

Immunology

KATB 205
1428 – 1429

Textbook:

Immunology
FIFTH EDITION

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اللهم طهر قلبي من النفاق وعلمي من الرياء ولساني من الكذب وعيني من الغش فأنت تعلم خائنة الالعين وما تخفي الصرور
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ومن الكتاب المقرر

عسا ان ينفعني واياكم

اذكرونا بالخير ولا تحرمونا من دعاءكم

DR.NOOP

Introduction to Immunology and classification of Immunity

Chapter – 1

What is immunology?

■ Immune (Latin- “immunus”) = To be free, exempt

» People survived ravages of epidemic diseases when faced with the same disease again

» **Immunity:** *The state of protection from infectious disease*

■ The study of mechanisms that humans and other animals use to defend their bodies from invading organisms such as , Bacteria, Viruses, Fungi, Parasites, and Toxins.

Immunology definitions :

Antigen (Ag): any substance (usually foreign) that binds specifically to a component of adaptive immunity (*an antibodies or a T cell receptor*).

Immunogen: any substance capable of eliciting an immune response. All immunogens are antigen, but some antigens are not immunogens.

Antibody (Ab): Secreted immunoglobulin from plasma cell

Immunoglobulin (Ig): an antibody or a heavy or light polypeptide chain that is a part of an antibody molecule.

Vaccination: deliberate induction of protective immunity to a pathogen

Immunization: the ability to resist infection

Allergen: noninfectious antigens that induce hypersensitivity reactions, most commonly IgE-mediated type I reactions.

Adaptive Immunity: host defenses that are mediated by T & B cells following exposure to Ag.

Innate immunity: nonspecific host defenses that exist prior to exposure to Ag.

Epitope (antigenic determinant): the portion of Ag that is recognized and bound by an Ab or T cell receptor.

Pathogen: a disease causing organism

If you are confused about any immunological terminology refer to the Glossary at the end of your textbook

Where & what are antigens?

- » Microorganisms & their related products (proteins, polysaccharides, lipids) ,or may be
- » Environmental substances , or
- » Drugs
- » found in Organs, tissues, and cells

Types of Immunity :

► *Innate (nonspecific) Immunity*

- » Host defense mechanisms that act from the start of an infection but do not adapt to a particular pathogen
- » Recognize “patterns” of amino acid, saccharides, etc.

- innate immunity provide the first line of defense
- is a set of disease resistance mechanisms
- non specific to a particular pathogen
- macrophages , play an important role in many aspects of the innate immunity.

► *Adaptive (specific) Immunity*

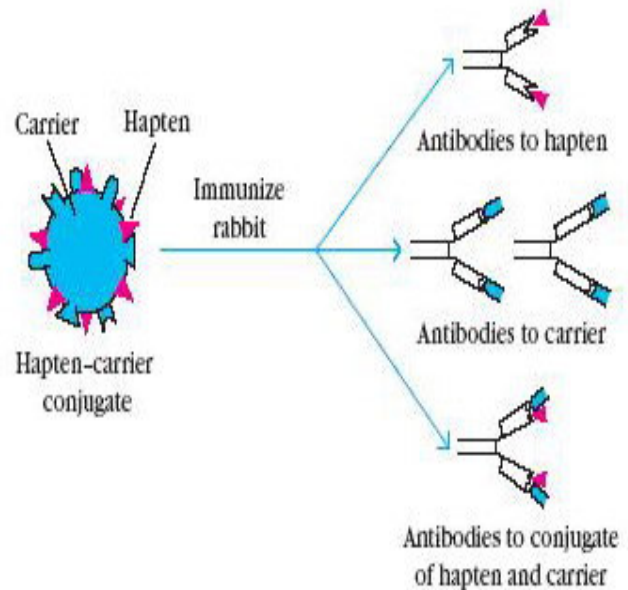
- » Response of an antigen-specific B and T lymphocytes to an antigen
- » Exhibit Immunological memory, diversity, specificity and self/nonself recognition

- does not come into play until there is antigenic challenge to the organism.
- display a high degree of specificity as well as the remarkable immune property of "memory" cell
- exposure to the same antigen some time in the future results in memory : the immune response to the second challenge occur more quickly than the first, is stronger, and often is more effective in neutralizing and cleaning the pathogen.

» **Antigenicity**, is the ability of an antigen simply to interact specifically with free antibodies and/or with antigen binding receptor on lymphocyte.

» **Immunogenicity**, is the ability of a substance to induce an immune response by either the humoral or the cell-mediated under a give set of condition .

» **Hapten**, is a small molecule that can bind to antibodies but cannot by themselves induce an immune response. however, they conjugate formed by coupling a hepten to a large carrier protein is immunogenic and elicits production of anti-hepten antibodies when injected into an animal. Such injections also produce anti-carrier and antihapten/ carrier antibodies as well.



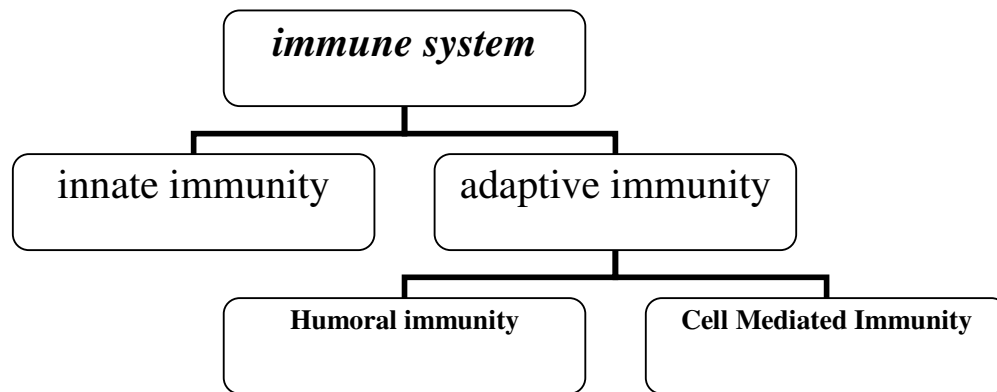
Factors contributing to immunogenicity

»Antigen itself:

- Foreignness
- Molecular size
- Chemical composition and heterogeneity
- Susceptibility to Ag processing and presentation

»Biological system:

- Genotype
- high/low responder
- Route of administration
- Dosage
- Adjuvant (are substances that, when mixed with an antigen and injected with it, enhance the immunogenicity of that antigen. Adjuvants are often used to boost the immune response when an antigen has low immunogenicity or when only small amounts of an antigen are available.)



Humoral immunity

Immunity that is mediated by antibodies

Can be transferred by to a non-immune recipient by serum

Cell Mediated Immunity

Immune response in which antigen specific T cells dominate

Historical Events in Immunology :

1796-Edward Jenner (smallpox)

1881-Loius Pasteur (vaccines)

1884-Elie Metchnikoff (phagocytes)

1890-Emil von Behring* (antibodies)

1895-Jules Bordet* (complement)

1906-August Wasserman (syphilis)

1959-Rodney Porter

Gerald Edelman* (antibodies)

1960-F McFarlane Burnet* (tolerance)

1975-Cesar Milstein*(monoclonal Ab)

1987-Susumu Tonegawa* (genetics)

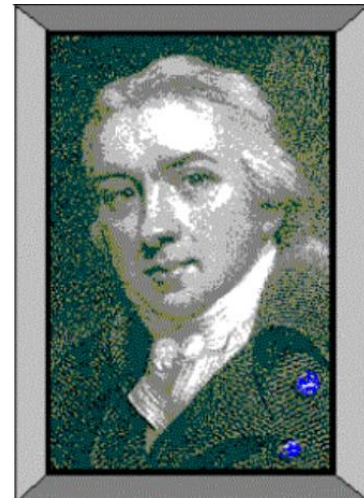
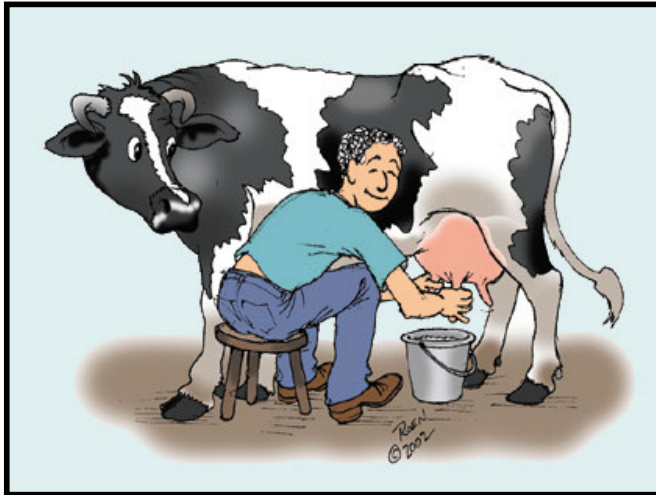
1996-Peter Doherty

Rolf Zinkernagel* (MHC)

1798 Edward Jenner :

Observation:

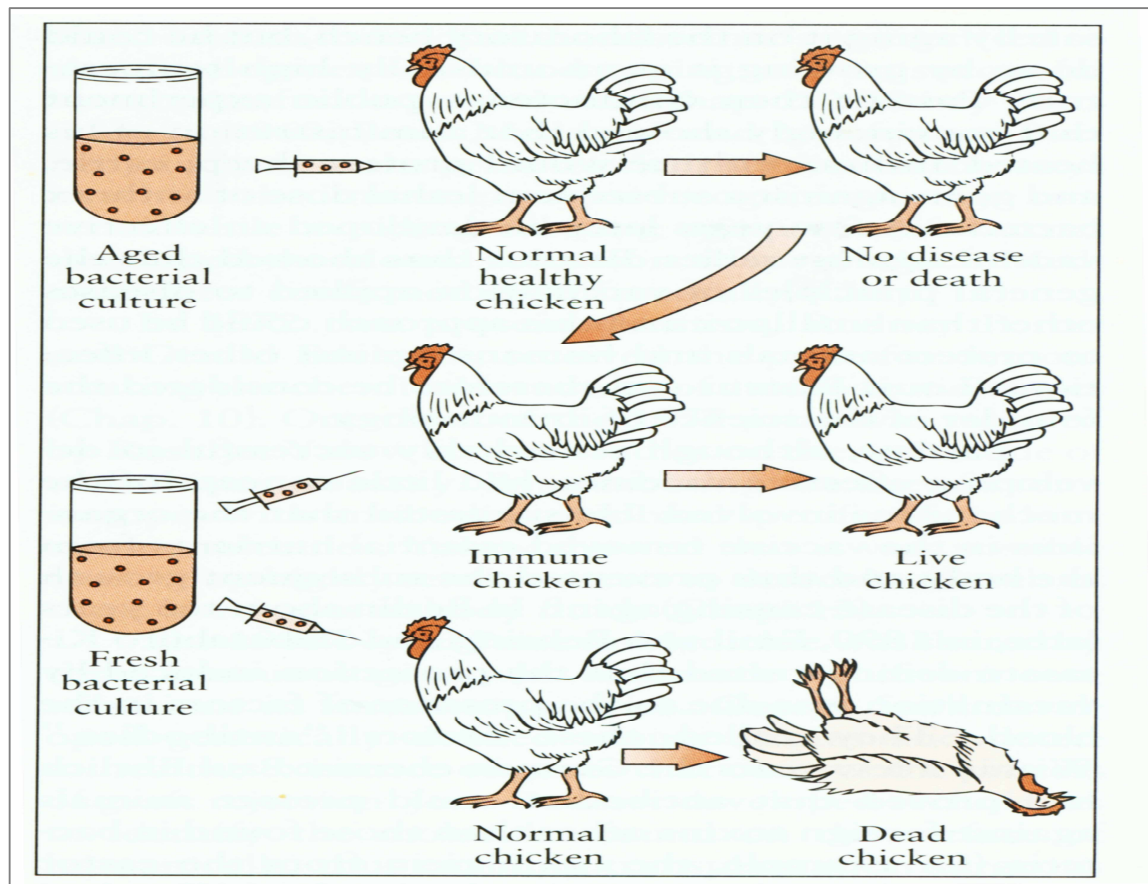
Milkmaids who contracted cowpox (a mild disease) were subsequently immune to small pox



Profound results:

- (1) Jenner's technique of inoculating with cowpox to protect against small pox spread quickly throughout Europe.
- (2) Began the science of Immunology, the study of the body's response to foreign substances

Louis Pasteur :



Observation:

Anthrax

Reasoning:

Aging had weakened the virulence of the pathogen and that such an attenuated strain (called vaccine) might be administered to protect against disease.

Profound result:

Began the discipline of Immunology

Immunology :
began as a branch of microbiology