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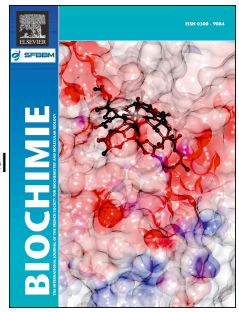

Exploring the biophysical properties of phytosterols in the plasma membrane for novel cancer prevention strategies

Omar Fakih, Didem Sanver, David Kane, James L. Thorne

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ABSTRACT

Cancer is a global problem with no sign that incidences are reducing. The great costs associated with curing cancer, through developing novel treatments and applying patented therapies, is an increasing burden to developed and developing nations alike. These financial and societal problems will be alleviated by research efforts into prevention, or treatments that utilise off-patent or repurposed agents.

Phytosterols are natural components of the diet found in an array of seeds, nuts and vegetables and have been added to several consumer food products for the management of cardio-vascular disease through their ability to lower LDL-cholesterol levels. In this review, we provide a connected view between the fields of structural biophysics and cellular and molecular biology to evaluate the growing evidence that phytosterols impair oncogenic pathways in a range of cancer types. The current state of understanding of how phytosterols alter the biophysical properties of plasma membrane is described, and the potential for phytosterols to be repurposed from cardio-vascular to oncology therapeutics. Through an overview of the types of biophysical and molecular biology experiments that have been performed to date, this review informs the reader of the molecular and biophysical mechanisms through which phytosterols could have anti-cancer properties via their interactions with the plasma cell membrane. We also outline emerging and under-explored areas such as computational modelling, improved biomimetic membranes and *ex vivo* tissue evaluation. Focus of future research in these areas should improve understanding, not just of phytosterols in cancer cell biology but also to give insights into the interaction between the plasma membrane and the genome. These fields are increasingly providing meaningful biological and clinical data but iterative experiments between molecular biology assays, biosynthetic membrane studies and computational membrane modelling improve and refine our understanding of the role of different sterol components of the plasma membrane.