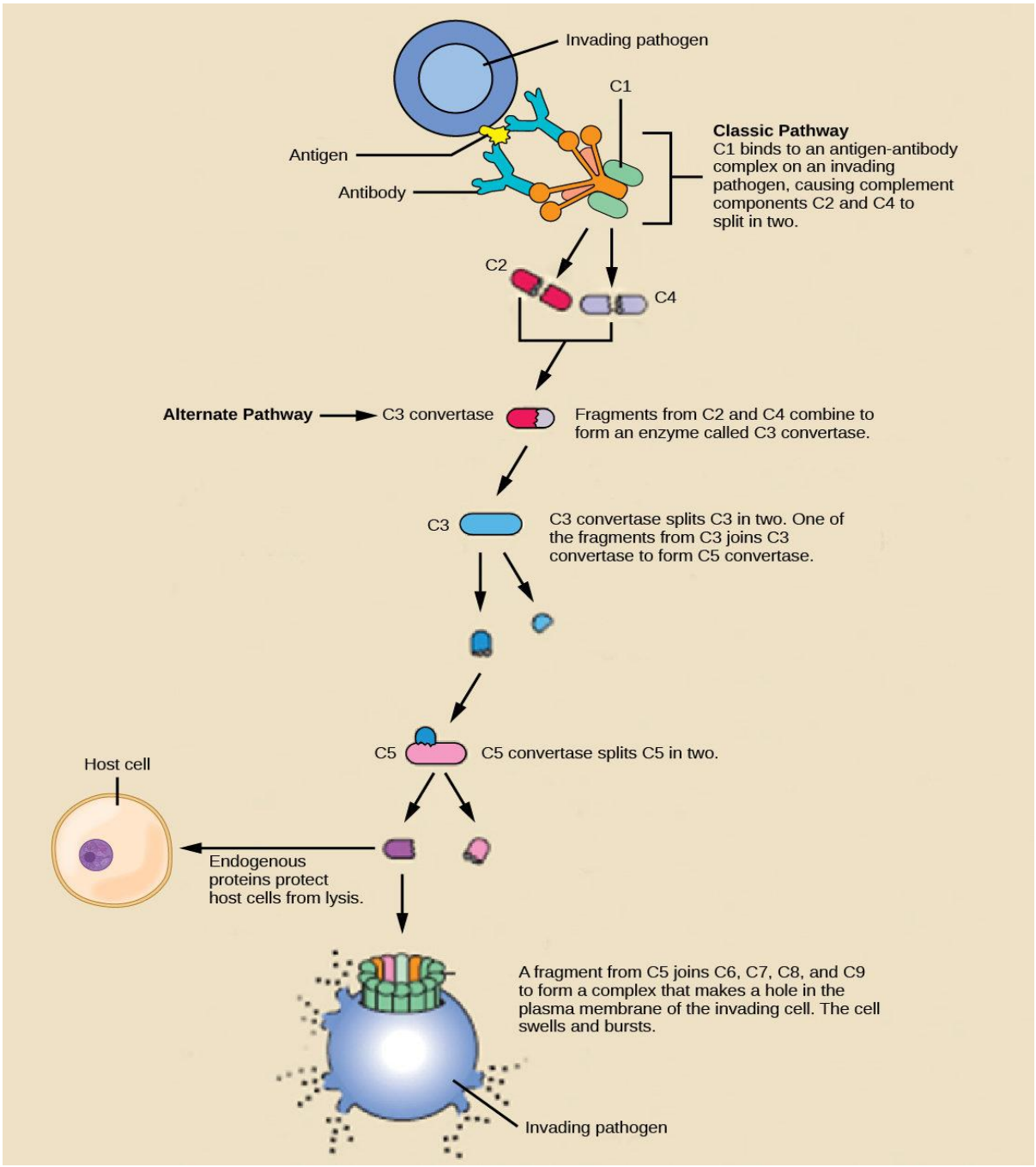
Immunology Practical session 4 Correction

Exercise 1 : Complete the figure's legend



Exercise 2 : Complete the table

	Classical pathway	Lectin pathway (MBP)	Alternative pathway
Activateurs	Ab-Ag immun complex	MBP binding microbial mannose residues	C3b fragment binding microbial surface
Protéines de la phase d'activation	C1q, C1r, C1s C4, C2	MBL, MASP1, MASP2, C4, C2	C3b, FB, FD
C3 convertase	C4bC2a	C4bC2a	C3bBb
C5 convertase	C4bC2aC3b	C4bC2aC3b	C3bBbC3b
CAM	C5b6789	C5b6789	C5b6789
Anaphylatoxines	C3a, C4a, C5a	C3a, C4a, C5a	C3a, C5a

Biological Consequences of Complement Activation:

A. First, the **C3b protein** coats microbes and promotes their **binding to phagocytes**, thanks to **C3b receptors** expressed on the surface of phagocytic cells.
As a result, **microbes opsonized** by complement proteins are **rapidly ingested and destroyed** by phagocytes.

B. Second, certain **proteolytic fragments** of complement, particularly **C5a and C3a**, act as **chemoattractants for phagocytes**. They promote **leukocyte recruitment** (inflammation) to the site of complement activation.

C. Third, complement activation culminates in the formation of a **polymerized protein complex** that **inserts into microbial cell membranes**, disrupting membrane permeability and leading to **osmotic lysis** of the microbe.

Exercise 3 :

1. Interpretation of the Tubes:

- Tube 1: Control
  The sheep red blood cells (SRBCs) are intact (healthy).
  → No treatment applied.
- Tube 2:
  The SRBCs are agglutinated.
  → This means that the addition of antibodies caused agglutination of the red blood cells.
- Tube 3:
  The SRBCs are lysed.
  → Thus, the addition of complement in the presence of antibodies caused lysis of the SRBCs.
- Tube 4:
  The SRBCs are intact.
  → The presence of complement alone does not cause agglutination or lysis of the SRBCs.

2. Roles of Antibodies and Complement:

- Role of antibodies:
  Bind specifically to the SRBCs, forming immune complexes that result in agglutination.
- Role of the complement system:
  Induces lysis of SRBCs by forming the membrane attack complex (MAC).
- This corresponds to activation of the classical complement pathway (antigen-antibody complex is required).

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3. Complement Property:

- The complement is species non-specific.
  → For example, in this experiment: complement from guinea pig and antibodies from rabbit.
  The complement binds to antigen-antibody complexes, regardless of whether the antibodies are from the same species as the complement or a different species, as shown in this case.

Exercise 4:

1. Complete the labels:

- An injury breaks the natural barrier of the skin
- Bacteria (antigen)
- Immune cells present in the tissues (sentinel cells):
  - Dendritic cells
  - Macrophages
  - Mast cells
- Red blood cells (erythrocytes)
- Circulating immune cells:
  - Granulocytes
  - Monocytes
  - Lymphocytes

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2. What is the role of sentinel cells, which are the first to take action?
Sentinel cells, whether resident in tissues or circulating, monitor the integrity of the body.
Mast cells, dendritic cells, and macrophages express receptors on their surface that recognize antigenic patterns from foreign elements that have entered the body.
→ These cells initiate the immune response.

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3. Complete the labels:

- The binding of a sentinel cell to a bacterium

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4. What is the consequence of this binding? Give an example.
Once recognition occurs, the cells release chemical mediators, for example:

- Histamine → vasodilation and increased vascular permeability, allowing circulating immune cells to enter the tissues
- Cytokines → attract macrophages
- Prostaglandins → stimulate nerve fibers → pain

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5. What are the clinical signs of the inflammatory reaction and their causes?

Manifestation	Cause
Redness	Dilation of capillaries (vasodilation); vessels become so wide they appear transparent
Heat	Slowing of blood flow and activity of immune cells
Swelling (edema)	Plasma exudation (fluid leakage) and diapedesis (white blood cells entering tissue)
Pain	Stimulation of nerve endings due to:

- Mechanical pressure from edema
- Mediators like prostaglandins and leukotrienes

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6. Which cells intervene next, and how?
The next responding cells are phagocytes (resident macrophages, neutrophils, and dendritic cells), which are attracted by released chemokines.
These cells will:

- Phagocytose the antigens
- Present antigenic determinants bound to MHC molecules

→ This leads to the recruitment of adaptive immune cells: lymphocytes.

Key terms:

- Sentinel cell
- Antigenic marker (PAMP)
- Membrane receptor (PRR)