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SHORT COMMUNICATION

FINDING OF A *g*-DETERMINANT IN THE FLAGELLA OF *SALMONELLA HAELSINGBORG*

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In the Kauffmann-White classification of *Salmonella* serotypes (Kauffmann, 1961), one of the antigenic groups, *g*, is usually associated with some of others, *f*, *m*, *p*, *q*, *s*, *t* and *u* (cf. Table 1), and this is interesting with respect to the phylogeny of the serotypes. However, *S. haelsingborg*, according to Kauffmann's serotype, apparently lacks the *g* antigen, while it contains *m*, *p*, *t* and *u* antigens (Kauffmann et al. 1957). It has been argued that Kauffmann's criterion for absence of the antigen *g* is merely his observation that H antiserum of *S. rostock* with flagellar antigen *gpu* was completely absorbed by a combination of the serotype in question and *S. enteritidis* with the established antigenic

TABLE 1. *Tube agglutination tests by H antiserum to S. haelsingborg*

Strains used as agglutinogen		serotype	Agglutination titer
S. haelsingborg	#505	6,7; mptu: —	1:2304
S. amsterdam	#564	3,10; gms: —	1: 288
S. dublin	NCTC4197	9,12; gp: —	1: 576
S. bechuana	#532	4,12,27; gt: —	1: 144
S. milwaukee[a]		43; fg: —	1: 576
S. moscow	NCTC5797	9,12; gq: —	1: 576
S. derby	NCTC1729	4,12; fg: —	1: 288
	Tr16[b]	4,12; fg: —	1: 144
O cells of S. haelsingborg		6,7	< 1: 36

Formalin-killed bacteria were injected intravenously into rabbits and the antisera were absorbed with O cells of the strain which had been boiled at 100°C for 2 hours and thoroughly washed.

a: This strain was obtained from the Japanese National Salmonella Center.

b: Tr16 was prepared by introducing the allele of flagellar antigens *fg* in NCTC1729 to a phase 1 stable strain of *S. abortus-equi* with phage P22-mediated transduction.

composition *gm*. However, this does not necessarily mean that *S. haelsingborg* lacks *g* antigen. We have therefore reinvestigated the antigenic composition of *S. haelsingborg* and have established that antigen *g* is present in its flagella.

A stock culture of *S. haelsingborg*, #505, was obtained from the Salmonella Reference Laboratory, the National Collection of Type Cultures, London, and antiserum to this was prepared by immunizing a rabbit with formalin-killed bacteria. The antiserum was absorbed with O cells. The H antiserum agglutinated not only bacteria carrying *gms*, *gp* or *gt*, but also those bearing no common determinants, *fg* or *gq* (cf. Table 1). *g* Antigen is common to all these cross-reacting serotypes and therefore it was infered that *S. haelsingborg* contains the antigen.

The antigenic determinant, *g*, has recently been shown to be further divisible into at least 5 distinct determinants, g_1, g_2, g_3, g_4 and g_5 (Yamaguchi and Iino, 1969). To see which *g* antigen is present in *S. haelsingborg*, reagent antisera specific to g_3f, g_4f and *f* were prepared by absorption of anti-Tr16 with appropriate transductants having various compositions of *g* determinants as shown in Table 2. Antibodies to O antigens were also removed completely by the absorption procedure. The positive agglutination of *S. haelsingborg* by anti-Tr16, from which antibodies to O antigens had been removed, was restored on absorption of antibody to g_4 but disappeared on removal of antibody to g_3.

To test for the presence of g_1 and g_2 determinant, two antigenic recombinants, SJ1744 and SJ1747, antigenic compositions of which are listed in Table 3 and specific antisera to them provided monospecific reagents to g_1 and g_2. Neither anti-g_1 nor anti-g_2 could agglutinate *S. haelsingborg*.

The results presented here demonstrate the presence of *g* antigen, identified as g_3, and Kauffmann's description need be modified accordingly, as *gmptu*.

TABLE 2. *Agglutination tests of S. haelsingborg with anti-Tr16 absorbed with other appropriate transductants*

Strains used as agglutinogen	Anti-g_3f^a	Anti-g_3f^b	Anti-g_4f^c	Anti-f^d	saline
Tr16	+	+	+	+	−
Tr6	+	+	−	−	−
Tr17	−	−	+	−	−
Tr11	−	−	+	−	−
#505 (S. haelsingborg)	+	+	−	−	−

The compositions of flagellar antigens of these transductants are given by Yamaguchi and Iino (1969) as: Tr6 ((g_0), g_1, g_2, g_3, *t*), *Tr11* ((g_0), g_1, g_4, g_5, *p*), *Tr16* ((g_0), g_3, g_4, *f*), *and Tr17* ((g_0), g_1, g_2, g_4, g_5, *m*).
a: anti-Tr16 was absorbed with Tr17.
b: anti-Tr16 was absorbed with Tr11.
c: anti-Tr16 was absorbed with Tr6.
d: anti-Tr16 was absorbed with Tr11 and Tr6.

TABLE 3. *Negative agglutination of S. haelsingborg with monospecific reagents to g_1 and g_2*

Strains used as agglutinogen	Anti-$g_1{}^a$	Anti-$g_2{}^b$	saline
Tr6	+	+	−
Tr16	−	−	−
Tr17	+	+	−
SJ1747	−	+	−
#505 (S. haelsingborg)	−	−	−

The compositions of flagellar antigens of SJ1744 and SJ1747, which are antigenic recombinants between Tr16 and Tr6, are given by Yamaguchi and Iino (1969) as: SJ1744 ($P22^+$) ((g_0), g_1, g_2, g_3, g_4, *f*), *and SJ1747* ($P22^+$) ((g_0), g_2, g_3, g_4, *f*).
a: anti-SJ1744 serum was absorbed with SJ1747.
b: anti-SJ1747 serum was absorbed with Tr16 ($P22^+$).

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