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CROSS-REACTIVITY OF THE MEMBRANE TEICHOIC ACID OF *Streptococcus faecalis* N.C.I.B. 8191 IN ANTIPNEUMOCOCCAL TYPE XII AND TYPE XVI SERA*†

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ABSTRACT

The membrane teichoic acid (MTA) precipitates heavily in the equine and rabbit antipneumococcal (anti-Pn) type XII sera tested. MTA contains multiple kojibiosyl residues and this reaction confirms the presence of kojibiosyl residues in the capsular polysaccharide, S XII, the antigenic determinant of pneumococcal type XII. MTA also precipitates one-third of the antibodies in an anti-Pn XVI serum: the poly(glycerol phosphate) residues of MTA may be involved in this reaction as well as D-glucose residues. Precipitation of MTA in anti-Pn XII is strongly inhibited by kojibiose, but the reaction in anti-Pn XVI is unaffected.

INTRODUCTION

The membrane teichoic acid (MTA) of *Streptococcus faecalis* N.C.I.B. 8191 is a poly(glycerol phosphate) in which some of the hydroxyl groups of glycerol are substituted by D-alanyl and kojibiosyl[1] [2-*O*-α-D-glucopyranosyl-(1→2)-D-glucopyranosyl] residues. MTA precipitates antisera to the whole cells of this strain. The present study was undertaken because the occurrence of kojibiosyl residues in MTA suggested a possible cross-reaction in antipneumococcal (anti-Pn) type XII sera. There was also strong precipitation in anti-Pn XVI. Data on these reactions are given in Table I. After these experiments were completed, it was called to our attention that kojibiose had actually been isolated[2] from polysaccharide S XII.

MATERIALS AND METHODS

The equine antisera used were obtained from the Laboratories of the New York City and New York State Departments of Health. Quantitative microanalyses for

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antibody nitrogen precipitated in the cross-reactions were carried out as described in previous papers[3,4].

RESULTS

Table I shows that MTA gives heavy precipitates in anti-Pn XII and anti-Pn XVI sera and (footnotes b and c) that the precipitates actually involve antibody and not non-specific protein. Inhibition tests with kojibiose, kindly provided by Dr. E. A. Kabat, showed a strong effect with MTA and anti-Pn XII, and no inhibition with MTA and anti-Pn XVI.

TABLE I

CROSS-REACTIONS OF THE MEMBRANE TEICHOIC ACID OF *Streptococcus faecalis* N.C.I.B. 8191

Substance	*Weight (μg)*	*Weight (μg) of antibody N precipitated from antipneumococcal type*[a]	
		XII296	*XVI594*
Homologous polysaccharide			
	250	1000	
	500		872
Membrane teichoic acid			
	100	222	55
	200	322	111
	300	410[b]	
	400	465[b]	174
	500	490[b]	
	800		271[c]
	1200		299[c]
	1500		281

[a]At 0° per ml of equine antiserum. The sera were absorbed with group-specific pneumococcal C-substance. [b]Supernatants + 180 μg of Pn polysaccharide S XII gave 450 μg N; total 905 μg. [c]Supernatants + 380 μg of Pn polysaccharide S XVI gave 415 μg N.

DISCUSSION

The strong reactivity of the membrane teichoic acid in antipneumococcal type XII sera is of interest for several reasons. It had been suspected[5–7] that kojibiosyl residues occurred in the capsular polysaccharide, S XII, the type-specific determinant of pneumococcal type XII. Dextrans containing (1→2) linkages of D-glucose residues precipitated in anti-Pn XII serum more or less strongly and yielded kojibiose, among other products, on mild hydrolysis. This disaccharide was also the best inhibitor of the cross-reaction of such dextrans in anti-Pn XII serum. Kojibiosyl residues are present in MTA[1], so that the strong reaction of this substance in anti-Pn XII, added to previous evidence, confirms the presence of multiple[8] kojibiosyl residues in polysaccharide S XII. Kojibiose has now been isolated[2] from S XII.

MTA was also found to give heavy precipitation in the anti-Pn XVI serum available (Table I). Polysaccharide S XVI, the type-specific antigenic determinant of

pneumococcal type XVI, is composed of galactose, glucose, rhamnose, galactosamine, glucosamine, and glycerophosphate residues[9]. Anti-Pn XVI serum had previously been found to precipitate weakly with streptococcal poly(glycerol phosphate)[10]. It is therefore possible that polysaccharide S XVI contains (1→2)-linked residues of D-glucose, the only sugar common to MTA and S XVI, and that these residues reinforce the reaction due to multiple residues of glycerol phosphate.

EXPERIMENTAL

The data obtained for cross-reactive precipitating antibody are given in Table I. Inhibition tests were performed in a total volume of 0.315 ml and the tubes were kept at 0° for 11 days. MTA, anti-Pn XII, saline: 45 μg N; MTA, anti-Pn XII, 3.8μM kojibiose: 4.5 μg N; inhibition, 90%. A similar experiment with anti-Pn XVI gave 32 and 31 μg N without and with 3.8μM kojibiose, respectively.

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