

- Am J Clin Nutr. 2006 Nov;84(5):1027-32

Onion and garlic use and human cancer.

Galeone C, Pelucchi C, Levi F, Negri E, Franceschi S, Talamini R, Giacosa A, La Vecchia C. Istituto di Ricerche Farmacologiche "Mario Negri," Milan, Italy, Italy.

BACKGROUND: Interest in the potential benefits of allium vegetables, in particular, onion (*Allium cepa*) and garlic (*Allium sativum*), has its origin in antiquity, but the details of these benefits are still open to discussion. **OBJECTIVE:** We investigated the role of allium vegetables in the etiology of various neoplasms. Previous data are scanty and are based mainly on Chinese studies. **DESIGN:** Using data from an integrated network of Italian and Swiss case-control studies, we analyzed the relation between frequency of onion and garlic use and cancer at several sites. We calculated odds ratios (ORs) by using multivariate logistic regression models that were adjusted for energy intake and other major covariates. **RESULTS:** Consumption of onions varied between 0-14 and 0-22 portions/wk among cases and controls, respectively. The multivariate ORs for the highest category of onion and garlic intake were, respectively, 0.16 and 0.61 for cancer of the oral cavity and pharynx, 0.12 and 0.43 for esophageal cancer, 0.44 and 0.74 for colorectal cancer, 0.17 and 0.56 for laryngeal cancer, 0.75 and 0.90 for breast cancer, 0.27 and 0.78 for ovarian cancer, 0.29 and 0.81 for prostate cancer, and 0.62 and 0.69 for renal cell cancer. **CONCLUSIONS:** This uniquely large data set from southern European populations shows an inverse association between the frequency of use of allium vegetables and the risk of several common cancers. Allium vegetables are a favorable correlate of cancer risk in Europe.

Publication Types: Research Support, Non-U.S. Gov't
PMID: 17093154 [PubMed - indexed for MEDLINE]

- In Vivo. 2006 Jan-Feb;20(1):85-90

Crude extract of garlic induced caspase-3 gene expression leading to apoptosis in human colon cancer cells.

Su CC, Chen GW, Tan TW, Lin JG, Chung JG.
School of Chinese Medicine, China Medical University, Taiwan, ROC.

Garlic (*Allium sativum*) is a popular spice, a remedy for a variety of ailments and is also known for its medicinal uses as an antibiotic, antithrombotic and antineoplastic agent. Epidemiological and animal studies have shown that garlic consumption reduces the incidence of cancer e.g. in the stomach, colon, breast and cervix. The aim of this study was to investigate whether garlic extract has any influence on caspase-3 activity and gene expression and on the signal induction of apoptosis in vitro. As an assay system, the flow cytometry assay, Western blotting and cDNA microarray were applied in human colon cancer colo 205 cells. Our results indicated that garlic extract, when administered to the colo 205 cell cultures, reduced the percentage of viable cells, induced apoptosis, increased the levels of Bax, cytochrome c and caspase-3, but decreased the level of Bcl-2. The results also showed that raw extract of garlic decreased the mitochondrial membrane potential and increased the caspase-3 activity and gene expression. We conclude that crude extract of garlic can induce apoptosis in colo 205 cells through caspase -3 activity, by means of a mitochondrial-dependent mechanism.

Publication Types: Research Support, Non-U.S. Gov't
PMID: 16433033 [PubMed - indexed for MEDLINE]

- Mutat Res. 2005 Nov 11;579(1-2):115-24. Epub 2005 Jul 18

The role of reactive oxygen species (ROS) production on diallyl disulfide (DADS) induced apoptosis and cell cycle arrest in human A549 lung carcinoma cells.

Wu XJ, Kassie F, Mersch-Sundermann V.

Institute of Indoor and Environmental Toxicology, Faculty of Medicine, Justus-Liebig-University of Giessen, Aulweg 123, D-35385 Giessen, Germany.

Diallyl disulfide (DADS), an oil soluble constituent of garlic (*Allium sativum*), has been reported to cause antimutagenic and anticarcinogenic effects in vitro and in vivo by modulating phases I and II enzyme activities. In recent years, several studies suggested that the chemopreventive effects of DADS can also be attributed to induction of cell cycle arrest and apoptosis in cancer cells. In the present study, we reported that DADS-induced cell cycle arrest at G2/M and apoptosis in human A549 lung cancer cells in a time- and dose-dependent manner. Additionally, a significant increase of intracellular reactive oxygen species (ROS) was induced in A549 cells less than 0.5h after DADS treatment, indicating that ROS may be an early event in DADS-modulated apoptosis. Treatment of A549 cells with N-acetyl cysteine (NAC) completely abrogated DADS-induced cell cycle arrest and apoptosis. The result indicated that oxidative stress modulates cell proliferation and cell death induced by DADS.

PMID: 16024053 [PubMed - indexed for MEDLINE]

- J Med Food. 2004 Fall;7(3):334-9.

Effects of aqueous extracts of garlic (*Allium sativum*) and neem (*Azadirachta indica*) leaf on hepatic and blood oxidant-antioxidant status during experimental gastric carcinogenesis.

Arivazhagan S, Velmurugan B, Bhuvaneshwari V, Nagini S.

Department of Biochemistry, Faculty of Science, Annamalai University, Annamalainagar, Tamil Nadu, India.

The modifying effects of aqueous extracts of garlic and neem leaf during the pre-initiation and post-initiation phases of gastric carcinogenesis induced by N-methyl-N'-nitro-N-nitrosoguanidine were investigated in male Wistar rats. The extent of lipid peroxidation and the status of phase II biotransformation enzymes such as glutathione peroxidase and glutathione-S-transferase that use reduced glutathione (GSH) as substrate were used to biomonitor the chemopreventive potential of these extracts. Enhanced lipid peroxidation in the liver and blood of tumor-bearing animals was accompanied by significant decreases in the activities of GSH-dependent antioxidants in the pre-initiation as well as in the post-initiation phases. Our results suggest that the modulatory effects of garlic and neem leaf on hepatic and blood oxidant-antioxidant status may play a key role in preventing cancer development at extrahepatic sites.

PMID: 15383228 [PubMed - indexed for MEDLINE]

- Eur J Pharmacol. 2004 Feb 6;485(1-3):97-103

Allicin (from garlic) induces caspase-mediated apoptosis in cancer cells.

Oommen S, Anto RJ, Srinivas G, Karunakaran D.

Division of Cancer Biology, Rajiv Gandhi Centre for Biotechnology, Poojappura, Thiruvananthapuram-695014, Kerala, India.

Garlic (*Allium sativum*) has been used for centuries for treating various ailments, and its consumption is said to reduce cancer risk and its extracts and components effectively block experimentally induced tumors. Allicin, the major component present in freshly crushed garlic, is one of the most biologically active compounds of garlic. We found that allicin inhibited the growth of cancer cells of murine and human origin. Allicin induced the formation of apoptotic bodies, nuclear condensation and a typical DNA ladder in cancer cells. Furthermore, activation of caspases-3, -8 and -9 and cleavage of poly(ADP-ribose) polymerase were induced by allicin. The present results demonstrating allicin-induced apoptosis of cancer cells are novel since allicin has not been shown to induce apoptosis previously. Our results also provide a mechanistic basis for the antiproliferative effects of allicin and partly account for the chemopreventive action of garlic extracts

reported by earlier workers.

Publication Types: Research Support, Non-U.S. Gov't
PMID: 14757128 [PubMed - indexed for MEDLINE]