Antibacterial Activity of Simple Coumarins: Structural Requirements for Biological Activity*

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Coumarins, Antibacterial Activity, Structure-Activity Relationships

The antibacterial activity of a series of simple coumarins was evaluated against 8 microorganisms, including three Gram-positive (Staphylococcus aureus, beta-hemolytic Streptococcus and Streptococcus pneumoniae) and five Gram-negative bacteria (Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Proteus mirabilis and Haemophilus influenzae), using the microdilution broth method. The coumarins tested showed broad diversity regarding growth inhibitory activity with minimum inhibitory concentrations ranging from 0.9 to >12.4 µm. This study, presenting the first systematic analysis of structure-activity relationships among this group of coumarins, revealed some interesting structural requirements. While coumarins with a methoxy function at C-7 and, if present, an OH group at either the C-6 or C-8 position are invariably effective against the spectrum of tested standard bacteria (Gram-negative microorganisms including the Gram-positive bacterium Staphylococcus aureus), the presence of an aromatic dimethoxy arrangement is apparently favourable against those microorganisms which require special growth factors (beta-hemolytic Streptococcus, Streptococcus pneumoniae and Haemophilus influenzae). A combination of these structural features, two methoxy functions and at least one additional phenolic group as reflected by the highly oxygenated coumarins, identify promising candidates with antibacterial broad-spectrum activity.

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