VITAMIN A IN PEDIATRICS

Essay

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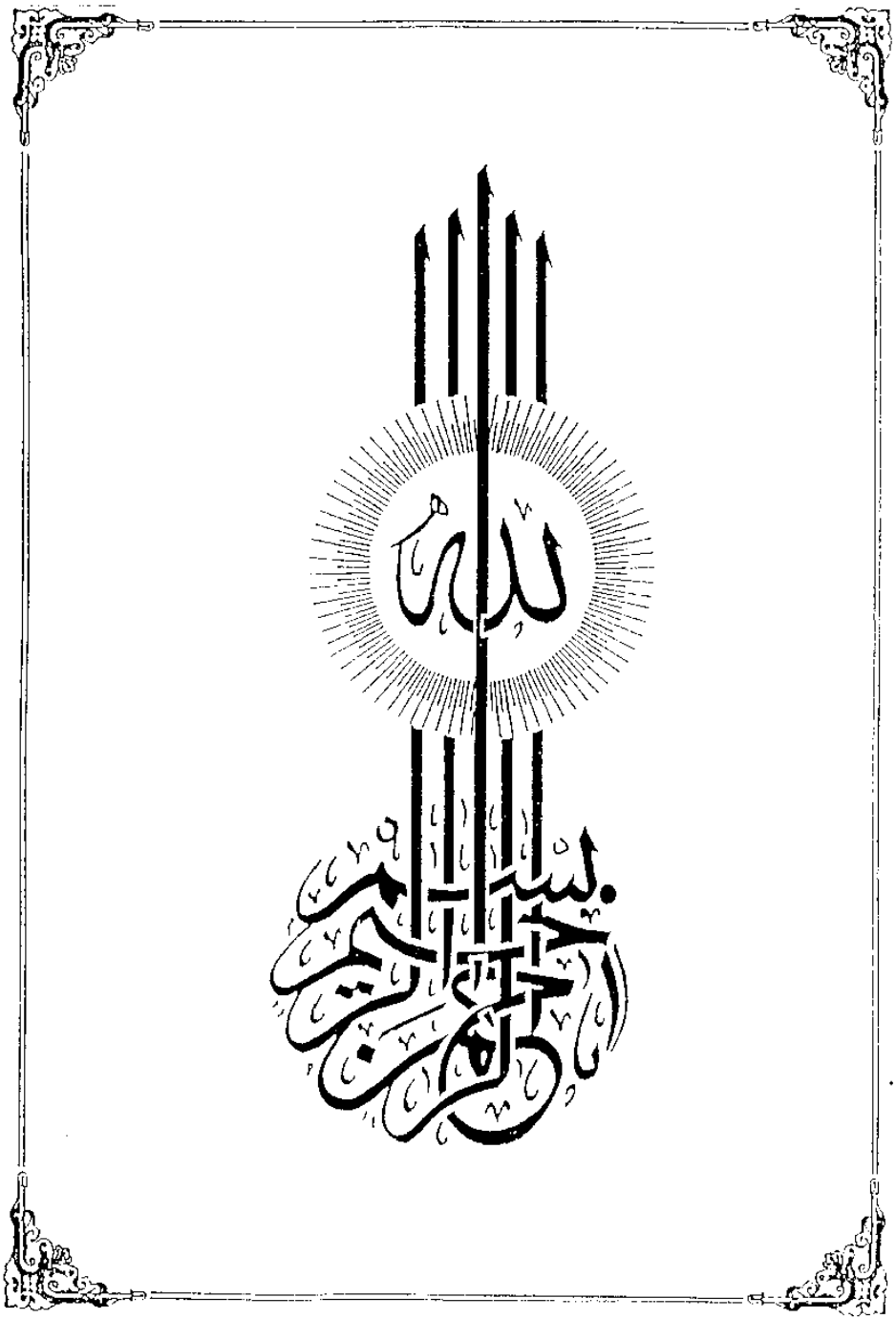
بسم الله الرحمن الرحيم

سبحانك

لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم

صدق الله العظيم

سورة البقرة ـ اية (٣٢)



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APPREVIATIONS

BPD	Bronchopulmonary dysplasia
CRABP	Cellular retinoic acid binding protein
CRALBP	Cellular retinal binding protein.
CRBB	Cellular retinol binding protein.
CRBP II	Cellular retinol binding protein type II.
G.E.	Gastroenteritis
IRBP	Interstitial retinol binding protein.
LMBS	Laurence - Moom Biedl syndrome.
PCM	Protein calorie malmutrition.
PEM	Protein energy malnutrition.
PGE_2	Prostaglandin E_2
RDS	Respiratory distress syndrome.
TPN	Total parentral nutrition.
XIA	Conjunctival xerosis
XIB	Conjunctival xerosis and Bitot's spots.
X2	Corneal xerosis.
X3A	Corneal xerosis and ulceration.
X_3B	Keratomalacia.
XN	Night blindness.
XF	Xerophthalmic fundus.
XS	Corneal scar.

ERRATA

Page	Line	Wrong	Right
8	1	smalller	smaller
8	12	carring	carrying
17	20	Phototrcepta	Photoreceptors
22	4	boud	bound
22	19	1877	1977
32	5	take	tokes
35	17	effets	effect
36	1	sugget	suggests
47	18	condrocyte	chondrocytes
49	12	carring	carrying
74	10	400-500 Iu.	400-500 ug or 1,400 -3,500 IU

INTRODUCTION

HISTORICAL BACKGROUND

Night blindness was recognized as a disease entitey in ancient Egypt. Although this disease was not linked to dietary deficiency, tropical treatment with roasted or fried liver was wisely recommended. Hippocrates later suggested that eating beef liver leads to recovery from night blindness. The relationship to nutritional deficiency was definitively recognised in the last century. (Goodman, 1984)

In 1887, endemic night blindness was reported to occur among the Orthodox Russian Catholics who fasted during the lenten period. They noticed that nurslings of mother who fasted were prone to develop spontaneous sloughing of the cornea. (Mandel and Cohen, 1980)

MaC Collum and Dovis in 1913 reported that an essential lipid soluble substrate in certain food promoted growth in rats. they later called this substrate "Fat soluble A", to distinguish it from essential water-soluble nutrients. Further studies by a number of investigators showed that "Fat soluble A" did not only maintain growth but was also capable of preventing xerophthalmia and night blindness. (Goodman, 1980)

Clinical and experimental vitamin A deficiency was recognized during World War I, when it became apparent that xerophthalmia in human-being was a result of a decrease in the content of butter fat in the diet. (Mandel and Cohen, 1980)

Karrer and associates determined the chemical structure of B carotene in 1930, and vitamin A in 1931, so the relation between vitamin A in animals and the provitamin carotene was clarified. (Goodman, 1979)

Nomenclature policy for vitamin A:

Vitamin A is an organic dietary constituent necessary for life, health and growth that does not function by supplying energy.(Ganong, 1985).

As vitamin A has a specific function in the retina of the eye, and because its chemical nature is an alcohol, it has been given the name retinol. However, it is commonl referred to by its letter name vitamin A. (William, 1981)

The word "retinoids" is a generic term that includes both naturally occurring compound with vitamin A activity and

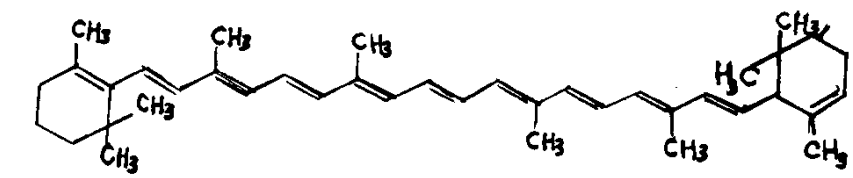
synthetic analogous of retinol, with or without biologic activity. (Goodman, 1984)

The provitamin A "Carotenoids" is the ultimate source of all vitamin A in plants. It is an unsaturated hydrocarbon "C40H56" having a molecular weight 536.85. It is found in certain plant pigment, and called carotene because it was first identified in the yellow pigment of carrots. A confusion arose from the fact that the carotene have such a deep, intense colour while pure vitamin A is colourless. Several isomeric α , β , γ and δ carotenes are found in deep yellow and green plants. Of these, beta carotene is the most significant. (William, 1981) Fig. 1

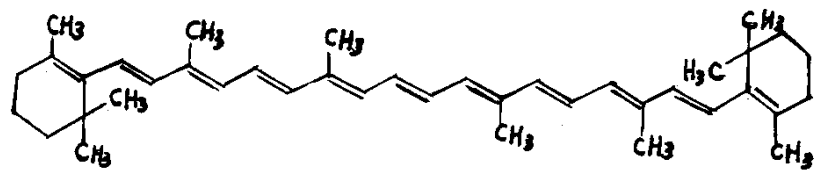
Nutritional equivalent:

One international unit of vitamin A is equal to 0.3 ug of all the retinol. For nutritional purposes, it is better to use "retinol equivalent" which is used to convert all sources of vitamin A and carotenoids in the diet to a single unit. Thus 1 ug of all trans retinol is assumed to be biologically equal to 6 ug of beta carotene or to 12 ug of mixed dietary carotenoids. (Hurley, 1986) Table 1

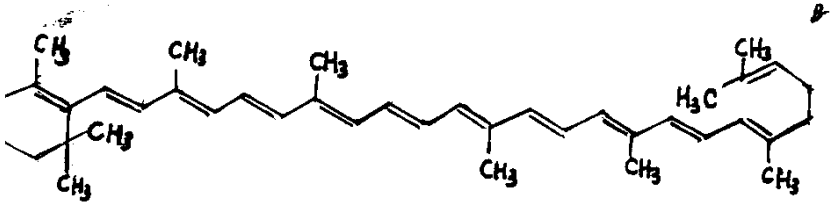
The chemical structure of ∝ , β , γ and δ carotene



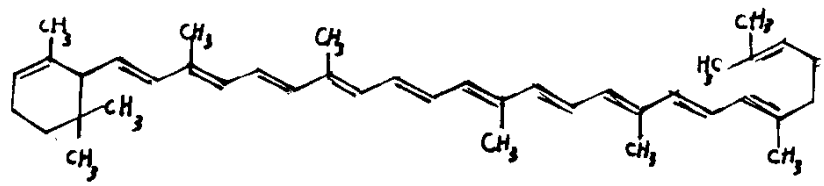
∝-Carotene



β-Carotene



γ-Carotene



δ-Carotene

Figure (1)

(William, 1981)

REVIEW OF LITERATURE

Physical chemistry of vitamin A:

Vitamin A is now known to be composed of three biologic active forms: retinol-retinal and retinoic acid. These major vitamin A compounds all contain a trimethyl-cyclohexenyl groups and an all trans prolene chain with four double bonds. Fig. 2

The basic structure has the physical property of extreme hydrophobicity. It is soluble in fat, soluble in organic solvents with retinoic acid being more polar than the others. It oxidizes readily upon exposure to temperature higher than those ordinarly used in cooking and so it is fairly stable in cooking. Antioxidant vitamin E has been used with vitamin A to preseve it. (William, 1984)

Oxidation of retinol or retinal by peripheral cell is not reversible , thus neither retinoic acid nor retinal is metabolically converted to retinol. (Kaplan, 1984)

Retinoic acid is more active than retinol in stimulation of growth and in differentiation of epithelial tissue , but fails to support visual function, which is the role of the aldehyde from retinal. (Deluca , 1979)