THE CAUSE OF MOTTLED ENAMEL

MOTTLED enamel, a tooth defect first reported in the United States by Messrs. G. V. Black and F. S. McKay[1] in 1916, is wide-spread. A recent Public Health Report[2] by Kempf and McKay shows mottled enamel to exist in districts in Colorado, Texas, Virginia, Arizona, Italy, Holland, China, Mexico, Spain, Argentina, Cape Verde Islands, Bahama Islands and other South American and South African countries. Other centers have been reported recently in Illinois, North Dakota and Minnesota.

Mottled enamel is usually characterized by dull white or "paper white" patches scattered irregularly over the surface of the tooth. In some cases the whole tooth surface shows this dead white, unglazed appearance. In many cases the enamel is badly pitted. Mottled teeth probably erupt with the intercementing material absent. They may or may not become stained later.

From experiments in progress in the nutrition laboratory at the University of Arizona it appears evident that the causative factor of mottled enamel lies in the water supply of the afflicted communities, a view long since held by McKay. By several lines of evidence in our laboratory the destructive action of the water upon the developing enamel of the teeth has been shown to be due to its content of flourine. A condition resembling mottled enamel has been produced in the incisors of rats by the use of water obtained from St. David, Arizona, an endemic community. This water was reduced to one eighth of its original volume by evaporation and given to rats to drink. Water residues were incorporated in the rations of other rats. In both cases a defect of the teeth was produced which was similar, if not identical, to that condition produced in litter mates by the addition of sodium flouride to their ration. The teeth were chalky white, and in many cases decidedly pitted. An abnormal effect in the structure of rats' teeth produced by the feeding of sodium flouride was demonstrated in 1925 by McCollum and his coworkers,[3] but was not at that time associated with mottled enamel. The incisors were reported to be abnormal in color, the orange tint normally seen on their anterior surfaces being nearly absent.

Quantitative analysis of the water from St. David and other afflicted communities has shown a high content of flourine as compared with but small amounts present in the waters of neighboring unaffected regions.

Geologic relations to water supply are being investigated. The finding of prehistoric animals of the late Cenozoic age (mastodons) the tusks and bones of which are unusually high in calcium flouride suggests a possible source of enrichment of the water in flourine in that community. The deposit of cryolite (Na_3AlF_6) on Pike's Peak suggests the source of contamination of the water supply of Colorado Springs, another community in which mottled enamel is endemic.

Gautier[4] has analyzed waters from many different sources for flourine and has shown that waters in volcanic regions, waters produced eruptively and so-called mineral waters contain higher concentrations of flourine.

The relation between the degree of mottling and the concentration of flourine in the drinking water supply of humans is being investigated.

There is some evidence in the author's laboratory to show that certain types of dietary inadequacies make the destructive action of flourine containing waters more pronounced.

Work upon all these lines is being actively pursued.

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RELIC OF AN EARLY AERIAL POST

QUOTING from the Encyclopedia Britannica, eleventh edition, vol. 1, p. 264:

> The first balloon voyage across the English Channel was accomplished by Jean Pierre Blanchard (1753–1809) and Dr. J. Jeffries, an American physician, on the 7th of January, 1785. . . . In their channel crossing Blanchard and his companion, who started from Dover, when about one-third across found themselves descending, and threw out every available thing from the boat or car. When about three-quarters across, they were descending again, and had to throw out not only the anchor and cords, but also to strip and throw away a part of their clothing, after which they found they were rising, and their last resource, viz., to cut away the car, was rendered unnecessary. As they approached the shore, the balloon arose, describing a magnificent arch high over the land. They descended in the forest of Guinnes.

It may be added that a fine monument has been erected at the spot where they landed.

On this journey from Dover Dr. John Jeffries wrote a card to his friend, Mr. Thayer, and dropped it before passing from the English coast. This yellowed and stained bit of early aerial post has recently come into the possession of the Snell Museum of

[1] G. V. Black and F. S. McKay, "Mottled Teeth," *Dental Cosmos*, June 16, 1916.

[2] G. A. Kempf and F. S. McKay, "Mottled Enamel in a Segregated Population," *Public Health Reports*, 45, p. 2923, 1930.

[3] McCollum and coworkers, "The Effect of Additions of Flourine to the Diet of Rats on the Quality of Their Teeth," *Jour. Biol. Chem.*, 63: 553, 1925.

[4] A. Gautier and P. Clausmann, "Le Flour dans les Eaux Minerales," *Compt. Rend. Acad.*, 158: 1631, 1914.

Physics at Amherst College. It was presented to the college many years ago by Thatcher Thayer, D.D., of the class of 1831, Amherst, a descendant of the Thayer to whom it was originally written.

The post-card was written with a lead pencil, and is fairly legible except for a stain in one corner. The inscription is as follows:

From the Balloon above the Clouds.
Let this afford one proof, my dear Mr. Thayer, that *no separation shall make me unmindful of you*,—have confidence,—hopeful that happier days are in store for you, my dear Mr. T. I wish you much pleasure,—believe me as I ever have been,
faithfully yours,
J. JEFFRIES.

This little bit of post-card was prophetic of the days when the Wright brothers' "Strange Contraption" should rise at Kitty Hawk in 1903, when Louis Blériot, 1909, should drive an aeroplane from France to the white cliffs at Dover, when aeroplanes and dirigibles should become the speedy carriers of our mails and when we should see

. . . the heavens fill with commerce,
argosies of magic sails,
Pilots of the purple twilight,
dropping down with costly bales.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE ABDOMINAL WINDOW

SIMPLIFICATION of methods and apparatus in experimental procedures is a goal that is earnestly sought after in teaching. Too frequently, however, when the goal is attained, the results are disappointing. In our laboratory we have devised a piece of apparatus in our teaching courses which has several attractive features that are of interest to teachers, especially those who must combine economy with success. The abdominal window is simple in construction, the results are gratifying, and the expense is almost nothing. There have been many methods devised for observing the movements of stomach and intestines in anesthetized animals; *e.g.*, submerging the intestines under saline solution with the abdominal wall open and making direct observations; feeding a meal mixed with material opaque to x-ray and observing the contractions of the intestines on the opaque material; opening the abdomen in the midline and inserting a watch-glass under the abdominal muscles but over the intestines; opening the abdomen and without further preparation observing the movements as long as they last. Those who have used the above methods will recall readily certain vital objections to each method especially for use in class work.

The abdominal window which we have been using since 1922 in our laboratory is not a new principle but a modification which has proved very successful here. The method was demonstrated at the meeting of the Federation of American Societies for Experimental Biology at Chicago in March, 1930. The window is a modification of the old watch-glass method. One of the most annoying features with that method was the tendency for a loop of intestine to move out of the field of observation, especially after normal observations had been obtained and a procedure inaugurated whose effect one wished to observe. The watch glass was easily placed, but the results were too frequently disappointing. We felt that a larger field of observation should be provided in order to obviate the disappearance of a particular loop of intestine in which we had become interested.

The abdominal window which we have developed is shown in Fig. 1. It consists of a piece of old x-ray film (A) which has had the coating removed and which was cut in the shape shown. It is 7″ long, 4½″ wide. This has been found to be a satisfactory size for both cats and rabbits. We have used it mostly in rabbits. In the upper third is cut a hole 1¼″ in diameter and centered laterally. A lid or door (B) is then cut from another piece of film of such size and shape that it may effectually close this opening or expose it when swung on the hinge (C). This hinge is made with an ordinary office combination punch and eyelet machine. Near the outer margin of the lid (about ½″) a slit is cut just wide enough to permit the insertion of one jaw of a No. 46 Dennison card holder (E). This clip insures the lid being fastened shut. Release of the clip permits the opening of the hole in the window. Woven back and forth through the lid is a wire (D) which is bent slightly with its concavity downward. We used the wire of a No. 1 paper clip straightened out. The object of this wire is to prevent the lid from curling up laterally when it becomes warm. The Dennison clip and the hinge prevent curling in its long diameter. The object of the lid is to permit the making of injections directly into the loop of an intestine or to make applications of agents directly on the outside of the intestinal tract.

The placing of the abdominal window requires a little more operative procedure than the watch glass,