

Food for a Healthy Planet II- Summary Notes

Food Sustainability

Feeding the World

- Current Agriculture Systems increase CO₂ emissions
 - Due to fertilizers, transport, pesticides and livestock
- Extreme weather can affect food production
- Fossil Fuels
 - Human, trade and political influences change oil prices
 - At Peak Oil, there is increase use but low extraction ∴ increase price
- Water Use
 - Most important part of food production
 - Decrease Use with changing climate as not as much is available
 - Dairy uses the most water
- Land Use
 - Increase with need for more food and due to Urban Sprawl
 - Less land available for agriculture due to urban sprawl
 - Discretionary Food uses lots of land
- Food Waste
 - 1/3rd of Food is wasted (∴ also wasting resources put into making the product like water, pesticides...)
 - Increase demand for Animal products increases waste at the farm level

Ways to make Food Production more Sustainable

- Reduce/Reuse
 - Decrease consumption and portion size
 - Eat according to the food pyramid
 - Compost food waste to use as Nutrient Cycling for energy
- Use different Food Suppliers
 - Not just supermarkets
 - Make production closer to consumption
- Diversify
 - Use Organic produce, Nutrient Cycling and more technology
- Renewable Energy
 - Don't compete with other resources and decrease H₂O use
- Food Valuing
 - Realize what goes into making food and appreciate/pay for the actual value (eg/ Dairy Crisis 2016 → Fonterra)

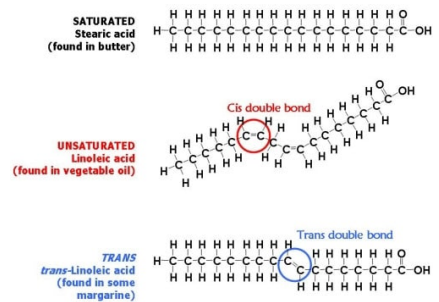


Cities and Urban Centres

- 50% of Worlds population live in Urban areas and expected to be 80% by 2050
- Consume lots of food but produce none
- Food Systems Approach
 - Be aware of interactions within the city and food making centers
 - Be able to respond to changes while still delivering goods

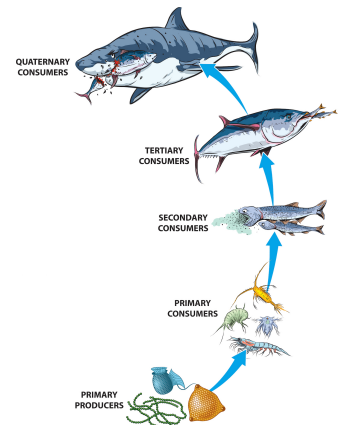
- TRANS FATS

- Used in deep fried and baked foods
- Created by a process called hydrolisation of vegetable oils which turns fat liquid to solid
 - Creates a kink in the fatty acid chain
- Enables fat to be used in cooking and cheaper than butter
- Decreases amount of High density Lipoproteins (HDL) which takes cholesterol to Liver for processing (GOOD)
- Increases Low Density Lipoproteins (LDL) which takes cholesterol to cells where they build up (BAD)
- Saturated Fats increase both types of Lipoproteins \therefore its not as bad as Trans Fats
- Trans fats are currently banned in USA due to health concerns but not in Australia
- TRANS (worst) > SATURATED > UNSATURATED (best)



- ESSENTIAL FATTY ACIDS

- Can't be produced by the body and thus needs to be obtained in the diet
- Total fat consumption has increased with substantial increase of saturated fats and decrease of essential fatty acids
- We have moved away from Omega3/6 Balance by eating too much processed food
- Omega-3
 - Produced by zooplankton which are eaten by larger fish
 - Found exclusively in cold water fish (Tuna, Salmon...)
 - Decrease blood clots, inflammation and fat deposition
 - Decreased Cardiac Diseases in fish cultures ie/Japan
- Omega-6
 - Found in nuts, seeds and grains (Linoleic Acid)
 - Increase Blood Clot and fat deposits

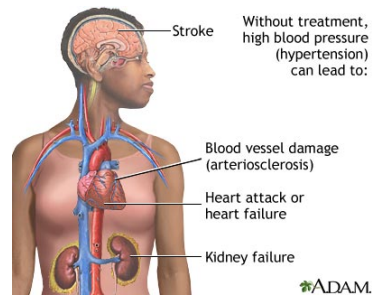


Salt

- Ionic Molecule consisting of Sodium (Na) and Chlorine (Cl)
- Lots of salt in preserved food and cured meats
- History of Salt Use
 - Hunter and Gatherers used salt as a preserver to store food
 - 1950's \rightarrow Fridges used \therefore less salt used
 - Now \rightarrow Increased amounts of salt for flavour
- Role of Salt
 - Helps reabsorb water back into the blood stream
 - Food preserver and flavour
- Dehydration
 - Loss of H_2O and Na from the cell
 - Isotonic Dehydration \rightarrow lose both salt and water (Normal)
 - Hypertonic Dehydration \rightarrow only loss of water thus only need to replace water

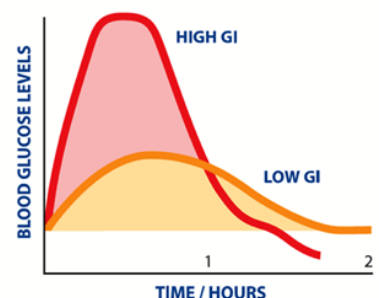
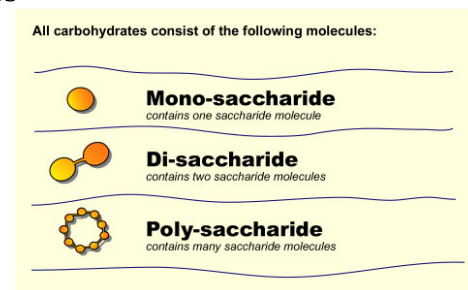


- Adverse Health Effects of High Salt Intake
 - Calcium Loss/ Excretion
 - Leads to osteoporosis and thus weaker bones
 - Increased Blood Pressure
 - Hypertensive (140/90) or Pre-hypertensive (between 120/80 and 140/90)
 - A leading cause of death in western nations due to diet
 - Increased risk of Cardiovascular Disease with more than 5g of salt per day (2.5g recommended per day)
 - Consequences of Hypertension
 - Blood Vessel Stress - Sclerosis
 - Renal Failure - Vascular Fibrosis
 - Cardiac Hypertrophy leading to dysfunction
- How to Minimize the affects of Salt
 - Individual
 - Limit processed food and increase Fruit and veg consumption (for more Potassium)
 - Use less salt in cooking
 - Government
 - Set Industry targets for food manufacturers to lower salt content
 - Educate the population about the dangers of high salt diet
 - Eg/ 'Drop the Salt' campaign
 - Food Industry
 - Agree to levels of salt set by food experts and government
 - Gradually reduce salt levels in food so as not to affect taste levels but still reduce salt



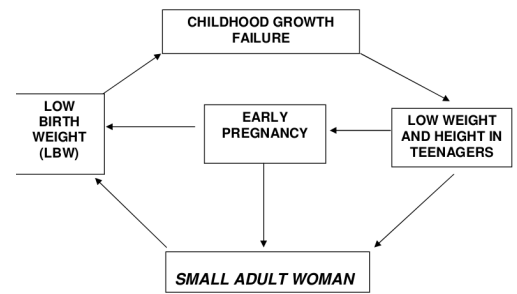
Carbohydrates

- Found in grains, Fruit and Veg... that provide energy, fibre and thus spares use of protein/fat stores as well as increasing gut health
- The body can digest Sugars (mono/disaccharides) and Starches (polysaccharides)
- Metabolism of Carbs
 - Broken down into mono/disaccharides in the stomach/Small Intestine and absorbed in small intestine
 - Goes into Portal Vein to be processed at Liver
 - Liver stores/uses sugars with help of pancreas
- Glycemic Index (GI)
 - Low → usually natural foods (potatoes) that releases energy slowly over a number of hours
 - High → preserved sugars that are released quickly and in high concentrations
- Food Preserving
 - Keeps microbes away from water in food thus they cant grow
- Recommended intake of carbs 40-60% of daily food intake
 - This should be from Fruit/Veg and grains, not sugars



Malnutrition

- Defined as having too many or not enough nutrients
 - Usually associated with having not enough
- Low Birth Weight (<2.5kg) is main indicator
 - Increases chances of not reaching full potential
 - Underweight → low weight for age (includes stunting and wasting)
- Intergenerational Cycle (Shown Right)
 - Is very difficult to break and highlights malnutrition throughout generations particular in impoverish areas of the globe
- Stunting → low weight/height for age due to chronic malnutrition
 - → Increase Disease Risk and decreased brain development and growth
- Wasting → low weight for height due to acute malnutrition
 - → Usually due to famine or disease and increases risk of immediate death
- Obesity → high weight for height (BMI is an indicator)
 - → Due to imbalanced diet but often lacking in micronutrients
- CAUSES OF MALNUTRITION
 - Basic Causes → Poor access to resources and global politics
 - Underlying Causes → Food Insecurity and Inadequate feeding practices
 - Immediate Causes → Disease and Inadequate food

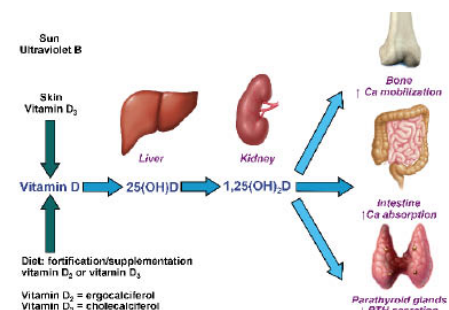


Interventions to counteract Malnutrition

- 2008 Copenhagen Consensus
 - Best investment in the world is for malnutrition
 - Micronutrient supplements/fortification and nutrient programs
 - Must target the first 1000 days
- Approaches
 - Supplements to address deficiencies
 - Diversify diets of those affected
 - Fortify commonly used products (Milk, Sugar, Bread, Rice...)
- Interventions
 - Maternal → protein and micronutrient supplements to increase folate
 - Malaria prevention
 - Child → encourage breastfeeding
 - Zinc and Vit A supplements

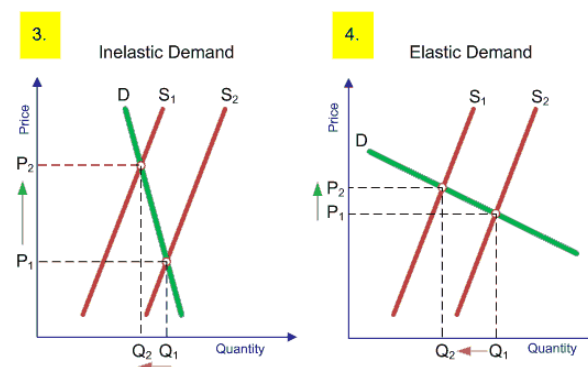
Micronutrient Deficiencies

- Needed for growth, immunity, productivity and brain development
- More than 3 billion affected from micronutrient deficiency
- Eg/ Iron, Iodine, Zinc, Calcium, Vitamin A...
 - Vitamin A → blindness and decreased immunity
 - Vitamin D → need UV radiation to help absorb Calcium
 - Not enough due to protection from melanoma



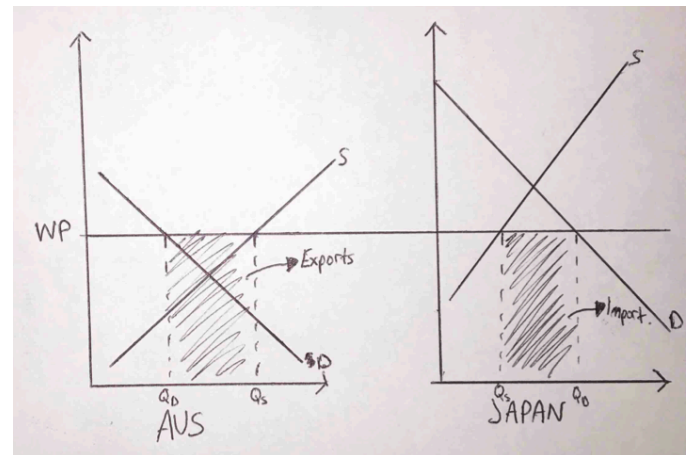
- Elasticity

- Highlights the change in price when supply changes
- Elastic (Flat) → small change in price leads to a big change in quantity demanded ∴ very price responsive [Luxury items]
- Inelastic (steep) → large change in price leads to a small change in quantity demanded ∴ not price responsive [Essential items like milk]



- International Trade

- When the quantity supplied (Q_s) and Demanded (Q_D) are not in equilibrium in a country then in order to satisfy all parties international trade must be explored
- By buying and selling goods on the international market producers are able to export goods at a higher price and consumers can buy goods at a lower price due to imports
- Australia → produces more food than it consumes ∴ we export food
 - This makes it better for producers as they sell their product on the World Market at the world price (WP)
- Japan → consumes more food than it produces ∴ they must import food
 - This is better for consumers as they get products at a lower price than what their own producers can sell it at



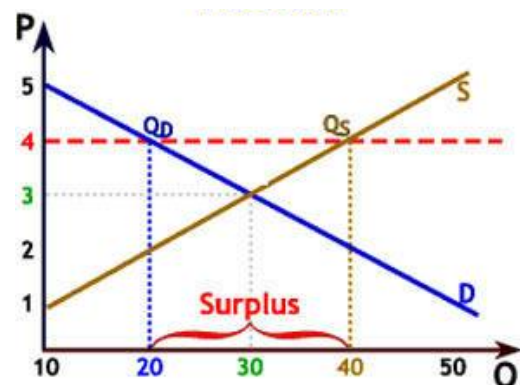
Government Policies

- Price Floors

- This is used when government is looking after local producers
- They raise the price to above the equilibrium thus the producers sell goods at a higher price

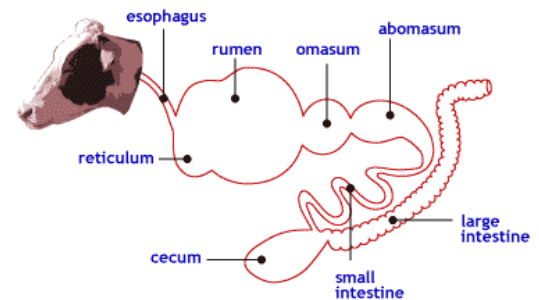
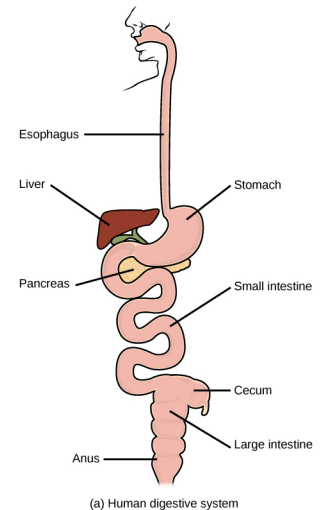
- Biofuels

- Corn and Sugar → Ethanol
- Decrease food supply but increases Raw material demand
- Good for farmers as they have increase demand for their product
 - ∴ right shift of demand curve



The Meat Forum

- One of the five essential food groups thus if not eating it then supplements are required
- History of Meat Consumption
 - 4m yrs ago → more animals ∴ increased grassland hunting
 - Began eating bone marrow and brain (fat and protein) ∴ got bigger and stronger and could target larger prey/animals
 - Primitive Humans → omnivores and GIT reflects this
 - As agriculture expanded → more grains in diet
 - Industrial Revolution → more processed food
 - Fast Food → led to a reliance on high energy
- Human Gastro- Intestinal Tract (GIT)
 - Evolved to digest more animal products but kept the ability to digest some plant material
 - Long small intestine with under developed caecum and smaller large intestine
- Ruminant GIT
 - Ruminants (herbivore) → with 4 large stomachs and a huge large intestine with bacteria to break down cellulose (plant cell walls)
 - Due to the breakdown in stomachs, these animals burp lots of methane (70% of agricultural pollution)
 - Methane levels have increased while ruminant animal numbers have decreased
- Meat and its Health Effects
 - Provides protein, fats and is an energy source
 - Meat contains good cholesterol however the white/yellow parts of the meat contains bad fats
 - Lean Meats have no effect on cholesterol
 - Vegetarian/Vegan Diet
 - No Meat is consumed ∴ no B12 in diet
 - Effects brain and cognitive development (irreversible in kids)
 - Also leads to low Iron, Zinc and Omega-3's



Celiac Disease Forum

- Wheat
 - Wheat Flour created from endosperm
 - Gluten → storage protein of wheat, rye and barley
 - High in glutamate and proline
 - Need large proteins to breakdown Glutenins (insoluble) and Gliadins (alcohol soluble)
 - Celiac → a non-IGE mediated immune activity due to gluten
 - Ingested → Immediate reaction from w-5-Gliadin (Tri-a 19)
 - → Delayed Reaction from Gliadin protein

Feeding the World

Current Ag systems ↑CO₂ emissions
Extreme weather affects food production
Fossil Fuels= peak oil (use v extraction)
Water= important for food production but ↓ w climate Δ
Land= Urban sprawl, ↑degradation/land use
Food Waste= $\frac{1}{3}$ wasted ∴ waste resources too &
↑demand for animal products (unsustainable)
↑ **Sustainability**
Reduce/Reuse= ↓consumption/portions &
Nutrient Cycling
Food Suppliers= not just supermarkets
(production closer to where consumed)
Diversify= organic food, nutrient cycling...
Renewable Energy= to not compete w other resources & ↓water use
Food Valuing= know what goes into it ∴ wont waste it (Dairy crisis)

Cities

$\frac{1}{2}$ of world pop live in urban areas ∴ consume but don't produce
Use water and create heat islands (concrete absorbs heat ↑AC use)
Food System= balance efficiency & redundancy = be resilient (respond to Δ & still deliver functions)
Hinterland= good land outside cities being made for suburbia and makes the food transported further
72% of waste= organic
Urban Food Systems
84% rain into ocean ∴ water tanks & vege gardens
Anaerobic Digestion→fertilizers (from organic waste)
↓Heat Islands ∴ green on buildings (cool, ↓water + energy)
Community Gardens ∴ produce food closer to consumption & ↑ social interaction

Fats

Uses= energy, insulation, vitamins, membranes, shock absorber
Food= flavour, tenderness, FAs, ↑shelf life
Fat Cell lives for 7yrs
Cultural Δ away form fats
Trans
Kink in the chain due to hydrolisation of vege oil
Alternative to butter (cheap & shelf life)
In fried + baked food , margarine
Banned in USA (due health reasons) ↑CVD + obesity
Aus=Industry self regulation but <1% allowed
↓HDL & ↑LDL
LDL=cholesterol to cells HDL=cholesterol to liver
Saturated ↑both

Essential FA's

Body cannot produce ∴ get from diet
Fats ↑ but Omega's ↓ (w ↑ Ag)
0-3= Marine fish that eat the algae (food chain)
↓Clots & fat deposits & Anti-inflam
↓death rates in fish cultures (Japan)
0-6= in seeds & nuts ∴ ↑ clots & fat deposits (has linoleic acid)

Nutrogenomics

Study of association between nutrition & food
Provide nutritional approaches to individuals
Help regulate disease for individuals
Every1 responds to food intake differently
People more aware to how their body will react to certain foods ∴Δ diet accordingly

Malnutrition

Micronutrients= small amounts but essential (>3billion=defecient0
Fe, I Vit A...→ Immunity, growth...
Vit D= cholesterol w UV rays (melanoma)→ helps absorb Calcium
Phytonutrients= produced by plant (berries)
French paradox→ lots of fat but low CVD due to lots of phytonutrients
Functional Food= add to processed food & claim health benefit (not needed in diverse diet)
Diversify Diet= food security, nutritional education & ↑food accessibility
Fortify Food= iodized salt ↓deficiencies
Biofortification= nutrient dense staples (↑Zn in soil)

Malnutrition

LBW<2.5kg (not reach full potential)
Intergen Cycle= Low child>growth failure>low teen>low adult
Stunt= Low weight & height for age (chronic→ ↓brain develop ↑disease)
Waste= low weight for height (Acute→ famine ↑mortality)
Underw= low weight for age (both stunt and waste)=indicates malnutrition
Obesity= high weight for age (imbalanced diet)
Micronutrients
Growth, immunity, development (Fe, I, Zn, VitA[blindness & ↓immunity] >3bill affected
1000days= poor uterine enviro (maternal health, diet, multiple births)
Breast feeding= ↑nutrients & immunity (↓mortality by x14)
Vicious Cycle= Diet>weight loss> ↑disease risk> ↓appetite
Causes
Basic (resources & politics)> Underlying (food security)>Immediate (disease & inadequate food)
Interventions
'08 Copenhagen=best investments (malnut won)
Supps, diversify and fortify food
Maternal (↑protein, folate & malaria vaccine) & Child (breast feed & VitA/Zn [gut syndrome])
Zn= gut health VitA=immunity Fe=anemia I=brain development
UNICEF= nutrition (supps & breast milk) underlying causes ∴ target education, sanitation & women rights

Organics

Current Ag processes aren't sustainable
Farming= no chem fertilizers, pesticides, or herbicides
No artificial ∴ ↑biodiversity (back 2 nature)
Why Buy= worried about toxins, antibiotics, residues & enviro
↑ freshness & nutrition (myth)
Risk?= pesticides only on surface (x200 ↓ NOEC) [rigorous testing]
Organics= ↑risk with manure not washed off & \$\$\$
Tactics= crop rotation & resistant crops ↓pesticides
Not all organics are differentiated (Organic Salt)
People who buy the food= live healthier anyway
Metabolic Syndrome= multifactorial w obesity, BP & fat
↑Non-communicable & ↓communicable diseases

Salt

Hunter/gatherer & 1900's=fridges ∴ ↓Salt (now ↑ salt for flavour)
hydration, AP's, Na/K pumps, preservative & flavour
Dehydration= loss of water & salt (iso=lose both and hypertonic= only lose water)
Hypertension (Heart attack, stroke, CVD, kidney, arteries, Ca loss)
↓Salt ∴ ↓BP in people w hypertension
Frozen Food= bitter if no salt
Recommended= 6 (UL), 3(good) but now @ 10g Individual (processed food, F&V, cooking, Na:K ratio)
=Gov (industry targets, Drop Salt, coordinate, educat)
=Industry (agree to levels & gradually reduce)

Food Risks

Scientists V Public= no empathy (vaccine problem), media influences people= need co-op to ↑food safety
Scientists work on small/abstract things & results offend people
Syst1= rapid (association of concepts)
Syst2= slow and thought out
Halo effect= exaggerate emotional coherence (guilt free yoghurt)
Naturalistic Fallacy (assume natural foods safer= marketed)
Bonsoy Milk= claims natural but uses Umami (bacteria but highly processed)
Chinese Myth (MSG)= AA glutamate w no proof artificial MSG= harm
Frozen Berries= Hepatitis & Liver Disease (human faeces)
Freeze=preserve virus & sewage hard to detect (isolated)>monitor @ site of contamination
Programs=for high risk foods and ID control steps (cooking & storage) eg. Pasteurization
Hazards
Chemicals/components of food
Bio agents (bacteria, virus, fungi)
Errors eg. Temp abuse & prep correctly
European Food Outbreak
Faeces in salads (young females affected)→ poo blood & kidney loss
EColi produced toxins attacked kidney (specific DNA)
Banned imports & removed from shelves
Tracked to sprouts from Egypt
Look @ bacteria DNA and link to common source (thru food chain)

Food Economy

Challenges= ↑pop, 2billion food deficient, ↑70% food production
↑Food demand (pop & income)
= Urban sprawl, competing resources, climate Δ
Food Security
Access to safe, nutritious food @ all times
Utilizing food, food trade & ↓waste (storage/transport)
Chronic (no food) & transitory (season/war)
↑INCOME to help vulnerable (China middle class)
Peasant (family grown) Modern (trade, infrastructure, technology, supply chain)
Storage=mitigates price Δ's=buffer
Gov. Policies
Biofuels invest (↑demand for food products)
International trade
Subsidies for farmers
R&D→ better techniques for farming/yields (12% return, ↓ since 90's, free-rider)
Food Aid V Food Stamps
Infrastructure, education (China)

Carbs

Energy, Fibre, build macros, protein/fat sparing
Food= Natural but preservative, flavor, browning...
GI= low & High: w metabolism (amylase)
Intake= 40-60% of DI (not sugars)
Disease= Teeth (decay, acid from bacteria), Addiction (prefer sweet @ birth & overrides lectin), Obesity ($\frac{2}{3}$ Aus's, ↓weight ∴ ↑protein & Low GI)
Type II (liver, eyes, feet)
Metabolic Syndrome (BP, cholest, CVD)
Fructose
cheap, sweet preservative (good in F&V no access)
Only metabolized liver→ triglycerides
No insulin needed ∴ ↑Visceral fat
→insulin & lectin resistance
Resistant Starch
grains (legumes), granules (banana), retrograded (crystals, potato) & chemical (fortified)
Fermented→ ↑SCFA (buterate= pH, gut lining, ↑apoptosis) & Pre-biotic, poo, satiety, low GI

