POND WATER COMPOSITION AND MOSQUITOES

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The writer frequently has had occasion to spend some weeks on a farm near Wooster, Ohio where there is a fish pond supplied with water from a fountain. It has been a matter of considerable pleasure and no little curiosity to find that there are no mosquitoes near this pond although they are plentiful about 1,000 feet away in any direction one might go. About 75 feet from this pond there is a creek which runs considerable water the year around and there are many mosquitoes both up and down this stream especially in the more marshy spots along its banks. In trying to find a possible reason for their absence about the vicinity of the pond the most promising answer seemed to center in the difference between the composition of the water from the fountain and that from the creek. The latter is a rather soft water drawn from surface drainage and springs along the hillsides whereas the fountain water is a very hard mineral water which cattle and horses prefer to that of the creek.

The table which follows gives a partial analysis of this fountain water in parts per million. The analysis was made by the Water Softening and Purification Works Laboratory of Columbus, Ohio.

Alkalinity	347
Non-carbonate hardness	63
Total hardness	410
Magnesium	38
Anhydrous sulphuric acid SO_4	150
Chlorine as chlorides Cl	11
Calcium	102
Total Solids	592

It will be noted from the table that the water is quite alkaline containing a considerable quantity of magnesium, sodium, calcium, bicarbonate, also magnesium and sodium sulphate with a total solids content of 592 P. P. M.

The water runs from a 2″ iron pipe and flows into a cement trough. This soon becomes covered with a precipitate probably largely composed of iron hydrate and carbonate. At one place on the outside of the trough where the cement wall is somewhat porus water has seeped through slowly and a white deposit of magnesium sulphate has been formed. The water flows from the trough to a pond which covers about half an acre. The water with its extensive mineral content seems a culture solution for many kinds of water plants such as *Bidens connota, Juncus effusus, Cyperus gragii*, etc., and especially a very green alga which grows luxurioulsly in the pond but not in the creek during July and August. The presence of algae seems to be associated usually with an abundance of mosquitoes hence their absence in this instance often causes comment. It is possible that the basic condition of the water may be unfavorable to the growth of mosquito larvae as MacGregor* found that tree-hole mosquitoes bred

*MacGregor, M. E. The influence of the hydrogen-ion concentration in the development of mosquito larvae. Parasitology, **13**: 1921.

in water at pH 4.4, but when transferred to water with a pH of 8.2-8.4 they succumbed or remained stunted.

Rudolph and Lackey† carried on similar studies and noted when pH of water changed rapidly the larvae were killed in 24 hours but a gradual change did not greatly affect the death rate. It is possible that the change in pH is partly responsible for the death of larvae in this pond as the calcium and sodium bicarbonate present in the water are rapidly decomposed by water plants during the hours the sun is shining producing a more basic water due to the formation of calcium and sodium carbonate. Osterhout and Haas have suggested that this change in pH, caused by decomposition of $NaHCO_3$ to Na_2CO_3 while the sun shines, might be used to measure the rate of photosynthesis under controlled conditions. The death of the larvae in the pond may be due to the alkaline water or change of pH from this cause but it still does not account for the absence of mosquitoes close to the pond since there must be many other breeding places where the supply in the vicinity is produced, hence some other reason for their absence must be found.

The water from this fountain comes from one hundred feet beneath the ground and is very cold, 48 degrees F, when it reaches the surface. Upon standing under atmospheric conditions gasses are formed as the water warms and the pressure is released. This is evidenced from the deposit formed in the cement trough as well as when the water is placed in a bottle the gas released amounts to approximately 80 cubic centimeters per gallon. No detailed analysis of this gas has been made as yet but tests have shown it to contain some sulphur dioxide, and carbon dioxide.

The writer does not claim much intimate acquaintance with the mosquito and the life history of the different families of this king of pests, but it is hoped that this brief study of the conditions surrounding one of nature's mosquito protected spots may throw some light on how protection may be had in regions where the little bug is halting the march of civilization.

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†Rudolphs, W. and Lackey, J. B. The compostion of water and mosquito breeding. Amer. Jour. of Hygiene, **9**:1-60. 1929

‡Osterhour, W. J., Hass, A. R. C. A simple method of measuring photosynthes Sci. **47**:1217-1918.