By noting the color of the food and that of the feces it was made certain that each bolus was digested and the waste ready for voiding before the bird could be stimulated to receive food again. The young bird, then, does not take food until the previous bolus has been digested. Immediately upon swallowing a fresh supply a very complicated reflex is set up, which not only leads to defecation but places the young bird in an unusual position in which the parent bird can most easily collect the excreta as voided and remove it from the nest.

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The rôle of B. acidophilus in dental caries.

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Since the first pronouncement by Miller[1] in 1890 that tooth caries is the result of the acid fermentation of carbohydrates by bacteria, students of this subject have been searching for a specific organism of caries.

Kligler[2] first pointed out that in the lesions of caries *B. acidophilus* is commonly present, associated with *L. buccalis, C. placoides,* and *B. putrificus.* Later Howe and Hatch[3] found in advanced lesions of caries the Moro-Tissier group of organisms associated with certain other types which they called respectively Bacillus X, M, and Y. More recently MacIntosh, James and Lazarus-Barlow[4, 5] in England, and Rodriguez[6] in this country, by the use of acid media have found that in deep carious lesions

[1] Miller, W. D., *The Micro-organisms of the Human Mouth,* Philadelphia, 1890.

[2] Kligler, I. J., *J. Allied Dent. Soc.,* 1915, x, 141, 282, 445.

[3] Howe, P., and Hatch, R., *Dental Cosmos,* 1917, lix, 961.

[4] MacIntosh, J., James, W., and Lazarus-Barlow, P., *Brit. Dent. J.,* 1922, xliii, 728.

[5] Idem, *Brit. J. Exp. Path.,* 1924, v, 175.

[6] Rodriguez, F. E., *Military Dental J.,* 1922, v, 199.

B. acidophilus is invariably present and is the most predominant acid-resistant organism associated with the disease. They were also able to produce caries-like lesions in teeth which were immersed in cultures of *B. acidophilus*.

During the past year, in our study of the cause and means of preventing dental caries, we have devoted our attention to a study of the initial stages of caries and the bacteria found to be associated with the first lesion on the tooth. In a study of 73 cases, we found *B. acidophilus* present in 100 per cent of initial caries, in 94 per cent of advanced caries, and in 16 per cent of mouths that were immune to caries. In carious mouths this organism exhibited a high degree of proliferation and a tendency to localize on the tooth, but when present in caries-immune mouths it did not appear to grow in concentrated masses, nor did it predominate in the oral flora as was the case in carious individuals.

We found further that caries-like lesions of the tooth may be produced artificially by lactic acid solutions in concentrations below pH 4.4, in 11 days; also by different strains of *B. acidophilus* in glucose media in from 6 to 8 days when the action was confined to a limited area of the tooth. In a study of the cultural characteristics of over 30 strains of *B. acidophilus,* isolated from carious lesions, it was found that this organism is highly pleomorphic, and that morphologically and biochemically these strains are similar to those isolated from the intestines by Moro.[7] For this reason we see at the present time no justification for giving this organism a new name such as has been suggested by other workers in this field, nor have we as yet found satisfactory grounds for grouping strains into various types on the basis of morphology and fermentation tests.

Our observation that *B. acidophilus* is intimately associated with the initial lesion of caries, and that this organism is capable of producing caries-like lesions in teeth, *in vitro,* establishes the probability that dental caries is essentially a specific infective process dependent on the presence of certain types of organisms and on environmental conditions favorable to their growth and localized acid formation on the tooth. In the attempt to apply these findings to the clinical control of dental caries, we have combatted overgrowths of *B. acidophilus* on the teeth by direct measures of sterilization. Using a mixed solution of brilliant green and crys-

[7] Moro, E., *Jahrb. f. Kinderh.*, 1900, lii, 38.

tal violet (1 per cent of each in 50 per cent alcohol), which we have found to be highly antagonistic to *B. acidophilus* (inhibitory in dilutions of 10 to 15 million), we were able to decrease materially the overgrowth of this organism and to improve greatly the hygienic condition of the mouth. From clinical evidence so far obtained it appears that this procedure may be of considerable practical value in the control of dental caries.

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Continuous recording changes in hydrogen ion concentration of circulating blood: The relation to respiration.

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In the study of the chemical regulation of respiration a need for a continuous method of recording changes in the hydrogen ion concentration of the circulating arterial and venous blood was felt. Such a method has been developed.

By means of a specially devised electrode vessel, a manganese dioxide electrode was placed in the circulating blood. The chain was closed with a non-polarizable electrode, and the E. M. F. recorded potentiometrically on smoked paper by means of a writing point attached to the hard rubber drum of a Leeds and Northrup type K potentiometer.

The continuity of the method, the facility of recording changes in C_{H+}, the amount of data obtainable from single animals, and the possibility of recording synchronous changes in C_{H+} in the arterial and venous blood along with changes in pulmonary ventilation, oxygen consumption, blood pressure, etc., are advantages which make the method extremely valuable. In experiments so far performed the method has shown characteristic changes in the C_{H+} of the blood with various procedures.

The administration of CO_2 eliciting increased pulmonary ventilation was accompanied by a sharp rise in the C_{H+} of the arterial blood, followed by a slower fall in C_{H+} during recovery.