## LECTURE 3 – CARBOHYDRATES: SUGARS, STARCHES, FIBRES

**Complex carbs =** polysaccharides including glycogen, starches (storage form of glucose in plants) or fibre (include cellulose, gums and pectins)

- Starches have alpha links between sugars making it digestible, cellulose has beta links that humans don't have the enzyme required to breakdown

**Free sugars** = monosaccharides – glucose, galactose (naturally in milk) and fructose (fruits, honey)
disaccharides – sucrose (glucose + fructose, sugarcane), lactose (glucose + galactose), maltose (2x glucose in fermentation)
oligosaccharides

**Condensation reactions =** produces water, links molecules together
**Hydrolysis** = requires water, splits molecules, occurs commonly in digestion

### BLOOD GLUCOSE CONTROL

Maintained within very narrow limits as many cells including the brain require constant supply of glucose ~ 4-7mM. Extremely high or low levels can cause death. If above 10mM can cause loss of glucose in urine, dehydration, fatigue and other complications such as diabetes. Maintained by removing from blood after eating and replacing during fasting, initially by liver reserves (6-12hours) then conversion of mainly muscle protein (>12 hours).

**Hypoglycaemia** – below 4mM
**Hyperglycaemia** – above 11mM
**Insulin –** moves glucose into storage, released from pancreas
**Glucagon**- move glucose into blood, released from pancreas
**Adrenaline**- acts quickly to bring glucose out of storage during times of stress

**Type 1 diabetes –** no insulin produced from pancreas
**Type 2 Diabetes –** fat cells resistant to insulin

### EFFECTS OF FOODS ON BLOOD GLUCOSE

**Glycaemic index –** potential of a food in raising blood glucose
**Glycaemic load –** foods glycaemic index and the amount of carbs the food contains
**Glycaemic response** – how quickly the blood glucose rises and elicits an insulin response

High GI foods = potato, white rice, bagels, watermelon, honey
Low GI foods = sweet potato, carrot, brown rice, yoghurt, lentils
Added sugars should not make up more than 25% of total energy intake. Aspartame 200x sweeter than sucrose.

### TYPES OF FIBRE

Soluble – found in fruits and veges, digested by gut bacteria and can help reduce cholesterol in blood
Insoluble – found in grains and veges, not digested, increase water in the intestine and reduce constipation, may reduce bowel cancer
Functional fibres – added health benefitting fibres to foods or supplements

### HEALTH EFFECTS OF FIBRE

All fibres delay stomach emptying and create the feeling of fullness. May provide protection from heart disease and stroke (bind with cholesterol rich bile salts and lower blood cholesterol levels). May also displace fat in the diet. Reduce risk of type 2 diabetes by decreasing rate of glucose absorption. Enhance GI health as limiting absorption of toxins.

Can cause dehydration, abdominal discomfort, displace energy and nutrient-dense foods in excessive amounts. May interfere with absorption of some minerals. **Phytic acid or phytate** related to fibre binds to some minerals (e.g Fe, Ca, Mg) preventing absorption. Not a problem unless fibre is high