

SPECIFICITY IN THE GENUS *BALANTIDIUM* BASED ON
SIZE AND SHAPE OF BODY AND MACRONUCLEUS,
WITH DESCRIPTIONS OF SIX NEW SPECIES.*

By

ROBERT HEGNER.

(Received for publication May 22, 1933.)

1. Introduction. The large ciliate, *Balantidium coli*, has been recorded from man in many parts of the world and is generally recognized by protozoologists and physicians as pathogenic. Human infections are supposed to result from the ingestion of cysts passed by pigs infected with the same species. It is of both scientific and practical importance to know whether the balantidia in man and pig belong to the same species and to determine the specificity of members of the genus inhabiting other animals.

During the past 15 years the writer has encountered ciliates of the genus *Balantidium* in a number of different species of animals and has in several places remarked that the question of the specificity of these, and other balantidia that have been described, awaited a detailed study of the entire genus. More than 30 species of *Balantidium* have been proposed, and a number of balantidia have been reported that are probably distinct species but for which specific names have not been suggested. Recently a preliminary study has been made of many of these species and descriptions of many others in the literature have been brought together. As a result, the writer believes that in certain cases characteristics involving the shape and size of the body and macronucleus are sufficient to distinguish one species from another, provided at least 10 typical specimens in the trophozoite stage are available that are not undergoing binary division or reorganization after conjugation.

* From the Department of Protozoology of The Johns Hopkins University, School of Hygiene and Public Health. This work was aided by a grant from the Committee on Medical Research of the American Medical Association. The writer is indebted to Miss Lydia Eskridge and Mr. Conrad Bauer for technical assistance. The material from the opossum and red spider monkey was obtained in Panama while working under the auspices of the Gorgas Memorial Laboratory, Dr. Herbert C. Clark, Director. Funds for the work in Panama were provided by the National Research Council and the Bache Fund.

In other cases the existence of specific differences can probably be determined with certainty only after careful studies of specimens from various individuals of a designated host taken at intervals during a period of as long as one year; specimens obtained from pure cultures, that is, from cultures inoculated with a single individual; and of organisms maintained in foreign hosts, for example, balantidia from the pig that have been grown in rats. Work of this type requires much time and labor but is now in progress and will eventually furnish the necessary data.

The principal characteristics involving the size and shape of the body and the size and shape of the macronucleus that may be used in separating the different species of *Balantidium* appear to be as follows.

- (1) Body length: range; average.
- (2) Body breadth: range; average.
- (3) Ratio of body length to body breadth.
- (4) Area of body.
- (5) Point of greatest body breadth.
- (6) Ends of body blunt or pointed.
- (7) Macronuclear length: range; average.
- (8) Macronuclear breadth: range; average.
- (9) Ratio of macronuclear length to macronuclear breadth.
- (10) Area of macronucleus.
- (11) General shape of macronucleus.
- (12) Ratio of body length to macronuclear length.
- (13) Ratio of body area to macronuclear area.

Other features that have been used as specific characters are the shape and position of the peristome, cytostome and cytophyge, the position of the micronucleus, the number and position of the contractile vacuoles, the relative thickness of the cortical layer of ectoplasm, the number of nuclei in the "ripe" cyst, and the species of host in which the organism lives.

Area is considered by the writer a better measure of size than length and breadth. For example, the *coli* type from the pig (see table 1) averages 70.9 μ in length and 58.9 μ in breadth and the *suís* type from the pig averages 74.1 μ in length and 52.2 μ in breadth. From these measurements one cannot determine with accuracy which is the larger. A similar situation exists with respect to the nuclei. An examination of the drawing (figs. 1 and 2) also leaves one uncertain. Ten persons were asked which body and which nucleus in these two drawings were the larger; 8 voted for the *coli* body and