Abstract

It has been demonstrated that Linoelaidic acid, an isomer of omega-6 fatty acid, can prevent cancer both *in vivo* and *in vitro* by decreasing cell viability, increasing oxidative stress, causing DNA fragmentation, and inducing cell cycle arrest. Linoelaidic acid is obtained from the oil of Tapra fish (***Opisthopterus tardoore***). Breast cancer, the most common disease among women worldwide, is a major public health concern that impacts individuals and communities everywhere, but particularly in low- and middle-income countries. Even though there are efficient therapies and early detection techniques, there are still issues with disparities in access to care, different survival rates, and the disease's many risk factors. In order to lessen the burden of the disease and enhance results, societal efforts concentrate on early identification, prompt diagnosis, thorough management, and lowering risk factors through lifestyle modifications. There are many type of medication and chemotherapeutic treatments available in market for cancer treatment but these treatments are very expensive, time consuming, less effective and not free from the side effects and also not an ultimate treatment of cancer. Towards alternative treatment strategies, this Ph.D. work was aimed to establish an innovative approaches to manage the cancer by supplementation of Linoelaidic acid in both in vivo and in vitro which might be shown increment of apoptosis rate in cancer by covering the basic physiological process for the management of cancer by noting the upregulation of p53 on cell proliferation inhibition and DNA fragmentation.

To achieve the ultimate aim and objectives of the thesis, **at first** the Linoelaidic acid was identified after isolation and characterization of Tapra fish (*Opisthopterus tardoore*) oil and also check out the purification of Linoelaidic acid by using HPLC. For checking the edibility of this fish oil physicochemical properties was checked. **Second experiment** was designed to check the anticancer potentiality of Linoelaidic acid by checking cell viability, cell cytotoxicity, intracellular redox balance, and checked different gene expression of both ER

positive(MCF-7) & ER negative (MDA-MB-231) human breast cancer cell line after treatment with linoelaidic acid in different doses (2µM/ml, 5µM/ml, 10µM/ml) and also checked the effect of Doxorubicin (5µM/ml) on MCF-7 and MDA-MB-231 human breast cancer cell line. **Third experiment** was designed to check if there are any adverse effect of Linoelaidic acid on Peripheral Blood Lymphocyte (PBLs) which is known as a normal blood cell. This experiment demonstrated that both Linoelaidic acid and Doxorubicin was applied on Peripheral Blood Lymphocyte (PBLs) as per same doses applied on MCF-7 and MDA-MB-231 human breast cancer cell line by checking cell viability, cell cytotoxicity, intracellular redox balance measurement and responsible gene marker of apoptosis was checked. In that case the Doxorubicin shows adverse effect on Peripheral Blood Lymphocyte (PBLs) but there is no hazardous effect find out on PBLs after supplementation with Linoelaidic acid. In **fourth experiment** of this work explained about the mechanism of apoptosis induces by Linoelaidic acid on both MCF-7 and MDA-MB-231 human breast cancer cell line by Immunoblotting, morphological changes of these two types of breast cancer cell line and DNA fragmentation. After completion of *in vitro* study we applied Linoelaidic acid on in vivo (C57BL 6J) model in **fifth experiment.** Mice were separated in 4 groups, and injected with MDA-MB-231 cancer cell at 5×10^6 cell /100g body weight. After 15 days treatment group I, II and III were treated with Linoelaidic acid at selected dose up to 56 days. After sacrifice tumor size was measured, single cell prepared from tumor tissue and morphological changes was checked by using DAPI staining, AO/Et-Br dual staining, and DNA fragmentation by TUNEL assay.

The overall findings and outcomes from all the experiment, it has been proved that Linoelaidic acid mitigates the cell viability in both *in vivo* and *in vitro* group without hampering the normal cell. Linoelaidic acid helps to increase the mitochondrial dysfunction for increase the oxidative stress to initiate apoptosis. So that it may be established that it is an innovative approach that the source of linoelaidic acid is cheap, more convenient and harmless therapy

and people can easily consume this type of fatty acid though their daily diet as food component to prevent or manage breast cancer. This Tapra fish **(*Opisthopterus tardoore*)** is easily available in the southern part of West Bengal. All type of community people can easily effort this fish as their daily diet.