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BACTERIOLOGICAL STUDY OF DYSENTERY IN PORTO RICO

A Preliminary Report

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In comparing health reports of the colder countries with those of warmer countries it is frequently noted that while in the former, diseases of the respiratory and vascular systems stand first in the mortality tables, diseases of the gastro-intestinal tract generally occupy first place in the tropics.

Some time ago while looking over the report of the Commissioner of Health of Porto Rico for the fiscal year 1924-1925 the writer was impressed by two things:

First, the large number of deaths recorded as due to diarrhea and enteritis (4,802), with no special classification, this figure for all ages being higher than those of tuberculosis (3,085), and malaria (1,474) for the same period. For persons two years of age and over, the figure (1,532) ranked next to that for tuberculosis and exceeded that of malaria. See Fig. I.

The second thing was the fact that out of 31,350 deaths for the year only one death was attributed to amoebic dysentery, none to bacillary dysentery, and 119 to unclassified dysentery.

These figures show that bacillary and amoebic dysentery are either rare or unrecognized conditions in Porto Rico or that these infections are so mild that they cause no deaths. It is evident that if there are deaths from either type of dysentery, they are recorded under the general heading of diarrhea and enteritis, that is, such cases are not properly reported to the Bureau of Vital Statistics. It was due to these facts that we were induced to take up the problem of bacillary dysentery in Porto Rico at the School of Tropical Medicine.

Before going into the details of the investigations carried out thus far, it may make for greater clearness if a few considerations in regard to dysentery are briefly set forth.

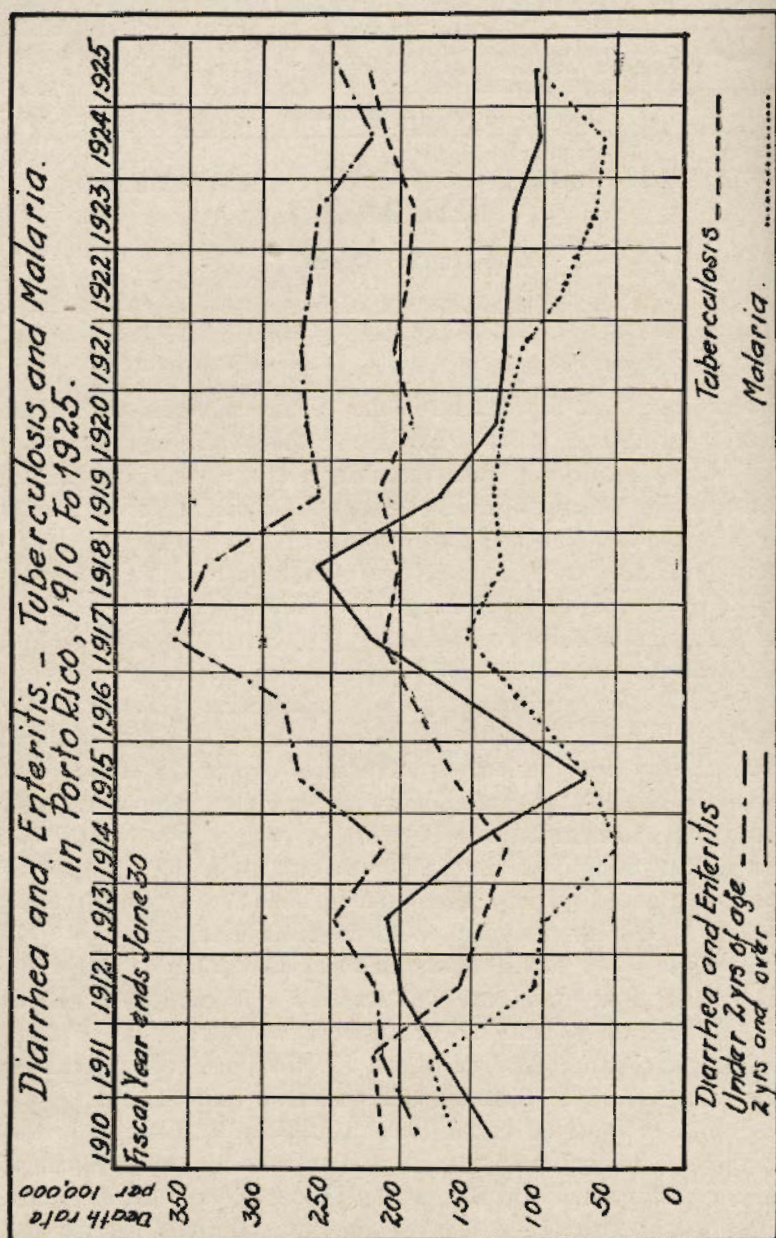


Fig No 1.

What do we understand by dysentery? The term is derived from a Greek word meaning simply "bowel trouble" and may be defined as an acute, sometimes chronic, condition of the intestinal tract of varied origin, occurring sporadically or in small epidemics and characterized by frequent watery stools with or without blood and mucus. The term has thus a clinical rather than a pathological significance and as the definition just given shows, there is no sharp line of division between "dysentery" and "diarrhea", also a clinical term.

In the present paper an etiological rather than a descriptive basis of classification will be followed. The term bacillary dysentery will be used to mean a specific infection of the intestines by dysentery bacilli, with no regard to symptomatology. It is clearly recognized that other micro-organisms may sometimes produce "dysenteric" manifestations.

The importance of this group of disorders was emphasized by Sir Patrick Manson in 1914 when he said that in the tropics the group of morbid conditions included under the general term "dysentery" ranked second in importance only to malaria. Whether this judgment of Manson is accepted or not, practically every investigator in tropical medicine agrees that bacillary dysentery is a widespread disease in the tropics, that it is a serious malady with a comparatively high mortality, that the sequelae of the disease are to be feared, that many cases run such a mild course as to go unrecognized, and that serum treatment though of proved value at the start decreases in value as the disease progresses. From the above, the importance of arriving at a correct and prompt diagnosis, and of instituting treatment at once is evident.

In passing we may say that bacillary dysentery may be caused by—

1. *Eberthella dysenteriae*
Shiga-Kruse.
2. *Eberthella para-dysenteriae*.
 - a. Flexner
 - b. Hiss—Russell
 - c. Strong
 - d. English types, V-W, X-Y, Z.
 - e. Sonne types,
 - f. Others.

Dysenteric manifestations may be produced by a great variety of living agents, not only bacteria (among which may be mentioned *S. enteritidis*, *S. suipestifer*, *S. schottmülleri*, *S. paratyphi*, *S. Morgani* and others) but certain protozoa (*Endamoeba histolytica*,

Giardia lamblia and *Balantidium coli*), and finally by metazoan parasites such as *Schistosoma*, *Ascaris* and hookworm.

In the plan of investigation followed bacteriological examination of all suspected cases was made, together with a large number of cases picked at random for controls, with the additional object of detecting possible "carriers" or mild cases of dysentery which might go unrecognized clinically or be classified as mild diarrhea.

The technique of recovering dysentery bacilli from the stools is a procedure that involves care, work, and time.

Details of the technique employed will not be presented in this summary, but a brief statement of the method may not be out of place.

The stool was plated routinely on Endo and eosin-methylene-blue plates, at times also on brilliant green agar and McConkey's agar. The suspicious colonies, that is, the non-lactose fermenters, were picked and planted in Russell's double sugar. If acid was produced on the slant, recognized by the red coloration, the culture was discarded; if no acid, it was planted in other media and agglutination reactions made to determine the group to which the isolated organism belonged. For the collection of the stool a sterile receptacle is preferable and the specimen must be plated as soon after passage as feasible, the sooner the better, since the longer the time that elapses after passage of the stool the less the chances of recovering *B. dysenteriae* if present.

We have studied bacteriologically the feces of 149 cases, with special reference to the organisms of the group. Of these, seventy-seven were cases of acute diarrhea with or without blood and mucus. The stools were fresh and were obtained through the cooperation of the Municipal Hospital, Presbyterian Hospital, Biological Laboratory and several physicians of San Juan and the Island. As controls seventy-two cases were taken at random, the only point in common being that none were suffering from diarrhea.

Among the seventy-seven cases of acute diarrhea six were positive for *B. dysenteriae*, and in each case the organism proved to belong to the Flexner type. In the series arranged chronologically the positive were Nos. 2, 14, 26, 35, 39 and 42.

Brief notes regarding these six cases follow:

- No. 2. White continental american male, 32 years old. Contracted the disease at Ponce, one month after arrival from the United States. Taken suddenly ill with diarrhea, abdominal pain, tenesmus and violent spasms.

- Stools, liquid with blood and mucus, and microscopically showed numerous polynuclears, erythrocytes and epithelium. No parasites or ova. Treated freely with polyvalent anti-dysenteric serum. Recovered after three weeks during which time he was acutely ill, with continued fever and marked toxic symptoms.
- No. 14. Female, 30 years, from Maunabo. Diarrhea for last six years, becoming more severe and associated with fever, blood and mucus in stools in last few days. Has pain and tenesmus on evacuation. Microscopically, stool shows abundant polynuclears, few erythrocytes and epithelium. *B. dysenteriae* (Flexner) demonstrated. At a second examination six months later, patient was still sick. Stools were liquid with no mucus or blood, but numerous polynuclears and epithelial cells. *B. dysenteriae* could not be demonstrated.
- No. 26. White male, 18 years, from Sunoco, a *barrio* of Santurce. Taken suddenly ill with headache, fever, pain in the abdomen and tenesmus with violent diarrhea. Condition grew steadily worse and on the twelfth day he was brought from his home to the Municipal Hospital, San Juan. At this time stool was liquid with abundant blood and mucus. Microscopically, feces showed abundant polynuclears, erythrocytes and epithelial cells. Patient died in spite of treatment with polyvalent anti-dysenteric serum. Permission for an autopsy could not be obtained.
- No. 35. Female 40 years, from Arecibo. Taken suddenly ill with malaise, nausea, severe abdominal pain, fever, and diarrhea. Stools liquid with abundant mucus and blood. Diarrhea very severe. Made uneventful recovery.
- No. 39. Female, 35 years, from Vega Alta. Acutely ill with fever, pain in abdomen, tenesmus and diarrhea. Stool liquid, with blood and mucus, and microscopically, showed abundant polynuclears and epithelial cells. Made uneventful recovery.
- No. 42. Man, 76 years, from Canóvanas. Acutely sick for past five days with diarrhea without blood at first, but later began to pass blood in stool. Abundant mucus present. Abdominal pain on pressure, no fever. Microscopically, showed abundant polynuclears, epithelial cells and erythrocytes. Made uneventful recovery.

Among the interesting points brought up by this study is the relative infrequency of *B. dysenteriae* as the cause of the prevalent diarrheas, at least in the vicinity of San Juan, where most of the cases studied lived.

Probably the most typical case of dysentery among the six in which *B. dysenteriae* was demonstrated was No. 2, a continental American who contracted the infection shortly after arriving in

Porto Rico. The patient was desperately ill but recovered. Specific serum therapy was begun on the third day of illness.

The single fatality among the six was a man who had been ill twelve days before serum treatment was started.

As in the case of other observers we have encountered among the cases of acute diarrhea the following organisms, in addition to *B. dysenteriae*:

B. proteus, *B. fecalis alcaligenes* (*Alcaligenes fecalis*), *B. pyocyaneus* (*Pseudomonas aeruginosa*), *B. suispestifer* (*Salmonella suispestifer*), *B. para-typhosus* *B.* (*Salmonella schottmülleri*).

Whether these organisms were in any measure responsible for the diarrhea we cannot say at present.

In stools of perfectly healthy individuals the following organisms were also met with:

B. paratyphosus *B.* (*S. schottmülleri*), *B. fecalis alcaligenes* (*Alcaligenes fecalis*) *B. enteritidis* (*Salmonella enteritidis*), *B. pyocyaneus* (*P. aeruginosa*).

In both normal and diarrheic stools we have found organisms belonging to the meta-dysentery group (Castellani's classification), genus "dysenteroides" and "lankoides".

We have found active free-moving *Endamoeba histolytica* in six cases, and an amoeba whose type has not been definitely established as yet was seen in three cases.

In the hope of obtaining some idea of the distribution and frequency of dysentery in the Island and of locating possible endemic foci, the following questionnaire was prepared and sent to 310 physicians distributed in 58 towns of Porto Rico:

1. Do you see in your practice typical cases of dysentery with blood and mucus in the stools. If so, about how many in one year?
2. Do the cases occur chiefly in children or in adults?
3. Is the infection more common in rural or in urban districts?
4. What proportion of the cases are fatal?
5. Are the feces examined for amoeba? If so, with what result?
6. Remarks.

Answers have been received from 120 physicians representing altogether 51 towns. As was expected the replies differed considerably on certain points, particularly on the matter of incidence, due largely, no doubt, to location, and character and extent of practice. But when the answers and comments are grouped a number of facts stand out clearly. Some of the salient points are:

1. Intestinal disorders associated with blood and mucus in the

stools are frequent in practically all the towns. Certain large towns seem to stand out by the large number of cases present.

2. It is the general observation that dysenteric disorders are more prevalent in late summer after the heavy rains.

3. Dysentery appears in epidemics in certain definite areas from time to time, usually at the same time that typhoid epidemics appear.

4. Malaria is frequently associated with "dysentery".

5. Cases are frequent in city jails.

6. Hepatic abscess is rare, only four cases being reported.

7. It is the impression that dysentery is more common in the rural zones than in the towns.

8. A large number of physicians report finding amoeba in the stools of many of their cases, but it should not be forgotten that unless typical free-moving amoebae are seen, the identification of such organisms as *Endamoeba histolytica* is difficult even for those who are experienced in this field of work.

This opportunity is taken to emphasize the importance of early diagnosis of bacillary dysentery and the prompt institution of serum treatment. The only way to establish the diagnosis is by microscopic and bacteriologic examination of the stool. Many claim that a bacteriologic diagnosis involves too great a delay, but in forty-eight hours more or less, one can determine definitely the type of organism. Where there is doubt and the symptoms are severe, serum should be given without waiting for the laboratory report.

Since the disease most easily confused with bacillary dysentery is amoebic dysentery, we have prepared the following table of differences between these two infections:

	Bacillary	Amoebic
Onset	Acute, with fever and toxemia. Pain and tenesmus on evacuation. Pain and tenderness over the whole abdomen.	More insidious as a rule. No fever in uncomplicated cases. Generally sub-acute or chronic, prone to recur. Pain and tenderness over the abdomen, but more localized.
Gross appearances of stool	Loses its fecal character, becomes liquid, and has shreds of mucus and blood.	Although diarrheic, tends to maintain its fecal character. Has small streaks or splashes of blood with mucus.
Microscopic examination of stools	Abundance of cellular exudate. Preponderance in exudate of polynuclears over all forms.	Scantiness of cellular exudate. Preponderance of mononuclears over all forms.

	Bacillary	Amoebic
	Evidence of toxic necrosis of cells, degenerative changes in all parts of the cell including the nucleus.	Evidence of proteolytic digestion of cells, beginning at the periphery of the cell and affecting nucleus last. Absence of phenomena characteristic of inflammation. Presence of <i>Endamoeba histolytica</i> .
Bacteriologic examination	Isolation of the offending organism.	

Certain non-specific disorders of the large intestine may give rise to diarrhea with the presence of pus and mucus, and examination of the stool may show desquamated cells and leucocytes. This exudate may resemble very closely the exudate of bacillary dysentery. In cases Nos. 7, 27, 16, 19 and 24 of our series we had such a picture.

Instances of double infection by *B. dysenteriae* and *Endamoeba histolytica* are rare. It is the opinion of most observers that where a double infection does exist the toxins of the bacilli kill the amoebae, resulting in the predominance of the bacillary infection.

It should be kept in mind that *Endamoeba histolytica* may be found in a large percentage of individuals without producing symptoms.

SUMMARY

1. Though vital statistics show that "diarrhea and enteritis" cause more deaths in Porto Rico than any other group of diseases, the number of deaths attributed to either bacillary or amoebic dysentery is comparatively small. A more thorough clinical and laboratory study of this large group of infections is needed.

2. A bacteriological study of the stools in seventy-seven cases of acute diarrhea revealed the Flexner type of dysentery bacillus in six cases, but no other organisms of the dysentery group. (One of the cases proved fatal.)

3. Examination of stools from seventy-two controls brought to light no carriers of the dysentery bacillus.

4. Various other organisms, including *B. paratyphosus* B, *B. enteritidis*, *B. suipestifer*, of possible significance in intestinal disorders, were encountered in both the diarrheal and non-diarrheal (control) cases.

5. A table of differential diagnosis between bacillary and amoebic dysentery is presented.