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A NEW SALMONELLA SEROTYPE, SALMONELLA TRAVIS (4, 5, 12:g, (p), z_{51}:1, 7) AND A REDEFINITION OF THE H ANTIGENS OF SEVERAL SALMONELLA SEROTYPES

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SUMMARY: A new Salmonella serotype, Salmonella travis (4,5,12:g,(p),z_{51}:1,7) is described. The factor z_{51} is closely related to Arizona H antigen 13. This factor also is present in Salmonella alamo, Salmonella new-mexico, Salmonella wayne, and Salmonella maricopa. The antigenic formula for phase 1 of these types is emended to g, (p), z_{51}. The method of preparation of factor serum for antigen z_{51} is described.

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The organism to be described, 5063-61, was isolated in the laboratories of the Texas State Department of Health from the stool of a person affected with diarrhea. The bacterium was motile and possessed the biochemical characteristics of the family Enterobacteriaceae and of subgenus I of the genus Salmonella (Kauffmann, 1960). The organism failed to produce indol, was methyl red positive and Voges-Proskauer negative, grew rapidly on Simmons' citrate medium, produced hydrogen sulfide but failed to produce urease or phenylalanine deaminase, liquefied gelatin and failed to grow in Moeller's KCN medium. Lysine and ornithine decarboxylase and arginine dihydrolase were produced. When tested by the method of Kauffmann and Petersen (1956), D-tartrate, citrate and mucate were utilized rapidly. I-tartrate and malonate were not utilized. Glucose, arabinose, rhamnose, maltose, trehalose, dulcitol, mannitol, and sorbitol were fermented rapidly with production of gas. Glycerol was fermented after three days and cellobiose after five days incubation. Lactose, sucrose, raffinose, adonitol, inositol, and salicin were not fermented.

Serologic examination revealed that the organism was a member of Salmonella O group B and possessed somatic antigens 4, 5, 12. It was agglutinated to the titre of Salmonella typhi-murium O serum and in absorption tests removed all agglutinins from the serum. The H antigens of the organism were diphasic. When first examined in flagellar sera, the culture flocculated readily with sera derived from antigens 1, 2; 1, 5; 1, 6; and 1, 7. When tested with single factor sera for antigens 2, 5, 6 and 7, agglutination occurred only in serum for factor 7. The organism was flocculated to half the titre of sera derived from phase 2 of Salmonella bredeney (1, 7) and Salmonella madelia (1, 7). In absorption tests 5063-61, phase 2 failed to remove all agglutinins from either serum and in addition agglutinins for Salmonella paratyphi B, phase 2, (1, 2) and Salmonella thompson, phase 2 (1, 5) remained after absorption. All agglutinins for Salmonella anatum, phase 2 (1, 6) were removed from the two sera by absorption with 5063-61. While phase 2 of 5063-61 obviously was 1, 7, the antigens were quite different from those of the 1, 7 phase of S. bredeney and S. madelia.

Phase 1 of the H antigens was obtained by migration of the organism through semisolid medium that contained 1, 7 serum. The phase thus obtained was agglutinated slowly and weakly by S. dublin (g, p) serum but not by diagnostic dilutions of other Salmonella H sera. When examined in tube tests with single factor sera for antigens f, m, p, q, s, t, and u, the organism failed to react in the usual diagnostic doses of the sera. When larger amounts of the sera were added, the culture flocculated slowly and weakly in q serum but not in the other factor sera. In slide tests with living cultures, slight agglutination was observed in f, p, and q sera. In comparable tests kindly performed by Dr. F. Kauffmann and Dr. R. Rohde weak positive reactions were obtained in f and p sera, while Dr. Joan Taylor noted a very weak positive reaction in q serum only.

From the conflicting results, together with the fact that phase 1 of 5063-61 reacted only in low dilutions of Salmonella H sera, it was obvious that the major antigens of phase 1 did not correspond to the recognized H antigens of the Salmonella group. On the contrary, phase 1 of 5063-61 was agglutinated to the titre of sera for H antigens 13, 14 and 13, 15 of the Arizona group which are known to be related slightly to Salmonella H antigens g, p. This behavior closely

resembled that of Salmonella alamo (6, 7:g, (p):1, 5), Salmonella new-mexico (9, 12:g, (p):1, 5), Salmonella wayne (30:g, (p):-) and Salmonella maricopa (1, 42:g, (p):1, 5) of Edwards, Kauffmann and Fife (1961). When phase 1 of 5063-61 was tested with sera prepared respectively from phase 1 of S. alamo, S. wayne, and S. maricopa, flocculation occurred to the titres of the three sera. Further, in absorption tests phase 1 of 5063-61 removed all H agglutinins from the three sera, even though S. alamo, S. wayne, and S. maricopa each are known to contain small specific fractions not shared by the others. Thus, it was evident that the antigens of phase 1 of 5063-61, as well as those of phase 1 of S. alamo, S. new-mexico, S. wayne and S. maricopa, contained a very strong flagellar component not shared by other known Salmonella types. In order to prepare a factor serum specific for this component, S. maricopa, phase 1 serum was absorbed with various serotypes which had H antigens related to those of S. dublin. It was found necessary to absorb the serum with a combination of S. dublin, S. moscow, and S. budapest in order to prepare a serum specific for 5063-61, S. alamo, S. new-mexico, S. wayne and S. maricopa. The specific factor thus obtained was a very strong one which amounted to half the titre of the unabsorbed serum. This antigenic factor was assigned the symbol z_{51}*. The H antigens of phase 1 of all of these organisms were designated g, (p), z_{51}. The culture 5063-61 was assigned the name Salmonella travis. The antigenic formulas of S. travis and the other types in question should be expressed as follows:

S. travis 4, 5, 12:g, (p), z_{51}:1, 7
S. alamo 6, 7:g, (p), z_{51}:1, 5
S. new-mexico 9, 12:g, (p), z_{51}:1, 5
S. wayne 30:g, (p), z_{51}:-
S. maricopa 1, 42:g, (p), z_{51}:1, 5

Inclusion of the factor z_{51} in the antigenic formulas of these serotypes permits much better characterization and much easier recognition of their antigens.

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