National Genetics Education and Development Centre

Functions of cells

The difference in both structure and function between the different cell types in the human body is largely a result of the different proteins they contain, brought about by different gene expression. Very broadly, these proteins can be classified as:

- **Structural proteins**
  Collagen, elastin and other proteins form the **extracellular matrix** – the mortar that holds cells together in many tissues. Actin and related proteins do the same job inside cells, forming the **cytoskeleton** that gives a cell its shape and structural stability.
- **Directly functional proteins**
  Thousands of specific **enzymes** catalyse the innumerable chemical reactions needed to keep us working – to break down the food we eat and use the products to build the molecules we are made of. Other functional proteins are **transporters**: haemoglobin transports oxygen around the body, proteins located in cell membranes transport molecules into and out of cells. Some proteins are **motor proteins**, causing movements such as muscle contraction.
- **Regulatory proteins**
  Elaborate networks of proteins within a cell control its behaviour and allow it to react to external conditions. Specific proteins within a cell control which parts of the information in the DNA is used in any one cell at any one time – that is, they switch genes on and off. Receptor proteins on the cell membrane receive protein signals from other cells telling them what to do.

The life choices of a cell

During a cell's lifespan, it may carry out the following activities:

- It can **simply get on with its job** (producing enzymes to help digestion, making hormones, transmitting nerve impulses, or whatever its function is).
- It can **divide** to form two cells. An adult human consists of maybe 10 million million cells – and these have all been produced from the original fertilised egg by repeated cell division. Cell division doesn't stop when you are fully grown, it is going on all the time, though at different rates in different tissues, in order to replace dead or worn out cells.
- It can **differentiate** (develop into a more specialised sort of cell). All the different cell types of your body (nerve cells, muscle cells, skin cells and so on) are derived by differentiation of less specialised cells in the embryo. As mentioned above, the different cell types differ because they use different sub-sets of the genetic information contained in the DNA of the nucleus. Differentiation involves switching genes on or off to adapt the cell to form a particular structure or function.
- It can **die**. Cells may die by accident or because they have become too damaged to survive, but cells also have a built-in suicide programme called **apoptosis** or programmed cell death. Apoptosis is a crucial part of development. For example, you wouldn't have five separate fingers unless the cells in the paddle-like hand of an embryo weren't programmed to die to form the gaps between fingers.

The activity that the cell carries out is in response to external signals (hormones, signals from neighbouring cells, etc) and internal genetic programmes.