Variation of Sequence of Genes Encoding the MurMN Operon and Cell Wall Composition in Streptococcus pneumoniae Strains of Different Susceptibility Levels to Penicillin

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ABSTRACT

It has been reported that there are structural differences in the muropeptides of the cell wall in penicillin-resistant Streptococcus pneumoniae. The cell wall composition and variation of the murMN operon sequence of S. pneumoniae strains with different penicillin susceptibilities were investigated. PCR amplification and sequencing of the murM and murN genes were carried out on three selected strains of S. pneumoniae. The cell wall was then extracted and elucidated using Fourier Transfer InfraRed (FTIR) Spectroscopy, followed by proton Nuclear Magnetic Resonance (NMR) Spectroscopy. The sequences of the murM and murN genes were shown to be highly conserved while FTIR and NMR analysis suggested a branching structure of the cell wall and also the presence of ethanolamine in the resistant strain. The variations in murM and murN genes may have caused modifications in the cell wall structure leading to decreased binding capacity of penicillins and other β-lactam drugs. (J Infect Dis Antimicrob Agents 2009;26:97-108.)