RESEARCH BULLETIN

Shark Cartilage & Antiangiogenesis

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Cancer has become one of the most frightening words today. We are constantly reminded that one in three individuals will develop this dreaded disease in their lifetime and, while science has had success in healing some cancers, to most people the diagnosis of cancer elicits the fear of pain, suffering and death. Shrouded in this frightening word is the confusion over how this could happen. Most individuals feel that they are random targets of some unknown environmental or genetic lottery.

In reality, cancer statistics reveal that only 2% of diagnosed cancers are related to environmental pollution and 12% are related to genetic tendencies. Scientists now concur that over 65% of cancers are directly related to life-style. In further scrutinizing the disease process, science has learned that life threatening illness, such as cancer, are multistep processes in which cells accumulate multiple genetic alterations as they progress to more malignant mutations.
Although there are many steps along this road, some scientists have grouped them into three distinct phases.

The first phase in the process is the damage caused by agents collectively referred to as *carcinogens*. Carcinogens may be chemicals, radiation or viruses which, by themselves do not necessarily lead to cancer. In order for cancer to develop, the process must proceed to the point where precancerous cells will reproduce, associate and develop their own blood supply and defense system.

The second phase in cancer development is called *"promotion".* In this phase precancerous cells are allowed to reproduce rapidly and change their membrane surface properties to those characteristic of malignant cells. Even with promotion, the proliferating cells will not necessarily develop into cancer. Scientists tell us that the cell mass must grow large enough to affect the body's metabolism and start its own blood supply and defense system. Science suggests we still have a chance to stop this promotion phase by eliminating known promoters such as smoking, alcohol, stress and poor diet.

The third phase is called "progression" and directly infers cancer, including the malignant tumors of carcinoma and adenocarcinoma and eventually metastasis (the spread of cancerous cells to other areas).

Progression can often be a "bone-chilling" word when used by your doctor or other health care professional who is evaluating your ongoing chronic health problem. When associated with cancer, this word suddenly thrusts us into a state of disbelief, despair and confusion. How could this be happening to me? Do I seek a second or third opinion, or do I just have to accept my fate?

This happens hundreds of times daily and places the heaviest burden on those who are the most uninformed and unprepared, and do not know where to turn for help.

The fear is often justified, since the "progression" phase is the most difficult to address.

It is during this phase that the body makes new blood vessels, a process called "neovascularization" or "angiogenesis". Angiogenesis is derived from "angio" meaning "pertaining to blood vessels" and "genesis" meaning "formation of"; therefore, the development of blood vessels.

In the "progression" phase, patients are quickly introduced to conventional therapies as their only hope for survival. These treatments are designed to cure cancer by destroying cancer cells. Chemotherapy and radiation, while somewhat effective at poisoning life threatening malignant cells, also damage and destroy healthy cells and cause tremendous suffering to an already weakened patient.

Stopping the *Progression* of Cancerous Tumors

It is widely recognized that solid tumors are formed by growing colonies of abnormal cells. As this growing mass increases in size, it develops a network of blood vessels to provide it with adequate blood supply and nourishment. This process has been collectively referred to as *angiogenesis*.

It is well recognized that a blood vessel network is needed to feed the tumor and remove its waste products.

By producing new capillaries through angiogenesis (also called vascularization), the tumor is able to increase its nutrient and blood supply in order to sustain its enormous rate of growth.

Many cancer researchers are in agreement that the logical place to look for natural inhibitors of angiogenesis, which could effect cancerous cells even in the proliferation stage, would be in tissue not having blood vessels (avascular).

The most common avascular tissue is cartilage.

Could it be that cartilage is avascular tissue because it contains inhibitors of new vascularization?

Discovering an Alternative Treatment
A factor that inhibits tumor growth

In the mid-70s, at the Massachusetts Institute of Technology, **Dr. Robert Langer and Dr. John Prudden** discovered a factor in cartilage that inhibited tumors.[1] Shortly thereafter, in 1975 scientists showed that they could inhibit capillary growth by 75% using a form of cartilage. In this study, it was shown that new blood vessel growth was prevented completely in 28% of the tumors.[2] These experiments suggest that some inhibitor present in cartilage directly interfered with the growth of capillaries. They further suggest that this factor could prove useful in keeping tumors in check through a process called *antiangiogenesis*.[3]

Dr. Judah Folkman of the Children's Hospital of Boston has pioneered the research into the relationship between this blood vessel growth process (angiogenesis) and tumor growth in cancer. In 1987, he hypothesized that solid tumors are dependent on angiogenesis and that substances with antiangiogenetic activity could potentially be used to treat cancer.[4]

In the search for answers, Dr. Folkman's research showed that if a tumor cannot develop this extensive network of blood vessels to feed itself, it will not grow beyond the relatively small size of 1 to 2 millimeters in diameter (about the size of a pinhead).[5]

He was further able to show that tumors larger than this stopped growing when they were separated from their capillary bed (source of blood and nutrients). However, the same tumor resumed it's rapid growth when the vascular network was restored.[6]

This work opened the door for the development and discovery of new strategies that could possibly slow or prevent this network of blood vessels from forming.[7]

Shark Cartilage an Inhibitor of Tumor Angiogenesis

The first public attention on this research came in a 1983 article in the journal *Science* titled "***Shark Cartilage contains Inhibitors of Tumor Angiogenesis***", which proposed that shark cartilage contains a substance that strongly inhibits the growth of red blood vessels toward solid tumors, thereby restricting tumor growth.[8]

Further research revealed that the active substances in Shark Cartilage do not act directly on tumors themselves, but starve them by depriving them of their blood supply and nourishment.

Additional studies followed. One study of particular interest examined transplanted tumors that were not allowed to develop new capillaries. Over a two week period there was no tumor growth. During the same period, tumors that were allowed to develop a new blood vessel network underwent extremely rapid growth, increasing their volume by 16,000 times.[9]

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A Belgian Chemotherapist, **Dr. Ghanea Atassi of the Institute Jules Bordet in Brussels** (one of the largest and most prestigious cancer research centers in Europe) has shown a direct relationship between angiogenesis and tumor growth. In his research, he used nude mice (mice bred specifically for cancer research with no immune system) that were grafted with human cancers under their skin. After transplanting human melanoma into his nude mice and waiting two days, the mice were given dried shark cartilage powder orally. After twenty-one days, the tumors in the control group were growing at an exponential rate, while the tumors in the mice receiving oral shark cartilage had hardly progressed.

It was further observed that the untreated tumors in the control group were developing their capillary beds during the first 14 days of the experiment. After that, the tumor growth rate literally exploded. By contrast, the tumors in the mice treated with shark cartilage showed about a 40 percent shrinkage between day fourteen and day twenty one because they were unable to nourish themselves.[10]

In 1988, **Patricia D'Amore** proposed that metastasis (the spreading of cancer) may depend on the growth of new blood vessels. She reasoned that "since vascularization is so clearly essential for the establishment and subsequent growth of metastases, it seems equally obvious that inhibition of vascularization might be a way to prevent the formation of metastases.[11] Further research has demonstrated that the destruction of tumor tissue is exponentially related to the reduction of vascularization.[12] Her research shows that the destruction or prevention of a single capillary segment led to the death or inhibition of thousands of tumor cells.[13]

In 1990, **researchers at the Massachusetts Institute of Technology** isolated and identified the antiangiogenesis factor in cartilage as a macro protein and named the substance cartilage-derived inhibitor (CDI).[14]

On December 26, 1991, **Dr. William Lane, the author of the book, Sharks Don't Get Cancer,** was granted a U.S. Patent covering the use of shark cartilage to inhibit angiogenesis. This patent was fully supported by a CAM assay and by showing the inhibition of angiogenesis by Shark Cartilage. Additional patents are underway.

On February 28, 1993, the television show, "60 Minutes" televised an interview by Mike Wallace with **Dr. Lane** on the results of a Cuban study in which the Cuban Doctor indicated that the results from their trials using Shark Cartilage were very encouraging. Many patients experienced tumor regression, reduction or cessation of pain and improvement in appetite, attitude and quality of life. [15]
The "60 Minute" program concluded, "Shark Cartilage Therapy was a promising treatment." [16]

In a study involving 76 Cancer patients of a New Jersey physician, all 76 patients responded to Shark Cartilage Therapy. The Shark Cartilage Therapy was shown to work on all solid tumors, but appeared to be most effective with breast, liver, brain and esophageal tumors, where major changes within four to six weeks were noticeable. Lung and prostate cancer seemed to respond more slowly. Some good responses were observed with pancreatic tumors when very high dosage levels were administered.[17]

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Shark Cartilage and inflammatory disease of the joints

Cartilage supplement has been shown to provide relief to the symptoms of arthritis. Most of the research in this field has been focused on rheumatoid arthritis, an inflammatory disease of the joints, and osteoarthritis, a destructive disease of cartilage in joints. Research tells us that both of these forms of arthritis are associated with the damaging effects of chronic inflammatory and abnormal growth of capillary blood vessels into the joint cartilage.[18]

Robert Greenberg, D.C.,N.M.D.,F.A.S.A., has worked extensively with Shark Cartilage during his 15 years of treating patients with bone and joint disorder. Dr. Greenberg recently completed a pilot study of 7 patients treated with Shark Cartilage supplements for osteoarthritis and rheumatoid arthritis. During the 90 day study, all of the patients showed improvements in the symptoms assessed, which included degree of motion, visual appearance, pain and stiffness and overall subjective improvements.[19]

Shark Cartilage vs. Bovine Cartilage

Sharks have been swimming in the ocean for some reported 400 million years. Their survival suggests that they must have an incredibly powerful immune system. For the past 25 years, scientists have been trying to unlock the mystery of the shark's cancer preventing immune system. Marine biologist, Dr. Carl Luer, has tried unsuccessfully for years to grow transplanted cancer cells in sharks.[20]

One of the main differences between sharks and higher vertebrae like fish and mammals is that their skeleton is composed entirely of cartilage and contains no true bony tissue. Many scientists believe that it is this cartilaginous skeleton that contains the substance (CDI) which provides sharks with immunity to cancer.

Cartilage is different from bones and muscles in that it is **avascular,** meaning that it does not contain any blood vessels. Recent research indicates that it is this lack of blood vessels in shark cartilage that explains why sharks do not get cancer.

Although bovine cartilage has been shown to inhibit the growth of cancerous tumors in animal models, the supply is somewhat limited. In addition, a calf's body contains less than 0.6 percent cartilage, while a shark is composed of six percent cartilage or ten times as much. It takes about 500 grams of calf cartilage to produce the same amount of tumor-inhibiting factor that can be obtained from 0.5 grams of shark cartilage. This makes shark cartilage approximately **one thousand times more potent** than bovine cartilage. In addition, a large shark may contain up to one hundred thousand times more inhibiting factor than calf.

Shark Cartilage, pound for pound, is by far the most active antiangiogenic.[21]

Another reason for not using bovine cartilage is the possibility of mad cow disease contamination.

Availability of Shark Cartilage

According to statistics, about 10 million sharks are caught each year for shark-fin soup, a Chinese delicacy long reported to have health benefits. A majority of the sharks are caught off the coastal waters of Central America near Costa Rica and in the Orient.

The meat serves as a source of food for the locals and, up until recently, the cartilaginous skeletons were discarded. If the heads and backbones, which represent the majority of the cartilage, were kept and used, there would be enough shark cartilage to treat 625,000 cancer patients a year without any additional sharks. It would certainly be a better utilization of natural resources than throwing the skeletons away unused.

Is Shark Cartilage safe?

Shark Cartilage is a completely natural product that is safe and nontoxic. It is an excellent source of calcium and phosphorus and contains a significant amount of a type of carbohydrate called mucopolysaccharide. Powdered Shark Cartilage is classified as a food supplement. Thus, it is not controlled by the FDA and does not require a prescription.

Dosage recommendations
As a preventative dietary supplement, four to five 725 mg capsules per day is usually recommended. The capsules should be taken on an empty stomach about thirty minutes before meals or between meals so that the digestive acids in the stomach do not destroy the active substances.

For more intensive supplementation, take four to five capsules three times daily. For dosage above this level, consult with your health care practitioner.

For those who have difficulty swallowing capsules, cartilage can be used as a powder by pulling capsules apart and mixing them in juice, water or applesauce.

Much of the research on Shark Cartilage has been performed by rectally administered high doses (15 to 20 grams) as a retention enema. It is usually mixed with about 4 ounces of body temperature water. The lining of the rectum has a rich supply of capillaries, making it the most efficient and effective route of absorption [22]

Studies show that Shark Cartilage can be used in conjunction with alternative and conventional cancer therapies without conflict [21]

A survey of users of Shark Cartilage yielded interesting results. Although not scientific, these results were encouraging: 106 cancer patients (78.3 percent) reported fair, good or excellent results; 140 out of 158 arthritis patients (88.6 percent) reported fair, good or excellent results; and 25 out of 30 psoriasis patients (88.3 percent) reported fair, good or excellent results.

Source: Whitaker, Julian M.D., Dr. Whitakers Guide to natural Healing. Prima Publishing, 1995. p.335

Special Note:
Since Shark Cartilage inhibits new vascularization, those having suffered a recent coronary occlusion (heart attack), pregnant women and those wanting to conceive, and people recovering from recent surgery should all refrain from use for a logical time period.

References

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[21] Pelton, Op. cit. p. 127.