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论文

壳多糖抑制细菌生长的构效关系

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摘要:

运用化学结构已清楚, 分属4大系列的29种壳多糖, 以4种不同类型的细菌(革兰氏阳性菌Ecoli K1、革兰氏阴性菌Bacillus cereus、Bacillus megaterium和Staphlylococcu aureus)为研究对象, 进行了壳多糖抑菌能力构效关系的研究. 在实验中采用96孔平板, 用计算机\|吸光值读数仪直接测定每个孔的吸光值, 获得了各个细菌在不同壳多糖浓度中的生长曲线和壳多糖抑制细菌生长的最低抑制浓度(MIC, Minimum inhibit concentration). 通过比较同一(各个)系列的壳多糖在这些相同(不同)细菌的MIC变化规律与壳多糖的化学结构的关系, 发现同一壳多糖对不同的细菌的MIC值是不相同的, 因而壳多糖抑制细菌生长的能力首先与细菌本身特点有关, 但与是否为革兰氏阳性菌或阴性菌无直接的相关性; 同一细菌对不同化学结构的壳多糖有一定的相关性, 在壳多糖的聚合程度(DP)相同的条件下, 壳多糖中氨基被乙酰化(DA)的程度越低, 壳多糖抑制细菌生长的MIC值越低, 壳多糖抑制细菌生长的能力就越强; 同样,在DA相同的情况下, 分子越小, 壳多糖抑制细菌生长的MIC值越低, 抑制细菌生长的能力越强. 根据上述实验结果, 初步推测壳多糖抑制细菌生长的机制可能与其在溶液中所带的正电荷多少有关.

关键词: 壳多糖; 抑制细菌活性; 最低抑制浓度; 细菌

Structure-Functional Relationship of Chitosans Against Bacteria

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Abstract:

The relationship between antibacterial activity of chitosans and their chemical structure(DA, degree of acelytation and DP, degree of polymerization) was investigated. MICs(minimum inhibiting concentration) of four different series of 29 different “pure” chitosans whose DA and DP were well characterized against four different bacteria(gram-positive bacterium E. coli K1, gram-negative bacteria Bacillus cereus, Bacillus megaterium and Staphlylococcu aureus) were determined with micro plate reader. The growth and MICs of these 29 chitosans against these bacteria were different for different bacteria. Antibacterial activity of chitosan depended on bacterium itself even though it was independent directly of the gram-positive or gram-negative bacterium. Every growth pattern and MIC against two bacteria(E. coli K1 and Bacillus cereus) were analyzed and compared with their chemical structure(DA and DP). The results show that antibacterial activity(or MIC) of every chitosan was different even against the same bacterium, nd the antibacterial activity of every chitosan against different bacteria was different. The antibacterial activity of a chitosan depended on the chemical structure of the chitosan, the antibacterial activity of the chitosans was increased with decreasing DA of the chitosans when DP of the chitosans was the same, and that antibacterial activity was increased with decreasing DP of the chitosans when DA of the chitosans was the same. These results suggest that static electricity might be the main force of antibacterial activity of a chitosan.

Keywords: Chitosan Antibacterial activity MIC Bacterium

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