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Serologic Relationship Between Streptococcus Group H and *Streptococcus sanguis.*

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Definition of streptococcus group H by Hare[1] was based on cultures from apparently normal throats. Little has since been published on strains of this serologic group. Lancefield[2] included it in her review of hemolytic streptococci. Hehre and Neill,[3] studying dextran formation by streptococci from cases of subacute bacterial endocarditis, observed that many strains producing dextran belonged to group H. Loewe and others[4] described a streptococcus isolated from cases of subacute bacterial endocarditis that required large doses of penicillin for successful treatment. The strains produced green discoloration of blood agar and dextran from sucrose. They were designated *Streptococcus* s.b.e. and, later, *Streptococcus sanguis*.[5] Their relationship to group H was not determined.

Thirty-six streptococcus strains isolated from samples of air* and 4 from cases of subacute bacterial endocarditis which were identified as group H have been studied in comparison with 6 strains of group H identified by Dr. Ronald Hare, and with 2 strains of *Streptococcus sanguis,* types I and II from Dr. James Sherman.

All strains produced small colonies on blood agar and grew well in beef infusion broth.[6] Many strains produced green discoloration of blood agar. A few, including the group H strains from Doctor Hare, produced hemolytic and green colonies. All strains fermented sucrose. The colonies of all except 8 strains from air samples and 2 from subacute bacterial endocarditis were altered in appearance when grown on blood agar containing 5% sucrose.[3] Precipitation with 1.2% alcohol of the sucrose broth cultures of 27 of the strains producing such colonies suggested dextran production. No correlation was noted between dextran production and fermentation of raffinose and salicin.[3,4]

Antisera were produced in rabbits by immunization with heated and formalin treated cells of streptococcus group H No. 36251 and *Streptococcus sanguis* types I and II. Untreated hydrochloric acid extracts[7] and extracts partially purified by precipitation with three volumes of 95% alcohol[8] were used. Reproducible results were obtained with the alcohol precipitated extracts, while some variation was noted in the reactivity of the untreated ones. Extracts of the 6 representative group H strains and of the 2 strains of *Streptococcus sanguis* reacted with group H and *Streptococcus sanguis* antisera in the precipitation test. Tests with absorbed sera demonstrated antigenic differences.

Extracts of strains from air samples and from subacute bacterial endocarditis were tested with the unabsorbed sera and 3 absorbed sera (Table I). These absorbed antisera were chosen because they served to separate the group H and *Streptococcus sanguis* strains into 4 divisions represented by

1 Hare, Ronald, *J. Path. and Bact.*, 1935, **41**, 499.

2 Lancefield, R. C., In Harvey Society, New York. Harvey lectures, 1940-41, Series 36, 251.

3 Hehre, E. J., and Neill, J. M., *J. Exp. Med.*, 1946, **83**, 147.

4 Loewe, Leo, and others, *J. Am. Med. Assn.*, 1946, **130**, 257.

5 White, J. C., Streptococci from subacute bacterial endocarditis. Ithaca, N. Y., Cornell University, 1944, 47 p. Thesis.

* These cultures were isolated from air samples taken in schools in New York State in the course of a study of the effect of ultraviolet irradiation.

6 Wadsworth, A. B., Standard Methods of the Division of Laboratories and Research of the New York State Department of Health; 3rd ed. Baltimore, Williams and Wilkins, 1947, p. 186.

7 Lancefield R. C., *J. Exp. Med.*, 1928, **47**, 91.

8 Lancefield, R. C., *J. Exp. Med.*, 1934, **59**, 441.

TABLE I.
Serologic Relationship of Representative Strains of Streptococcus Group H and *Streptococcus sanguis*.

Culture extracts		Antisera: Group H 36251				Sanguis type I 4647				Sanguis type II 4648			
			Absorbed with				Absorbed with				Absorbed with		
Original designation	Group and strain	Not abs.	4647	4648	36658	Not abs.	36251	4648	36658	Not abs.	36251	4647	36658
Perrier	H36251	+*	+	+	+*	+*	—	—*	—*	+*	—	+	—
Sanguis I	4647	+	—	—	—	+	+	+	+	+	—	—	—
" II	4648	+	+	—	—	+	+	—	—	+	—	+	—
Challis	H36658	+	+	—	—	+	+	+	—	+	—	+	—

+ Indicates ring formation in 10 min. and a definite cloud or precipitate in 2 hr at 35°C.
* These sera were used in the differentiation of strains.

TABLE II.
Serologic Differences Among Strains Identified as Streptococcus Group H.

Source	Colony on 5% sucrose blood agar	Number of strains with reactivity similar to: No. 36251 group H	No. 4647 *Strep. sanguis* type I	No. 4648 *Strep. sanguis* type II	No. 36658 group H
Air sample	Altered	9	4	15	0
	Unchanged	2	1	5	0
Subacute bacterial endocarditis	Altered	0	0	2	0
	Unchanged	0	0	2	0

strains Nos. 36251, 4647, 4648 and 36658.

Table II indicates the distribution among these 4 divisions of strains from air and subacute bacterial endocarditis. Of 40 streptococcus strains from samples of air and from cases of subacute bacterial endocarditis identified as streptococcus group H, eleven reacted similarly to group H No. 36251; 5 appeared similar to *Streptococcus sanguis* type I and 22 to type II, under the conditions of the test. Extracts of 2 air sample strains, one of which produced colonies with altered appearance on 5% sucrose blood agar, reacted only in unabsorbed group H No. 36251 antiserum.

Summary. Representative strains of streptococcus group H and *Streptococcus sanguis* and of 40 strains from samples of air and from cases of subacute bacterial endocarditis identified as group H were tested with unabsorbed and selected absorbed antisera produced against streptococcus group H No. 36251 and *Streptococcus sanguis* types I and II. The results of the tests indicated that the strains belonged in at least 5 antigenically different types.