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EVALUATION OF DIARRHEA IN HIV-INFECTED PATIENTS

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Diarrhea is a major problem for individuals infected with HIV. Initial studies indicated that 50% of HIV seropositive patients developed diarrhea,[27, 30] but this may be an underestimate. May and colleagues[23] suggest an even higher incidence. They reviewed the charts of 258 patients presenting to an outpatient HIV clinic. Of these patients, 36 (14%) of 258 complained of diarrhea on initial presentation. Moreover, of 168 patients who were initially asymptomatic, 94 (57%) developed diarrhea during 3 years of follow-up; diarrhea was thus reported in 71% of their cohort. Diarrhea has an appreciable adverse affect on the quality of life of these patients and they utilize more health care facilities and health care dollars than HIV-positive patients without diarrhea.[22] Individuals who have homosexuality or bisexuality as their HIV risk factor are more likely to have diarrhea and to have an enteric pathogen identified as the cause of diarrhea than are patients who have heterosexuality or intravenous drug use as their risk factor.[2, 26]

The etiology of diarrhea can be separated into three broad categories: (1) infectious, (2) medication-induced, and (3) idiopathic. Infectious complications can be attributed to either AIDS-related opportunistic infections (e.g., Microsporidia, *Cryptosporidia, Mycobacterium avium* complex [MAC], cytomegalovirus [CMV]) or infections that occur in immunocompromised as well as in nonimmunocompromised hosts. The most important medications associated with diarrhea in patients with AIDS are the antiretroviral agent ddI and antibiotics. DdI has been reported to produce a self-limited diarrhea in up to 20% of individuals so treated. Due to the frequent use of antibiotics in patients with AIDS, antibiotic-associated diarrhea and

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pseudomembranous colitis always should be considered in the differential diagnosis when these patients develop diarrhea. The term *AIDS enteropathy* is no longer used, because it had been a wastebasket term applied to individuals with diarrhea of unclear etiology. The preferred term is *idiopathic AIDS diarrhea*. Postulated causes for this condition include unrecognized or difficult to diagnose opportunistic infections; bacterial overgrowth; autonomic dysfunction (similar to diabetic diarrhea); abnormal intestinal motility; and alterations of intestinal mucosal structure and function caused by HIV infection of the gastrointestinal tract. Regardless of its cause, patients with AIDS who develop chronic diarrhea have more weight loss and a greater degree of immunosuppression than those without diarrhea, as manifested by their lower CD4 counts and a greater incidence of extraintestinal opportunistic infections.[32]

The evaluation of diarrhea in all HIV-infected patients should include a complete history and physical examination; routine blood tests; and stool studies (noninvasive tests). Invasive studies, such as endoscopy, only should be done in certain situations.

EVALUATION OF DIARRHEA IN HIV-POSITIVE PATIENTS

In the past, there had been considerable controversy over what constituted appropriate evaluation of diarrhea in HIV seropositive patients. This controversy in large measure was precipitated by a cost-benefit analysis reported by Johanson and Sonnenberg[16] in which the authors concluded that stool culture alone was an adequate evaluation for all HIV-positive patients with diarrhea and that full evaluation should only be performed for those not responding to nonspecific antidiarrheal agents. It was realized soon, however, that there were a number of problems with this analysis and its recommendations. First, and most importantly, their analysis was performed before effective or potentially effective therapy was available for many of the AIDS-related opportunistic infections. Controlled trials have documented effective therapy for CMV.[9] Therapeutic regimens for MAC decrease bacterial load and improve symptoms,[15] and promising therapies for *Cryptosporidia*[33] and Microsporidia[10] are being evaluated. Second, the analysis was based on a number of small uncontrolled studies, the results of which were not consistent with the general experience of physicians caring for these patients. Third, in the time it takes for a patient to be considered a nonresponder, he or she may become significantly malnourished. This is important, because nutritional status is an important predictor of survival in HIV-infected patients. Fourth, by not attempting to determine the etiology of diarrhea, a treatable pathogen may be missed. Fifth, patients with pathogens that many consider as being untreatable, such as Microsporidia and *Cryptosporidia*, are denied the possible benefits of experimental agents. Although minimal evaluation of just stool culture for bacterial pathogens is inappropriate, it does not make sense to perform endoscopy on all HIV-infected patients with diarrhea. One appropriate approach to HIV-positive

patients with diarrhea is to tailor the intensity of the evaluation to the patients' symptoms, signs, and laboratory examination (especially the CD4 count). Figure 1 outlines one reasonable approach to the evaluation of diarrhea in HIV-positive patients.

Patients with signs and symptoms of proctitis, such as tenesmus, urgency, and so forth frequently have a pathogen or disorder identified by stool culture or flexible sigmoidoscopy, and therefore should not be treated empirically. Sigmoidoscopy probably should be performed as soon as possible, even while the results of stool cultures are pending. Sigmoidoscopy should be performed to diagnose conditions that are not usually diagnosed by stool culture, such as chlamydial and gonorrheal proctitis and CMV proctosigmoiditis. The use of the CD4 count and weight loss as a determinant of the need for endoscopy is discussed later. Patients treated empirically need to be followed closely. Most patients with idiopathic diarrhea do well during long-term follow-up. Patients with a pathogen as the cause of diarrhea may not respond to empiric antidiarrheal agents and either continue to have diarrhea or lose weight; these patients should undergo an endoscopic evaluation.

NONINVASIVE TESTS

Stool studies, except when signs and symptoms suggest proctitis, should be performed prior to any invasive testing. Appropriate stool

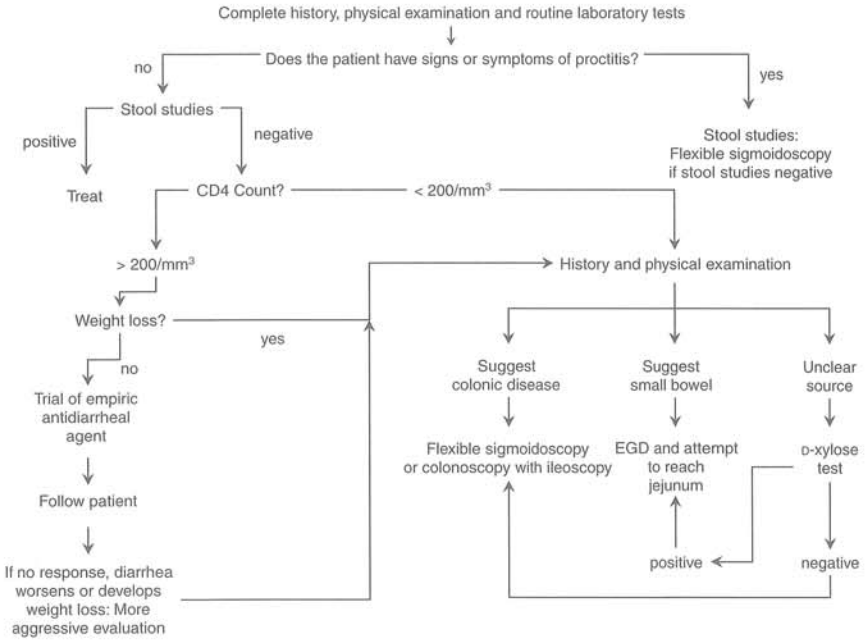

Figure 1. Algorithm for the evaluation of diarrhea in HIV-positive patients with AIDS.

tests include culture and sensitivity for bacterial pathogens (including *Salmonella, Shigella, Campylobacter*); examination for ova and parasites (including *Cryptosporidia, Isospora, Giardia,* Microsporidia), and a *Clostridium difficile* toxin assay. *C. difficile* toxin assay should be performed if the patient is currently taking antibiotics or has been treated with antibiotics anytime in the preceding 4 weeks.

Acid-fast staining of the stool should be considered if the CD4 count is less than 100 to 200/mm^3, even though positive staining is only suggestive of MAC infection. A positive stool culture for MAC is strong evidence of infection, but not all patients with positive stool cultures have gastrointestinal tract involvement. The usefulness of a stool MAC culture is limited because it takes 4 to 6 weeks to obtain the results of this test. A majority of subjects with a positive stool acid-fast stain or MAC culture have positive MAC blood cultures. Therefore, it is important to obtain blood cultures in any AIDS patients with fever to diagnose MAC and other pathogens, such as *Salmonella.*[2] Recent data suggest that only 75% of patients with cryptosporidiosis have oocysts identified in the stool.[13]

What is the appropriate number of stool samples to be examined for ova and parasites? The original studies done by Sawitz and Faust[28] in the 1940s found that examining one stool sample yielded about 50% for *Entamoeba histolytica.* Their study is the basis for the current recommendation that three separate stool specimens be examined for ova and parasites. More recent data from two separate studies performed in Canada suggest that one stool sample may be adequate. Senay and MacPherson[29] reviewed the number of positive stool examinations in patients who had two or three sets of stool specimens sent to their parasitology laboratory (Table 1); the first specimen was positive in at least 90%. Due to its intermittent shedding, *Giardia lambia* was the most common intestinal pathogen not identified in the initial stool specimen. It can be argued that 90% is low by current standards because most parasitology laboratories use monoclonal antibodies to identify *Cryptosporidia* and *Giardia.* In another study, using a similar method, Montessori and Bischoff[24] reported that 95.6% of enteric pathogens were identified in the initial stool specimen. The authors of these studies recommended waiting for the result

Table 1. YIELD OF STOOL OVA AND PARASITE EXAMINATIONS

	N (%) of Sets	
	2 Sample Sets (n = 276)	**3 Sample Sets (n = 401)**
First of set positive	258 (93)	361 (90)
First of set negative	18 (6)	30 (8)
Second of set negative		10 (2)

From Senay H, MacPherson D: Parasitology: Diagnostic yields of stool examination. Can Med Assoc J 140:1329–1331, 1989; with permission.

from the initial stool specimen before submitting additional specimens. This strategy must be weighed against the practicality of the patient returning to give additional stool specimens or of additional hospital days just for this purpose.

A reliable noninvasive stool test to diagnose Microsporidia would result in a decreased need for endoscopy in patients with AIDS. Microsporidia spores can be found in stool by staining it with either Giemsa or a modified trichrome stain (MTS or Chromotrope stain). Uvitex 2B, fungiqual A, and calcofluor white are fluorochrome stains that have been reported to help identify fecal Microsporidia spores. Fluorochrome stains bind to the citin component of the spore coat and fluoresce when exposed to the proper ultraviolet light spectrum. A recent study comparing the MTS and Uvitex 2B stains reported[8] that both techniques have excellent sensitivity and specificity. All patients with negative stool studies had negative small bowel biopsies for Microsporidia. Fourteen of the 20 AIDS patients with positive stool studies for Microsporidia had positive small bowel biopsies. In the six patients with negative small bowel biopsies, four had spores identified in the stool by electron microscopy. The Uvitex 2B fluorescent stain has the advantage of being a more rapid technique that allows for identification of a greater number of spores and is easier to perform than MTS; it can be used for screening, with the MTS used as a confirmatory test. A limitation of the Uvitex 2B technique is that its fluorescence fades over weeks to months, whereas the MTS can be used as a permanent record. Uvitex 2B reagents are difficult to obtain, whereas the other fluorescent stains (fungiqual A and calcofluor white) have similar sensitivities and are commercially available.

None of these staining techniques can differentiate *Enterocytozoon bieneusi* from *Encephalitozoon intestinalis* (previously called *Septata intestinalis*). Speciation requires electron microscopic study of either stool or tissue specimens; currently, there are few centers doing such speciations. Identification of microsporidian spores is time consuming and requires a significant amount of expertise. Experience is important because microsporidian spores are confused easily with vacuolating or sporulating bacteria on MTS and with yeast and hyphae, which also weakly fluoresce with fluorochrome stains. These stains should be available in centers that serve a large AIDS population. The ideal stool test for Microsporidia is a fluorescent-labeled antibody test, as is used with *Cryptosporidia* and *Giardia.* Because *E. bieneusi* cannot be grown in tissue culture, however, monoclonal antibodies cannot be produced. Preliminary studies using monoclonal and polyclonal antibodies (derived from microsporidian species other than *E. bieneusi*) in an ELISA-based system have not been encouraging.[1] Giemsa or modified trichrome staining of a spun urine sediment also may be helpful diagnostically, because *E. intestinalis* frequently infects the kidney and its spores are excreted into the urine.[12]

A number of enteric viruses, including adenovirus, rotavirus, astrovirus, calicivirus, coronavirus, and small round viruses, have been reported

Table 2. STUDIES OF THE USEFULNESS OF ENDOSCOPY IN THE EVALUATION OF DIARRHEA IN HIV-POSITIVE PATIENTS

	Kotler and Orenstein[21]	Wilcox et al[34]	Connolly et al[6]	Blanshard and Gazzard[5]	Greenson et al[14]	Smith et al[31]	Bini[3]	Kearney et al[18]
# Patients Studied	141	48	33	155	22	20	307	14
% With Pathogens Identified	83	44	36	59–79 (see below)	50	85	48	50
Was Panendoscopy Done?	In the majority	Yes	No; only flexible sigmoidoscopy done	No; only flexible sigmoidoscopy done	No; only flexible sigmoidoscopy done	Yes	No	Yes
Findings: N	Micro = 55 Crypto = 33 CMV = 23 MAC = 19 Adherent Bacteria = 18	Micro = 7 Crypto = 1 CMV = 9 *C. diff* = 1 CMV + crypto = 1 CMV & *C. diff* = 1	Crypto = 4 CMV = 4 Giardia = 2 Salmonella = 1 Campylo = 1 *E. histolytica* = 1	Micro = 37 Crypto = 46 CMV = 28 MAC = 12 Giardia = 18 Campylo = 7 Shig = 2, Salm = 1 Adenovirus = 9 Isospora = 1	Micro = 5 MAC = 4 MAC & Giardia = 1 CMV & Crypto = 1	Crypto = 3 CMV = 9 MAC = 1, HSV = 1 Giardia = 3, KS = 1 Campylo = 3 Salm = 5 Amaeba = 5	CMV = 60 Micro = 25 MAC = 21 Crypto = 12 *C. diff* = 6 Giardia = 6 Other = 17	CMV = 2 Crypto = 2 Micro = 1 CMV + Micro = 1 Giardia + Micro = 1
Study Strengths	Extensive study of consecutive patients and the only study that looked for enteroadherent bacteria.	Only study in the literature with well-defined criteria. Consecutive patients studied and all had EGD and colonoscopy.	Consecutive patients studied, measured stool weights, performed up to six stool studies.	A large study that did an extensive evaluation including stool viral studies.	All patients had extensive negative stool studies prior to enrollment.	Patients had an extensive evaluation.	A large study and all patients had negative stool studies prior to endoscopy.	All had panendoscopy and only patients with negative stool studies included.

Study Faults	Not all patients had panendoscopy. The degree of diarrhea and whether patients were taking antidiarrheal medications were not stated.	Only studied patients with ≥3 bowel movements per day after treatment with antidiarrheal agents.	A small study, only rectosigmoid biopsies were done and not stated if patients were on antidiarrheal medications.	Only rectosigmoid biopsies done. Not clearly stated why patients studied. Only states that "no cause for diarrhea has been identified after a series of investigations." Only patients with ≥3 bowel movements per day & CD4 < 200. The use of antidiarrheal medications not stated.	Only rectosigmoid biopsies done and patients with ≥3 bowel movements per day. The use of antidiarrheal medications not stated.	Not stated in which patients endoscopy was helpful. Studied only patients with ≥3 bowel movements per day and use of antidiarrheal medications not stated.	Not all patients had panendoscopy. The degree of diarrhea and whether patients were taking antidiarrheal medications were not stated.	A small study. The degree of diarrhea and whether patients were taking antidiarrheal medications were not stated.
Other Findings & Comments	An abnormal D-xylose predicts a small bowel pathogen. It is not proven that adherent bacteria are a cause of diarrhea.	No pathogen found if CD4 > 100 or no weight loss. Most pathogen-negative patients did well.	No pathogen found if no weight loss & stool weight <400 mL/d. Abnormal Schilling test also predicts pathogens.	Most pathogen-negative patients did well & 20% had a pathogen found during F/U. The 59% is close to 75% if pathogens are included that are possibly associated with diarrhea.		These results are what is expected in a patient presenting de novo with diarrhea. Many of these diagnoses should be made by stool studies alone.	This study has only been published as an abstract. No pathogens found if CD4 > 200.	This study has only been published as an abstract.

to be the cause of diarrhea in AIDS patients. There is little reason to perform stool studies for these enteric viruses because the clinical significance of many of these viruses is unknown and currently testing for these agents is time consuming and expensive.

INVASIVE TESTS

A critical question is, what is the role of endoscopy in evaluating AIDS patients with chronic diarrhea? There have been a number of studies looking at the prevalence of different pathogens in patients with AIDS-related diarrhea. These studies have varied their inclusion and exclusion criteria, the number of stool studies performed, what was called a pathogen, and in the degree of endoscopic evaluation. There have been a few studies that have looked at the role of endoscopy in investigating diarrhea in patients with negative stool studies. Some of these studies are listed in Table 2. These studies indicate that if endoscopy is performed, the etiology of diarrhea is identified in 40% to 80% of patients and that patients without pathogens identified tend to do well.

The yield of endoscopy can be improved if certain patient subgroups are studied. A recent study by Wilcox et al[34] reported that a cause of diarrhea could not be identified in any patient with a CD4 count greater than 100/mm^3 and without weight loss. This study confirmed the earlier study by Connolly et al[6] in which pathogens were not identified in patients without weight loss. The retrospective study by Bini[3] also reported that in no patient with a CD4 count greater than 200/mm^3 was a pathogen identified. The data from these three studies are the basis for much of the algorithm in Figure 1. Evidence of malabsorption, as determined by abnormal D-xylose test and Schilling tests, also identifies a subgroup for which the yield of endoscopy is greater than it is in the absence of these abnormalities.

The patient's history and physical examination can be used to determine whether upper or lower endoscopy should be the initial diagnostic test (Table 3). Features suggestive of a lower tract cause for diarrhea include tenesmus; urgency; multiple, small bowel movements; fever; lower abdominal pain; and the presence of white blood cells and red blood cells in the stool. Upper tract pathology is characterized by large-volume diarrhea, a variable frequency of bowel movements, midabdominal pain, the presence of undigested food in the stool, clinical features of malabsorption, and the absence of fecal white and red blood cells. If it is unclear whether the patient has upper or lower tract disease, a D-xylose test can be performed. This is a rapid, easily performed test, which when abnormal suggests upper tract pathology.

An important question is whether colonoscopy or flexible sigmoidoscopy should be performed when evaluating the colon. Wilcox et al[34] reported that flexible sigmoidoscopy was adequate to make the diagnosis in 12 of their 13 patients with colonic disease. This supports the study by Connolly et al[7] reporting that colonoscopy identifies more extensive

Table 3. CLINICAL DIFFERENCES BETWEEN SMALL INTESTINAL AND COLONIC DISEASE

	Small Intestinal Disease	Colonic Disease
Frequency	3–8	3–30
Volume	large	small
Regularity	variable	regular
Formed stools	rarely	occasionally
RBC and WBCs in stool	no	yes
Undigested food in stool	yes	no
Urgency/tenesmus	no	yes
Abnormal D-xylose	yes	no
Debilitation	mild/moderate	moderate/severe
Appetite	fair/good	poor/fair
Pathophysiology	malabsorption	inflammation

RBC = Red blood cell; WBC = white blood cell.

disease than does flexible sigmoidoscopy, but that in only 1 (5%) of 20 patients was an additional diagnosis made. Two smaller studies[18, 27] also reported that flexible sigmoidoscopy was adequate to establish a diagnosis of CMV colitis. These studies are in contrast to that of Dieterich and Rahmin,[11] in which 39% of their 40 patients with CMV colitis had disease localized only to the right colon. Bini and Weinshel,[4] in an abstract, reported that 21 (28%) of 74 patients with a colonic pathogen had it localized to only the right side of the colon.

Colonoscopy combined with ileoscopy may be the best single test to evaluate diarrhea in patients with AIDS. Kamradt et al[17] reported on 35 patients undergoing colonoscopy and ileal intubation. Colonic biopsy and ileal biopsy identified a pathogen in 12 and 13 patients, respectively. Ileoscopy identified a pathogen not found by colonoscopy in eight patients. Greenberg and Cello[13] compared biopsies from different parts of the gastrointestinal tract and found that *Cryptosporidia* was more prevalent in the terminal ileum than in the colon. This confirms physiology studies[19] that indicate *Cryptosporidia* is an ileal pathogen. Microsporidia appears to be identified with equal frequency in the ileum and the duodenum (personal communication, D. Kotler, 1995). If enteropathogenic bacteria[20, 25] identified in the right colon and terminal ileum are found to be a significant cause of diarrhea in AIDS patients, colonoscopy with ileoscopy may become the diagnostic procedure of choice.

References

1. Aldras AM, Orenstein JM, Kotler DP, et al: Detection of microsporidia by indirect immunofluorescence antibody test using polyclonal and monoclonal antibodies. J Clin Microbiol 32:608–612, 1994
2. Antony MA, Brandt LJ, Klein RS, et al: Infectious diarrhea in patients with AIDS. Dig Dis Sci 33:1141–1146, 1988

3. Bini EJ: High diagnostic yield of endoscopy in HIV-positive patients with chronic diarrhea. Gastroenterology 112:A936, 1997
4. Bini EJ, Weinshel E: Colonoscopy is superior to flexible sigmoidoscopy in HIV-positive patients with chronic diarrhea. Gastrointest Endosc 45:320, 1997
5. Blanshard C, Gazzard BG: Natural history and prognosis of diarrhea of unknown cause in patients with acquired immunodeficiency syndrome (AIDS). Gut 36:283–286, 1995
6. Connolly G, Forbes A, Gazzard B: Investigation of seemingly pathogen-negative diarrhea in patients infected with HIV 1. Gut 31:886–889, 1989
7. Connolly GM, Forbes A, Gleeson JA, et al: The value of barium enema and colonoscopy on patients infected with HIV. AIDS 4:687–689, 1990
8. DeGirolami PC, Exratty CR, Desai G, et al: Diagnosis of intestinal microsporidiosis by examination of stool and duodenal aspirates with Weber's modified trichrome and Uvitex 2B stains. J Clin Microbiol 33:805–810, 1995
9. Dieterich DT, Koter DP, Busch D, et al: Ganciclovir treatment of cytomegalovirus colitis in AIDS: A randomized, double-blind, placebo-controlled multicenter trial. J Infect Dis 167:278–283, 1992
10. Dieterich D, Lew E, Kotler DP, et al: Treatment with albendazole for intestinal disease due to *Enterocytozoon bieneusi* in patients with AIDS. J Infect Dis 169:178–183, 1994
11. Dieterich DT, Rahmin M: Cytomegalovirus colitis in AIDS: Presentation in 44 patients and a review of the literature. J AIDS 4(suppl 1):S29–S35, 1991
12. Dore GJ, Marriott DJ, Hing MC, et al: Disseminated microsporidiosis due to *Septata intestinalis* in nine patients infected with human immunodeficiency virus: Response to albendazole. Clin Infect Dis 21:70–76, 1995
13. Greenberg PD, Cello JP: The diagnosis of *Cryptosporidium parvum* in patients with severe diarrhea and AIDS. Am J Gastroenterol 90:A1899, 1995
14. Greenson J, Belitsos P, Yardley J, et al: AIDS enteropathy: Occult enteric infections and duodenal mucosal alterations in chronic diarrhea. Ann Intern Med 114:366–372, 1991
15. Horsburgh CR: *Mycobacterium avium* complex infection in the acquired immunodeficiency syndrome. N Engl J Med 324:1332–1338, 1991
16. Johanson J, Sonnenberg A: Efficient management of diarrhea in the acquired immunodeficiency syndrome. Ann Intern Med 112:942–948, 1990
17. Kamradt JM, Zwas FR, Eisen RN: Ileoscopy in the evaluation of diarrhea in patients with HIV infection. Gastroenterology 108:A19, 1995
18. Kearney DJ, Koch J, Cello JP: Prospective study of endoscopic evaluation of patients with AIDS-related diarrhea. Gastroenterology 108:A20, 1995
19. Kelly P, Thillainayagam AV, Keating J, et al: HIV-related cryptosporidial diarrhoea: Water and electrolyte transport in human jejunum. Gastroenterology 106:A709, 1994
20. Kotler DP, Giang TT, Thiim M, et al: Chronic bacterial enteropathy in patients with AIDS. J Infect Dis 171:552–558, 1995
21. Kotler DP, Orenstein JM: Prevalence of intestinal microsporidiosis in HIV-infected individuals referred for gastrointestinal evaluation. Am J Gastroenterol 89:1998–2002, 1994
22. Lubeck DP, Bennett CL, Mazonson PD, et al: Quality of life and health services use among HIV-infected patients with chronic diarrhea. J AIDS 6:478–484, 1993
23. May GR, Gill MJ, Church DL, et al: Gastrointestinal symptoms in ambulatory HIV-infected patients. Dig Dis Sci 38:1388–1394, 1993
24. Montessori GA, Bishoff L: Searching for parasites in stool: Once is usually enough. Can Med Assoc J 137:702, 1987
25. Orenstein JM, Kotler DP: Diarrheogenic bacteral enteritis in acquired immunodeficiency syndrome. Hum Pathol 26:481–492, 1995
26. Rabeneck L, Crane MM, Risser JM, et al: Effect of transmission category and CD4 count on the occurrence of diarrhea in HIV-infected patients. Am J Gastroenterol 88:1720–1723, 1993
27. Rene E, Marche C, Begnier B, et al: Intestinal infections in patients with acquired immunodeficiency syndrome. Dig Dis Sci 34:773–780, 1989
28. Sawitz WG, Faust EC: The probability of detecting intestinal protozoa by successive stool examinations. Am J Trop Med Hyg 22:131–136, 1942
29. Senay H, MacPherson D: Parasitology: Diagnostic yields of stool examination. Can Med Assoc J 140:1329–1331, 1989

30. Simon D, Brandt L: Diarrhea in patients with AIDS. Gastroenterology 105:1238–1242, 1993
31. Smith PD, Lane HC, Gill VJ, et al: Intestinal infections in patients with the acquired immunodeficiency syndrome. Ann Intern Med 108:328–333, 1988
32. Smith PD, Quinn TC, Strober W, et al: Gastrointestinal infections in AIDS. Ann Intern Med 116:63–77, 1992
33. White AC, Chappell CL, Hayat CS, et al: Paromomycin for cryptosporidiosis in AIDS: A prospective, double blind trial. J Infect Dis 170:419–424, 1994
34. Wilcox CM, Schwartz DA, Cotsonis G, et al: Chronic unexplained diarrhea in human immunodeficiency virus infection: Determination of the best diagnostic approach. Gastroenterology 110:30–37, 1996

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