

Nano Transdermal Delivery Potential of Fucoidan from *Sargassum* sp. (Brown Algae) as Chemoprevention Agent for Breast Cancer Treatment

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ABSTRAK

Conventional chemotherapy substances are associated with mild to severe side effects that affect both healthy and cancer cells. It is presumed to improve therapeutic efficacy in coexistence reducing chemotherapy's side effects. Fucoidan is an anticancer bioactive compound derived from *Sargassum* sp. that has low cytotoxic activity. The purpose of this study was to explore the effectiveness of anticancer activities of fucoidan from *Sargassum* sp. against breast cancer then analyze the suitability of nano transdermal patch of fucoidan and blueprint the long-term research design of nano transdermal patch as a chemoprevention agent in the chemotherapeutic management of breast cancer. This research was performed through a literature study and *in silico* study by imposing carbonic anhydrase IX (CA IX) as a marker of hypoxia and metastatic state of cancer cells. The results showed that the fucoidan from *Sargassum* sp. effectively induced apoptosis and prevented metastasis of breast cancer cells through the Bcl-2, Bcl-w, and bad pathways. Fucoidan, in addition, was predicted to inhibit CA IX by Glu4 Glu5, Leu7, Pro8, and Asp6 residues. Therefore, the delivery of fucoidan is favored to have a local effect on the site of breast cancer cells by nano transdermal patch preparations using fucoidan nanoparticle polymer. Further nano transdermal patch development as a treatment for breast cancer is suggested through the stages of formulation optimization, optimum formula activity testing, patent filing, and distribution in health services.

Key words: *Anticancer, Breast cancer, Fucoidan, Nano transdermal, Sargassum sp. .*