Editorial.

THE THERAPEUTIC VALUE OF YEASTS.

MANY of our readers are doubtless familiar with or can recall to memory the homely application of ordinary beer yeast for the cure of boils, carbuncles and other inflammatory conditions. The empiricism of the housewife is now being replaced by the more exact work of the man of science, and an increasing literature on this subject draws attention to the various diseases over which yeast exercises a controlling influence, also to the different forms and methods of its administration.

We believe that Presta and Taruella (*Revista de Med. y cirurgia*, June 15, 1901) were the earliest workers to adduce experimental proof of the value of yeast, the most important of their conclusions being the following: (1) Beer yeast exercises a local and general curative action upon streptococcal and staphylococcal infections in rabbits, when administered hypodermically for five to twelve days in 10 cc. doses of a well-grown culture; (2) similar injections repeated for four consecutive days render rabbits immune to these coccal infections; (3) the curative principles of yeast are intracellular, and act only after liberation by a leucocytic or humoral ingestion of the cell; (4) blood serum of rabbits treated by yeasts has an agglutinating action upon *Streptococcus* and *Staphylococcus albus* and *aureus*. Yeast cultures in beef and barley medium show this same power after two days' growth, and lose it when heated to 55° C.; (5) mixed cultures of yeast and streptococcus and staphylococcus produce attenuation of the virulence of the latter; (6) in the pus of a subject treated by yeast the pyogenic organisms decrease in number and in virulence. Only about seven-tenths of an average sample of beer yeast consists of *Saccharomyces cerevisiæ*, the rest being impurities. If a yeast be kept in a dry but cool place it is capable of secreting its soluble ferments after a long lapse of time; moisture and warmth alter its character rapidly, mainly by enabling the impurities to replace the true *Saccharomyces cerevisiæ*. The results obtained by yeast in the treatment of boils and carbuncles are apparently due to its antiseptic, phagocytic and immunising

action, and not to any specific action upon particular pathological lesions. Numerous observers have obtained surprising results with yeast in the treatment of boils and carbuncles, and failure in the hands of others may be attributed to the impure quality of the preparation used. Infantile diarrhœa, infective and muco-membranous enteritis or dysentery, have all been much relieved by the action of beer yeast.

As far back as 1895 Cassaët recommended beer yeast for the treatment of diabetes mellitus, its beneficial action in this disease depending upon the conversion of all starchy elements into alcohol; thus the invertin which it contains changing cane sugar into glucose, and its diastase converting the glucose into alcohol. Boigey, in a recent paper (*Arch. Gen. de Med.*, April 7, 1903) confirms these theoretical considerations and maintains that in beer yeast we have a valuable remedy in diabetes. He ascribes to yeast a phagocytic action, a toxic secretion which is bactericidal, and a stimulating secretion producing leucocytosis. These actions being vital phenomena, their manifestation must depend upon the condition of the yeast and the intestinal contents at the time of ingestion. Beer yeast normally grows in a neutral medium and at a low temperature, and when taken into the stomach undergoes digestion, the quantity of its various secretory products being inversely proportional to the rapidity of digestion. From this it is obvious that to obtain the maximum effects from yeast, we must employ cultures which have been more or less educated up to the conditions under which we wish and expect it to act. For this reason the use of pure grape yeast, acclimatised to an acid medium and a body temperature, offer the best chances of success. Boigey used saccharomyces of grapes of warm countries active at a temperature of 35° to 39° C., and grew them on a medium having an acidity equal to that of the stomach. He also administered some of the active medium at the same time as the yeast, thereby enabling the latter cells to continue to elaborate their secretory products or ferments. The results in diabetes have been most encouraging, especially after the employment of a yeast artificially acclimatised to the gastric juice and one of recent growth. This last desideratum raises an important practical point, as yeasts are specially liable to variation, and their preservation, in active form, necessitates the employment of suitable cold storage chambers. It is true that dried prepara-

tions can be obtained, by evaporation, from moist recent growths; these preparations are certainly easy to handle, but somewhat erratic in their activity. We have recently examined several samples and found that many contained only the *débris* of the yeast cells. A good preparation should show, under the microscope, complete healthy cells. There is reason to believe that much of the diarrhœa and dyspepsia frequently observed after the administration of yeast is attributable to the use of dried inefficient preparations.

We have alluded already to the value of yeast in furuncular affections, and a suggestive article by Boix in the *Arch. Gen. de Med.*, May 12, 1903, emphasises the satisfactory clinical results obtained by various observers in the staphylococcal and streptococcal infections as well as in exanthemata. Presta and Taruella (*Revista Ibero-Americana de Ciencias Médicas*, 1902, p. 368, and *Gac. med. Catalana*, 1903, March 15) have treated forty-three cases of variola, twenty-four of erysipelas, twenty-eight of measles, seventeen of scarlet fever, also adenitis and whitlow, successfully by administration of three teaspoonfuls of dried yeast daily. Muntorid observed a pulmonary pyorrhœa cease in a week under the influence of yeast, while Molist reports a case of mastoid abscess and Felgar a case of recurrent or chronic appendicitis cured by its use. Without going so far as to suppose that in yeast we have found a panacea for these various human ailments, we are bound to admit that the experimental and clinical facts are both suggestive and encouraging. Much accurate work has still to be done, but we hope that, by referring to what has already been noted, others may be stimulated to inquire further into the feasibility of regarding yeast as something more than a mere agent for the production of fermented liquor.

Review.

A Monograph of the Tsetse Flies. By E. E. Austen. London: Longmans and Co., 1903. Nine plates with 16 figures in the text. Pp. 319. Price 15s.

The rapid accumulation of facts regarding the infection of man and beasts with the different species of trypanosoma renders the appearance of this work of immense value and interest, as it furnishes all that is known about the genus of flies to which the name of *Glossina* has been given. It is based on the collection in the British Museum, and has been printed by order of the Trustees with a view not only to supply a *résumé* of our knowledge of the tsetse flies, but also to enable those who may be engaged in Africa itself upon the investigation of the maladies produced by the various species of trypanosoma, to determine the species of Glossina responsible for the dissemination of the hæmatozoon. The preparation of thesystematic portion of the volume appears to have been a matter of some difficulty, owing partly to the remarkable dearth in the genus *Glossina* of structural characters, such as might be utilised for the distinction of species, and partly to the faulty condition of much of the material available for examination.

Since the insects which form the subject of this monograph were first discovered by Englishmen, in the vicinity of the Limpopo, the word tsetse was long used by us to mean *Glossina morsitans*, and that species only. Even now it is so used by the majority of persons who are unaware of the existence of more than one species of Glossina. With the opening up of Africa and the recognition of fresh species, the use of the word tsetse needs to be used in a generic rather than a specific sense, and it is in a generic sense that it is employed in this work. It has yet to be discovered whether all the species of Glossina are capable of conveying the hæmatozoon of tsetse fly disease, but the species of the genus differ so markedly from other blood-sucking flies in various details of external structure, as well as to their appearance when at rest, that it is impossible to speak of a particular species as the true tsetse fly in contradistinction to the others. It follows, therefore, that the name tsetse must be taken as the equivalent of the genus rather than of any one species, even the one which is best known.

A highly technical description of the genus *Glossina* and of the seven known species (*G. palpalis*, *G. pallicera*, *G. morsitans*, *G. pallidipes*, *G. longipalpis*, *G. fusca*, *G. longipennis*) are given in chapter iv., but it may not be out of place to give here a short description of these flies, so that a non-entomological reader may recognise a tsetse specimen at sight. Tsetse may be described as "ordinary-looking, sombre, brownish or greyish-brown flies, varying in length from $3\frac{1}{2}$ to $4\frac{2}{3}$ lines ($7\frac{1}{2}$ to 10 millimetres) in the case of *G. morsitans* to about $5\frac{1}{2}$ lines ($11\frac{1}{2}$ millimetres) in that of *G. fusca* or *longipennis*, with a prominent proboscis in all species. The hinder half of the body or abdomen in the best known species, though not in all, is of a paler colour and marked with sharply defined dark brown bands, which are interrupted on the middle line; the abdomen, however, is invisible

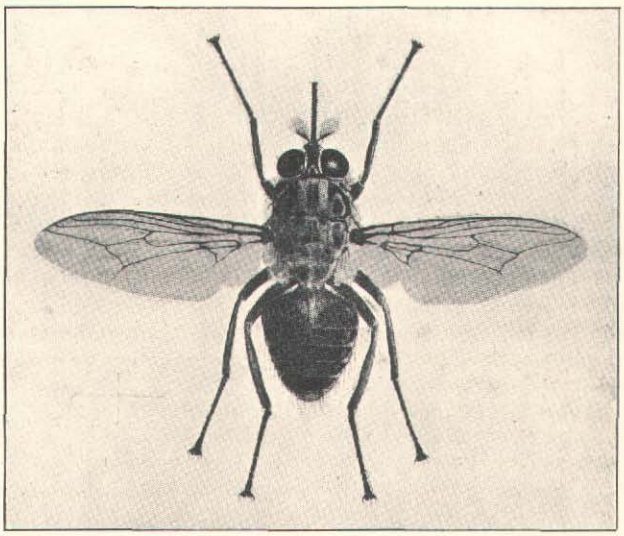

FIG. 1.—*Glossina palpalis*, Rob. Desv., ♂. (× 3¾.)

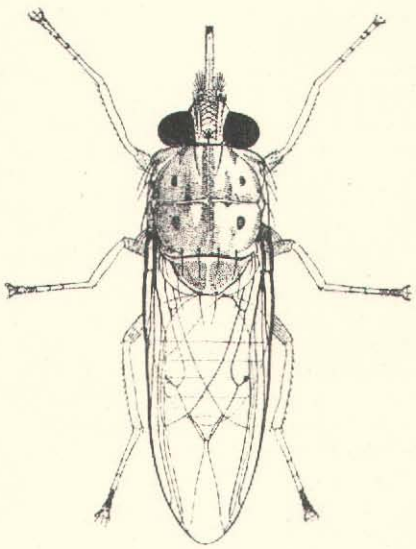

FIG. 2.—A Tsetse-fly (*Glossina longipennis*, Corti, from Somaliland) in resting attitude, showing the position of the wings. (× 3½.)

when the insect is at rest, as it is then concealed by the wings. The sexes of tsetse flies can readily be distinguished when specimens can be examined, since in the male the external genitalia form a conspicuous knot-like protuberance (hypopygium) beneath the end of the abdomen, which is absent in the female." It is probable that only those who have suffered from the attacks of tsetse can recognise them when on the wing, but in the resting position their identification is easy. "In this attitude they can be distinguished from all other blood-sucking diptera, especially from those belonging to the genera *Stomoxys* and *Hæmatopota*, which are most likely to be mistaken for them, by the fact that the brownish wings lie closed flat over one another down the back, like the blades of a pair of scissors, while the proboscis, ensheathed in the palpi, projects horizontally in front of the head" To facilitate the conception of the size of these flies, it may be stated that an ordinary house-fly in Europe measures about 3

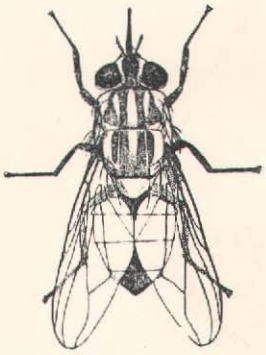

FIG. 3.—*Stomoxys sp.*, from Natal, in resting attitude, showing the position of the wings. (× 4.)

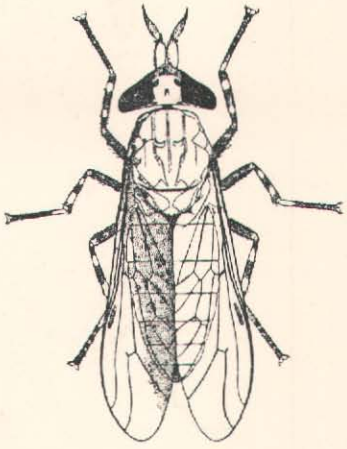

FIG. 4. — *Hæmatopota sp.*, from Zululand, in resting attitude, showing the position of the wings. (× 4.) The wing markings are omitted.

lines, or 7 millimetres; on this basis *G. morsitans* measures about half an inch, from the tip of the proboscis to the ends of the closed wings; *G. fusca* is about three-fourths of an inch. Apart from the prominent proboscis and the mode of carrying the wings when at rest there is nothing remarkable or striking about the appearance of a tsetse fly. *Stomoxys* and *Hæmatopota* are the only two species likely to be confused with *Glossina*. The females of both are greedy blood-suckers and often torment domestic animals. Although *Stomoxys* has a prominent proboscis, it is ensheathed in the palpi, and is consequently finer than that of *Glossina*. The various species of the former are small greyish flies with black markings; they are smaller than tsetse flies, and their wings when in the resting position diverge at an angle, like those of the house-fly. *Hæmatopota*, which is a small horse-fly of the family *Tabanidæ*, has a superficial resemblance to *Glossina* when

at rest. The species of this large genus are of about the same size as the larger tsetse flies, and of the same colour and elongate shape. Their abdomen, however, is never marked with dark bands on a light ground, neither do their wings close over while in the resting position, but diverge slightly at the tips and meet together at the base like the ridge of a house-roof. Their antennæ, too, project horizontally in front of the head, while those of tsetse flies and all Muscidæ are drooping. With the permission of Professor Ray Lankester and Mr. Austen we are able to reproduce some drawings from this work, which we hope may materially help our readers to understand the superficial features of this group of flies; but for exact details the monograph itself must be consulted.

Considerable space is devoted, in this volume, to an analysis of the evidence regarding the tsetse fly areas or belts, and in this connection the reader's

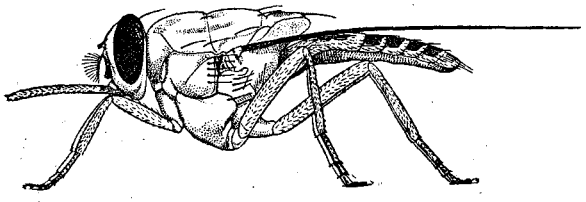

FIG. 5.—A Tsetse-fly (*Glossina morsitans*, Westw., ♀), before feeding. (× 5.)

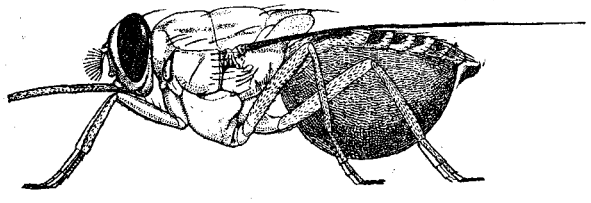

FIG. 6.—A Tsetse-fly (*Glossina morsitans*, Westw., ♀), after feeding, showing abdomen distended with blood. (× 5.) From a drawing from life by Mrs. Bruce.

attention is directed to a particularly good bibliography; but it must be borne in mind that the limits of a "fly belt" are not necessarily the same to-day as they were even a few years ago, while in certain cases the belt itself may have ceased to exist. The tsetse fly is undoubtedly gregarious in its instincts and particularly local in its distribution, being found only in warm, moist tracts near water, where cover occurs as bush or forest. These facts point to a connection between the fly and game, and Mr. Austen is disposed to think that were it not for the big game, on the blood of which it feeds, the tsetse would soon cease to exist, at least in numbers sufficient to be formidable. The tsetse appears to pass the night resting on the ground or on the smaller branches of bushes or trees, and although there is a general belief that fly belts may be crossed with impunity during darkness, there is much evidence to show that this is not invariably the case. Contrary to what is the case among horse-flies (*Tabanidæ*), of which the females alone

suck blood, in the tsetse both sexes are blood-suckers. Another curious fact is that odour, which has so strong an attraction for many diptera, especially of the family *Muscidæ*, to which the genus *Glossina* belongs, has precisely the opposite effect on the tsetse flies. For this reason they avoid the presence of man, and are rarely found within houses or towns. Until the publication of Lieut.-Col. Bruce's classical report on Nagana, the tsetse fly was believed to lay eggs and breed in the droppings of the buffalo, like the flies belonging to the closely allied genera, *Stomoxys* and *Lyperosia*, which undoubtedly breed in dung. According to Bruce, the tsetse fly does not lay eggs at all, but extrudes a yellow-coloured larva, which is furnished with a black hood at one end and two minute spikes at the other. It is annulated and consists of twelve segments. On being born the larva creeps actively about, evidently searching for a hole or cover in which to hide. Having found seclusion, it immediately changes colour and in a few hours becomes a jet-black hard pupa or nympha. The perfect insect hatches out in about six weeks. In these metamorphoses the tsetse fly shows a similarity to the mode of reproduction among certain parasitic flies belonging to the family *Hippoboscidæ*.

We have dwelt at some length on the contents of this book, as an accurate knowledge of blood-sucking flies is clearly indispensable for further progress in the inquiry as to the dissemination of trypanosoma. On many points further observation is needed, especially as to habits, locality and life-history of blood-sucking insects. In no way will this be better secured than by a study of this fascinating volume, which, in addition to its scientific details, gives an extensive bibliography of references and reports by many observers. A map of Africa illustrating the present knowledge of the distribution of Glossina is also given.

R. H. F.