

*VITAMINS AND S KELETAL
DISORDERS*

Essay

*Submitted In Partial Fulfilment Of
The Master Degree In
Orthopaedic Surgery*



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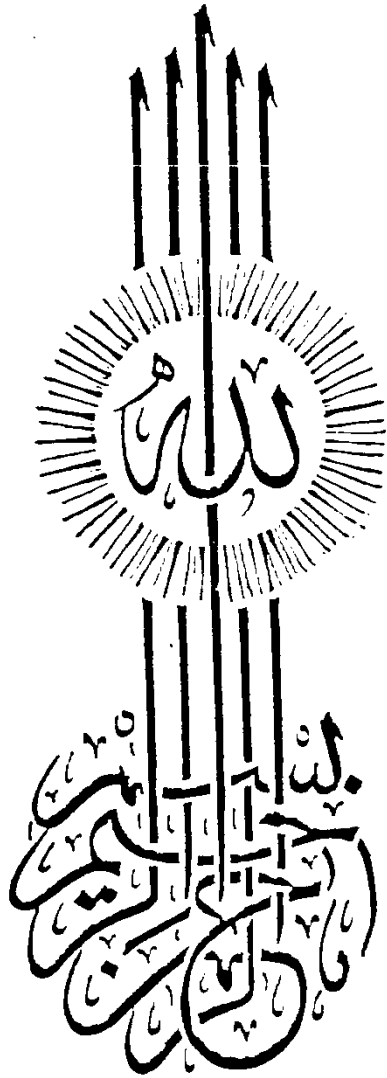
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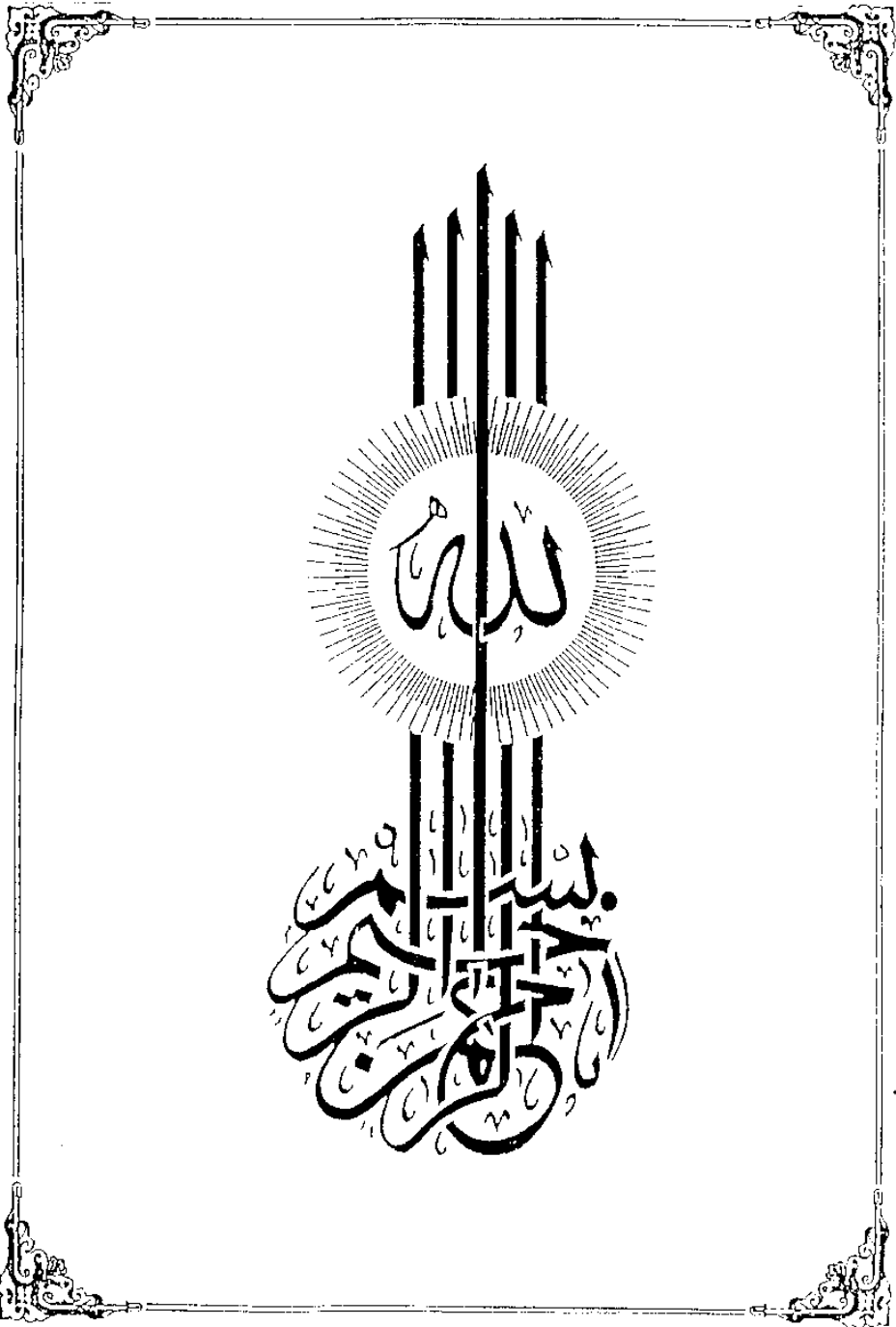


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ACKNOWLEDGMENT

I would like to express my deepest gratitude and cordial appreciation to Prof. *Dr. EL SAYED M. WAHB* Prof. & Chairman of Orthopaedic Surgery, Ain Shams University, for his constant guidance, valuable advice, honest assistance and continuous encouragement throughout the whole work.

W.

I am also deeply indebted to Prof. *Dr. USAMA SHATTA*, Prof. of Orthopaedic Surgery, Ain Shams University, for his kind supervision, guidance and continuous encouragement throughout the whole work.

R.

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A.

Lastly, my cordial gratitude to my family and friends for their continuous encouragement, help and patience.

USAMA ALI I. GAMAL EL DIN

1991

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INTRODUCTION

INTRODUCTION

Vertebrates are distinguished from invertebrates by the presence of a calcified endoskeleton that provides them with enhanced locomotive, protective, and supportive properties.

The bones of the skeleton serve a mechanical function, enabling the vertebrates to stand erect, to balance on one limb and to resist the force of gravity (Boskey A.L. et al., 1984).

In this thesis we are going to discuss the effect of the vitamins on the skeletal system.

Hypovitaminosis and hypervitaminosis are decreasing in incidence due to advance in therapy and the gaining knowledge of people.

Vit. D deficiency rickets is still seen in developing countries.

Scurvy is rarely if ever seen nowadays hypervitaminosis D is not seen nowadays due to advance of

VITAMINS AND SKELETAL DISORDERS

therapy in diseases treated before with vit. D as rheumatoid arthritis, T.B.

Hypervitaminosis A is not seen nowadays because more attention is paid to the exact dose of vit. A in treating cases of hypovitaminosis A.

HYPO AND HYPER VITAMINOSIS

HYPER AND HYPOVITAMINOSIS

Vitamins were discovered when it was observed that diets adequate in calories, essential amino acids, fats and minerals failed to maintain health.

The term vitamin has now come to refer to any organic dietary constituent necessary for life, health and growth that does not function by supplying energy (Ganong W.F., 1987).

Vitamins cannot be synthesized by the body in adequate amount. One requires either microgram or milligram quantities of each vitamin per day.

Vitamins are divided into two groups:

- 1- Water - soluble vitamins.
- 2- Fat - soluble vitamins.

Water - soluble vitamins:

Water - soluble vitamins include the vitamin B complex and ascorbic acid. Water - soluble vitamins are absorbed into hepatic portal vein, and any surplus is excreted in the urine. There is thus little storage of the free vitamin. Which in most instances needs to be continually supplied in the diet.

FAT SOLUBLE VITAMINS

VITAMIN D

BIOCHEMISTRY OF VIT. D

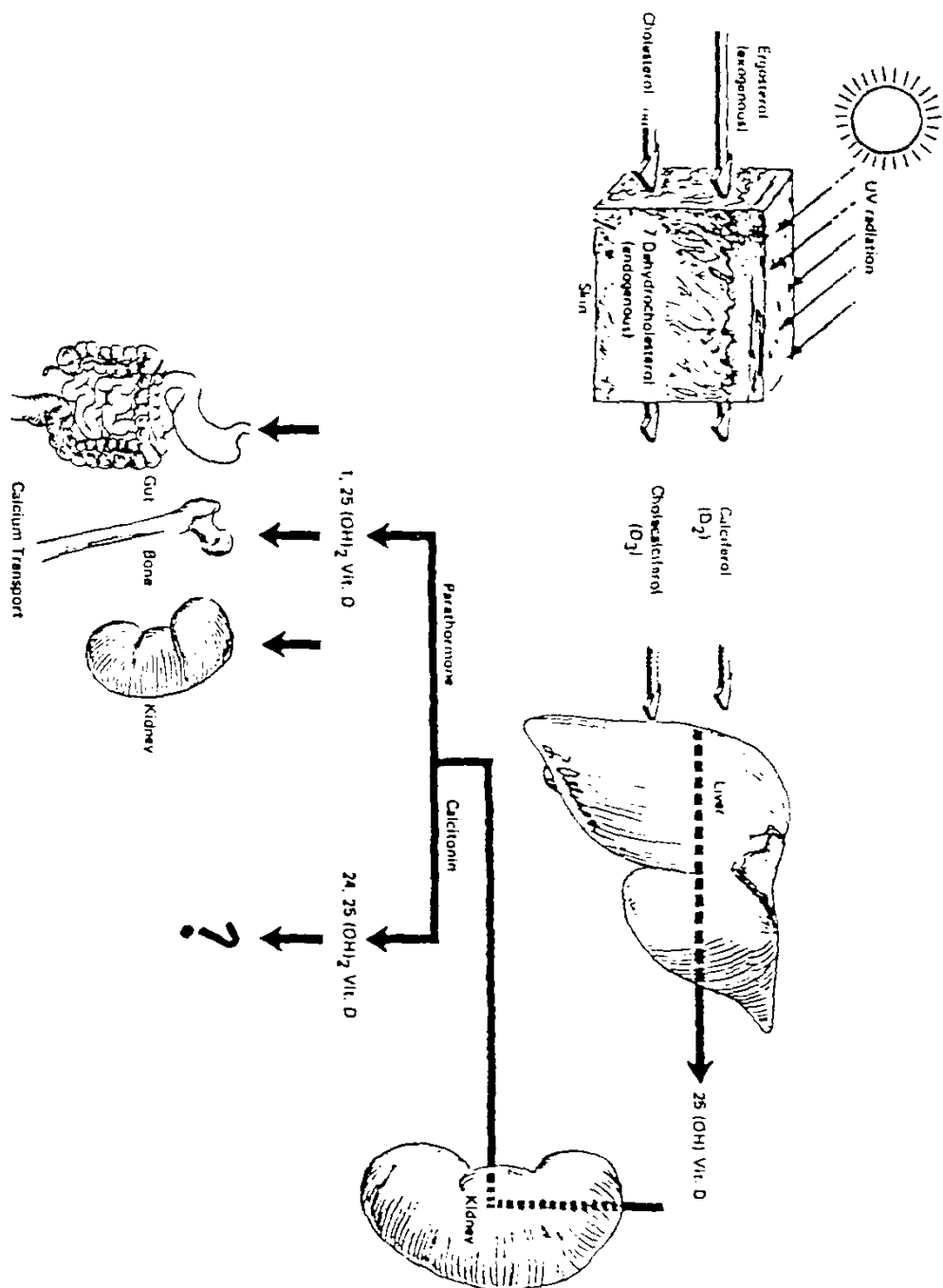
Biosynthesis:

Calcitriol is a hormone in every respect. It is produced by a complex series of enzymatic reactions that involve the plasma transport of precursor molecules to a number of different tissues. The active molecule, calcitriol, is transported to other organs where it activates biologic processes in a manner similar to that employed by the steroid hormones.

Vitamin D is synthesized in the following organs:

1- Skin:

Small amounts of vit. D occur in food as fish liver oil, egg yolk, but most of vit. D available for calcitriol synthesis is produced in the malpighian layer of the epidermis from 7. dehydrocholesterol in an ultraviolet light-mediated, non enzymatic photolysis reaction. The extent of this conversion is directly related to the intensity of the exposure and inversely related to the extent of pigmentation in the skin. Also there is an age related loss of 7. dehydrocholesterol in epidermis that may be related to the negative calcium balance associated with old age.



2- Liver:

A specific transport protein called the D-binding protein bind, vitamin D₃ and its metabolites and moves vitamin D₃ from the skin or intestine to the liver where it undergoes 25 hydroxylation, the first obligatory reaction in the production of calcitriol. 25 hydroxylation occurs in the endoplasmic reticulum. The 25OH-D₃ enters the circulation, where it is the major form of vit. D found in plasma, and is transported to the kidney by D binding protein.

3- Kidney:

25OH-D₃ is a weak agonist and must be modified by hydroxylation at position C₁ for full biologic activity. This is accomplished in mitochondria of the renal proximal convoluted tubule. This system produces 1.25(OH)₂-D₃ which is the most potent naturally occurring metabolite of vit. D.

4- Other tissues:

The placenta has 1 alpha -hydroxylase that appears to be an important extra renal source of calcitriol. Enzyme activity is found in a variety of other tissues, including bone; however the physiologic significance of this appear to be minimal, since a