Carnitine as a potential therapeutic agent in PCOS: Impacts on metabolism and hormonal balance.

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Introduction

Carnitine, a naturally occurring compound primarily involved in fatty acid metabolism, has garnered attention as a potential therapeutic agent in managing Polycystic Ovary Syndrome (PCOS), a common endocrine disorder affecting women of reproductive age [1]. PCOS is often characterized by insulin resistance, hormonal imbalances, and metabolic disturbances, which contribute to the disorder's symptoms, including irregular menstrual cycles, infertility, and excessive androgen production [2]. The potential role of carnitine in mitigating some of these issues lies in its ability to improve metabolic function and restore hormonal balance [3].

Carnitine plays a pivotal role in the transport of long-chain fatty acids into mitochondria for beta-oxidation, thus facilitating energy production [4]. In women with PCOS, insulin resistance and obesity are common, leading to an increased risk of metabolic syndrome. Carnitine supplementation has shown promise in improving insulin sensitivity by enhancing glucose metabolism, a key factor in managing PCOS-related metabolic disturbances [5].

Studies have reported that carnitine supplementation can reduce insulin resistance and lower circulating insulin levels, which are typically elevated in women with PCOSarnitine has been observed to exert positive effects on hormonal balance, particularly in reducing elevated androgen levels, which are a hallmark of PCOS [6].

High androgen levels contribute to symptoms such as hirsutism, acne, and alopecia. Research suggests that carnitine's ability to modulate hormonal profiles might be linked to its influence on lipid metabolism and oxidative stress reduction [7]. By decreasing oxidative stress and improving mitochondrial function, carnitine may help lower the production of excess androgens by the ovaries and adrenal glands. This reduction in androgen levels could, in turn, help alleviate some of the physical manifestations of PCOS [8].

Moreover, carnle in reducing oxidative stress is particularly important in PCOS, as women with the condition often exhibit elevated levels of reactive oxygen species (ROS), which contribute to cellular damage and exacerbate both metabolic and reproductive dysfunctions [9]. By acting as an antioxidant, carnitine helps mitigate this oxidative damage, potentially improving ovarian function and the overall reproductive health of women with PCOS [10].

Conclusion

Carnitine holds promise as a therapeutic agent in the management of PCOS by addressing both metabolic and hormonal imbalances. While further research is needed to fully understand its mechanisms and efficacy, the existing evidence supports the potential benefits of carnitine supplementation in improving insulin sensitivity, reducing oxidative stress, and normalizing androgen levels in women with PCOS.

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