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The Effects of Different Exercise Modalities on s-Klotho after Surgery: A Call for Action

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Although phrased in many different ways, it has been known for many years that different modalities of exercise may have a positive influence on the extent and pace of recovery from different types of surgery. Now days this idea is termed "Exercise is Medicine", and has great relevancy to post-surgery recovery through exercising.

Klotho gene expression in positively influenced by different exercise modalities acting as an epigenetic influencer [1], resulting in increased work capacity, performance, and lifespan, and decreased aging in healthy and diseased populations [2-4]. As is the case with exercise, positive adaptations decrease and diminish with time if exercise training is not maintained.

Klotho is a transmembrane protein that provides some control over the sensitivity of the organism to insulin and appears to be involved in aging [5]. Age-related declines are manifest by a decreased ability for aged skeletal muscle to respond to physiological stimuli such as muscle loading or acute injury, and disease related effects [6,7].

Regular aerobic exercise participation promotes health and disease prevention [8].

Endurance exercise like biking, walking, swimming and running, appear to benefit longer life expectancy than anaerobic exercise like power lifting [9]. It has been suggested that circulating Klotho levels are upregulated in response to an acute exercise bout, but that the response may be dependent on fitness level [10-13].

Compared to sedentary young and old subjects, in the elite well aerobic trained young runners and master athletes s-Klotho levels are markedly elevated while, IGF-I levels were decreased [14]. IGF-I is generally thought to be associated with anabolism and wellbeing [15], yet, signaling through IGF-I and Insulin receptors is negatively related to adults [16]. A meta-analysis study indicated that increased circulating concentrations of IGF-I is associated with increased risks for colorectal, prostate, and premenopausal breast cancers [17].

Several clinical studies have suggested that Klotho gene exerts strong cardio-protective effects. S-Klotho has been proposed as a key regulator of the development of cardiovascular disease. An association between low levels of s-Klotho and the occurrence and severity of cardiovascular disease has been reported, as well as a reduction of cardiovascular risk when levels were high [17]. This protein is related to the attenuation of vascular calcification as well as prevention of cardiac hypertrophy.

In recent years, studies have been conducted in order to study the effects of different types of surgery on s-Klotho in a variety of research designs.

Kakareko et al. [18] concluded that "Nephrectomy among patients with preserved renal function before surgery does not increase c-FGF-23 but reduces sKL. Moreover, nephrectomy results in derangements in bone turnover markers in short-term follow-up. These changes may participate in pathogenesis of bone disease after nephrectomy".

Liao et al. [19] reported as part of their study's conclusions that "There was no change in circulating FGF23 and Klotho concentrations after PTX in hemodialysis patients given postoperative calcium supplements and/or vitamin D analogue. Serum FGF23 concentrations pre-PTX and at days 5 and 90 after PTX were inversely related to serum calcium concentrations".

Kimura et al. [20] concluded that "The current data regarding the urinary soluble Klotho in recipients support the hypothesis that the kidney is a major source of urinary soluble Klotho among the numerous components of the urinary tract. In living donors, the complex nature of events associated with acute reductions in the renal mass may modulate the release of soluble Klotho from the kidneys into the urine".

Takahashi et al. [21] while aiming to "determine the impact of parathyroidectomy [PTx] on serum FGF23 and soluble Klotho levels in patients with severe secondary hyperparathyroidism" suggested that "the parathyroid gland is not the major site of soluble Klotho production in patients with end-stage renal disease, and the production of Klotho by other organ(s) is affected by alterations in mineral metabolism or medications taken after PTx".

Kohler, et al. [22] concluded that "Soluble Klotho could be useful in the follow-up of acromegalic patients. The question arises whether s-Klotho not only reflects the activity of GH-secreting pituitary adenomas but whether Klotho (ectodomain clipping?) could also mediate selected actions of GH" while GHR genotyping 112 patients with acromegaly after transsphenoidal surgery.

While s-Klotho is being researched more and more as of late, to the best of the author's knowledge, very few data exist that has been published in peer reviewed journals pertaining to the influence of exercise on s-Klotho, an "emerging" new biomarker of anti-aging and health, evermore so when it pertains to the influence of post-surgery exercising on this biomarker.

As both data pertaining to the role of surgery of different types on s-Klotho and data pertaining to the influence of exercising post-surgery on s-Klotho are limited, it is the wish of the author via this editorial to call for more research to be conducted in order to establish an ever-growing pool of knowledge regarding the influences of surgery and post-surgery exercising on s-Klotho.

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