Effects of Muramyl Peptides on Macrophages, Monokines, and Sleep
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- Interleukin-1
- Tumor necrosis factor-\textalpha{}
- Fever
- Sleep

Abstract
Muramyl peptides are fragments of peptidoglycan from the cell walls of bacteria. Because of their unique chemistry, the immune system recognizes that muramyl peptides are products of bacteria, and it responds by becoming activated to resist infection. This resistance to infection is nonspecific, and extends to unrelated species of bacteria, fungi, and viruses. A key mechanism of the resistance to infection is activation of macrophages. Macrophage activation results in increased production of microbicidal oxygen radicals like superoxide and peroxide, and in increased secretion of inflammatory cytokines like interleukin-1\textbeta{} and tumor necrosis factor-\textalpha{}. These cytokines, besides activating neutrophils, B lymphocytes, and T lymphocytes, act on the central nervous system to induce physiological responses like fever and sleep. These physiological responses also aid in combating infection. Muramyl peptides also activate macrophages and other cells of the immune system to kill cancer cells. Muramyl peptides and similar agents will become more important as therapeutic agents in the future, due to increasing resistance of microbes to antibiotics, and increasing numbers of patients with immunodeficiencies.

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