at a time. Human amylases are α-amylases; they are also called endoamylases

because they can attack the α-1,4-linkage in a random manner anywhere along the polyglucan chain (*Tietz*, 1987).

Sources of α-Amylase

α-amylase is present in a number of organs and tissues. The greatest concentration is present in the pancreas. The salivary glands also secrete a potent amylase to initiate hydrolysis of starches while the food is still in the mouth and oesophagus, the action of salivary enzyme is terminated by the acid medium in the stomach.

Amylase activity is found in extracts from semen, testes, ovaries, fallopian tubes, striated muscles, lung and adipose tissue. The enzyme is also found in colostrum, tears and breast milk. There is little or no amylase activity in liver. The enzyme present in normal serum is predominantly of pancreatic and salivary gland origin (*Tietz*, 1987).

Normal Values

Most textbooks suggest that serum amylase is first detected in the second to third month of life, rising to attain low-normal adult levels by one year (*Somgyi*, 1941). However, *Searcy et al.* (1966) used a sensitive micro-technique to detect the presence of serum amylase at birth.