SPECIAL ARTICLES

RELATION OF EXTERNAL ENVIRONMENT TO COURSE OF A B. ENTERITIDIS INFECTION IN MICE

IN a previous communication[1] it was reported that if corresponding groups of rats are fed massive doses of cultures of *B. enteritidis* and kept in cold and warm rooms respectively the mortality is greater among those kept in the cold room. The results were not, however, conclusive, because rats are highly resistant to infection and infant rats and massive doses of bacteria had to be used.

The experiments are now being repeated with mice, and thus far the results indicate clearly that the external environment has a profound influence on the course of a *B. enteritidis* infection in mice. Animals kept in a cold room with a high relative humidity reacted quite differently from those kept in a warm room with a low relative humidity. The results varied also with the mode of infection.

Equal numbers of young mice of about the same weight (10 to 12 grams) were placed in battery jars. One set was kept in a cold room with a temperature range of 7° to 10° C., and a relative humidity of 70 to 80. The other was kept in a room incubator at a temperature of 28° C. and a relative humidity of 40 to 50. When the mice were infected intraperitoneally or subcutaneously the period between the day of infection and the first fatality was longer and the number of survivors greater in the cold than in the warm room. When the infection was given per os the reverse was the case: the incubation period was shorter and the mortality greater in the cold than in the warm room. A summary is shown in tabular form.

Dose (No. of bacteria) and method of infection	Temperature	No. of mice	Incub.* in days	No. of deaths	No. of survivors		Average duration of life from day of infection
3,000 ...	28° C.	8	4	5	3		
i.p. ...	9° C.	8	6	3	5		
30,000 ...	28° C.	9	2	8	1		5½
i.p. ...	9° C.	9	4	7	2		6
300,000 ...	28° C.	9	1	9	0		3
i.p. ...	9° C.	9	2	8	1		4½
3,000,000 ...	28° C.	10	0	10	0		1.9
i.p. ...	9° C.	10	0	9	1		2.4
3,000,000 ...	28° C.	7	2	5	2	(30 per cent.)	5.8
subcut. ...	9° C.	5	6	3	2	(40 per cent.)	7.7
200,000,000 ...	28° C.	10	...	0	10		
per os ...	9° C.	8	10	7	1		
1,000,000,000 ...	28° C.	8	9	2	6		
per os ...	9° C.	8	8	8	0		

* Equals days until first death appeared.

In other words, the septicemic type of infection runs a more rapid course at a higher temperature, while the oral type is much more severe at the lower temperatures. These results may account for the seasonal character of typhoid-paratyphoid epidemics in man as well as in mice.[2] They may also provide an explanation for the lower case fatality in countries with a warm climate than in those with a temperate one. The investigation is being continued with a view to ascertaining the precise effects of temperature and humidity on the variation in host resistance recorded above.

I. J. KLIGLER
L. OLITZKI
HEBREW UNIVERSITY,
JERUSALEM

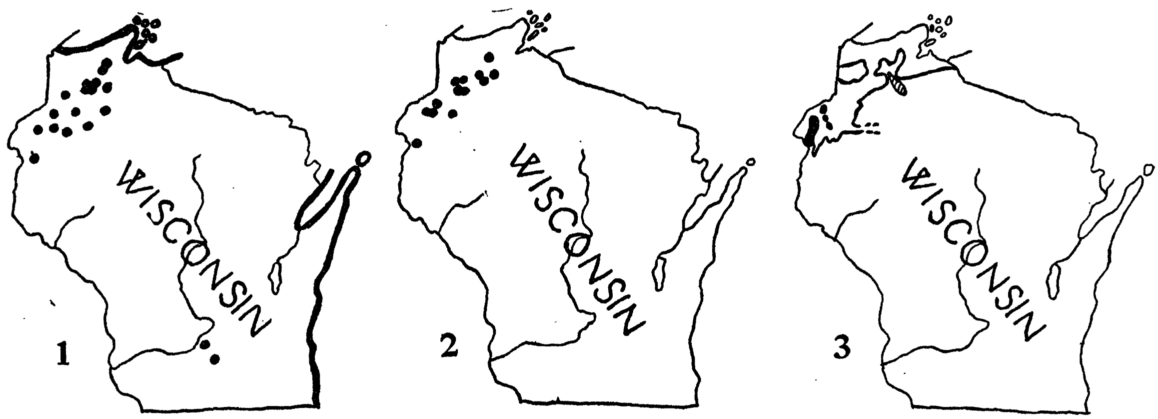
[1] I. J. Kligler, *Proc. Soc. Exp. Biol. and Med.*, 25: 20, 1927.

[2] I. J. Kligler, *Jour. of Hyg.*, 27: 14, 1927; Ida W. Pritchett, *Jour. Exp. Med.*, 41: 209, 1925; 43: 173, 1926.

BOTANICAL AND GEOLOGICAL EVIDENCE FOR AN ANCIENT LAKE

THE presence, in early postglacial times, of a large lake in northwestern Wisconsin is indicated by the distribution of certain plants collected in that region during the summer of 1928. The first clue was given by *Juncus balticus*, var. *littoralis*. This rush, common along the shores of the Great Lakes, was first found in the interior of Wisconsin on the shore of Crystal Lake, in Dane County, near Prairie du Sac. Crystal Lake is described[1] as a relic of a larger glacial lake. The *Juncus* was next found on Lake Wingra, a few miles to the southeast, also a relic of a once larger body of water. In northwestern Wisconsin the plant was found last summer on a number of lakes (Fig. 1 shows the range in Wisconsin of *Juncus balticus*, var. *littoralis*). These lakes all have certain features in common, notably broad sandy shores and abandoned beaches several feet higher than the present water level. On each of such lakes, also, some or all of the following species, elsewhere unknown in that part of the state, were invariably found: *Panicum albemarlense, P. meridionale, Muhlenbergia uniflora, Stenophyllus capillaris, Ryncho-*

[1] W. C. Alden, U. S. Geol. Sur. Prof. Paper 106: plate III, 1918.



spora capitellata, Fimbristylis Frankii, Xyris torta and *Polygonella articulata.* The presence of these plants in a definite circumscribed area, on the margins of a distinct type of lake whose shores indicate shrinking of their area, suggested the next point, that these lakes were once connected. The general distribution of these plants, already noted as inland extensions of the Atlantic coastal plain flora which migrated westward along the margin of the retreating Wisconsin ice sheet,[2] placed the time of this large lake as early postglacial.

One plant apparently was endemic on the shores of this ancient lake. *Bidens connata,* var. *pinnata,* originally described from near Minneapolis, Minnesota, occurs in Wisconsin only on these relic lakes (Fig. 2). The type region lies a few miles southwest of the Wisconsin stations; the presence of the plant there indicates that part of the old lake lay in Minnesota.

It is possible, in the region under consideration, to determine by a glance whether or not these plants will be found on the margin of any given lake. The relic character is at once indicated by the type of shore line. But similar lakes, separated by a ridge of high ground from the ancient lake bottom, have only such wide-spread forms as *Bidens frondosa, Eleocharis acicularis, Scirpus validus,* etc.

Certain other coastal plain plants, such as *Potamogeton bupleuroides, Eriocaulon septangulare* and *Bidens discoidea,* occur in northern Wisconsin with no apparent relation to the old lake bed.

During the past four field seasons parties of the Wisconsin Geological Survey have accumulated evidence leading to the conclusion that the greater part of what is commonly known as the Barrens of northwestern Wisconsin was a great interior arm of proglacial Lake Superior. The evidence may be summed up as follows:

(1) Shore-line processes have been active along the 1,150-foot contour (Fig. 3, heavy line), which surrounds the basin except on the west and the northeast.

(2) The basin thus enclosed is a rock-controlled structure. Its long axis is parallel to that of the main axis of folding of the Keweenawan or Lake Superior syncline. The northeast is closed structurally by an arch or crossfold (Fig. 3, cross-lined area) which separated the interior body from that part of proglacial Lake Superior which lay to the northeastward.

(3) Moraines within the basin (Fig. 3, solid black) show subaqueous erosion.

(4) Clays have accumulated in the lower basin (southwest) over an area at least forty-five miles long and twenty miles wide. These clays have given rise to two soil types, mapped by the State Soil Survey.

While the waters of the lake were receding, shore lines were extremely irregular, due to the rolling character of the lake bed. This fact may be seen by inspection of topographic maps of the area. With continued recession closed basins within these irregular shore lines became isolated lakes.

The independent lines of study in this region thus supplement each other. The botanical evidence points to the probability that the innumerable isolated lakes were at one time coalesced into a much larger body; the geological evidence indicates that the many small lakes are but present-day relics of a former greater body of water. The authors believe that similar corroboration of geological findings by botanical evidence may perhaps be discovered in connection with problems of this type throughout the glaciated middle west.

H. R. ALDRICH
Assistant State Geologist, Wisconsin
N. C. FASSETT
Department of Botany, University of Wisconsin
MADISON, WISCONSIN

[2] D. C. Peattie, *Rhodora,* 24: 57–70, 80–88, 1922.