Evolution of Capsule Synthesis Genes of *Streptococcus pneumoniae*

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Most bacterial polysaccharides are synthesized via a similar route; the repeating oligosaccharide subunit is made on a lipid-carrier molecule at the cytoplasmic surface of the membrane and after polymerization of these subunits the polysaccharide is transported and exposed on the surface of the bacterium. The structure of an oligosaccharide subunit is determined by 1) transferases that link a specific monosaccharide to a growing structure and ii) synthetases that make the specific monosaccharides. The enormous diversity in polysaccharide structures is due to variation in i) the monosaccharide composition; ii) the specific linkage between the sugars within a subunit; iii) the linkage between the subunits; iv) modifications. The molecular basis of polysaccharide synthesis and of its structural diversity is investigated using *Streptococcus pneumoniae* capsule polysaccharides as a model. This species is divided into 85 different capsular serotypes each one having its own specific polysaccharide structure. We have cloned and sequenced a large part of the capsule locus of *S. pneumoniae* serotype 14 and identified 9 ORF's (*cps14A-I*). *Cps14A-D* are probably involved in regulation and transport, while *cps14E* and *cps14G* were identified as glycosyl transferase genes Cps14E links glucose-1-phosphate to the lipid carrier. The amino acid sequence at the carboxy-terminus shows homologies to other bacterial glycosyl transferases that all catalyze the transfer of the first sugar to the lipid carrier, but they differ in the type of the monosaccharide which is transferred. Glucosyl transferase activity (like Cps14E) is found in many *S. pneumoniae* serotypes that contain glucose in their polysaccharide structure, but they not all carry a *cps14E*-like gene. Thus, *S. pneumoniae* glucosyl transferase genes are not all homologous and probably originate from different sources.

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