

Monoclonal and Polyclonal Antibodies

First studied as early as 1895, antibodies comprise an integral element of the human immune response to infection. Advances in the field of immunochemistry by such pioneers as Arrhenius, Pauling, and Karl Landsteiner have provided a working model of antibody-antigen binding, while the development of X-ray crystallography has revealed the fine structural variation between the five classes of antibodies, or immunoglobulins. In the last forty years, scientists have been able to harness this knowledge to develop an array of biological assays that have since become essential in the modern molecular biology laboratory.

Polyclonal antibodies bind to multiple epitopes of a given antigen and are produced by (1) immunizing a mammal – often a goat or rabbit – with an antigen, (2) bleeding the animal periodically, and (3) extracting the antibodies directly from the serum.¹ The process is relatively inexpensive, and large quantities of an antibody can be isolated from a single extraction.

As their name implies, monoclonal antibodies are derived from a single ('mono-') clone of antibody-producing B cells. After immunizing a mammal, the animal's spleen (location of B cell production) is extracted, and the B cells are *fused* to immortal myeloma cells; the fused B cells and myeloma cells – or hybridomas – are screened via ELISA, and the selected hybridoma line is injected into a second mammal. The myeloma component of the hybridoma induces localized tumor growth in the animal, and an antibody-rich fluid called *ascites* can be extracted from the tumor; the antibodies are then isolated themselves through column chromatography.² A powerful feature of monoclonal antibodies is that the immortal nature of the hybridoma allows for its continual reculturing, thus providing a constant source of monoclonal antibodies.

Diagram showing the method of production for monoclonal antibodies³:

Figure removed. Please see <http://ntri.tamuk.edu/monoclonal/mabcartoon.gif>.

Endnotes:

¹ Garvey, J. S.; Cremer, N. E.; Sussdorf, D. H. *Methods in Immunology*; W. A. Benjamin, Inc.: Reading, Massachusetts, 1977.

² Kohler, G.; Milstein, C. *Nature* **1975**, *256*, 495-497.

³ Natural Toxins Research Center at Texas A&M University - Kingsville.
<<http://ntri.tamuk.edu/monoclonal/mabcartoon.gif>> Accessed November 3, 2004.