Omega 3 & 6 and cancer

Different Fatty Acid composition between normal and malignant cell lines

It is well recognized that exogenous fatty acids may be toxic to cultured cells at higher concentrations. In blood, the highest solubility of free fatty acids is 1 um above this concentration free fatty acids may act as detergents and disrupt protein and membrane architecture. Saturated fatty acids can be synthesized from acetyl-CoA and malonyl-CoA up to palmitic acid, then elongated and desaturated to longer chain fatty acids. Although mammalian systems possess four desaturases (Δ9, Δ6, Δ5 and Δ 4); they are unable to insert double bonds into positions beyond Δ9 Previous in vitro studies have demonstrated that the capacity of various polyunsaturated fatty acids (PUFA's) of killing cancer cells was associated to their ability to generate free radicals that stimulate the production of secondary products of lipid peroxidation.

These studies have been further validated in an in vivo system utilizing human mammary carcinoma cell lines (MDA-MB 231 and MCF-7) transplanted to nude mice. This growth inhibitory PUFA effect can be blocked by the addition of antioxidants such as vitamin E. However, one study showed that C20:5 n-3 had 60 % cell growth inhibition of human lung, breast and prostate carcinoma cells, while C22-6 n-3 had only 30 %. In another study C12:0 and C16:0 inhibited the growth of colon cancer cells (HT-29), in more significant manner than 18-2 n-6 and this inhibitory action was not blocked by vitamin E. These studies suggest yet another mechanism in addition to lipid peroxidation that may be operating in the fatty acid effect upon cell proliferation.

Differences in prostaglandin metabolism have been suggested. Nevertheless it seems paradoxical that the same fatty acid could either be a promoter of tumor genesis or an anti-tumor agent. It has been reported that the linoleic acid (LA), an essential fatty acid, can

be an effective promoter of mammary tumor genesis. In contrast it has also been reported that LA suppressed malignant cell line proliferation in culture. While we have tackled this issue previously, we believe that fatty acids influence upon cell metabolism can be different in different types of cell. We also believe that by balancing fatty acids (Omega 3 and 6) in the cell we may positively influence membrane transport, energy and prostaglandin metabolism.

Therefore by modifying cell membrane fatty acid composition we may be capable of modulating many aspects of cell metabolism including cell proliferation. In this way it becomes relevant to know the fatty acid composition of these normal and malignant cell liver frequently used in the laboratories. In this study four normal and seven malignant cell lines were analyzed for fatty acid composition.