

OVERVIEW

Aimed at **key stage 4** pupils.

This is a worksheet-based activity to explore why bacteria cause problems for people with cystic fibrosis (CF) and how to reduce infections.

LEARNING OBJECTIVES

- To review the way cystic fibrosis affects the lungs
- To understand the main treatments used for lung infections for CF patients
- To appreciate the role of antibiotics and how resistant bacterial strains can develop

CURRICULUM LINKS

- KS4:** The ways in which organisms function are related to the genes in their cells
- KS4:** Human health is affected by a range of environmental and inherited factors, by the use and misuse of drugs and by medical treatments

Activity

- Introduce the main features of cystic fibrosis
- Show the film Ryan's story on www.genesareus.org
- Give students the worksheets to complete independently

ANSWERS

1. Which parts of the body are affected by CF?

Mainly the lungs and pancreas

2. What is the consistency of mucus from a patient with CF?

Thick and sticky

3. Why do bacteria grow successfully in mucus?

Mucus is sugary and this is a good food source for the bacteria.

4. How can physiotherapy help to fight bacteria?

a) Removes the mucus, which the bacteria live on

5. Which of the following is an antibiotic?

c) penicillin

6. What affect do antibiotics have on viruses?

c) They never kill them or stop them growing

7. What is the name for the evolutionary process enabling some bacteria to develop resistance to antibiotics?

a) Natural selection

8. Why are antibiotics not always effective?

b) Some bacterial cells can resist the effects

9. How would you feel if you had a serious health condition but were not able to meet other teenagers affected by the same thing?

Answers might mention that this would be frustrating and you could feel isolated. Pupils might suggest that you could use webcams and social media to communicate with other teenagers with CF.

10. Name three useful things that bacteria do for you.

Pupils should identify a range of uses, such as:

- Food production, for example cheese and yogurt
- In human gut – help with digestion
- Recycling waste, for example sewage and oil spills
- Biotechnology, for example producing insulin and enzymes used in washing powders






TEACHER'S NOTES

FIGHTING BACTERIA

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FURTHER INFORMATION

-  The CF Trust provides excellent information about the condition www.cftrust.org.
This website includes information about preventing cross-infection www.cftrust.org.uk/aboutcf/livingwithcf/crossinfection.
-  The Society for General Microbiology has an excellent website with resources for schools to explore bacteriology www.microbiologyonline.org.uk
-  The 'Changing Futures' website has been made with teenagers affected by CF and the Nowgen team and it includes video diaries where the teenagers describe their treatments www.changing-futures.co.uk.

FOR MORE RESOURCES, GO TO WWW.JEANSFORGENES.ORG

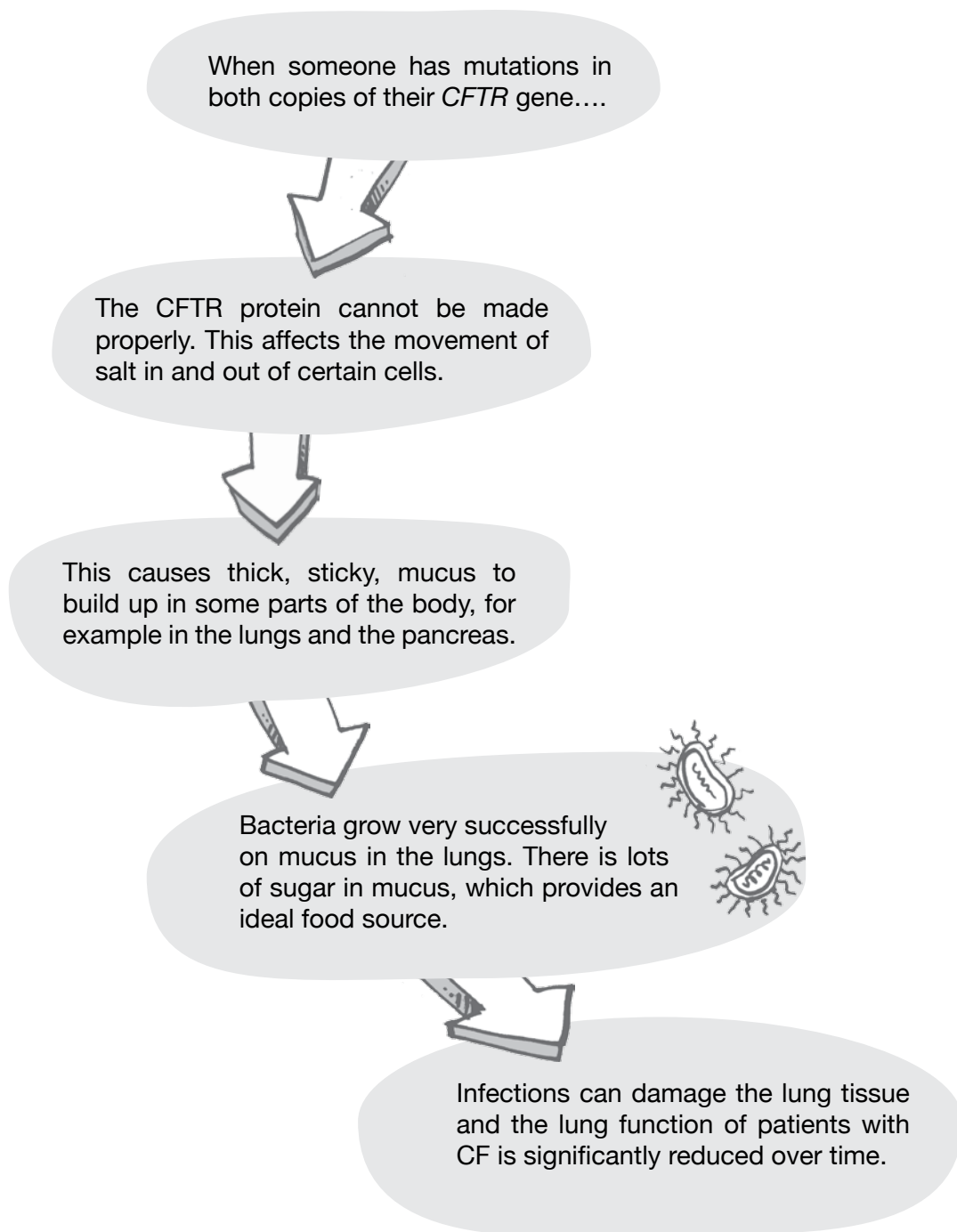
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FIGHTING BACTERIA

Cystic fibrosis (CF) is a genetic condition, so why are we talking about bacteria? Well, the symptoms of CF are mainly caused by bacterial infections, but the condition is caused by underlying changes in someone's DNA. The chart below explains further...



- 1 Which parts of the body are affected by CF?
- 2 What is the consistency of mucus from a patient with CF?
- 3 Why do bacteria grow successfully in mucus?

FIGHTING BACTERIA

Treatments for cystic fibrosis (CF) have improved greatly over the years. If children were born with CF 70 years ago, sadly many of them did not live beyond the age of one. The immune system is excellent at fighting infections, but in CF extra treatments are needed to tackle the extra bacteria effectively. Specialist teams treat people with CF and give them advice about their different symptoms.

Bacteria can grow out of control in the lungs of people with CF. From an early age, people with CF have lung infections and their lungs soon become colonised by bacteria. There are a number of different bacterial species that cause problems in the lungs of people with CF. One species called *Pseudomonas aeruginosa* causes particular problems for patients with CF and it can develop resistance to commonly used antibiotics. Different approaches are used to fight these bacteria and keep the lungs of CF patients working well. The main approaches used are:

1. Antibiotics
2. Methods to clear the thickened mucus in the lungs (for example physiotherapy, exercise and inhaled medicines to loosen or thin the mucus)

- 4** *How can physiotherapy help to fight bacteria?*
- a) *Removes the mucus, which the bacteria live on*
 - b) *Breaks apart the bacterial cells*
 - c) *Strengthens the immune system*

- 5** *Which of the following is an antibiotic?*
- a) *pneumonia*
 - b) *pseudomonas*
 - c) *penicillin*

- 6** *What affect do antibiotics have on viruses?*
- a) *They always kill them or stop them growing*
 - b) *They sometimes kill them or stop them growing*
 - c) *They never kill them or stop them growing*

Antibiotics are substances that can kill bacteria or stop their growth. Many different antibiotics have been developed over the last century and have saved countless lives. Many CF patients are prescribed antibiotics all the time to try to suppress infection. This is continually monitored and tailored to the individual.

Sometimes strains of bacteria can develop resistance to antibiotics. This is possible because bacteria replicate quickly and grow in large numbers. Within a large population of bacteria, sometimes a few bacteria will grow that are not affected by the antibiotic. These bacteria will survive and reproduce and soon large numbers of bacteria will be resistant to the antibiotic.

- 7** *What is the name for the evolutionary process enabling some bacteria to develop resistance to antibiotics?*

- a) *Natural selection*
- b) *Natural variation*
- c) *Natural reproduction*

- 8** *Why are antibiotics not always effective?*
- a) *Some lung cells can resist the effects*
 - b) *Some bacterial cells can resist the effects*
 - c) *Some white blood cells can resist the effects*

In the past children with CF met up quite regularly and helped to support one another. Now, doctors advise people with CF not to meet one another to avoid this risk of cross-infection as people with CF can pass dangerous bacterial strains on to one another.

- 9** *How would you feel if you had a serious health condition but were not able to meet other teenagers affected by the same thing?*

We have focused on how we fight bacteria, as that's so important for people with CF. It is important to remember most bacteria do us no harm and we rely on bacteria in many ways.

- 10** *Name three useful things that bacteria do for you.*

