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[Intervention Review]

Cranberries for preventing urinary tract infections

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Contact: Elisabeth M Hodson, emhodson@exemail.com.au.**Editorial group:** Cochrane Kidney and Transplant Group.**Publication status and date:** New search for studies and content updated (conclusions changed), published in Issue 4, 2023.**Citation:** Williams G, Hahn D, Stephens JH, Craig JC, Hodson EM. Cranberries for preventing urinary tract infections. *Cochrane Database of Systematic Reviews* 2023, Issue 4. Art. No.: CD001321. DOI: [10.1002/14651858.CD001321.pub6](https://doi.org/10.1002/14651858.CD001321.pub6).

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ABSTRACT

Background

Cranberries contain proanthocyanidins (PACs), which inhibit the adherence of p-fimbriated *Escherichia coli* to the urothelial cells lining the bladder. Cranberry products have been used widely for several decades to prevent urinary tract infections (UTIs). This is the fifth update of a review first published in 1998 and updated in 2003, 2004, 2008, and 2012.

Objectives

To assess the effectiveness of cranberry products in preventing UTIs in susceptible populations.

Search methods

We searched the Cochrane Kidney and Transplant Specialised Register up to 13 March 2023 through contact with the Information Specialist using search terms relevant to this review. Studies in the Register are identified through searches of CENTRAL, MEDLINE, and EMBASE, conference proceedings, the International Clinical Trials Register Search Portal (ICTRP) and ClinicalTrials.gov.

Selection criteria

All randomised controlled trials (RCTs) or quasi-RCTs of cranberry products compared with placebo, no specific treatment or other intervention (antibiotics, probiotics) for the prevention of UTIs were included.

Data collection and analysis

Two authors independently assessed and extracted data. Information was collected on methods, participants, interventions and outcomes (incidence of symptomatic UTIs, positive culture results, side effects, adherence to therapy). Risk ratios (RR) with 95% confidence intervals (CI) were calculated where appropriate. Study quality was assessed using the Cochrane risk of bias assessment tool. Confidence in the evidence was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach.

Main results

For this update 26 new studies were added, bringing the total number of included studies to 50 (8857 randomised participants). The risk of bias for sequence generation and allocation concealment was low for 29 and 28 studies, respectively. Thirty-six studies were at low risk of performance bias, and 23 studies were at low risk of detection bias. Twenty-seven, 41, and 17 studies were at low risk of attrition bias, reporting bias and other bias, respectively.

Forty-five studies compared cranberry products with placebo or no specific treatment in six different groups of participants. Twenty-six of these 45 studies could be meta-analysed for the outcome of symptomatic, culture-verified UTIs. In moderate certainty evidence, cranberry

products reduced the risk of UTIs (6211 participants: RR 0.70, 95% CI 0.58 to 0.84; $I^2 = 69\%$). When studies were divided into groups according to the treatment indication, cranberry products probably reduced the risk of symptomatic, culture-verified UTIs in women with recurrent UTIs (8 studies, 1555 participants: RR 0.74, 95% CI 0.55 to 0.99; $I^2 = 54\%$), in children (5 studies, 504 participants: RR 0.46, 95% CI 0.32 to 0.68; $I^2 = 21\%$) and in people with a susceptibility to UTIs due to an intervention (6 studies, 1434 participants: RR 0.47, 95% CI 0.37 to 0.61; $I^2 = 0\%$). However, in low certainty evidence, there may be little or no benefit in elderly institutionalised men and women (3 studies, 1489 participants: RR 0.93, 95% CI 0.67 to 1.30; $I^2 = 9\%$), pregnant women (3 studies, 765 participants: RR 1.06, 95% CI 0.75 to 1.50; $I^2 = 3\%$), or adults with neuromuscular bladder dysfunction with incomplete bladder emptying (3 studies, 464 participants: RR 0.97, 95% CI 0.78 to 1.19; $I^2 = 0\%$).

Other comparisons were cranberry products with probiotics (three studies) or antibiotics (six studies), cranberry tablets with cranberry liquid (one study), and different doses of PACs (two studies).

Compared to antibiotics, cranberry products may make little or no difference to the risk of symptomatic, culture-verified UTIs (2 studies, 385 participants: RR 1.03, 95% CI 0.80 to 1.33; $I^2 = 0\%$) or the risk of clinical symptoms without culture (2 studies, 336 participants: RR 1.30, 95% CI 0.79 to 2.14; $I^2 = 68\%$). Compared to probiotics, cranberry products may reduce the risk of symptomatic, culture-verified UTIs (3 studies, 215 participants: RR 0.39, 95% CI 0.27 to 0.56; $I^2 = 0\%$). It is unclear whether efficacy differs between cranberry juice and tablets or between different doses of PACs as the certainty of the evidence was very low.

The number of participants with gastrointestinal side effects probably does not differ between those taking cranberry products and those receiving placebo or no specific treatment (10 studies, 2166 participants: RR 1.33, 95% CI 1.00 to 1.77; $I^2 = 0\%$; moderate certainty evidence). There was no clear relationship between compliance with therapy and the risk for repeat UTIs. No difference in the risk for UTIs could be demonstrated between low, moderate and high doses of PACs.

Authors' conclusions

This update adds a further 26 studies taking the total number of studies to 50 with 8857 participants. These data support the use of cranberry products to reduce the risk of symptomatic, culture-verified UTIs in women with recurrent UTIs, in children, and in people susceptible to UTIs following interventions. The evidence currently available does not support its use in the elderly, patients with bladder emptying problems, or pregnant women.

PLAIN LANGUAGE SUMMARY

Cranberries for preventing urinary tract infections

What is the issue?

Cranberries (as cranberry juice, tablets or capsules) have been used for many years to prevent urinary tract infections (UTIs). Cranberries contain proanthocyanidins (PACs), substances that can prevent bacteria from sticking to the walls of the bladder. This may help prevent infections and reduce the need for working people to take time for medical appointments. However, there is currently no established regimen for what PACs dose to use and no formal regulation by health authorities of cranberry products. In particular, the dose suggested may not be included on the package.

What did we do?

We analysed the results of randomised controlled trials (RCTs), which compared the occurrence of UTIs in people taking a cranberry product with those taking a placebo or no treatment. We also analysed the results of RCTs comparing a cranberry product with other treatments such as antibiotics or probiotics.

What did we find?

We found 50 RCTs involving 8857 people. Forty-five RCTs compared cranberry with a placebo or no treatment. Taking cranberries as a juice, tablets or capsules reduced the number of UTIs in women with recurrent UTIs, in children with UTIs and in people susceptible to UTIs following an intervention such as bladder radiotherapy. However, UTIs did not appear to be reduced in elderly institutionalised men and women, in adults with neuromuscular bladder dysfunction and incomplete bladder emptying, or in pregnant women. Few people reported any side effects with the most common being tummy pain. We did not find enough information to determine if cranberry products are more or less effective compared with antibiotics or probiotics in preventing further UTIs.

Conclusions

Cranberry products may help to prevent UTIs which cause symptoms in women with frequent UTIs, in children with UTIs and in people who have undergone an intervention involving the bladder. However, further assessment is required in well-designed and prospectively registered RCTs to clarify further who with UTIs would benefit from cranberry products.