Does daily consumption of barley affect blood cholesterol concentrations?

Systematic review and meta-analysis

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Background

- Compared with other grains, high levels of soluble fibres such as β-glucan and arabinoxylan are present in barley (*Hordeum vulgare*).
- Soluble fibres in barley have been reported to affect blood cholesterol concentrations in humans.
- Reductions in total and LDL cholesterol and increases in HDL cholesterol are beneficial health effects due to being inversely associated with the risk of coronary heart disease.

Aim

- To investigate whether the dietary intake of wholegrain barley or its minimally-processed products obtained by dehulling, drying, cutting, flaking, pearling, rolling and grinding can reduce blood total and LDL cholesterol concentrations.

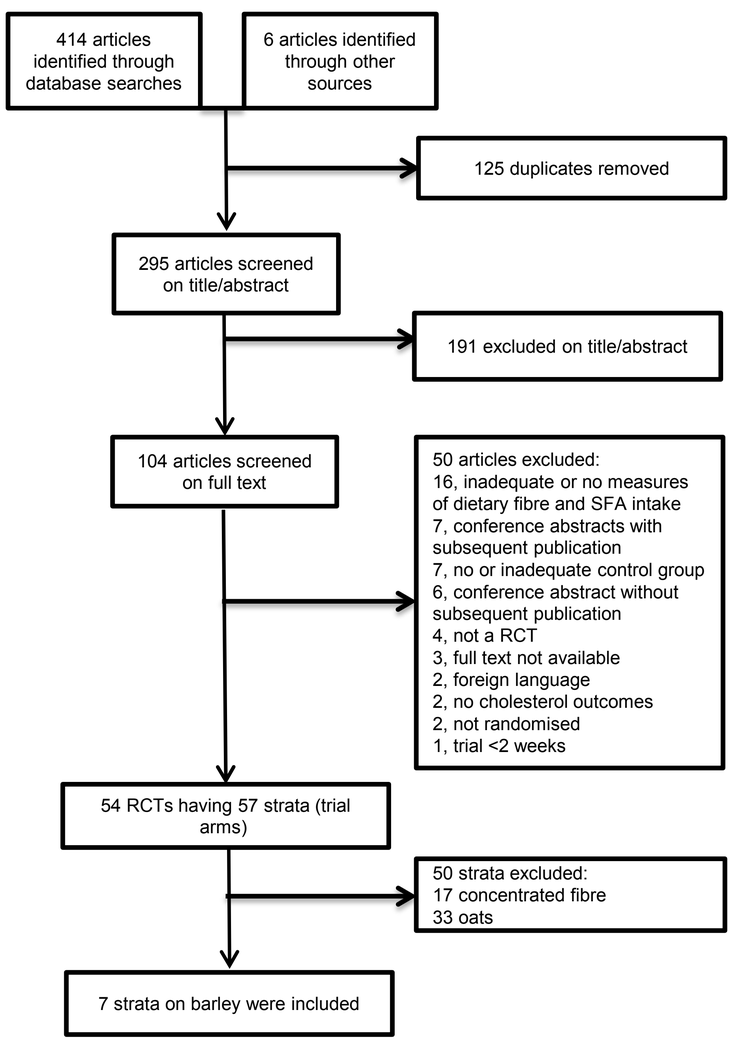
Methods

- A search was conducted in December 2014 through EMBASE, PubMed and Cochrane Library followed by a hand-search within articles screened on full-text.
- As part of a bigger project, the search covered cholesterol changes by dietary intake of oats, barley, or β-glucan extracted from either oats or barley.
- To be included in the systematic review, a study must meet the eligibility criteria summarised in Table 1.
- Studies involving acutely ill subjects were excluded, as were trials with concomitant intervention or lipid-lowering medication, unless the intervention did not differ between the control and test groups.
- Records identified during the search process were imported into EPPI-Reviewer v4. Screening was conducted separately by two researchers.
- Total, LDL and HDL cholesterol data were extracted and cross-checked separately by two researchers.
- Studies were assessed for risk of bias by Review Manager v5.3 according to the Cochrane Handbook.
- Meta-analysis was performed in Review Manager v5.3 using a random effects model and the generic inverse variance method to allow combination of the varied data reporting methods, and to ensure cross-over studies were not given less weight compared to parallel studies.

Table 1. PICOTS criteria for study selection

Population	Non-acutely ill adults or children (2 years and older)
Intervention	Consumption of wholegrain or minimally-processed barley
Comparator	Alternative grain/cereal or usual diet, or lower amounts of barley
Outcome	Total and/or LDL and/or HDL cholesterol concentration
Time	At least 2 weeks duration of the intervention and comparison intakes
Study design	Randomised controlled trial (RCT)

Figure 1. PRISMA diagram of the studies identification process



Results

- The screening of articles retrieved from the search strategies is detailed in Figure 1.
- Seven strata (n = 185 participants) from 7 randomised controlled trials (RCTs) with low risk of bias (Figure 2) were included in the review and the meta-analysis.
- Five of the seven strata were conducted in people with hypercholesterolaemic concentrations (baseline of total cholesterol ≥ 5.5 mmol/L).
- Consumption of barley resulted in a significant change in total cholesterol by -0.32 [95% CI: -0.42, -0.21] mmol/L (Figure 3, top). Heterogeneity (I^2), was low at 40%.
- Intake of barley reduced LDL cholesterol significantly by -0.25 [95% CI: -0.32, -0.18] mmol/L (Figure 3, middle) with no important heterogeneity (I^2 = 12%).
- In contrast with total and LDL cholesterol, consumption of barley had no significant effect (*P* = 0.08) on HDL cholesterol concentration (Figure 3, bottom).
- The body of evidence has low risk of bias with no concerns about its consistency or directness. However, there is serious imprecision due to the low number of participants (n = 185).

Conclusions

- Daily barley dry weight achieving the effect ranged between 30 g and 175 g, which cover the median daily cereal intake of 40 g in Australia.
- Dietary consumption of ≥30 g barley showed a consistent and significant reduction in blood total and LDL cholesterol concentrations.
- Cholesterol reduction by barley intake can be explained by a plausible biological mechanism.
- Due to the serious imprecision, the quality of evidence has a moderate degree of certainty.

Figure 2. Risk of bias summary for the studies included in the meta-analysis

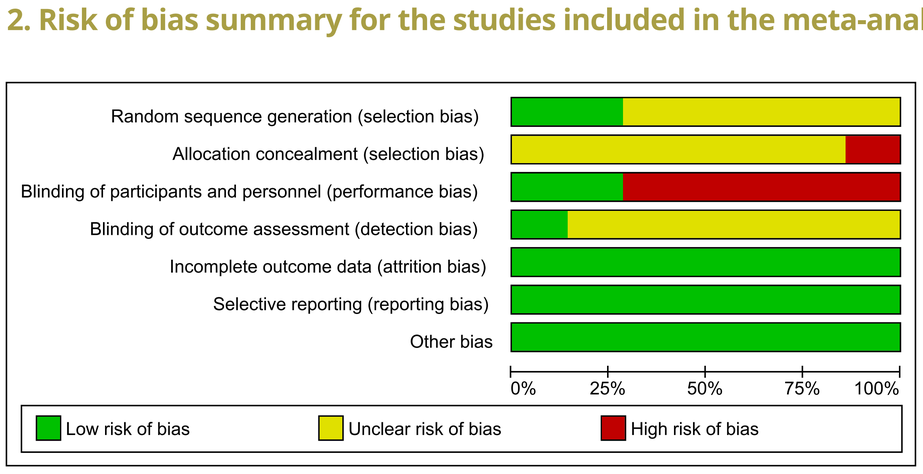
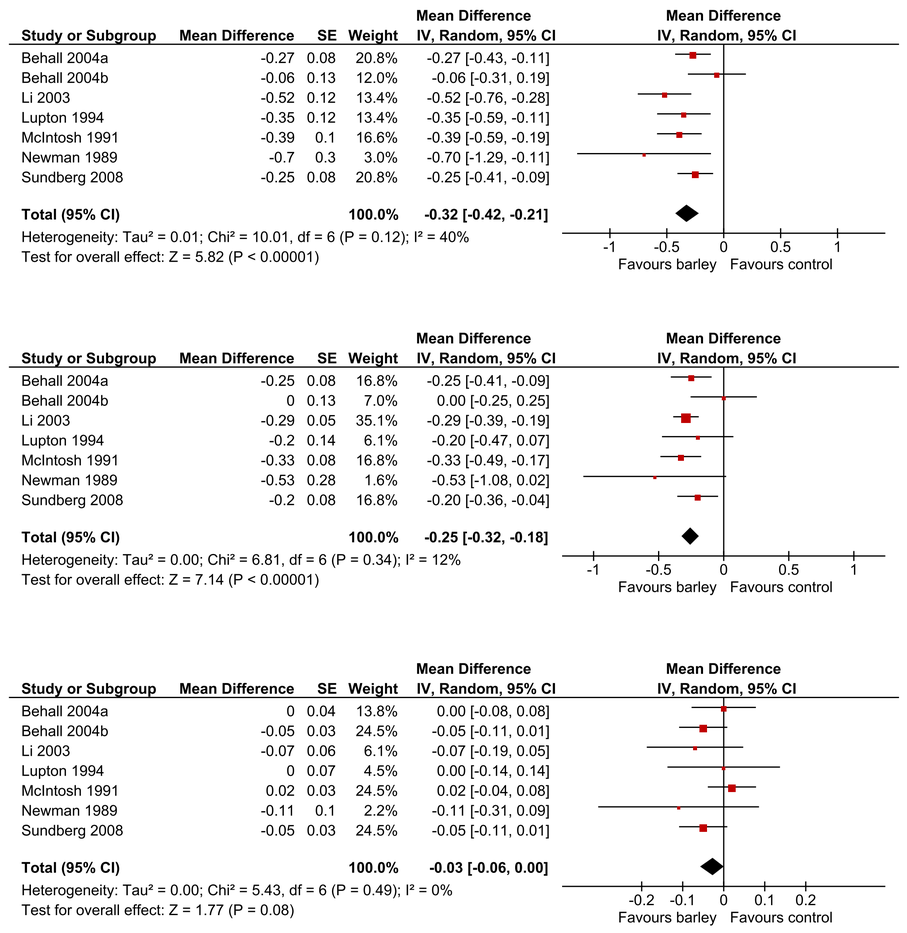


Figure 3. Forest plot for effects of consuming barley on total cholesterol concentration (top), LDL cholesterol concentration (middle) and HDL cholesterol concentration (bottom)



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