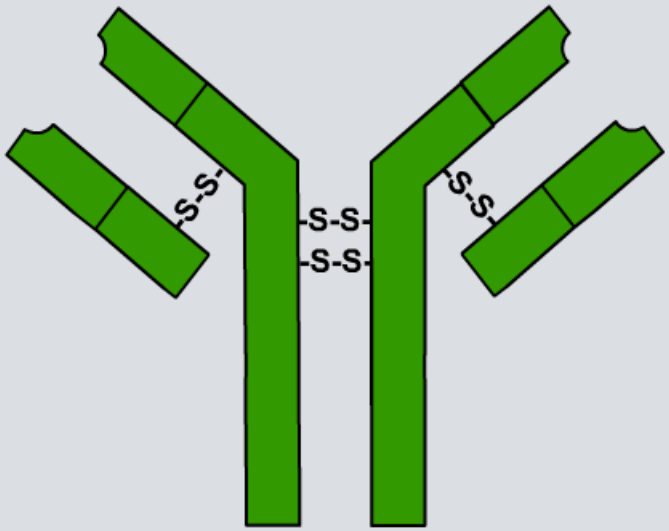
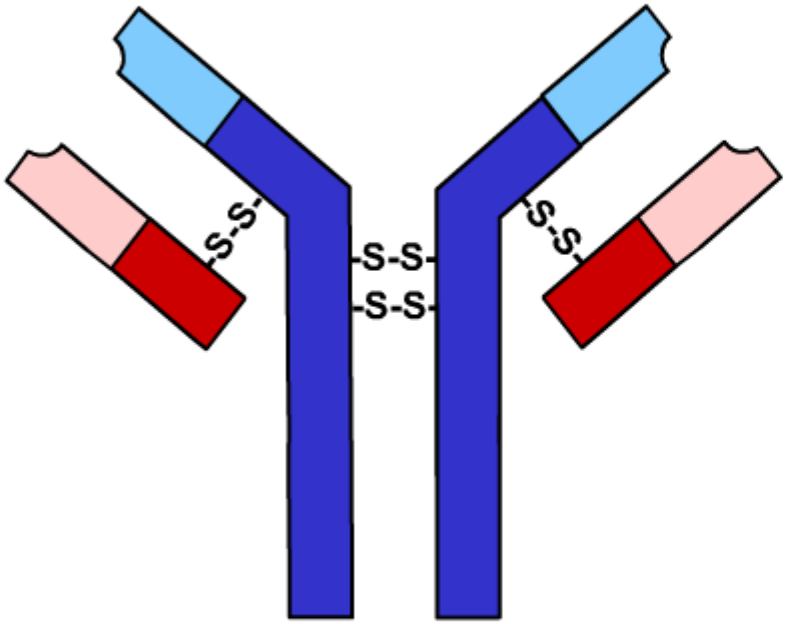
Antibodies and Vaccination



Antibody structure

What is the structure of an antibody molecule?

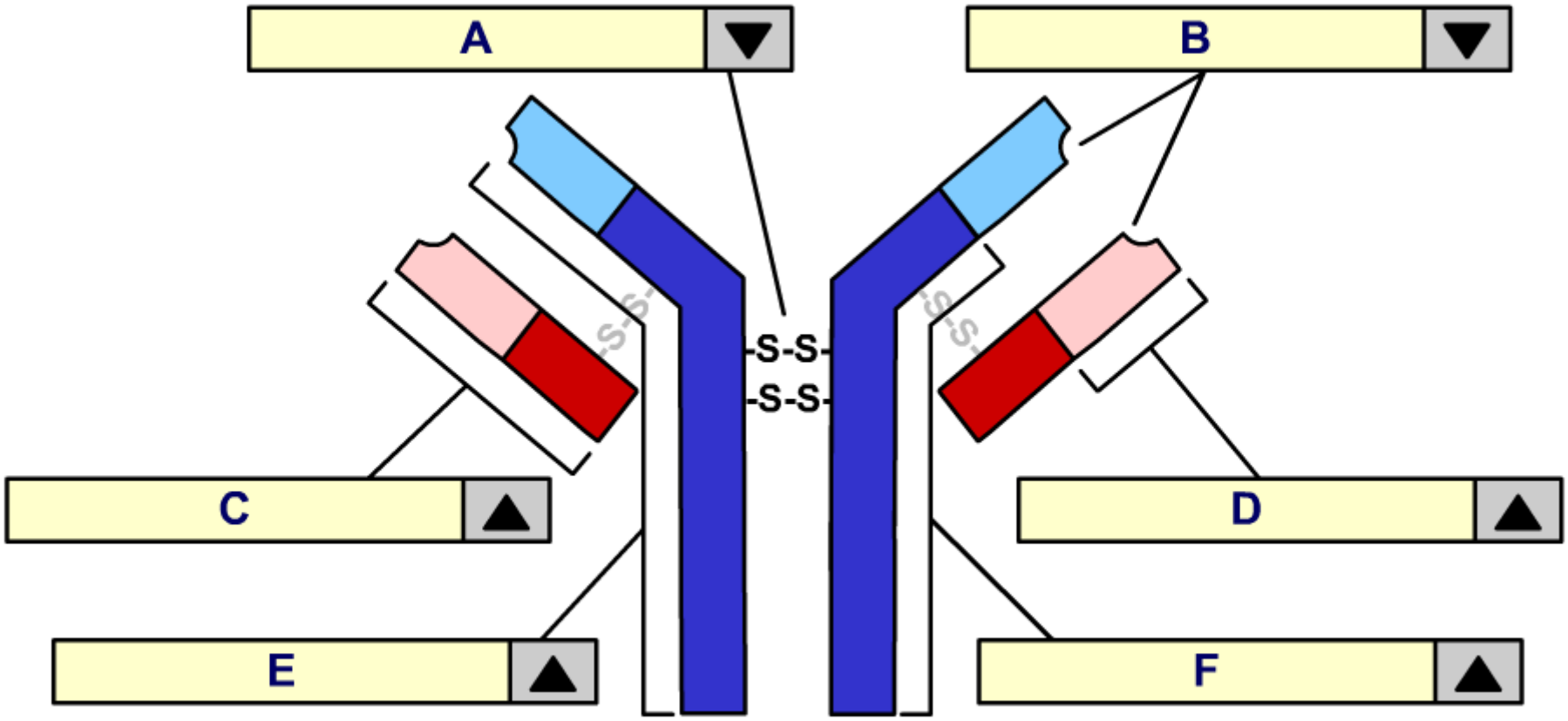
Click on a button for more information about the structure of an antibody molecule.



- antigen-binding site
- disulfide bonds
- polypeptide chains
- constant regions
- variable regions

Antibody structure

What is the structure of an antibody?



What are monoclonal antibodies?

Polyclonal antibodies are naturally produced in an immune response. Different plasma cells secrete antibodies, resulting in a variety of different antibodies against a specific antigen.

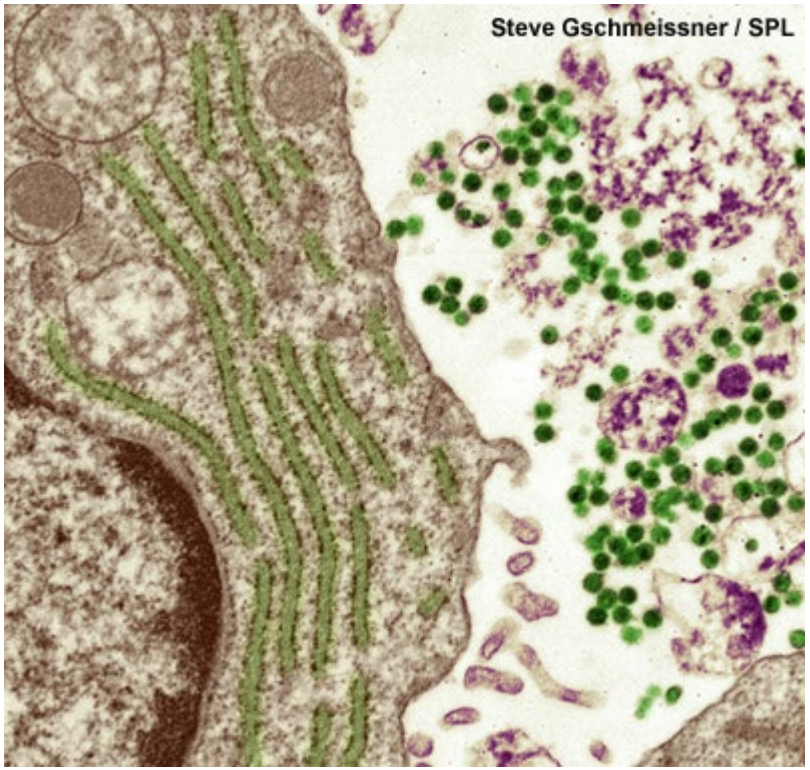
Monoclonal antibodies (**mAbs**) are antibodies produced from clones of a single plasma cell and are therefore all identical. They have many important uses, such as:

- the treatment of cancer and other diseases
- drug screening
- home pregnancy kits
- scientific research.

Production of monoclonal antibodies

Large quantities of mAbs can be produced using mice or rabbits.

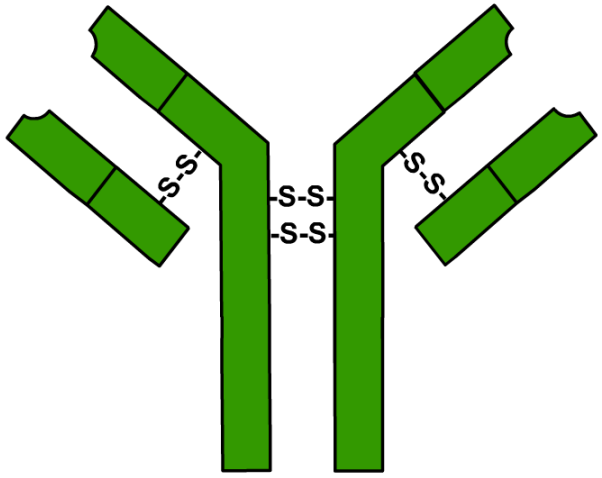
A specific antigen is injected into the animal, stimulating the production of plasma cells.



The plasma cells are removed from the animal and fused with cancerous **myeloma cells** from normal mice. These form immortal **hybridoma cells**, which can produce a single type of antibody indefinitely.

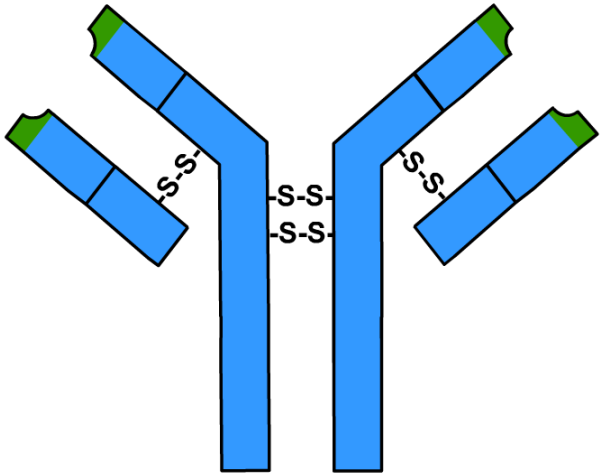
Production of monoclonal antibodies

The problem with using mouse-derived (**murine**) mAbs in humans is that they may be recognized as foreign. This will trigger an immune response, which quickly inactivates the mAbs.



murine

The immune response can be minimized by using genetic engineering to create **humanized mAbs**. These consist of mainly human polypeptide chains, with only the amino acids at the antigen-binding site derived from mice.



humanized

Artificial immunity

How is immunity acquired?

immunity

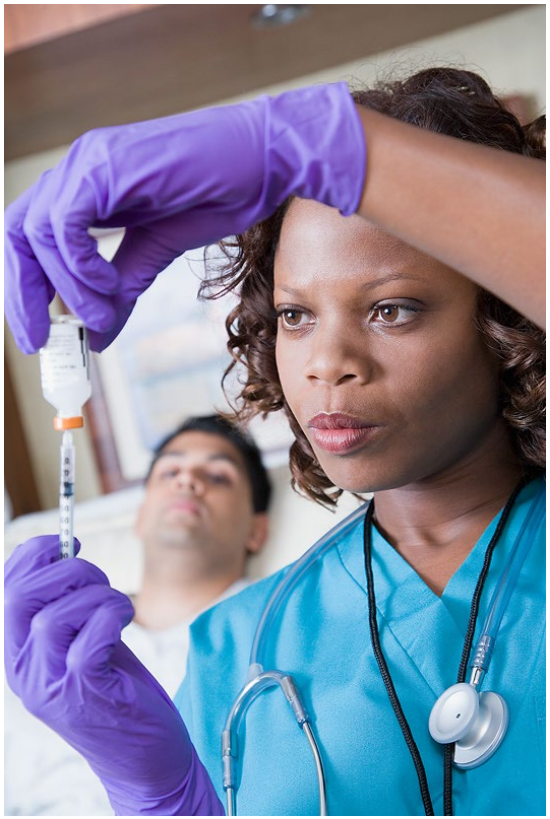
show

What is vaccination?

Vaccines stimulate the production of antibodies and memory cells against the target pathogen without causing illness.

Why don't vaccines cause illness?

- They may contain an inactivated form of the pathogen, killed by heat treatment (which leaves the immune-stimulating antigens intact).
- They may contain an **attenuated** (less virulent) form of the pathogen.
- They may contain isolated antigens, such as cell surface proteins, from the pathogen.



Influenza vaccines

New strains of the influenza virus are constantly emerging. This is because antigens displayed on the virus change due to mutation. This causes **antigenic variation**.

Antigenic variation makes it hard to immunize a patient against the influenza virus for life with just a single vaccine.

The government works with other organizations to identify current strains of influenza. An effective vaccine is developed each year.

Vaccination

What are the missing words about vaccines?

1. Vaccination is an example of A ▼ B ▼ immunity.

2. Vaccines contain a small number of attenuated or C ▼ micro-organisms, or isolated D ▼.

3. Vaccines E ▼ the production of antibodies and memory cells without causing illness.