

# **FOOD FOR A HEALTHY PLANET**

## **Topics:**

- Lecture 1: Nutrients
- Lecture 2: Energy
- Lecture 3: Sport
- Lecture 4: Optimal Health
- Lecture 5: Diabetes
- Lecture 6: Obesity
- Lecture 7: Cardiovascular Disease
- Lecture 8: Adverse Reactions to Food
- Lecture 9: Uncharted Territory
- Lecture 10: Food Production Requires Energy
- Lecture 11: Climate Change Impacts
- Lecture 12: Global Food Security in the Face of Change
- Lecture 13: Sustainable and Resilient City Region Food Systems
- Lecture 14, 15, 16: The Nature of the World Population, Income and Food Problem
- Lecture 17: Chocolate and Coffee
- Lecture 18: GMO's
- Lecture 19: Food (In)Security and Famines
- Lecture 20: Food Insecurity
- Forum Notes

## **Lecture 1: Nutrients**

### **What we need to survive?**

Body is 96% water (oxygen and hydrogen) and Carbon, Nitrogen and other elements.

Earth provide us with everything we need

- Rainwater – Hydrogen and oxygen
- Plants – Carbon, Hydrogen and oxygen (photosynthesis)
- Soil- Nitrogen and Minerals

## **MACRONUTRIENTS**

### **Packaging the Elements into Macronutrients**

- Carbohydrates – Carbon, Hydrogen and Oxygen
- Lipids – Carbon, Hydrogen and Oxygen
- Protein - Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorus and Sulphur

### **Macronutrients are Carbohydrates, Lipids and Proteins**

- Need in large amounts

- Provides the body with energy
- Alcohol can also provide us with energy

## Carbohydrates

- Single sugar units (monosaccharides): glucose, fructose & galactose
- Two sugar units (disaccharides): sucrose, maltose & lactose
- Multiple sugar units (polysaccharides): amylose & amylopectin.

### Carbohydrate Digestion

- Begins in the mouth as the enzymes (amylase) break down the starches, most digestion occurs in the stomach and small intestine
- Once in the stomach the salivary amylase is inactivated so no carb digestion occurs
- Small Intestine- most starch is digested and broken down into smaller sugars
- Then can be absorbed into the blood stream
- In the live can be stored as glycogen, sent back to be used as energy or be stored as fat

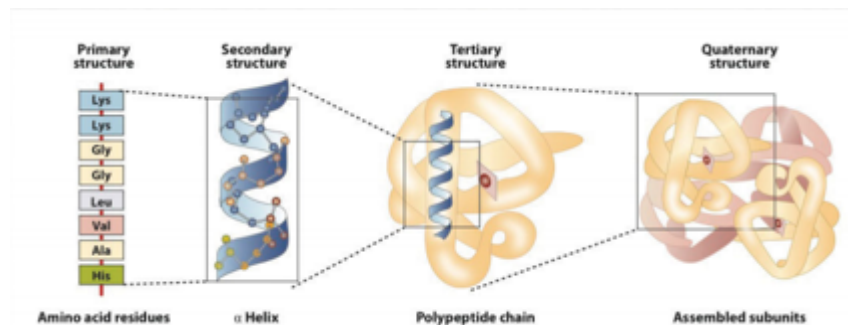
### Carbs and Health

- Simple Carbs (sugars) – bad
- Complex Carbs (starches) - good
- High GI (watermelon) - bad
- Low GI (sweet potatoes) – good
- Added Carbs (cereal) - bad
- Naturally Occurring Carbs (fruit) - good
- Protein Sparring – Carbs give the body energy so that the body doesn't have to use the protein for energy
- Fat Sparring
- Gut Health``
- Building of Macromolecules
- Brain and RBC's

Source includes dairy

## Protein

Made of amino acids joint together



## Digestion

- Throughout the digestive track broken down into the amino acids
- The acids are released into the blood stream into the portal vein then to the liver
- In the liver, can build them into body proteins, or build them into other nitrogen containing compounds, help to build carbs (gluconeogenesis), or used for energy.

### Protein and Health

- Animal Protein vs Plant Protein (High Fat protein diet causes cholesterol issues)
- Complete Protein (Animal) (contains all of the essential amino acids the body needs)  
Incomplete Protein (Plant) eat different combinations
- Digestibility/ Bioavailability/ Utilization (Animal sources the body uses more effectively as they're more similar)

### Role in the Body

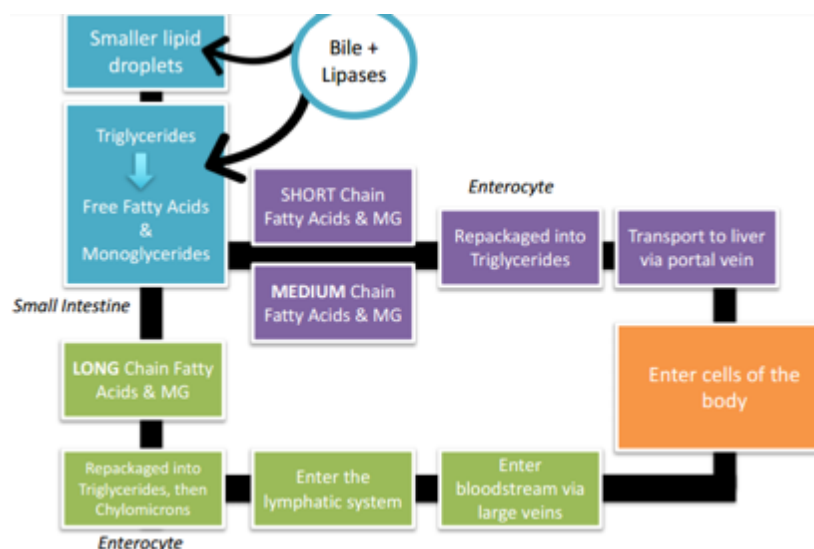
- Protein is the building block of all cells in the body
- Every cell in the human body contains protein
- growth and development of all cells
- make enzymes, hormones and other chemicals

### Lipids (Fats and Oils)

- Lipids are made up of combinations of fatty acids, packaged up as triglycerides. A fatty acid is a chain of carbons with a carboxyl group on one end.

### Digestion

- Lipids are lipid soluble
- Breaks into smaller droplets of fat
- Breaks apart the bonds into Free Fatty Acids and Monoglycerides



### Lipids and Health

- Long, Medium, Short Chain Fatty Acids
- Saturated (high cholesterol), Unsaturated (low cholesterol) Fatty Acids
- Trans (bad- made during processing), Cis (good) Fatty Acids

## Roles of Lipids

- Energy
- Carrier of fat soluble vitamins (A, D, E, K)
- Precursor of some hormones and enzymes
- Needed for brain function and structure
- A component of cell membranes
- Cushioning of vital body organs
- Warmth

## Lecture 2: Energy

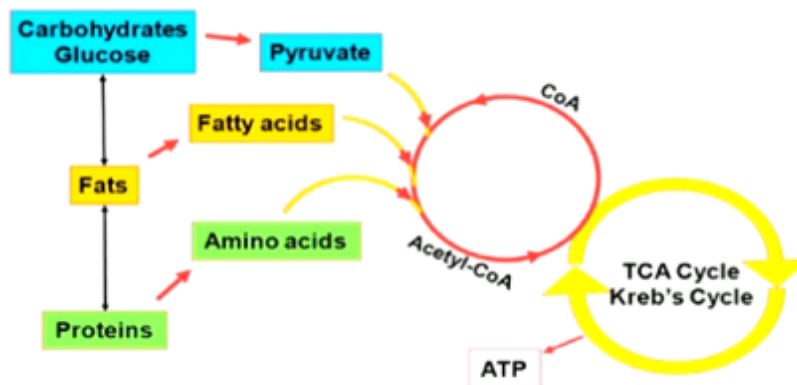
### Energy

1 cal = 4.2 Joules

1 Cal (1kcal) = 1000 cal (4.2 Kilojoules)

Nutrient	KJ/g	Cal/g
Carbohydrate	16	4
Protein	17	4
Lipid	37	9
Alcohol	29	7

From Macronutrients to ATP



ATP splits apart and the body gets energy

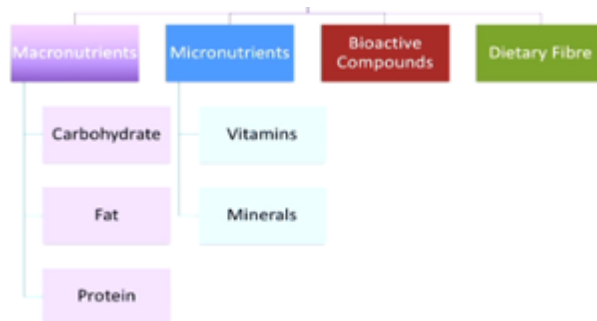
Energy that is not used is stored in the body

### Macronutrients Summary

- The Earth provides humans with the elements that we need to live and grow.
- Most importantly C-H-O-N-P-S, are packaged up into Macronutrients and Micronutrients for the body to metabolise.
- Include carbohydrate, protein and lipids.
- Important roles in the body.

- Studied in relation to health and disease
- Provide the body with energy in the form of ATP

## MICRONUTRIENTS & BIOACTIVE COMPOUNDS



### Vitamins

- Organic (contains carbon) compounds
- Vital for human survival
- Needed in only small amounts (less than 1g /day)
- Cannot be synthesized by the body, obtained through diet

Water Soluble (B group,C) – easily travel around in the body, easily absorbed but not easily stored.

Fat Soluble (A, D, E, K) – stores well

### Functions in the body

VITAMIN	SOURCES	FUNCTIONS
A	EGG, MILK, CARROT, PAPAYA	<ul style="list-style-type: none"> <li>• For growth and promote healthy skin</li> <li>• For good night vision</li> </ul>
B	EGG, YEAST, LIVER, NUTS, TOMATO	<ul style="list-style-type: none"> <li>• Promotes the effective functioning of the nervous system</li> <li>• Controls the supply of carbohydrates to the muscle and nerve cells</li> </ul>
C	GREEN VEGETABLES, TOMATO, LIME	<ul style="list-style-type: none"> <li>• Increases immunity against diseases</li> <li>• Promotes healthy skin</li> </ul>
D	EGG, MILK, COD LIVER OIL	<ul style="list-style-type: none"> <li>• Helps in the absorption of calcium and phosphorus in the small intestines</li> </ul>
E	VEGETABLE OIL, EGG, LIVER, MILK, PALM OIL	<ul style="list-style-type: none"> <li>• Maintains a healthy reproductive system</li> </ul>
K	SUNFLOWER SEEDS, MAIZE	<ul style="list-style-type: none"> <li>• Necessary for the clotting of blood</li> </ul>

**Vitamin A** – is a problem in more than half of all countries. Deficiency is the leading cause of preventable blindness in children. Carried in breastmilk

Fortification of common foods

Bio fortification – eg golden rice in Bangladesh, Indonesia and the Philippines.



## Vitamin D

1/3 Australians Vit D deficient

Important for bone health

Solutions – Dietary Intake, fortified foods, supplements

## Vitamin B12

- Required for synthesis of fatty acids in myelin
- DNA synthesis
- Normal blood function and neurological function

## Absorption

Intrinsic factor is made in the stomach and binds with vitamin B12 then they are absorbed together.

## Causes

- Pernicious Anaemia – the body doesn't make enough intrinsic factor
- Diseases of stomach or small intestine
- Dietary intake

## Solutions

- Diet
- Fortified foods (breakfast cereals)
- Supplements

## Minerals

- Essential minerals come from the earth and cannot be made by the body
- Required for bodily functions

### Essential macro-minerals:

- Required in >100mg/day
- Ca, Na, K, P, C, S

### Essential micro-minerals (trace):

- Required in <100mg/day
- I, Cr, Co, Cu, Fe, Mg, Mn, Mo, Se, Si, Zn

### Calcium

- Bones and teeth
- Heart and blood vessel health
- Muscle function
- Nerve transmission
- Cell signalling

### Deficiency

- Difficult to measure
- Blood levels tightly regulated
- Have to look at intake or bone mineral density

### Iron

Iron helps to transport oxygen around the body.  
Also important in energy production and immune function.

#### Deficiency:

- Fatigue / weakness / dizziness
- Lack of concentration
- Increased risk of infection
- Pale skin

#### Causes of deficiency:

- Inadequate dietary intake (particular vegetarian diets)
- Blood loss
- Pregnancy
- Vigorous exercise
- Absorption problems
- Reduced gastric acid

Heme Iron (animal)

Non-heme Iron (plant) – not as well utilised by the body – absorption dependent on pH.

(nuts, raisins, beans, whole grains, dark leafy greens)



Transform with vitamin c

### Zinc

- Component of various enzymes in the body
- Growth and Immune function

Deficiency common in developed and developing countries

## Causes

- Low intake
- High levels of inhibitors in the diet (fibre and phytates)
- Zinc deficient soils
- Protein foods increase bioavailability
- Soaking, sprouting and fermenting foods decreases the phytic acid

## Solutions

- Dietary diversification
- Supplementation
- Fortification (added during processing)
- Bio fortification

(cashews, watermelon seeds, almonds, pumpkin seeds, Cacao/Cocoa)

## Iodine

- **World's leading cause of preventable brain damage**
- Essential component of thyroid hormones
- Metabolic processes
- Aus soils low in iodine

(Baked potatoes, dried seaweed, iodized salt, cranberries, strawberries)

## Bioactive Compounds

Not macro or micro nutrients but play an important role in the body

Colour, aroma and flavour

Evidence that consumption of fruits and vegetables provide

- Cardiovascular protective effects
- Cancer protective effects
- Immune modulating effects
- CNS modulating effects
- Detoxification system protective effects
- Antioxidant effects
- Antimicrobial activity

## Summary

- Micronutrients and bioactive compounds are extremely important in the diet and should not be overlooked.
- Just because you are not overweight or obese does not mean your body is getting everything it needs.
- Diets high in processed foods DO NOT provide your body with all the essential elements it needs to be healthy
- People who follow vegetarian diets should be very careful to make sure they have adequate B12, iron and Zinc.
- A balanced diet, containing whole foods (vegetables, fruit, grains, lean meat, dairy, oils ) can supply the body with everything it needs to survive.
- Supplements and fortified foods may be of benefit when dietary intake is inadequate.