SCIENCE · BIOLOGY AGES 11–16

How Vaccines Work

A harmless preview of a germ trains your immune system to beat the real thing.

Vaccine is given

A jab or drops deliver a harmless antigen: a weakened or killed germ, a piece of it, or instructions to make one.

Antigen is spotted

Cells such as macrophages and dendritic cells swallow the antigen and show pieces of it to T cells.

Antibodies are made

Helper T cells switch on matching B cells, which multiply and release antibodies that fit that antigen.

Memory cells are kept

Some B and T cells become long-lived memory cells that remember the antigen's shape.

Is protection strong enough?

If not, more doses are given weeks or months apart, or boosters later, to build lasting memory.

The real germ arrives

Memory cells recognise it at once and trigger a faster, much bigger antibody response.

Illness is prevented

The germ is usually cleared before it can make you seriously ill.

India beat polio

Pulse Polio drives took drops to every child. India's last case was on 13 January 2011, and WHO certified it polio-free on 27 March 2014.

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