Flaxseed oil reduces the growth of human breast tumors (MCF-7) at high levels of circulating estrogen.

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Abstract
Flaxseed (FS) has been shown to attenuate mammary tumorigenesis, possibly due to its high alpha-linolenic acid (ALA)-rich oil (FSO) content. This study determined the effect of FSO on the growth of estrogen receptor-positive human breast tumors (MCF-7) in ovariectomized athymic mice at high premenopausal-like estrogen (E2) levels. Mice with established MCF-7 tumors were fed basal diet (control) or basal diet supplemented with FSO (40 g/kg) for 8 wks. Compared with control, FSO reduced tumor size (33%, p<0.05) and tumor cell proliferation (38%, p<0.05) and increased apoptosis (110%, p<0.001). FSO also reduced human epidermal growth factor receptor-2 (79%, p<0.05) and epidermal growth factor receptor (57%, p=0.057) expression, which then may have led to a reduction in Akt (54%, p<0.05) and phosphorylation of mitogen-activated protein kinase (MAPK) to phosphorylated MAPK (pMAPK, 28%, p<0.05). Insulin-like growth factor-1 receptor, vascular endothelial growth factor receptor, MAPK and phosphorylated Akt were not affected. FSO increased (p<0.001) serum ALA, eicosapentaenoic acid and docosahexaenoic acid and, in vitro, ALA reduced MCF-7 cell proliferation (33%, p<0.001). Thus, FSO regressed estrogen receptor-positive human breast tumorigenesis at high E2 levels via downregulation of the growth factor mediated pathway, likely through its ALA content, and may explain the anti-tumorigenicity of FS.

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