

LECTURE: 25

Title **MONOCLONAL ANTIBODIES**

LEARNING OBJECTIVES:

The student should be able to:

- Define the term "monoclonal".
- Define the term "monoclonal antibody".
- Define the term "clone".
- Define the term "Hybridoma".
- Define the term "single specificity".
- Compare between the monoclonal antibody and any normal antibody, in regarding to the producing cell, specificity, and life span.
- Explain the function of the enzyme hypoxanthine phosphoribosyl transferase (HRPT).
- Determine the main function of the hypoxanthine, aminopterin, and thymidine (HAT).
- Explain the technique used in the production of the monoclonal antibodies.
- Explain the usage of the monoclonal antibodies in serology, research studies, and clinical applications.

LECTURE REFERENCE:

1. TEXTBOOK: MARY LOUISE TURGEON. IMMUNOLOGY & SEROLOGY. IN LABORATORY MEDICINE. 2ND EDITION. Chapter 2. pg 29-31.

2. TEXTBOOK: ABUL K. ABBAS. ANDREW H. LIGHTMAN. CELLULAR AND MOLECULAR IMMUNOLOGY. 5TH EDITION. pg 45, 47, 383, 494, 408-409, 409t.

3. TEXTBOOK: CATHERINE SHEEHAN. CLINICAL IMMUNOLOGY PRINCIPLES AND LABORATORY DIAGNOSIS. 2nd edition. Pg 86, 179, 180, 347.

MONOCLONAL ANTIBODIES

I. INTRODUCTION

A. Physiology

Immunoglobulins, or **antibodies**, are glycoproteins present in the gamma globulin fraction of serum.

B. Immunology

Immunoglobulins are produced by **B lymphocytes (B cells)** or **plasma cells** in response to exposure to an antigen. They react specifically with that antigen in vivo or in vitro and are hence a part of the **adaptive immune response**—specifically, **humoral immunity**.

MONOCLONAL ANTIBODIES

Monoclonal antibodies are homogenous populations of antibody molecules, derived from a single antibody producing-cell, in which all antibodies are identical and of the same precise specificity for a given epitope. The biotechnology for the production of **hybridomas**, developed by Kohler and Milstein in 1970s, by **fusing** antibody-producing lymphocytes (normal cells) which have an enzyme deficient in the malignant (immortal) cell **hypoxanthine phosphoribosyl transferase (HPRT)** with the malignant cell (poor producers of antibody), the fusion if accomplished by the use of the **polyethylene glycol (PEG)** or by inactivated **Sendai virus**. The nuclei of the hybrids also fuse, and the Hybridoma cells then possess both the capacity to manufacture immunoglobulins and the ability to survive in culture in select medium. Hybrids then separated from the malignant cells which do not survive. These hybrid cells synthesizing specific antibody are selected by some test for antigen reactivity and then **cloned** from single cells and propagated in tissue culture, each clone synthesizing antibodies of a **single specificity**. These produced monoclonal antibodies are used in numerous procedures, ranging from specific diagnostic tests to the usage in the immunotherapy of cancer, where various drugs or toxins are conjugated to monoclonal antibodies, which in turn deliver these substances into the tumor cells against which the antibodies are specifically directed.

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