

SALMONELLA RUBISLAW WITH THREE "NORMAL" FLAGELLAR ANTIGENS

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Edwards, McWhorter, and Douglas (J. Bacteriol. **84**:95, 1962) and McWhorter and Edwards (J. Bacteriol. **85**:1440, 1963) reviewed the subject of diphasic *Salmonella* serotypes that possess three or more recognizable flagellar components. These investigators noted that in certain instances complex forms possessed well-known and recognized *Salmonella* flagellar antigens, such as in *S. salinatis* (4,12:d,e,h:d,e,n,z₁₅), whereas in others the microorganisms contained more recently characterized antigens, such as z₄₃ or z₄₅, as a major component of both phases. The culture (2209-63) described here was an unusual example of the first of the two above-mentioned categories.

Culture 2209-63 was isolated from a stool specimen of a male child, aged 2 months, who was ill with gastroenteritis and was hospitalized in Louisiana. The biochemical reactions given by the culture were similar to those given by members of the genus *Salmonella*, and the strain was a member of subgenus I of Kauffmann (Acta Pathol. Microbiol. Scand. **49**:293, 1960; **58**:109, 1963). However, it differed from the standard strain of *S. rubislaw* in that it utilized *l*-tartrate but failed to utilize *i*-tartrate and mucate.

The strain was a member of *Salmonella* O antigen group 11, was agglutinated to the titer of an O antiserum prepared with *S. aberdeen* (O11), and in absorption tests removed all agglutinin from that antiserum. When received, the culture

was flocculated to the titer of H antiserum *d* derived from *S. typhi*, but not by diagnostic dilutions of other *Salmonella* H antisera. When numerous single colonies from platings were examined, it was found that about 85% agglutinated in diagnostic dilutions of *d* antiserum alone, whereas the remainder reacted strongly in *d* and *e,n,x* antisera (phases 1 and 2, respectively, Table 1). Five colonies that were agglutinated by *d* antiserum alone were placed in semisolid medium containing *d* antiserum. Four of these yielded forms that were agglutinated only by *r* antiserum, and one colony gave rise to a form that was flocculated only by *e,n,x* antiserum. When similarly treated, five colonies, which originally were agglutinated by both *d* and *e,n,x* antisera, yielded *e,n,x* forms and a sixth yielded a *r* form. Single-colony isolations from more than 20 cultures (including the 11 colonies mentioned above) that had been passed through *d* antiserum were placed in semisolid medium that contained both *r* and *e,n,x* antisera and passed serially through five transfers. In every instance, these cultures were immobilized and the *d* form was not recovered.

The *r* and *e,n,x* phases (Table 1) of culture 2209-63 were identical with those of *S. rubislaw* phase 1 (*r*) and *S. abortus equi* (*S. abortivoequina*) (*e,n,x*), respectively, as demonstrated by appropriate agglutinin-absorption tests. The *d* antigen of 2209-63 reduced the titer of *S. typhi d* antiserum from 1:12,800 to 1:400 in absorption tests; hence, it was not identical with the *d* antigen of *S. typhi*.

Thus, the antigenic composition of culture 2209-63 was characterized as 11:d,r:d,e,n,x. Since it was possible to derive a culture indistinguishable from *S. rubislaw* (11:r:e,n,x) from culture 2209-63, it was regarded as a complex form of that serotype, and completely comparable with complex forms of *S. montgomery* (Edwards, Kauffmann, and Huey, Acta Pathol. Microbiol. Scand. **41**:517, 1957) and *S. salinatis* (Edwards and Bruner, J. Bacteriol. **44**:289, 1942).

TABLE 1. Agglutination reactions of the flagellar antigens of *Salmonella rubislaw* 2209-63

Antigen	Antiserum		
	<i>S. typhi</i> (<i>d</i>)	<i>S. rubislaw</i> phase 1 (<i>r</i>)	<i>S. abortus equi</i> (<i>e,n,x</i>)
2209-63, phase 1*	6,400	100	<100
2209-63, phase 2*	3,200	<100	3,200
2209-63, <i>r</i> phase†	<100	6,400	<100
2209-63, <i>e,n,x</i> phase†	<100	400	3,200

* From single colonies from original culture.

† The *r* and *e,n,x* phases of culture 2209-63 were obtained by passage of phase 1 and phase 2, respectively, through *d* antiserum.