Everglades muck, or Homestead marl soils. It does not occur on clay soils or on soils subject to overflow from clay lands. So far as known, this is the first natural copper deficiency reported.

Yearlings and heifers suckling first calves are most affected, although all ages suffer. It has been observed in sheep, goats and swine. Growth is retarded as much as one half. Reproduction is greatly impaired. This condition, known locally as "Salt Sick," has always been the cause of much loss to Florida's cattle industry. On some areas it has been impossible to keep cattle for any length of time.

Affected animals exhibit almost complete loss of appetite, emaciation, weakness and pale mucous membranes. Clay, sand, rags or dry weeds may be eaten when all feed is refused. Constipation and diarrhea in advanced cases are observed. The mortality rate has been high where cattle were not moved to healthy range or fed grain from an unaffected area.

Early workers at the Florida Agricultural Experiment Station described the post-mortem findings as identical with those of chronic tick fever (with which Salt Sick has been confused), except for the spleen. The spleen parenchyma is atrophied, the entire organ being about one quarter of its normal size. The hemoglobin of the blood often falls below four grams per cent., and the blood volume is reduced. All tissues are pale. The heart muscle is flabby and lacks tone. Otherwise the findings are those of extreme inanition.

Several hundred cases have been treated in the field. Three fluid ounces of a six per cent. solution of ferric ammonium citrate fortified with copper sulfate in molecular ratio of 50:1 given daily as a drench has been effective even in advanced cases. Two ounce doses are given to smaller animals. For prevention of the trouble and cure of less advanced cases, a lick made of 100 pounds of salt, 25 pounds of ferric oxide and one pound of copper sulfate given *ad libitum* has been found to be satisfactory.

Some hemoglobin determinations made in the field by means of a standardized Dare hemoglobinometer during the field work are as follows:

15 critical cases of salt sick	39.5 per cent.
87 visibly affected cases	60.3 " "
87 cases after one month treatment	77.2 " "
34 healthy animals in same herds	100.9 " "
185 healthy animals in unaffected areas	93.1 " "

Controlled feeding trials now in progress completely confirm the results of the field work. Iron supplements alone, even with the amount of copper present in *technical* chemicals, have proven inadequate. This may indicate a relatively high copper requirement in the bovine. Chemical and histological studies of all cases developed are being made. Tabulation of iron analyses of forage samples confirm the deficiency of iron, and copper analyses are being prosecuted.

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DECREASE IN RATE OF OXYGEN CONSUMPTION UNDER THE INFLUENCE OF VISIBLE LIGHT ON SARCINA LUTEA

FOR these experiments cultures of the micrococcus *S. lutea* were grown for twenty-four hours on 1 per cent. peptone agar. The organisms were then gently washed from the medium with distilled water, centrifuged rapidly, washed again and finally suspended in such a quantity of distilled water that there were approximately 5×10^8 cells in each cubic centimeter. Of this suspension, one cubic centimeter was pipetted into each of four reaction vessels of Warburg manometers;[1] one cubic centimeter was heated to boiling for a minute, made up to volume and pipetted into a fifth reaction vessel; the remainder of the suspension was used to inoculate new cultures and for other purposes. The reaction chamber of a sixth manometer contained one cubic centimeter of sterile distilled water. These vessels, into the side-arm of which a half cubic centimeter of normal base (NaOH) had been introduced, were then affixed to their respective manometers. The manometers were set in position in the water bath and allowed to shake for half an hour with open stopcocks, until temperature equilibrium. Then the stopcocks were shut; and since the base absorbed all the carbon dioxide excreted, the change in pressure registered by the manometers can be attributed wholly to the consumption of oxygen by the *Sarcina* in the closed system. The water bath was thermostatically controlled so that the temperature did not vary more than $\pm 0.02°$ C., during the course of any experiment. Illumination was provided by 10 60-w. frosted Mazda lamps arranged in two rows below the water bath, the light passing through the plate glass bottom of the tank and then nine inches of water before impinging on the reaction vessel. The two vessels in which we measured the oxygen consumption in the dark were wrapped in tin foil. The intensity of illumination was frequently controlled and found to be 556 ± 8 meter candles at the level of the vessels.

[1] O. Warburg, "Über d. Stoffwechsel d. Tumoren," 1926.

Fig. 1 shows a pair of curves drawn through the plotted data of four pairs of series, each plotted point representing the arithmetic mean of twenty

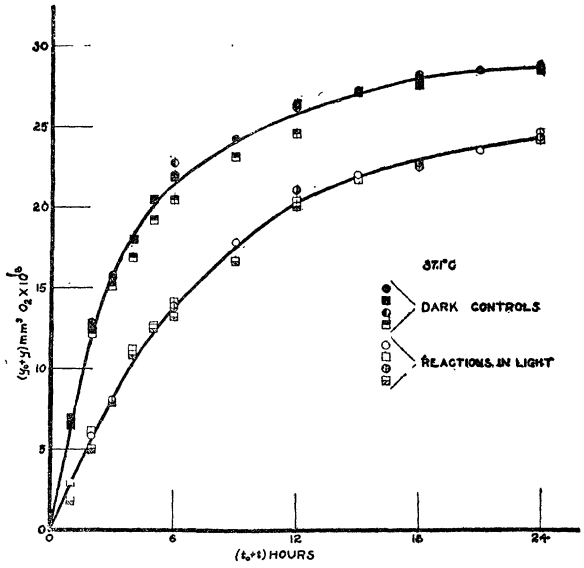

FIG. 1. Curves plotted to data from four series of experiments in distilled water and inorganic salts. Each point represents the arithmetic mean of twenty determinations. t_o is the time elapsed between the beginning of starvation and the beginning of measurement; similarly, y_o is the oxygen consumption during the period t_o. Both t_o and y_o are presented as unknown.

observations. In from 48 to 72 hours, the oxygen consumption falls off to practically nil, while the total quantity of oxygen consumed is approximately equal in the irradiated series and in the dark controls. At the end of a run, the *Sarcina* were plated out to make a count of viable organisms; the results of the counts indicate either that there had occurred no appreciable number of deaths during the period, or that the number of deaths was compensated by the appearance of an almost equal number of new organisms.

The gradual falling off in the rate of oxygen consumption is of interest, especially since we could attribute it neither to a limitation of oxygen supply nor to an accumulation of metabolites in the suspension medium. Apparently, the only substance excreted into the medium by the cells is carbonic acid; since we could find in it no traces even of fatty acids or of nitrogenous compounds. And, furthermore, if we added small quantities of fatty acids or alcohols, we found either that they did not affect the rate of oxygen consumption and were left in the suspension medium, or that they materially accelerated the rate of oxygen consumption and were taken up by the cells from the medium.

It may be noted that of the four series of data plotted, one describes the oxygen consumption of *S. lutea* in distilled water, one in phosphate buffer[2] (pH 6.5–8.0), one in half normal sodium chloride solution, and the fourth in tenth per cent. potassium cyanide solution. We could as well have plotted the data taken on the oxygen consumption of *S. lutea* in a medium of normal potassium iodide, tenth normal potassium chloride, fiftieth molar ferric chloride, or Ringer solution. The data all lie scattered along the same curves; the effects of the different ions and of the different osmotic pressures being less than the experimental error for any determination, that is, less than 3 per cent. of the mean value of twenty determinations in any other of the suspension media. Similar lack of effect of changing osmotic pressure has been reported by Falk,[3] and is discussed by Beck.[4] Thus, it appears that *S. lutea* is an organism in which the respiration is not responsive to changes in the osmotic pressure of its suspension medium; and furthermore, in which iron catalysis of respiration does not occur[5]—or if it does occur, normally, is not essential for the maintenance of cell oxidations.

By inspection, it is evident that even though the total oxygen consumption turns out to be equal in the two series, the rates of oxygen consumption diverge somewhat widely when the cells are irradiated in one case and in the other when they are shielded from light. Indeed, during the first hour, while there is apparently a quantity of light-sensitive material in the cells, the rate for the dark control (at this temperature—37.1° C.) may be as much as five times that for the irradiated organisms.

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