

Do sauna therapy and exercise act by raising the availability of tetrahydrobiopterin?

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Source

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Abstract

Sauna therapy has been used to treat a number of different diseases known or thought to have a tetrahydrobiopterin (BH4) deficiency. It has been interpreted to act in multiple chemical sensitivity by increasing chemical detoxification and excretion but there is no evidence that this is its main mode of action. Sauna therapy may act to increase BH4 availability via two distinct pathways. Increased blood flow in heated surface tissues leads to increased vascular shear stress, inducing increased activity of GTP cyclohydrolase I (GTPCH-I) in those vascular tissues which will lead to increasing BH4 synthesis. A second mechanism involves the heat shock protein Hsp90, which is induced by even modest heating of mammalian tissues. Sauna heating of these surface tissues may act via Hsp90, which interacts with the GTPCH-I complex and is reported to produce increased GTPCH-I activity by lowering its degradation. The increased consequent availability of BH4 may lead to lowered nitric oxide synthase uncoupling, such as has been reported for the eNOS enzyme. Increased BH4 synthesis in surface tissues of the body will produce increased circulating BH4 which will feed BH4 to other body tissues that may have been BH4 deficient. Similar mechanisms may act in vigorous exercise due to the increased blood shear stresses and possibly also heating of the exercising tissues and heart. There is a large and rapidly increasing number of diseases that are associated with BH4 depletion and these may be candidates for sauna therapy. Such diseases as hypertension, vascular endothelial dysfunction, multiple chemical sensitivity and heart failure are thought to be helped by sauna therapy and chronic fatigue syndrome and fibromyalgia may also be helped and there are others that may be good candidates for sauna therapy.

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