EFFECT OF VARIOUS FOODSTUFFS ON PLASMA GLUCOSE LEVEL

THESIS

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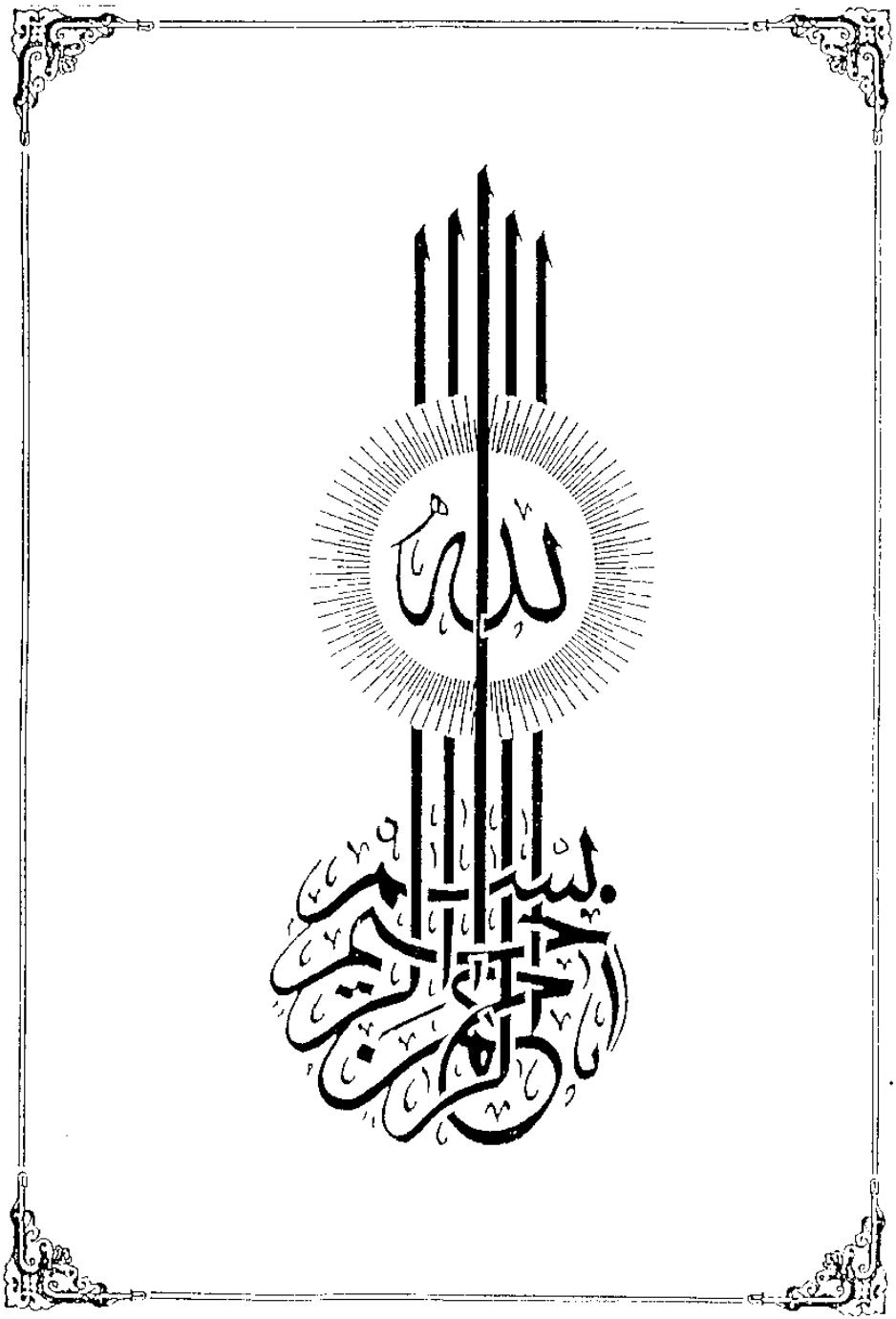
بسم الله الرحمن الرحيم

سبحانك لا علم لنا إلا
ما علمتنا إنك أنت
العليم الحكيم

" صدق الله العظيم "



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CONTENTS

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LIST OF TABLES

LIST OF FIGURES

INTRODUCTION AND AIM OF THE WORK

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Recent work has suggested that the carbohydrate exchange lists, that have regulated the diets of many diabetics for over three decades may not reflect the physiological effect of foods.

Such factors as food form, dietary fibre and the nature of the carbohydrate have been shown to have a marked influence on the postprandial glycaemia and allowances cannot be made for this in lists which take into account only the available carbohydrate content of foods.

On the other hand, the interplay of food constituents (protein, fat and carbohydrate) could result in plasma glucose responses different from those obtained by the administration of a single agent of such foodstuffs.

Although the mechanisms responsible for differences among foods, or among the same food prepared in different ways are under investigation, we cannot yet predict the response to a given food.

It is clear however, that we need to work towards a system that allows us to make dietary recommendations on the basis of the expected biologic response to ordinary foods.

The aim of this work is to study the effect of various foodstuffs on glucose metabolism, therefore we have fed healthy volunteers, lean and obese, a group of commonly eaten foods, among Egyptians, so that physiological data on the blood glucose response in man could be obtained in a part of series to supplement tables of dietary recommendations.

PHYSIOLOGICAL REGULATION OF PLASMA GLUCOSE

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Glucose is the only metabolic fuel utilized by the central nervous system, under most conditions encountered in normal life. The brain can neither synthesize nor store glucose nor can it concentrate glucose from the circulation. Thus maintenance of the plasma glucose concentration at levels sufficient to provide a continous supply of glucose to the central nervous system is crucial.

Maintenance of a rather narrow range of plasma glucose concentration under a variety of physiologic conditions requires remarkable metabolic adaptation. Common variations include :

1- Postprandial state, when exogenous glucose is plentiful
2- Postabsorptive state " e.g. after an overnight fast " when endogenous glucose production is required.
3- During exercise, when accelerated glucose utilization by exercising muscle must be compensated by enhanced glucose production. (Cryer, 1981).

In the postabsorptive state hepatic glucose production is approximately 2 - 2.4 mg/kg/min (a daily rate of roughly 200 — 240 g), of this about 75 % is derived from hepatic glycogenolysis with the remaining 25 % from hepatic gluconeogenesis.

Approximately 60 % of the glucose produced is utilized by the nervous system. 20 % by tissues such as blood cells and renal medullae. 20 % by muscle and fat.

If fasting is prolonged for a few days, gluconeogensis becomes the predominant and then the exclusive source of glucose production, and glucose utilization by muscle and fat declines even further. In the postabsorptive " and fasting " state, the liver is an organ of net glucose production.

The postprandial state is charcterised by suppressed endogenous " hepatic " glucose production and enhanced glucose storage in a variety of tissues including the liver. Over the three hours following the ingestion of 100 g glucose, endogenous glucose production is suppressed and the liver is an organ of net glucose uptake.

Minuk, et al, 1980 estimated that enhanced glucose utilization by exercising muscle is matched by increased hepatic glucose production during mild to moderate exercise. With exercise to exhaustion glucose utilization may exceed glucose production resulting in hypoglycaemia.

The hormonal, neural and auto-regulatory processes that normally result in maintenance of the plasma glucose concentration despite wide variation in glucose availability and utilization are to be discussed.

Their relative physiologic roles, in so for as they are known, are discussed in relation to the correction of, and the prevention of hypoglycaemia in normal humans and in patients with diabetes mellitus.