Chapter 13: Cytokines

Definition: secreted, low-molecular-weight proteins that regulate the nature, intensity and duration of the immune response by exerting a variety of effects on lymphocytes and/or other cells.

- Cytokines bind to specific receptors on target cells.
- Originally were called lymphokines because they were initially thought to be produced only by lymphocytes. Then monokines because they were secreted by monocytes and macrophages. Then interleukin because they are produced by some leukocytes and affect other leukocytes. The term “cytokine” is now used more widely and covers all of the above.
- Don’t forget chemokines, they are also considered cytokines.

**Cytokines can act in an:**
- **Autocrine** (same cell),
- **Paracrine** (close proximity)
- **Endocrine** (long distance)

1. Cytokines are **pleiotropic** ... one cytokine can have different effects on different cells.

2. Cytokines can be **redundant** ... different cytokines can have the same effects.

3. Cytokines can **synergize** with each other.
4. Cytokines can **antagonize** each other.

![Antagonism Diagram](image)

5. Cascade effect, cytokines can stimulate the production of other cytokines.

![Cascade Effect Diagram](image)

6. Cytokines can influence the expression of **cytokine receptors**.

![Cytokine Receptors Diagram](image)

7. Cytokines play key roles in regulating **hematopoiesis**, **innate immunity** and **acquired immunity**.

![Hematopoiesis Diagram](image)

**SO...cytokines can have many effects, depending on:**

- the target cell
- the state of differentiation/activation of the target cell
- the presence or absence of other cytokines

![Sandwich ELISA Diagram](image)
Exam Question!!!!

There are many cytokines, including...

- IL-1
- IL-2
- IL-3
- IL-4
- IL-5
- IL-6
- IL-7
- IL-8
- IL-9
- IL-10
- IL-11
- IL-12
- IL-13
- IL-15
- IL-16
- IL-17
- IL-18
- IL-19
- IL-20
- IL-21
- IL-22
- IL-23
- IFN-α
- IFN-β
- IFN-γ
- TNF-α
- TNF-β
- TGF-β1
- M-CSF
- G-CSF
- GM-CSF
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