Seaweed and Spheroids: Investigating the Maintained Anti-Cancer Efficacy of the Seaweed Extract Fucoidan Against Adenocarcinoma Cultured Two and Three Dimensionally, Year III

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Fucoidans are sulfated polysaccharides that provide structure in brown seaweeds. Medical research has found a substantial amount of evidence for the investigation into fucoidan as an anticancer agent. Fucoidans have been observed to have an adverse effect on the viabilities of cancer cells, either by inducing apoptosis, performing a G0/G1 arrest in cancer cells, or inhibiting metastasis by harming the production of fibronectin. This project aimed to investigate how successful fucoidan is at maintaining its anticancer efficacy when advancing from 2D to 3D models. Spheroids are three-dimensional cultures of cells used to better model tumor microenvironments. MCF-7 adenocarcinoma cells were cultured into spheroid structures by being fed magnetic nanoparticles and subsequently exposed to a magnetic field, inducing accumulation. Two separate cultures of the cells, one grown two-dimensionally and the other grown three-dimensionally were treated with solutions of fucoidan in phosphate-buffered saline (PBS), paclitaxel in PBS as a positive control, paclitaxel and fucoidan together in PBS, and vehicle and negative controls of PBS and nothing respectively. Pictures of the spheroids were taken before and after treatment for visual analysis of their structures. Post-treatment, an MTT assay was performed to determine the cell viabilities in each group. The results of the MTT assay for the 2D trial indicated that the fucoidan had a significantly adverse effect on the breast cancer cells. The visual analysis of the spheroids post and pre-treatment from the 3D trial revealed similar impacts in the fucoidan, as it severely damaged the structures of the spheroids.

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