

Final Exam Answer key

Response 1: (4 pts)

Define the following terms:

Dendritic Cell (DC): is an immune cell characterized by cytoplasmic extensions called dendrites and is present throughout all tissues of the organism. Dendritic cells play several roles in the immune response: They function as phagocytic cells and as antigen-presenting cells (APCs), enabling them to activate B and T lymphocytes within secondary lymphoid organs. **1 pt**

Allotypic Variation: concerns differences in a few amino acids and reflects genetic polymorphism within the same species. It most often involves the constant regions of heavy chains. A given allotype is therefore found in a subgroup of individuals within the same species. **1 pt**

Immunization: is the process by which immunity is conferred, either through the injection of antigens (active immunization) or through the administration of serum containing specific antibodies (passive immunization). **1 pt**

Live attenuated vaccines: These consist of bacteria, and especially viruses, whose pathogenicity has been attenuated through repeated passages in culture media, while maintaining intact antigenic structures. Microorganisms are attenuated using various experimental procedures. Some viruses are attenuated by culturing them in non-human cells, which generates mutations leading to loss of pathogenicity after several replication cycles. **1 pt**

Response 2: (5 pts)

The technique used for the production of monoclonal antibodies is Hybridoma technique **0.5 pt**. The steps are as follow:

1. Immunization **0.5 pt**
2. Preparation of lymphocytes **0.5 pt**
3. Collection of myeloma cells **0.5 pt**
4. Fusion **0.5 pt**
5. Selection of hybrids in HAT medium **0.5 pt**
6. Cloning **0.5 pt**
7. Antibody selection **0.5 pt**

The addition of dimethyl sulfoxide (DMSO) prevents crystal formation inside the cells **0.5 pt**.

The polyethylene glycol (PEG) is a fusion agent which facilitate the fusion of cell membranes
0.5 pt.

Response 3: (5 pts)

| Ig | Number of subunits | Type of the heavy chain | Localization | Function |
|------------------------------|----------------------------|--------------------------------------|---|---|
| IgG 0.25 pt | Monomer 0.25 pt | Gamma γ 0.25 pt | Intra- and extravascular compartments 0.25 pt | Major class during the secondary immune response |
| IgA 0.25 pt | Dimer 0.25 pt | Alpha α 0.25 pt | Mucosal secretions 0.25 pt | |
| IgM 0.25 pt | Pentamer 0.25 pt | Mu μ 0.25 pt | Intravascular compartment 0.25 pt | Predominant during the primary immune response |
| IgD 0.25 pt | Monomer 0.25 pt | Delta δ 0.25 pt | Trace amounts in serum or bound to the surface of B cells (BCR) 0.25 pt | Not precisely known |
| IgE 0.25 pt | Monomer 0.25 pt | Epsilon ϵ 0.25 pt | Trace amounts in serum or bound to the surface of mast cells 0.25 pt | Anti-parasitic immunity and in immediate hypersensitivity reactions |

Exercise: (6 pts)

1- **In woman A**, no antibodies are detected. This means that there is no infection (therefore no immunization) in either the mother or the child. **1 pt**

In woman B: no antibodies are detected at the beginning of pregnancy. The woman had never been in contact with *T. gondii* before her pregnancy. Woman B becomes infected and immunized during pregnancy (between the 1st and the 3rd month): this is a primary infection (the first contact with the antigen) because IgM antibodies appear. The antibody kinetics (IgM and IgG) are typical of a primary immune response.

The IgG antibodies found in the newborn are maternal antibodies passively transmitted from the mother to the child through the placenta. **2 pts**

For woman C, she was infected before pregnancy because she already had IgG antibodies from the 1st month and no IgM antibodies. These antibodies remain at a stable level during the first 3 months. Therefore, this is an old infection with previous immunization. Woman C had a second contact with the *T. gondii* agent during pregnancy. Her immune system was therefore restimulated. The response is secondary, characterized by an increase in IgG without the appearance of IgM.

The IgG antibodies found in the newborn are maternal antibodies passively transmitted from the mother to the child through the placenta. **2 pts**

2- To determine whether the newborns are infected with toxoplasmosis, a new measurement of IgG and IgM should be performed after 1 to 2 months.

- If the child is not infected: IgG levels decrease because these are antibodies passively transmitted from the mother to the child. They will gradually be degraded. IgM antibodies remain absent. **0.5 pt**

- If the child is infected: IgG levels increase and IgM antibodies appear; this indicates active immunization. **0.5 pt**