PhysicalNutrition

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EAT • TRAIN • GLOW

PhysicalNutrition

Dietary Influence on Diversity of the Microbiome

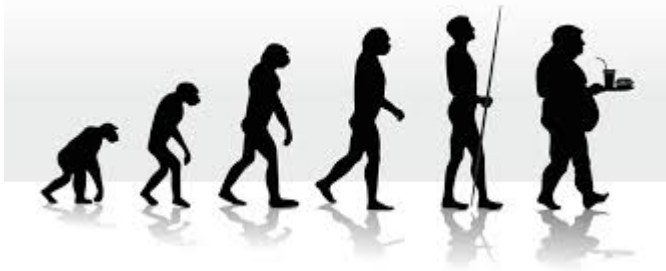
- How different food choices can affect the composition of the microbiome
  - Fibre
  - High carbohydrate vs high protein/fat diets
  - Animal protein vs vegetable protein
  - FODMAPs
  - Therapeutic diets

Global Diversity of the Microbiome

- US and European microbes distinct from each other.
- Smaller regions such as Spain and Denmark can be distinguished by their microbes
- Japanese have genes from marine bacteroides species that degrade seaweed in the gut
  - Not seen in land dwelling communities
  - Are people without these factors in their gut able to digest these foods?

Evolution of the Microbiome

- Analysis of hunter gatherer diets
  - Very rich in fibre
  - Very diverse microbiome
- Introduction of agriculture
- Western world
  - Preservatives, pesticides, emulsifiers, low fibre, antibiotics
- Conditions such as MS and IBD did not exist in ancestral communities.



Diversity

- Diversity of the microbiome is key for good health
- Low diversity linked to a multitude of chronic disease
- Diversity is driven by diversity of the diet
  - Bland diet of highly processed foods leads to low diversity
- You are what your microbes eat!

Diversity

- Affected by:
  - Weekly plant food count
  - Prebiotic intake
  - C-Section vs vaginal birth
  - Breastfed vs bottle-fed
  - Antibiotics
    - Recent use
    - Childhood use
    - Frequency of use
    - Cocktail
  - NSAID use
  - PPI use
  - Urban vs country living
  - Restrictive diet

Diet and Diversity

- Our beneficial gut bacteria LOVE fibre

- Our beneficial gut bacteria do NOT LOVE low fibre, processed foods
  - Less diversity
  - Hungry bacteria
    - May start to eat mucal barrier
  - Starves the good bacteria
  - Encourages growth of bad bacteria

Microbial Diversity

- Improved by:
  - A wide, varied plant based diet
    - Eat the rainbow
    - 40+ different whole, unprocessed plant foods weekly
  - High fibre foods
    - Resistant starches
    - Polyphenols
    - Prebiotic-rich foods
    - Mucilages
    - Pectins
    - Soluble and insoluble fibres

Resistant Starch 1

- Grains, seeds, legumes
- Not broken down by our normal digestive processes
- Broken down by some gut bacteria and inner starch consumed by microbiome
- Cooked oats vs. soaked oats
  - Cooking process breaks down starch
    - Also higher GI
  - If oats are soaked, more resistant starch reach the microbiome
    - Lower GI

Resistant Starch 2

- High in plantain flour, green banana flour and potato flour
- Must be eaten unheated (e.g. smoothie) or resistant starch is lost
- Cooking makes starch digestible so it doesn’t reach microbiome intact.

Resistant Starch 3

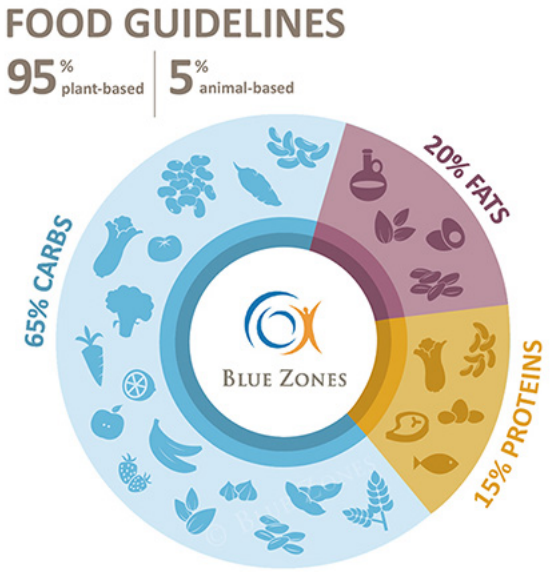
- Formed when starchy foods such as root vegetables and whole grains are cooked then cooled
- Aka retrograde starch
- Cooling process converts digestible starches to resistant starches.
- High in legumes
  - Black beans – loaded with black polyphenols

Soaking and Sprouting

- Makes foods high in resistant starch easier to digest => less gas
- BUT
  - Less resistant starch and not as nourishing for the microbiome

Diet and the Microbiome

- High polyphenol, raw plant foods, tea, coffee, dark chocolate, red wine
  - Linked to high diversity
  - Blue zone diets very high in a diverse range of plant based foods



Polyphenol Rich Foods

- Vegetables
  - Broccoli, purple and orange carrots, red lettuce, red cabbage, purple/red potatoes.
- Fruits
  - Black elderberries, black currants, cherries, strawberries, blackberries, plums, raspberries, apples (red), black grapes
- Nuts and Seeds
  - Flaxseed meal, black tahini, pecans, chestnuts, hazelnuts
- Wholegrains
  - Red, black and brown rice, red and black quinoa, wholegrain sourdough rye
- Drinks
  - Green tea, matcha, red wine

Prebiotics

- Fertilizer for your microbiome
- Soluble, non-digestible fibres that naturally occur in fruits and vegetables
- Fermented by bacteria living in your large intestine to produce short-chain fatty acids like butyrate
  - Provide nutrition for cells that line gut
- Stimulate growth of healthy bacteria

Prebiotic Foods – Oligofructose/Inulin

- Chicory Root
- Dandelion Greens
- Jerusalem Artichoke
- Garlic
- Onions
- Leeks
- Asparagus
- Bananas
- Barley
- Oats
- Apples
- Cacao
- Flaxseeds
- Wheat bran
- Seaweed

Prebiotic Rich Foods – Galacto oligosaccharides

- Legumes
- Brassica family vegetables
- Fresh beans
- Beetroot
- Rye sourdough (if gluten tolerant)
- Sunflower seeds
- Pepitas
- LSA

Butyrate

- Short chain fatty acid
- In the gut:
  - Main fuel for colonocytes – the cells that make up the gut
  - Provides 70-80% of energy for colonocytes
  - Maintains intestinal barrier integrity in the colon and small intestine
  - Decreases endotoxin absorption
  - Enhances colonic motility
  - Maintain acidic pH in the gut
- Systemic
  - Enhances insulin sensitivity
  - Protects brain cells
  - Anti-inflammatory

Butyrate

- Dietary strategies that decrease butyrate production to be AVOIDED
  - Western Diet
  - High fat diets
  - High protein – low carb diets
    - Decrease butyrate concentrations
    - Decrease populations of butyrate-producing bacteria

Butyrate

- To increase Butyrate levels
  - Feed butyrate producing microbes
  - Whole food high fibre diet rich in resistant starch and soluble fibre
  - Supplement prebiotics
    - Fructo oligo saccharides/Inulin
    - Partially hydrolysed guar gum
    - Psyllium seeds and husks
      - Ground seeds produce more butyrate than husks

Gut Acidity

- Optimal pH range 5-6.5
  - Western diet acidity levels 7 up – too alkaline.
    - Encourages non beneficial gut bacteria to multiply
  - SCFA's produced by gut bacteria keep pH down
    - SCFA's produced from fibre and prebiotic foods
  - pH also affected by transit time
    - The faster the stool moves the lower the pH
    - Low fibre diet => constipation

Probiotic-Like Foods

- Bacteria found naturally in the human gut or in fermented foods such as yoghurt etc.
  - E.g. lactobacillus
- Referred to as ‘good bacteria’ or ‘helpful bacteria’.
- Research starting to show promising applications for specific strains of probiotics for specific disease.
- Potential future applications for disease management

Probiotic-Like Foods

- Introduce new species into the gut
  - On a temporary basis
  - Encourage growth of bacteria already resident
- Benefits:
  - Produce antimicrobial compounds
  - Keep out harmful bacteria that compete for nutrients and prebiotics
- Probiotics don’t need to survive to have an effect
  - Alter gut bacteria behaviour as they pass through

Probiotic-Like Foods

- Good quality yoghurt
- Kefir
- Sauerkraut
- Microalgae
- Miso Soup
- Pickles
- Tempeh
- Kimchi
- Kombucha
- Natto






Probiotic Supplements – The Hype

- Large range found in local supermarkets
- Lack of research evidence to suggest these strains work
- Are they alive?
- Is it the right probiotic for you?

Animal Protein

- Some part of the protein we eat is always malabsorbed
  - i.e. it is not digested through the stomach and small intestine and reaches the large intestine.
    - Metabolised by bacteria that consume amino acids
    - Leads to putrefaction
      - Higher production of the gas hydrogen sulphide
        - Rotten egg smell!
- Hydrogen Sulfide
  - Impairs cytochrome oxidase, tissue metabolism, mucus formation and DNA methylation
  - Increased risk of colon cancer

Animal vs Plant Protein

Harvard Study

- Sudden switch to vegan diet did not have immediate effect
- Sudden switch to high meat and cheese diet
  - Significant changes overnight
  - Substantial increase in bacteria linked to heart disease
    - Bilophila wadsworthia
  - Evolution link

David et al (2014)

FODMAPS

F: fermentable
O: oligo-saccharides
D: disaccharides
M: monosaccharides
A: and
P: polyols

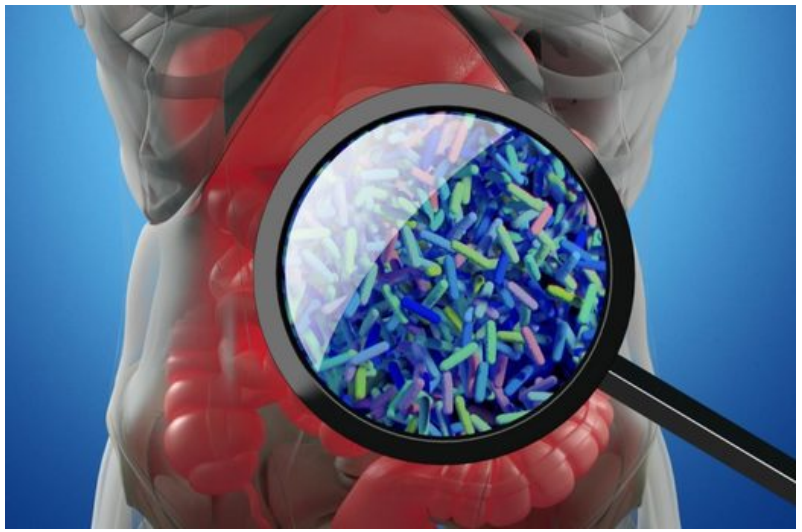
FODMAPS

- High prebiotic foods
- Fermented by gut bacteria
  - Increases small intestinal water volume
  - Increased colonic gas production
- Visceral hypersensitivity
  - If gut is inflamed, may not be able to tolerate high gas producing foods
  - Leads to IBS symptoms
    - Gas
    - Bloating
    - Discomfort
    - Diarhoea/constipation

Foods high in FODMAPs				
Excess Fructose	Fructans	Lactose	Galacto Oligo	Polyols
Apple	Custard Apples	Buttermilk	Chickpeas	Apples
Boysenberry	Nectarines	Custard	Legume beans	Apricots
Cherries	White peaches	Condensed milk	(e.g. baked	Blackberries
Figs	Persimmon	Dairy desserts	beans, kidney	Longon
Mango	Tamarillo	Evaporated milk	beans, borlotti	Lychee
Pear	Watermelon	Ice cream	beans etc)	Nashi pears
Tamarillo	Artichoke	Milk	Lentils	Nectarines
Watermelon	Chicory	Milk kefir	Nectarine	Peaches
Asparagus	Garlic (and	Milk powder	Pistachio nuts	Pears
Artichokes	powder)	Unripened	Cashews	Plums
Sugar Snap	Leek	cheeses (e.g	Oat milk	Cauliflower
Peas	Onion (and	ricotta, cottage,	Soy milk	Mushrooms
Fruit Juices	powder)	cream,	Almonds	Snow Peas
Dried Fruit	Spring onion	mascarpone)	Hommus	Sauerkraut
High-fructose	(white part)	Yoghurt	Tahini	Isomalt (953)
corn syrup	Barley		Ketchup	Maltitol (965)
Honey	Rye			Mannitol (421)
	Wheat			Sorbitol (420)
				Xylitol (967)

FODMAPs and the Microbiome

- Reduced numbers of bifidobacteria
- Reduced numbers of butyrate producing bacteria
- Increased numbers of mucin-degrading bacteria



FODMAPs

- Not a long term solution
- Should only be followed strictly for 4-6 weeks
- Gradual introduction of each individual sugar group
- Reaction indicative of gut dysfunction
  - One big food reaction causing the rest?

The Mediterranean Diet

- Fruit and vegetables with every meal
- Red meat once per week or fortnight
- Oily fish
- High fibre carbohydrates – 50-60%
- Plant based proteins
- Legumes
- Nuts and seeds
- Olive oil


Vegetables
Plate with a diameter of up to 9 inches (23cm)
Whole Grains
Meats & Alternatives

Mediterranean Diet Resources

https://www.csiro.au/en/Research/Health/CSIRO-diets

Paleo Diet

- Fruit and vegetables with every meal
- Animal proteins generally with every meal
- Nuts and seeds
- No beans, peas, lentils and other legumes
- No grains
- Avoid consumption of bad fats
  - Oily fish
  - Olive oil
  - Avocado
- Gluten and dairy free

Anti Nutrients

- Lectins and phytates
  - Legumes and grains
  - A challenge for some to digest

Paleo Resources

https://paleoleap.com/paleo-diet-recipes/

http://eatdrinkpaleo.com.au/paleo-recipes/paleo-dinner-recipes/

https://ultimatepaleoguide.com/recipes/

https://www.bbcgoodfood.com/recipes/collection/paleo

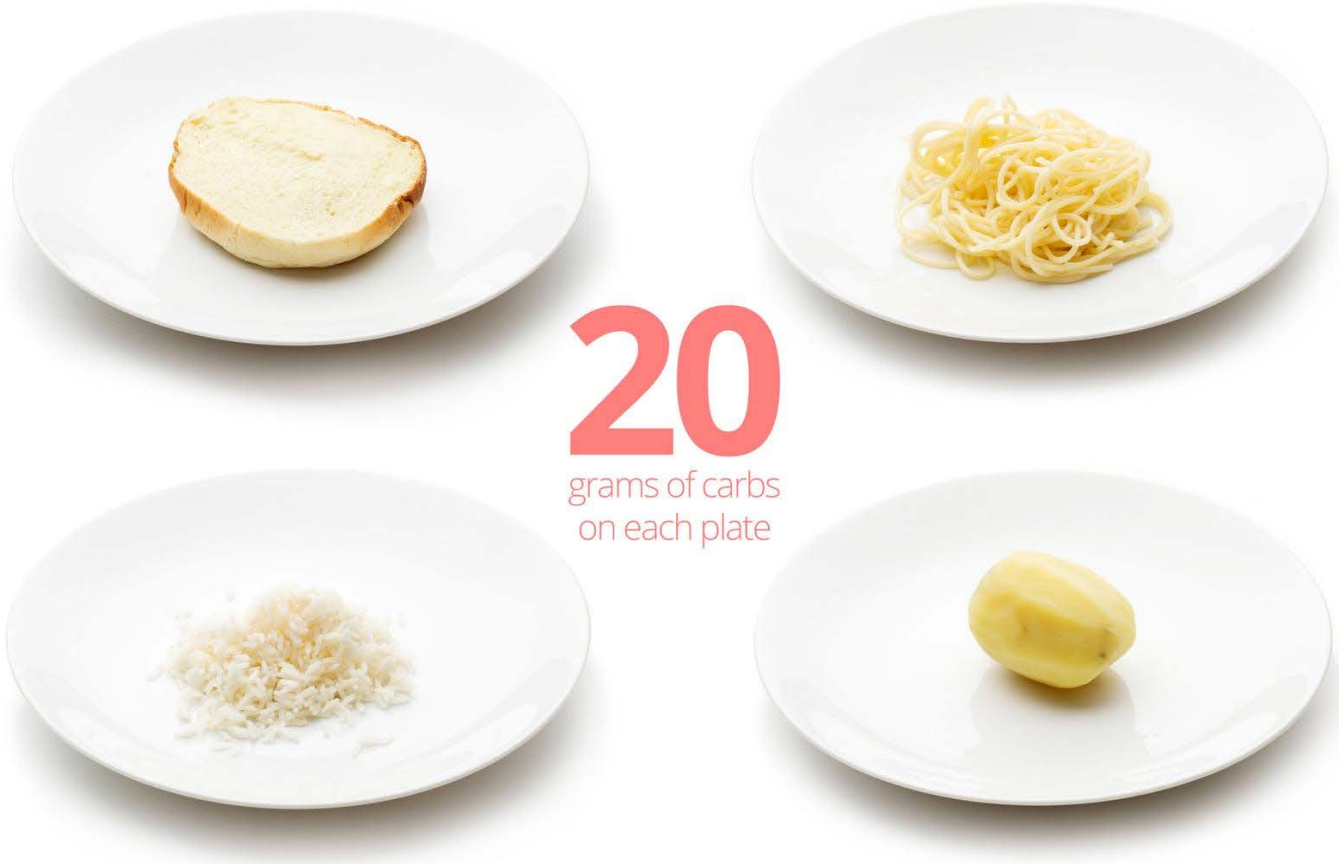
https://nomnompaleo.com

Ketogenic Diet

- 70% fat
- 20-50g carbohydrates per day
- Above ground vegetables
- Protein
- Limited below ground vegetables
- Limited fruit
- Good fats

Keto Diet – What Can I Eat?

Not Keto – 20g of Carbs



Keto – 20g of Carbs

Low Carb vs. High Carb Diets

- Greater weight and fat loss initially on low carb diet but results even out as diet continues when calories are restricted
- BUT those on Keto diet showed:
  - Greater reductions in fasting glucose
  - Greater improvements in HDL cholesterol – the good one!
  - Greater improvements in glycated haemoglobin (HbA1c) (Harvey et al 2019).

Keto Resources

https://www.dietdoctor.com/

Case Study – July 2019

- 56 year-old female
- 10kgs overweight
- Insulin resistant – Metformin
- Hypercholesterolemia
- Chronic bronchitis
- Sleep apnoea
- Chronic candida
- Chronic constipation
- Constant sugar cravings
- Persistent gut bloating
- Had molar pregnancy in 1995 and 6 weeks of heavy dose antibiotics

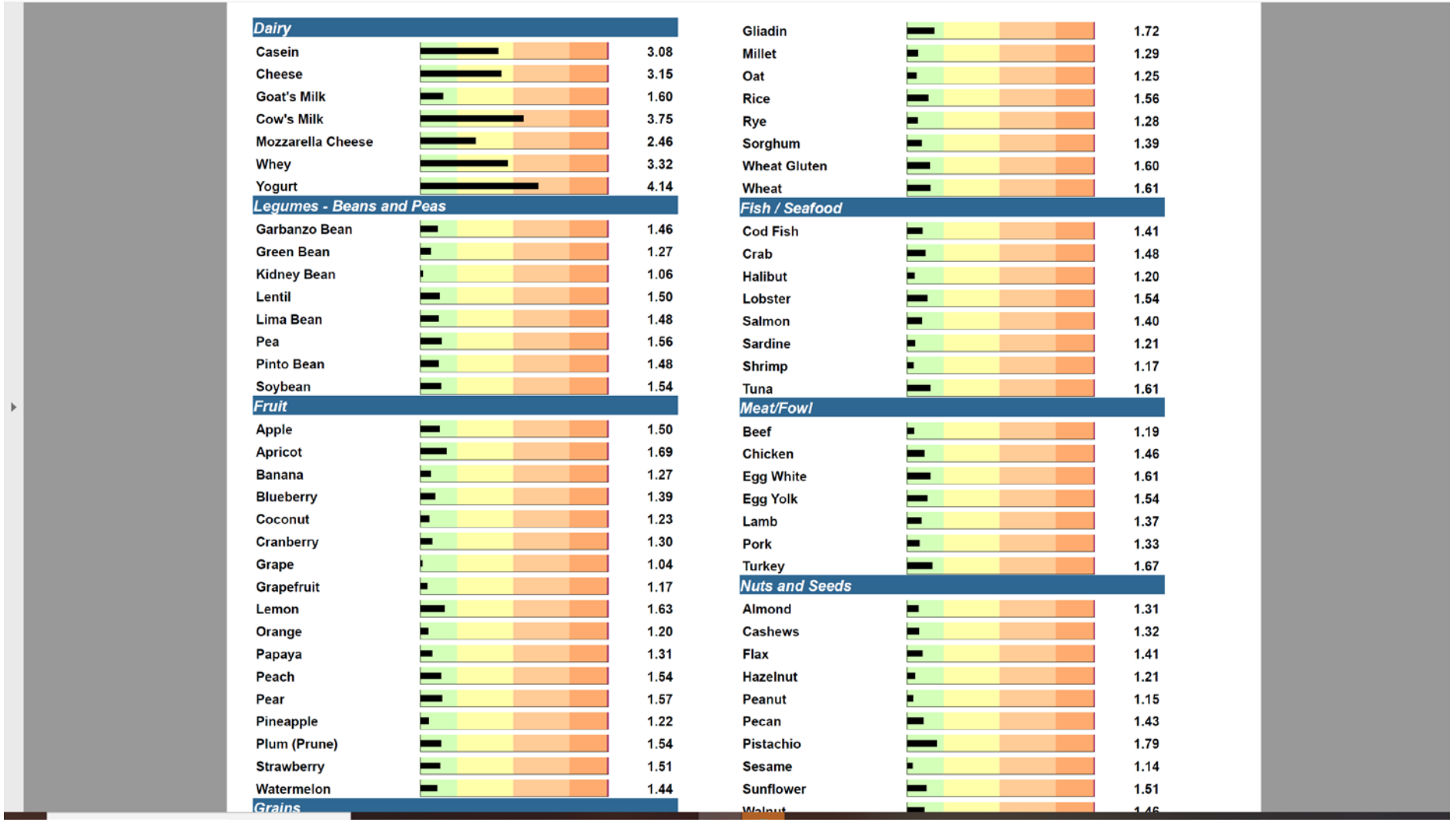
Case Study Diet

- Breakfast
  - Toasted bacon and egg sandwich
  - Yoghurt with stevia and nuts
- Lunch
  - Egg sandwich
  - Stir fry noodles or rice
  - Rice paper rolls
- Dinner
  - Enchiladas
  - Wraps
  - Protein, potatoes and vegetables
- Mid afternoon snacks – biscuits or crackers. Often had cake at the office.
- 1 Flat white coffee daily

Treatment Plan 1

- Mediterranean diet – negotiated with client to go low carb at dinner
- Gluten free
- Client resistant to dairy out so kept it in
- Walking goal 30 minutes daily
- HCL bicarb test
- Recommended a food intolerance test
- Supplemented B12

Test Results



Dairy	
Casein	3.08
Cheese	3.15
Goat's Milk	1.60
Cow's Milk	3.75
Mozzarella Cheese	2.46
Whey	3.32
Yogurt	4.14
Legumes - Beans and Peas	
Garbanzo Bean	1.46
Green Bean	1.27
Kidney Bean	1.06
Lentil	1.50
Lima Bean	1.48
Pea	1.56
Pinto Bean	1.48
Soybean	1.54
Fruit	
Apple	1.50
Apricot	1.69
Banana	1.27
Blueberry	1.39
Coconut	1.23
Cranberry	1.30
Grape	1.04
Grapefruit	1.17
Lemon	1.63
Orange	1.20
Papaya	1.31
Peach	1.54
Pear	1.57
Pineapple	1.22
Plum (Prune)	1.54
Strawberry	1.51
Watermelon	1.44
Grains	
Gliadin	1.72
Millet	1.29
Oat	1.25
Rice	1.56
Rye	1.28
Sorghum	1.39
Wheat Gluten	1.60
Wheat	1.61
Fish / Seafood	
Cod Fish	1.41
Crab	1.48
Halibut	1.20
Lobster	1.54
Salmon	1.40
Sardine	1.21
Shrimp	1.17
Tuna	1.61
Meat/Fowl	
Beef	1.19
Chicken	1.46
Egg White	1.61
Egg Yolk	1.54
Lamb	1.37
Pork	1.33
Turkey	1.67
Nuts and Seeds	
Almond	1.31
Cashews	1.32
Flax	1.41
Hazelnut	1.21
Peanut	1.15
Pecan	1.43
Pistachio	1.79
Sesame	1.14
Sunflower	1.51
Walnut	1.46

Case Study – August 2019

- 2.6kgs down
- Gluten and Dairy free for 4 weeks
- Mucous in throat much improved
- Had mild sore throat but passed within 2 days
- Has lost ‘swollen feeling’
- Gut bloating much improved but still mild constipation
- HCL test showed that stomach acid low
- Still eating too many carbs but diet much improved

Case Study – Supplementation

- Betaine HCL and pepsin
- Saccharomyces Boulardii
- Gut healing powders
  - Pectin
  - Slippery Elm
  - Aloe Vera
  - Glutamine
- Prebiotic powder
- Lactulose

Case Study – Progress

- 6.1kgs lost
- Blood glucose, cholesterol and insulin normalised – no Metformin since mid 2020
- Daily bowel movements type 4
- No chest infections since going gluten and dairy free
- Diet has been low carb since late last year
- No candida since diet changes

References

David LA, Maurice, CF, Carmody, RN, Gootenberg, DB, Button, JE, Wolfe,BE, Ling, AV, Devlin, AS, Varma, Y, Fishbach, MA, Biddinger, SB, Dutton, RJ and Turnbaugh, PJ 2014, 'Diet rapidly and reproducibly alters the human gut microbiome', *Nature,* vol. 505, no. 7484, pp. 559-563, viewed 22 June 2018, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3957428/

Harvey CJDC, Schofield, GM, Zinn, C, Thornley, SJ, Crofts, C & Merien, FLR 2019, 'Low carbohydrates diets differing in carbohydrate restriction improve cardiometabolic and anthropometric markers in healthy adults: a randomized control trial', *PeerJ,* vol.2019, no. 7, p.e6273, viewed online 12 March 2019, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6368026/

Resources

- ‘The Probiotic Advisor’ Facebook page and education links.