SCIENCE FOUNDATIONS

Immunity and disease basics

Difficulty level: Intermediate

Science Foundations

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Overview of the concept

This is how a vaccine trains your body to recognise a germ before you ever catch it, so you fight it off fast instead of getting properly sick. Your immune system remembers past infections the way you remember a face, and reacts faster the second time it sees one. A flu shot each year matters because the virus changes its appearance, so your memory needs an update. Knowing immunity tells you why vaccines work, why some illnesses only strike once, and why a weak immune system leaves you open to infections.



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Rule

Lines of defence: the first line is the skin and mucus barriers that stop germs getting in. The second line is inflammation, the swelling where white blood cells gather, and the white blood cells that fight germs already inside the body.

The third line is specific immunity: antibodies, proteins that target one particular invader, and memory cells that remember it.

Worked examples

EXAMPLE 1

Q **Why does a second infection with the same germ often feel milder?**

SOLUTION

The first infection leaves memory cells behind: white blood cells that remember this germ.

On second contact, the memory cells recognise the germ at once and respond faster and stronger.

The germ is cleared sooner, so the illness feels milder.

The result is memory cells give a faster, stronger response.

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EXAMPLE 2

Q What does a vaccine do?

SOLUTION

A vaccine trains immunity without causing the disease.

It shows the immune system a harmless form or part of the germ, too weak to make you sick.

Memory cells form and stay behind, ready to recognise the real germ at once.

The result is vaccines build memory without the disease.

Practice questions

1 A child who had measles once rarely catches measles again. Why?

- **A** The germs have all died out
- **B** The skin grows thicker
- **C** Memory cells respond faster and stronger
- **D** Antibodies disappear after the first infection

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2 Why is a flu shot given every year?

- **A** The flu virus changes its appearance, so the immune memory needs an update
- **B** The flu virus gets weaker every year
- **C** Memory cells disappear after one year
- **D** The skin barrier wears out every year

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3 A tetanus vaccine is given after a deep cut. What does it do?

- **A** It kills the germs in the cut
- **B** It trains memory without causing the disease
- **C** It gives you tetanus mildly
- **D** It replaces white blood cells

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4 Why does a tetanus vaccine protect you without giving you tetanus?

- **A** It contains live germs that cause a mild case
- **B** It stops all germs entering the body
- **C** It makes the skin thicker
- **D** It shows the immune system a harmless form of the germ, and memory cells form

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5 First line of defence?

- **A** Skin and mucus barriers
- **B** Inflammation and white blood cells
- **C** Specific immunity
- **D** Memory cells

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6

Second line of defence?

A Skin and mucus barriers

B Antibodies only

C Inflammation and white blood cells

D Vaccines

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7

Third line of defence?

A Skin and mucus barriers

B Inflammation and white blood cells

C Specific immunity

D Memory cells

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8 What are antibodies?

A Cells that remember past invaders

B Proteins that target invaders

C Germs that cause disease

D Barriers on the skin

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9 What are memory cells?

A Proteins that target invaders

B Cells that make mucus

C White blood cells that cause inflammation

D Cells remembering past invaders

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10

Does a vaccine cause the disease it protects against?

A Yes

B No

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ANSWER KEY

1. Memory cells respond faster and stronger
2. The flu virus changes its appearance, so the immune memory needs an update
3. It trains memory without causing the disease
4. It shows the immune system a harmless form of the germ, and memory cells form
5. Skin and mucus barriers
6. Inflammation and white blood cells
7. Specific immunity
8. Proteins that target invaders
9. Cells remembering past invaders
10. No

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