

### OVERVIEW

Aimed at **key stage 4** pupils.

In this activity, the class will answer comprehension questions on Sickle Cell Anaemia, as explained in the film **Pamela's Story**.

### LEARNING OBJECTIVES

- To learn about the function of haemoglobin
- To understand how to treat some of the symptoms of Sickle Cell Anaemia
- To describe the inheritance of Sickle Cell Anaemia

### 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

### you will NEED

- Student worksheets

### Activity

- This activity can be completed individually or in pairs after watching **Pamela's Story**.

### ANSWERS

#### 1. What symptoms of Sickle Cell Anaemia does Pamela experience?

Pamela experiences unpredictable and intense pain, which can either be very sharp or more chronic and can affect her in the day or night.

#### 2. Why do sickle-shaped red blood cells cause problems?

Sickle-shaped red blood cells can get stuck in small blood vessels, which can lead to blockages of capillaries. This reduces blood flow to particular parts of the body – causing damage and pain.

#### 3. What treatment for Sickle Cell Anaemia does Pamela describe in the film and how does it work?

Pamela receives regular blood transfusions to reduce the amount of sickle-shaped red blood cells and increase the amount of normal red blood cells in her circulation.

#### 4. When Pamela has her blood transfusion, what blood group is she given?

Type O (this is known as the 'universal donor' blood type)

#### 5. What does 'anaemia' mean?

It means that someone has too few red blood cells or not enough haemoglobin in their blood.

#### 6. Why do people with anaemia often feel tired?

When someone has anaemia, less oxygen is delivered to their tissues. This means that less respiration can occur – leaving people feeling tired.

#### 7. Where do haemoglobin molecules pick up oxygen and why do they give it away?

Haemoglobin molecules bind to oxygen as they pass through the capillaries surrounding the alveoli in the lungs. The oxygen is released once they red blood cells have travelled to some respiring cells that require oxygen.

#### 8. Pamela explains that both of her parents have sickle cell trait. This means that her parents have one copy of the allele that causes Sickle Cell Anaemia, but they do not have the condition.

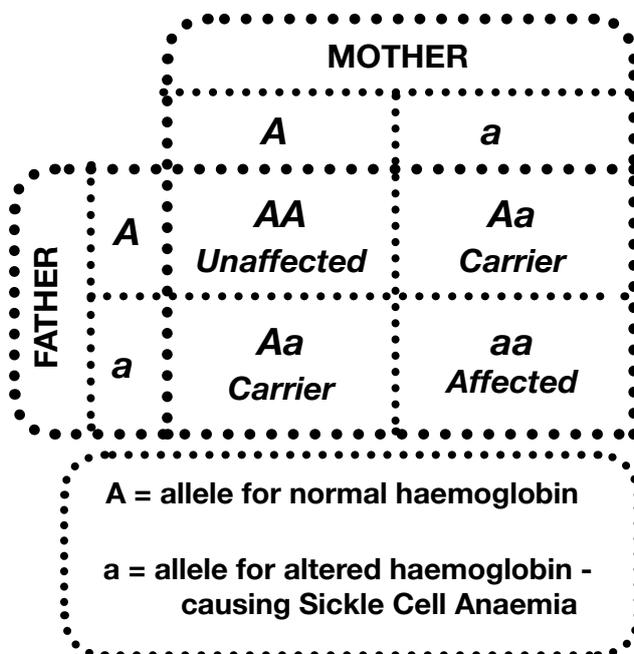
Does this mean that Sickle Cell Anaemia is inherited in a dominant or recessive pattern?

Explain your answer.

Sickle Cell Anaemia is inherited in a recessive pattern. This means that someone needs to inherit two altered copies of the gene that makes haemoglobin in order to be affected.

9. Pamela's parents are thinking about having another child, but are worried about he/she having Sickle Cell Anaemia.

Complete the Punnett Square below to determine the chance of this happening.



Chance of a child having Sickle Cell Anaemia is **1 in 4**

10. Given the result of question 9, how do you think Pamela's parents might feel about having another child?

The risk of having a child who is affected with Sickle Cell Anaemia is fairly high and this is likely to cause considerable concern, as this is such a serious condition.

They might decide that they do not want to take this risk and won't have any further children. They might want to find out about using prenatal diagnosis during the pregnancy to find out if the baby is affected or not. They might reach the conclusion that they will try for a baby and take their chances. Everyone has different experiences and values, so they will reach their own personal choice about what is best for them.

## FURTHER INFORMATION

See Pamela's Story Teacher Factsheet on Sickle Cell Anaemia for basic information. For more detailed information, link to the patient support group:

[www.sicklecellsociety.org](http://www.sicklecellsociety.org)

For more detailed scientific information about Sickle Cell Anaemia, the American website, Your Genes, Your Health provides an excellent summary:

[www.ygyh.org/sickle/cause.htm](http://www.ygyh.org/sickle/cause.htm)

FOR MORE RESOURCES LIKE THESE AND TO SIGN UP FOR JEANS FOR GENES DAY, VISIT US AT [WWW.JEANSFORGENES.ORG](http://WWW.JEANSFORGENES.ORG)

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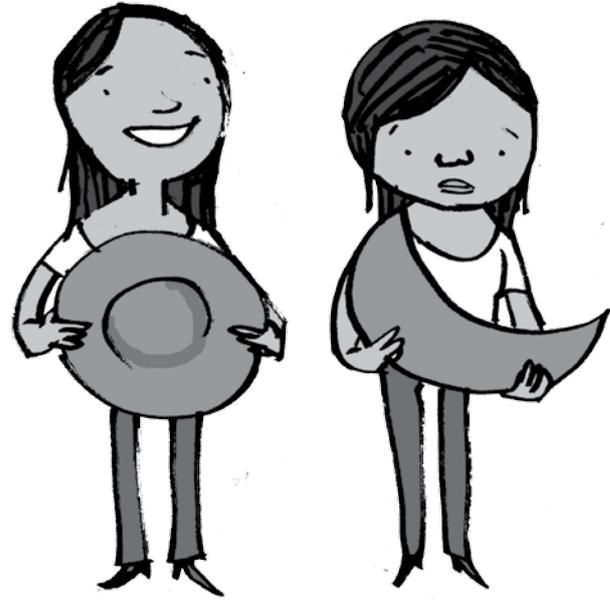
A Centre for Genetics in Healthcare



# SICKLE CELL ANAEMIA

**Sickle Cell Anaemia** is a genetic condition in which there's an abnormality in haemoglobin (the oxygen-carrying protein found in red blood cells). Once abnormal haemoglobin molecules give up their oxygen, some cluster together and form long, rod-like structures. These structures cause red blood cells to become stiff and sickle-shaped.

Sickle-shaped red blood cells can block small blood vessels, such as capillaries, so less blood reaches particular parts of the body. Tissues and organs that do not receive a normal blood flow become damaged, which can lead to severe pain.



- 1 **What symptoms of Sickle Cell Anaemia does Pamela experience?**
- 2 **Why do sickle-shaped red blood cells cause problems?**
- 3 **What treatment for Sickle Cell Anaemia does Pamela describe in the film and how does it work?**
- 4 **When Pamela has her blood transfusion, what blood group is she given?**
- 5 **What does 'anaemia' mean?**
- 6 **Why do people with anaemia often feel tired?**
- 7 **Where do haemoglobin molecules pick up oxygen and why do they give it away?**

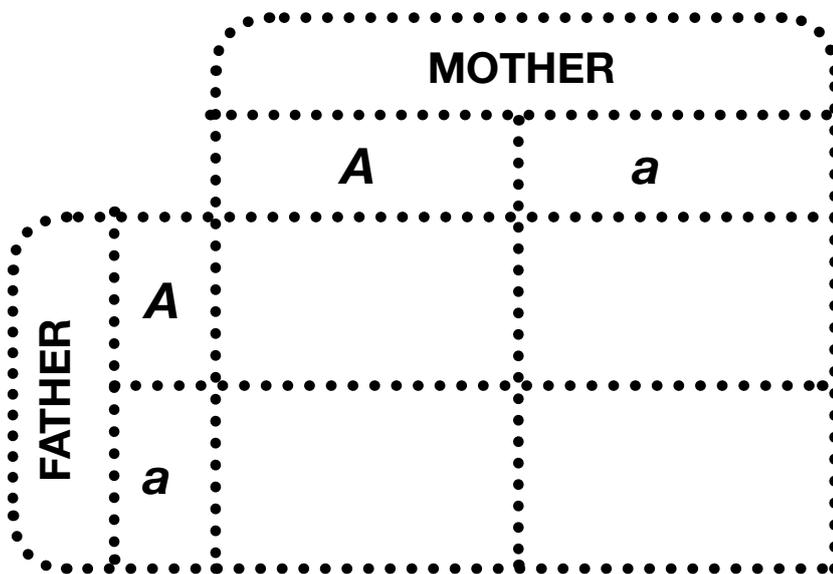
# UNDERSTANDING SICKLE CELL ANAEMIA

**8** Pamela explains that both of her parents have sickle cell trait. This means that her parents have one copy of the allele that causes Sickle Cell Anaemia, but they do not have the condition. Does this mean that Sickle Cell Anaemia is inherited in a dominant or recessive pattern? Explain your answer.

**9** Pamela's parents are thinking about having another child, but are worried about he/she having Sickle Cell Anaemia. Complete the Punnett Square below to determine the chance of this happening.

A = allele for normal haemoglobin  
 a = allele for altered haemoglobin - causing Sickle Cell Anaemia

Chance of a child having Sickle Cell Anaemia is  
 1 in \_\_\_\_



**10** Given the result of question 9, how do you think Pamela's parents might feel about having another child?