Slide #2:

- Immunology is sometimes regarded as part of microbiology department because it started there as an investigation of ways used to prevent against infectious agents (e.g. microorganisms). However, Immunology now is an independent science.
- Every single medical field has an application related to this science (e.g. immunopathology, immunobiochemistry, etc.).

Slide #4:

- Would-be pathogens: bacteria, viruses, toxins of such agents; that require certain mechanisms to defeat.

Slide #5:

- In the case of AIDS: these patients have deficient immunity which makes them susceptible to many bacterial and viral infections.
- These infections are usually the cause of death in such patients, not the virus (HIV) itself.
- In conclusion: opportunistic infections along with tumors are mainly responsible for death in AIDS patients.

- Remember that tumors could arise in human body continuously due to exposure to many factors (e.g.: drugs, viruses, ..).
- However, there are certain immune surveillance mechanisms that act to detect tumors (cancerous cells) as they arise and elevate them.
- Unfortunately, these mechanisms can be overwhelmed in some cases; so the tumor becomes out of control leading to cancer.
- Therefore, some mechanisms are used in immunotherapy to defend against cancers, like vaccines and utilization of sensitized lymphocytes.
- **Allergy**: the case in which individuals show immune response (represented by production of IgE antibodies) against commonly occurring antigens in the nature
- Those individuals are known as “atopic individuals”

- Different kinds of allergy emerge: allergic asthma, allergic rhinitis, allergic conjunctivitis, etc. These can cause *dysfunction of certain organs [immune mediated tissue damage]*.
- Pathology of some viruses is due to immune response & not due to the virus itself. E.g. HAV, HBV.

- **Organ transplantation** is now an acceptable way of therapy for end-stage-organ-disease (kidney failure, liver failure, etc.)
- The most important barrier to a successful transplantation is the immune response
- So we try to prevent patients’ responses by matching individuals or by giving immunosuppressant.
- The most common type of transplantation is **blood transfusion**, performed in two million patients daily.
- Blood transfusions’ reactions can be fatal! [immunologic basis]. So as mentioned earlier matching recipients & donors is essential.
- The first successful renal transplantation: 1954 (✿)
Slide #6:

- **First line of defense consists of:**
  - anatomical (mechanical) barries
    - skin
  - physiological barriers
    - secretions
    - e.g. beta lysine and lysozyme.

- If this line is breached, **the second line of defense** comes into play.
- The first two lines are of great importance & are rarely breached!
- If this happened, the third line represented by lymphocytes is activated.
- The doctor mentioned some dates and numbers. If interested, please refer to the record minute 26.

Slide #11:

- The adaptive immunity requires days to weeks to mount a response against foreign substances, for example: the effector mechanisms which are of cellular nature, like T lymphocytes, require about a week to come into play, whereas antibody production mechanism requires weeks (about 10-14 days usually), but in second time exposure antibodies are produced in an accelerated rate.
The Innate immunity is very efficient and usually results in the protection of the host.

PRRs (also called “Toll like receptors”) : are molecules present on WBCs (macrophages, neutrophils, eosinophils...ect), there’re 30 in number, those receptors can recognize the invaders (like microbes) as they bind to certain molecules (ligands) derived from them.

Slide #13:

- These glycolipids and glycoproteins are recognized by the previously mentioned PRRs.
- The innate response effector mechanisms are composed of barriers and cells that phagocytose the microbes, process, and present them to the adaptive response (to B and T lymphocytes).

Slide #14:

- All the potential antigens that an individual might be exposed to are detectable by the adaptive immunity and this is due to the presence of different types of receptors on lymphocytes.
- Of course the germ line DNA of these cells can’t encode already for all the possible receptors to recognize every single foreign antigen, this is solved by the process of gene rearrangement during the maturation of lymphocytes.

Slide #15:
The adaptive immune response can’t deal with antigens unless they’re first processed and presented by the innate immunity, so the innate immunity is the activator of the adaptive one.

**Slide #16:**

- You can notice that the process of dealing with invaders in the innate immunity requires only hours (about 3 hours usually), but it extends to days for the adaptive response.

**Slide #17:**

- Specificity: a specific clone of lymphocytes for each antigen.
- Non-reactivity to self: The adaptive immune response recognizes foreign antigens only and don’t respond to self, but the innate immunity don’t discriminate between self and non-self, that’s why an inflammatory response can be directed against self antigens by the immune response isn’t (that’s under the natural conditions).

**Slide #20:**

- At times, the immune system appears to be a collection of paradoxes: this means that the same mechanism can be utilized to explain one condition and its opponent, like autoimmunity and tolerance, here the same mechanism is used to establish the state of tolerance against self, and also used to explain the autoimmunity disorders.

**Slide #21:**

- More than 95% of T-lymphocytes in the thymus die through the process of self education, also B lymphocytes in the bone
marrow that have the ability to recognize self die, although they’re given the chance to change their receptors, but if they still carry receptors responding to self they must be deleted.

Slide #23:
- Auto-reactivity results when the process of education fails.

Slide #24:
- Lymphocytes develop and mature in the absence of antigens (a process that’s antigen independent), each lymphocyte has one receptor to recognize only one antigen, and during the maturation and development of lymphocytes the process of gene rearrangement is responsible of the diverse specificity of cells.

Slide #25:
- The memory cells wait for the antigen to be introduced in the future.

Slide #26:
- Lymphocytes that are self reactive don’t even complete their maturation, only those which are reactive against foreign antigens undergo full maturation and proliferation.

Slide #29:
- Many lines of cells are originated from the same stem cell, this stem cell differentiates into many cell types under the
influence of cell contact and many soluble mediators (cytokines), these cells interact with each other to produce an immune response, and the response is amplified by the complement system and phagocytic cells.

“Tell your heart that the fear of suffering is worse than the suffering itself. And that no heart has ever suffered when it goes in search of its dreams, because every second of the search is a second's encounter with Allah and with eternity”
~~ Paulo Coelho ..

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~~ By : Majd Al-Majali & Yasmeen Al-Jade