

Polyclonal and Monoclonal Antibody

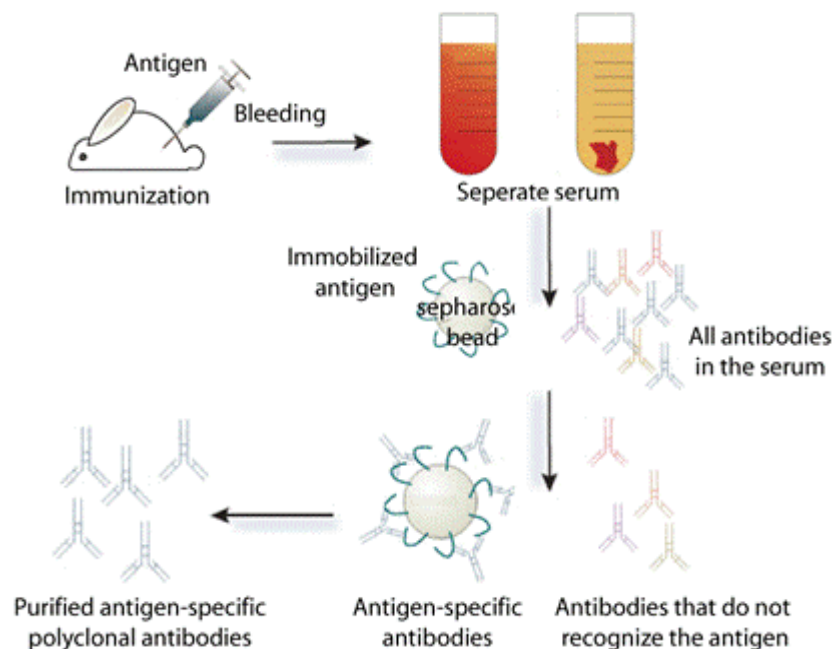
What Is the Difference Between Polyclonal and Monoclonal Antibodies?

Antibodies, also known as immunoglobulins, are secreted by B cells (plasma cells) to kill antigens like bacteria and viruses. Structure of an antibody is a Y-shaped molecule composed of four polypeptides, 2 heavy chains and 2 light chains. Each end of the "Y" is called a paratope that is specific for one particular epitope on an antigen. Specific binding occurs between these regions. These antibodies can be classified into two primary types (monoclonal and polyclonal) by the means in which they are created from lymphocytes.

Polyclonal Antibodies vs. Monoclonal Antibodies: Production.

Polyclonal antibodies (pAbs) are mixture of heterogeneous which are usually produced by different B cell clones in the body. This means that the polyclonal antibodies have polyvalent affinity and recognize many epitopes of an antigen.

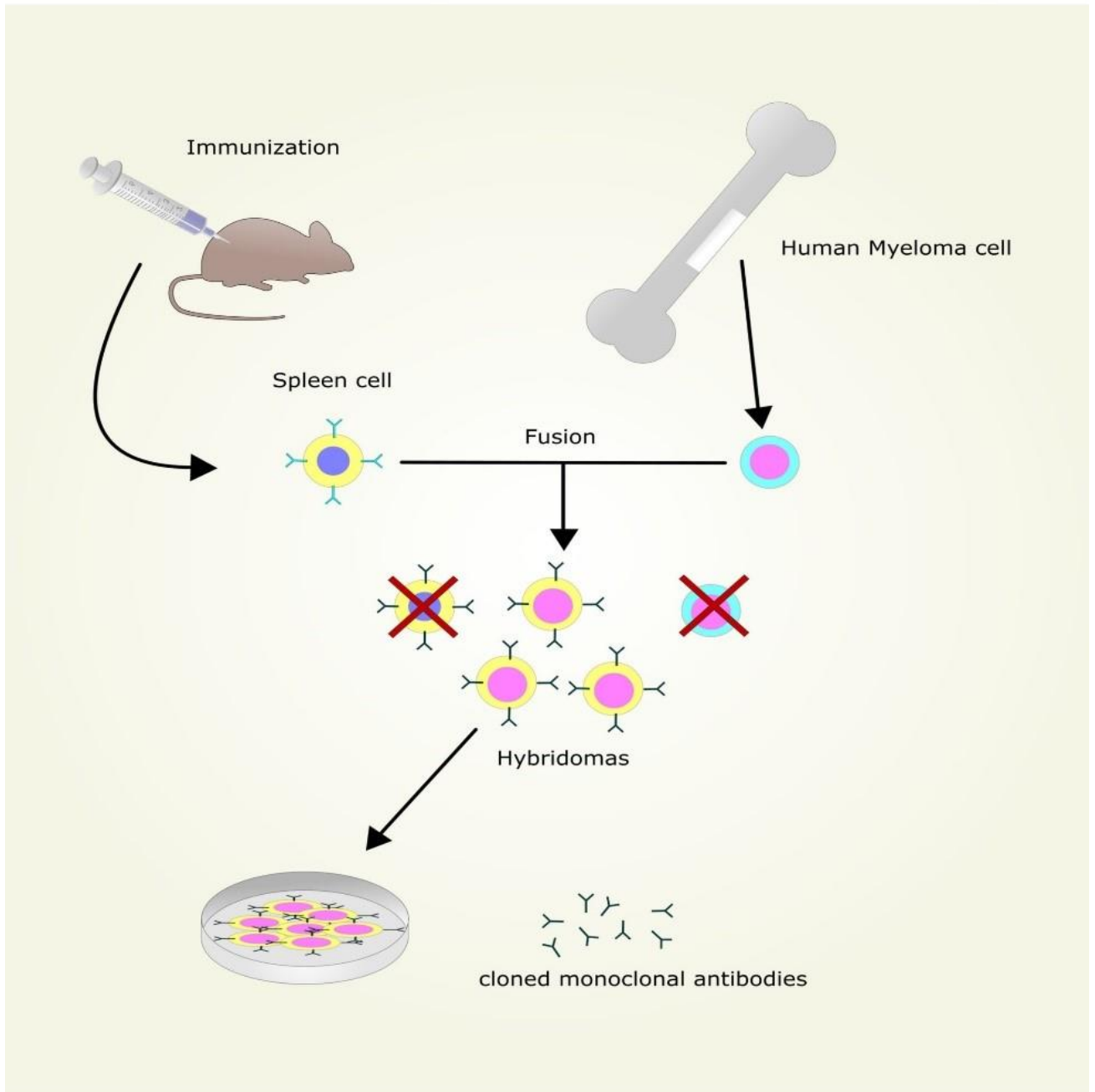
Polyclonal antibodies are produced by injecting an immunogen into an animal. After being injected with a specific antigen to elicit a primary immune response, the animal is given further immunization to produce higher titers of antibodies against the particular antigen. Thereafter, polyclonal antibodies are obtained straight from the serum of blood after purification procedure to remove other blood proteins.



Monoclonal antibodies (mAbs) are generated by identical B cells which are clones from a single parent cell. This means that the monoclonal antibodies have monovalent affinity and only recognize the same epitope of an antigen.

pAbs are produced in live animals, whereas mAbs are produced *ex vivo* using tissue-culture techniques. The process begins with an injection of the desired antigen into an animal, often a

mouse, multiple times. Once the animal develops an immune response, the B-lymphocytes are isolated from the animal's spleen and fused with a myeloma cell line, creating immortalized B cell-myeloma hybridomas. The hybridomas, which are able to grow continuously in culture while producing antibodies, are then screened for desired mAb.



Advantages of Polyclonal Antibodies

- Short production time and low cost.
- Highly stable and tolerant of pH or buffer changes.

- High affinity. Since the antibodies bind to more than one epitope, they can help amplify the signal from target protein even with low expression level. This makes these antibodies ideal for immunoprecipitation and chromatin immunoprecipitation.
- Tolerant of minor changes of antigen. Polyclonal antibodies are less sensitive to antigen changes (slight denaturation, polymorphism, heterogeneity of glycosylation) than monoclonal antibodies.

Disadvantages of Polyclonal Antibodies

- Prone to batch to batch variability.
- Multiple epitopes make it important to check immunogen sequence for any cross-reactivity.

Advantages of Monoclonal Antibodies

- Highly specific recognition of only one epitope of an antigen
- Immortal hybridoma cell lines have the ability to produce unlimited quantities of antibodies
- High consistency among experiments
- Minimal background noise and cross-reactivity
- Excellent for affinity purification

Disadvantages of Monoclonal Antibodies

- Developing a monoclonal takes time and requires high technical skills.
- They can produce large amounts of specific antibodies but may be too specific to detect in across a range of species.
- Vulnerable to the change of epitope. Even a slight change in conformation may lead to dramatically reduced binding capacity.

