

is distinguished in that recombinant versions of this protein are used as drugs for therapy against multiple sclerosis. Interleukin-10 is distinguished in that it is a Th2-type cytokine, that it cools down the immune system, and counteracts excessive response to interferon-gamma. To repeat, the four classes of cytokines are based on the structures of the corresponding receptors, and not on the basis of the function of the cytokines themselves. It can be seen that the Type I cytokines include both Th1-type cytokines (IL-12), and Th2-type cytokines (IL-4 and IL-5).

Some of the cytokines fall into another scheme for classifying cytokines. This scheme is that of Th1-type cytokines and the Th2-type cytokines. This scheme was devised by Mosmann et al. (21).

These two classes received their name according to two different patterns of expression that are taken during immune response by CD4⁺ T cells (helper T cells) (22). Although the terms “Th1” and “Th2” take their name from “helper T cells,” the Th1-type cytokines and Th2-type cytokines are expressed not just by helper T cells, but also by CD8⁺ T cells, dendritic cells, macrophages, and others.

The Th1-type cytokines include the following:

- IL-12, and
- Interferon-gamma.

The Th2-type cytokines include the following:

- IL-4,
- IL-5,
- IL-9,
- IL-10,
- IL-13, and
- IL-25.

In addition, another category of cytokines is that of IL-17 and IL-21, also known as the “IL-17/IL-21 axis” (23,24). Interleukin-17 is expressed by Th17-type T cells. These cells are different from the classical Th1 or Th2 cells in that they tend not to express any of the classical Th1 or Th2 cytokines.

The amino acid sequence of human interferon-gamma is as follows (25).

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1  mamlrvqpea  qakvdvfred  lctktenllg  syfppkisel  daflkepaln  eanlsnlkap
61  ldipvpdpvk  ekekeerkkq  qekedkdekk  kgededkgpp  cgpvncneki  vlllqrlkpe
121 ikdvieqlnl  vttwlqlqip  riedgnnfgv  avqekvfelm  tslhtklegf  htqiskyfse
181  rgdavtkaak  qphvgdyrql  vheldeaeyr  dirilmvmeir  nayavlydii  lknfeklkkp
241  rgetkgmiy

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²¹ Mosmann TR, Cherwinski H, Bond MW, Giedlin MA, Coffman RL. Two types of murine helper T cell clone. I. Definition according to profiles of lymphokine activities and secreted proteins. *J Immunol.* 1986;136:2348–2357.

²² Zhu J, Paul WE. CD4 T cells: fates, functions, and faults. *Blood.* 2008;112:1557–1569.

²³ Kleinschek MA, Owyang AM, Joyce-Shaikh B, et al. IL-25 regulates Th17 function in autoimmune inflammation. *J Exp Med.* 2007;204:161–170.

²⁴ Zhu J, Paul WE. CD4 T cells: fates, functions, and faults. *Blood.* 2008;112:1557–1569.

²⁵ GenBank Accession No. AAA53230.1.