Lab dx - microscopy misc

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The Impact of HIV on the Usefulness of Sputum Smears for the Diagnosis of Tuberculosis

Richard Long, MD, Marcella Scalcini, MD, MPH, Jure Manfreda, MD, Michel Jean-Baptiste, MD, and Earl Hershfield, MD

ABSTRACT

In a developing country, 289 patients were examined for active pulmonary mycobacterial disease (sputum smear and culture) and HIV infection (serology) to compare the sensitivity and positive predictive value of sputum smears for diagnosing pulmonary tuberculosis in patients with and without antibodies to HIV. Seventy-nine percent of HIV-seronegative vs 66% of HIV-seropositive patients with positive cultures for *Mycobacterium tuberculosis* were smear positive ($P < .05$), and a positive sputum smear predicted the presence of *M. tuberculosis* in 90% of HIV seronegative vs 80% of HIV seropositive patients ($P < .05$). In our opinion, HIV did not significantly compromise the diagnostic utility of the sputum smear. (*Am J Public Health.* 1991;81:1326–1328)

Introduction

The continuing usefulness of sputum smears for the diagnosis of tuberculosis in developing countries has been questioned. In a recent editorial,[1] Pitchenik expressed concern that immunosuppression resulting from human immunodeficiency virus (HIV) type 1 may not only have reduced the sensitivity of the sputum smear by reducing caseation necrosis, and thus the number of acid-fast bacilli in the airway,[2–5] but may also have affected the specificity of the sputum smear by increasing the proportion of patients with nontuberculous mycobacteria.[6] To determine whether HIV has compromised the usefulness of the sputum smear, we compared the sensitivity and positive predictive value of smears for the diagnosis of pulmonary tuberculosis in rural Haitians with and without antibodies to HIV.

Methods

Over a 1-year period beginning March 1988, 323 consecutive rural Haitians presented to a district hospital (Hopital Albert Schweitzer) with suspect pulmonary mycobacterial disease had positive sputum smears for acid-fast bacilli and/or positive cultures for mycobacteria. None had received antituberculous drugs in the preceding 12 months. HIV antibody status was determined in 297 (92%) patients; serum was not available for 4 patients who died shortly after admission and 22 who either refused the test or had already left the facility. Eight HIV-tested children were excluded because the positive culture was from a gastric aspirate and not a sputum specimen. This left a total of 289 (89%) patients for whom results of HIV testing, sputum smear examination, and sputum culture were available.

Two to three fresh, first morning deep cough specimens of sputum were collected from each patient and processed in a manner identical to that reported previously.[7] Standard methods of decontamination, staining, culture, and speciation were applied.[8–11] After obtaining informed consent, serum was collected and tested for antibody to HIV using standard methodology.[12]

Chi-square and Fisher's Exact test were used to compare the sensitivity and positive predictive value of sputum smears for the diagnosis of tuberculosis in HIV-seropositive and HIV-seronegative patients with pulmonary mycobacterial disease.[13]

Results

The 289 study patients ranged in age from 12 to 95 years; 54% were male and 46% female. Table 1 shows that 74 (26%) were HIV seropositive, 222 (77%) smear positive, and 266 (92%) culture positive. Culture was positive for *Mycobacterium tuberculosis* alone in 236, for both *M. tu-*

The research for this paper was conducted at the Department of Medicine, Hopital Albert Schweitzer, Haiti (MS, M J-B), and the Department of Medicine, University of Manitoba, Winnipeg, Canada.

Requests for reprints should be sent to Richard Long, MD, Room C5116, Department of Medicine, St. Boniface General Hospital, 409 Tache Avenue, Winnipeg, Manitoba, Canada, R2H 2A6.

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berculosis and nontuberculous mycobacteria (NTM) in 21, and for NTM alone in 9 patients.

It can be deduced from Table 1, that the sputum smear was significantly ($P<.05$) less likely to be positive for acid-fast bacilli in HIV seropositive (50/74, 68%) than in HIV seronegative (172/215, 80%) patients. Likewise, a sputum culture positive for *M. tuberculosis* was less likely ($P=.05$) to be present in HIV seropositive (61/74, 82%) compared to HIV seronegative patients (196/215, 91%). In contrast, HIV seropositive patients were more likely ($P=.05$) to have sputum cultures positive for an NTM alone (5/74, 7%) than were HIV seronegative patients (4/215, 2%). The proportion with a negative culture was not significantly different between HIV seropositive (8/74, 11%) and seronegative (15/215, 7%) patients.

The sensitivity of a positive acid-fast smear to identify subjects with a positive *M. tuberculosis* culture was significantly greater in HIV seronegatives than in HIV seropositives. The sensitivity in HIV seronegatives was 79% (155/196) in comparison to 66% (40/61) in HIV seropositives. In addition, a positive sputum smear predicted the presence of *M. tuberculosis* in 80% (40/50) of HIV seropositive patients and 90% (155/172) of HIV seronegative patients, a difference that was also statistically significant ($P<.05$). Neither the sensitivity nor the positive predictive value varied by age or sex.

The species of NTM isolated from 30 patients are shown in Table 2. *M. scrofulaceum* was the most common NTM isolated (13/30, 43%). In 10 instances it was isolated together with *M. tuberculosis* and in 3 it was the only isolate. All of the latter isolates were from HIV seropositive patients. *M. fortuitum* was the next most common NTM isolated (6/30, 20%). In each instance (except one where it was isolated together with *M. gordonae*) it was the only isolate, accounting for 67% (6/9) of the patients in which an NTM alone was isolated. Of the 6 patients from whom *M. fortuitum* was isolated, 2 were HIV seropositive.

TABLE 1—Sputum Smear and Culture Status of HIV Seropositive and Seronegative Haitians with Pulmonary Mycobacterial Disease

	HIV Positive (n=74)		HIV Negative (n=215)	
Culture	Smear +	Smear −	Smear +	Smear −
TB	37	18	143	38
TB and NTM	3	3	12	3
NTM	2	3	2	2
Negative	8	0	15	0
Total	50	24	172	43

Note: HIV = human immunodeficiency virus type 1; TB = *M. tuberculosis*; NTM = nontuberculous mycobacteria; + = positive; − = negative.

TABLE 2—Species of NTM Isolated from HIV Seropositive and Seronegative Haitians with Pulmonary Mycobacterial Disease

	HIV Positive				HIV Negative				
	Smear +		Smear −		Smear +		Smear −		
	TB Culture		TB Culture		TB Culture		TB Culture		
NTM	+	−	+	−	+	−	+	−	Total
M. scrofulaceum	2	2	1	1	6	1			13
M. gordonae					4		2		6
M. fortuitum				1[a]		2[b]		2[b]	5
M. flavescens			1		1				2
M. avium complex					1				1
M. vaccae			1						1
M. avium complex + *M. gordonae*	1								1
M. gordonae and *M. fortuitum*				1[a]					1
Total	3	2	3	3	12	3	2	2	30

Note: HIV = human immunodeficiency virus type 1; NTM = nontuberculous mycobacteria; TB = *M. tuberculosis*; + = positive; − = negative.
[a] Biovariant *peregrinum*.
[b] Biovariant *fortuitum*.

Discussion

Particularly in developing countries, where resources for mycobacterial culture are often not available, acid-fast smears are relied on to diagnose tuberculosis. Before the AIDS epidemic the sensitivity of a positive sputum smear was relatively low, but the positive predictive value was high.[14] A patient with a positive smear was almost certain to have tuberculosis and was treated accordingly. Whether HIV modifies the sensitivity and positive predictive value of the sputum smear, especially in developing countries where HIV seroprevalence may be high,[15] is not known. In our study of rural Haitians we found small but significant differences in the sensitivity and positive predictive value of sputum smears between HIV seropositive and HIV seronegative pulmonary tuberculosis patients; 79% of HIV seronegative vs 66% of HIV seropositive patients with positive cultures for *M. tuberculosis* were smear positive, and a positive sputum smear predicted the presence of *M. tuberculosis* in 90% of HIV seronegative vs 80% of HIV seropositive patients. In our opinion, these differences are small and do not significantly compromise the usefulness of sputum smears in developing countries such as Haiti, where the prevalence of tuberculous infection is high.[16] Regardless of HIV status, patients with sputum smear positive pulmonary mycobacterial disease should be assumed to have disease caused by *M. tuberculosis* and should be treated accordingly. □

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ABSTRACT

During 1987 and 1988, exposures to eight pet wild raccoons in South Carolina and West Virginia resulted in administration of rabies postexposure prophylaxis to 19 children and 26 adults. All eight raccoons appeared normal at the time of capture, and three had no signs of illness when sacrificed. The direct medical costs resulting from these exposures was $25,714 ($527 per person). Regulations and public education may help decrease this type of rabies exposure. (*Am J Public Health* 1991;81:1328–1330)

Human Exposure to Rabies from Pet Wild Raccoons in South Carolina and West Virginia, 1987 through 1988

Bradley A. Woodruff, MD, MPH, Jeffrey L. Jones, MD, MPH, and Thomas R. Eng, VMD, MPH

Introduction

Although human rabies deaths in the United States are extremely rare, approximately 18 000 persons per year receive rabies postexposure prophylaxis (CDC, unpublished data). In most southeastern and mid-Atlantic states, including South Carolina and West Virginia, raccoons account for the largest proportion of laboratory-confirmed rabid animals.[1] Most human exposures from rabid raccoons and other wild animals involve animals encountered in the wild, but exposures to rabid wild animals kept as pets have been documented.[2–4] As a result, several health organizations and government agencies recommend that wild animals not be kept as pets, and most states have laws requiring special permits to keep such animals[5]; however these measures may be ineffective. In this report, we describe eight incidents where wild raccoons were captured and kept as pets resulting in potential human exposure to rabies in South Carolina and West Virginia in 1987 and 1988.

Methods

State public health personnel in West Virginia and South Carolina were interviewed regarding incidents of possible human rabies exposure resulting from pet wild raccoons during 1987 and 1988. All reports were further investigated by interviewing exposed persons, physicians, and public health personnel and by reviewing records in state laboratories, physicians' offices, and emergency rooms. Data were available only for persons who received prophylaxis.

Bradley A. Woodruff and Jeffrey L. Jones are with the Epidemiology Program Office of the Centers for Disease Control. Bradley A. Woodruff also is with the West Virginia Department of Health, and Jeffrey L. Jones also is with the South Carolina Department of Health and Environmental Control. Thomas R. Eng is with the Division of Viral and Rickettsial Diseases of the Center for Infectious Diseases.

Requests for reprints should be sent to Bradley A. Woodruff, NCID:DVRD:HB, Mailstop A-33, Centers for Disease Control, 1600 Clifton Road, Atlanta, GA 30333.

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