Effect of cocoa and tea intake on blood pressure
Taubert D, Roesen R, Schomig E

CRD summary
This review assessed the effects of cocoa or tea on blood-pressure. The authors concluded that cocoa-rich foods may reduce blood-pressure but tea intake appeared to have no effect. The authors’ cautious conclusion appears appropriate in view of the limited evidence available.

Authors' objectives
To evaluate the effects of cocoa and tea intake on blood-pressure.

Searching
MEDLINE, EMBASE, Scopus and the Science Citation Index were searched from 1966 to October 2006, in addition to the Cochrane CENTRAL Register; the search terms were reported. No language restrictions were applied. The reference lists from original and review articles were also screened. Only studies published as full articles were included.

Study selection
Study designs of evaluations included in the review
Crossover and parallel-group randomised controlled trials (RCTs) with 10 or more participants were eligible for inclusion.

Specific interventions included in the review
Studies that evaluated cocoa or tea intake for at least 7 days and described the type, duration and amount of cocoa or tea were eligible for inclusion. Studies that only evaluated supplements of tea or cocoa ingredients, concomitant vitamin supplements or polyphenol-rich foods, or used other dietary treatments combined with tea or cocoa were excluded.

The included cocoa studies compared dark or high-flavonoid chocolate containing between 213 and 500 mg of polyphenols with polyphenol-free white chocolate, low-flavonoid chocolate or cocoa butter chocolate. The energy values contained in the chocolate ranged from 240 to 544 kcal per day. All but one of the included tea studies assessed black tea (a minimum of 5 or 6 cups per day or containing 1,350 mg polyphenols); the remaining study assessed green tea. Water was the most common control used. Other controls used were: no tea; water with added caffeine matched to intervention caffeine levels; and water, milk and sugar with caffeine matched to intervention caffeine levels. The median duration was 2 weeks for the cocoa studies and 4 weeks for the tea studies.

Participants included in the review
Studies of normotensive or hypertensive adults (aged 18 years or older) were eligible for inclusion. In the included studies, 34% of participants in the cocoa studies and 48.5% of participants in the tea studies had hypertension or high-normal blood-pressure. Most of the participants in the included studies (63.9% in the cocoa studies and 70.7% in the tea studies) were male. In only one of the included studies were any participants taking medication (aspirin plus antihypertensive drugs).

Outcomes assessed in the review
Studies that reported means (or differences between means) and standard deviations (SDs) or 95% confidence intervals (CIs) of systolic and diastolic blood-pressure (SBP and DBP, respectively) at baseline and post-treatment were eligible for inclusion.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.
Assessment of study quality
Two reviewers independently assessed validity using the 11-item Jadad scale. Any disagreements were resolved through consensus. The maximum possible score was 13 points. Studies scoring more than 9 points were considered to be good quality; studies scoring 9 or fewer points were considered to be poor quality.

Data extraction
Two reviewers independently extracted the data and resolved any disagreements through consensus.

For each study, changes in the mean (plus SD) were extracted for SBP and DBP. If the studies did not report SDs these were estimated using reported methods. Where possible, data from the crossover studies were analysed as paired data; otherwise, changes were input using the methods employed for the parallel-group studies.

Methods of synthesis
How were the studies combined?
Pooled mean differences between treatments were calculated using the DerSimonian and Laird random-effects model. Publication bias was assessed using a funnel plot and the Egger regression test.

How were differences between studies investigated?
Statistical heterogeneity was assessed using the Cochran Q statistic and the I-squared statistic. A sensitivity analysis was performed to determine the effect of excluding individual studies and to examine the effect of using different values (0 and 1 instead of 0.68 used in the main analyses) for the correlation coefficient in pooled estimates.

Results of the review
Ten RCTs (n=516) were included. Five of the RCTs (n=173) evaluated cocoa intake and the other five (n=343) evaluated tea intake.

The quality scores ranged from 8 to 10 out of 13, with half of the studies being assessed as good quality. Methodological problems included lack of reporting of randomisation method, lack of assessment of adverse effects and no prior power estimation.

Cocoa was associated with a statistically significant reduction in SBP (-4.7 mmHg, 95% CI: -7.6, -1.8, p=0.002) and DBP (-2.8 mmHg, 95% CI: -4.8, -0.8, p=0.006) compared with a cocoa-free control. Significant heterogeneity between the studies was found for SBP and DBP (p<0.001; I-squared 87.6%). Two studies appeared to be responsible for the heterogeneity and excluding these studies made little difference to the results.

There was no statistically significant difference between tea and no tea for either SBP (0.4 mmHg, 95% CI: -1.3, 2.2, p=0.63) or DBP (-0.6 mmHg, 95% CI: -1.5, 0.4, p=0.38). No significant heterogeneity was found.

Results from the meta-analyses were similar after excluding each study in turn.

There was no evidence for publication bias from the funnel plots or Egger's test.

Authors' conclusions
Cocoa-rich foods may reduce blood-pressure but tea intake appears to have no effect.

CRD commentary
The review question was clear in terms of the study design, participants, intervention and outcomes. Several relevant sources were searched and attempts were made to minimise language but not publication bias. The potential for publication bias was assessed and no evidence of it was found; however, this was based on only a few studies with small sample sizes and so the potential for publication bias cannot be ruled out. Methods were used to minimise reviewer error and bias in the validity assessment and data extraction, but it was not clear whether similar steps were taken at the
study selection stage. Study quality was assessed using an aggregated quality scoring system but details of the individual components were not reported in full, which limited the evaluation of study validity.

The study synthesis appears appropriate. Heterogeneity was assessed and the studies responsible for significant heterogeneity in the meta-analyses were identified; however, the reasons for such differences were not explicitly discussed. The authors acknowledged that the evidence in favour of cocoa reducing blood pressure is based on only a few studies of short duration and small sample size, showing inconsistent results. The authors’ cautious conclusion appears appropriate in view of the limited evidence available.

**Implications of the review for practice and research**

**Practice:** The authors stated that any dietary advice based on the review findings must include a discussion of the high sugar, fat and calorie content of most cocoa products.

**Research:** The authors did not state any implications for further research.

**Bibliographic details**

Taubert D, Roesen R, Schomig E. Effect of cocoa and tea intake on blood pressure. Archives of Internal Medicine 2007; 167(7): 626-634

**PubMedID**

17420419

**DOI**

10.1001/archinte.167.7.626

**Original Paper URL**

http://archinte.ama-assn.org/cgi/content/abstract/167/7/626

**Additional Data URL**

http://www.nature.com/ajh/journal/v23/n1/full/ajh2009213a.html#abs

**Other publications of related interest**


**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Beverages; Blood Pressure /drug effects; Cacao; Humans; Randomized Controlled Trials as Topic; Tea

**AccessionNumber**

12007008109

**Date bibliographic record published**

29/02/2008

**Date abstract record published**

29/02/2008

**Record Status**

This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract
contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.