



WHOLEGRAINS: The Whole Truth and Nothing but the Truth

Anchor Yeast Breakfast Seminar
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Monique Piderit, RD (SA)



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OVERVIEW

- Defining the Whole Grain
- Whole Grains Around the World
- Processing of Wholegrains
- How much wholegrains should we eat?
- Benefits of Whole Grains
 - Wholegrains in Children's Diets
 - Mortality, Diabetes, Heart Disease
 - Gluten-free
 - Mental Health and the Gut-Brain Axis
- Sustainability of Whole Grains
- Conclusion



Whole grains are a part of the carbohydrate food group.



Carbs

Starch

Bread, rice, pasta, pap, cereals, oats

Fruit

Fresh and dried

Vegetables

Potato, sweet potato, corn

Legumes

Chickpeas, lentils, beans

Sugar

Honey, jam, treats

Protein

Meat, chicken, fish

Dairy

Milk, yoghurt, cheese

Eggs

Legumes

Chickpeas, lentils, beans

Nuts

Fat

Bad fats

Butter, chicken skin, fat on meat, coconut, cheese

Good fats

Olives, avo, seeds, nuts, oils



WHOLEGRAINS: BRAN, GERM, ENDOSPERM

Whole Grains

Endosperm

Bran

Germ

Grains are nutrient-dense foods providing shortfall nutrients:

↑ Fiber (23%), iron (38%), folate (40%),
magnesium (40%), calcium (13%)

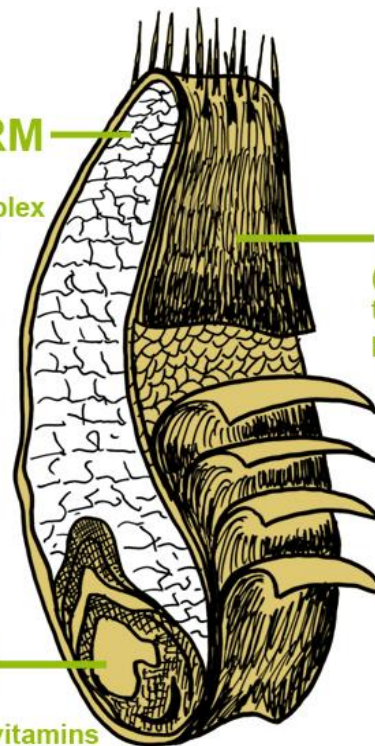
↓ Total fat (6%), saturated fat (5%), sodium
(14%), added sugars (9%)

The Whole Grain Kernel

ENDOSPERM
(source of complex carbohydrates, B-complex vitamins and proteins)

BRAN
(fiber, B-complex vitamins, trace minerals and phytonutrients)

GERM
(essential fatty acids, vitamin E, B-complex vitamins and trace minerals)



WHAT IS A WHOLEGRAIN?

Grains from cereals, which, after milling (if milled), naturally contain all the components, namely endosperm, bran, germ and all the macronutrients, micronutrients and trace elements of the original unprocessed whole kernel.” DOH, 2010

Fortification of maize and wheat flour mandatory following the promulgation of Regulations Relating to the Fortification of Certain Foodstuffs (R.504)

Lack of appropriate SA labelling regulations misleads consumers by food labels that indicate whole grain.

- ✓ Vitamin A
- ✓ Thiamine (Vitamin B1)
- ✓ Riboflavin (Vitamin B2)
- ✓ Niacin
- ✓ Folic acid
- ✓ Pyridoxine (Vitamin B6)
- ✓ Iron
- ✓ Zinc

THE EU HEALTHGRAIN PROJECT

HEALTHGRAIN EU Project:

“Wholegrains as grains that consist of the intact, ground, cracked, or flaked kernel after the removal of inedible parts such as the hull and husk.”

Small losses of components ($< 2\%$ of the grain/10% of the bran) that occur through processing methods consistent with safety and quality are allowed.

Principal anatomical components (endosperm, germ and bran) present in the same relative proportions as they exist in the intact kernel.

Whole Grains

(HEALTHGRAIN)

Cereals

Maize (corn)

Barley

Oats

Wheat

Rye

Rice

Millet

Sorghum

Triticale

Teff

Canary seed

Job's tears

Fonio

Hull-less or naked
barley, not pearled

Spelt, emmer, faro,
einkorn, khorasan,
durum

Brown, black, red,
other coloured
varieties

Pseudo cereals

Amaranth

Buckwheat

Quinoa



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A WHOLE NEW WORLD: WHOLEGRAINS IN DIETARY GUIDELINES



Austria: 4 servings daily of cereals, bread, pasta, rice, preferably whole grain.

UK: 1/3 of Eat Well Plate bread, rice, potatoes, pasta, and other starchy foods, choosing whole-grain varieties whenever possible

Mexico: cereals, preferably whole grains without added sugar. Whole grains should be eaten with every meal.

Chile: half of grains should be whole grain to reach recommended amount of fibre

Singapore: grains, especially whole grains. Out of the 5–7 servings of rice and alternatives, 2–3 servings per day of whole-grain foods.

China: 300–500 g daily of total grains, cereals, and legumes, with at least 50 g from whole grains.

Australia: 3–8 1/2 servings of grain foods, mostly whole grain e.g. breads cereals, rice, pasta, noodles, polenta, couscous, oats, quinoa, barley

Global Dietary Wholegrain Guidelines (Ferruzzi et al, 2014)

A WHOLE NEW WORLD: WHOLEGRAINS IN DIETARY GUIDELINES

Have plenty of
vegetables and fruits

Eat protein foods

Make water
your drink
of choice

Choose
whole grain
foods

Canada: Choose wholegrain foods.

Canada's Food Guide: Eat Well, Live Well, 2019

WHEAT, MAIZE, RICE: HALF OF THE WORLD'S ENERGY NEEDS

Wheat

Wheat bran: major source of dietary fibre (mostly insoluble fibres)

Per gram of fiber, wheat bran has a greater effect on faecal weight compared to fruit, veg, oat bran, cellulose, corn, legumes, pectin

Deficient in some essential amino acids, especially lysine

Cummings, 2010; Awika et al, 2011



Maize (corn)

Most produced cereal globally

SA: 2% of the world's maize production

Maize porridge: most commonly consumed food

Fortified as per regulation.

Maize and maize porridge costs subsidized by government (VAT exempt)

Gramene, 2018; Mchiza et al, 2015

Rice

White rice: predominate rice consumed around the world
USDA, 2010: 70% white rice

Glutamic and aspartic acids: the major amino acids

Lysine: limiting amino acid

Nanri et al, 2010; Villegas et al, 2007

WHEN WHOLEGRAIN BECOMES PROCESSED GRAIN



7.3 g



3.5 g



8.0 g



6.0 – 8.2 g



MRC FoodFinder 3.0



2.0 g



1.4 g



2.0 g



1.5 - 2.0 g

HOW MUCH WHOLEGRAINS ARE WE ACTUALLY EATING? USA

Fiber:*

Children: 13.2 g
Adults: 16.1 g

Wholegrains:*

Children: 14.7 g
Adults: 17.2 g

Wholegrain Sources:

Children: ready-to-eat cereals,
breads/rolls, crackers, salty grain snacks

Adults: breads/ rolls, ready-to-eat cereals,
pastas/ cooked cereals/ rice.

Whole Grain Roundtable Expert Panel:

30 g serving of grain min content of whole grains that
is nutritionally meaningful *Ferruzzi et al, 2014*

Fibre Goals:*

25g (women) | 38 g (men)
19 – 25 g (1 – 8 yrs.) | 26 – 38g (9 – 18 yrs.)

American Dietetic Association Position Statement, 2015

*“Recommending cereals, breads and grains with
higher contents of dietary fiber and wholegrain are
important to increase intake”*



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NHANES 2001 – 2010, McGill et al, 2015 | *daily

HOW MUCH WHOLEGRAINS ARE WE ACTUALLY EATING? UK

Average Wholegrain Intake (daily): 20g adults | 3g children/ teenagers

- 18% of adults do not consume any wholegrains
- 15% of children/ teenagers do not consumer any wholegrains
- Those from lower SES group has significantly lower wholegrain intake

“Favourable pricing with increased availability of wholegrains and education to increase wholegrain intake is recommended.”



WHOLEGRAIN IN THE DIET'S OF CHILDREN

Children who eat breakfast cereal (compared to non-breakfast eaters):

- ✓ Less likely to have vitamin and mineral intakes below the recommended daily requirements, especially for calcium
- ✓ ↓ daily cholesterol intakes
- ✓ ↑ nutritional status, especially for thiamine, riboflavin, pyridoxine and iron
- ✓ ↑ milk consumption and ↑ wholegrain consumption per day
- ✓ ↑ range of different foods at the breakfast meal



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Williams et al, 2014

WHOLEGRAIN IN THE DIET'S OF CHILDREN

Breakfast cereals: Most commonly consumed breakfast food
Major sources of wholegrains in the diet of children and adolescents

Mullan and Singh, 2010 ; Reicks et al, 2014; McGill et al, 2015; Albertson et al, 2016

Fibre and wholegrain intake
from the N-HANES (USA):
breakfast cereals account for
31% of whole grain sources in
children and adolescents

McGill et al, 2015

Italy: 21 g wholegrain per day
in children and adolescents, of
which breakfast cereals
contributed 32%

Sette et al, 2017

Denmark: Wholegrain intake
increased from 25 - 54 g/day
in children (4 – 14 yrs.)

*Danish Wholegrain Campaign; Kyro et al,
2012*

USA: Less than 1% of children (6
– 18 yrs.) meet whole grain
recommendations (N-HANES)

Albertson et al, 2016

UK: 15% of children (8 months -
18 yrs.) do not consume any
whole grain
1 in 5 eat one serving of
wholegrain per day

Mann et al, 2015



South African girls
are significantly
heavier than boys

1 in 5 SA children
skip breakfast

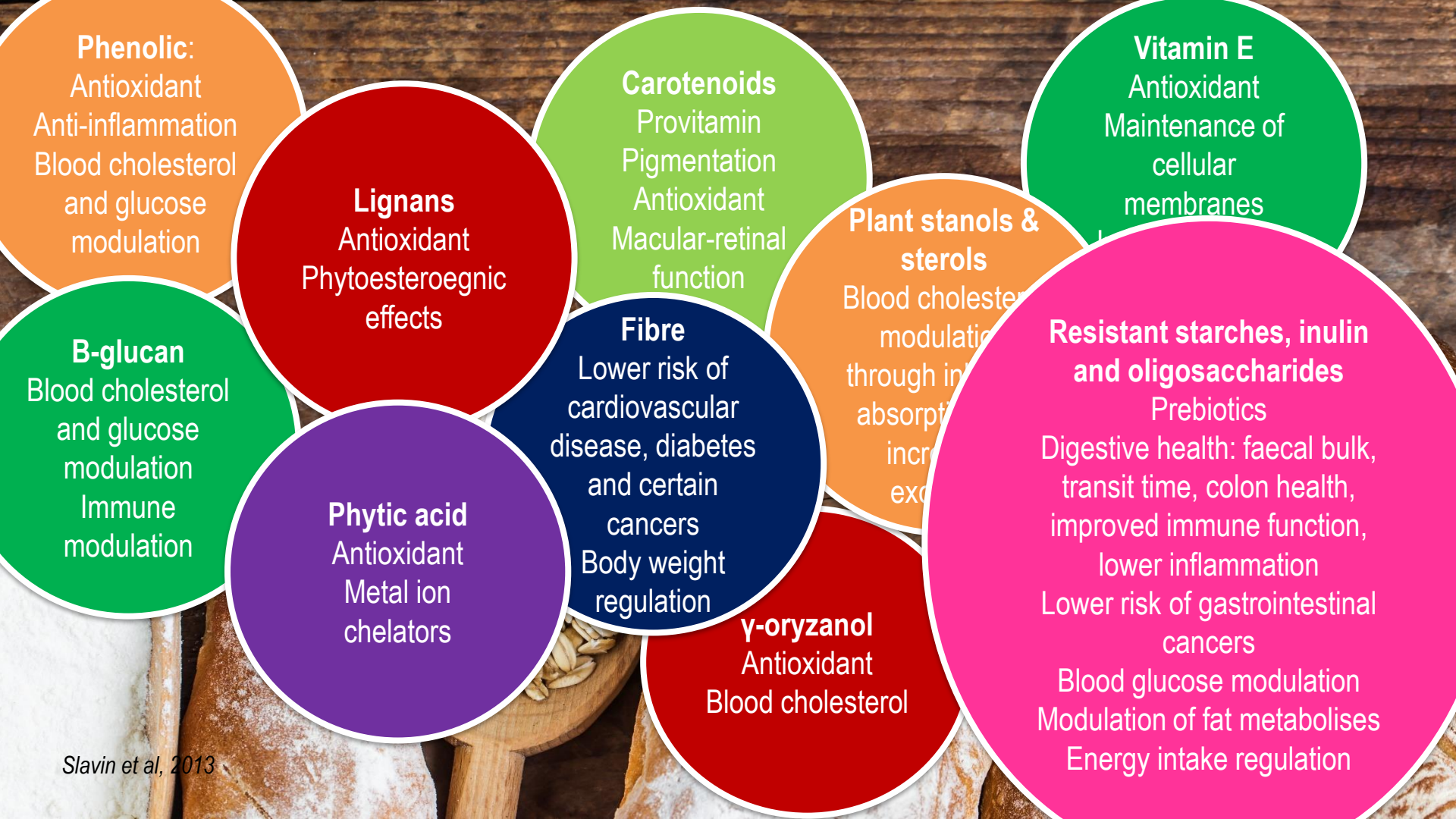
9 in 10 Brazilian
adolescents
breakfast daily

Pereira et al, 2017

Children and
adolescents who
regularly eat
breakfast less likely
to have vitamin and
mineral intakes
below the
recommended daily

Breakfast eaters in
general have a
better overall
nutritional







BREAD IS LIKE THE
SUN. IT RISES IN THE
YEAST AND SETS
IN THE WAIST

The image shows a rectangular chalkboard with a dark green frame. The chalkboard is mounted outdoors, as evidenced by the grass and a building in the background. The text is written in white chalk in a simple, hand-drawn font. The background includes a green sign with the word "ultimate" and some trees.

WHOLEGRAINS: A WEIGHT ISSUE?

Wholegrain eaters (adults and children) have significantly better intakes of nutrients and dietary fibre.

As wholegrain intake increases, BMI and waist circumference decreases.

NHANES 2001 – 2012, Albertson et al, 2016

People who eat certain grains (compared to those who eat almost no grains)

Weigh 3.2kg less

Eat less sugar and saturated fat

Eat more fibre, calcium, vitamin D and magnesium

Papanikolaou et al, 2016



WHEAT BELLY?

65% of Americans eat gluten-free products because they think it's more healthy and 27% believe it helps with weight loss.

It is true that an increase in wheat sales has occurred paralleled to soaring obesity rates...

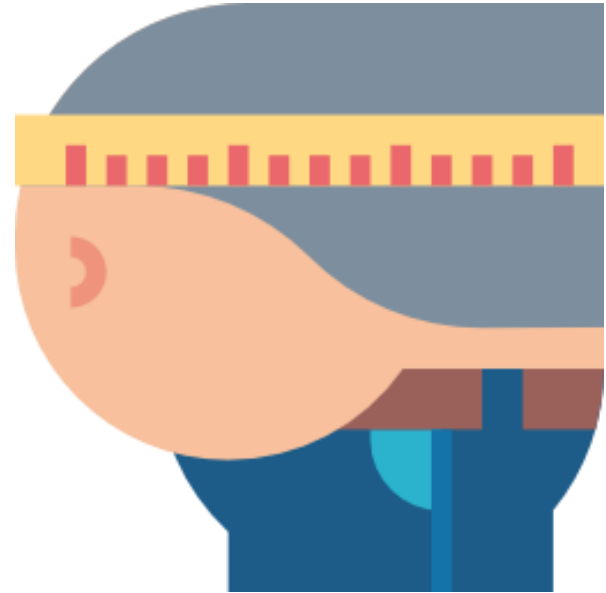
BUT

There's also been an increase in car sales, availability smart phones on the market, world records at the Olympics, global gas emissions.

Correlation does not prove causation

Wheat consumption cannot be linked to prevalence of obesity in the general population

Assigning cause of obesity to one food component, rather than overconsumption of energy and inactivity, is not correct.



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Watson et al, 2015; Brouns et al, 2013;

GLUTEN FREE BREAD

	Gluten Free: White		Wheat-containing: Brown	
	Per 100g	Per slice (45g)	Per 100g	Per slice (20g)
Energy (kJ)	1039	468	867	328
Carb (g)	39	18	37	14
Protein (g)	5.1	2.3	8.8	6.8
Fat (g)	6.9	3.1	1.3	1.0
Fibre (g)	3.6	1.6	5.7	4.3
Sodium (g)	306	138	376	282
Cost (per loaf)	R49.99 for 375g		R12.99 for 700g	

WHOLEGRAINS AND CHRONIC DISEASE RISK

Type 2 diabetes: Three servings (45g of wholegrain) per day may reduce type 2 diabetes risk by 20% (compared to half serving of 7.5g of wholegrains) Chanson-Rolle *et al*, 2015

For every 50 g increase in wholegrains:

- ↓ 22% risk of total mortality
- ↓ 30% for cardiovascular heart disease mortality
- ↓ 8% for cancer mortality

(32 studies on 180 000 deaths)

Chen et al, 2016

For every 90 g increase intake of wholegrains:

- ↓ 19% for coronary heart disease
- ↓ 12% for stroke
- ↓ 22% for cardiovascular disease
- ↓ 15% mortality risk
- ↓ 17% cancer mortality risk
- ↓ 22% all-cause mortality
- ↓ 51% for respiratory disease mortality
- ↓ 32% diabetes mortality

(45 studies) Aune *et al*, 2016

WHOLEGRAINS: CARBOHYDRATE QUALITY AND HUMAN HEALTH

135 million person years of data from 185 prospective studies and 58 clinical trials

When comparing high fiber consumers to low fiber consumers, 15 – 30% ↓ in

All-cause mortality

Cardiovascular-related mortality

Incidence of coronary heart disease

Stroke incidence and mortality

Type 2 diabetes

Colorectal cancer

Clinical trials:

↓ body weight

↓ (systolic) blood pressure

↓ total cholesterol

25 – 29 g fiber per day

Similar findings for whole grain intake

GUT HEALTH

Genetics
Gender
Ethnicity

Medication
Antibiotics
Age

Length of
Gestation
Birthing
Procedure

Diseases
Disorders

Vaccination
Sanitation
Stress

Parasite
Infections

Smaller
Family
Sizes
Fridges

Sedentary
Lifestyles
Diet & Food
Processing
Westernized
Diet

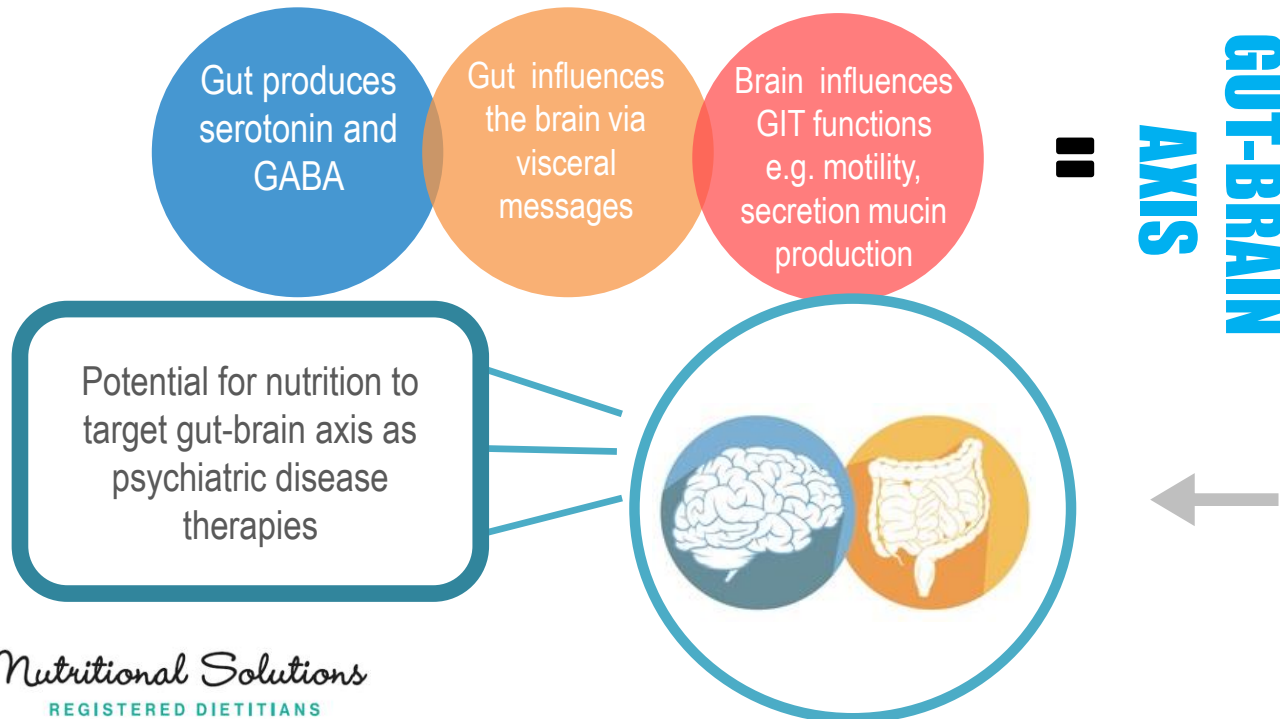
Brown, K, et al., Diet induced dysbiosis of the intestinal microbiota and the effects on immunity and disease, Nutrients, 2014: 4: 1095-1119.



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CAN YOUR BRAIN TALK TO YOUR GUT?

The gut and the brain are in constant bidirectional communication. Through physical and biochemical cross talk and connections, the gut microbiota may profoundly influence brain function and mental health.



Gut forms part of the enteric nervous system, comprehensive division of the autonomic nervous system

200 – 600 million neurons

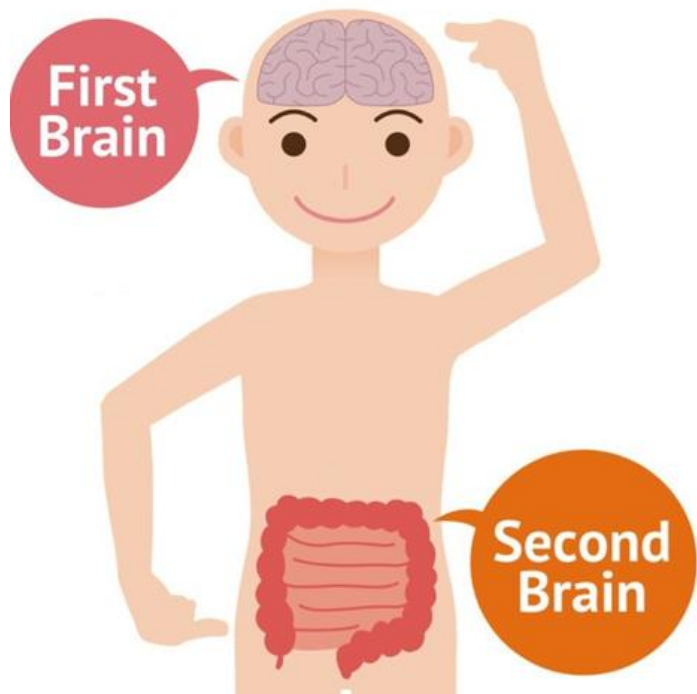
Vagus Nerve



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Emotional
function

Anxiety
and
depression

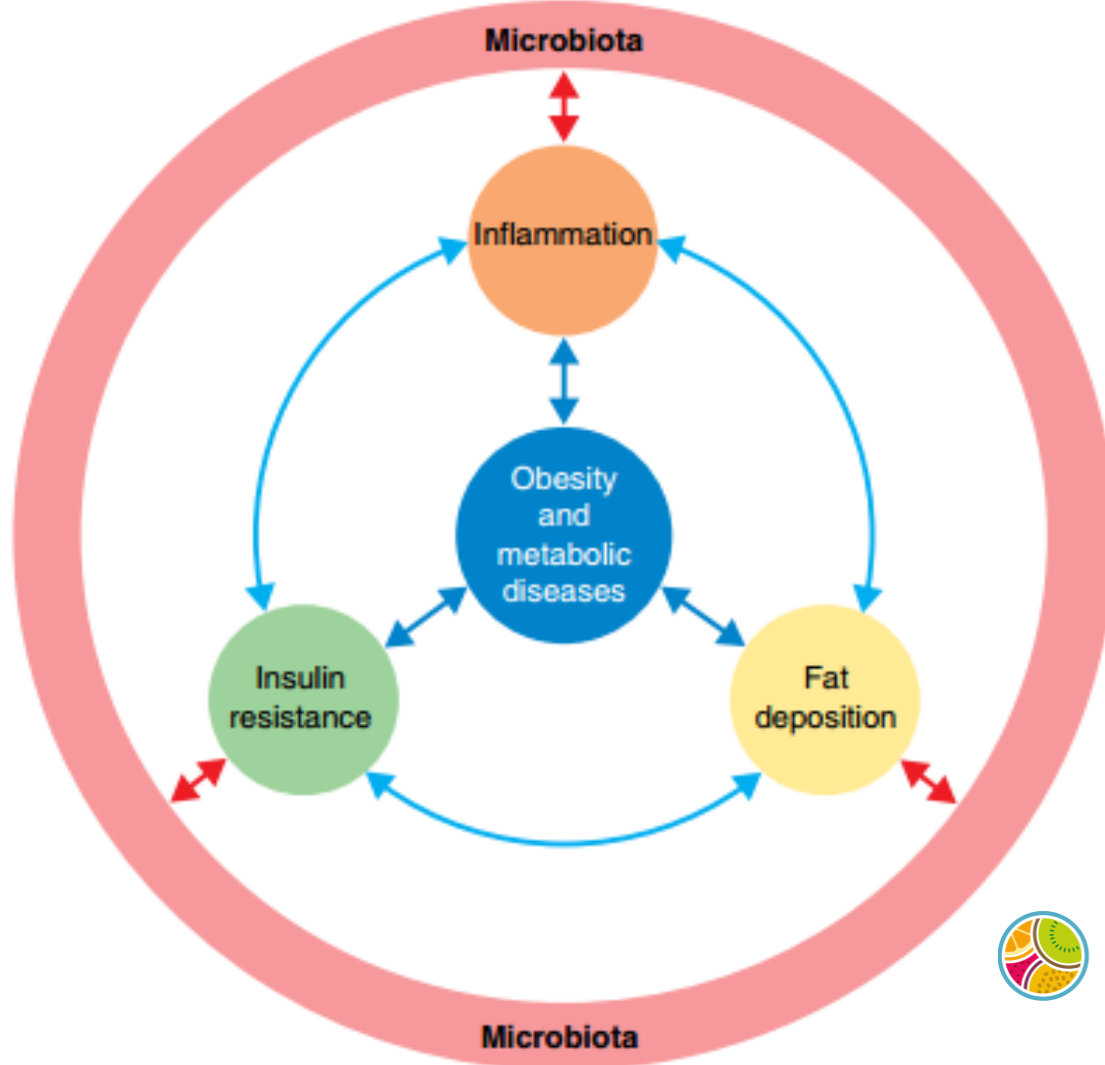
Parkinson's
Disease

Schizophrenia

Bipolar mood
disorder

IBS
IBD

Crosstalk between Gut and Metabolic Health of Host



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Boulangue et al, 2016



Immune &
inflammatory
processes

Water and
electrolyte
absorption

Promotes
gut integrity

Inhibits
pathogenic
organisms

Reduces
disease
causing
bacteria

Reduces pH
of gut

Increases
beneficial
bacteria

SCFA_s



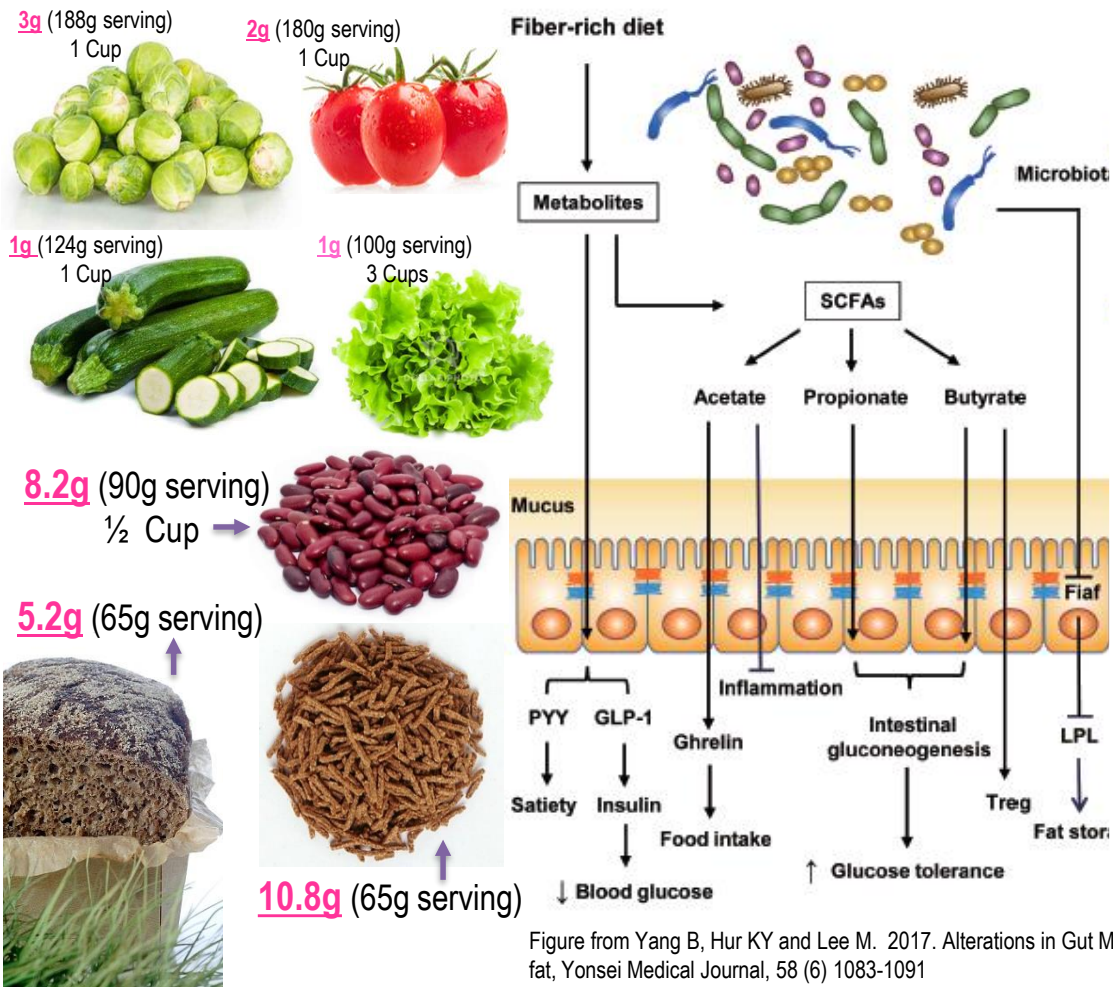


Figure from Yang B, Hur KY and Lee M. 2017. Alterations in Gut Microbiota and Immunity by dietary fat, Yonsei Medical Journal, 58 (6) 1083-1091

SUSTAINABLE DIETS

“Those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations.”

- ✓ Protective and respectful of biodiversity and ecosystems
- ✓ Culturally acceptable
- ✓ Accessible
- ✓ Economically fair and affordable
- ✓ Nutritionally adequate,
- ✓ Safe and healthy
- ✓ Optimizing natural and human resources.



PLANNING YOUR PLATE FOR THE PLANET

What does a sustainable diet look like?

Predominantly plant-based
Low amounts of animal-based foods, refined grains, highly processed foods or added sugars.

Global consumption of red meat and sugar needs to decrease by 50%

Consumption of grains, nuts, fruits, vegetables and legumes must double.



CHANGE YOUR DIET TO SAVE THE WORLD*

Vegetables: 300 g

Wholegrain Carbs: 232 g

Dairy: 250 g

Fruit: 200 g

Legumes: 75 g

Starchy veg: 50 g

Nuts: 50 g

Fish: 28 g

Meat: 14 g red, 29 g chicken

Eggs: 13 g

*Grams per day over a week

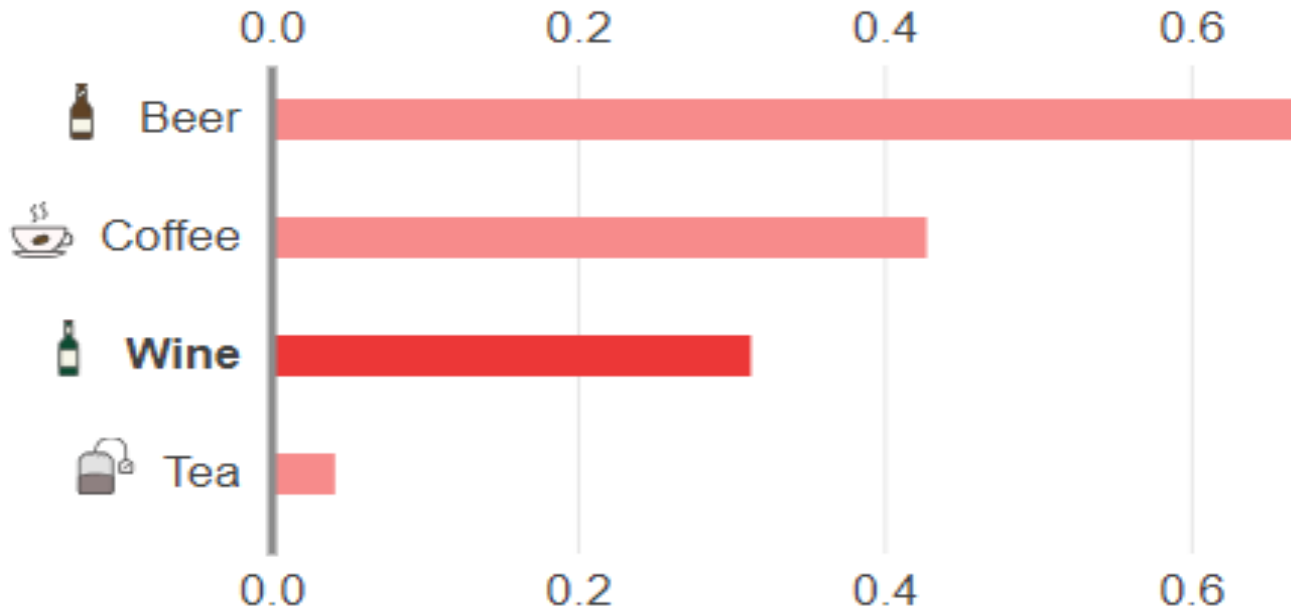
EAT-LANCET Commission, 2019

THE CLIMATE CHANGE CALCULATOR: WHAT'S YOUR CARBON FOOTPRINT?



How drinks compare

Kilograms of greenhouse gases per serving

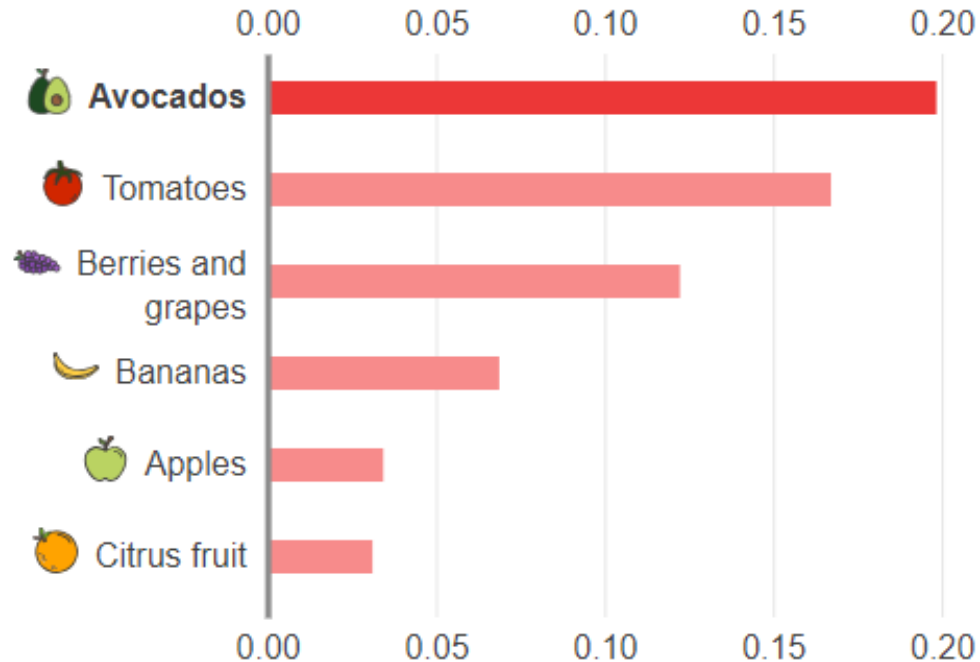


HOW SUSTAINABLE IS YOUR DIET? Owen Frisby (SAAFoST)



How fruit & veg compare

Kilograms of greenhouse gases per serving

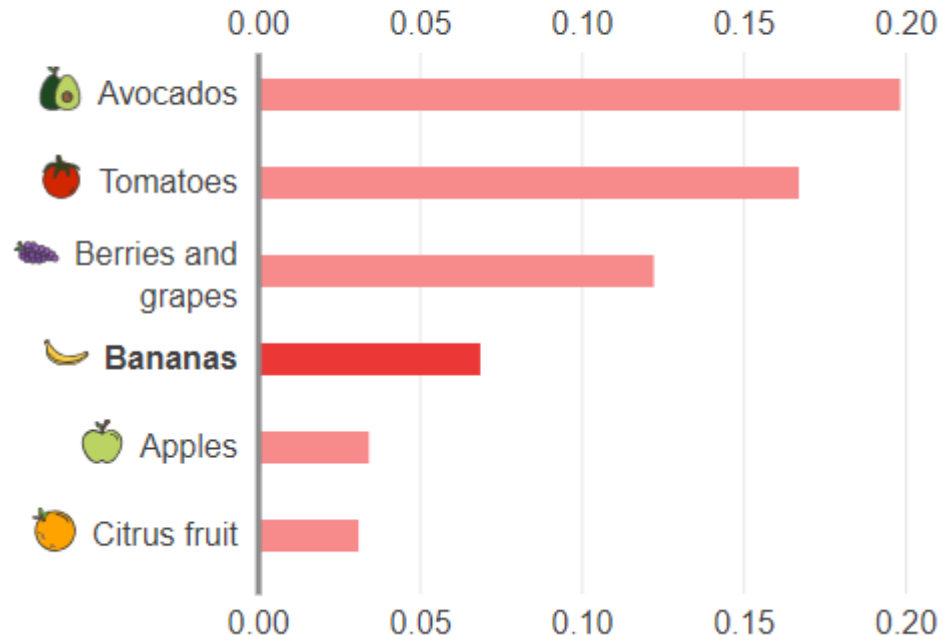


HOW SUSTAINABLE IS YOUR DIET? Nigel Sunley (Sunley Consulting)



How fruit & veg compare

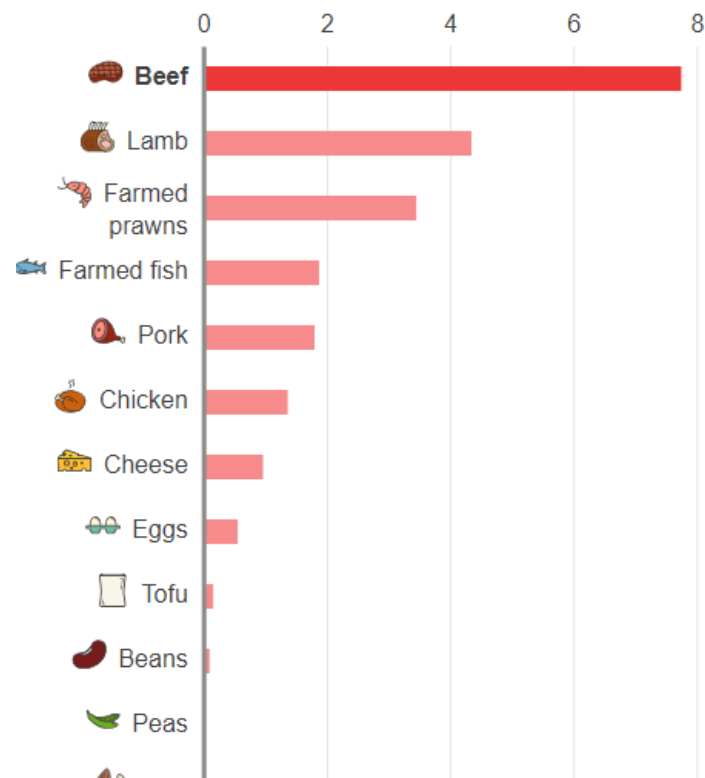
Kilograms of greenhouse gases per serving



HOW SUSTAINABLE IS YOUR DIET? Geoff Penny (Executive Director: SACB)

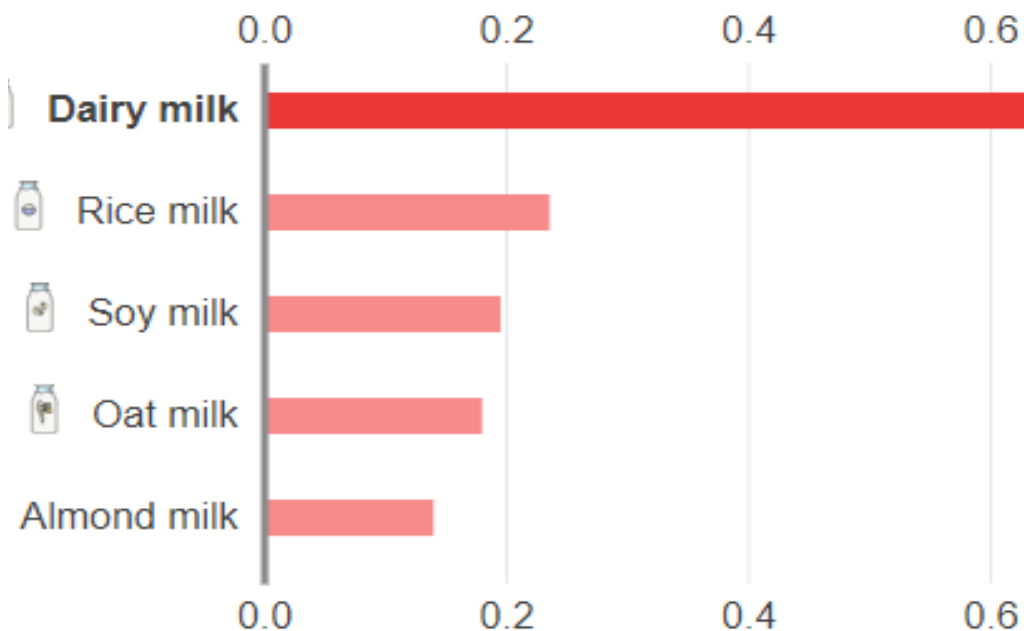
How proteins compare

Kilograms of greenhouse gases per serving



How milks compare

Kilograms of greenhouse gases per serving

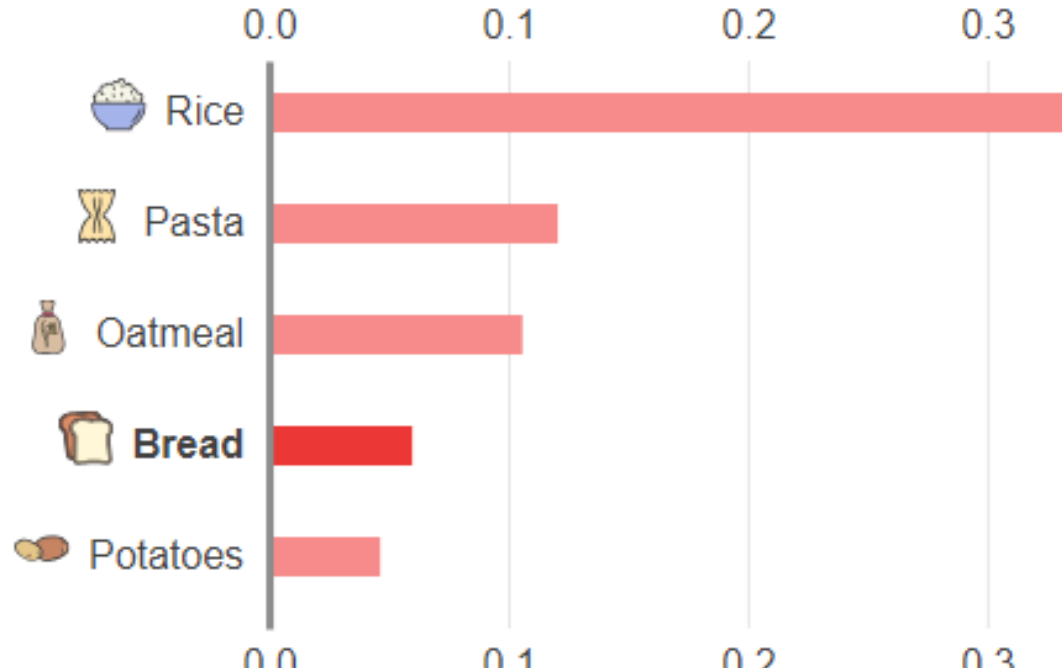


HOW SUSTAINABLE IS YOUR DIET? Lorraine Bezuidenhout (Director: Anchor Yeast)



How starches compare

Kilograms of greenhouse gases per serving





15g of fibre



28g of fibre



13g of fibre



31g of fibre





There is clear, consistent and strong scientific evidence to support the inclusion of wholegrains as part of a healthy and balanced diet.

That is the truth, the whole truth, and nothing but the truth.



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REFERENCES

Available on request:

monique@nutritionalsolutions.co.za



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THANK YOU



@nutritionalsolutionssa

monique@nutritionalsolutions.co.za



011 463 5502



@MoniquePiderit
@NSDietitians



www.nutritionalsolutions.co.za



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