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The Effects of Increasing Intake of Intact Wheat Fibre or Wheat Bran on Gut Microbiota Diversity: a Systematic Review

Angie Jefferson¹ and Katie Adolphus²

¹Freelance Dietitian, Bracknell, United Kingdom and

²The Kellogg Company, Manchester, United Kingdom

Abstract

The influence on health of the human gut microbiota is increasingly recognised, however wheat fibre, consumed frequently in Western diets has traditionally been considered inert with regard to gut microbiota composition and metabolic activity. We undertook a systematic review (PRISMA methodology) of human intervention studies examining the effects of intact cereal fibres on gut microbiota composition among healthy adults.⁽¹⁾ Studies published in the past 20 years were identified on PubMed and Cochrane electronic databases. Inclusion criteria were: healthy adult participants, at least one intact cereal fibre (or its sub-fraction) and measurement of faecal microbiota related outcomes. Out of forty studies meeting inclusion criteria, seventeen manipulated wheat fibre/bran or its key constituent arabinoxylans (AXOS), and ten used a whole diet approach with predominantly wheat fibre. Results from these twenty seven wheat fibre papers are presented here. Eight studies provided wheat bran/fibre (ranging from 5.7g-21g/day wheat fibre or 13g-28g/day wheat bran). Three reported significant effects on gut microbiota abundance and/or diversity (both at phyla and species level) and one showed no effect. Six reported significant increases in fermentation metabolites and one reported no significant change. Ten studies manipulated whole day fibre intake (predominantly wheat but also permitting some oats, rye and rice). Wholegrain intake ranged from 80g-150 g per day and fibre from 13.7g-40 g per day. Six found significant increases in bacterial diversity and/or abundance and five showed significant increases in fermentation metabolites. Two identified that response to high fibre intervention is dependent on baseline gut microbiota richness - those with limited richness exhibiting greater microbiota change over time in response to fibre increase. Two reported no significant effects. Nine studies utilised manipulation of AXOS (2.2g-18.8 g per day) with five demonstrating significant increases in target bacterial species and six significant increases in fermentation metabolites. One reported no significant effect to faecal metabolites. This review supports a role for the wheat fibre found in everyday foods (such as bran breakfast cereal of high fibre breads) promoting both microbiota diversity and abundance. While the healthy microbiome is yet to be defined, consumption of a single daily serving of wheat bran fibre appears sufficient to effect gut microbiota fermentation (with demonstrable effects arising from as low as 6g/day), and promote species diversity, with potential benefit to health. However exploration of stability over longer time frames (> 12 weeks) is now required.

Conflict of Interest

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Reference

1. Jefferson A, Adolphus K (2019) www.frontiersin.org/articles/10.3389/fnut.2019.00033/full