FULLERS' EARTH IN THE INTESTINAL
DISORDERS OF INFANTS*

ALFRED F. HESS, M.D.

NEW YORK

Of late the use of kaolin has been recommended for the treatment of a variety of disorders.¹ It has been reported to have therapeutic value in enteritis, in furunculosis and in vaginitis, and, more recently, has been recommended for application to the nose and throat in infections of these organs.²

The underlying basis of this type of therapy—the use of nonabsorbable substances—is not thoroughly understood; some believe that its value is due to the inhibition of the growth of bacteria, and others that, because of its adsorptive property, it possesses antitoxic value. Influenced by these favorable reports I prescribed kaolin in the intestinal disorders of infants. For this purpose it was either mixed with the milk or was given by the teaspoon. The results in either case were disappointing. In normal infants, kaolin occasioned only a slight degree of constipation, and in those manifesting diarrhea it was found not to reduce the number of stools materially. Dissatisfied with the results of kaolin I turned to the use of fullers' earth. Although these two substances are considered synonymous in the United States Dispensatory and the National Dispensatory they are by no means alike, either in their composition or physiologic action. It is difficult to give a standard analysis of fullers' earth, as it differs considerably, depending on the location in which it is obtained. However, the following analysis of this earth, as well as that of kaolin may be regarded as typical:

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	Alka- lies	Water
Kaolin	45.40	37.34	1.92	0.44	0.20	0.52	14.0
Fullers' earth..	57.26	18.33	1.87	2.58	1.06		18.4

It will be seen that there is a considerable difference between the two substances, the main distinction being that kaolin has a far greater amount of hydrous aluminum silicate, and fullers' earth considerably more calcium. They are different, however, not only in their chemical composition, but also in their physical properties. One of the most noteworthy characteristics of these earths is their power to absorb various alkaloids. In view of this fact, they have been recommended³ as antidotes in the case of various alkaloidal poisonings. In this respect fullers' earth stands preeminent, as it is characterized by its porosity and, as shown by Parsons⁴ "carries an unusually large proportion of colloids of high adsorptive power." In this quality various specimens of earth are by no means uniform. This adsorptive property can most readily be tested by determining the quantity of earth required to remove from solution a given amount of dye. In making tests of this kind, we followed the procedure recently recommended by Fantus,⁵ in which a 1 per cent. malachite green and 0.25 per cent. morphin solution are employed. It seems hardly necessary in a paper pre-

senting a clinical view to give the data of these various examinations. The results may be summarized by the statement that fullers' earth possessed a greater degree of adsorptive power than kaolin, but that among the six specimens of earth which were obtained from various parts of the United States, there were marked individual variations.

It was realized, however, that the value of these earths in the intestinal tract cannot be determined by their ability to adsorb dyestuffs, but must be learned by direct clinical observation and experience. Accordingly, fullers' earth was given to a considerable number of normal infants, in order to test its physiologic effect; to this end, 1 ounce of the earth was given in the day's feeding. This mixture was taken without difficulty by the infants, and was found to occasion no disorder whatsoever. Its sole effect, which may be stated to have been constant, was that it induced constipation. The stools became firm, dry and formed; indeed, in some cases the constipation became so marked that the addition of the earth had to be discontinued. The preparation was then given to infants suffering from indigestion, as manifested by diarrhea, accompanied in some instances by vomiting. In these cases, the earth was either added to the food, consisting of the diluted milk, or it was given by teaspoon every hour or two. Either or both of these methods can be used. No difficulty was experienced in giving the powder suspended in a little water, especially when it was sweetened by means of saccharin (two-fifths grain to 1 ounce of fullers' earth). In severe cases of enteritis, no food whatsoever was given, but merely teaspoonful doses of this preparation as often as every half hour. In some cases it was fed through the stomach tube—1 or 2 table-spoons being introduced in this way three times a day.⁵

As in every type of therapy, success is not invariable. We may state, however, that this therapeutic agent has had a greater effect on inhibiting the diarrhea than has bismuth, chalk mixture or other drugs which are commonly used for this purpose. In some cases it has also seemed to exert a sedative effect on the stomach, as judged by the fact that vomiting ceased in the course of this treatment. In no instance were any harmful effects noted, although the earth was given to patients suffering not only from enteritis, but also from pneumonia and nephritis.

When we turn to consider the modus operandi of this treatment, we tread on ground that is by no means firm. We know that this earth, as Fantus has shown, is "capable of lessening in the human the absorption of substances that are readily absorbed." It is therefore possible that this property is of value in its therapeutic application—that it adsorbs toxins and bacteria, which would otherwise be harmful for the body. In this connection we may add that experiments carried out with solutions of dye showed that casein likewise possesses adsorptive properties to a considerable extent. This naturally raises the question whether casein does not exert an influence on the intestinal tract and its contents owing to its physical as well as to its chemical composition, and whether we are not giving too little thought and credit to this point of view in our dietetic treatment of diseases. It may well be, for example, that part of the therapeutic success which is so regularly obtained by the use of albumin milk (casein or

* From the Research Laboratory, Department of Health, New York.

1. Hektoen, L., and Rappaport, B.: The Use of Kaolin to Remove Bacteria from the Throat and Nose, *THE JOURNAL A. M. A.*, June 12, 1915, p. 1985.

2. In three diphtheria carriers in which kaolin was applied to the pharynx in order to rid it of bacilli, it seemed to exert no effect, although it was used many times a day for several days.

3. Fantus, Bernard: Fullers' Earth: Its Adsorptive Power, and Its Antidotal Value for Alkaloids, *THE JOURNAL A. M. A.*, May 29, 1915, p. 1838.

4. Parsons, C. L.: Mineral Technology, Bull. 71, Bureau of Mines, Dept. of the Interior, October, 1913.

5. Lloyd's reagent, a preparation composed of very fine particles of fullers' earth, was given to a number of infants, but did not seem to possess any advantages over the inexpensive common specimens of fullers' earth.

protein milk), is the result, not only of the antifermentative action of the casein, but of its adsorptive properties as well. However this may prove to be, I wish to point out the difference in therapeutic efficiency between kaolin and fullers' earth, and also to recommend the use of the latter in the gastro-intestinal disorders which are so common in early infancy.

16 West Eighty-Sixth Street.

THE TREATMENT OF INTUSSUSCEPTION

F. J. PARMENTER, M.D.

Fellow of the American College of Surgeons; Attending Surgeon to the Buffalo General Hospital, and the Buffalo Children's Hospital

BUFFALO

The treatment of intussusception is that of acute bowel obstruction, and therefore always surgical. At present, laboratory research has established two facts of considerable importance, which make clear the necessity for early operative intervention. These facts are, first, that death is due to the entrance into the body of a certain toxin or toxins, the exact origin of which, whether chemical or bacterial, has not been definitely established. Some believe the toxin exists under normal conditions in the intestine, while others believe it to be formed after the obstruction. It does not matter, if this point is remembered, that "every case of obstruction is absorbing a poison, which if too long continued will kill, in spite of any treatment yet devised."

Second, this toxin can be absorbed only when the epithelial cells of the mucosa are damaged, as they are by the mechanical closure of the bowel, and the resulting distention. The greater the amount of damage to the epithelial cells, the more toxin is absorbed, and the more danger to the patient. Admitting these statements, who of us will undertake to say how much toxin is being absorbed in a given case, or how much poison the patient can stand, any more than one would try to prophesy the outcome of a case of appendicitis, treated medically? Early operation will save practically every patient. Late operations are hopeless, for the reasons just stated.

The following technic is the one which I have used in seven cases. First let us take the simple case seen during the first twelve hours, usually a baby or a young child. As soon as the diagnosis is made, all fluids by mouth are withheld, the abdomen is painted one coat of tincture of iodine U. S. P., and a hypodermic of morphine and atropine given in appropriate dose.

The operating room is then fully prepared, instruments laid out, needles threaded, subcuticular salt solution made ready, and provision made for every emergency which may arise, so that no time will be lost. The surgeon, assistants and nurses are scrubbed and masked, and gloves and gowns donned before the anesthetic is started. Just before anesthesia, the stomach is washed out if frequent vomiting is taking place. The anesthetic, drop ether, preceded by a few drops of oil of orange for the psychic effect, has been the one used.

As soon as the patient is etherized, subcutaneous salt solution is started, the abdomen repainted with tincture of iodine, sheets placed, and the incision made, usually a high median, and unless good relaxation is secured easily, the muscle is infiltrated with novocain.

The intestines are not allowed to escape from the abdominal cavity if they can be prevented. Usually, however, this is not wholly possible, and as fast as they appear they are wrapped in gauze moistened in hot salt solution. The intussusception is found and delivered. If much bloody serum is encountered in the peritoneal cavity, it indicates a marked degree of interference with the blood supply. The reduction is accomplished by gently squeezing the intussusception from below, and at the same time making gentle traction on the intestine above. After reduction, if of the ileocecal type, and the appendix is quite dark and congested, it is removed, and at the same time the cause of the intussusception sought for. In babies and very young children, abnormalities of the cecum and appendix or enlarged lymph nodes at the ileocecal junction have been mentioned by writers as important etiologic factors, and must be treated accordingly. The combination of all three was present in my last case. In the adult, intestinal adenoma, polyp or Meckel's diverticulum are too frequently present to be ignored, and careful search must be instituted if a recurrence is to be avoided. The intestine is then returned to the abdomen and the wound closed in the usual manner. Recurrence is extremely unlikely; should this be feared, however, the ileum and cecum can be tacked to the peritoneum by a couple of fine chromic gut sutures.

Drainage of the upper loop may at times be necessary to relieve distention, which aids in limiting the absorption of toxin. However, for the reason stated above, no fear need be felt in allowing the toxic contents of the upper bowel to flow on down over normal mucous membrane.

After the operation, the salt solution is continued, or, in the case of a small baby, given at intervals by an antitoxin syringe, until the patient's condition is satisfactory. This treatment may be necessary for several days. Fisher's solution, consisting of sodium carbonate (crystalline) 10 gm., sodium chloride 14 gm. and water to make 1,000 c.c., is administered by rectum, by the Murphy drip, to supply fluid and neutralize starvation acidosis. As soon as possible, fluid is given by the mouth, and nourishment started, especially in a baby. Morphine or its derivatives is used in sufficient doses to quiet the patient. If vomiting continues, lavage of the stomach and colon at frequent intervals is carried out, and large amounts of fluids given subcutaneously and by rectum. Draper has found that the feeding of epithelial cells scraped from the duodenum of a freshly killed dog or frog seems to possess the power of neutralizing this toxin, which is responsible for the continuance of the vomiting, and this method of treatment should be tried. The latter forms of treatment would be especially indicated in the middle cases which just escape resection.

It is not my object to discuss the technical methods of operative procedure in cases demanding resection, which would be of interest only to the operating surgeon, but simply to make a plea for a more careful study and earlier diagnosis than have been accorded this condition in the past. True, progress is rapidly being made in diagnostic methods, but there is still room for improvement, and the statistics which I have collected are illuminating. Among fifty-three patients operated on by a considerable number of Buffalo surgeons, twenty-three were operated on in from three to twenty-four hours. Out of these, twenty-two recovered and one died. This was a 3-months-old child,