Experiments in which oysters were fed *Chlorella* sp., *Nitzschia closterium*, *Euglena viridis*, other plankton forms, and a common variety of yeast have shown that there are rather definite concentrations above which the density of the microorganisms begins to interfere with the feeding of oysters. These concentrations corresponded to approximately 2,000,000 *Chlorella*, 70,000 *Nitzschia*, and 3,000 *Euglena*/cc. of water. As may be seen, the size of the cells played an important part because a much higher number of small cells, such as *Chlorella*, was needed to produce the same effect as that caused by a smaller number of larger organisms.

In concentrations higher than those given above, the rate of feeding was reduced, and the character of the shell movement of the oysters changed noticeably. In many experiments a correlation was noticed between the density of the microorganisms and the rate of feeding. When the plankton cells were too abundant, little or no food was swallowed by the oysters and the crystalline style was usually absent. Under such conditions the oysters ejected large quantities of pseudofeces to cleanse their gills and palps of an excessive accumulation of plankton. Sometimes the shells remained open for periods of several hours, although no water was pumped. If the oysters were kept in heavy concentrations for a long time, they became sluggish, their responses to stimuli diminished, and the tonus of the adductor muscle was partially lost.

Both the filtrate of the cultures, containing metabolic products of the cells, and the cells themselves affected the oysters because the rate of feeding was reduced or even entirely stopped when they were subjected to strong concentrations of either component.

When, after exposure to heavy concentrations of microorganisms, the oysters were again subjected to a flow of sea water, their rate of feeding usually showed a marked increase. The intensive pumping of water indicated an attempt to remove the microrganisms which had accumulated in the gills and mantle chamber.

In light concentrations, which contained fewer cells than those mentioned above, the rate of feeding and the shell movements remained normal. In many instances the rate of feeding was even greater than when the oysters were kept in running sea water. The possibility is not excluded that the presence of small quantities of plankton in sea water stimulates the pumping activities of the oysters.

The quantities of pseudofeces formed by the oysters were usually roughly proportional to the quantities of plankton present in the water, whereas a reverse relationship existed in the formation of true feces. The presence of large quantities of pseudofeces usually indicated that feeding proceeded under the relatively unfavorable conditions caused by heavy concentrations of plankton in the water. Small quantities of pseudofeces, or their absence, in the presence of large quantities of true feces showed that the oysters were feeding efficiently.

The results of our experiments indicate that both Kellogg and Grave were only partially correct in their conclusions. The opinion advanced by Kellogg, that oysters feed most efficiently only if the water contains small quantities of suspended matter, was corroborated by our studies. Contrary to his opinion, nevertheless, we found that oysters can also feed in water containing a relatively large number of microorganisms, although under such a condition the rate of feeding is decreased. It is true, however, that when the plankton is too heavy, the oysters cease feeding. On the other hand, Grave's conclusion may be considered correct only if it was qualified with the statement that the efficiency of feeding of oysters decreases in water rich in microorganisms. Since no such statement was made by Grave, his conclusion creates the impression that it is unimportant whether or not the water is relatively clear or heavily laden.

A full description of these studies will appear in the official publication of the U. S. Fish and Wildlife Service.

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Antagonistic Effect of *Corynebacterium diphtheriae gravis*

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The object of this note is to report the occurrence of an antibiotic effect produced by *Corynebacterium diphtheriae gravis* against several organisms. This strain of *C. diphtheriae gravis* was isolated in a culture from a diphtheritic throat and was identical in all particulars to the requirements of this organism. It was the specimen used in instruction of medical bacteriology at the Naval Medical School.

In checking its characteristics on potassium tellurite blood agar, the plate containing 15 mg. potassium tellurite/100 ml. blood agar became contaminated with *Bacillus subtilis*. The result is shown in Fig. 1. The black, clearly defined colonies are

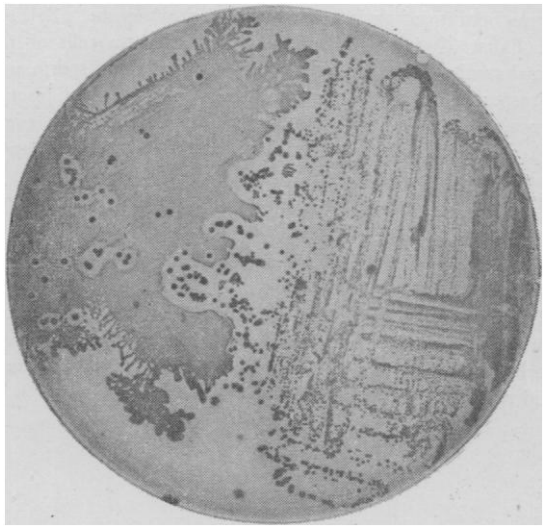

FIG. 1

C. diphtheriae; the confluent growth, *B. subtilis*. About many of the *C. diphtheriae* colonies is a clearly defined zone where growth of *B. subtilis* has been inhibited.

Using moist blood agar plates containing the same amount of potassium tellurite, the strain of *C. diphtheriae gravis* was tested against *Proteus vulgaris*, *Salmonella typhimurium*, and *S. paratyphi A*. The same inhibitory effect was observed.

In October 1945 one of us was discharged from the Navy and this investigation ceased, although cultures of the organism were carried for future work. Eight months later an attempt was made to repeat and amplify the above experiments. During the extended period of storage and irregular transfer, however, the organism had apparently lost its ability to produce the inhibitory effect, and no antagonistic activity was demonstrable. Prior to loss of this effect no attempt was made to separate the diphtheritic exotoxin from the possible antibiotic substance.

Since there is no previous record of antagonistic activity of *C. diphtheriae*, this note is presented merely to record the fact that *C. diphtheriae gravis* may produce an antibiotic substance and to stimulate others to look for it among strains of this genus.

Mechanism of Sex Determination

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It has long been known that the ratio of males to females, 106:100 (*7*) in man, deviates appreciably from the 100:100 ratio which is predicted on the basis of the chromosome theory. This deviation has also been observed in plants and in other animals. Correns (*3*) thought that in plants, among other influences, might be the different masses of the male- and female-producing pollen grains. Bluhm (*2*), in her work with white mice, suggested the different masses of the two types of sperm as a factor, stating that male-producing sperms (androsperms) may have a better chance to reach the egg than the gynosperms because of their lesser mass of chromosome. Zeleny and Faust (*6*) found dimorphism in the sperm cells of 15 animal species. They believe that the two types of sperm are androsperms and gynosperms and that, due to their different masses, they may have different chances to reach the egg. Parkes (*5*) found dimorphism in the case of man, the rat, and the mouse.

This explanation involves the assumption that the average kinetic energy of both types of cell is the same, so that the two types travel with different velocities due to their differences in mass.

The purpose of this paper is to show that, to produce an appreciable difference between the velocities of the two types of cells, the differences in mass would have to be larger than could reasonably be expected.

By the definition of kinetic energy,

$$KE_x = \tfrac{1}{2}m_x v_x^2 \quad \text{and} \quad KE_y = \tfrac{1}{2}m_y v_y^2,$$

where KE_x is the average kinetic energy of a gynosperm; KE_y, that of an androsperm; m_x, the average mass of a gynosperm; and v_x, the average velocity of a gynosperm.

If the average kinetic energy of androsperms and gynosperms is equal,

$$\tfrac{1}{2}m_x v_x^2 = \tfrac{1}{2}m_y v_y^2.$$

Hence,

$$\frac{m_x}{m_y} = \left(\frac{v_y}{v_x}\right)^2.$$

Thus, the ratio of the masses of gynosperms to androsperms must be equal to the inverse ratio of the velocities of the two types of cells, squared. However, the number of males born must be proportional to v_y, and the number of females to v_x; hence, for a ratio of, for example, 106 males:100 females, we have:

$$\frac{v_y}{v_x} = \frac{106}{100} = 1.06. \quad \text{Since } \left(\frac{v_y}{v_x}\right)^2 = 1.1236, \ \frac{m_x}{m_y} = 1.1236.$$

This means that, to account for a ratio of 106:100, an average difference of about 12 per cent would have to exist between the masses of androsperms and gynosperms. If one takes into consideration the high index of mortality of male zygotes, the primary ratio of males to females must be at least 116:100 (*1*). Using this ratio in the above calculation, one obtains: $\frac{m_x}{m_y} = 1.3456$, which would be a difference of about 35 per cent in the average masses of androsperms and gynosperms.

The difference is mass is presumably due to that of only one chromosome (*4*). It then becomes apparent that the difference in mass between androsperms and gynosperms would have to be far greater than cytological evidence permits us to deduce in order to explain this great deviation from the normally expected 100:100 ratio, if mass of chromosome alone were to be considered the decisive factor.

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