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Product Information

Mycolic acid
from *Mycobacterium tuberculosis* (bovine strain)

Catalog Number **M4537**
Storage Temperature –20 °C

CAS RN 37281-34-8

Product Description

Among different groups of bacteria (e.g., Gram-positive, Gram-negative, spirochetes, mycobacteria, and mycoplasma), there are various types of cell envelopes that represent a departure from the normal simplicity of bacterial cell structure compared to animal cells.

Included among the components of the mycobacterium cell envelope are the cytoplasmic membrane, the cell wall, and the capsule. The cytoplasmic membrane is a phospholipid bilayer unit membrane similar to that found in eukaryotic cells. Overlaying the cytoplasmic membrane is a structure consisting of a number of polymers called the cell wall. As for most types of bacteria, highly crosslinked peptidoglycan is a component of the cell wall. Surrounding the cell wall is an outer layer called the capsule consisting of polysaccharide and protein with traces of lipid.[1]

Among the non-peptidoglycan polymers found in the cell wall, mycobacteria contain large amounts of lipids and glycolipids such as mycolic acid, arabinogalactan-lipid complex, and lipoarabinomannan. The waxy lipid mycolic acid makes up ~60% of the cell wall and contributes to the impermeability of the cell wall.

Mycolic acid is not a single molecular species, but a mixture of homologous acids. The term mycolic acid (eumycolic acids) is used to describe a mixture of closely related, long (60-90 carbon atoms), branch chained fatty acids with a molecular mass range of 1,100–1,300 Da. Some mycolic acid is covalently bound by a polysaccharide to peptidoglycan. Other mycolic acid-containing compounds are part of the thick, waxy cell wall material not attached to the peptidoglycan.[2]

Due to the high lipid content of the cell wall, mycobacteria do not stain well with Gram stain techniques. Heat and a solvent such as phenol are required for stains to penetrate mycobacteria. Once stained, however, the bacteria retain the stain even when flooded with mineral acids and alcohols. This ability to retain stains after acid washings defines acid-fast bacteria.

The impermeable cell wall impedes the entry of nutrients causing mycobacteria to grow slowly, but the low permeability also contributes to the organism's high resistance to chemical agents and resistance to lysosomal digestion by phagocytes.

Successful lysis of *Mycobacterium tuberculosis* by phagocytes causes the release of mycolic acid. The mycolic acid molecules bind to receptors on macrophages causing them to release cytokines such as tumor necrosis factor-alpha (TNF-α). Most of the damage in the lungs during tuberculosis is thought to be due to the inflammatory effects of TNF-α along with the release of toxic lysosomal components from the macrophages trying to kill the mycobacteria.[3,4]

Precautions and Disclaimer

This product is for R&D use only, not for drug, household, or other uses. Please consult the Material Safety Data Sheet for information regarding hazards and safe handling practices.

Preparation Instructions

Mycolic acid is soluble in hexane (10 mg/ml) or chloroform:methanol (9:1) (50 mg/ml) resulting in a clear, colorless solution.

Storage/Stability

Store the product at –20 °C.

References

1. Daffe, M., and Draper, P., The envelope layers of mycobacteria with reference to their pathogenicity. Adv. Microb. Physiol., **39**, 131-203 (1998).
2. Barry, C.E., 3rd et al., Mycolic acids: structure, biosynthesis and physiological functions. Prog. Lipid. Res., **37(2-3)**, 143-79 (1998).
3. Beckman, E.M. et al., Recognition of a lipid antigen by CD1-restricted $\alpha\beta^+$ T cells. Nature, **372(6507)**, 691-694 (1994).
4. Ryll, R. et al., Immunological properties of trehalose dimycolate (cord factor) and other mycolic acid-containing glycolipids--a review. Microbiol. Immunol., **45(12)**, 801-811 (2001).

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