Week 2 – Nutrients in Food:

➢ **Nutrition** is the science of food, the nutrients and the substances therein, their action, interaction, and balance in relation to health & disease, and the process by which the organism ingests, absorbs, transports, utilizes and excretes food substances.

➢ **Food science** is the study of food before it enters the mouth.

➢ Food contains **nutrients** such as water, lipids, carbohydrates, protein, vitamins & minerals.

➢ Food also contains other **non-nutrient substances** such as dietary fibre, phytochemicals & additives.

Essential Nutrients:

- Are required for normal body function but cannot be synthesised by the body or cannot be synthesised by the body in amounts adequate for good health.
- Must be obtained from dietary sources
- Examples include:
  - o Fatty acids (from lipids and fats) – omega 3, omega 6
  - o Amino acids (from proteins) – arginine, cysteine etc.
  - o Vitamins – vitamin A, B, C etc.
  - o Minerals – calcium, iron, potassium etc.

What is our body made up of?

- Around 60% water
- Around 12-20% fat (males) & 20-30% (females)
- Carbohydrate, protein, vitamins, minerals & other minor constituents

  ➢ **Foods similar in composition** to our body include meat (high in protein & fats) & fruits (high in water).

Macronutrients & micronutrients:

  ➢ **Macronutrients** are lipids, carbohydrate & protein
  ➢ They are needed in fairly large amounts and can provide energy
  ➢ **Micronutrients** are vitamins & minerals
  ➢ They are needed in very small amounts and do *not* provide energy (however some micronutrients) are involved in processes that provide energy for the body)

Energy yielding nutrients:

- **Fat:** 37kJ/g (9kcal/g)
- **CHO:** 17kJ/g (4kcal/g)
- **Protein:** 17kJ/g (4kcal/g)
- **(Alcohol):** 29kJ/g (7kcal/g) *alcohol is *not* a nutrient but it does provide energy
- These values have been adjusted for digestibility & metabolism.

⇒ Fats & oils (aka lipids):

- Food fat/oil is chemically called triglycerides.
- The main lipid in our diet is triglycerides.
- **Triglycerides** are made up of 3 fatty acids attached to a glycerol backbone.
- The length of the fatty acid chain & the location of the bond influence the type of fat.
- A fat generally contains more saturated fatty acids than an oil (which contains more unsaturated fatty acids).
- Fat is solid at room temperature, oil is liquid at room temperature.
- Lipids are **non-polar**, so it doesn't mix with water.
- Lipids also include other substances in small amounts in foods (e.g. cholesterol).

Fatty Acids:

- **The carbons in fatty acids** can be attached to each other as **saturated** or **unsaturated** double bonds.
- Fats in foods are mixtures of fatty acids that can either be **saturated** (no double bonds – therefore are saturated with hydrogen atoms), **monounsaturated** (one double bond) or **polyunsaturated** (more than one double bond)
- The **main factor in determining whether a fat is a solid or a liquid** (oil) **at room temperature** is the relative number of fatty acids. The more saturated fatty acids it contains the more solid it is, and the more unsaturated fatty acids it contains the more liquid it is.
- Examples of **foods high in saturated fats include** butter, coconut oil and meat fats.
- Examples of **foods high in unsaturated fats include** avocado, canola oil & olive oil.

Essential Fatty Acids (EFA's):

- Are those fatty acids that the body cannot make and therefore can only be derived from your diet
- **Linoleic acid** (omega-6) (mainly found in vegetable oils) and **linolenic acid** (omega-3) (found in fish & fish oil) are essential fatty acids.
- **EFA's are needed for** immune function, vision, cell membrane health, and the production of hormone like-compounds.

Fats & Oils in Foods:

Fats and oils have important **properties for food & cooking**:

- Carry flavours (mostly non-polar based)
- Mouth feel/texture
- Provides tenderness/moisture (e.g. meat/pastry)
- Good at heat transfer (e.g. deep frying)

⇒ **Carbohydrates in food:**
- Carbohydrates are mainly found in plant-based foods.
- Starches & dietary fibres (mainly cellulose, hemicelluloses & pectic substances) are made up of many sugars attached (polysaccharides).
- All carbohydrates consist of **monosaccharides** (simple sugars – found in fruit, candy, cake, milk etc.), **disaccharides** or **polysaccharides** (complex carbohydrates – found in foods such as breads, legumes, rice, pasta, and starchy vegetables).

Monosaccharides:
- The simplest form of carbohydrates
- Contain one saccharide molecule
- They are the building blocks for disaccharides & polysaccharides
- Examples include glucose, fructose, and galactose.
- Absorbed in the small intestine.

Disaccharides:
- Formed when 2 sugars join together.
- Composed of two monosaccharides.
- For example:
  - **Lactose** (milk sugar) = glucose + galactose
  - **Sucrose** (cane sugar) = glucose + fructose
  - **Maltose** (found in potatoes, beer, pasta) = glucose + glucose

Polysaccharides:
- Composed of long chains of monosaccharides
- Can be linear (in a horizontal line) or highly branched
- For example, starch and glycogen.

monosaccharide (glucose)

disaccharide (sucrose)

polysaccharide (amylose starch)