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Physical Activity, Ultraviolet B derived 1, 25-Vitamin D3 and Vascular Regeneration

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I read with interest the paper by Wong *et al* on the effects of vitamin-D supplementation on vascular repair [1].

Outdoor physical-activity promotes health as well as treat chronic conditions e.g. psoriasis possibly by increasing biosynthesis and biological-activity of active hormone 1,25-dihydroxycholecalciferol (1,25-dihydroxy-vitamin-D3; 1,25-VitD3) on endothelial function and vascular repair.

The beneficial effects of physical activity on endothelial function can be mediated in a number of ways, including synthesis of molecular mediators, changes in neurohormonal release and oxidant/antioxidant balance. Physical activity can also elicit systemic molecular pathways connected with angiogenesis and chronic anti-inflammatory action with consequent modification of the endothelial function [2]. It is already known that Vitamin-D receptors are present in all the major cardiovascular cell types including cardiomyocytes, arterial wall cells, and immune cells. Vitamin-D deficiency is associated with vascular diseases through mechanistic changes in endothelial cells, smooth muscle cells, macrophages, dendritic cells, T cells, cardiomyocyte and aortic valve fibroblasts [3]. Renin-angiotensin-systems are also present locally in almost all tissues of body. Hyperglycemia, obesity and hypertension stimulate tissue renin-angiotensin-systems whereas glucagon-like peptide-1, vitamin-D, and aerobic exercise are inhibitors of tissue renin-angiotensin-systems and to some extent can prevent metabolic diseases. Angiotensin II, stimulates reactive-oxygen-species, induces tissue damage, and can be associated with most diabetic complications [4] .

Increasing biological activity of sunshine (Ultraviolet B (UVB) exposure) derived 1,25-VitD3 is particularly relevant for South Asians (grandparents originating from India, Pakistan, Bangladesh) because they are viscerally obese, physically inactive and insulin resistant. There is an increased risk of endothelial dysfunction leading to diabetes, ischaemic heart disease and ischaemic stroke when compared with Europeans. There is no evidence that the diabetes and cardiovascular diseases status changes in South Asians with vitamin D supplementation or even with the fortification of foods with vitamin D or differences in sun exposure in different continents [5].

Sunlight exposure for adequate biosynthesis of biological active 1,25-VitD3 is discouraged particularly in the West because of fear of melanomas. A recent study ‘Melanoma in Southern Sweden’ demonstrated that avoidance of sun exposure was a risk factor for all-cause mortality. Sunburn might be an outdoor problem if a person is sunbathing (static exposure) rather than when conducting activity (motion).

Research resources are finite in these times of austerity and there are cost implications with vitamin-D supplementation at population level, as vitamin-D deficiencies are up to 70% in some population groups. Getting adequate vitamin-D from outdoor UVB exposure ought to be population-health goal. Measures to increase biological-activity of 1,25-VitD3 derived from UVB exposure through outdoor-physical-activity may well have the potential to stimulate both the increased *biosynthesis* and the *bioavailability* of cholecalciferol. Moreover, there is no issue of hypervitaminosis with UVB derived vitamin-D. Optimum doses of vitamin-D supplementation are not established and high doses induce ectopic vascular calcification.

It would be interesting to study the effects of physical-activity (sub studies: outdoor versus indoor activity; in summer versus winter) on biological-activity of active hormone 1,25-VitD3 by monitoring 24-hydroxylase expression and the effect this has on the prevention of cardio-metabolic conditions such as type 2 diabetes, autoimmune diseases and neoplastic conditions.

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