Traditional herbal medicine kills pancreatic cancer cells, researchers report

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An herb used in traditional medicine by many Middle Eastern countries may help in the fight against pancreatic cancer, one of the most difficult cancers to treat. Researchers at the Kimmel Cancer at Jefferson in Philadelphia have found that thymoquinone, an extract of nigella sativa seed oil, blocked pancreatic cancer cell growth and killed the cells by enhancing the process of programmed cell death.

While the studies are in the early stages, the findings suggest that thymoquinone could eventually have some use as a preventative strategy in patients who have gone through surgery and chemotherapy or in individuals who are at a high risk of developing cancer.

According to Hwyda Arafat, M.D., Ph.D., associate professor of Surgery at Jefferson Medical College of Thomas Jefferson University, nigella sativa helps treat a broad array of diseases, including some immune and inflammatory disorders. Previous studies also have shown anticancer activity in prostate and colon cancers, as well as antioxidant and anti-inflammatory effects.

Using a human pancreatic cancer cell line, she and her team found that adding thymoquinone killed approximately 80 percent of the cancer cells. They demonstrated that thymoquinone triggered programmed cell death in the cells, and that a number of important genes, including p53, Bax, bcl-2 and p21, were affected.

The researchers found that expression of p53, a tumor suppressor gene,

and Bax, a gene that promotes programmed cell death, was increased, while bcl-2, which blocks such cell death, was decreased. The p21 gene, which is involved in the regulation of different phases of the cell cycle, was substantially increased. She presents her findings May 18 at the Digestive Disease Week in San Diego.

Dr. Arafat and her co-workers also found that thymoquinone caused “epigenetic” changes in pancreatic cancer cells, modifying the cells’ DNA. She explains that these changes involve adding acetyl groups to the DNA structure, specifically to blocks of proteins called histones. This “acetylation” process can be important for genes to be read and translated into proteins. In this case, it could involve the genes that are key to initiating programmed cell death.

“We looked at the status of the histones and found surprisingly that thymoquinone increased the acetylation process,” Dr. Arafat says. “We never anticipated that.”

At the same time, adding thymoquinone to pancreatic cancer cells reduced the production and activity of enzymes called histone deacetylases (HDACs), which remove the acetyl groups from the histone proteins, halting the gene transcription process. Dr. Arafat notes that HDAC inhibitors are a “hot” new class of drugs that interfere with the function of histone deacetylases, and is being studied as a treatment for cancer and neurodegenerative diseases. Finding that thymoquinone functions as an HDAC inhibitor, she says, “was very remarkable and really exciting.”

Pancreatic cancer, the fourth-leading cause of cancer death in this country, takes some 34,000 lives a year. The disease frequently is detected after it has spread and only 4 percent of individuals with pancreatic cancer live for five years after diagnosis.

Source: Thomas Jefferson University