



The evidence for the promotion of whole grain foods

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Wholegrain definitions

AACCI definition:

“Wholegrains shall consist of the intact, ground, cracked or flaked caryopsis, whose principal anatomical components, the starchy endosperm, germ and bran are present in the same relative proportions as they exist in the intact caryopsis”

HEALTHGRAIN definition (2010)

Small losses of components - i.e. less than 2% of the grain/10% of the bran - that occur through processing methods consistent with safety and quality are allowed.

[Also allows recombination of the grain components in a fixed ratio, including heat treatment of the germ to prevent rancidity]



A selection of whole grains from the AACCI list of whole grains

Whole wheat

Wild rice

Whole oats/oatmeal

Buckwheat

Whole grain corn

Triticale

Popcorn

Bulgur (cracked wheat)

Brown rice

Millet

Whole rye

Quinoa

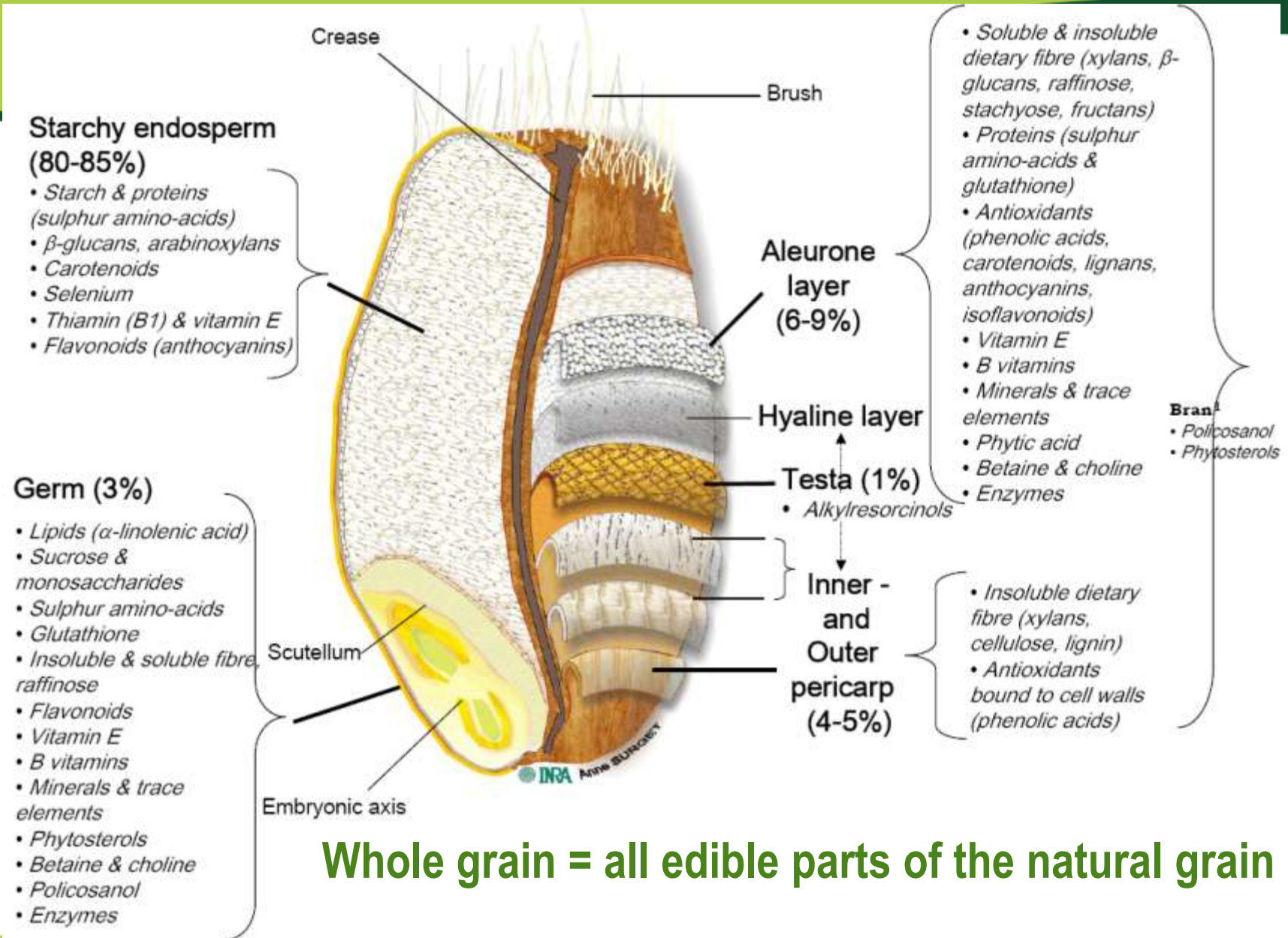
Whole grain barley

Sorghum

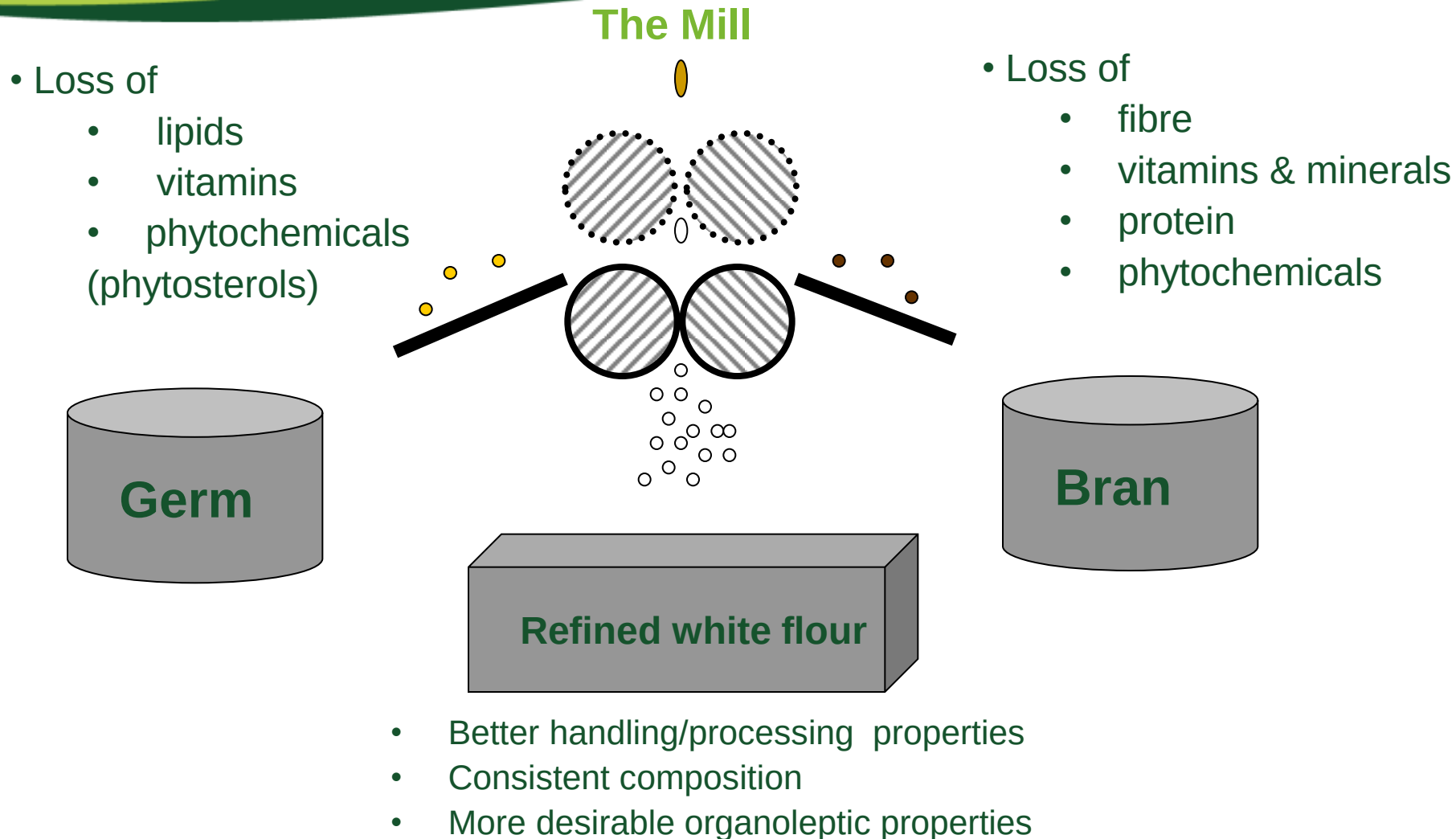
Note: these include pseudo-cereals (Buckwheat and Quinoa) to provide gluten free 'wholegrains' with similar macronutrient composition for those with an allergy to gluten



Refined grains strip out all parts of the grain except the endosperm

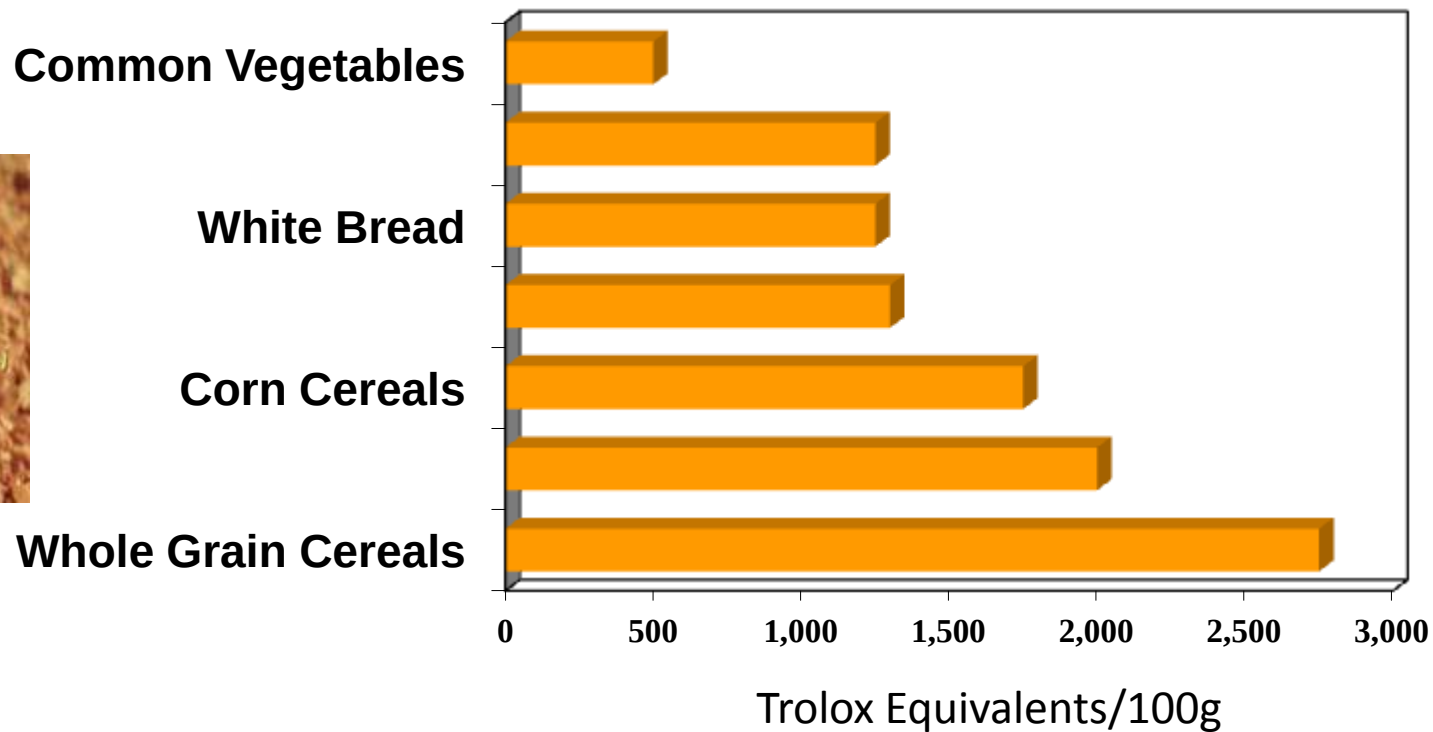


Refining grains removes many important nutrients



Whole Grain & Antioxidants

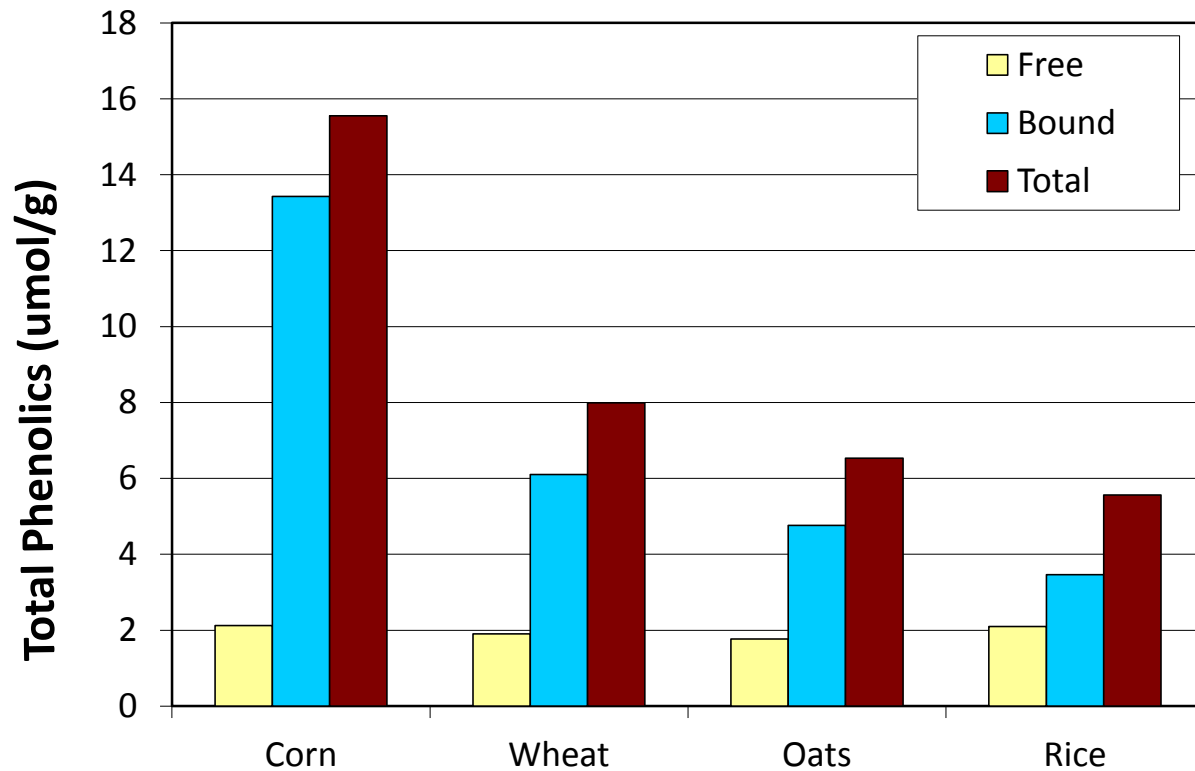
Comparison of Antioxidant Activity



Miller HE, et al., 2000

Whole Grain Polyphenols

Phenolic Content of Whole Grains



Adom and Liu, 2002, J Agri Food Chem. 50: 6182-87



Fibre Levels Differ From Grain to Grain

Type of Grain	Fiber (gram per 100g)
Whole wheat	12.2 g
Whole oats	10.3 g
Whole corn	7.3 g
Brown rice	1.8 g

Source: USDA National Nutrient Database for Standard Reference



If rice is the main type of grain, fibre intakes may be lower than desired

- Consume various types of grains



Research shows diets rich in whole grains are associated with positive health outcomes



Health benefits of wholegrains

People who eat more wholegrains tend to:

- have a lower body mass index (BMI)
- have a smaller waist circumference
- Less likely to be overweight



Meta-analysis of whole grains and weight management

- > 15 studies, n=>119,000
- > Pooled data from populations in UK, US, Iran, Norway, Sweden & Finland
- > >3 servings/day c.f. <1 serving/day

Outcome	No. datasets included in analysis	No. subjects in grouped data	Unit of change in high vs. low wholegrain consumers	P value
BMI	15 trials	n=119,829	0.63kg/m ²	P<0.0001
Waist circumference	6 trials	n=4178	2.7cm	P=0.03
Waist:hip ratio	4 trials	n=20,147	0.023	P<0.0001

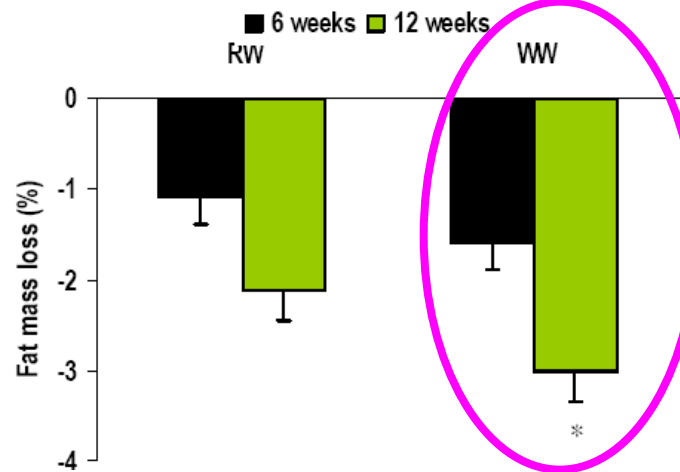
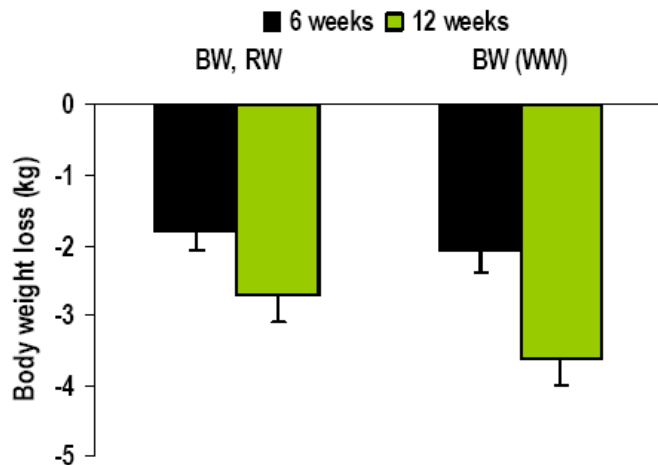
**People consuming more whole grain foods
have a lower BMI and lower central adiposity and less likely to
gain weight over time.**



Wholegrains may influence the distribution of weight

Kristensen M et al (2009)

- > 12-week intervention, overweight women
- > **Control:** Calorie-restricted diet + wholegrain wheat foods
- > **Treatment gp:** Calorie-restricted diet + refined grain foods
- > No significant difference in weight lost
- > Significant difference in fat mass



Wholegrains and heart health

Meta-analyses

- > Anderson et al (2000), 12 studies, 77,002 subjects
- > Anderson et al (2003), 13 studies [update]

26% ▼ risk CHD

29% ▼ risk CHD

Food or fibre source	No. of studies	Risk ratio	95 % CI	
			Lower	Upper
Whole grains	5	0.71	0.48	0.94
Cereal fibre	4	0.9	0.8	1.01
Total fibre	6	0.73	0.65	0.83
Fruit	7	0.77	0.7	0.86
Vegetables	8	0.86	0.77	0.96

Effects were greatest for wholegrains vs. cereal fibre or total fibre

Source: from Anderson et al (2003)



WHOLEheart Study – an intervention

Brownlee I, Seal C et al (2010)

- N=316 overweight but otherwise healthy adults
- Consumed 60-120g whole grain foods over 16 weeks
- Trend to reduce inflammatory and lipid markers but none were significant
- Participants gained weight during trial
- Many subjects “added” whole grain foods to their diet rather than substituting for refined grain foods.
- Subjects did not have high cholesterol so lack of effect may not be surprising

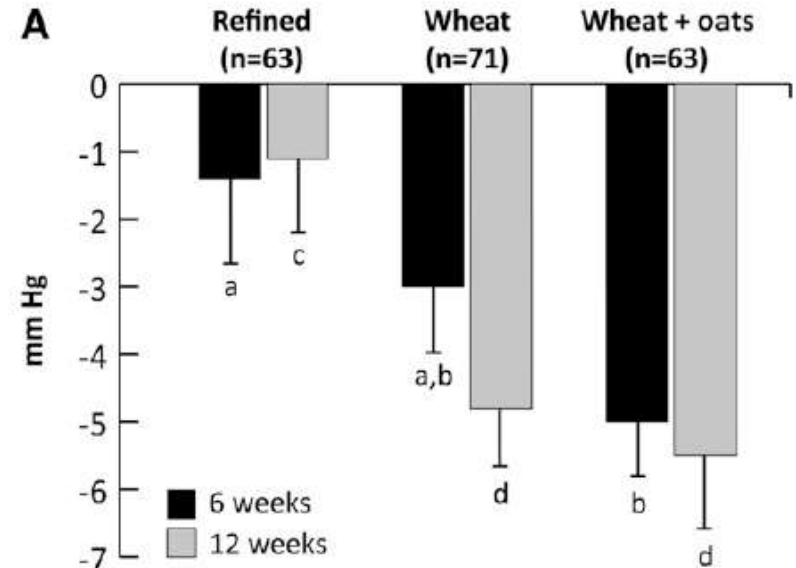
Brownlee et al (2010) Brit J Nutr doi:10.1017



Health effects of whole grains may extend beyond cholesterol

Tighe P et al 2010

- N=233 healthy adults
- 4-week “run-in refined grain diet”
- Consumed either:
 - refined grains
 - Wheat
 - wheat + oats



Results

- Significant reductions in systolic blood pressure and pulse pressure
- Authors suggest equivalent to a 25% reduction in stroke risk

Tighe P et al (2010) Am J Clin Nutr doi: 10.3945



Nutrition Recommendations for Diabetes include whole grains

Nutrition Recommendations and Interventions for Diabetes

A position statement of the American Diabetes Association

American Diabetes Association

Metabolic syndrome therapy (MST) is important in preventing diabetes, managing existing diabetes, and preventing complications. The role of diet in the development of diabetes complications is a key factor in the management of diabetes. This position statement provides evidence-based recommendations for the management of diabetes complications (see Table 1). This position statement provides evidence-based recommendations for the management of diabetes complications (see Table 1). This position statement provides evidence-based recommendations for the management of diabetes complications (see Table 1).

Improvements in diabetes management, including lifestyle changes and medical therapy, have led to a reduction in the complications of diabetes. However, the ADA still recommends that individuals with diabetes should aim to prevent complications by following the ADA's recommendations for the management of diabetes complications (see Table 1).

GOALS OF MNT FOR PREVENTION AND TREATMENT OF DIABETES

Goals of MNT that apply to individuals with diabetes or who are at risk for diabetes or who are prediabetic.

To decrease the risk of diabetes and its complications, individuals should aim to prevent complications by following the ADA's recommendations for the management of diabetes complications (see Table 1).

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range or as close to normal as is safely possible.

To prevent or reduce the risk of development of the diabetic complications of diabetes, individuals should aim to prevent complications by following the ADA's recommendations for the management of diabetes complications (see Table 1).

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Recommendations for whole grains are included in the 2008 ADA Nutrition Recommendations and Interventions for Diabetes

- Inclusion of foods containing whole grains
- At least one-half of grain foods should come from whole grains

Challenges of whole grain intervention studies

- Short duration of interventions
- Baseline diets – were they high in whole grain already, have diets been matched for fibre?
- Addition of whole grain foods vs. substitution of refined grains
- Incorrect assumptions about the WG content of the foods
- Definitions of whole grain foods
- Frequently high variability in outcome measures:
 - Take blood samples at same time
 - Use of a pre-meal can help
- Study population – are they healthy or at risk of disease?

Need for more WG intervention studies in Asian populations





**Most people are NOT getting
enough wholegrain**

**Singaporeans also fall short of
50g whole grain/d**



9.6g

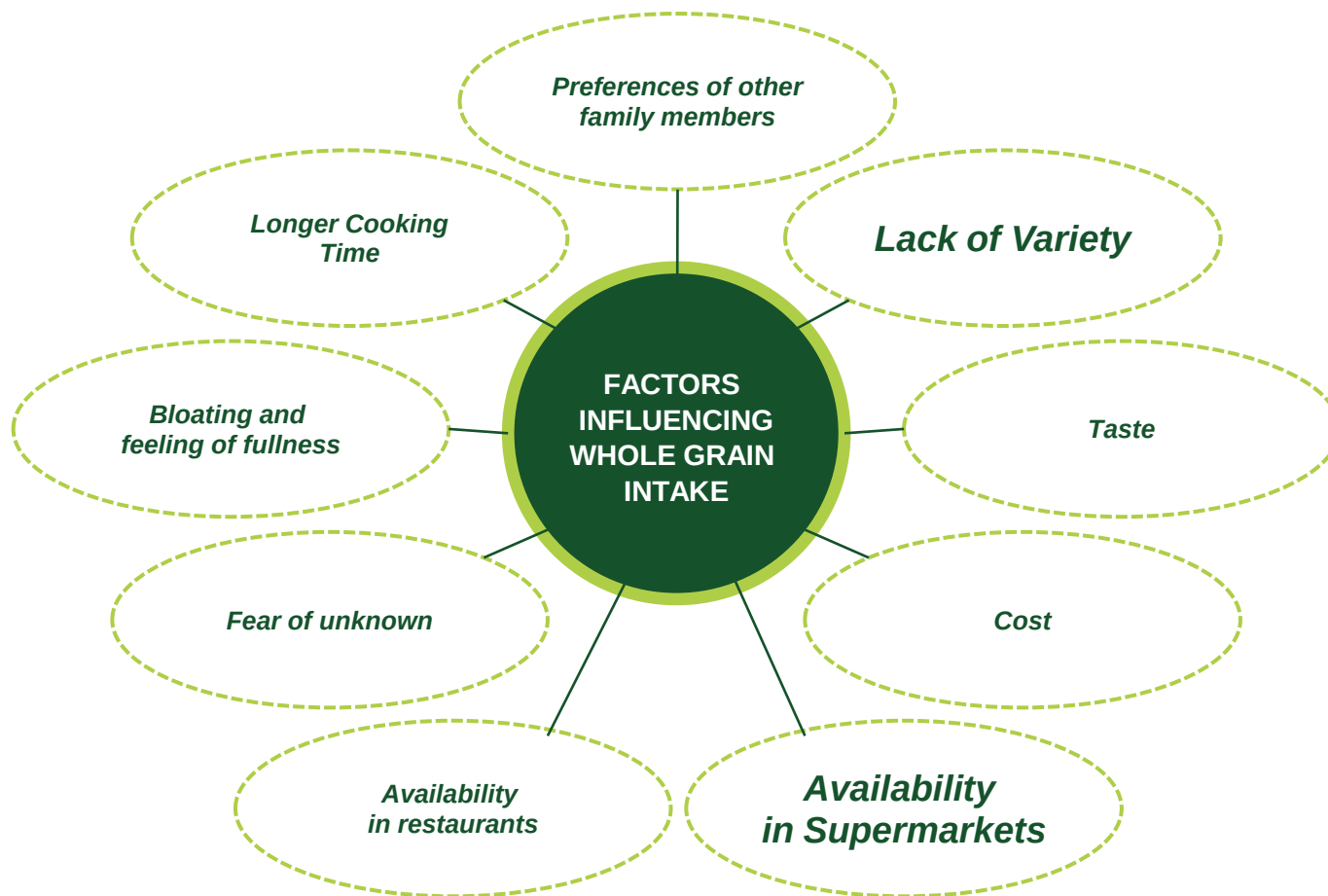
13.2g

Source: Report of the National Nutrition Survey for Singapore, 2004



**So why are people not eating
more whole grains?**

Variety and greater availability are key to increasing wholegrain intakes



ADAPTED FROM SEAL & JONES, 2007



Consumers need help selecting wholegrain foods

- *How to spot a wholegrain food?*
- *How much is enough?*
- *Why are they better for me?*

It's not always easy to spot a food made with whole grain



Wild rice?
Whole grains?
Multigrain bread?



Reading labels is too time-consuming for most consumers

IDENTIFYING WHOLEGRAIN FOODS TAKES TIME & PATIENCE!

INGREDIENTS

CONTAINS GLUTEN-CONTAINING CEREALS AS INDICATED IN BOLD TYPE. CEREAL GRAINS [WHOLEGRAIN MAIZE (23.1%), WHOLEGRAIN WHEAT (20.8%), RICE FLOUR, WHOLEGRAIN OATS (8.2%), WHOLEGRAIN RICE (8.1%)], SUGAR, WHEAT STARCH, GOLDEN SYRUP, GLUCOSE SYRUP, VEGETABLE OIL [ANTIOXIDANTS (306, 304)], COLOURS: CARAMEL AND ANNATTO, SALT, ACIDITY REGULATOR (TRISODIUM PHOSPHATE). VITAMINS AND MINERALS: VITAMIN C, NIACIN, VITAMIN E, THIAMIN (B1), RIBOFLAVIN (B2), VITAMIN B6, FOLIC ACID (FOLATE), CALCIUM CARBONATE, IRON & ZINC. PACKED ON EQUIPMENT THAT ALSO PROCESSES PRODUCTS CONTAINING TREE NUTS AND MILK POWDER.

CONTAINING TREE NUTS AND MILK POWDER
PACKED ON EQUIPMENT THAT ALSO PROCESSES PRODUCTS
CONTAINING TREE NUTS AND MILK POWDER



Adding wholegrain to cereals presents many technical and commercial challenges

Increasing wholegrain and fibre in cereals impact product quality

- May reduce shelf life due to rancidity caused by lipids in the germ
- Can impair ability of the cereal recipe to “puff” and affect texture
- May cost more to produce
- May be difficult to source whole grain flours

We have installed mills to allow us to mill our own whole grain flours



Adding whole grain can impact “puff” and shape



Nestle Breakfast Cereals Are Made With Whole Grain Nutrition



27%



30%



28%



29%



27%



53%



40%

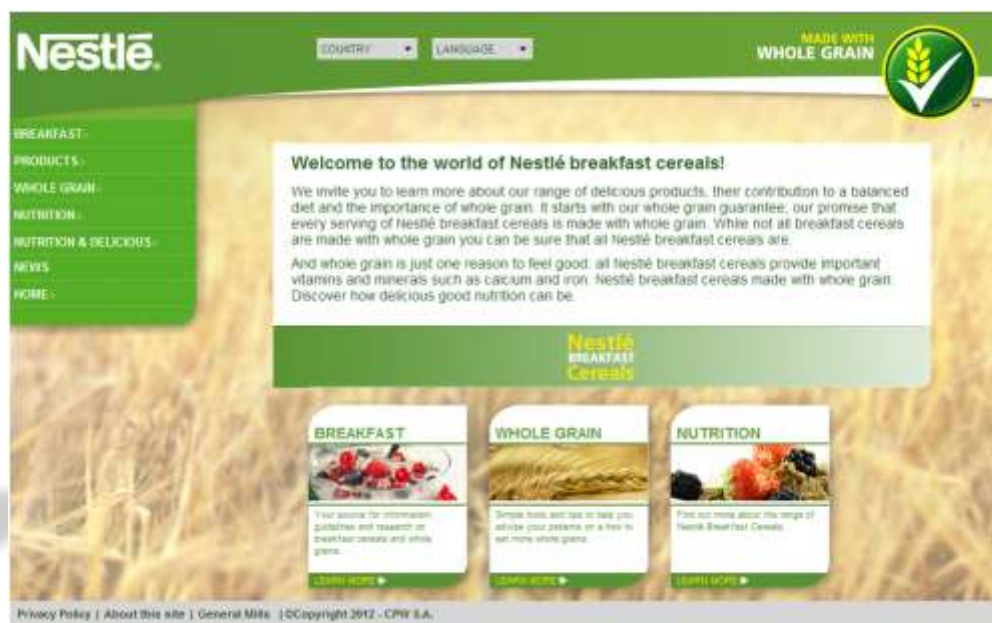
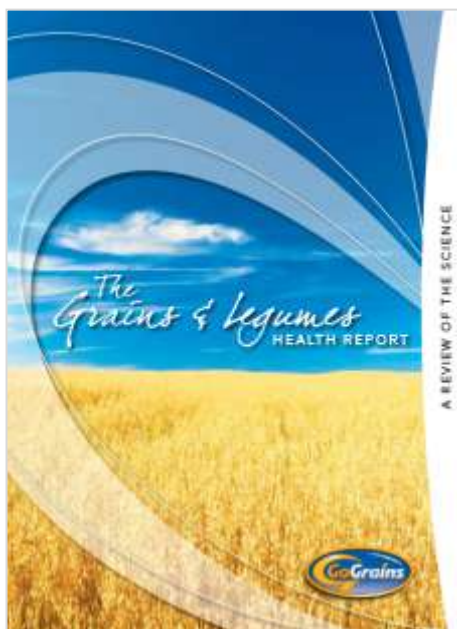




Globally, we have added
2.7 billion extra serves
of wholegrain to the food supply

Sources of further information

- Grains and Legumes Nutrition Council website (formerly Go Grains) for webinars and factsheets <http://www.glnc.org.au/>
- USDA Evidence Libraries (Carbohydrates/Whole grains) www.nutritionevidencelibrary.com
- Nestle Breakfast Cereals (for health professionals) www.nestle-cereals.com





**Together, we can make a positive
difference to people's diets**