Peer Review File

Article information: https://dx.doi.org/10.21037/atm-23-1816

Reviewer A

Comments:

Comment 1: Does the author think that β-glucan in Oats and Barley have the same properties? There are reports that the physiological functions are not the same because the DP3/DP4 ratio of each β-glucan is different. The author's opinion should be stated.

Reply 1: Thank you for your suggestion. Reiners et al. reported that there were no differences in body weight, body composition, blood pressure, blood lipids, glycemic measures, or hs-CRP between the oat and barley conditions. These data suggest that there were no material differences in the physiological effects of the β-glucan in oats vs. barley. Therefore, in our view, discussing the DP3/DP4 ratio of oats and barley will not enhance the editorial commentary. Additionally, we do not feel it is necessary to discuss the DP3/DP4 ratio of β-glucan in the editorial commentary since the original paper did not provide these values, which vary within each cereal species category depending on the cultivar, variety, place of growth, processing, etc. (Lante, Canazza, & Tessari, 2023).

Changes in the text: No changes were made to the text.

Comment 2: The viscosity is also related to the LDL cholesterol-lowering effect, but since the cholesterol-lowering effect is exerted even when the molecular weight is lowered, it is thought that short-chain fatty acids from intestinal fermentation are involved. The reviewers were under the impression that the possible mechanistic explanation of the LDL cholesterol-lowering effect was too classical.

Reply 2: A recent meta-analysis by Ghavami, et al. (2023) reported that soluble fiber supplementation reduced LDL-C and total cholesterol more than the control. These reductions in LDL-C were observed in the fermented/viscous (mean difference (MD): -8.89 mg/dL; 95% CI: -10.35, -7.42; $P<0.001$), fermented/non-viscous (MD: -4.12; 95% CI: -7.32, 0.92; $P = 0.011$), and non-fermented/viscous (MD: -12.70; 95% CI: -22.75, -2.64) subgroups. Notably, the magnitude of the effect for the change in LDL-C was much larger in the fermented and non-fermented viscous subgroups vs. the fermented non-viscous subgroup, although all subgroups showed a statistically significant reduction in LDL-C. The subgroup analyses for total cholesterol followed the same pattern. Furthermore, McRorie, et al. (2017) provides an overview of the hypothesis that soluble, non-viscous, fermentable fibers improve blood lipids via the byproducts of fermentation. The authors reviewed 17 randomized, well-controlled clinical studies, which showed no effect of soluble non-viscous, fermentable fibers on LDL-C or total cholesterol. The results of these reviews support our statement that the primary mechanisms for the cholesterol-lowering effects of fiber are related to viscosity. Fermentability of fiber may play a smaller, secondary role, although the evidence for this is mixed.

Changes to the text: We modified the commentary on page 3 to emphasize that trapping of cholesterol and bile acids by viscous fibers is the primary mechanism for cholesterol-lowering effects, although other mechanisms may play some role.

Comment 3: The viscous fiber from oats and barley had been explained, but the reviewer would like to know what the viscosity of β-glucan contained in oats and barley is. If possible, comparisons with other viscous fibers should be shown.

Reply 3: Reiners, et al. did not report the viscosity of the β-glucan provided by the oat and barley conditions in the study. Viscosity of the β-glucans is highly dependent upon the solubility, concentration, and molecular weight of the β-glucan, as well as external factors (e.g., cultivar, environment, and processing) (Lante et al., 2023; Schmidt, 2022). Mikkelsen, et al. (2010) reported that the viscosity of a β-glucan extract from oats was approximately 100-fold higher in comparison to a β-glucan extract from barley. However, Leuzinger, et al. (2018) used magnetic resonance imaging to simulate the viscosity of β-glucan solutions that form inside the gastrointestinal tract and reported higher intestinal viscosity after intake of β-glucan from barley vs. oats. Accordingly, we prefer not to include a discussion of the relative viscosities of beta-glucan from oats and barley in the commentary because these were not measured and reported by the authors of the study that is the focus of the commentary and because of the high variability and number of factors that can affect the viscosity of a particular product or food.
Changes in the text: No changes were made to the text.

Comment 4: The text must include that the FDA and EFSA had approved a health claim for the LDL cholesterol-lowering effects of beta-glucan in oats and barley and include references related to the approvals.

Reply 4: Thank you for this suggestion.
Changes to the text: We added a discussion about the FDA and EFSA approved health claims to the bottom of page 3.

Reviewer B
Comments:
Comment 1: The manuscript explain how cholesterol levels can be reduced by ingestion of viscous dietary fibers. The importance of comsuption of oats and barley is justified in this review.

Reply 1: Thank you for taking the time to review our editorial commentary. We appreciate your positive feedback.
Changes to the text: No changes were made to the text.

References

1. Lante, A., Canazza, E., & Tessari, P. (2023). Beta-Glucans of Cereals: Functional and Technological Properties. Nutrients, 15(9). doi:10.3390/nu15092124
2. Ghavami, A., Ziaei, R., Talebi, S., Barghchi, H., Nattagh‐Eshtivani, E., Moradi, S., . . . Marx, W. (2023). Soluble fiber supplementation and serum lipid profile: a systematic review and dose-response meta-analysis of randomized controlled trials. Advances in Nutrition.
3. McRorie, J. W., & McKeown, N. M. (2017). Understanding the Physics of Functional Fibers in the Gastrointestinal Tract: An Evidence-Based Approach to Resolving Enduring Misconceptions about

Insoluble and Soluble Fiber. J Acad Nutr Diet, 117(2), 251-264. doi:https://doi.org/10.1016/j.jand.2016.09.021

4. Schmidt, M. (2022). Cereal beta-glucans: An underutilized health endorsing food ingredient. Critical reviews in food science and nutrition, 62(12), 3281-3300.
5. Mikkelsen, M. S., Jespersen, B. M., Møller, B. L., Lærke, H. N., Larsen, F. H., & Engelsen, S. B. (2010). Comparative spectroscopic and rheological studies on crude and purified soluble barley and oat β-glucan preparations. Food Research International, 43(10), 2417-2424.
6. Leuzinger, S., Steingötter, A., & Nyström, L. (2018). Viscosity of Cereal?-Glucan in the Gastrointestinal Tract: Swiss Society for Food Chemistry Young Scientist Awards 2019. Chimia, 72(10), 733-733.