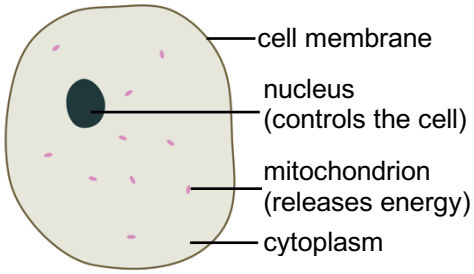
6 Cells & COVID-19

Links:
- *Exploring Science* 7Ad, 7Ae, 8Cb
- *Edexcel 9-1* CB1c, CB8a, CB8b

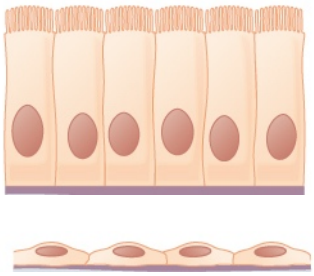
Animal cells

Animals are **multicellular** (made of many **cells**). Animal cells have a **cell membrane** (to control what goes in and out) and **cytoplasm** (a watery jelly where cell activities occur). Structures in the cytoplasm are called **organelles** (e.g. **nucleus**, **mitochondria**).



Specialised cells

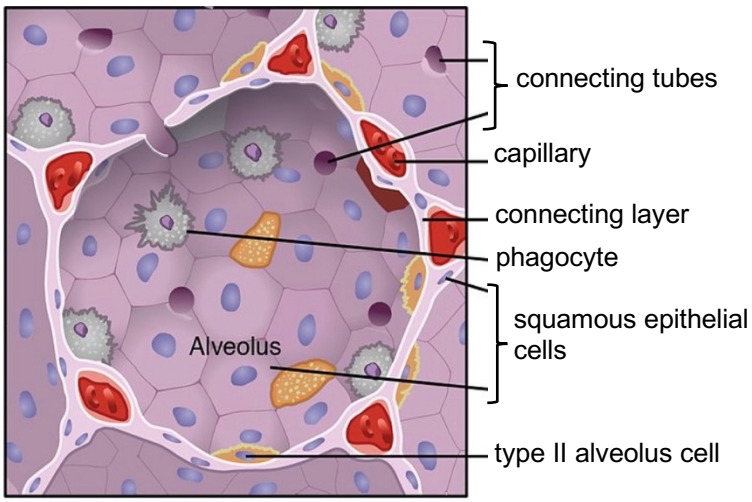
Not all cells in your body are the same. Many have adaptations (features) that help them to do their functions (jobs). There are many specialised cells in the breathing (or gas exchange) system.



Tall **ciliated epithelial cells** line the tubes that take air to the lungs. Their tops have waving strands (**cilia**) to sweep away dust and microorganisms.

Alveoli (air sacs) inside the lungs contain many different cells. Their walls are made of squamous epithelial cells, which are flat so that gases do not have to travel far between the air in an alveolus and blood in a capillary.

Type II cells produce a fluid that coats the inside of an alveolus. There are also **white blood cells** called **phagocytes**. These are very flexible so that they can surround and destroy **microorganisms** (e.g. bacteria, viruses). Phagocytes can signal for back-up from **lymphocytes**, another type of white blood cell. Lymphocytes also help to destroy microorganisms; they release **antibodies** that stick to microorganisms.



A cell membrane has proteins sticking out of it. Different cells have different proteins. The coronavirus also has proteins on its surface. Some of these lock onto the ACE-2 protein on some human cells. Ciliated epithelial cells and type II cells have a lot of ACE-2 in their cell membranes.

Find out

I. 1. Histology is the study of cells, tissues and organs. Cells of the same type form a tissue.
   a. Use www.histology.leeds.ac.uk to find:
      i. the names of the four basic tissue types _____

_____

ii. the names of the basic different types of epithelial *cell*. _____

_____

b. Which epithelial cell type are ciliated epithelial cells? _____

2. Do some research to draw lines that link these cells to their functions and adaptations.

Cell	Function	Adaptation
erythrocyte	absorbs nutrients	packed with haemoglobin (no organelles)
goblet cell	produces mucus	filaments that can shorten the cell
neurone	transports oxygen	microvilli to increase surface area
cardiac muscle	carries signals	many organelles called secretory vesicles
enterocyte	changes shape	long length and many connections

Test yourself

3. Complete this table about the specialised cells on page 1.

Cell	Function	Adaptation
type II cells	make fluid in which oxygen dissolves	many organelles called secretory vesicles

4. Explain which cells on page 1 are most likely to become infected with coronavirus.

_____

_____

Check-up

I. Check your answers.

II. How could you create a model showing the function of ciliated epithelial cells? You could make a stop-motion film with a phone or tablet.

Answers

Note to home educators

The worksheet is designed to support understanding of specialised animal cells. You may wish to share these objectives with students:

- Identify and describe the functions of the nucleus, cell membrane, cytoplasm and mitochondria in animal cells
- Describe how ciliated epithelial cells are adapted to their function.
- Draw conclusions about a cell's function from its adaptations. (GCSE)
- Describe the functions of the different types of blood cells (erythrocytes, phagocytes, lymphocytes). (GCSE)

To access this sheet, students will need a knowledge of lung structure, including the trachea, bronchi and alveoli.

It is suggested that students complete the worksheet independently, making use of the internet to complete questions 1 and 2. Questions 3 and 4 should be completed without help from additional sources.

All questions are accessible by students in Key Stage 3 (Years 7 – 9) but some of the cell adaptations are drawn from the GCSE 9-1 specifications.

If you wish to check the answers, keep this part of the sheet away from the questions!

I. 1. a. i. nerve, muscle, epithelia (epithelium), connective

ii. squamous, cuboidal, columnar, (transitional)

b. columnar

2. erythrocyte – transports oxygen - packed with haemoglobin (no organelles)

goblet cell – produces mucus - many organelles called secretory vesicles

neurone – carries signals - long length and many connections

cardiac muscle - changes shape - filaments that can shorten the cell

enterocyte - absorbs nutrients - microvilli to increase surface area

3.

Cell	Function	Adaptation
type II cells	make fluid in which oxygen dissolves	many organelles called secretory vesicles
ciliated epithelial cells	sweep dust and microorganisms away from lungs	cilia
squamous epithelial cells	allow gases to pass through easily	flat
phagocytes	surround and kill microorganisms	flexible shape
lymphocytes	attack microorganisms	release antibodies

4. Ciliated epithelial cells and type II cells; because these cells have a lot of ACE-2 protein in the cell membranes, which the coronavirus locks on to.

II. Any model of ciliated epithelial cells needs to represent the waving motion of cilia, which sweep away dust and microorganisms (trying to stop them entering the lungs). This could be modelled with pieces of string. (Some students may include goblet cells.)