Omega-3 fatty acids more effective at inhibiting growth of triple-negative breast cancer

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Researchers from Fox Chase Cancer Center have found that omega-3 fatty acids and their metabolite products slow or stop the proliferation, or growth in the number of cells, of triple-negative breast cancer cells more effectively than cells from luminal types of the disease. The omega-3s worked against all types of cancerous cells, but the effect was observed to be stronger in triple-negative cell lines, reducing proliferation by as much as 90 percent. The findings will be presented at the AACR Annual Meeting 2013 on Tuesday, April 9.

Omega-3 fatty acids are found in oily fish like sardines and salmon, and also in oils derived from plants like hemp and flax. Previous studies suggest these compounds can negatively affect critical mechanisms in cancer cells, namely those responsible for proliferation and for apoptosis, or programmed cell death. Lead author on the study Thomas J. Pogash, a scientific technician in the Fox Chase Cancer Center lab of Jose Russo, MD, says the new work underscores the important role common compounds found in food may play in keeping cancer at bay.

"Diet can play a critical role in breast cancer prevention," says Pogash. "When you compare a western diet to a mediterranean diet, which has more omega-3s, you see less cancer in the mediterranean diet. They eat much more fish."

Breast cancer is a heterogeneous group of cancers comprising diseases

that differ on the molecular level. Patients with different types of breast cancer respond differently to treatments. Four distinct categories of the disease are generally recognized. Two of those, luminal A and luminal B, grow in the luminal cells that line milk ducts in the breast and have receptors for estrogen and progesterone (prognosis is generally better for patients with luminal A than with luminal B). A third category includes tumors that test positive for the HER2 receptor.

Tumors in the fourth category, triple-negative, lack receptors for progesterone, estrogen, and a protein called HER2/neu. As a result, this type of disease is insensitive to treatments like trastuzumab, which disrupts the HER2 receptor, and tamoxifen, which targets the estrogen receptor.

Russo notes that no targeted therapies are currently available for patients diagnosed with triple-negative breast cancer. Combination chemotherapies are the standard of care for early-stage disease.

"This type of cancer, which is found more frequently in Latina and African-American women, is highly aggressive and has a low survival rate," says Russo. "There is not any specific treatment for it."

When a cancer cell digests omega-3s, the fatty acid is broken down into smaller molecules called metabolites. Russo, Pogash, and their colleagues tested the effect of large omega-3 parent molecules, as well as their smaller metabolic derivatives, on three luminal cell lines and seven lines that included basal-type triple-negative cells.

Omega-3 and its metabolites were observed to inhibit proliferation in all cell lines, but the effect was dramatically more pronounced in the triple-negative cell lines. In addition, the metabolites of omega-3 reduced the motility, or ability to move, by 20-60 percent in the triple-negative basal cell lines.

This study is part of a consortium between Fox Chase Cancer Center and Pennsylvania State University under a five-year grant awarded by the Komen Foundation. Russo is the principal investigator of the project at Fox Chase. Andrea Manni, MD, leader of the Pennsylvania State University team, has extended this work to animal models, studying the anticancer effects of omega-3s and its metabolites on mouse models of triple-negative breast cancer.

Russo and his colleagues are working on two related projects, one on the role of epigenetic events in the mechanism of cell transformation and another on the potential action of peptides of the hormone human chorionic gonadotropin (hCG) on breast cancer prevention.

Provided by Fox Chase Cancer Center