

DIENTAMOEBEA FRAGILIS, A CAUSE OF ILLNESS

REPORT OF CASE¹

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Received for publication November 20, 1935

Observations on some cases of *Dientamoeba fragilis* infection have led me to the assumption that this ameba may cause gastrointestinal disorder associated with considerable general debility. A report of a case which offered an unusual opportunity for accurate observations is presented.

The patient, a physician, white male, aged 48, had been residing in Panama for about a year and a half. A year ago, when returning from an expedition to the "interior" he developed an acute colitis which lasted four days. During this disorder the stools were examined several times by competent men and found negative for amebae and other protozoa. Rest, liquid diet, and a few doses of bismuth subcarbonate were the only therapeutic measures required. There were no recurrences and the patient had no gastro-intestinal troubles, except a tendency to constipation, until the onset of the present illness. Several stools were examined during the course of the year and at no time did they show any protozoal or helminthic infection. The medical history prior to the patient's arrival in Panama is of no importance.

On June 19, 1935, the morning stool was softer than usual and was not followed by the normal feeling of complete evacuation but a fullness and irritation in the rectum and slight colicky pain in the upper abdomen. This distress continued through the day, the appetite became impaired and the patient felt tired. In the afternoon he had a second bowel movement, a mushy, sticky stool mixed with a small amount of clear mucus; this stool was examined within a few minutes after evacuation. In the wet smears in normal saline the fields were literally crowded

¹ Read at thirty-first annual meeting of The American Society of Tropical Medicine, November 20-22, 1935, at St. Louis, Missouri.

with *D. fragilis*; it appeared as if one-half of the fecal mass was made up of amebae.

During the following two days there was practically no change in the symptoms and the stools showed the same luxuriant growth of *Dientamoeba*. On the fourth and fifth days of the illness the patient had less abdominal distress and the rectal irritation was less annoying. Coincident with this improvement the growth of the *Dientamoeba* in the stool showed a striking change. There was a decrease in number to an average of four per field of the 16 mm. objective, a diminution in size from an average of 11 to 9 microns and even when examined immediately after evacuation the amebae showed the vacuoles of early degeneration. During the sixth day in the afternoon there was an aggravation of the symptoms, and the morning stool on the seventh day showed a return of the active growth of the *Dientamoeba*. Some of the amebae now had reached a size of 14 microns and all had a finely, uniformly granular endoplasm without vacuoles of degeneration. Although the patient had in mind to let the infection run its course undisturbed by drugs in order to afford an opportunity for prolonged study, the distress now was so annoying that he asked for relief. Bismuth subcarbonate, a heaped teaspoonful q.i.d., was started. Some amelioration was experienced in the evening, and during the following day, the eighth day of the illness, he felt much improved with practically no distress, better appetite, and zest for work. The stools, now gray from bismuth, again showed only the degenerate, smaller forms of the *Dientamoeba*. Bismuth was discontinued. For three days the patient remained quite comfortable although he still had mild colicky pains in the region of the transverse colon and rectal burning particularly after the bowel movements. He had three to four stools a day, still mushy but not as sticky as before. They showed only a relatively scanty growth of *Dientamoebae* which in most of the stools were small, uniform in size and vacuolated. In the morning of the twelfth day another exacerbation occurred. He had three stools during the forenoon, all of which showed the *Dientamoeba* again in the active growth previously described. The patient was obviously ill. The disturbance of digestion and loss of appetite had resulted in a loss of 5 pounds, he felt fatigued and disinclined to do anything but the most necessary daily routine. Bismuth subcarbonate, a heaped teaspoonful q.i.d., was prescribed again. Within 24 hours there was some slight improvement which, however, lasted only a day in spite of continued administration of the bismuth. Although the stools were grayish black from bismuth they remained soft and mushy with all

smears showing an abundant growth of vigorous *Dientamoebae*. The patient felt that some more active treatment should be tried. The bismuth was then discontinued, on the fourteenth day of the illness, and 0.25 gm. carbarsone t.i.d. begun. The next morning he felt much improved, the appetite was good and his strength returning. He passed the whole day without any abdominal pain and only slight rectal burning. The morning stool was formed, soft, with less mucus and stickiness than previously and although numerous smears were made, no *Dientamoeba* could be found. Another stool, passed at noon, also was thoroughly examined in wet and stained smears and similarly found entirely negative. The following day the patient felt as if he had completely recovered and after having taken the morning dose of carbarsone, treatment was discontinued. He has had no recurrences of the symptoms and the stools which were examined daily for two weeks and then twice a week for a period of five months have been normal in all gross features and although exhaustively searched microscopically have proved negative for *Dientamoeba* and other protozoa. There was no fever or any other clinical signs of toxemia at any time during the illness. No blood counts were made. The urine was negative. The stools at no time contained red blood cells and only an occasional small round degenerate pus cell.

PROBABILITY OF THE DIENTAMOEBIA FRAGILIS BEING THE CAUSE OF THE ILLNESS

It does not seem possible that *D. fragilis* played its reputed rôle of a harmless commensal during this illness. Its appearance in the stools with the onset of the illness, the variations in its growth corresponding to variations in the severity of the symptoms, and the prompt recovery of the patient when the infection disappeared strongly indicate a direct etiological relationship. It is not necessary to assume that the *Dientamoeba* produced specific lesions in the intestinal mucosa, but rather that the disturbance was a result of the luxuriant growth of the ameba in the fecal mass changing it from a formed stool to a mushy, or mushy-diarrheal, sticky, irritating mass.

The numerous and painstaking examinations of the feces, before, during, and after the illness, all of which were negative, except for the presence of the *Dientamoeba* during the illness, definitely eliminate other protozoa as possible etiological factors.

There had been no dietary change or indiscretion and no alcoholic indulgence, or medication to account for the intestinal upset. Rectal examination revealed no hemorrhoids, fissures, or other lesions as a cause of the anal irritation which was present throughout the illness.

OPINIONS OF PREVIOUS WRITERS AS TO THE PATHOGENICITY OF
DIENTAMOEBIA FRAGILIS

Although *D. fragilis* hitherto has not been incriminated as the etiological agent of any illness, some observers apparently have suspected it as a cause of diarrheal and other gastro-intestinal trouble. Jepps and Dobell (1) who in 1918 first described this ameba, although inferring from its mode of nutrition, which resembles that of *Entamoeba coli* and *Endolimax nana*, that it was a harmless commensal, point out "that 3 of our 7 cases infected with *Dientamoeba* have histories of intestinal troubles of long standing, as a cause of which no concomitant protozoal or bacterial organism has yet been incriminated." A year later, however, Dobell (2) referring to the same series of 7 cases states that "although most of these cases have suffered from dysentery, there is no evidence that it was in any way due to infection with *D. fragilis*; and none of them were suffering from dysentery at the time when their infections were discovered." This supposed innocence of *D. fragilis* seems not to have been questioned seriously by subsequent observers and the organism became, as Dobell and O'Conner (3) predicted in 1921 "more interesting to the zoologist than to the medical practitioner."

A few papers mention the clinical condition of the host. The case reported by Thompson and Robertson (4) "had a slight diarrheic attack associated with some form of food poisoning, and in the fluid motion the *Dientamoeba* were found." Robertson (5) reports a *D. fragilis* infection in a young woman who had "suffered from recurrent attacks of diarrhea accompanied by pain and tenderness along the line of the large intestine which was frequently much distended." However, in this case also, there were other probable etiological factors and the author apparently did not consider *D. fragilis* the cause of the disorder.

Taliaferro and Becker (6) report an infection with *D. fragilis* in a three-year-old girl, who "was apparently healthy and, as far as could be found, had never suffered from any intestinal disorder." Wenrick, Stabler and Arnett (7) collected some clinical data from a group of college freshmen whom they examined for intestinal protozoa and found that the individuals infected with *D. fragilis* reported more symptoms than those harboring *E. histolytica*. In the literature at our disposal no other references to the clinical significance of *D. fragilis* infections have been found.

COMMENTS ON DIAGNOSIS

Obviously the diagnosis is made by finding *Dientamoeba fragilis* in the stool. For a detailed account of the morphology of this ameba reference should be made to the original description by Jepps and Dobell (1). Some observations and diagnostic methods which have been of assistance to us in recognizing the *Dientamoeba* appear to be of sufficient importance to be mentioned.

In the routine normal saline smear the *Dientamoebae* at first are rounded up and immotile, even if the smears are made from stools immediately after evacuation. During this stage of immobility, which lasts from 5 to 10 minutes, they are seen as spherical bodies filled with a thin only slightly refractile, uniformly granular endoplasm. When present in great numbers, as they frequently are when the stools are mushy or diarrheal, they present, even in this stage of immotility, a very characteristic picture. Recovering from this temporary "paralysis" they become drop-like or angular and then go into their typical motility. The thinness of the pseudopodia is particularly noteworthy and their leaf-like or fan-shaped outline with lobes and indentations is distinctive. No flow of endoplasm into the pseudopodia has ever been observed and although looked for with care and patience no definite progression has been seen. A few times it has appeared as if some amebae did move a minute distance but the probability of currents in the surrounding fluid always made this observation doubtful.

For a positive identification two procedures have been employed: the aqueous smear, and the wet-fixed stained smear. The reaction of *Dientamoeba* in aqueous smears, in which tap water is substituted for the normal saline, recently has been described by the author (8). This procedure has been found to be of considerable practical value in finding and identifying the *Dientamoeba* in the routine examinations for intestinal protozoa. No other protozoa in the human stool has been seen to exhibit a similar reaction in aqueous smears. The explosive rupture with complete evacuation of the endoplasm through an elastic rent leaving a spherical ectoplasmic shell without trace of the tear, is diagnostic. It should be noted, however, that in a case recently studied, the *Dientamoeba* in an occasional stool had lost this toughness and resiliency of the ectoplasm and while still rupturing explosively in the aqueous smear the ectoplasm instead of forming an empty shell would break up and together with the endoplasm would form a small mass of granules, at the edge of which not infrequently the nucleus or nuclei could be seen; but this explosive destruction of a distending protozoa from the human stool has been found as diagnostic of *D. fragilis* as when the ectoplasmic shell remains intact.

Satisfactory stained smears of *D. fragilis* are more difficult to make than of other amebae in the human stool. Jepps and Dobell (1) and some subsequent writers mention that they are troublesome to stain. In stained smears made for the general purpose of revealing the protozoa in a stool the *Dientamoeba* is not likely to appear stained well enough for identification. To be satisfactory the smear has to be fixed specifically for *Dientamoeba*. This makes it of particular importance to recognize its presence or probable presence in the wet smears so that proper staining method can be applied. A simplified technique which has been found satisfactory for clinical purposes recently has been devised by Johnson (9).

The specific name of this ameba, "*fragilis*," and its description in some texts may lead to the impression that the organism quickly disintegrates and that it can be seen only in fresh stools.

We have not found this to occur in any kind of stool, whether diarrheal, mushy or formed. On the other hand the strains of *D. fragilis* which have come under our observations have persisted in stools very much in the same manner as the other human amebae in their vegetative form. In some stools, particularly those in which active putrefaction takes place, the *Dientamoebae* have disintegrated and disappeared within 24 hours, while in stools with much starchy residue in which there apparently have been fermentative rather than putrefactive processes they have persisted for 48 hours (figs. 1 to 8).

In normal saline smears sealed with vaseline and kept at room temperature numerous *D. fragilis* have been seen in active motility after 3 days and sluggishly motile after more than 4 days (figs. 9 to 16). Cultures of *D. fragilis* have been grown from stools as late as 48 hours after evacuation, the stools having been kept at room temperature.

These observations bear out the correctness of the statement by Wenrich, Stabler and Arnett (7) that *D. fragilis* is "apparently much more persistent in stools than is generally believed." They came to this conclusion after having found an incidence for this ameba of 4.3 per cent, although the stools were from 4.5 to 12 hours old when examined.

The process of degeneration, which also was described in detail by Jepps and Dobell (1) and considered characteristic by these authors, has been observed in many specimens and some features of interest noted. It was first found that the late stage of degeneration during which the *Dientamoeba* presents a ring-like form resembling *Blastocystis* was very seldom seen and then only after extensive search. Since, in fact, it is only this late ring-like stage which is characteristic of the degenerating *Dientamoeba* the process as seen in routine examinations of feces is seldom of diagnostic importance. The vacuolate, degenerating *D. fragilis* usually seen, is very similar to degenerating trophozoites of *E. nana*, *I. butschlii* and small *E. histolytica*. However, these vacuolate forms of *D. fragilis* often can be recognized on the motility which they frequently retain until a few hours before disintegration.

Similarly the toughness and resiliency of the ectoplasm as seen in the diagnostic reaction in aqueous smears is not lost for some time after vacuolization of the endoplasm has begun.

COURSE OF *DIENTAMOEBIA FRAGILIS* INFECTIONS

Observations up to this time indicate that *D. fragilis* can exist in the human bowel for an indefinite time. In 1 case it has been present in the stools for 10 months except for a few short periods of constipation with hard dry stools. Another case has shown *D. fragilis* in all stools for two months. On the other hand, a few instances of apparently transient infections, less than one week in duration, have been seen. However, a more extensive search for the amoeba in these cases might have revealed a persistence of the infection. In the case reported above the termination of the infection apparently was due to the administration of carbarsone although it seems incredible that such a small amount of the drug could have eradicated the amoeba.

CONCLUSIONS

1. *Dientamoeba fragilis* when under conditions which are favorable for a luxuriant growth in the human bowel may cause annoying gastro-intestinal symptoms.

2. *Dientamoeba fragilis* does not disintegrate in the evacuated feces as rapidly as generally believed, but usually survives for 24 to 48 hours.

3. *Dientamoeba fragilis* exhibits diagnostic features in normal saline and aqueous smears and readily can be recognized in these preparations.

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PLATE 1

All drawings from smears in normal saline solution. $\times 1000$. The sketches of motile forms were made about 30 seconds apart and do not in all instances represent consecutive changes in contour. All stools and preparations were kept at room temperature.

FIGS. 1 TO 4. Drawings of *D. fragilis* actively motile, from a stool 32 hours old.

FIGS. 5 TO 8. Drawings of *D. fragilis* from a stool 48 hours old. Figs 5 to 7. Immotile, vacuolate forms. Fig. 8. A ring-like remnant with one nucleus still intact.

FIGS. 9 TO 16. Drawings of *D. fragilis* in a normal saline smear sealed with vaseline. Figs. 9 to 12. An actively motile *D. fragilis* after 77 hours. Figs. 13 to 16. A sluggishly motile *D. fragilis* after 97 hours.

