A summary of recent research on the health benefits of fibre and whole grains
Executive Summary

Whole grains are an excellent dietary choice however the role of dietary fibre seems to have been largely forgotten. The positive health impacts of cereal fibre have been well documented\textsuperscript{1-7} and mounting evidence indicates that fibre is an important contributor to the health benefits associated with whole grain consumption. An independent literature review of the scientific evidence behind a claim for whole grain intake and cardiovascular disease (CVD) risk reduction concluded that there is insufficient evidence to support the claim\textsuperscript{10}. However, when the definition of whole grain was broadened to include the presence of added bran, germ or fibre, the claim could be supported. The evidence to date suggests that both whole grain and fibre content should be considered when selecting grain-based foods for their health benefits.

Introduction

Whole grains contain all three parts of the grain - the endosperm, the germ and the bran - whereas fibre is specific to the outer bran layer of the grain. Both fibre and whole grains make a significant contribution to a healthy diet; however, new evidence indicates many of the health benefits associated with whole grains may be more accurately attributable to their fibre content.

The benefits of dietary fibre have been well documented. Eating a diet rich in cereal fibre has been shown to reduce the risk of developing coronary heart disease\textsuperscript{1} and type 2 diabetes\textsuperscript{2}, support good digestive health\textsuperscript{3}, help protect against lower digestive tract cancers\textsuperscript{4}, promote satiety\textsuperscript{5} and help manage weight\textsuperscript{6-7}.

The nutritional robustness of whole grains is well established. They are packed with essential nutrients, including B-vitamins, antioxidants and fibre-rich bran, which are all known to play a role in maintaining health. Consumption of 2-3 serves of whole grain foods a day is reported to reduce the risk of developing chronic disease, including CVD\textsuperscript{8}, type 2 diabetes\textsuperscript{2} and certain cancers\textsuperscript{9}. However, there is often confusion surrounding the definition of whole grains, which creates complexity in interpreting the research.
Whole grain characteristics

Whole grains contain all parts of the grain - the bran (fibre-rich outer layer), the germ (nutrient-rich inner core) and the endosperm (middle starch and protein layer), which comprises approximately 80-90 percent of the grain. In the grain-refining process, the bran is removed, resulting in loss of dietary fibre, vitamins, minerals, phytoestrogens, phenolic compounds and phytic acid. Examples of whole grains include wheat, rice, barley, corn, rye, oats and triticale.

Definitions of whole grains are inconsistent

Using the US Food and Drug Administration’s (FDA) definition of whole grain, which is consistent with the definition prescribed by Food Standards Australia New Zealand (FSANZ)**, the Life Sciences Research Office (LSRO) conducted an independent literature review of the relationship between whole grain consumption and reduced risk of CVD and diabetes. One striking finding of the review was that the majority of studies applied the definition of whole grain inconsistently, thus confounding results. In many cases, constituents of whole grains such as isolated bran or germ were used to evaluate health outcomes, but were classified as whole grains in the findings.

In the review, only studies that measured a validated endpoint for CVD and/or diabetes in a healthy US population and populations representative of the US were considered. Studies were excluded if they did not specifically describe or define whole grains according to the FDA definition. Based on these criteria, four studies were included in the analysis and no CVD health benefit could be determined.

When expanding the analysis to include a broader definition of whole grains, a total of 29 human...
studies (15 intervention and 14 observational) were reviewed for the association between whole grain intake and CVD risk and 21 studies for the association between whole grain intake and diabetes risk. These included studies that considered added bran and germ as whole grains or studies that did not explicitly use the term “whole grains” but were in fact conducted with individual whole grains. Thirty-eight studies were excluded for not meeting one or more of the inclusion criteria.

Whole grains, CVD and diabetes risk reduction

A key finding of the review was that there is inconsistent scientific evidence to support a whole grain and CVD risk reduction health claim if only whole grain studies that conform to the FDA whole grain definition (using native proportion of endosperm, bran and germ) are considered. However, when the broader definition of whole grain was applied, which included added bran and germ or studies that did not explicitly use the term “whole grains” but were, in fact, conducted with whole grains, a whole grain and CVD risk reduction health claim could be supported. These findings suggest that cereal fibre content is an important consideration when choosing grain-based foods for their health benefits. The link between whole grains and diabetes risk reduction was found to be suggestive but inconclusive, whether or not fibre was considered.

Additional new research was conducted by Brownlee et al (2010) on the effect of whole grain consumption on markers of CVD risk. The four-month, randomised, controlled dietary intervention (n=316), which investigated the impact of replacing refined grains with whole grains in the diets of non-whole grain consumers, showed no significant change in CVD risk after increased consumption of whole grain foods. Participants were assigned to one of three groups: control [no dietary change], intervention 1 [60g of whole grains a day for 16 weeks] and intervention 2 [60g of whole grains a day for 8 weeks followed by 120g of whole grains a day for 8 weeks.] The markers of CVD risk (measured at 0, 8 weeks and 16 weeks) were BMI, percent body fat, waist circumference, fasting plasma lipid profile, glucose and insulin; and indicators of inflammatory, coagulation and endothelial function. Although whole grain consumption was significantly increased among the intervention groups, there were no significant differences in any markers of CVD risk between the groups.

Commenting on the link between whole grain consumption and functional health benefits, Brownlee et al stated that, “although there are strong observational data to support the health benefits of increased whole grain consumption, data from small-scale interventions are conflicting and direct evidence from intervention studies carried out in large numbers is not available.”
Whole grain doesn’t always mean high fibre

The nutrient profile of whole grains differs. Although whole grains contain all three anatomical parts, the health benefits observed from consumption of one grain do not necessarily apply to other types. This is due to great variability among various whole grains in their content of macronutrients, micronutrients and bioactive components.

The nutritional variation between whole grains is particularly relevant for fibre content. While the energy content is similar across the various grains, the fibre content differs significantly. For example, brown rice has 3.4 g of fibre per 100g compared with whole wheat, which contains 12.2 g per 100g.

Nutrient concentrations of a variety of whole grains

<table>
<thead>
<tr>
<th>Nutrient/100g</th>
<th>Barley</th>
<th>Brown Rice</th>
<th>Corn (Yellow)</th>
<th>Oats</th>
<th>Rye</th>
<th>Wheat</th>
<th>Wild Rice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy, kJ</td>
<td>1481</td>
<td>1548</td>
<td>1527</td>
<td>1628</td>
<td>1402</td>
<td>1389</td>
<td>1494</td>
</tr>
<tr>
<td>Protein, g</td>
<td>12.48</td>
<td>7.50</td>
<td>9.42</td>
<td>16.89</td>
<td>14.76</td>
<td>12.61</td>
<td>14.73</td>
</tr>
<tr>
<td>Fat, g</td>
<td>2.3</td>
<td>2.68</td>
<td>4.74</td>
<td>6.9</td>
<td>2.50</td>
<td>1.54</td>
<td>1.08</td>
</tr>
<tr>
<td>Carbohydrate, g</td>
<td>73.48</td>
<td>76.17</td>
<td>74.6</td>
<td>66.27</td>
<td>69.76</td>
<td>71.18</td>
<td>74.90</td>
</tr>
<tr>
<td>Total Fibre, g</td>
<td>17.3</td>
<td>3.4</td>
<td>7.3</td>
<td>10.6</td>
<td>14.6</td>
<td>12.2</td>
<td>6.2</td>
</tr>
</tbody>
</table>


Conclusion

Fibre and whole grains are both important elements of a healthy diet. Based on new evidence, there is a need for consistency in the definition of whole grains. While whole grains are commonly recommended, the important role of cereal fibre should not be overlooked.
Processed bran is the richest source of fibre

Isolating the bran layer of the whole grain provides a concentrated source of fibre. The table below compares the fibre content of various whole grains and their processed bran counterparts per 100 grams.

<table>
<thead>
<tr>
<th>Type of cereal</th>
<th>Fibre in 100g whole grain</th>
<th>Fibre in 100g processed bran</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>12.2g</td>
<td>45.4g</td>
</tr>
<tr>
<td>Oats</td>
<td>10.6g</td>
<td>15.9g</td>
</tr>
<tr>
<td>Brown Rice</td>
<td>3.4g</td>
<td>25.5g</td>
</tr>
</tbody>
</table>


Whole grain and fibre recommendations

The Australian Dietary Guidelines recommend adults consume nine serves of cereals each day, with the emphasis on whole grains.

The NH&MRC recommended daily intakes for fibre are 30g for men and 25g for women. Suggested daily targets to reduce the risk of chronic disease are 38g for men and 28g for women.

Go Grains Health & Nutrition Limited recommends adults consume 48g of whole grains each day.