3. The rhythms have been shown to be independent of environmental changes and due to inherent phenomena in the cell.[1]

The present cytological study demonstrates that:

1. The rhythms in the division rate of *Paramaecium* are the physiological expression of profound nuclear changes.

2. These periodic nuclear phenomena involve the formation of a complete new nuclear apparatus by a definite sequence of morphological changes disintegration of old macronucleus; multiple division of micronuclei, formation of new macronuclear Anlagen which simulate typical conjugation. This results in the reorganization of the cell without the fusion of two animals.

This nuclear reorganization is evidently a normal substitute for typical conjugation in this race, but does not preclude its occurrence for the latter process has occurred in subcultures from this race subjected to environmental conditions suitable for its consummation.[2]

Details of this remarkable process, together with a discussion of its theoretical importance from the standpoint of the sexual potentiality of unicellular organisms and the physiological behavior of long pedigreed races of Infusoria, will be presented in another paper.

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The aggressin-like action of anaphylatoxin.

By HANS ZINSSER and J. G. DWYER.

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In the course of experiments upon the repeated injection of anaphylatoxin into guinea-pigs the writers noticed a phenomenon which suggested to them that the anaphylatoxic substances may possibly possess properties similar to those described by Bail for his "aggressins." In the earlier experiments the anaphylatoxins were prepared with typhoid bacilli by emulsifying one slant of the bacteria in 8 c.c. of fresh guinea pig complement and allowing

[1] Woodruff and Baitsell, *Jour. Exper. Zool.*, XI, 1911, p. 339. Erdmann, *Archiv. für Protistent.*, XXIX, 1913, p. 118.

[2] Woodruff, *Jour. Exper. Zool.*, XVI, 1914, p. 237.

the emulsion to remain in the incubator for 6 hours. At the end of this time centrifugation for one to two hours at high speed was used to throw down the bacteria.

Although the supernatant fluid after such centrifugation was clear, nevertheless it appeared in many cases that not all the bacteria were thrown down. Intraperitoneal injection of the anaphylatoxin occasionally resulted in the rapid death of the guinea-pigs with extensive proliferation of typhoid bacilli in the peritoneal exudate and presence of the organisms in the heart's blood.

Since the lethal dose of the typhoid culture employed varied between 1/10 and 1/50 of an agar slant (for guinea-pigs of about 200 grammes on intraperitoneal injection) and since the amounts of bacteria injected with 2 to 3 c.c. of an apparently clear anaphylatoxin could not have been anything like as much as the smallest lethal dose, special experiments were carried out to determine this point. An example of such experiments is the following:

EXPERIMENT 2, 9, 14.

Anaphylatoxin prepared in the ordinary way,—centrifugalized for over one hour until supernatant fluid appears absolutely clear. Cultivation experiments from this fluid show, however, that it is not absolutely sterile,—a few colonies resulting from a planting of several loopfuls.

	Dose Typhoid culture	Experiment Intraperitoneal injection	
Control			
No. 1	1/10	+ 3 c.c. salt solution	= death in 52 hrs.
2	1/20	+ 3 c.c. salt solution	= death in 18 hrs.
3	1/50	+ 3 c.c. salt solution	= remains alive
Experiment			
1	1/100	+ 3 c.c. anaphylatoxin	= death in 22 hrs.
2	1/100	+ 3 c.c. anaphylatoxin	= death in 18 hrs.
3	1/200	+ 3 c.c. anaphylatoxin	= death in 18 hrs.
4	1/200	+ 3 c.c. anaphylatoxin	= death in 35 hrs.
5	1/200	+ 3 c.c. anaphylatoxin	= death in 35 hrs.
6	1/300	+ 3 c.c. anaphylatoxin	= remains alive

A number of similar experiments were made in all of which it was found that 1/200 to 1/300 of a typhoid culture combined with 2 to 3 c.c. of anaphylatoxin would bring about the rapid death of a guinea-pig by typhoid infection within a short time, when 1/50 of a culture alone, and in some cases as much as 1/20 and 1/10 of a culture alone, did not kill. 3 c.c. of anaphylatoxin

injected alone intraperitoneally either did not kill or whenever it did, the peritoneum was found filled with free typhoid bacilli. In some of the experiments the bacteria found in the peritoneal cavities of dead guinea-pigs appeared larger than organisms of the same strain taken from agar, having some of the characteristics of which Bail speaks as "Tierische bazillen." In one of our experiments, so far, they have shown resistance to agglutination.

We have carried out several experiments to determine whether or not this "aggressin" action is specific but owing to the difficulties of entirely ridding the anaphylatoxin of the bacteria with which it was produced we have been prevented from coming to definite conclusions. Filtration through Berkefeld candles in a few cases in which it was tried seemed to render the anaphylatoxin harmless when intravenously injected. From a number of experiments carried out with the *Staphylococcus aureus* and the *Bacillus prodigiosus*, however, we are inclined to believe that the action is not specific.

It seems not unlikely to us that the aggressins with which Bail worked were rather of the nature of "anaphylatoxin" and that the invasive properties of bacteria may well be gradually enhanced in the animal body as contact with the serum induces the formation of these substances. We abstain from further theoretical expansion of the ideas suggested by these experiments at present.

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(a) The lipolytic activities of human duodenal contents. (b) The separation of the castor bean lipases.

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Some years ago, Loevenhart[1] showed that extracts of the pancreas and of the liver of various animals contained different lipases. The pancreas extracts exerted greater lipolytic action under comparable conditions toward complex esters such as glyceryl triacetate, and the liver extracts showed greater action toward simple esters such as ethyl butyrate.

[1] *J. Biol. Chem.*, 2, 429 (1907).