other day for 3 days, and incubated on the intervening days. The precipitate which forms is discarded and only the clear supernatant used for injection.

Mice infected intraperitoneally with appropriate doses of meningococci suspended in 2 cc of mucin usually succumb within 6 to 24 hours. Cultures of the heart's blood have always been positive if made soon after death. The peritoneal exudate contains large numbers of organisms and relatively few leucocytes. Maximum virulence has been attained by using as the inoculum peritoneal exudate, diluted with mucin. Of nine recently isolated strains, one has been found by this method to have a minimum lethal dose of less than 100 organisms, and another of less than 200 organisms. In the case of the more virulent of these two strains, parallel titrations of peritoneal exudate made with saline and mucin showed the minimum lethal dose with the former diluent to be approximately a million times as great as with the latter. Thus far the loss of virulence resulting from cultivation on artificial media has been regained by two or three passages through mice.

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THE FEEDING REACTION OF SEVERED PROBOSCIDES OF DILEPTUS ANSER

DILEPTUS is a holotrichous ciliate protozoan which possesses at its anterior end a long undulating proboscis, at the posterior end of which there is a mouth. On the oral side of the proboscis trichocysts are situated. The cilia of this region are longer and stronger than those of the rest of the animal.

A finely drawn glass rod was used as a cutting instrument. The animals were isolated from stock cultures and placed into depression slides. Under a binocular dissecting microscope, having a magnification of approximately 40 diameters the glass rod was used to sever the proboscides of these animals from the main body portions. The feeding reactions were observed under a compound microscope.

The proboscides of some of the animals were cut off just anterior to the mouth and the proboscides of others were cut off just posterior to the mouth. Thus two categories of proboscides were obtained: (1) Proboscides possessing a mouth and (2) Proboscides not possessing a mouth. These were separately placed into isolation dishes containing numerous Colpodas in a small amount of hay medium. In both cases the well-known feeding reaction that Visscher[1] has described took place.

[1] J. Paul Visscher, "Feeding Reactions in the Ciliate, Dileptus gigas, with Special Reference to the Functions of Trichocysts," *Biol. Bull.*, Vol. 45, 1923.

A. REACTION OF PROBOSCIDES POSSESSING A MOUTH

These swam around quite actively; much more so than the main body portions from which they were severed. If, by chance, one came in contact with a Colpoda it immediately extruded trichocysts. Most frequently either of the following reactions took place:

(1) The cell membrane of the Colpoda was broken down at the point of contact with the trichocysts and thus an amorphous Colpoda was produced.

(2) The Colpoda retained its shape but became immobile. The Colpoda was then passed by action of the cilia of the proboscis toward the mouth, which became distended to receive its food. A food vacuole of the type described by Visscher was formed. The ingested food remained within the posterior portion of the proboscis. A plasma membrane probably had formed at the posterior end where the proboscis had been severed from the main body portion. Such a proboscis continued its activities and with each added Colpoda its posterior portion became more and more swollen until the proboscis lost all semblance to the shape that it had when it was first severed. I have observed as many as six food vacuoles in one of these proboscides.

B. REACTION OF PROBOSCIDES NOT POSSESSING A MOUTH

These also swam around quite actively and undulated in the manner similar to that when they were on the whole animals. The same reaction to Colpodas took place with these proboscides. The affected Colpoda was passed down to the posterior end where the mouth was formerly located. Then the proboscis rotated on its posterior end around the Colpoda for a time before swimming away. This characteristic feeding reaction as shown by a specialized small part of the total organism is an interesting physiological phenomenon. The proboscis met up with other Colpodas in a short time and repeated the reaction. The Colpoda was always passed to the posterior end (where the mouth was formerly located) and most often the proboscis with its posterior end closely applied to the Colpoda would gyrate around it.

These experiments were done many times and the same results were recorded in each instance.

The posterior portions usually regenerated new proboscides within two hours. The proboscides that were severed in the evening were seen to have regenerated into complete animals which were about one third as large as a normal-sized Dileptus the following morning.

As a result of these experiments it may be seen

that stomatous and astomatous proboscides have the same feeding reactions as normal Dilepti.

The interesting point is that a small specialized portion of the organism is capable of the same complicated response that is characteristic of the total organism.

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SOLID AND HOLLOW STEMMED GRASSES OF THE JORNADA EXPERIMENTAL RANGE

ORTHODOX descriptions of the grass family contain the statement "stems usually (or mostly) hollow." This characterization has been generally accepted as applying to all mature grasses other than the genera grouped under the tribes Andropogoneae and Nazieae, which are usually cited as exceptions.

My own conception of the stem structure of grasses conformed to this description until early in 1927 when certain grasses, not members of either of the excepted tribes, were found to have solid stems. This discovery led to further investigations, the results of which show that a very high percentage of the mature grasses native to the Jornada plains in southern New Mexico have solid internodes.

A subsequent search of the literature and other sources of botanical information has produced meager results regarding the occurrence of the solid stems in grasses. Only two statements were found to be out of the ordinary. Bews[1] states that the solid stem in grasses may be regarded as a primitive characteristic. Vavilov[2] refers to a solid-stemmed variety of *Agropyrum cristatum* Beauv., which he reports is widely distributed over European and Asiatic Russia.

Bews[1] also states that the culms of grasses are usually hollow, but a number of types have solid stems, including the Andropogoneae and many of the Paniceae.

The scant measure of attention given by authors to the stem structure in the descriptions of species indicates that the prevalence of solid stems in the grasses of the semi-desert Southwest is a local condition, which, possibly, has escaped notice.

Investigations relative to the stem structure of the native and introduced grasses of the Jornada plain were started in the late summer of 1927 and carried through each succeeding summer up to and including 1930. Field methods employed consisted of the following procedure: mature stems of the various species were selected and cut transversely at a point about equidistant from the nodes. The cut ends were examined with a hand lens. If there was any doubt regarding the determinations made with the hand lens, a specimen was selected and preserved for microscopic study.

Grasses examined to date number 70 species, representing 30 genera and including members of 8 tribes. Solid-stemmed grasses numbered 52 species, or 74 per cent. of the total number collected, and hollow-stemmed grasses include 18 species, or 26 per cent.

Annual and perennial plants were classified separately. The annuals include 15 species, of which 7, or 47 per cent., were solid-stemmed and 8, or 53 per cent., were hollow-stemmed.

Perennial grasses included 55 species, of which 45, or 82 per cent., were solid-stemmed and 10 species, or 18 per cent., were hollow-stemmed.

Native perennial grasses produce the major part of all the forage on southwestern plains. In the Jornada region the species of 5 genera—Bouteloua, Sporobolus, Aristida, Hilaria and Scleropogon—furnish 85 per cent. or more of the forage derived from grasses. All the species representing these genera are able to withstand grazing to a marked degree during protracted drought. They have the ability to exist on the less favorable situations, as well as on the more favorable ones. Observed representatives of these genera native to this region are without exception solid-stemmed grasses.

The hollow-stemmed perennial grasses furnish very little forage. They are sparsely scattered throughout the region, being restricted to the more favorable sites. Even on these more favorable locations, such as the bottoms of intermittent streams, or on the higher elevations where the precipitation is greater, the hollow-stemmed species generally exist under the protection of some jutting rock or in the shade of some hardy shrub.

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[1] J. W. Bews, "The World's Grasses," Longmans Green and Company, London, New York and Toronto, 1929.

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