Common food additive found to increase risk and speed spread of lung cancer

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New research in an animal model suggests that a diet high in inorganic phosphates, which are found in a variety of processed foods including meats, cheeses, beverages, and bakery products, might speed growth of lung cancer tumors and may even contribute to the development of those tumors in individuals predisposed to the disease.

The study also suggests that dietary regulation of inorganic phosphates may play an important role in lung cancer treatment. The research, using a mouse model, was conducted by Myung-Haing Cho, D.V.M., Ph.D., and his colleagues at Seoul National University, appears in the first issue for January of the *American Journal of Respiratory and Critical Care Medicine*, published by the American Thoracic Society.

"Our study indicates that increased intake of inorganic phosphates strongly stimulates lung cancer development in mice, and suggests that dietary regulation of inorganic phosphates may be critical for lung cancer treatment as well as prevention," said Dr. Cho.

Lung cancer is the number one cause of cancer deaths in the world and is also the most frequently diagnosed solid tumor. Non-small cell lung cancer (NSCLC) constitutes over 75 percent of lung cancers and has an average overall 35-year survival rate of 14 percent. Earlier studies have indicated that approximately 90 percent of NSCLC cases were associated with activation of certain signaling pathways in lung tissue. This study revealed that high levels of inorganic phosphates can stimulate those same pathways.

"Lung cancer is a disease of uncontrolled cell proliferation in lung tissue, and disruption of signaling pathways in those tissues can confer a normal cell with malignant properties," Dr. Cho explained. "Deregulation of only a small set of pathways can confer a normal cell with malignant properties, and these pathways are regulated in response to nutrient availability and, consequently, cell proliferation and growth.

"Phosphate is an essential nutrient to living organisms, and can activate some signals," he added. "This study demonstrates that high intake of inorganic phosphates may strongly stimulate lung cancer development by altering those (signaling) pathways."

In the study, lung cancer-model mice were studied for four weeks and were randomly assigned to receive a diet of either 0.5 or 1.0 percent phosphate, a range roughly equivalent to modern human diets. At the end of the four-week period, the lung tissue was analyzed to determine the effects of the inorganic phosphates on tumors.

"Our results clearly demonstrated that the diet higher in inorganic phosphates caused an increase in the size of the tumors and stimulated growth of the tumors," Dr. Cho said.

Dr. Cho noted that while a moderate level of phosphate plays an essential role in living organisms, the rapidly increasing use of phosphates as a food additive has resulted in significantly higher levels in average daily diets. Phosphates are added to many food products to increase water retention and improve food texture.

"In the 1990s, phosphorous-containing food additives contributed an estimated 470 mg per day to the average daily adult diet," he said. "However, phosphates are currently being added much more frequently to a large number of processed foods, including meats, cheeses, beverages, and bakery products. As a result, depending on individual

food choices, phosphorous intake could be increased by as much as 1000 mg per day."

"Although the 0.5 percent was defined as close to 'normal,' the average diet today is actually closer to the one percent diet and may actually exceed it," Dr. Cho noted. "Therefore, the 0.5 percent intake level is actually a reduced phosphate diet by today's scale."

Dr. Cho said future studies will help refine what constitutes a "safe" level of dietary inorganic phosphate, with recommendations that will be easily achievable in the average population.

"The results of this study suggest that dietary regulation of inorganic phosphates has a place in lung cancer treatment, and our eventual goal is to collect sufficient information to accurately assess the risk of these phosphates," he said.

John Heffner, M.D., past president of the ATS, stated that this line of investigation in animals addresses the complex interactions between host factors and the environment that underlie cancer in man. "We know that only some patients who smoke develop lung cancer but the reasons for this varying risk are unknown. This study now provides a rationale for funding case-control studies in humans to determine the potential role of dietary phosphates in promoting cancer."

Source: American Thoracic Society