A Coagulase-destroying Factor produced by Variants of *Staphylococcus aureus*

It has recently been shown[1] that rough variants of *Staphylococcus aureus* give high, and smooth variants low, yields of coagulase. The present communication shows that certain smooth variants produce a factor capable of destroying coagulase.

It was noticed that some colonies of the smooth variants were surrounded, on 'chocolate' agar, by a zone of discoloration and transparency. Cultures made from such colonies were more proteolytic (speed of liquefaction of gelatin, peptonization of milk), and yielded less coagulase than smooth variants with no action on chocolate agar. Some, in fact, did not clot plasma in 24–48 hr.; it is important, however, to mention that these were unstable and sooner or later gave rise to coagulase-positive cultures. From both the weakly positive and the apparently coagulase-negative, proteolytic variants a coagulase-destroying factor was isolated.

Many colonies showing a maximum zone of discoloration on chocolate agar were selected; each colony was suspended in 2 ml. of saline and inoculated on to a large agar slope in an 8-oz. flat bottle. After 18 hr. incubation at 37° C. each slope was washed with 4 ml. of meat-extract broth (*p*H 7·2); the suspensions were spun, the sediments discarded and the supernatants tested for plasma-clotting power. Those failing to cause clot in 24 hr. or with long clotting times (more than 6 hr.) generally contained the coagulase-destroying factor.

The coagulase-destroying activity of the supernatants was estimated in the following manner: mixtures of cell-free, heated coagulase were made with: (*a*) the supernatant, (*b*) the autoclaved supernatant and (*c*) meat-extract broth of a *p*H identical with that of the supernatant. All reagents contained 0·1 per cent merthiolate. Destruction of coagulase was revealed by a progressive increase of clotting time and decrease of titre of the mixture of coagulase with non-autoclaved supernatant (*a*); no destruction of coagulase was observed in the controls (*b*) and (*c*).

Variants showing the presence of the coagulase-destroying factor were found in all of ten strains examined, five strains giving extremely active variants. Thus the clotting power of a coagulase of a titre of 1 : 8,000 and a clotting time of 2 min. was completely abolished by incubation for 24 hr. with an equal volume of a very active supernatant. With potent preparations of the coagulase-destroying factor the destruction of coagulase at 37° C. became apparent 15–30 min. after mixing and progressed for 24–40 hr. The activity of the coagulase-destroying factor was most marked at a *p*H of 6·8–7·2; the activity was not strain specific. Cell-free coagulase-destroying factor was obtained by filtration through sintered glass and could be concentrated by cold (4° C.) precipitation with ten volumes of ethanol. The activity of the crude preparation was partly lost on heating for 10 min. at 70° C. and abolished by boiling for 30 min.; the ethanol-precipitated preparation was more heat-sensitive. The coagulase-destroying factor was inhibited by whole serum (man and horse), by serum globulins and by egg white.

Purely as a working hypothesis, it is assumed that the coagulase-destroying factor is a proteolytic enzyme. It is thought that along with the rough ⟷ smooth variation in *Staphylococcus aureus* the occurrence of this factor may explain the irregularity of coagulase production *in vitro* observed by many workers. It seems also logical to believe that the coagulase-destroying factor is at least partly responsible for the low coagulase yields of smooth variants of this organism.

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[1] Smith, D. D., Morrison, R. B., and Lominski, I., *J. Path. Bact.*, **64**, 567 (1952).

Noise from Aircraft at Supersonic Speeds

T. GOLD, in *Nature* of November 8[1], has directed attention to the need for an explanation of the bangs that have been heard when aircraft in the vicinity have exceeded the speed of sound.

Gold develops his argument sufficiently far as to indicate when bangs may be expected. Briefly, an observer will experience a bang from every occasion on which the aircraft is travelling towards him at the speed of sound. This happens whenever $-dr/dt = c$, where r is the scalar distance of the aircraft from the observer, and c is the speed of sound. We see at once that triple and quadruple bangs will occur if there are three or four occasions respectively on which the aircraft is travelling towards the observer at sonic speed. Moreover, the aircraft itself does not have to pass through sonic speed more than twice to cause such multiple bangs: they can be caused by changes of course.

The occurrence of bangs having been explained, one must next consider their intensity. This will depend primarily upon d^2r/dt^2, varying inversely as the square root of this quantity if d^3r/dt^3 and higher derivatives can be neglected. It should be noted that d^2r/dt^2 is not the acceleration of the aircraft away from the observer, which is $d^2r/dt^2 - r(d\theta/dt)^2$. For d^2r/dt^2 small, the intensity will depend also upon d^3r/dt^3. A flight path such that dr/dt is constant and equal to $-c$ is of interest, as d^2r/dt^2, d^3r/dt^3 and all higher derivatives are zero, and a bang of enhanced intensity would be expected. Such a flight path is the equiangular spiral of angle equal to the Mach angle, $r = r_0 \exp\{-\theta/\sqrt{(M^2-1)}\}$, where M is the Mach number. It degenerates for a Mach number of unity into a straight line, and for a Mach number of infinity into a circle. The former is of interest in indicating that disturbances of enhanced intensity are to be expected from periods of steady flight at a Mach number of unity, although they will be localized, and will be experienced only by observers in the direct line of flight.

The final point that needs clarification is the cause of the bangs. Three possible sources of the disturbances can be put forward, the disturbances in all cases being propagated in the same manner, as outlined by Gold. First, there are the aerodynamic disturbances that would result from flight through an inviscid fluid: these will depend upon the size and shape of the aircraft. Secondly, there are the aerodynamic disturbances due to the turbulence created by the boundary layers, by regions of flow