What are muscles?

Muscles move the different parts of your body, inside and outside. Muscles are made of fibres. Each fibre is made up of long thin cells which are packed in bundles. The fibres have two kinds of protein, myosin and actin. Each bundle is wrapped in a thin skin called perimysium (say perry-miss-ee-um).

Each muscle has lots of these bundles - the bigger the muscle the more bundles of fibres it has.

Inside the muscles there are nerves which carry messages to and from the brain. There are also blood vessels, which carry the energy that your muscles need and also carry away waste that your muscles have finished with.

If you eat meat you will know what a muscle looks like, because meat is muscles of the animal.

Types of muscles

Muscles move parts of your body around. Many of them are attached to your bones and are called skeletal muscles, because it is their job to move your bones. Some are attached from one part of an organ to another part (such as the muscles in your heart).
Muscles come in four different shapes.

- **Spindle-shaped muscles** - like your biceps and triceps in your upper arms - are thick in the middle and thinner at the ends. You can see the shape when you bend your arm up.

- **Flat muscles** are the muscles like your diaphragm or in your forehead.

- **Triangular muscles** are like the deltoid (say del-toy-d) muscle at the top of your arm. This pulls your arm up when you want to ask the teacher a question.

- **Circular muscles**, sometimes called ring-shaped muscles, are found in many places including around the mouth, around the pupils of the eyes and also inside you where they close off the bladder and the anus when you have finished going to the toilet.

### How muscles move

- Muscles move the body by contracting and relaxing.
  - Contracting means becoming shorter. The muscle fibres slide together and stack up to make a fatter shape, a bit like when you shuffle a pack of cards together.
  - Relaxing means the fibres slide apart and the muscle gets longer and thinner.

- Muscles which move bones act together in pairs. This means that as one muscle contracts, its partner relaxes. Then as the partner muscle contracts the first muscle relaxes again.

- The messages sent by the brain are 'contract' or 'relax'. The brain sends the messages to one muscle.

### Voluntary and involuntary muscles

- **Voluntary** (vol-un-tary) muscles are the ones that you can control. Most of them move your bones around. If you want to run, walk, ride a bike, wave your arms around, or eat your favourite sandwich, it is your voluntary muscles which move your arms, legs and body around. But they can't do that unless your brain sends the right muscles the messages to 'contract' or 'relax'.

- **Involuntary** muscles don't need the brain to send them messages. They know their job and they keep right on doing it. Some examples are:
  - The muscles in your heart, which keep blood pumping round your body.
  - The muscles in your digestive system which move food down to your stomach and keep moving it along your bowel until all the goodness that your body needs is taken out. Then they work to push the waste that is left over out of your body. The topic Your waste disposal system can tell you more about this.
  - The tiny muscles at the bottom of the hairs on your arms which make your hairs stand up when you are cold, or suddenly feel scared.

### Feed your muscles

- Muscles get most of their energy from glucose. Glucose is made from several types of carbohydrates such as sucrose (which is usually called sugar), lactose (from milk) or fructose (from fruits).
> When muscles need to get energy from glucose they do this by changing the glucose into other chemicals such as water and carbon dioxide which releases the energy. We sometimes call this 'burning' the glucose. They use the oxygen being carried in the blood to help them do this.

> The carbon dioxide that is left over from this process is carried away by the red blood cells and sent out through your lungs.

Your muscles get warm when they are burning energy, and that keeps your body warm too.

If you want to keep warm in winter, then exercise, and keep those muscles moving.

**Keep muscles working**

Muscles need to move to keep healthy and strong. Have you heard the saying, "Use it or lose it"? Probably not, as it is usually said to older people who don't exercise enough!

You can help your muscles stay strong and healthy by exercising every day and using different sets of muscles when you exercise.

**What can cause muscles to hurt?**

When you exercise a lot, your muscles get tired from all that contracting and relaxing. Your muscles might hurt then. The next day they can still be sore if you have not exercised them much before.

Have you ever had cramp? This is when your muscles seem to lock up, and you have a pain in your foot or your leg, or a 'stitch' in your side? This happens when one or more of your muscles contracts and will not relax again (called a spasm).

> If you exercise too long, you can get a build up of chemicals like lactic acid in your muscles, and this can cause it to tighten up.

> Sweating and not drinking enough on a hot day may mean that you are more likely to get a muscle cramp. Try drinking water, and stretching and massaging the muscle that hurts and it will get better.

Strains can happen when muscles are stretched too far. Some of the muscle fibres can be torn and there can be bruising inside the muscle. It can take several days for the fibres to heal and the bruising to go away.

**Diseases that can affect muscles**

**Polio** is a virus that attacks the spinal cord. The brain can't send messages to the muscles and they stop working. Not long ago a lot of kids would catch this illness, but nowadays not many people get poliomyelitis, (that's its full name), because kids are given an immunisation against it. Look at our topic on Immunisation if you would like to know more.

**Tetanus** also affects muscles, and kids will have already had 'shots' to stop them getting this too.

There are some other diseases that can affect muscles. Maybe you know someone who has **muscular dystrophy, multiple sclerosis** or cerebral palsy?
What kids say

- "My legs hurt when I am in bed sometimes. Mum says that is growing pains."
- "I hurt my hamstring in my leg when I was running. It hurt for a long time."
- "My muscles feel sore after playing a game of soccer, but they are not as bad after training."
- "I sometimes get cramp in my foot when I am in bed. It hurts and I have to get up and walk round."
- "My brother does weights. He wants to build up his muscles and have a 6 pack."
- "My mum has big muscles in her legs, she plays tennis a lot."

There was a young man called Russell
Who wanted to build up his muscle
He exercised each day
All his fat went away
And he shouted "Hip, hip, hooray!"
By Jessica and friend

Dr Kim says:

To grow strong healthy muscles you don't need to be a weightlifter. In fact lifting weights before you are fully grown can damage your body.

Have a healthy well balanced diet and exercise every day. Eating fruit, vegetables, potatoes, pasta and bread will give you the glucose you need to fuel your muscles.

Because your muscles are made of protein, a healthy diet which has milk products, fish and meat will help your muscles to get the protein they need to build up to be strong and healthy.

You can learn more about muscles by doing an interactive quiz at the following web site
http://www.bbc.co.uk/science/humanbody/body/interactives/3djigsaw_02/index.shtml?muscles