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Association of Characters Among Dissociates from *Staphylococcus aureus.**

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Pinner and Voldrich[1] found that *albus* "dissociates" of *Staphylococcus aureus* are of low virulence and produce little or no hemolysin, coagulase or gelatin-liquefying enzyme. Burnet,[2] however, reports that in the absence of CO_2 his *albus* dissociates produced more hemolysin though less coagulase than his undissociated cultures.

We have studied enzyme-production in 36 paired smooth dissociates from 15 *aureus* strains (rough variants not studied). Thirteen pairs were obtained by plating 13 stock cultures and selecting the lightest and darkest colony on each plate. Eight pairs were isolated by the same technic from 5 *aureus* strains aged for 30 days in veal-infusion-broth. Fifteen pairs were isolated from 5-day cultures grown in oxalated Walbum's medium. Relative hemolysin, fibrinolysin, coagulase, gelatin-liquefaction and violet-reaction were determined for each pair.

To determine the association between any 2 characters, the entire population (72 dissociates) was divided as follows: *Group AB,* cultures in which relatively-high character A is associated with relatively-high character B, when comparison is made between the 2 paired dissociates from the same parent strain. *Group ab,* cultures in which relatively-non-high A (i. e. equal or relatively-low) and relatively-non-high B are similarly associated. *Groups Ab and aB,* cultures in which high A is associated with non-high B; or non-high A with high B.

The approximate ratio ("betting odds") in favor of a parallel quantitative variation in A and B was calculated by the formula, $R = (AB+ab)/(Ab+aB)$. The mathematical coefficient of association[3] was determined by the formula:

$$Q = \frac{(AB)\ (ab) - (Ab)\ (aB)}{(AB)\ (ab) + (Ab)\ (aB)}$$

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1 Pinner, M., and Voldrich, M., *J. Infect. Dis.*, 1932, **50**, 185.

2 Burnet, F. M., *J. Path. and Bact.*, 1930, **33**, 1.

3 Yule, G. U., An introduction to the theory of statistics, 1927, p. 37.

Ratios and coefficients thus obtained are recorded in Table I.

TABLE I.

Association of Characters in *Staphylococcus aureus.*

Relative hemolysin production was determined *for each pair* by parallel tests with 48-hour peptone-ammonium lactate-broth-cultures grown in the presence of 25% CO_2. Relative fibrinolysin production was determined for each pair by the fibrin-clot technic of Tillett and Garner.[4] Relative coagulase, by the clotting time of citrated human plasma plus an equal volume of 48-hour peptone-broth-culture. Relative gelatin-liquefaction, by stab-cultures (20° C.). Relative reaction to the violet-test, by the technic of Chapman and Berens.[5]

Character A	Character B	Correlation-groups AB	ab	Ab	aB	*R*	Q
Pale* color	High hemolysin	22	33	14	3	*3:1*	**89%**
" "	" gelatin-liquefaction	22	30	14	6	*5:2*	**77%**
" "	" fibrinolysin	11	36	25	0	*2:1*	**100%**
High hemolysin	" gelatin-liquefaction	21	40	4	7	*6:1*	**94%**
" "	" fibrinolysin	11	47	14	0	*4:1*	**100%**
High gelatin-liquefaction	" "	10	43	18	1	*5:2*	**92%**
Pale color	Equal* coagulase	35	1	1	35	*1:1*	**0%**
" "	" violet-reaction	35	1	1	35	*1:1*	**0%**

*In applying the formulæ relatively-pale color = A; relatively-dark color = a; equal coagulase = B; non-equal = b, etc.

[4] Tillett, W. S., and Garner, R. L., *J. Exp. Med.*, 1933, **58**, 485.

[5] Chapman, G. H., and Berens, C., *J. Bact.*, 1935, **29**, 437.

The table shows that relatively-high hemolysin, relatively-high gelatin-liquefaction and relatively-high fibrinolysin are each associated with relatively-low orange-pigment (or relatively-high white-pigment) production. In contrast with this association the violet-reaction and coagulase-production are apparently constant in spite of quantitative variations in pigment-production.