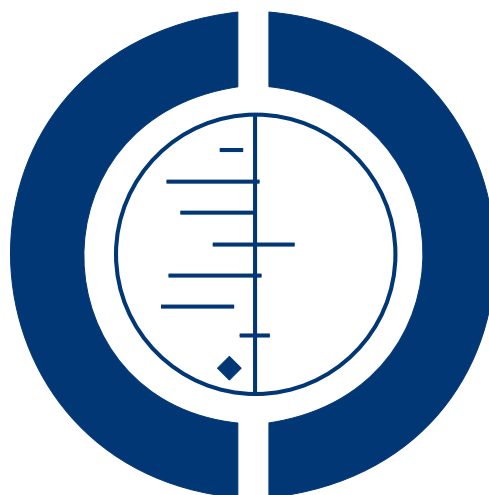


Garlic for the common cold (Review)

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[Intervention Review]

Garlic for the common cold

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ABSTRACT

Background

Garlic is alleged to have antimicrobial and antiviral properties that relieve the common cold, among other beneficial effects. There is widespread usage of garlic supplements. The common cold is associated with significant morbidity and economic consequences. On average, children have six to eight colds per year and adults have two to four.

Objectives

To determine whether garlic (*allium sativum*) is effective for either the prevention or treatment of the common cold, when compared to placebo, no treatment or other treatments.

Search methods

We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (2011, Issue 4), which includes the Cochrane Acute Respiratory Infections Group Specialised Register, OLDMEDLINE (1950 to 1965), MEDLINE (January 1966 to November week 3, 2011), EMBASE (1974 to December 2011) and AMED (1985 to December 2011).

Selection criteria

Randomised controlled trials of common cold prevention and treatment comparing garlic with placebo, no treatment or standard treatment.

Data collection and analysis

Two review authors independently reviewed and selected trials from searches, assessed and rated study quality and extracted relevant data.

Main results

Of the six trials identified as potentially relevant from our searches, only one trial met the inclusion criteria. This trial randomly assigned 146 participants to either a garlic supplement (with 180 mg of allicin content) or a placebo (once daily) for 12 weeks. The trial reported 24 occurrences of the common cold in the garlic intervention group compared with 65 in the placebo group ($P < 0.001$), resulting in fewer days of illness in the garlic group compared with the placebo group (111 versus 366). The number of days to recovery from an occurrence of the common cold was similar in both groups (4.63 versus 5.63). Only one trial met the inclusion criteria, therefore

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limited conclusions can be drawn. The trial relied on self reported episodes of the common cold but was of reasonable quality in terms of randomisation and allocation concealment. Adverse effects included rash and odour.

Authors' conclusions

There is insufficient clinical trial evidence regarding the effects of garlic in preventing or treating the common cold. A single trial suggested that garlic may prevent occurrences of the common cold but more studies are needed to validate this finding. Claims of effectiveness appear to rely largely on poor-quality evidence.

PLAIN LANGUAGE SUMMARY

Garlic for the common cold

Garlic is popularly believed to be useful for the common cold. This belief is based on traditional use and some laboratory evidence that garlic has antibacterial and antiviral properties. We looked for studies that investigated the use of garlic for either preventing or treating the common cold. Of the five studies identified, only one fulfilled the criteria for the review. This study of 146 participants found that people who took garlic every day for three months (instead of a placebo) had fewer colds. When participants experienced a cold, the length of illness was similar in both groups (4.63 versus 5.63 days). While this one study was positive, there is a need for large, high-quality randomised controlled trials to support these findings. Possible side effects in this small trial included odour and a skin rash. More information is needed about the possible side effects of garlic.

There is no information from randomised controlled trials about whether taking garlic at the time of a cold reduces either symptom severity or the number of days of illness.

BACKGROUND

Description of the condition

The common cold is a heterogenous group of diseases caused by numerous viruses that belong to several different families (Heikkinen 2003). The viruses include picornaviruses (notably, rhinoviruses and enteroviruses), coronaviruses, adenoviruses, parainfluenza viruses, influenza viruses, metapneumoviruses and respiratory syncytial viruses (Fendrick 2003). They all cause the common symptoms of nasal stuffiness and discharge, sneezing, sore throat and cough. Other symptoms may also include hoarseness, headache, malaise and lethargy (Heikkinen 2003). The transmission of these viruses occurs via contact with secretions or small- or large-particle aerosols (Heikkinen 2003). On average, children have six to eight and adults two to four colds per year (Heikkinen 2003).

The total annual economic impact of the common cold is estimated to be USD 40 billion in the USA, including the financial impact of medical costs, days off work and the possibility of severe complications in at-risk groups (Fendrick 2003).

Due to the many different virus types, all with varying pathogenetic mechanisms, it is understandable that an effective uni-

versal treatment for the common cold has not been developed (Heikkinen 2003). Current treatments aim to relieve the symptoms of the common cold but Cochrane Reviews suggest that most commonly used treatments are of limited or uncertain effectiveness (Hemilä 2010; Linde 2006; Singh 2011).

Description of the intervention

Garlic (*allium sativum*) has been traditionally used for both culinary and medicinal purposes (Rivlin 2001). Garlic remedies include raw garlic and commercial preparations such as powders, oil and aged extracts (Ruddock 2005; Staba 2001).

The exact usage of garlic for the common cold probably varies worldwide. A cross-sectional population study conducted in Australia in 2007 found that 10.7% of participants used garlic; 29.8% of these for cold, flu or fever (Zhang 2008). In data from the USA in 2002, 3.76% of the population used garlic supplements (Barnes 2004). However, like other usage surveys, this study did not report the indication for use (Barnes 2004; Harris 2000; MacLennan 2006). Since many manufacturers of garlic supplements claim their products boost the immune system and assist in the prevention and treatment of the common cold, it is reasonable to as-

sume that garlic supplements are commonly used by consumers for this purpose. The prevalence of herbal medicine use seems to be relatively consistent between Western countries (Harris 2000; MacLennan 2006).

How the intervention might work

Garlic is alleged to have antimicrobial, antifungal and antiviral properties (Ankri 1999; Ruddock 2005; Weber 1992). It is purported to lower cholesterol and triglyceride levels, reduce blood pressure, slow the development of atherosclerosis and act as an anticoagulant (Kyo 2001; NCCAM 2006; Tapsell 2006). Other studies have reported anti-carcinogenic and immunomodulatory effects (Kyo 2001).

The mechanism of action of garlic as an antimicrobial and antiviral agent is unknown. However, its sulphur-containing derivatives may exert an effect (Naganawa 1996; Weber 1992). Alternatively, the effects of garlic may be due to ajoene, a derivative of allicin which displays antiplatelet and antimicrobial activities in vitro (Naganawa 1996; Ruddock 2005; Weber 1992). When raw garlic is crushed, allicin is produced (Naganawa 1996; Weber 1992). Allicin has demonstrated antibacterial properties in vitro (Cavallito 1944) but some studies suggest it is an unstable compound that is not detected in the circulation after ingestion (Naganawa 1996). Fresh garlic is estimated to contain approximately 4.38 to 4.65 mg of allicin per gram of garlic; thus for one fresh clove of garlic, weighing approximately 4 g, there is approximately 17.52 to 18.60 mg of allicin (Ruddock 2005; Staba 2001; WHO 1999). It is important to recognise that commercial garlic preparations may contain different garlic-derived compounds according to the process used to formulate the product (Miller 2000; Ruddock 2005; Staba 2001; Weber 1992) and that there may be substantial differences in the release of allicin from different preparations (Lawson 2001). There may, therefore, be differences in the effects between preparations and this should be taken into account when evaluating studies of effectiveness. In vitro studies do not indicate clinical efficacy.

Why it is important to do this review

Systematic reviews of garlic for lowering cholesterol and minimising hypertension have been conducted (AHRQ 2000; Silagy 1994; Tapsell 2006). However, prior to this Cochrane Review, no systematic review of garlic for the common cold had been conducted.

OBJECTIVES

To determine whether garlic (*allium sativum*) is effective for either the prevention or treatment of the common cold, when compared to placebo, no treatment or other treatments.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCTs) comparing garlic with placebo, no treatment or standard treatment for the common cold.

Types of participants

Trials eligible for inclusion were those involving adults or children (0 to 17 years) who had no other acute illnesses or severe chronic condition. In terms of common cold prevention, 'cases' were those who developed a common cold during the course of the study. For treatment trials, participants were required to have a common cold or non-specific viral upper respiratory tract infection (URTI). Symptoms which were used to identify the common cold could include coryza, sore throat, rhinitis, headache and general malaise. We excluded studies of influenza or those in which the illness definition included myalgia and fever greater than 38 °C, as these are common distinguishing features of influenza.

Types of interventions

Trials of garlic in any medicinal formulation were included. However, we only assessed trials where garlic was the single active ingredient. Garlic extracts were acceptable but not trials where raw, unprocessed garlic was the intervention.

Types of outcome measures

Primary outcomes

For prevention trials, the outcome of interest was the number of occurrences of the common cold.

For treatment trials, the primary outcome of interest was the duration of symptoms of the common cold.

Secondary outcomes

Secondary outcomes included the duration of symptoms of the common cold (number of days), the number of days 'challenged' (where participants reported an occasional sneeze or felt that a cold was coming on) and the number of days to recovery.

We considered reported adverse effects.

Search methods for identification of studies

Electronic searches

For this update we searched the Cochrane Central Register of Controlled Trials (CENTRAL) (2011, Issue 4), part of *The Cochrane Library*, www.thecochranelibrary.com (accessed 9 December 2011) which includes the Cochrane Acute Respiratory Infections Group Specialised Register, MEDLINE (February 2009 to November week 3, 2011), EMBASE (March 2009 to December 2011) and AMED (March 2009 to December 2011). Details of the previous search are in [Appendix 1](#).

We used the following search terms to search MEDLINE and CENTRAL. We did not use a filter to identify randomised trials in MEDLINE as there were too few results. We adapted the search terms to search EMBASE ([Appendix 2](#)) and AMED ([Appendix 3](#)).

MEDLINE (OVID)

1 Common Cold/
2 common cold*.tw.
3 coryza.tw.
4 (acute adj2 (nasopharyngit* or rhinopharyngit*)).tw.
5 Rhinovirus/
6 (rhinovir* adj2 infect*).tw.
7 adenoviridae/ or adenoviruses, human/
8 Adenovirus Infections, Human/
9 respiratory syncytial viruses/ or respiratory syncytial virus, human/
10 Respiratory Syncytial Virus Infections/
11 (respiratory syncytial virus* or rsv).tw.
12 coronavirus/ or coronavirus 229e, human/ or coronavirus nl63, human/ or coronavirus oc43, human/
13 Coronavirus Infections/
14 coronavir*.tw.
15 exp Respiratory Tract Infections/
16 (respiratory tract infection* or respiratory infection*).tw.
17 or/1-16
18 Garlic/
19 garlic*.tw.
20 exp Allium/
21 (allium* or allisor* or allicin*).tw.
22 or/18-21
23 17 and 22

Searching other resources

There were no language or publication restrictions. We hand-searched the references of all identified studies. Two review authors (AB, EL) and an expert librarian carried out the search. We also

contacted the manufacturers of garlic supplements, experts in the field and the Cochrane Complementary Medicines Field.

Data collection and analysis

Selection of studies

Two review authors (AB, EL) independently reviewed and selected trials from searches, assessed and rated study quality and extracted relevant data. We resolved disagreements through discussion and consensus. We contacted trial authors to request missing data or to clarify methods whenever possible.

Data extraction and management

We extracted data using a standardised form. Information included:

- age and gender of participant;
- number of participants;
- whether analysis was by intention-to-treat (ITT);
- randomisation method;
- method of blinding;
- blinding of outcome assessment;
- smoking or non-smoking status;
- pre-existing chronic conditions;
- exclusion criteria;
- diagnostic criteria;
- treatment setting;
- duration of treatment;
- outcomes;
- duration of illness;
- functioning (for example, time to return to normal activity);
- severity of illness;
- occurrence of illness (prevention trials);
- adverse effects; and
- other medicines being used, including those with potential drug interactions.

Assessment of risk of bias in included studies

As with any systematic review, trials of poor quality may overestimate the treatment effect. We assessed the following aspects of trial quality:

- quality of randomisation;
- quality of blinding;
- quality of allocation concealment;
- presence of selective reporting;
- presence of incomplete outcome data; and
- analysis by intention-to-treat (ITT).

Specification of the dose and standardisation of the garlic extract are important for generalisability but should not affect quality. We

did not conduct a sensitivity analysis as only one study met our inclusion criteria.

The authors independently assessed 'Risk of bias' using the tool recommended by *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). There were no disagreements in assessments.

Measures of treatment effect

We reported the results as continuous data in days of common cold experienced. We did not conduct a meta-analysis as there was only one trial.

Unit of analysis issues

There were no included studies that utilised non-standard designs.

Dealing with missing data

There were no missing data to deal with.

Assessment of heterogeneity

Heterogeneity was not an issue as only one study was included.

Assessment of reporting biases

Reporting bias is possible. It was not possible to use a funnel plot to investigate this as there was only one included study.

Data synthesis

We did not conduct a meta-analysis as only one study met our inclusion criteria. There were insufficient data to conduct a meta-analysis of adverse effects and these were collected using different methods. We considered adverse effects reported in both included and excluded trials.

Subgroup analysis and investigation of heterogeneity

We did not conduct subgroup analyses as there was only one included study.

Sensitivity analysis

The exclusion of studies from the review was clearly objective and non-contentious. In addition, only one trial was included. Therefore, a sensitivity analysis was not required.

RESULTS

Description of studies

See: [Characteristics of included studies](#); [Characteristics of excluded studies](#).

Results of the search

In our first publication of this review (Lissiman 2009) we searched the following electronic databases: the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2009, Issue 1), which includes the Cochrane Acute Respiratory Infections Group Specialised Register: 0 search results; OLDMEDLINE (1950 to 1965) and MEDLINE (January 1966 to March Week 3, 2009): 27 search results; EMBASE (1974 to March 2009): 10 search results; and AMED (1985 to March 2009): two search results.

In this 2011 update we searched the following electronic databases: CENTRAL (*The Cochrane Library* 2011, Issue 4): one result; MEDLINE (Ovid) (1 February 2009 to November week 3 2011): six results; EMBASE from 1 March 2009 to December 2011: 31 search results; AMED from 2009 to December 2011: 0 results. We excluded one new trial in this update (Yakoot 2011).

Included studies

Of the six trials identified as potentially relevant from our searches, we eventually excluded five. However, we included information about adverse effects described in these studies as additional anecdotal reports.

Josling (Josling 2001) randomly assigned 146 participants to either garlic (one garlic capsule, containing 180 mg allicin powder, per day with the main meal) or a placebo, for 12 weeks. Participants kept a diary and the primary outcome measure was the number of occurrences of the common cold measured by participants' self rating. Other outcomes included the cold duration (number of days), the number of days 'challenged' (where participants reported an occasional sneeze or felt that a cold was coming on) and the number of days to recovery.

Excluded studies

Andrianova 2003 (Russian) was a randomised controlled trial (RCT), comparing Allicor (slow-release garlic tablets) to benzimidazole or placebo for treating acute respiratory disease (ARD) in children. The definition of ARDs included influenza, thus excluding it from our review. The trial was conducted in two stages; the first stage was a five-month open non-randomised controlled trial, which investigated the tolerability of Allicor and its effects on ARD morbidity; the second stage was a five-month double-blind RCT which assessed effects on morbidity. In the first stage, 172

children aged 7 to 16 years were given Allicor and were compared to 468 controls; there was no difference in prevalence of gastrointestinal side effects between the groups. In the second stage, 42 children aged 10 to 12 years were treated with Allicor, compared to 41 placebo-treated children. Allicor reduced ARD morbidity 1.7-fold compared to placebo.

Rafinski 1974 (Polish) assessed the clinical course of recurrent upper respiratory tract infections (URTI) in 49 children aged 2 to 15 years, following treatment with Alliofil, a coated garlic tablet. This study was excluded because there was no comparison group and it was a non-randomised controlled trial. Before treatment, swabs were taken from the patients and sensitivity tests were conducted for Alliofil and several major antibiotics (penicillin, streptomycin, terramycin, erythromycin, aureomycin, tetracycline, neomycin and sulphonamides). From the 49 cases of recurrent URTI, bacteria were sensitive to the tested antibiotics in only nine children. The authors report that the bacterial species isolated from the remaining 40 children were sensitive to Alliofil. Ushirotake 2004 (Japanese) was not a RCT and was thus excluded.

The study assessed the number of occurrences of the common cold and the severity of symptoms in 272 volunteer participants at drugstores. One hundred and thirteen had been taking Kyoleopin (containing aged garlic extract) for more than one year, 41 had been taking Leopin-5 (containing aged garlic extract) and 118 had not been taking either. As the study was not randomised or blinded, there is a high risk of bias. Of interest, this study has been used to support claims by a nutritional supplement company that garlic is effective in preventing the common cold and decreasing the severity of symptoms. This emphasises the need for careful consideration of evidence before accepting claims of scientific ev-

idence.

Hiltunen 2007 compared a cellulose nasal spray with a combination cellulose and garlic extract nasal spray to prevent airborne respiratory infections, including cold-like symptoms. The study was excluded because the study outcome did not meet the definition of the common cold defined in our protocol. Our protocol required that studies include either a placebo control group or a standard treatment group for comparison. This study did not meet this criterion as the cellulose could not be considered a standard treatment or a placebo.

Yakoot 2011 assessed the efficacy of a multiherbal formula (including garlic) in the treatment of the common cold. This RCT was excluded for two reasons. Firstly, garlic was combined with several other active ingredients. Secondly, the trial included participants with myalgia and fever, which did not meet our inclusion criteria.

Risk of bias in included studies

We conducted the assessment of study quality according to the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). The included trial (Josling 2001) was of reasonable quality. The trial author reported (in correspondence) that the study was analysed by intention-to-treat (ITT); that is, participant results were analysed according to the treatment group they were randomised to, regardless of whether they completed the study or changed treatment. Not analysing by ITT can affect the validity of results.

The overall risk of bias is presented graphically in Figure 1 and summarised in Figure 2.

Figure 1. 'Risk of bias' graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

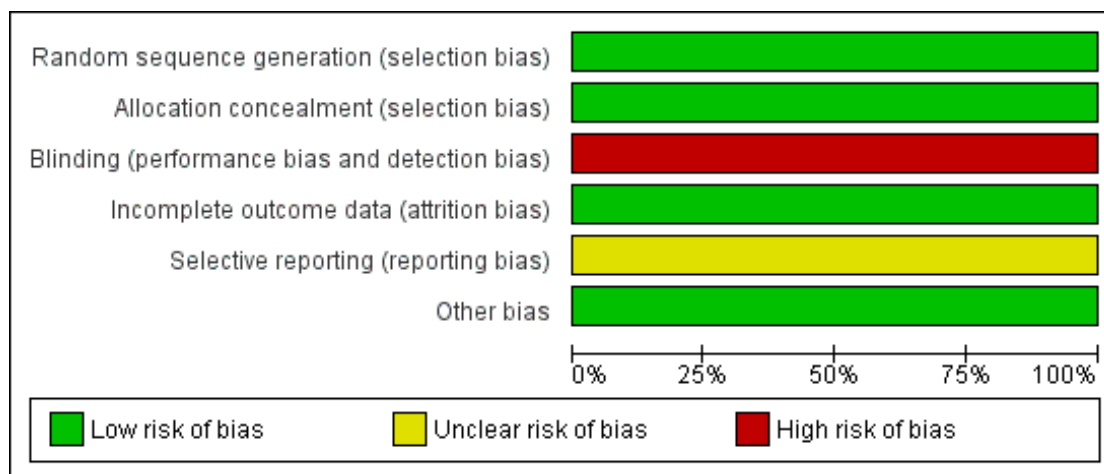
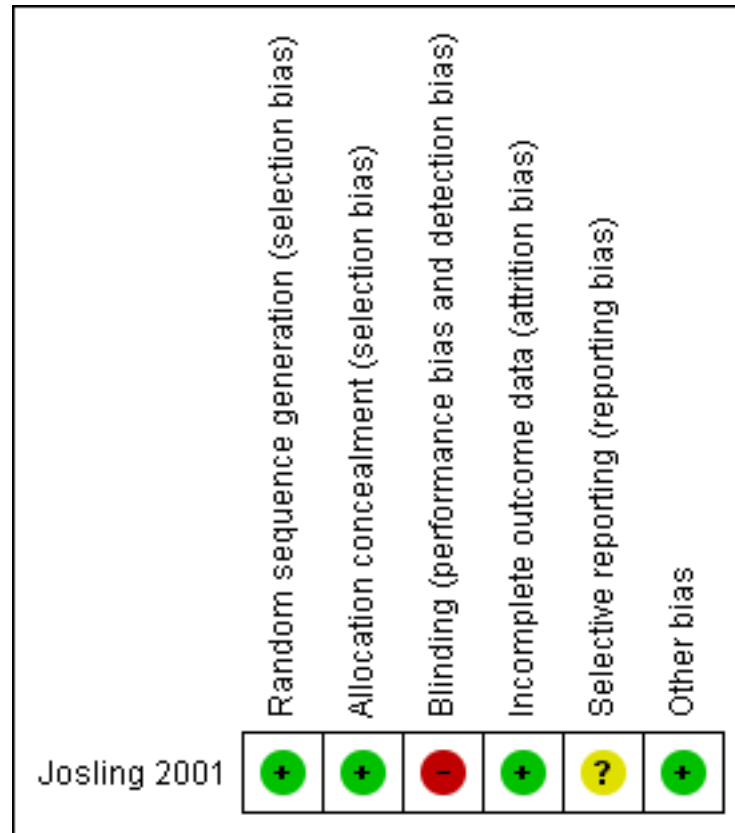


Figure 2. 'Risk of bias' summary: review authors' judgements about each risk of bias item for each included study.



Allocation

Participants were matched for age, sex and previous use of garlic; then randomised to the active or placebo group with the use of a random number generator. Adequate methods of allocation concealment were used; the trial author reported that the research co-ordinator was given plain white bottles marked A or B and these were provided to the patient according to the randomisation codes.

trial author was responsible for breaking the randomisation codes at the end of the trial after all diaries had been returned.

Blinding

The research co-ordinator was blinded for the duration of the trial. As the outcomes were self reported and participants were recruited through advertising, poor blinding of participants may have biased outcome reporting. Reasonable measures were taken to blind participants to the intervention; the investigators reported using foil wrapping to prevent the active treatment from being identified by its smell. However, four of the participants in the active group and one in placebo group noticed a 'smell' when burping. The

Incomplete outcome data

Four participants withdrew from the study; three from the active group and one from the placebo group. Criteria for participant inclusion and exclusion were not reported.

Selective reporting

There was no evidence of selective reporting of outcomes. However, the statistical analysis and primary outcomes do not appear to have been decided in advance. The analysis used may therefore have been chosen post-hoc to maximise the chances of finding a statistically significant result.

Other potential sources of bias

The trial author did not report a conflict of interest at the time of the study.

Effects of interventions

The trial reported 24 occurrences of the common cold in the garlic intervention group compared with 65 in the placebo group ($P < 0.001$). There were fewer days of illness in the garlic group compared with the placebo group (111 versus 366). A cold could be defined as 'feeling low and beginning to exhibit symptoms' or 'full cold symptoms' (headache, sneezing, runny nose, tiredness). Statistical significance was not reported for the number of days to recovery from an occurrence of the common cold (4.63 versus 5.63) but these appear similar. The trial authors reported that 16 participants taking placebo had more than one full-blown cold compared to two participants taking garlic but no statistical analysis was reported.

DISCUSSION

Evidence

Garlic may prevent occurrences of the common cold. The published evidence for this is positive but limited, as it comes from one relatively small trial with subjective outcome measures.

Only one trial (Josling 2001) that met the selection criteria could be identified, limiting the conclusions that can be drawn. The trial reported significant differences in effect between the placebo and intervention groups. Adverse effects reported were relatively minor (smell and skin rash). It is not certain whether the single case of gout reported could be reasonably attributed to the garlic. While the results suggest that garlic may have an effect on preventing the common cold, the subjective nature of the outcome measure mean this result is somewhat uncertain. The outcome of having a cold was not confirmed by any objective observation and may be unreliable. Further, a five-point categorical scale was collapsed for analysis; hence a cold was defined as a score of either 2 - 'feeling low and beginning to exhibit symptoms' or 1 - 'full cold symptoms' (headache, sneezing, runny nose, tiredness). The trial authors do not state whether this analysis was defined in advance and it is possible this was done to increase the likelihood of achieving a statistically significant result, since 'full cold symptoms' would seem to be the clearest definition of a cold. Inclusion and exclusion criteria were not reported, nor were differences in co-morbidity or concurrent illnesses. These factors reduce the generalisability of the trial and may have introduced bias into the results.

No trial was identified that looked at whether treating symptoms of the cold with garlic reduces their severity or duration. However,

in the included study the number of days to recover from a cold was similar in both groups.

Adverse effects

Josling 2001 reported that one participant allocated to receive the garlic preparation withdrew due to development of gout and another due to pruritic rash below the knees, which faded after the garlic supplement was discontinued. Four participants in the intervention group and one in the placebo group noticed a 'smell' when burping. Adverse effects reported in excluded studies were also considered, acknowledging that any adverse events reported could not be attributed to garlic, because of weaknesses in randomisation or the lack of a control group. In the Andrianova 2003 trial, there were no gastrointestinal side effects observed but it is unknown whether there were any other adverse effects. Rafinski 1974 reported that no side effects were observed and Yakoot 2011 reported that the frequency of side effects did not differ significantly between intervention and placebo groups (no data reported). It is not known whether Ushirotake 2004 reported adverse effects.

The safety of consuming small quantities of raw garlic is evident in its worldwide use as a culinary spice (WHO 1999). Adverse events associated with garlic have been reported in non-randomised studies, randomised trials in other conditions and in case reports. A review of other adverse effects reported in the literature included bad breath and body odour and allergic reactions, manifesting in minor respiratory or skin symptoms (AHRQ 2000; WHO 1999). There is a potential for high-dose garlic to interact with antithrombotic drugs (for example, warfarin), increasing the risk of bleeding, but the few reported case studies are inconclusive (AHRQ 2000; Fugh-Berman 2000; WHO 1999).

Summary of main results

The trial reported fewer occurrences of the common cold in people who took the garlic for 12 weeks (24) compared with the placebo group (65) ($P < 0.001$). Statistical significance was not reported for the number of days to recovery from an occurrence of the common cold (4.63 versus 5.63).

While this single small trial had a positive finding, there was insufficient evidence to confirm an effect of garlic on the common cold. No significant harms were reported.

Overall completeness and applicability of evidence

The one included trial addressed the objectives of the review. However, the small size of the trial limits the ability of this review to address the review question adequately. We identified no treatment trials.

Quality of the evidence

Only one, small trial was included. This trial also had several methodological limitations, including in blinding (high risk) and selective reporting (unclear risk). Therefore, the available evidence does not allow any robust conclusions to be drawn.

Potential biases in the review process

We conducted thorough searches of the literature, including of several large databases and the references of relevant studies. As few results were obtained, the searches were not limited to randomised controlled trials (RCTs). However, it is possible that not all relevant data were obtained, if published only in abstract format or in another language. The decisions to include and exclude studies were clearly objective and non-contentious.

Agreements and disagreements with other studies or reviews

There are no other systematic reviews assessing the efficacy of garlic for the common cold.

AUTHORS' CONCLUSIONS

Implications for practice

There is no conclusive evidence to recommend garlic supplements as a preventative or treatment option for the common cold. A

single, small trial was found suggesting garlic might reduce the frequency of symptoms of the common cold if taken continuously as a daily prophylactic but the results require validation. There is currently no evidence to help decide whether treating common colds with garlic will reduce symptom severity or days of illness. Anecdotally, adverse events reported include odour and minor skin or respiratory irritation. The frequency of adverse effects could not be determined from the evidence available.

Implications for research

Further research is needed to provide conclusive evidence of the efficacy of garlic for the common cold. Large, double-blind RCTs should be conducted. Outcomes should be measured objectively, according to pre-defined criteria, in a format that allows comparison.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Josling 2001

Methods	Participants randomly assigned to intervention and control groups, matched for age, sex and previous use of a garlic supplement	
Participants	146 participants, recruited voluntarily via newspaper advertisements	
Interventions	1 Allimax capsule per day with the main meal; or placebo	
Outcomes	Primary outcome: number of occurrences of the common cold in 3-month period Secondary outcomes: cold duration (number of days), the number of days 'challenged' and the number of days to recovery	
Notes	We contacted the study author to query how well garlic could be blinded to participants because of its strong smell. He replied that the tablets used had no odour with daily use. Asked how the groups were matched if they were randomly allocated, he replied that patients were "matched with a standard protocol rejecting same sex volunteers after the maximum number was reached. Age was included in the admission protocol so volunteers over 70 were rejected as were those under 20 years old." We took this to mean that the total sample recruited was balanced according to age, sex and previous garlic use and then randomly allocated	
Risk of bias		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	A random number generator assigned volunteers to the active or placebo group
Allocation concealment (selection bias)	Low risk	Randomisation codes were kept secure and were not broken until all the diaries had been returned
Blinding (performance bias and detection bias) All outcomes	High risk	5 participants (4 active, 1 placebo) noticed a 'smell' when burping. This suggests that blinding of participants may not have been adequate
Incomplete outcome data (attrition bias) All outcomes	Low risk	4 participants withdrew from the study: 3 from the active group, 1 from the placebo group
Selective reporting (reporting bias)	Unclear risk	There was no evidence of selective reporting of outcomes. However, the statistical analysis and primary outcomes do not ap-

Josling 2001 (Continued)

		pear to have been decided in advance
Other bias	Low risk	

Exclusion criteria and basis for selection not stated, which may introduce bias and reduces generalisability. Co-morbidity and concurrent illnesses or medications were not reported.

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Andrianova 2003	Randomisation method not defined; illness definition did not meet pre-specified criteria (included influenza)
Hiltunen 2007	Outcome did not meet pre-defined criteria of common cold. The comparator (intranasal cellulose powder) did not meet the criteria of either placebo or standard treatment
Rafinski 1974	Observational study. Not randomised or placebo-controlled; illness definition did not meet pre-specified criteria (that is, recurrent upper respiratory tract infections)
Ushirotake 2004	Retrospective study. Not randomised or placebo-controlled
Yakoot 2011	Randomised controlled trial. Intervention did not meet inclusion criteria (garlic not the single active ingredient) and illness definition did not meet inclusion criteria (participants with myalgia and fever were included)

DATA AND ANALYSES

This review has no analyses.

APPENDICES

Appendix I. Previous search strategy

We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2009, Issue 1), which includes the Cochrane Acute Respiratory Infections Group Specialised Register; OLDMEDLINE (1950 to 1965); MEDLINE (January 1966 to March Week 3, 2009); EMBASE (1974 to March 2009) and AMED (1985 to March 2009).

The following search terms were used to search MEDLINE. These terms were modified to search CENTRAL, EMBASE and AMED as required.

MEDLINE (OVID)

- 1 exp Garlic/
- 2 garlic.mp.
- 3 exp Allium/
- 4 allium.mp.
- 5 allicor.mp.
- 6 allicin.mp.
- 7 or/1-6
- 8 exp Common Cold/
- 9 common cold\$.mp.
- 10 coryza.mp.
- 11 acute nasopharyngitis.mp.
- 12 exp Rhinovirus/
- 13 rhinovirus infection\$.mp.
- 14 exp Adenoviridae/
- 15 adenovirus\$.mp.
- 16 exp Respiratory Syncytial Viruses/
- 17 exp Respiratory Syncytial Virus Infections/
- 18 (respiratory syncytial virus\$ or RSV).mp.
- 19 exp Coronavirus/
- 20 exp Coronavirus Infections/
- 21 coronavirus\$.mp.
- 22 exp Respiratory Tract Infections/
- 23 respiratory tract infection\$.mp.
- 24 respiratory infection\$.mp.
- 25 or/8-24
- 26 7 and 25

EMBASE.com

- #1. 'garlic'/exp AND [embase]/lim
- #2. garlic:ti,ab AND [embase]/lim
- #3. 'allicin'/exp AND [embase]/lim
- #4. (allium:ti,ab OR allicor:ti,ab OR allicin:ti,ab) AND [embase]/lim
- #5. #1 OR #2 OR #3 OR #4

- #6. 'common cold'/exp AND [embase]/lim
- #7. 'common cold':ti,ab OR 'common colds':ti,ab AND [embase]/lim
- #8. coryza:ti,ab AND [embase]/lim
- #9. 'acute nasopharyngitis':ti,ab AND [embase]/lim
- #10. 'rhinovirus'/exp AND [embase]/lim
- #11. 'rhinovirus infection':ti,ab OR 'rhinovirus infections':ti,ab AND [embase]/lim
- #12. 'adenovirus'/exp AND [embase]/lim
- #13. adenovirus*:ti,ab AND [embase]/lim
- #14. 'respiratory syncytial pneumovirus'/exp AND [embase]/lim
- #15. 'respiratory syncytial virus':ti,ab OR 'respiratory syncytial viruses':ti,ab OR rsv:ti,ab AND [embase]/lim
- #16. 'coronavirus'/exp AND [embase]/lim
- #17. coronavirus*:ti,ab AND [embase]/lim
- #18. 'respiratory tract infection'/exp AND [embase]/lim
- #19. 'respiratory tract infections':ti,ab OR 'respiratory tract infection':ti,ab AND [embase]/lim
- #20. 'respiratory infections':ti,ab OR 'respiratory infection':ti,ab AND [embase]/lim
- #21. #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20
- #22. #5 AND #21

AMED (Ovid) search strategy

- 1 allium sativum/
- 2 (garlic or allium or allisor or allicin).mp. [mp=abstract, heading words, title]
- 3 1 or 2
- 4 common cold/
- 5 common cold*.mp.
- 6 coryza.mp.
- 7 acute nasopharyngitis.mp.
- 8 rhinovirus.mp.
- 9 adenovirus*.mp.
- 10 respiratory syncytial virus*.mp.
- 11 rsv.mp.
- 12 coronavirus*.mp.
- 13 exp respiratory tract infections/
- 14 respiratory tract infection*.mp.
- 15 respiratory infection*.mp.
- 16 or/4-15
- 17 3 and 16

Appendix 2. Embase.com search strategy

- #20. #14 AND #19
- #19. #15 OR #16 OR #17 OR #18
- #18. allium*:ab,ti OR allisor*:ab,ti OR allicin*:ab,ti
- #17. 'allicin'/de
- #16. garlic*:ab,ti
- #15. 'garlic'/exp OR 'garlic extract'/de OR 'garlic oil'/de
- #14. #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13
- #13. 'upper respiratory tract infection':ab,ti OR 'upper respiratory infection':ab,ti
- #12. 'upper respiratory tract infection'/de OR 'viral upper respiratory tract infection'/de OR 'nose infection'/de
- #11. (coronavir* NEAR/2 infect*):ab,ti
- #10. 'coronavirus infection'/de OR 'coronavirus'/de
- #9. 'respiratory syncytial virus':ab,ti OR 'respiratory syncytial viruses':ab,ti OR rsv:ab,ti

- #8. 'respiratory syncytial pneumovirus'/de OR 'respiratory syncytial virus infection'/de
- #7. (adenovir* NEAR/2 infect*):ab,ti
- #6. 'human adenovirus infection'/de OR 'adenovirus infection'/de
- #5. (infect* NEAR/2 rhinovir*):ab,ti
- #4. 'human rhinovirus'/de OR 'rhinovirus infection'/de
- #3. ((nasopharyngit* OR rhinopharyngit*) NEAR/2 acute):ab,ti
- #2. 'common cold':ab,ti OR 'common colds':ab,ti OR coryza:ab,ti
- #1. 'common cold'/exp

Appendix 3. AMED search strategy

- 1 common cold/
- 2 common cold*.tw.
- 3 coryza.tw.
- 4 ((nasopharyngit* or rhinopharyngit*) adj3 acute).tw.
- 5 rhinovir*.tw.
- 6 adenovir*.tw.
- 7 (respiratory syncytial virus* or rsv).tw.
- 8 coronavir*.tw.
- 9 exp respiratory tract infections/
- 10 (respiratory tract infection* or respiratory infect*).tw.
- 11 or/1-10
- 12 exp allium/ or allium sativum/
- 13 allium*.tw.
- 14 garlic*.tw.
- 15 allicor*.tw.
- 16 allicin*.tw.
- 17 or/12-16
- 18 11 and 17

FEEDBACK

Garlic and the common cold, 10 July 2009

Summary

The plain language summary is erratic and therefore misleading as it states that “...(on average individuals taking garlic had colds lasting 1.52 days while those taking placebo had colds lasting 5.01 days)...”

In the review it is, more correctly, calculated that “..the number of days to recovery was similar in both groups (4.63 vs. 5.63 days)..”

The plain language text is probably to be quoted in the common press, journalists being not-so-thorough readers.

Submitter agrees with default conflict of interest statement:

I certify that I have no affiliations with or involvement in any organization or entity with a financial interest in the subject matter of my feedback.

Reply

Dear Frans Nuijten,

Many thanks for your perceptive and helpful comments. We agree that the reporting of results in the Plain Language Summary is confusing and will clarify this in our next update.

As you recognised:

The total number of days of illness in the garlic group was 111, compared to 366 in the placebo group. However when participants experienced a cold, the length of illness was similar in both groups (4.63 vs 5.63). The trial authors also reported 'average days of illness' (total number of days of illness / number of colds): 1.52 vs 5.01 days. This significant difference is evidently derived from including participants with 0 days of illness (i.e. no cold), of which there were more in the garlic group (number of colds 24 vs 65). This is misleading; the more relevant result is the number of days of illness when a cold is present (4.63 vs 5.63).

Many thanks,
Elizabeth Lissiman
Alice Bhasale
Marc Cohen

Contributors

Frans Nuijten

WHAT'S NEW

Last assessed as up-to-date: 9 December 2011.

Date	Event	Description
9 December 2011	New search has been performed	Searches updated. No new trials were included and one trial (Yakoot 2011) was excluded.
9 December 2011	New citation required but conclusions have not changed	The conclusions of our review remain unchanged.

HISTORY

Protocol first published: Issue 4, 2006

Review first published: Issue 3, 2009

Date	Event	Description
26 July 2009	Feedback has been incorporated	Clarification in Plain language summary, Results (Summary) and Results (Main document)
9 July 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

Alice Bhasale (AB) and Elizabeth Lissiman (EL) were responsible for searching for studies, data extraction and analysis and writing and editing the review.

Marc Cohen (MC) provided expert advice and guidance on the final drafts of the review.

DECLARATIONS OF INTEREST

None known.

INDEX TERMS

Medical Subject Headings (MeSH)

*Garlic [adverse effects]; Antiviral Agents [adverse effects; *therapeutic use]; Common Cold [*drug therapy; prevention & control]; Exanthema [chemically induced]; Odors; Phytotherapy [adverse effects; *methods]; Plant Extracts [adverse effects; *therapeutic use]; Randomized Controlled Trials as Topic; Sulfinic Acids [adverse effects; *therapeutic use]

MeSH check words

Humans