A History of Shark Cartilage as a Cancer Cure:
The Progression of a Populace Persuaded by Pseudoscience

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Abstract

Preventing or curing cancer can be as easy as two dosages of shark cartilage twice daily. That is what manufacturers like Lane Labs-USA, Seagate and Olympic Labs want you to think. In reality, such dietary supplements are not approved by the U.S. Food and Drug Administration (FDA), and there is no conclusive scientific research that substantiates medicinal claims made by the companies. Desperate patients are being duped into abandoning effective traditional treatments for alternative medicines. Cartilage harvesting combined with a demand for shark food products has had a devastating effect on shark populations and their surrounding ecosystems. The public has exhibited a susceptibility to the allure of pseudoscience, failing to recognize misrepresentations that lack scientific evidence. People are dying, and corporations continue to profit.
Nutrition and dietary supplementation is a billion-dollar industry that continues to grow in the United States. Weight-loss, weight-gain, body-cleansing, sexual health, and herbal remedies are among many examples of merchandise that Americans are purchasing and consuming. Unfortunately, most don’t challenge the claims made by manufacturers or investigate the science behind them. Consumers often overlook the FDA warning that “the product(s) are not intended to diagnose, treat, cure, or prevent any disease.” One item that carries this disclaimer is shark cartilage, but that doesn’t stop marketers from saying it relieves cancer, arthritis, psoriasis and other diseases.

The man first credited with publicly claiming the medicinal benefits of cartilage was Dr. I. William Lane. In 1992, Lane published “Sharks Don’t Get Cancer.” Like the title suggests, Lane suggests that sharks seldom develop cancer, because their skeleton is completely made-up of cartilage. He then proposes that and humans may benefit from the consumption of raw cartilage. Cartilage is made up of cells called chondrocytes surrounded by collagen and proteoglycans, which consist of protein and carbohydrates (National Cancer Institute [Patient], 2010). These proteins are believed to be anti-angiogenesis, which inhibits the process of blood vessel development. To thrive and grow in the body, tumors depend on a network of blood vessels. Theoretically, if the blood supply is cut-off, the tumor is starved of nutrition and begins to shrink into remission (American Cancer Society, Inc., 2008).

In addition to his book, a 1993 segment of “60 Minutes” followed Lane as he conducted a clinical trial in Cuba. Over a 16-week period, 29 terminally ill cancer patients were orally administered pure shark cartilage in capsule or powder form, or rectally through a retention enema (Lane, 1994). Narrator Mike Wallace was filmed with numerous patients doing exercise, and he reported that a majority of them felt better after some weeks of treatment (Barrett, 2004).
According to his book, almost three years after finishing shark cartilage treatment, “14 out of 29 terminal cancer patients were completely well and cancer-free” (Saben, 1997 [from Lane]). Although Lane claims were inconclusive and not supported by peer-review, the television segment sparked a frenzied interest in shark cartilage.

One of the first researchers to examine the use of animal cartilage for medicinal purposes was John Prudden, a surgeon from New York. In the early 1950’s Prudden used a powdered extract of bovine cartilage as a healing aid that was applied to injuries of patients recovering from surgery (American Cancer Society, Inc., 2008). Since Prudden’s observations, there have been dozens of preclinical (animal or laboratory) tests on the efficacy of cartilage as a cancer treatment. One of the most compelling studies was a published report that stated powdered bovine cartilage slowed the development of human cancer cells by half or more (National Cancer Institute [Patient], 2010). The test used a commercially available preparation called Catrix, a powered bovine cartilage extract. “Cells from 22 freshly isolated human tumors (nine ovary, three lung, two brain, two breast, and one each of melanoma, colon, pancreas, cervix, and testis) and three human cultured cell lines (breast cancer, colon cancer, and myeloma) were treated with Catrix” (National Cancer Institute [Health], 2010, p. 9). When high concentrations of the drug were used (1-5 milligram per milliliter of culture fluid) roughly 70 percent of tumor specimens in all three cultured cell lines displayed a growth inhibition of half or more. However, it is unknown if the inhibitory effects of Catrix were limited to cancer cells because it was not tested on normal cells. It is also not clear whether the dosages used in the laboratory could be safely administered to humans (National Cancer Institute [Health], 2010).

A liquid, or aqueous, extract of shark cartilage called AE-941/Neovastat has been reported to stop the growth of certain cancer cells, as well as block the formation of new blood vessels.
When administered orally to mice, the growth of breast cancer cells was slowed as well as the spread of lung cancer (National Cancer Institute [Patient], 2010). However, these claims have not been published, and lack the approval of peers in the scientific community. Although the results of AE-941/Neovastat were not consistent with other results found by independent investigators, there were aspects of the study that could be agreed upon. During the trials mentioned above, scientists were able to isolate more than one kind of angiogenesis inhibitor found in shark cartilage.

The first inhibitor, named U-995, contained two small proteins shown to have antiangiogenic properties when tested individually. “U-995 has been reported to inhibit endothelial cell proliferation, endothelial cell migration, matrix metalloproteinase activity in vitro, and the formation of new blood vessels in the chorioallantoic membrane of chicken embryos” (National Cancer Institute [Health], 2010, p.10). The second angiogenic inhibitor is a proteoglycan named SCF2. A proteoglycan is made up of protein and glycosaminoglycans (a major structural component of cartilage). Like U-995, SCF2 “has been shown to block endothelial cell proliferation in vitro, the formation of new blood vessels in the chorioallantoic membrane of chicken embryos, and tumor-induced angiogenesis in the corneas of rabbits” (National Cancer Institute [Health], 2010, p. 10). Even though the results could not be confirmed, the successful isolation of antiangiogenesis compounds in shark cartilage was viewed as a promising step toward finding a cure for cancer. Dr. Lane himself was inspired by a similar study of rabbit corneas performed at MIT in 1983 (Saben, 1997). But as shark cartilage began to receive more attention from the scientific community, additional studies were conducted. The results were not consistent with initial observations, and the prospect of a cure for cancer derived from cartilage began to lose credibility.
The first of Lane’s claims to be disputed was suggestion of his book title “Sharks Don’t Get Cancer.” This notion is flat-out untrue. Lane acknowledges in his texts that sharks do get cancer, but he incorrectly emphasizes that such cases are uncommon. According to Ostrander, et al., (2004), “sharks and their relatives do develop both benign and malignant neoplasms. These tumors are analogous to their counterparts in other organisms, including bony fishes, rodents, and humans” (p.7).

Figure 1 Tumors of spiny dogfish sharks found off the coast of Maine (Ostrander, et al., 2004, p.4)

Figure 1 displays previously unpublished photographs of a malignant kidney tumor (A) and a benign cartilage tumor (D) found in spiny dogfish sharks. In (A) there are four masses protruding from the kidney, two that exhibit widespread cellular death. Oslander, et al. (2004) describes “the histologic features of this tumor, including invasion, high mitotic activity, poor differentiation, and necrosis [at microscopic levels as] clearly consistent with malignancy,” (p.4). Shown in (D) is a well-defined tumorous mass taken from the dorsal fin. “The histologic appearances of the tumor cells, together with the tumor’s well-demarcated rather than invasive border, are consistent with a diagnosis of chondroma, a benign tumor of cartilage” (Oslander, et al., 2004, p.5). These examples show that sharks are susceptible to both benign and malignant tumors, even in avascular tissues like cartilage.

The above images were donated by the Maine Department of Natural Resources to the Registry of Tumors in Lower Animals (RTLA). In total, the RTLA has documented 42 cases of benign or
malignant tumors in cartilaginous fish over the past 150 years. “The tumors were widely distributed across 21 species in nine families among seven orders, including 24 sharks, 16 skates or rays, and 2 chimaeroids” (p.2) gathered from inshore and offshore waters of the Pacific and Atlantic; with the exception of five sharks and a stingray taken from laboratories or public aquaria (Ostrander, et al., 2004). The total appears low in comparison to the large number of documented cancer cases in other species. This can be explained by environmental and synergistic factors that make it very difficult for chondrichthyes (class of shark and closely related species) tumors to reach investigators. A lack of shelter and a variety of large predators provide a disadvantage to fish in open waters. There is a greater chance of a cancerous shark being eaten than being caught by man. If there were a wider effort to identify instances of shark cancer and a systematic approach to their documentation, then a baseline barometer of occurrences could be determined (Oslander, et al., 2004).

Initial preclinical trials of shark cartilage extracts did show results of possible antiangiogenesis properties in vitro and when administered to small rodents. The results of preclinical trials were a precursor for at least a dozen clinical trials with humans since the 1970s, seven of which were published in peer-reviewed scientific journals. The first published review of a randomized trial involved 83 incurable rectal, colon and breast cancer patients. The patients were randomly selected to receive either a placebo or shark cartilage, along with standard care (surgery, radiation therapy, chemotherapy, or hormonal therapy). “No difference was observed in survival or quality of life between those receiving shark cartilage and those receiving placebo” (National Cancer Institute [Health], 2010, pp. 13-14).

Another clinical study, whose partial results were presented at a scientific conference, involved the drug Catrix (mentioned above on page [4] showing significant growth inhibition in isolated
human tumors). Thirty-five patients with “metastatic renal cell carcinoma” were given identical doses of Catrix, that were administered orally or through dermal injection. There were no complete responses observed from 22 evaluable patients after three or more months of Catrix therapy. A follow-up of evaluable patients reported 17 having a progressive disease, and two having a stable disease. A relationship between tumor response and the drug Catrix could not be established (National Cancer Institute [Health], 2010). According to Harvard Researcher Judah Folkman (Saben, 1997), we are unlikely to see results from oral ingestion of cartilage because “the proteins are present in such tiny quantities that even if they could survive [acid breakdown in the stomach] and get into the bloodstream, you would have to eat pounds of it a day to get enough activity” (p.3) to see progressive results.

AE-941/Neovastat, a liquid shark cartilage extract shown to slow the spread of cancers in mice, was tested on 379 patients in a 2010 double-blind, randomized, placebo-controlled trial. Eligible patients (inoperable stage II non-small-cell lung cancer) received either AE-941 or a placebo, along with a preliminary treatment of chemotherapy and simultaneous chemotherapy with chest radiation. “No statistically significant difference in overall survival was observed between the group (n = 188) receiving chemotherapy and radiation therapy plus AE-941 (120 mL administered orally twice daily) and the group receiving chemotherapy and radiation therapy plus placebo (n = 191)” (p.15). The results correspond with those of powdered cartilage trials, showing no evidence that cartilage can be used as an effective cancer treatment in humans. In response to Lane’s findings in the rectal and oral studies done in Cuba, a review from the National Cancer Institute concluded that the results were “incomplete and unimpressive” (American Cancer Society, Inc., 2008).
In 1999, the U.S. Department of Justice filed a lawsuit against Lane Labs-USA of Allendale, New York. The major manufacturer of shark cartilage was founded by Andrew J. Lane, son of Dr. William Lane described as a consultant. The suit demanded the company discontinue the marketing and distribution of shark cartilage and two other products without approval by the FDA. The FDA case against Andrew Lane continued until a July 2004 ruling ordered Lane Labs-USA to halt sales of Benefin, SkinAnswer and MGN-3, and to make restitution to any persons that purchased the products since September 22, 1999. The judge also ordered the destruction of all product inventories, save a small amount of Benefin to be used for research purposes (Barrett, 2004). The ruling set a precedent against promoting shark cartilage to prevent or cure disease. In the FDA case against Lane Labs-USA, “noting that illegal promotion of the products had continued despite the FDA warning letter and the FTC cease-and-desist order, the judge described the defendants as untrustworthy and issued a permanent injunction against misrepresenting any product in the future” (Barrett, 2004, p.5).

Even though the FDA has classified shark cartilage as a dietary food supplement, unregulated products are still readily available for purchase. The shark cartilage industry makes a reported $50 million a year, with 25,000 to 100,000 people using different brands (Saben, 1997). The consequences of selling shark cartilage therapies extend beyond the overfishing of sharks and the exploitation of a vulnerable audience. When the power of mass media delivers sensational claims unsupported by scientific evidence, more and more of the public becomes susceptible to pseudoscience. According to Oslander, et al., (2004), “the stark contrast between the rigor of scientific peer review and the lack of any substantive review in the popular press underscores the failure of our educational and journalistic systems to ingrain the value of intellectual honesty or to promote the ability of the media and the public to think critically” (p.7). The claims of shark
cartilage as a cancer cure have been thoroughly debunked. Until consumers demand scientific proof for their therapies, the power of pseudoscience will persist.
References


