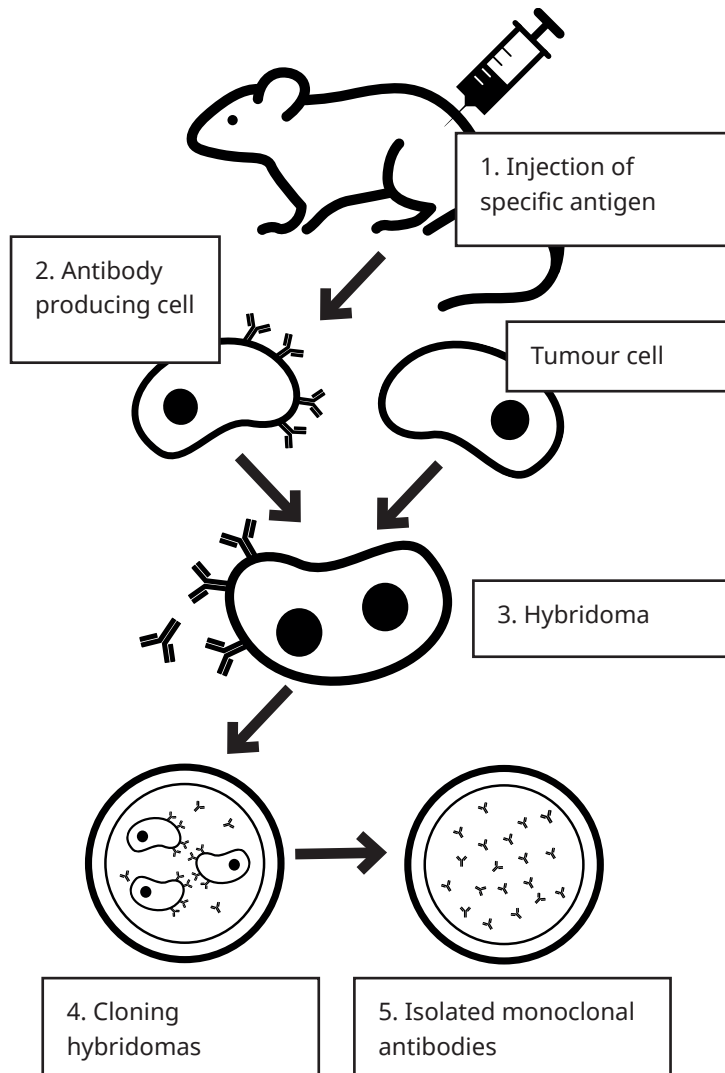




A monoclonal antibody is produced from **cloned** hybridomas which makes them identical.



1. The antigen that will stimulate the specific antibody production is injected into a mouse.
2. The mouse's immune system (B-lymphocytes) begins to produce antibodies specific to the antigen.
3. One of these antibody producing B-lymphocytes is fused with a tumour cell forming a hybridoma.
4. The hybridoma divides repeatedly producing many clones which all produce the same antibodies (monoclonal antibodies)
5. These Monoclonal antibodies (MAb) can then be isolated and used for many things.



Biology

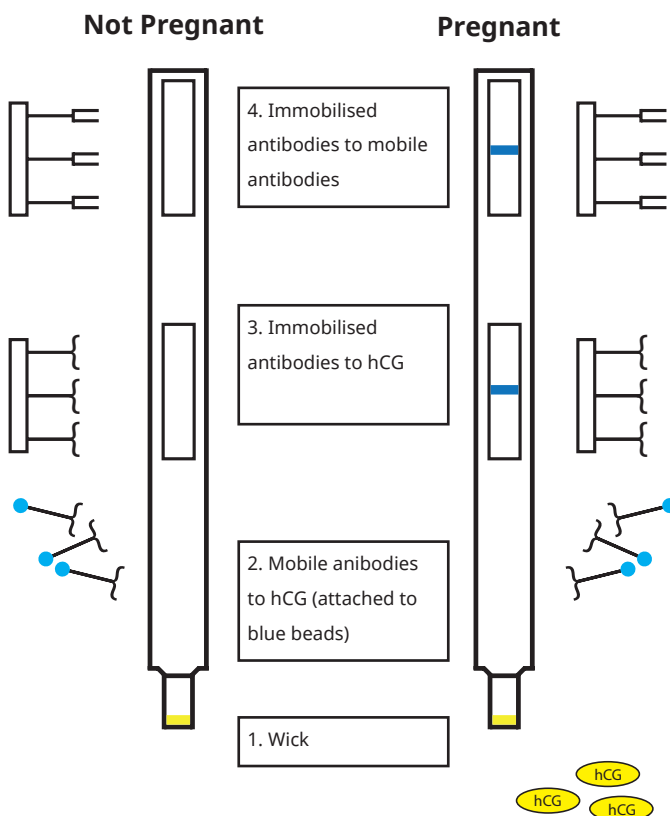
Immunoassays

The name immunoassay comes from “immune” the specific response against antigens and “assay” a test.

An immunoassay uses monoclonal antibodies to detect specific antigens. The monoclonal antibodies could be labelled so that if it binds to its specific antigen this can be detected.

Labelling could be radioactive and detected later in further tests or fluorescent molecules which are visible under a microscope.

Pregnancy tests are simple immunoassays:



1. Monoclonal antibodies are created which will bind to a specific antigen/hormone (HCG) only made during pregnancy.
2. Some are fixed in a line under the window on the pregnancy test others are labelled with a blue dye.
3. As the urine containing the pregnancy hormone seeps along an absorbent strip it attaches to the labelled monoclonal antibodies and they both move to the line of antibodies under the viewing window.
4. As more and more labelled hormone/antibody complexes attach to the line of monoclonal antibodies a blue line develops signalling pregnancy.

Immunoassays can also be used to diagnose disease by detecting antigens for *Chlamydia trachomatis*, HIV and *Plasmodium sp.* (malaria) the extent of the infection can be determined by the extent of the labelling detected.



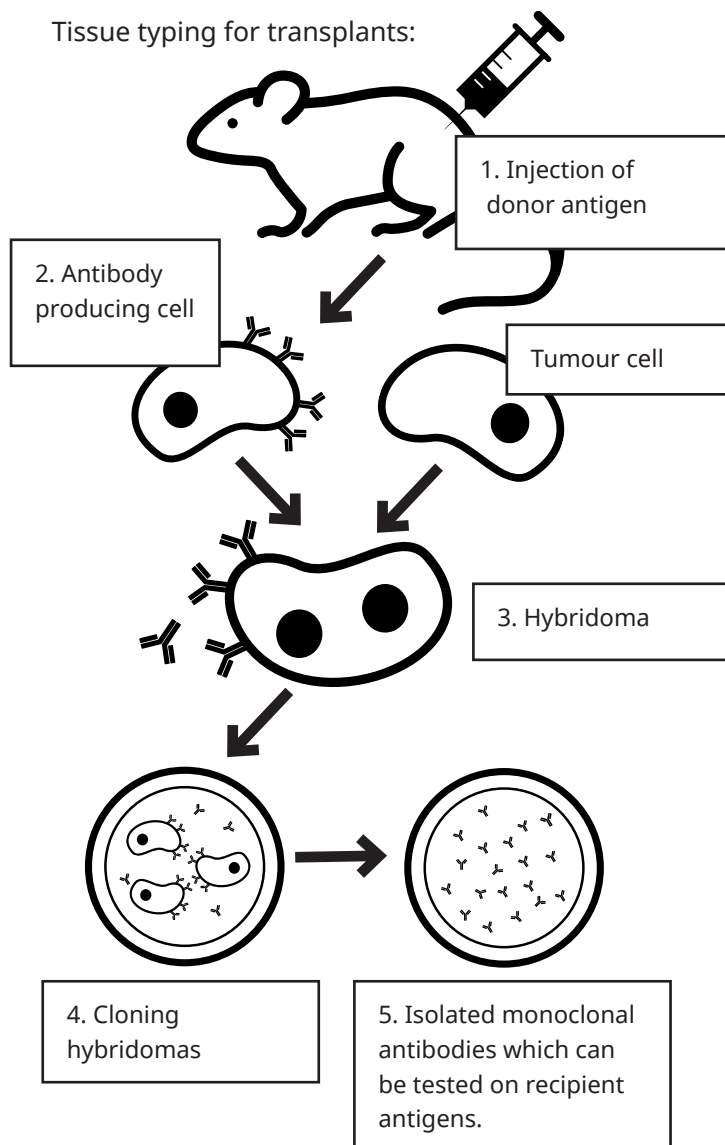
Biology

Tissue Typing

If a person requires an organ transplant they must wait until a suitable match is found. By this we mean their tissue type matches the donor organ.

A tissue type is used to determine the extent to which the immune system of the recipient of a donor organ will react against the donor organ antigens. A poor match could result in the rejection of a donor organ.

Tissue typing for transplants:



1. The donor organ antigens can be isolated from the donor and injected into a mouse.
2. The mouse B-lymphocytes will produce antibodies against the donor organ antigen.
3. The B-lymphocytes are extracted and fused with a tumour cell to produce a hybridoma.
4. The hybridoma divides continuously to produce many cells producing monoclonal antibodies.
5. These can then be cross matched with the recipients' antigens. The degree of binding will be a measure of their compatibility for transplantation.

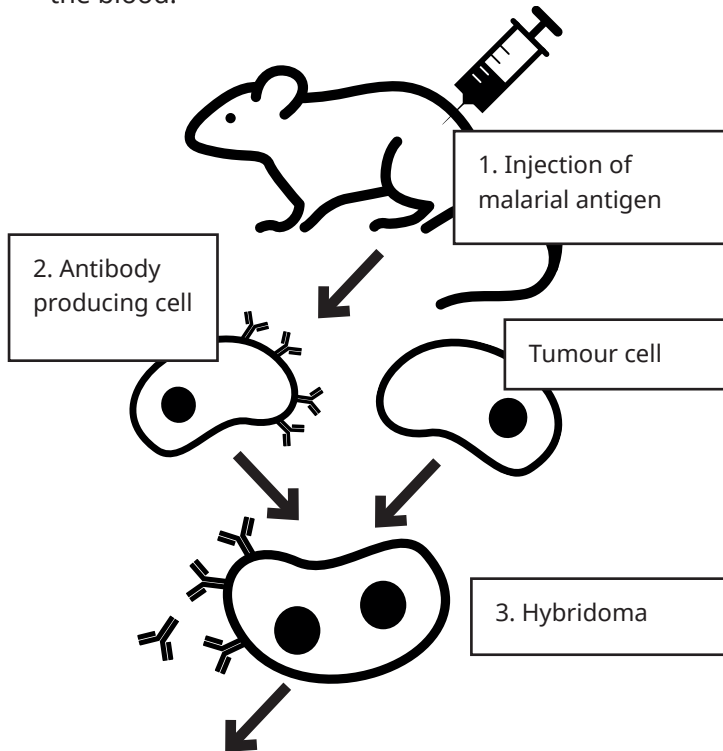
Monoclonal antibodies have been developed which can prevent rejection. They combine with inactivate Helper T cells without which the B lymphocytes that produce antibodies against the transplanted organ won't work.



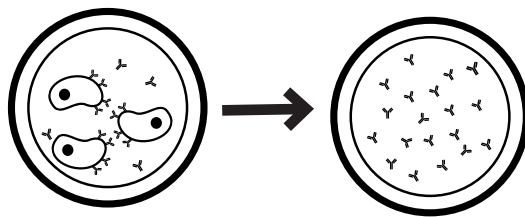
Biology

Monitoring Malaria

An immunoassay can be used to detect the presence of malarial antigens (*P. vivax*, *P. falciparum*) in the blood.



1. *P. vivax* or *P. falciparum* are the parasites which cause malaria. They are injected into a mouse.
2. The mouse B-lymphocytes will produce antibodies against the antigens on the malarial parasites.
3. The B-lymphocytes are extracted and fused with a tumour cell to produce a hybridoma.
4. The hybridoma divides continuously to produce many cells producing monoclonal antibodies which bind to malarial antigens.



4. Cloning hybridomas

Isolated monoclonal antibodies which can be labelled and so detect malaria antigens in the blood.

Blood samples are taken from many people and their blood is tested with monoclonal antibodies.

The labelled antibodies will detect living or dead *Plasmodium* in the blood stream. This can show the effectiveness of antimalarial drugs.

Eg. If a person's blood contains the *Plasmodium* antigen but the person is not suffering the symptoms of malaria then the drugs work.

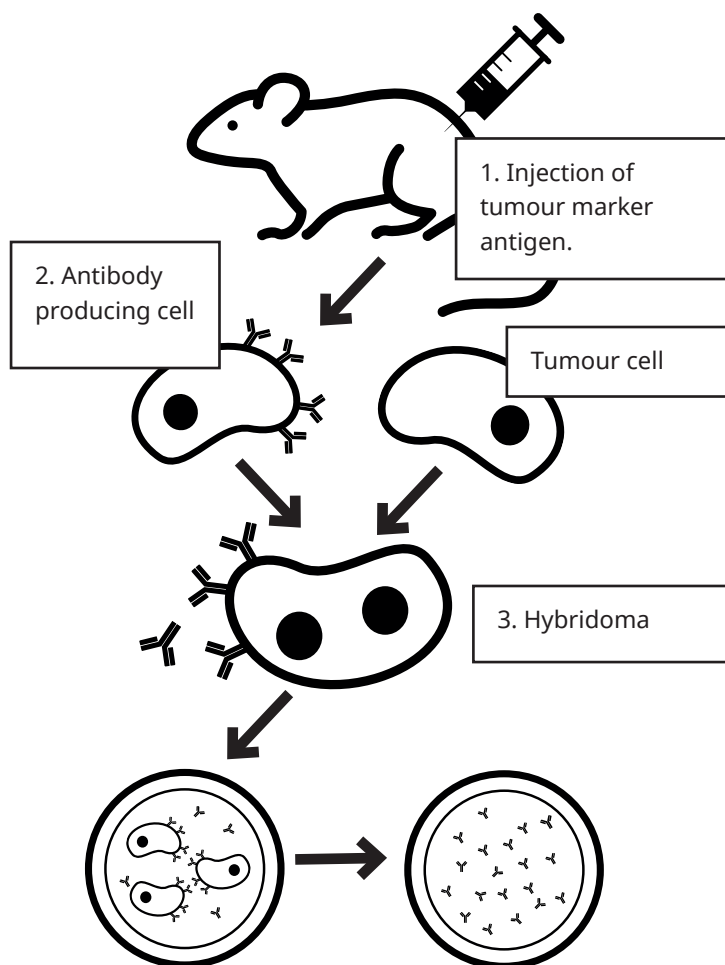


Biology

Chemotherapy for Cancer

A monoclonal antibody can be made which is specific to some types of antigen on cancer cells called tumour markers.

Anti-cancer drugs can be attached to these monoclonal antibodies and they will then deliver the drugs directly to the cancer cells.



1. The specific tumour marker can be isolated from the tumour cell and injected into a mouse.
2. The mouse B-lymphocytes will produce antibodies against the tumour marker antigen.
3. The B-lymphocytes are extracted and fused with a tumour cell to produce a hybridoma.
4. The hybridoma divides continuously to produce many cells producing monoclonal antibodies.