Principles of Nutrition **Carbohydrates Knowledge Organiser**

Macronutrients Are Measured in Grams

- carbohydrates
- proteins
- fats

Monosaccharides

A simple sugar: the most basic sugar molecule.

Disaccharides

Made up of two monosaccharides.

Polysaccharides

Complex carbohydrates: made up of lots of monosaccharides joined together.

Function

- Carbohydrates contain energy;
- Sugary foods release energy quickly;
- Sugary foods can cause uneven sugar balances;
- Starchy foods are complex carbohydrates – these provide slow release energy;
- Starch based carbohydrate foods should be eaten as a source of energy – not sugar foods.

Monosaccharides

Glucose	Fructose	Galactose
• fruits • vegetables • corn • cane/sugar beet • honey • animal blood	• fruits • vegetables • corn • cane/sugar beet • honey	• not in foods • produced when lactose is broken down in the body during digestion

Deficiency

Low carbohydrate diets may cause blood sugar (glucose) to drop, resulting in feeling hungry, weak and dizzy.

Disaccharides

glucose + fructose = sucrose	glucose + galactose = lactose	glucose + glucose = maltose
• sugar (used in cooking) • cane/sugar beet	• milk	• sweet potatoes • soya beans • barley • wheat

Excess

If more energy is consumed than burnt off, the excess glucose is stored in the liver and muscles as energy.

Over time, this leads to weight gain and obesity.

Obesity puts the body at higher risk of heart disease and type 2 diabetes.

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RDA

It is recommended that 1/3 of the diet should come from starchy foods.

1g carbohydrate = 16kJ/3.75 kcal

Energy

Carbohydrates are the main source of energy for the body.

Without carbohydrates, the body starts to burn fat, then protein, for energy

Intrinsic sugars (glucose, fructose and lactose) occur naturally in foods such as fruit and some sweet vegetables.

Extrinsic sugars (sucrose, sugar cane, sugar beet, corn) are added to food; they do not occur naturally.

Non-Milk Extrinsic Sugar (NMES) is mainly referred to as sucrose, but includes glucose, honey, fructose and glucose syrups.

Glycaemic Index – GI

Ranks carbohydrate foods based on blood glucose levels:

Foods absorbed slowly have a low GI rating.

Foods absorbed quickly have a high GI rating.

Polysaccharides

Starch	Cellulose	Pectin
• potatoes • wheat • barley • pulses • oats • corn • rice	• fruit • vegetables • whole salt	• fruit • vegetables

Low GI Foods – 55 or less

- most fruits
- non-starchy vegetables
- carrots
- 100% stone ground whole wheat bread
- legumes

Medium GI Foods - 56 - 69

- brown rice
- basmati rice
- oats

High GI Foods – 70 or more

- white bread
- corn flakes
- white rice
- white pasta
- pineapple
- melon

Maximum Daily Intake of Sugar by Age Group

Children Aged 4 to 6	Children Aged 7 to 10	Children Aged 11 to 18
19g of added sugar a day; approximately 5 sugar cubes.	24g of added sugar a day; approximately 6 sugar cubes.	30g of added sugar a day; approximately 7 sugar cubes.

Principles of Nutrition **Dietary Fibre Knowledge Organiser**

Insoluble fibre is not easily broken down by the digestive system. It passes through the body unchanged, keeping the bowels healthy and preventing digestive problems such as constipation and haemorroids.

Dietary fibre also known as:

- roughage
- cellulose
- non-starch polysaccharide (NSP)

Soluble fibre is broken down by bacteria in the bowel to be digested. It can help reduce cholesterol in the blood and guard against coronary heart disease.

Sources

Insoluble	Soluble
wholegrain cereals wholemeal bread bran nuts corn oats fruit vegetables (especially the skin)	oats barley rye most beans and peas fruit root vegetables

Excess

- bloated feeling
- flatulence
- stomach cramps
- diarrhoea
- can make it difficult for the body to absorb calcium and iron

Deficiency

A deficiency is often caused by eating too many refined foods, e.g. white bread instead of whole meal, or white rice instead of brown rice.

It may also be caused by a general lack of fruit and vegetables in the diet.

A deficiency can lead to constipation, haemorroids, colon cancer and/or diverticulitis.

Functions	
Keeps bowels healthy	• Helps prevent constipation. • Helps prevent type 2 diabetes. • Helps reduce colon cancer. • Lowers the risk of coronary heart disease.
Gives a feeling of satiety & fullness for longer	• Reduces the temptation to snack between meals. • Helps support a healthy weight. • Slows down absorption of carbohydrates in the blood to help keep blood sugar levels constant.

Recommended Daily Intake for Dietary Fibre

Children aged 2 to 5	Children aged 6 to 11	Children aged 11 to 16	Adults
15g	20g	30g	30g

A **high fibre diet** can reduce the chances of some diseases and help regulate blood sugar levels.

Fibre-rich foods contain **phytates**, which can reduce how much calcium and iron is absorbed into the body.

Principles of Nutrition **Fats, Oils and Lipids Knowledge Organiser**

Function

Fat provides the body with insulation and warmth, protects vital organs (heart, liver, kidneys) and supports the body with fat soluble vitamins (A, D, E, K).

Fats are important for hormone production and contain essential fats the body cannot make.

Energy

- 1g of fat = 37kJ/9kcal

Visible Fats

Those you can see, such as butter and lard.

Excess

An excess of fat in the diet can cause weight gain. Over time, this can lead to obesity, which in turn puts the body at risk of diabetes, heart disease, strokes and some cancers.

Invisible Fats

Fats hidden within products, such as milk, cheese and other dairy items.

Deficiency

Fat-soluble vitamins cannot be processed in the body, leading to health issues revolving around lack of vitamins (A, D, E, K).

Less fat means less insulation to keep the body warm and a thinner protective layer under the skin to protect the body from knocks and falls.

Lack of carbohydrate means the body uses the fat as an energy store, which can result in weight loss.

Fat Fact

Marks & Spencer became the first UK food retailer to ban hydrogenated fat in all of their foods.

Fat intake needs to be carefully monitored so it is **balanced**.

Cholesterol is a waxy substance which circulates in the blood. It is used by the blood to carry lipoproteins, which take the cholesterol between cells. The body needs a balance of good and bad cholesterol.

Low Density Lipoproteins (LDL) are often called 'bad cholesterol'. High levels build up in the arteries, meaning a higher risk of heart disease.

High Density Lipoproteins (HDL) are often called 'good cholesterol'. They carry cholesterol from around the body to the liver, which processes cholesterol out of the body.

Principles of Nutrition **Fats, Oils and Lipids Knowledge Organiser**

Fat	Description	Sources
Saturated	• considered the unhealthiest if eaten in large amounts • often from animal sources	• lard • butter • full fat dairy products • fats visible on meat • processed meat products (sausages & burgers) • pastries, cakes, biscuits • some vegetable fats – block margarine, palm oil, coconut oil
Trans	• hydrogenated vegetable oil • vegetable oils which have been processed to make them hard • trans-fats clog arteries & increase risk of coronary heart disease	• cakes, biscuits, convenience foods • products with an increased shelf life • doughnuts, pizzas • products labelled 'partially hydrogenated vegetable fat/oil' • occur naturally in meats and dairy products
Unsaturated	• healthier fats • usually liquid at room temperature • help promote healthy cholesterol	• olive oil • rapeseed oil • almonds • hazelnuts • peanuts • avocados
Monounsaturated		• sunflower, soya, corn & sesame oils • plant food sources: wholegrains and seeds • nuts • fruits and vegetables
Polyunsaturated		
Omega 3 & 6	• polyunsaturated fats • classed as 'good fats' or essential fatty acids • prevent blood clotting • promote healthy heart rhythm • can help with depression • supports eye development in children	• Omega 3 • fish, salmon, mackerel, trout, herring, sardines • walnuts, soya and rapeseed oil • Omega 6 • poultry • eggs • cereals • nuts • vegetable oils

How much fat do we need each day?

	Men	Women
Total Fat	95g	70g
Saturated Fat	30g	20g

Principles of Nutrition Knowledge Organiser

	Function	Sources	Deficiency	Excess Side Effects	RDA
Vitamin A Retinol	• Healthy immune system • Good health and development in children • Helps vision in dim light • Keeps mucus membranes moist	• Dairy products • Egg yolk • Oily fish • Fortified low fat spreads • Liver • Yellow, red and leafy green vegetables, spinach, carrots, sweet potato, tomatoes, peppers • Yellow fruits, mango, papaya, apricots	• Can cause night blindness • Reduces ability to fight infections • Limits growth in children	• Can affect bone health, causing increased fractures • Pregnant women should avoid liver and liver-based foods due to possibility of birth defects	• Men: 0.7 mg • Women: 0.6mg

	Function	Sources	Deficiency	Excess Side Effects	RDA
Vitamin D The Sunshine Vitamin	• Formation of strong bones • Helps control amount of calcium absorbed from food	• Oily fish • Eggs • Liver • Fortified foods – breakfast cereals, margarines, supplements	• Can lead to rickets due to poor absorption of calcium • Weak bones and teeth • Extreme cases can lead to heart failure	• Kidney damage • Hyperglycemia in infants	• 0.1mg • (naturally available in the summer through sunlight)

Fat Soluble Vitamins (Vitamins A, D, E and K)

The body needs access to these every day to function. Fat soluble vitamins are stored in the liver and fatty tissue to be used when needed.

Water Soluble Vitamins (B Vitamins and Vitamin C)

These vitamins dissolve in water – we need these daily as they are not stored in the body.

Micronutrients

- are vitamins, minerals and trace elements that the body needs in small amounts
- are measured in milligrams or micrograms

	Function	Sources	Deficiency	Excess Side Effects	RDA
Vitamin E Tocopherol	• Acts as an antioxidant protecting the body from disease • Strengthens immune system • Helps maintain healthy skin and eyes	• Plant oils, soya, corn, olive oil • Nuts, seeds, wheatgerm • Milk • Egg yolk • Polyunsaturated spreads and oils	Very rare – but can lead to weak muscles	• Headaches • Nausea • Can affect blood coagulation	• Men: 4mg • Women: 3mg

	Function	Sources	Deficiency	Excess Side Effects	RDA
Vitamin K	• Helps blood clotting • Supports healing of wounds • Good bone health	• Leafy green vegetables • Cauliflower • Liver • Bacon • Cereals • Vegetable oils • Small amounts found in meats and dairy	Rare – can cause uncontrolled bleeding in infants	• Any vitamin K the body doesn't need immediately is stored for future use	• 0.0001 mg for every kg of body weight

	Function	Sources	Deficiency	Excess Side Effects
Vitamin B1 Thiamin	• Releases energy from high carbohydrate foods • Promotes healthy nervous system • Supports healthy growth in childhood	• Red meat • Wholegrain cereals • Yeast and yeast extract • Dairy products • Fresh and dried fruits • Eggs • Seeds, nuts, beans • Fortified breakfast cereals	• Muscle wasting disease • Tiredness	• Headaches • Nausea • Can affect blood coagulation

	Function	Sources	Deficiency	Excess Side Effects
Vitamin B2 Riboflavin	• Releases energy from food • Helps support growth in childhood • Keeps skin, eyes and the nervous system healthy	• Red meat • Yeast and yeast extract • Dairy products • Eggs • Rice • Mushrooms • Fortified breakfast cereals • Wheat products	• Can cause swollen tongue • Dry skin and sores around the corners of the mouth	• Rare – but increased risk of kidney stones

	Function	Sources	Deficiency	Excess Side Effects
Vitamin B3 Niacin	• Releases energy from food • Keeps skin and nervous system healthy • Helps lower the levels of fat in the blood • Amino acid 'tryptophan' can be converted into niacin in the body	• Red meat • Liver • Wholegrain cereals • Yeast and yeast extract • Dairy products • Eggs • Seeds, nuts, beans • Fortified breakfast cereals • Wheat products	Pellagra – can cause diarrhoea, rough scaly and sore skin, confusion, memory loss	• Over time, can cause liver damage

	Function	Sources	Deficiency	Excess Side Effects	RDA
Vitamin K	• Helps blood clotting • Supports healing of wounds • Good bone health	• Leafy green vegetables • Cauliflower • Liver • Bacon • Cereals • Vegetable oils • Small amounts found in meats and dairy	Rare – can cause uncontrolled bleeding in infants	• Any vitamin K the body doesn't need immediately is stored for future use	• 0.0001 mg for every kg of body weight

	Function	Sources	Deficiency	Excess Side Effects
Vitamin B5 Pantothenic Acid	• Releases energy from fat and carbohydrate	• Beef, chicken, liver, kidney • Wholegrains, • Yeast • Potatoes • Broccoli • Tomatoes • eggs	• Unlikely due to it being in a lot of food sources	• Unlikely, but may lead to diarrhoea, dehydration, heartburn and nausea

	Function	Sources	Deficiency	Excess Side Effects
Vitamin B6 Pyridoxine	• Nerve function • Brain development • Helps body use protein • Supports the formation of hemoglobin	• Red meat, liver, kidney • Chicken, pork • Eggs • Soya beans • Yeast and yeast extract • Wholegrain cereal • Peanuts, walnuts	• Unusual, but can lead to anaemia and weakness	• Over time, could lead to loss of arms and legs

	Function	Sources	Deficiency	Excess Side Effects
Vitamin B7 Biotin	• Metabolism of fat • Production of energy • Metabolism of protein • Strengthens hair and nails	• Kidney, liver • Egg yolk • Dried fruit • Raspberries • Avocado • Cauliflower • Fish • Peanuts • Soya beans • Milk	If large quantities of egg white are consumed – it combines with biotin to make it unavailable to the body	• No toxic side effects

	Function	Sources	Deficiency	Excess Side Effects
Vitamin B9 Folate Folic Acid	• Release energy from food – especially protein • Works with vitamin B12 to form healthy red blood cell • Helps reduce the formation of spina bifida	• Leafy green vegetables • Potatoes • Beans, seeds, nuts • Oranges, berry fruits • Yeast extract	Anaemia - nausea, loss of appetite, diarrhoea Tiredness and muscle weakness Lack of folate can cause spina bifida	• High doses can cause stomach upsets, trouble sleeping and skin reactions

	Function	Sources	Deficiency	Excess Side Effects
Vitamin B12 Cobalamin	• Making red blood cells • Keeps the nervous system healthy • Releases energy from food • Processing folic acid	• Liver, meat • Fish • Eggs • Milk and cheese • Fortified breakfast cereal • Yeast	• Anaemia • Fatigue, depression • Long-term damage to nervous system and brain • Vegans need to supplement their diet with fortified foods	• No toxic side effects

	Function	Sources	Deficiency	Excess Side Effects
Vitamin C Ascorbic Acid	• Helps absorb iron from foods • Needed for formation of collagen • Helps resist infection • Helps wounds heal	• Fruits, citrus, kiwi, blackberries, tomatoes • Dark green leafy vegetables • Potatoes	• Extreme cases – scurvy • Bleeding gums, wounds not healing, general tiredness • Anaemia	• Excess vitamin C gets flushed out with urine

Minerals

Calcium Ca

Function	Sources	Deficiency	Excess Side Effects
• Forms, strengthens and maintains healthy bones and teeth • Supports blood clotting • Helps nerves and muscles working properly • Help with growth in children	• Dairy foods • Leafy green vegetables • Wholegrain cereals • Soya drinks with added calcium • Fish with edible bones, sardines, pilchards • Bread made with fortified flour	Can cause rickets Osteoporosis Those at higher risk – diet free from lactose or cow's milk, coeliac disease, osteoporosis, breastfeeding, past menopause	• Higher doses could lead to stomach pain and diarrhoea • Calcium buildup in kidneys could be fatal

Iron Fe

Function	Sources	Deficiency	Excess Side Effects
• Helps make haemoglobin	• Red meat • Wholegrain cereals • Leafy green vegetables • Beans, nuts • Dried fruits, raisins, apricots	Anaemia – lethargy, pale complexion Must be combined with vitamin C in order to effectively be absorbed	• Constipation • Vomiting • Stomach pain • Nausea

Potassium K

Function	Sources	Deficiency	Excess Side Effects
• Helps balance body fluids • Helps to lower blood pressure • Keeps heart healthy • Improves bone health • Helps prevent muscle cramps	• Fruits and vegetables • Pules, nuts and seeds • Fish, shellfish • Beef • Chicken, turkey • Coffee • Salt substitutes	• Diarrhoea • Heart failure	• Stomach pains • Nausea • Diarrhoea • Excess is excreted through the kidneys

Phosphorus P

Function	Sources	Deficiency	Excess Side Effects
• Helps build strong bones and teeth • Works with calcium • Important for energy release	• Animal and plant based foods • Red meat • Diary • Fish • Poultry • Bread • Brown rice • Oats	• Unlikely due to being in so many foods but can cause weak muscles and painful bones	• Can trigger involuntary muscles spasms • Diarrhoea and stomach pain • Over time, can reduce amount of calcium being absorbed resulting in fractured bones

	Function	Sources	Deficiency	Excess Side Effects
Magnesium Mg	• Bone development • Helps nervous system • Important for energy release	• Meat • Fish • Dairy foods • Wholegrain cereals • Nuts and seeds • Leafy green vegetables	• Rare, but can lead to loss of appetite, nausea, vomiting, fatigue • Can cause high blood pressure and heart disease	• Diarrhoea

	Function	Sources	Deficiency	Excess Side Effects
Sodium Na	• Helps control amount of water in the body • Helps body use energy • Helps control nerves and muscles	• Salt • Processed foods • Crisps, ready meals • Ham, kippers, sausages • Some breakfast cereals • Yeast extracts • Stock cubes	• Muscles cramps	• High blood pressure • Heart and kidney damage • Stroke

Trace Elements

Iodine I

Function	Sources	Deficiency	Excess Side Effects
• Helps make thyroid hormone	• Sea fish, shellfish, seaweed • Dairy products • Plant foods • Cereals and grains	• Body doesn't make enough thyroid hormone • In pregnancy can lead to baby's brain not developing • Vegetarians and vegans are at risk of deficiency	• Can affect the way the thyroid gland works

Zinc Zn

Function	Sources	Deficiency	Excess Side Effects
• Helps maintain immune system • Helps fight infection and disease • Helps wounds heals and blood to clot • Keeps skin healthy	• Meat • Dairy foods • Eggs • Shellfish • Pulses • Wholegrain cereals • White bread • Breakfast cereals • Fermented soya	• Poor growth in children	• Reduces the amount of copper the body can absorb – can lead to anaemia and weakening of bones

Fluoride F-

Function	Sources	Deficiency	Excess Side Effects
• Helps harden tooth enamel and prevent decay	• Tea • Sea fish • Vegetables • Tap water (in the UK)	• Tooth decay	• Discoloration of teeth

Selenium Se

Function	Sources	Deficiency	Excess Side Effects
• Supports the thyroid hormone • Helps the immune system function properly • Acts as an antioxidant • Helps prevent heart disease	• Red meat • Fish • Cereals • Eggs • Brazil nuts	• Depression	• Causes selenosis – loss of hair, skin and nails