

Table 1: Systematic reviews of garlic (*Allium sativum*) for cancer (prevention)

Source: Pilkington K, Ernst E, CAM-Cancer Consortium. [Garlic \(*Allium sativum*\) \[online document\]](#), November 2018.

Study year (ref)	Design and methods	Inclusion criteria	Included studies and participants	Included interventions and outcomes	Main results/Conclusions	Comments
Fleischauer 2000 (39)	Meta-analyses Search of MEDLINE in August 1999 No quality assessment	Epidemiologic studies (case-control and cohort studies) assessing garlic consumption and risk of colorectal and stomach cancers	22 studies (stomach: 4 case-control, 1 cohort; colorectal: 4 case control, 3 cohort; head and neck: 5 cases control; other cancers: 2 case-control, 2 cohort)	Various levels of garlic consumption (raw garlic, cooked garlic, or both (RC)) Risk of cancer (OR/RR)	Colorectal cancer: RR 0.69 (95% CI: 0.55, 0.89). Stomach cancer: 0.53 (95% CI: 0.31, 0.92). High intake of RC garlic may be associated with a protective effect against stomach and colorectal cancers	Search limited to one database; search strategy unclear Limited to English No details of study selection process No quality assessment
Hu 2014 (40)	Meta-analysis Search of MEDLINE and references lists of articles to October 2013 Newcastle-Ottawa Scale used for quality assessment	(1) prospective cohort studies (2) evaluated the association between garlic consumption and risk of colorectal cancer; (3) reported HR or RR with 95%CI, or data necessary to calculate them.	5 cohort studies Total of 335,923 subjects	Raw and cooked (RC) garlic and garlic supplement intake Risk of colorectal cancer (RR)	No significant associations were found between consumption of RC garlic (RR: 1.06; 95%CI: 0.95-1.19) or garlic supplements (RR: 1.12; 95%CI: 0.96-1.31) and risk of colorectal cancer. All studies judged to be high quality	Search limited to one database but strategy appropriate Only included cohort studies Selection, extraction and appraisal processes rigorous (7+ assessed as high quality)
Turati 2014 (41)	Meta-analysis Search of MEDLINE and check of reference lists to April 2014 No quality assessment	(i) Case-control or cohort study design, (ii) Outcome was colorectal (or colon, or rectal) cancer or colorectal adenomatous polyps incidence/death, (iii) examined the association with allium vegetables (including garlic, onions, leeks, and others), (iv) provided the RR with CI or data necessary to calculate them	16 studies (10 case-control and 6 cohort studies) Seven studies on garlic, six on onion, and four on total allium vegetables (13 333 cases)	Allium vegetables intake and risk of colorectal cancer and colorectal adenomatous polyps	RRs of colorectal cancer for the highest versus the lowest category of intake were 0.85 (95% CI 0.72–1.00) for garlic (0.76 for case-control, 0.99 for cohort studies), 0.85 (95% CI, 0.70–1.04) for onion (0.74 for case-control, 1.04 for cohort studies), and 0.78 (95% CI, 0.56–1.08) for total allium vegetables.	Search limited to one database but strategy appropriate Selection and extraction reasonably rigorous No quality assessment
Guercio 2016 (42)	Meta-analysis Search of MEDLINE and reference lists of articles to May 2015 No quality appraisal	Case-control or cohort design. Intake of allium vegetables (i.e., garlic, onion, leeks, Chinese chives and others) Included estimates of risk or data for calculating risk of occurrence of cancers of the oral cavity, pharynx, larynx, and oesophagus	25 studies (21 case-control and 4 cohort) Total number 'more than 11,000'	Various levels of consumption of total allium, garlic, and onion Risk of cancer (RR)	RR for squamous cell carcinoma: 0.79 (95% CI 0.56–1.11) for total allium, 0.74 (95% CI 0.57–0.95) for garlic for highest versus lowest consumption. Association stronger for case-control studies, studies in China and oesophageal compared with head and neck cancers. No relation found between allium vegetable intake and adenocarcinoma of the oesophagus	Search limited to one database but strategy appropriate Limited to English Study selection and data extraction process rigorous No quality appraisal

Ngo 2007 (43)	Systematic review/overview Search of Medline and PubMed databases from May 1996 to July 2007 Evidence graded according to type of study Quality of studies was assessed using criteria adapted and modified from those used by the NHMRC and the Cochrane Collaboration Narrative synthesis	RCTs (assigned the highest weight), meta-analyses of case control or cohort studies, case control or cohort studies, key epidemiological studies, and animal studies (assigned lowest weight) garlic, garlic constituents, and/or allium vegetables on colorectal cancer	43 studies (10 human – 1 RCT, 5 case-control, 3 cohort, 1 meta-analysis; 11 animal studies, remainder in vitro studies)	Intake of garlic, garlic constituents and/or allium vegetables. Range of primary and secondary outcomes (needed to have been identified by direct visualization by colonoscopy and confirmed pathologically)	'On balance, there is consistent scientific evidence derived from RCT of animal studies reporting protective effects of garlic on CRC despite great heterogeneity of measures of intakes among human epidemiological studies.'	Search limited and strategy unclear Few details on selection process Evidence assessed and graded Limited to English Note: the trial referred to is Tanaka 2004,2006
Kim 2009 (44)	Evidence-based review Medline and EMBASE databases searched from 1955–2007 Assessed on specific stated criteria: data collection, quality of the statistical analysis, type of outcome measured; characteristics of the study populations adjusted relative risk (RR) or odds ratio (OR) estimate, 95% CI, Narrative synthesis	Human studies (interventional and observational) High versus low intake of garlic or garlic products Occurrence of cancer Published in English or Korean Excluded studies without a control group.	19 studies (2 intervention; 17 case control/case cohort; 4 cohort) 4 studies on garlic intake and risk of gastric cancer 9 studies on colorectal cancer 4 studies on prostate cancer 3 on breast cancer 2 on lung cancer 1 study on various other cancers	Various levels of garlic intake Adjusted RR or OR estimates and 95% CIs for the highest category of garlic intake compared with the lowest	Colon cancer: 9 studies in total, 6 stronger studies did not show any reduced risk Prostate cancer: 4 studies in total, 3 stronger studies did not show reduced risk Oesophageal, larynx, oral, ovary, and renal cell cancers: 1 small study. There was no credible evidence to support a relation between garlic intake and a reduced risk of gastric, breast, lung, or endometrial cancer. Very limited evidence supported a relation between garlic consumption and reduced risk of colon, prostate, oesophageal, larynx, oral, ovary, or renal cell cancers.	Search limited to 2 databases plus 2 review articles Search strategy not reported in full Quality assessment not entirely clear Criteria for grading evidence included relevance to Korean population Combined intervention and observational studies
Chiavarini 2015 71	Systematic review and meta-analysis Search of 'multiple databases' including Web of Knowledge, MEDLINE and EMBASE databases in Sept 2014 Newcastle-Ottawa scale for quality assessment	(i) the study (cohort or case-control) must have had garlic consumption assessed; (ii) it must have provided a risk estimate (HR/RR/OR plus 95% CI) for colorectal, colon or rectal cancer incidence (iii) it must have provided information on adjustment for confounding factors.	14 studies (7 cohort and 7 case-control) Total number no reported	Various levels of garlic consumption (dietary intake and supplements) Risk of colorectal cancer (HR/OR/RR)	Garlic consumption was not associated with colorectal cancer risk (OR=0.93; 95% CI 0.82, 1.06, P =0.281). Quality scores: 5 to 8 (median: 6) for case-control; 6 to 9 (median: 8) for cohort studies Preventive effect suggested by the case-control studies may be due to potential confounding factors and exposure misclassification	Search terms appropriate but databases unclear Full details of study selection process not provided but 2 reviewers involved Quality assessment process rigorous (≥7 out of total of 9 used to indicate a high quality study)

Kodali 2014 (46)	Meta-analysis Search of MEDLINE, PubMed, and EMBASE to June 2014 No quality assessment	1) the study used a cohort, case control, or randomized control study design; 2) the study reported intake of garlic in gastric cancer cases and controls; 3) the risk point estimate was reported as OR plus CI or could be calculated	17 studies (14 case control studies, 2 randomized controlled studies, and 1 cohort study) Meta-analysis of a total of 8,621 cases and 14,889 controls	Intake of garlic Risk of gastric cancer (OR)	High, low, and any garlic intake were all associated with reduced risk of gastric cancer. High intake had the most significant risk reduction, OR D 0.49 (95% CI: 0.38–0.62). Heterogeneity was low (I2 D 30.85, P D 0.17). A more modest risk reduction was associated with low intake, OR D 0.75 (95% CI: 0.58–0.97). Half of the studies did not separate garlic intake into high or low amounts, only as consumption vs. non-consumption. Any amount of consumption still showed a risk reduction similar to low intake, OR D 0.77 (95% CI: 0.60–1.00).	Searched several databases but search terms limited Few details of selection and extraction processes No quality assessment
Turati 2015 (47)	Case-control plus meta-analysis Search of MEDLINE and reference lists to December 2013 No quality assessment	(i) had a case–control or cohort study design, (ii) their outcome was gastric cancer occurrence, (iii) examined the association with allium vegetables (including garlic, onion, leek, Chinese chives, and others), (iv) provided the RR with CIs, or data necessary to calculate them	27 studies (23 case–control and 4 cohort studies) Total of 10,143 cases	Consumption of allium vegetables (including garlic, onion, leek, Chinese chives, and others) and risk of gastric cancer	Pooled RRs were 0.78 (95% CI, 0.67–0.91) for allium vegetables (ten case–control and four cohort studies—6227 cases), 0.60 (95% CI, 0.47–0.76) for garlic (12 case–control studies—3807 cases)	Search limited to one database but search strategy appropriate Few details of selection and extraction process No quality assessment
Zhou 2011 (48)	Meta-analysis Search of MEDLINE from 1966 to 2010 Checking reference lists No quality assessment	(1) used a case-control or cohort study design; (2) had data of gastric cancer occurrence; (3) presented the consumption of Allium vegetables (including garlic, onion, leek, scallion, garlic stalk, onion leaves, Welsh onion, and Chinese chives); and (4) provided OR or RR plus CI or data necessary to calculate them.	21 studies (19 case-control studies, 2 cohort studies) 543,220 subjects	Consumption of Allium vegetables (highest and lowest consumption) and risk of gastric cancer occurrence	High versus low consumptions of Allium vegetables reduced the risk for gastric cancer (OR 0.54; 95% CI 0.43–0.65). OR for an increment of 20 g/day of Allium vegetables consumed (approximately 1 garlic bulb) was 0.91 (95% CI 0.88–0.94), Consumption of large amounts of Allium vegetables reduces risk for gastric cancer	Search limited to one database but search strategy appropriate Few details of selection process Extraction process appropriate No quality assessment

Zhou 2013 (17)	Meta-analysis Search of PubMed, EMBASE, Scopus, Web of Science, Cochrane register, and Chinese National Knowledge Infrastructure (CNKI) databases to May 2013 No quality assessment	(a) evaluation of the Allium vegetables intake and prostate cancer risk, (b) had a case control or cohort design, (c) reported the OR or RR and 95% CI.	9 studies (6 case-control and 3 cohort studies)	Allium vegetable intake and risk of prostate cancer	Significantly decreased risk of prostate cancer for intake of allium vegetables (OR = 0.82, 95% CI 0.70, 0.97). Subgroup analysis showed significant association with garlic intake (OR = 0.77, 95% CI 0.64-0.91) Allium vegetables, especially garlic intake, are related to decreased risk of prostate cancer.	Search comprehensive Selection and extraction appears appropriate No quality assessment
Zhu 2014 (50)	Meta-analysis Search of MEDLINE and EMBASE databases from inception to 2013 Checking reference lists and reviews No quality assessment	(1) the design of the study was prospective such as a cohort or case-cohort study; (2) the study investigated the relationship of allium vegetables or garlic supplements and colorectal cancer (CRC) risk; and (3) the study provided or allowed the calculation of RR with 95% CI	13 studies (8 studies of the effects of allium vegetables (5458 patients with CRC) and 5 studies of the effects of garlic supplements (2685 patients with CRC)	Consumption of allium vegetables or garlic supplements and colorectal cancer (CRC) risk	No association between higher intake of allium vegetables and CRC risk (RR 1.06; 95% CI 0.96–1.17; P 0.26). Intake of allium vegetables did not correspond to CRC risk. Higher consumption of allium vegetables was associated marginally with increased risk of colon cancer among women (RR, 1.23; 95% CI, 1.01–1.50; P [.05). Use of garlic supplements was associated significantly with an increased risk of CRC (RR, 1.18; 95% CI, 1.02–1.36; P [.03). “We found no evidence that higher intake of allium vegetables reduced the risk for CRC. We observed that garlic supplements increased the risk for CRC but this finding requires external validation”	Search of two databases but strategy not fully reported English-language only Some details of selection process reported Extraction process appropriate No quality assessment

Abbreviations: CI – confidence interval; HR – hazard ratio; NHMRC - National Health and Medical Research Council, Australia; OR – odds ratio; RR – risk ratio