

Abstract

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Ubiquinone and tocopherol: dissimilar siblings.

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BACKGROUND: Research on antioxidants and their potential health benefits expanded over the last decades from basic science to the medical and nutritional fields. This included supplementation studies of both vitamin E compounds and the endogenous antioxidant ubiquinone, to prevent or alleviate cardiovascular diseases and their pathophysiological consequences.

DISCUSSION: In many of these studies, only one antioxidant or one group of antioxidants was considered, disregarding the pharmacological and toxicological properties of their metabolites as well as possible cooperative and competitive effects on the overall physiological response. There are many--often indirect--effects, especially in gene regulation, observed on administration of both compound groups in cells, which have been assigned to these molecules without identifying the cellular targets.

SUMMARY: Therefore, this article focuses on direct chemical and biochemical effects of ubiquinone- and alpha-tocopherol-related compounds, which are evident from direct binding studies or direct interaction leading to chemical modification of the compounds. These groups include para-benzoquinones (ubiquinone and alpha-tocopheryl quinone) and chroma(e)nols (alpha-tocopherol and bicyclic ubiquinone derivatives). Their effects as antioxidants, co-antioxidants, and pro-oxidants as well as direct interactions with proteins are considered, pointing out similarities and dissimilarities of the two compound groups in a wider context.

CONCLUSION: The review of the isolated findings about one or a few of these compounds in the literature, disregarding structurally related compounds, suggests that comprehensive structure/activity relationship studies including related compounds would promote the understanding of biological functions and pharmacological effects of ubiquinone- and alpha-tocopherol-related compounds.

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