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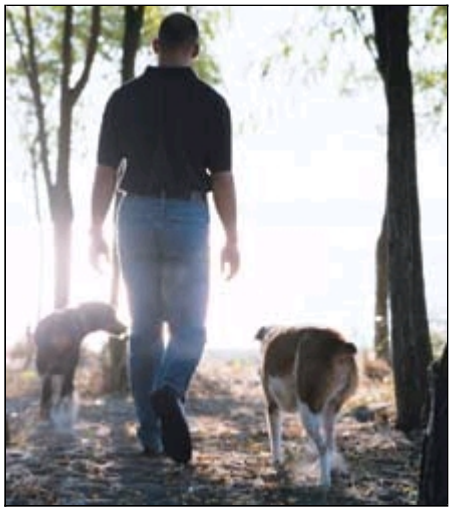
REPORT

Arginine and Fish Oil May Help Cancer Patients Undergoing Chemotherapy



When the people at Hills Pet Nutrition went looking for a diet that would help dogs with cancer, they didn't know it would take ten years to come up with the formula. In the end, they found that two things make a significant difference in remission and survival time: arginine and fish oil. Details of the diet and the research behind it were published as a 13-page report in Cancer, the journal of the American Cancer Society.

The American Cancer Society reports show that dogs with cancer (lymphoblastic lymphoma in this case) have elevated levels of lactic acid and insulin in their blood. These abnormal elevations go along with wasting syndrome, decreased survival time, and decreased time to recurrence. By normalizing levels with arginine and fish oil, the researchers were able to reverse these trends, and significantly increase survival time. (Survival time for stage III was 700 days with the supplemented diet versus 400 for the regular diet; the time to recurrence for dogs with the supplemented diet was 425 days versus 275 days without supplements).

All participants in the study were pets whose owners had brought them in for cancer treatment. All were given the standard chemotherapy of doxorubicin, and other drugs if warranted. The amount of arginine given to the dogs on the experimental diet was about double the usual amount; fish oil was 140 g EPA and 120 g DHA per kilogram of the animal's weight. An important point about the fish oil is that its ratio in relation to the n-6 fatty acids in the diet (from vegetable oils such as safflower oil) is more important than its absolute amount.

Along with lowering lactic acid and insulin, arginine and fish oil also lowered levels of cytokines that promote inflammation. Cytokines can help the growth of cancer and enable it to spread. Omega-6 oils are detrimental because they enhance production of these cytokines and enable growth. Omega-3 oils, such as fish oil, do the opposite-they hinder cancer growth. Omega-3 fatty acids can also sensitize cancer cells to doxorubicin.

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Arginine helps immunity

Over the past decade, surgical oncologists at the University of Pennsylvania have been investigating the effects of arginine against cancer. Arginine is an amino acid that is converted two different ways: it can become L-ornithine, or it can become nitric oxide. Each has different actions with regard to cancer. If it's converted to nitric oxide, it helps the type of immune cells that attack cancer. However, the tumor has to be of the type that promotes this response, i.e., it has to have antigens that provoke the production of anti-tumor antibodies. If it's converted to L-ornithine, it can help cancer grow (see subhead, "Arginine has opposite effects on some cancers").

Most people with cancer have some sort of surgery. Post-operative immune suppression is well-documented. In 1992, the Pennsylvania researchers reported that arginine has a beneficial effect on the immunity of cancer patients. People who underwent surgery for upper gastrointestinal malignancies would recover crucial aspects of their immunity only if given arginine, RNA and omega-3 fatty acids; otherwise, certain immune responses would stay depressed. They concluded that the three supplements "significantly improved immunologic, metabolic, and clinical outcomes in patients with upper gastrointestinal malignancies who were undergoing major elective surgery." In a different study on patients with colorectal cancer, 30 grams of L-arginine a day for 3 days before surgery caused the tumors to have more antigens (for immune cells to home in on).

Breast cancer patients undergoing chemotherapy have also benefitted from arginine. In a study from the University of Aberdeen, women who took 30 grams/day for 3 days prior to

each chemo treatment had stronger immunity.

Arginine and cancer growth

It has been known since the 1950s that arginine can stop the growth of some types of cancer cells. The idea of creating an "imbalance" of amino acids to cripple the growth of cancer cells was published in 1958. Cancer cells, just like normal cells, rely on certain amino acids for growth. The idea of overloading cancer cells with amino acids they don't want, and starving them of ones they do, has since proven to be a viable approach to cancer treatment.

Some cancers are hindered by excess arginine. Researchers in Japan gave rats infusions of arginine at the same time they were implanted with Yoshida sarcoma, and arginine proved very beneficial at slowing this cancer down at the early stages. It also inhibited metastases. Fifty percent of the animals receiving arginine had metastases to the liver versus 100% for those not receiving it. Similarly, 75% had lung metastases versus 100%. In the arginine-infused animals, the metastases were smaller and more localized. In addition, arginine helped maintain nitrogen balance and increased the activity of immune cells. Cancer causes alterations in the natural balance of amino acids: arginine was able to prevent this.

In other studies, the growth of human breast cancer cells (MCF-7) in vitro has been slowed with supplemental arginine. Arginine can also block the growth of mammary tumors in rodents.

Arginine has opposite effects on some cancers

Arginine does not always stop the growth of cancer. It can do the opposite. Arginine-induced growth has actually been used to good effect in an experiment where researchers were trying to put more cancer cells in the S-phase where they would be more readily killed by a certain chemotherapeutic drug. (Under normal circumstances, however, enhancing growth is obviously not desirable.)

Research shows that at least one pancreatic cancer cell line is arginine-dependent. And other studies show that if arginine is given at a certain phase of cancer development, it can promote, rather than block, growth.

The reason that arginine can act differently, depending on the cancer, probably has to do with an enzyme known as arginase. If the cancer creates a lot of the enzyme, it appears that it will use arginine to promote growth by converting it to L-ornithine. If the cancer doesn't create much arginase, it probably converts arginine to nitric oxide instead. Nitric oxide is used by immune cells to fight cancer. Since cancer cells are not tested for arginase, it's impossible to tell what effect arginine will have on cell growth. For that reason, arginine's role at this time is limited to its potential use as an immune stimulant during traditional cancer treatment, along with fish oil.

Human Cancer Cell

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