



## Chinese diet in the causation and prevention of cancer

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The dramatic differences in the cancer patterns between China and North America, and among different regions in China, illustrate the profound effects of diet on cancer. Whereas cancers of the colon, breast, and prostate are major concerns in Western Countries, the most prevalent cancers in China are those of the digestive tract, stomach, esophagus, and liver (which account, respectively, for 23.0, 22.3, and 15.1% of the total cancer deaths). Nasopharyngeal cancer, which is rare among Caucasians, is common among Cantonese residing in Canton and Hong Kong. Knowledge about the dietary factors which contribute to the high or low incidence of these cancers is important for their prevention.

Dietary factors and viral or bacterial infection may act synergistically in causing human cancers. Consumption of aflatoxin-contaminated foods, such as *Aspergillus flavus* infected corn and peanuts, and HBV infection are the major risk factors for liver cancer in Qidong and many other areas. Both chronic hepatitis B surface antigen (HBsAg) carrier status and liver AFB<sub>1</sub>-adduct levels were higher in patients with hepatocellular carcinoma than in controls. The viral and chemical factors work synergistically in the carcinogenic process, and in many cases the hepatocellular carcinomas have a characteristic codon 249 mutation of the p53 tumor suppressor gene. Similarly, consumption of salted fish (especially during weaning) and other preserved foods, in combination with EB virus infection, has been shown to be a major risk factor for nasopharyngeal cancer. Avoidance of these foods and prevention of viral infection are key measures in the prevention of these cancers.

The etiologies of the top two cancers in China, *i.e.*, stomach and esophageal cancers, are not as clear, although nitrosamines and nitrosamides have been strongly suspected. Consumption of salty foods and infection with *Helicobacter pylori* are believed to be

risk factors for stomach cancer, and consumption of moldy foods have been suspected to increase the risk for esophageal cancer. A common feature for the Chinese population at high risk to stomach, esophageal and other cancers is the infrequent consumption of fruits and vegetables, which contain micronutrients and phytochemicals. A case-control study on gastric cancer in Linqu, Shangdong indicated that frequent consumption of fresh fruits and vegetables, especially allium vegetables, has protective effect. Consumption of soybeans and soy products is also protective. Individuals with lower levels of plasma vitamin C and  $\beta$ -carotene had higher frequencies of intestinal metaplasia, a precancerous lesion of stomach cancer. A large scale nutritional intervention study on esophageal/gastric cardia cancer in Linxian, Henan, demonstrated that supplementation with  $\alpha$ -tocopherol/ $\beta$ -carotene/selenium for 5 years decreased the mortality rate of gastric cardia cancer and resulted in other health benefits. An ongoing intervention study on stomach cancer with dietary supplements as well as *H. pylori* eradication is being conducted in Linqu, Shangdong.

The traditionally rather low rates of colon, mammary, and prostate cancer in China are probably due to the high grain consumption, low intake of fat and meat, low total caloric intake, and high physical activity. The roles of possible cancer preventive agents, such as the polyphenols present in tea and soybeans, remain to be further investigated.

With the improvement of economic conditions and changes in dietary patterns in China, residents in Beijing, Shanghai, and other big cities are facing an increased risk for Western cancers, such as colon, prostate, and mammary cancers. This is the same problem experienced by Chinese in North America and in Taiwan. In order to reduce the cancer risk among Chinese inside and outside of China, I would like to make the following recommendations: (1) Chinese should keep the traditional high grain, low fat/ meat, and low sugar diet. Whole grains, such as brown rice, are far superior to refined grains because they contain micronutrients and fiber. A high grain and low fat/ meat diet will lower plasma cholesterol and derive beneficial effects in preventing cardiovascular diseases. For populations consuming refined grains and wheat flour, supplementation with micronutrients is very important to enhance public health. (2) The Chinese diet, especially the breakfast, is generally low in fresh vegetables and fruits. The consumption of these foods should be increased and increased availability of refrigerated or freshly frozen foods should be beneficial. The consumption of fruit juice should be encouraged. (3) The boiling/steaming cooking practice is healthier than grilling and baking. High temperature cooking is known to produce arylamines which are carcinogens. Boiling/steaming in well designed cookware can also save fuel. When stir-frying, excessive amounts of cooking oil should be avoided. (4) Fungal-contaminated and some ill-preserved foods should be avoided. Appropriate food inspections by governments are needed. These measures, together with cessation of smoking and increase in physical activity to maintain appropriate body weight, should effectively increase the health of the Chinese all over the world (support by NIH grants CA56673 and CA68871).

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