

Structural Studies on *Klebsiella* O Groups 1 and 6 Lipopolysaccharides

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The chemical composition of *Klebsiella* lipopolysaccharides (LPS), belonging to O groups 1 to 12, has recently been determined by Nimmich and Korten.¹ They all contain small and comparable amounts of 3-deoxyoctulosonic acid (KDO), heptose, *N*-acetyl-D-glucosamine, D-glucose, and D-galactose residues, which are most probably constituents of the common core. The sugars in the O specific side chains, which are the major sugar components present, however, vary considerably.

In the groups O1, O2, O6, O8, and O9, the LPS contains only one major sugar component, D-galactose. In the present paper, structural studies on two LPS, from *Klebsiella* K 66, O group 1 and *Klebsiella* K 64, O group 6, are reported.

In addition to the core sugars, the O1 and O6 LPS contained 48 and 54 %, respectively, of D-galactose residues. The IR spectra of the two LPS were almost superimposable and *O*-acetyl groups could not be detected (no absorption around 1740 cm⁻¹). The optical rotations were $[\alpha]_{578} + 80^\circ$ (O1) $[\alpha]_{578} + 75^\circ$ (O6). These figures are not very accurate as the LPS formed turbid solutions. It seems reasonable to assume that the optical rotation is essentially due to the D-galactose residues, which constitute about 50 % of the material. The result therefore strongly indicates that these residues are α -linked.

The lipopolysaccharides were methylated by the Hakomori procedure,² the fully methylated materials hydrolysed and the mixture of methylated sugars in the hydrolysate analysed, as their alditol acetates, by GLC-MS.³

The chromatograms of the two samples were similar, indicating that they con-

tained the same components in slightly different proportions. The major component, from its retention time and MS, was the alditol acetate of 2,4,6-tri-*O*-methyl-D-galactose. Five minor components, some of which may not be sugar derivatives, were present in amounts less than 2 % of the total. The amounts of one of these, identified as the alditol acetate of 2,3,4,6-tetra-*O*-methyl-D-galactose, were 0.4 % (O6) and 1.5 % (O1), respectively.

The O specific side chains of the O1 and O6 LPS thus consist of chains of α -(1 \rightarrow 3)-linked D-galactopyranose residues. These chains may be longer in the O6 than in the O1 LPS, as a higher percentage of 2,3,4,6-tetra-*O*-methyl-D-galactose, most probably derived from terminal groups of the O specific side chains, was obtained from the latter, which also contains the lower percentage of D-galactose residues.

As no significant differences in structure between the two LPS have been found, chemical evidence does not justify the differentiation between O groups 1 and 6. Kaluzewski,⁴ on the basis of immunological studies, has arrived at the same conclusion and suggested that O group 6 should not be regarded as a separate group, but should be included in O group 1.

Experimental. The LPS were isolated as described previously from *Klebsiella* K 66 (438/3a)⁵ and K 64 (8172).¹ The methylation analysis was performed as described before.⁶

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