Class Switching

- **Class switching, also known as isotype switching or class-switch recombination (CSR), is a biological process where B cells change the class of antibody, they produce without altering the antibody's specificity for a particular antigen.**

- **This shift allows B cells to produce different types of antibodies, such as IgM, IgG, IgA, or IgE, each with distinct functions and effector mechanisms, optimizing the immune response to different pathogens.**

Definition:

- Class switching is a DNA rearrangement where B cells alter the heavy chain constant region of their immunoglobulin (Ig) genes, effectively changing the antibody class (isotype) they produce.

Mechanism:

- This process involves a recombination event between specific switch (S) regions located upstream of the constant region genes.

Trigger:

- Class switching is triggered by specific signals, including T cell help, cytokines, and B cell activators.

Function:

- The resulting antibody, while still binding to the same antigen, now has different effector functions, allowing it to better neutralize the pathogen or target it for destruction by other immune cells.

Why is it Important?

Efficient Immune Response:

- By changing the antibody class, the immune system can tailor the response to the specific type of pathogen it encounters.

Specificity vs. Effector Function:

- Class switching allows the immune system to maintain the specificity of the antibody while simultaneously optimizing its effector function.

Protection Against Different Pathogens:

- Different antibody classes have different strengths and weaknesses in combating specific pathogens. For example, IgG is particularly effective at neutralizing toxins and facilitating complement activation, while IgA is important in mucosal immunity.
- In summary, class switching is a crucial mechanism for adaptive immunity that allows B cells to produce a diverse array of antibodies with different effector functions, optimizing the immune response to various pathogens.

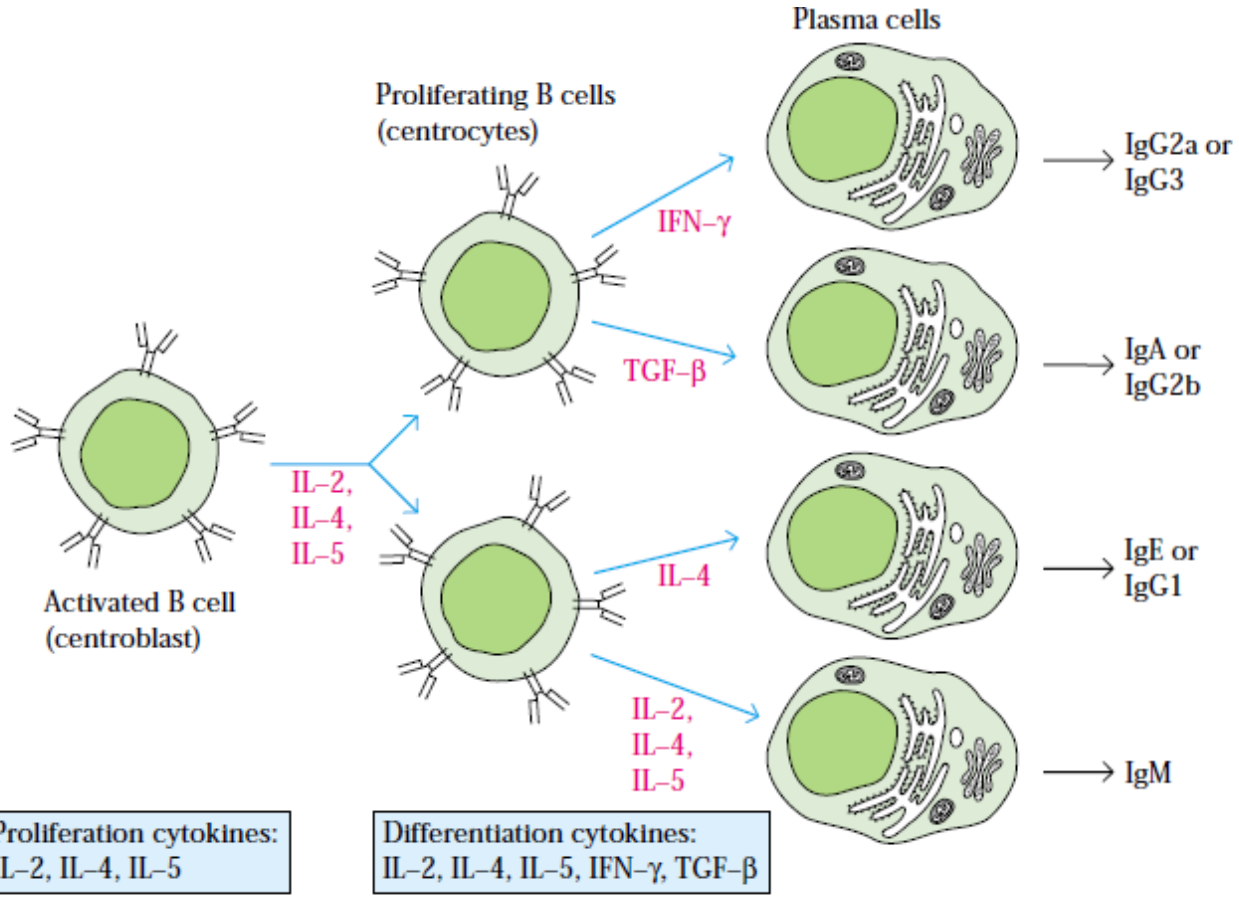
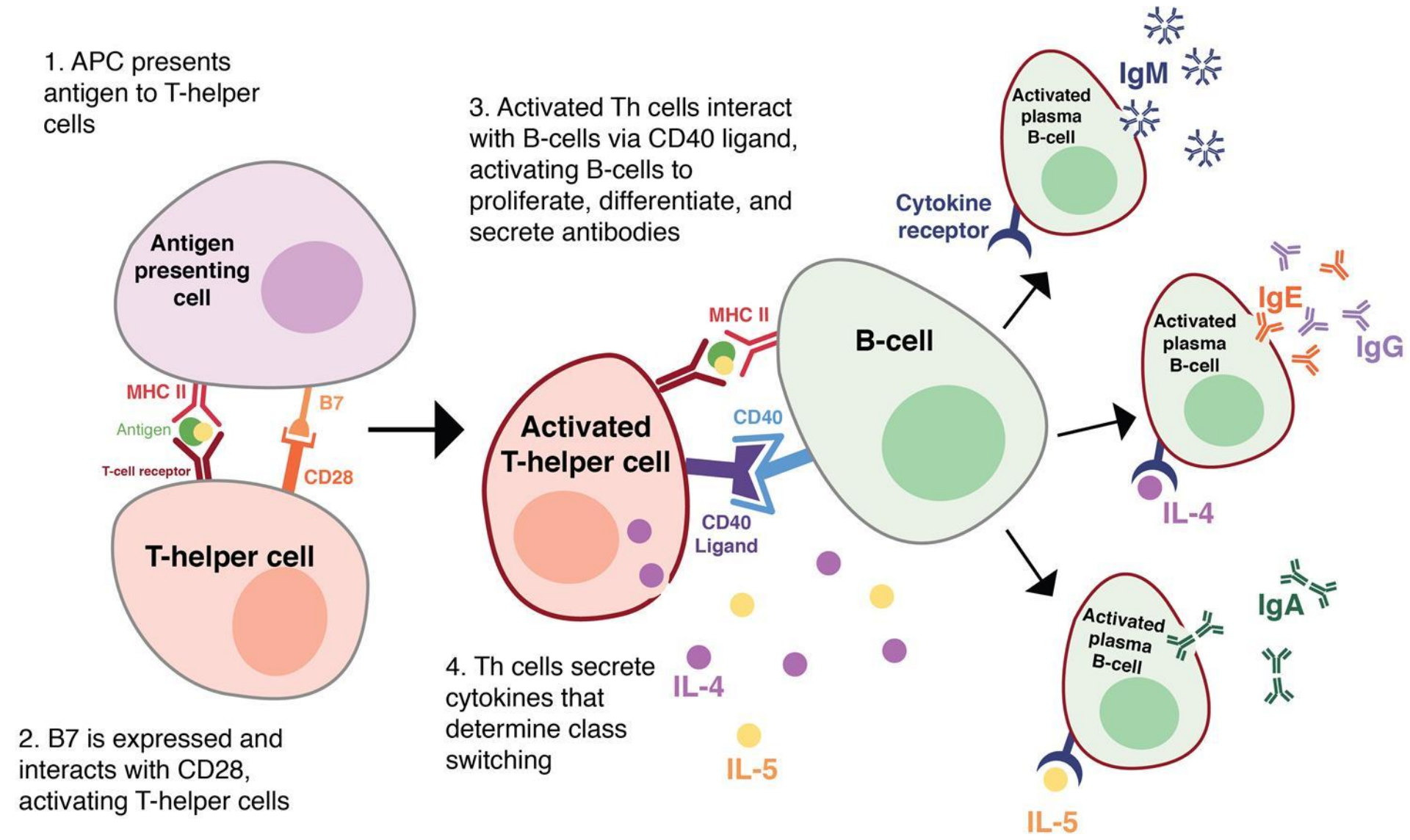


FIGURE 11-19 The interactions of numerous cytokines with B cells generate signals required for proliferation and class switching during the differentiation of B cells into plasma cells. Binding of the proliferation cytokines, which are released by activated T_H cells, provides the progression signal needed for proliferation of activated B cells. Similar or identical effects may be mediated by cytokines beyond the ones shown. Class switching in the response to thymus-dependent antigens also requires the CD40/CD40L interaction, which is not shown here.

Activation and Class-switching of B-cells



Lucy Liu