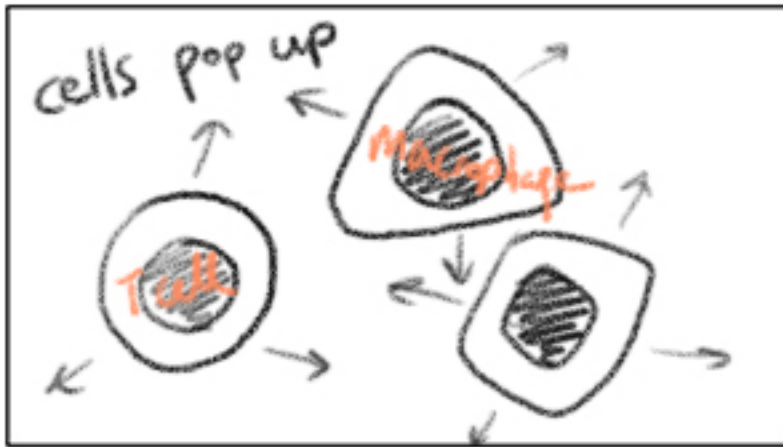


Immunology Video 1 Storyboard

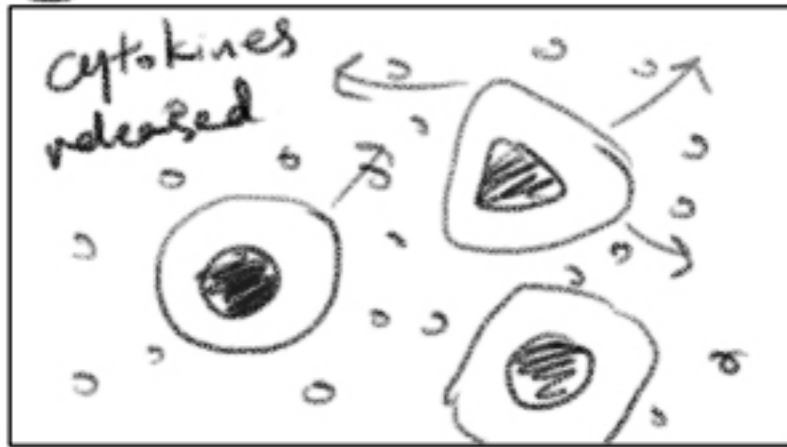
June 23rd, 2016
Wendy Gu

1



Cytokines are a large, heterogeneous group of small or glycoproteins secreted by many different

2



cell types, including T-helper cells and macrophages.

3

Zoom out



In humans, there are over 180 genes responsible for encoding cytokines.

4



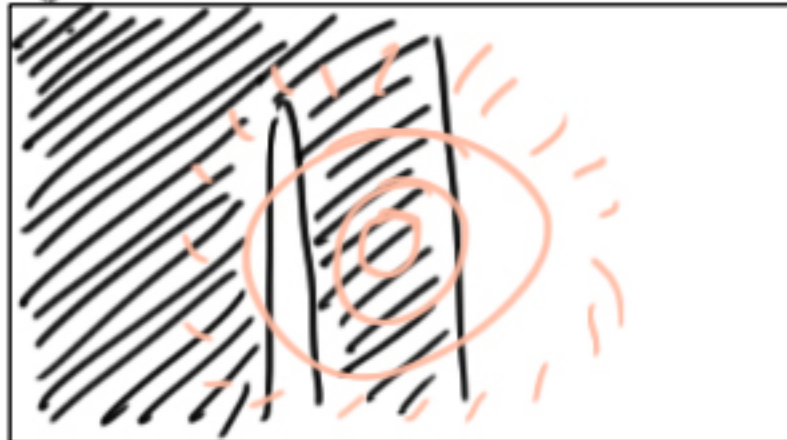
One of the major roles of cytokines in health and disease is to mediate immune responses.

5



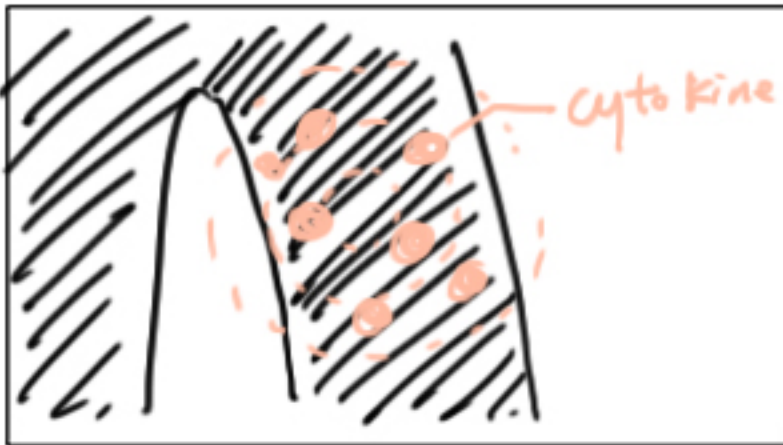
Excessive inflammation facilitated by high levels of cytokine activity is a hallmark of chronic inflammatory rheumatic disease,

6



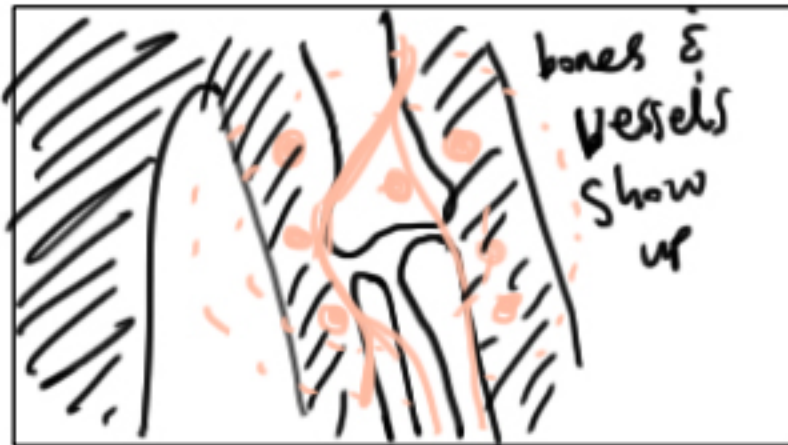
such as rheumatoid arthritis.

7



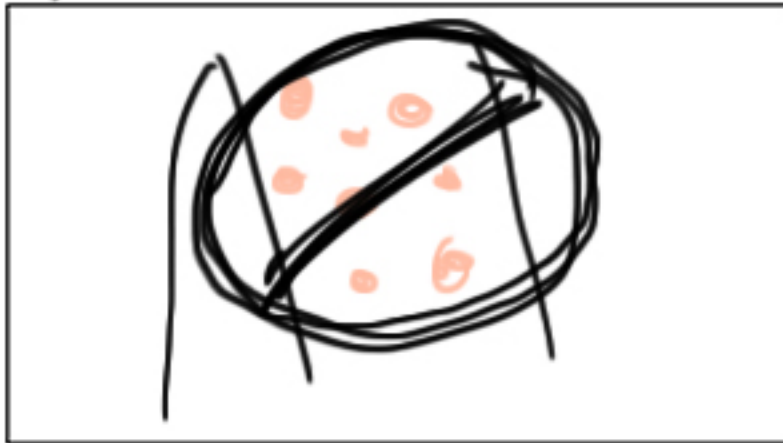
In rheumatoid arthritis, high levels of cytokines, such as interleukin 1, IL-6, and TNFa

8



are found in our joints and blood.

9



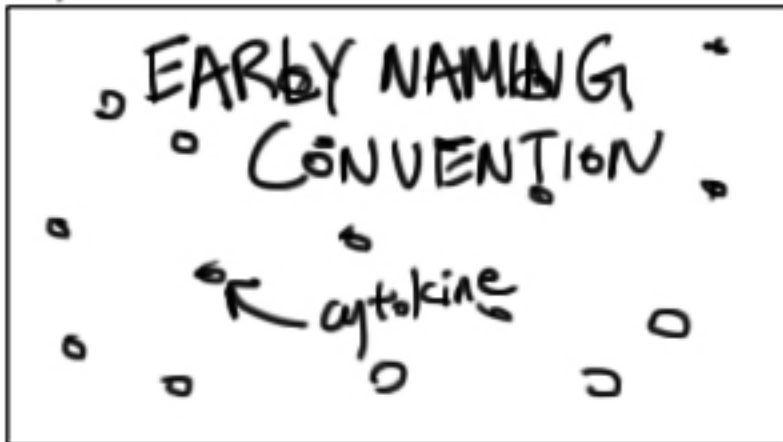
Inhibiting these cytokines is an effective means of controlling inflammation and

10



preventing additional damage in this disease.

11



Under early naming conventions, cytokines were named after their main known function.

12



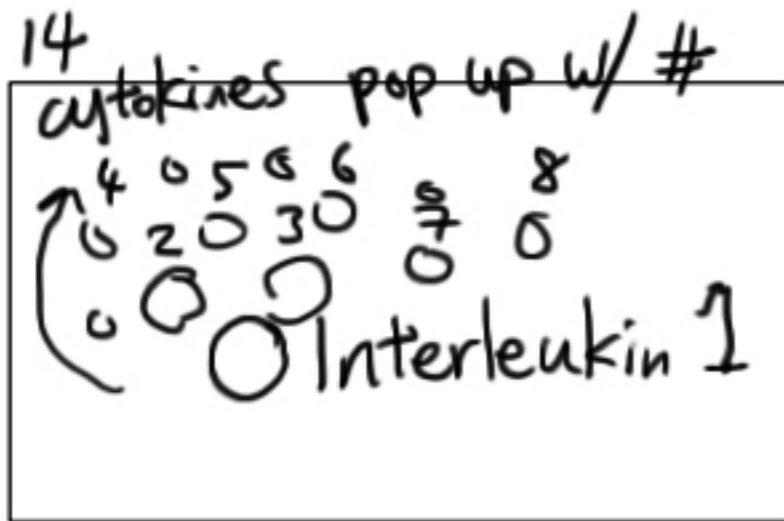
Examples of such names include Tumor Necrosis Factor, causing tumor necrosis,

13



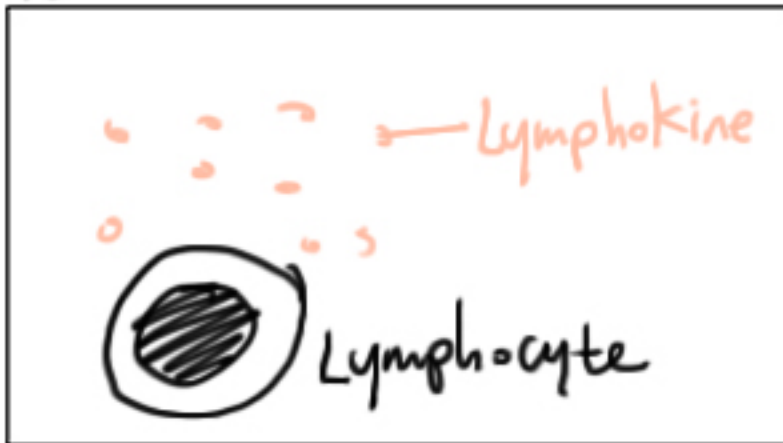
and Interferon, interfering with viral infection.

14



The standardized modern naming system uses the word Interleukin as a prefix followed by a number, in order of their discovery.

15



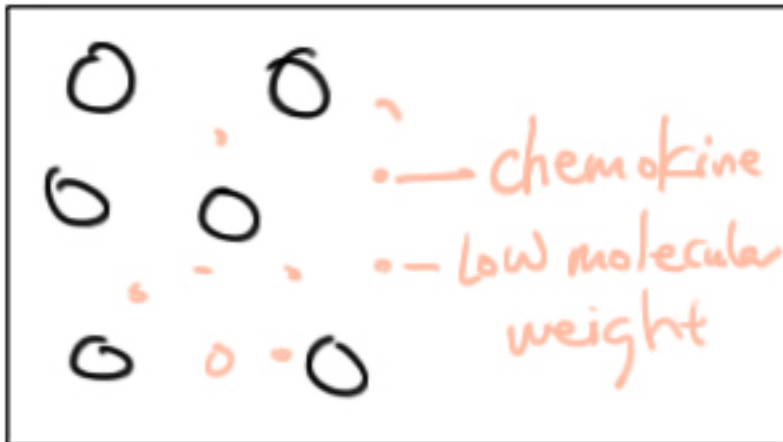
Other common words used to describe cytokines are: Lymphokines, cytokines produced by lymphocytes

16



monokines, produced by monocytes

17



and chemokines, cytokines with lower molecular weights that effect chemotaxis.

18



As a class of proteins aiding communication between cells, cytokines mediate and regulate all aspects of our innate and adaptive immunity.

19



Upon stimulation, individual cytokines are secreted by multiple cell types in a brief and self-limited fashion.

20



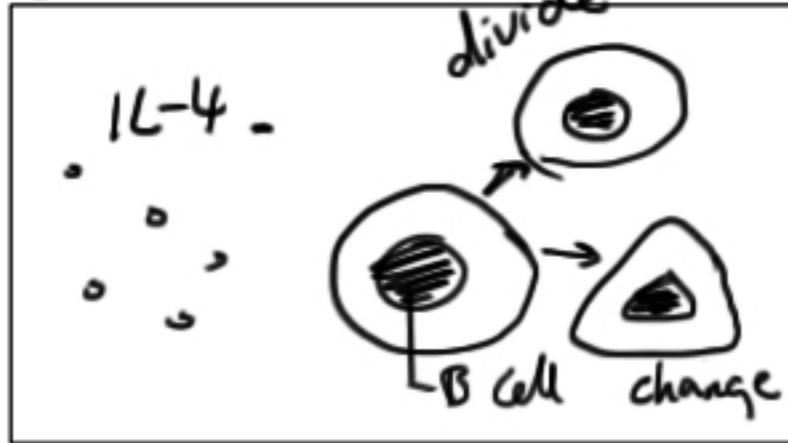
Different cytokines cover a vast variety of functions. These include regulating lymphocyte growth, activation and differentiation

21



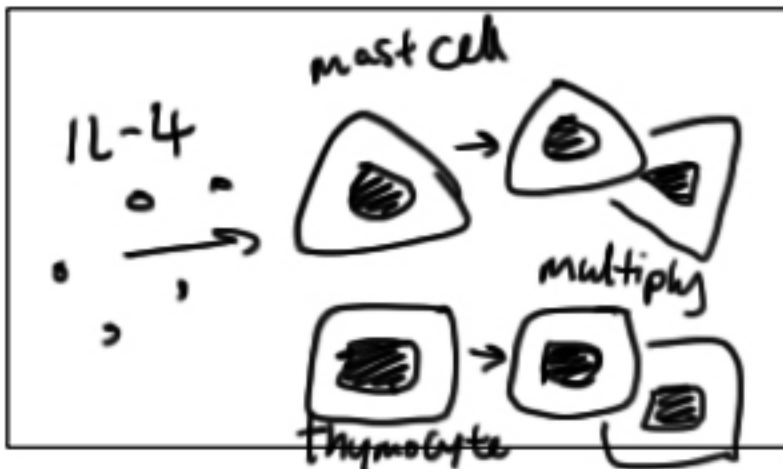
activating inflammatory cells, and stimulating hematopoiesis

22



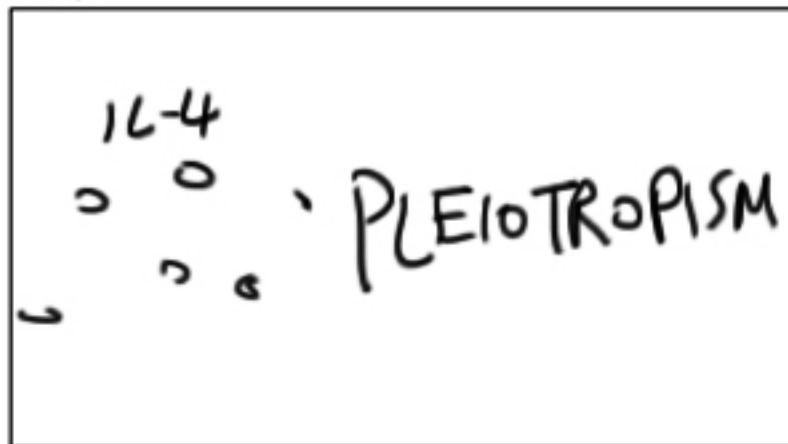
A single cytokine can act on multiple cell types. For example, while IL-4 can cause B-cell activation, proliferation, and differentiation.

23



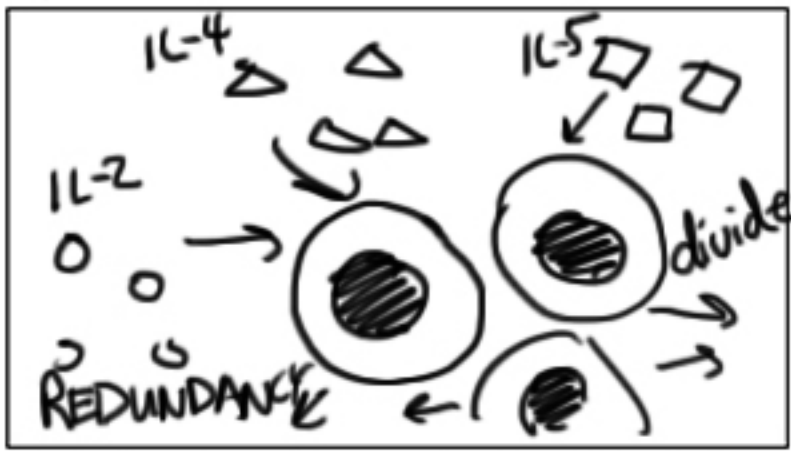
it can also cause mast cell and thymocyte proliferation.

24



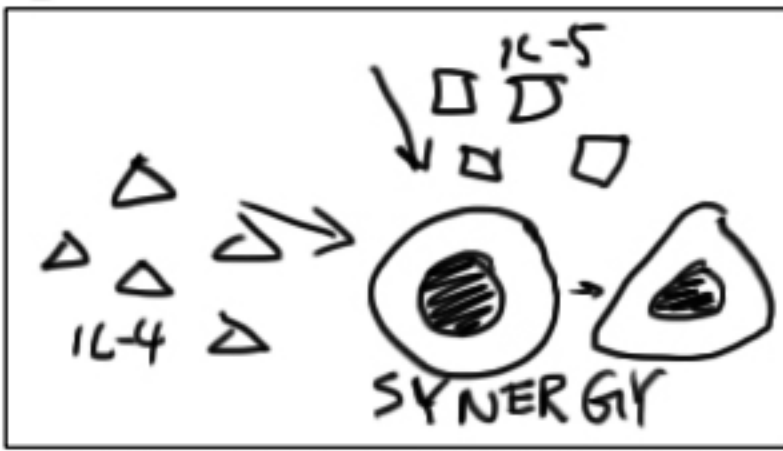
This property of cytokines is known as pleiotropism.

25



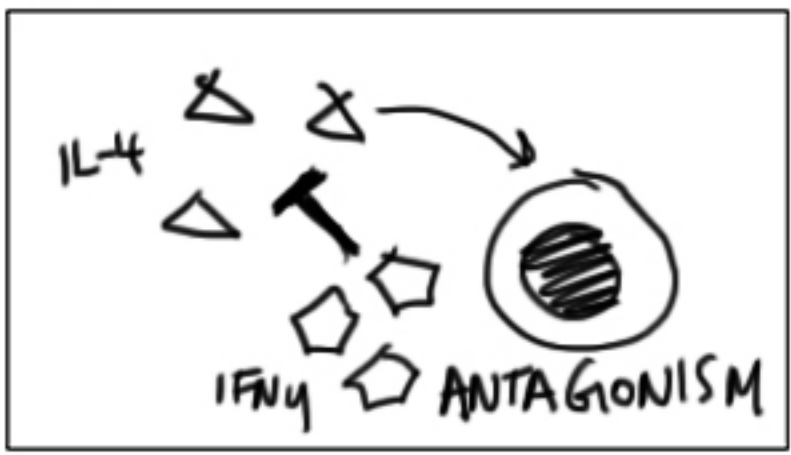
In addition, there exists redundancy in cytokine effects. For example, IL-2, IL-4, and IL-5 can all promote B-cell proliferation.

26



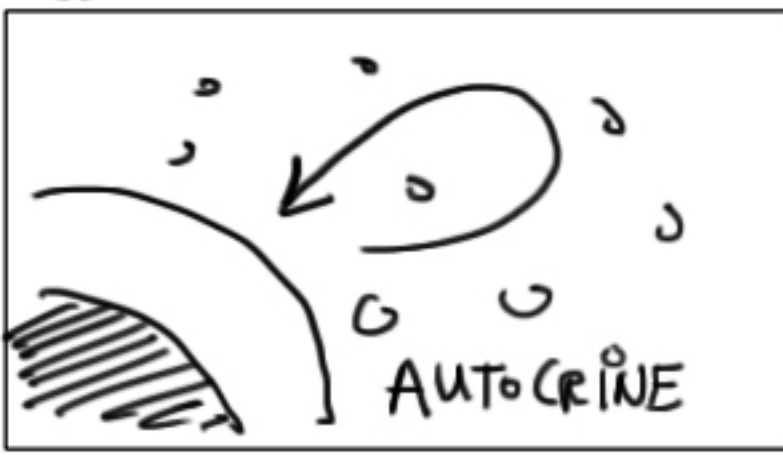
A cytokine can also modify the actions of other cytokines. In synergy, IL-4 and IL-5 work in tandem to induce B-cell Immunoglobulin class switchin to IgE.

27



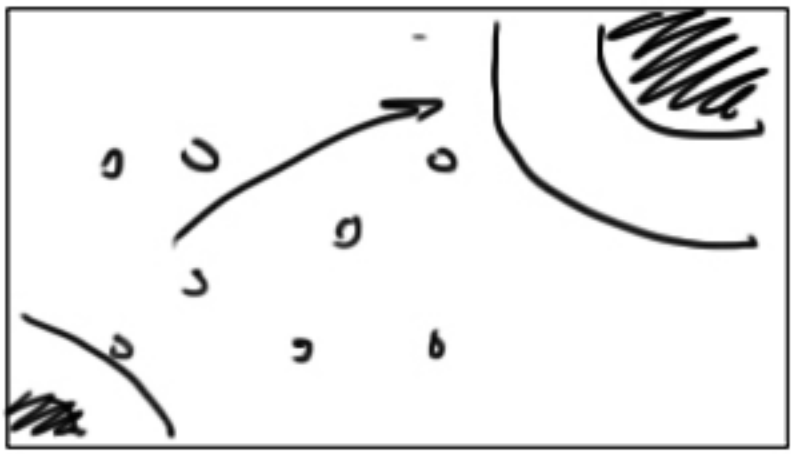
And finally, as an example of antagonism, IFN- γ inhibits the class switching action of IL-4

28



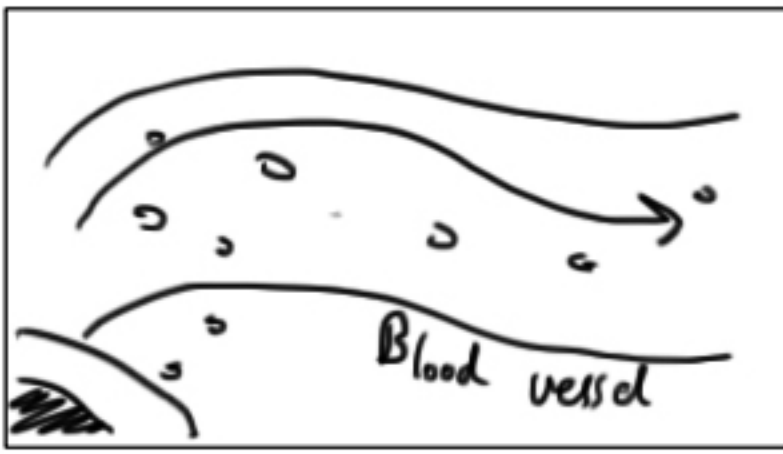
Cytokines have different locations of action. In autocrine action, cytokines affect the cell that secretes them.

29



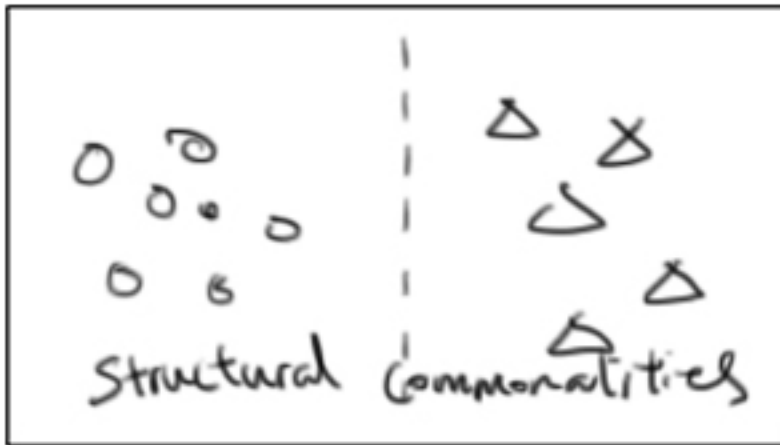
In paracrine action, they affect a nearby cell.

30



And in endocrine action, cytokines act on a distance cell through circulation.

31



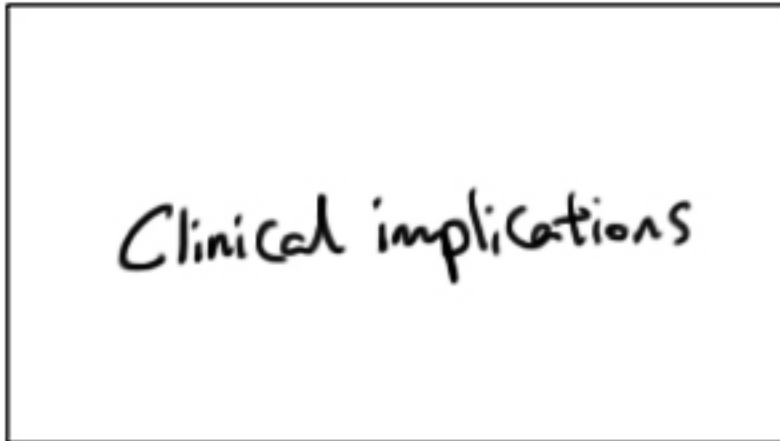
Traditionally, cytokine families are constructed based on structural commonalities, which can result in similar functions.

32



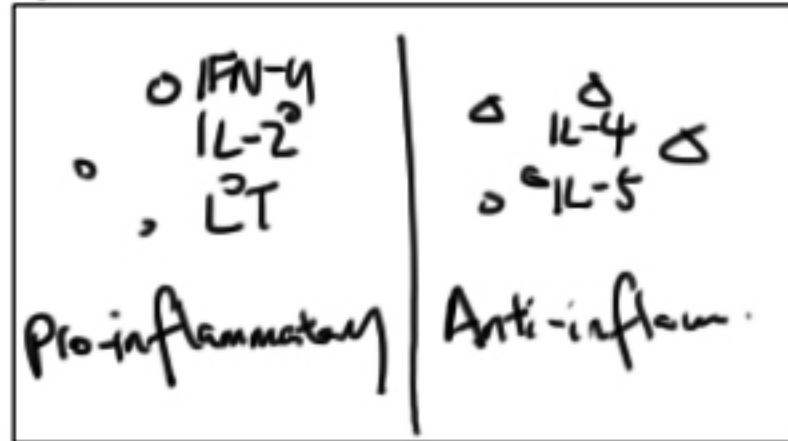
There are four families of cytokines: hematopoietin family, interferon family, tumor necrosis factor family, and chemokine family.

33



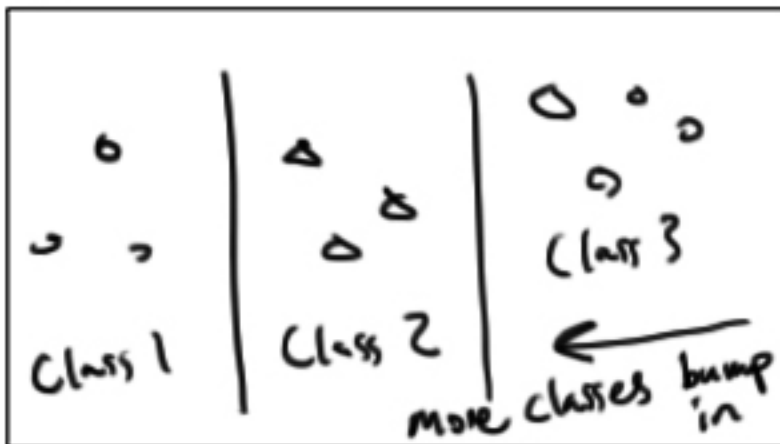
So what are the clinical implications of cytokines? Cytokines can be classified based on their functions and effects.

34



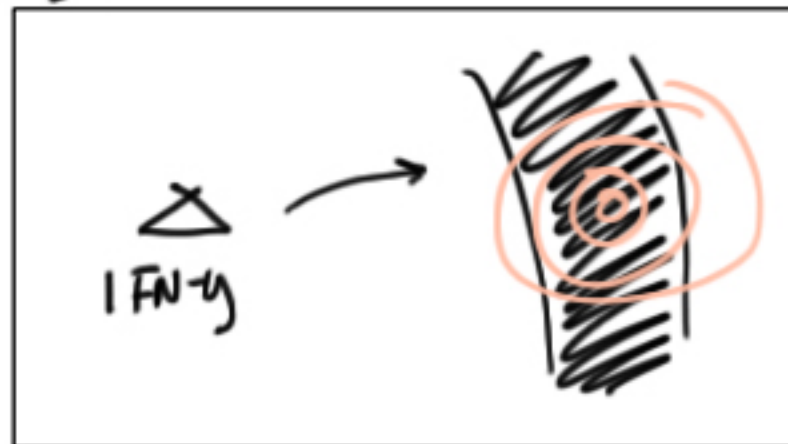
Based on function, T-cell cytokines were historically divided into 2 different families: proinflammatory, involving IFN- γ , IL-2, and LT, and anti-inflammatory, involving IL-4 and IL-5

35



With increasing knowledge, we have moved away from this 2-family classification to 3 or more classes, which will only increase with time.

36



Based on this original 2-way classification, IFN- γ is a pro-inflammatory cytokine

37



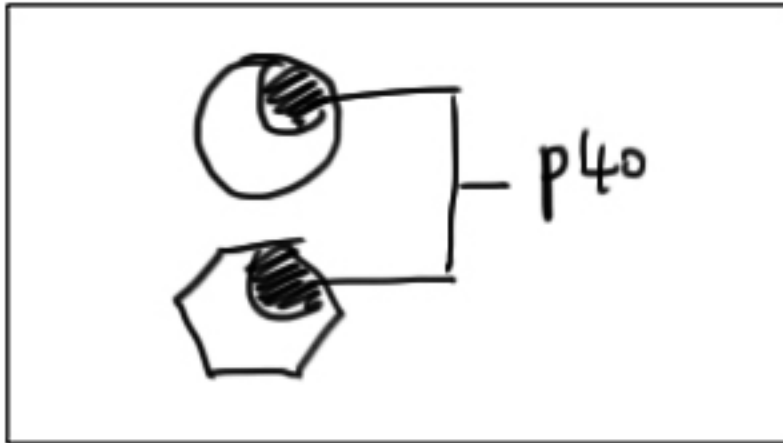
but administration of IFN- γ to the EAE mouse model for MS actually resulted in protection from the disease

38



Early evidence of resistance to autoimmunity in IL-12 deficient mice was later found to be due to knockout of the p40 subunit of IL-12.

39



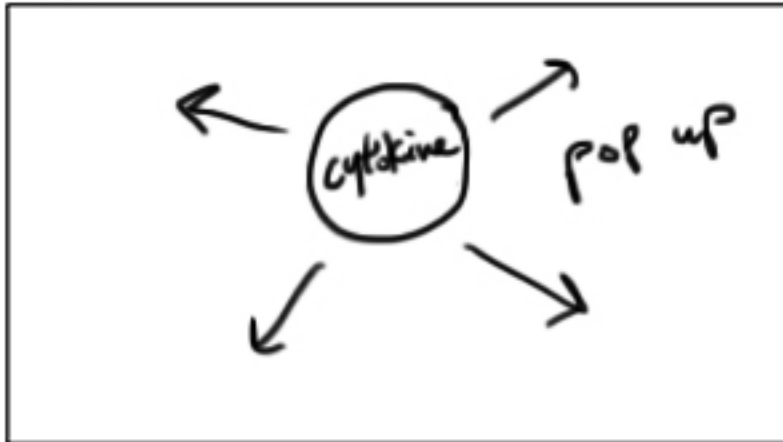
The p40 subunit is common to both IL-12 and IL-23.

40



Though related, IL-12 and IL-23 proved to have different functions. Indicating that the clinical classifications of cytokines are not as simple as pro vs. anti-inflammatory.

41



Cytokines only make up half of the story, as they cannot influence cells without signalling from appropriate receptors.

42



Watch the next video to learn about cytokine receptors and signalling pathways.