

RETINOIDS AND REXINOIDS AS VITAMIN A ANALOGS

Maadh Q. Abdulkadir*, Shayma L. Abdulhadi, Mohammed Kamil Hadi and Zahraa Raad Abd Aljabar

Department of Pharmaceutical Chemistry, College of Pharmacy, University of Baghdad, Baghdad, Iraq.

*e-mail : dr.maadhq@yahoo.com

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ABSTRACT : Vitamin A, namely retinol is still the most proper agent for modulating so many biochemical reactions and biological functions in different tissues and organs. In addition to the provitamins A and α , β and γ -carotenoids that are present in various foods from either animal or plant origin, retinoids and rexinoids form the natural and synthetic analogs that are chemically related or unrelated and can be added as food supplements for deficiency disorders of vitamin A or used to alleviate or treat certain health problems such as skin carcinoma, acne, skin aging and dermatitis.

Key words : Vitamin A, retinoids, rexinoids.

INTRODUCTION

Vitamin A can be said as a vital agent having multiple benefits to the human body and may be supplied as preformed vitamin A with foods from animals (liver) and as pro-vitamin A carotenoids present in plant meals (Harrison, 2012). Vitamin A (retinol) is important for human health at each level, from fetus to adolescence (Clagett-Dame *et al*, 2002; Clagett-Dame *et al*, 2011). Any shortage in vitamin A actually gives neonatal growth retardation and big serial congenital malformations collectively called as the fetal syndrome of “vitamin A deficiency” (VAD). Vitamin A is also necessary for adult vision, immunity and reproduction. New physiological roles of vitamin A are continuously found during insulin action, energy saving, lipid metabolism and the nervous system (Altucci *et al*, 2001).

Retinoids are both pleiotropic groups-including vitamins and also hormones. Heterodimers may also be gotten between two molecules of retinoid receptors and also between the receptor of retinoid X and that of vitamin D as well as tri-iodothyronine. Retinoids may show agonistic activity, neutral antagonism and inverse agonism (Tsunati *et al*, 1990). Vitamin A had been extracted from fish oil at 1931 and the chemical structure was identified at the next year. Vitamin A was prepared chemically for the first time in 1947 (Isler *et al*, 1947). The pro-vitamin A carotenoids are metabolized to the active species of vitamin A, which is obtained naturally either as free vitamin A or combined as the biologically active esters, chiefly of palmitic and some myristic and dodecanoic acids (Wald *et al*, 1968). Retinol (which is alcoholic

and the aldehyde (retinal) are often named as preformed vitamin A. Retinal is converted by *in vivo* to retinoic acid, the metabolite of vitamin A necessary for gene transcription. Retinol, retinal, retinoic acid and other relatives are called retinoids whereas beta-carotene and other carotenoids that are transformed inside tissues into retinol are known as pro-vitamin A carotenoids (Tareq *et al*, 2010). Retinoids mean the chemicals that have physiological similarities with the natural vitamin A, but not necessarily the same structural formula (Wiegand *et al*, 1998).

In Vivo Bioconversion

Retinol is a hydrocarbon chain containing isoprenoid and at one end of the molecule has a hydroxyl group (Olson *et al*, 2015). The main source of vitamin A in vegetables is beta-carotene, while retinol esters found in animals (Castenmiller *et al*, 2015). Retinol and retinoids after digestion bind to proteins to become soluble in blood and cytosol. Inside the cell retinol metabolized as follows: first the conversion of retinol to an aldehyde (retinal) or to a carboxylic acid (retinoic acid) by hydroxyl group oxidation. In addition, retinol can undergo esterification by lecithin retinol acyl transferase (LRAT) or acyl-Co acyl transferase (ARAT), which result in the formation of palmitate retinol, as well as other chemical forms, such as retinol oleate, retinol linoleate and more (Napoli *et al*, 2015) (Fig. 1).

Naturally Occurring Retinoids

Vitamin A (retinol) and its metabolic derivatives retinaldehyde and retinoic acid are the natural retinoids