

A HISTORICAL SUMMARY OF MYCOBACTERIAL CULTURES AT THE VETERANS ADMINISTRATION MEDICAL CENTER IN OKLAHOMA CITY (1960-1980)

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Mycobacterial culture results, from the Veterans Administration Medical Center in Oklahoma City, were evaluated retrospectively for the period 1960-1980. During the 21-year period, 1498 different patients had 7284 positive cultures of which 1541 were *Mycobacterium tuberculosis*, 251 speciated nontuberculous mycobacteria, and 142 unspciated mycobacteria. The number of patients with positive *M. tuberculosis* cultures decreased 39% in 21 years. *M. kansasii* and *M. avium-intracellulare* complex were isolated from 61% of all patients with nontuberculous mycobacteria. A total of 308 (20.5%) patients had positive mycobacterial cultures in more than one year. Our experience parallels the national trend of a decrease in the number of reported tuberculosis cases and an increase in the proportion of nontuberculous mycobacterial infections to all mycobacterial infections.

INTRODUCTION

Tuberculosis is still one of the most important infectious diseases occurring in the United States (USA), even though it has markedly decreased from 84,304 reported cases in 1953 to 27,749 reported cases in 1980 (1). Although tuberculosis has decreased, the number of infections caused by nontuberculous mycobacteria (NTM) appears to be increasing somewhat (2, 3, 4).

In the past, investigators at this institution have been involved with mycobacterial disease research (5-13) and participated in Veterans Administration controlled drug studies. This medical center primarily serves adult male patients, many with chronic infectious diseases. Since there has been a history of continuous interest here in mycobacterial diseases, we decided to summarize and evaluate mycobacterial culture results which were reported from 1960-1980. An emphasis was also placed on the relationship of *Mycobacterium tuberculosis* and NTM culture results.

MATERIALS AND METHODS

Raw data, in the form of culture results, were maintained in log books which had fortunately been kept at the Veterans Administration Medical Center in Oklahoma City (VAMC/OKC) since before 1960. The VAMC is a 434-bed general medical and surgical hospital serving primarily adult male patients. The institution operates a large ambulatory-care facility which was the source of a large portion of mycobacterial cultures discussed here. Patients were almost exclusively from Oklahoma and north central Texas. Additional confirmatory data, for individual patients, was kept on file cards and reference laboratory reports. Lists of all patients with positive acid-fast bacilli (AFB) cultures, for each year, were made from the above-mentioned sources. The data in these lists, including the patient's name, date and organism identification, were entered into a computer which alphabetized them. From 1960 to 1967, the identification of some of the isolates could not be found and these were thus classified as unspciated AFB. This also occurred in some other years, but to a much lesser extent. The computer list was checked and rechecked on several occasions for mistakes. A positive culture on a given patient was noted only once per year. The earliest month of a given year was chosen to be noted. Therefore, the alphabetized computer list of all patients with positive AFB cultures was utilized primarily in this evaluation.

During the 21-year period, AFB were isolated and identified by state-of-the-art methods, which have naturally improved somewhat in later years. This laboratory has an extent IV mycobacterial laboratory which began speciating NTM and per-

forming antimycobacterial susceptibility tests in the early 1960's. From 1960 to 1980, approximately 10 medical technologists were involved in identifying and performing antimycobacterial susceptibility tests. Media utilized included Lowenstein-Jensen and Middlebrook 7H-11, from Difco, which were both prepared in this laboratory. The fluorochrome stain (14) was used as the method for observing AFB smears. We began using this method about 1967; the Ziehl-Neelsen method (14) was used prior to this date.

RESULTS

A summary of the number of total and positive cultures and patients with *M. tuberculosis*, NTM, and unspiciated AFB by year is noted in Table 1. During the 21-year period, there were 1498 different patients with positive AFB cultures. Some of the following trends were observed: 1) a decrease in the number of AFB cultures, 2) a decrease in the number of positive cultures and proportion of positive/total cultures, 3) a decrease in the proportion of patients with positive *M. tuberculosis*/positive AFB cultures and 4) an increase in the proportion of patients with positive NTM cultures/positive AFB cultures.

Of the NTM, *M. kansasii* was the commonest, accounting for 40%, followed by *M. avium-intracellulare* complex (21%), as indicated in Table 2.

Table 3 illustrates the number of years that some patients harbored the same mycobacterial species. Only 7% of the patients with positive *M. tuberculosis* and 5% with positive NTM presented themselves for more than 8 years. Two patients had *M. tuberculosis* isolated from them for 17 years. Of the 46 NTM repeaters, *M. kansasii* occurred in 21 patients and *M. avium-intracellulare* complex in 14 patients. One patient had *M. kansasii* for 13 years.

The number of patients with positive cultures presenting by month over the 21-year period was evaluated. Patients who had positive cultures in different months of a given year were noted only once (earliest month of year) although each year was treated individually. A patient could therefore be counted in different years. The percentages of positive cultures by month were: January (17.8%), February (11.6%), March (9.5%), April (8.9%), May (8.1%), June (8.5%), July (6.5%), August (5.9%), September (7.3%), October (5.9%), November (5.0%) and December (5.0%). January had the most patients with positive cultures in 15 of the 21 years, while November had the fewest in 8 of 21 years. If the years were divided into quarters, January-March had the great-

TABLE 1. Numbers of patients with positive AFB cultures, 1960 to 1980.

Year	Total cultures	Positive cultures	Patients ^a with these organisms:		
			TB	NTM	unspiciated AFB
1960	4276	424	86	0	16
1961	4557	454	84	1	22
1962	4064	360	92	0	18
1963	4106	330	110	4	11
1964	4007	313	91	3	15
1965	4236	398	88	4	9
1966	5025	483	90	7	17
1967	4951	520	89	17	13
1968	4993	490	100	13	2
1969	4831	461	92	14	0
1970	4672	397	91	12	1
1971	4869	360	96	12	1
1972	5069	450	83	23	2
1973	4767	428	82	17	7
1974	4506	388	55	16	3
1975	4262	205	47	24	1
1976	3338	203	42	15	0
1977	3542	230	39	18	0
1978	3256	141	30	25	4
1979	3063	114	20	14	0
1980	3178	135	34	12	0
Total	89568	7284	1541	251	142

a some patients had positive cultures in more than one year.
TB (*M. tuberculosis*), NTM (nontuberculous mycobacteria).

TABLE 2. Numbers of patients with nontuberculous *Mycobacteria* (NTM)

Year	<i>M. kansasii</i>	<i>M. avium</i> ^a	<i>M. fortuitum</i>	other NTM
1960	0	0	0	0
1961	0	0	0	1
1962	0	0	0	0
1963	0	0	0	4
1964	0	0	0	3
1965	0	1	0	3
1966	3	0	0	4
1967	15	0	0	2
1968	8	1	0	4
1969	8	0	0	6
1970	6	0	0	6
1971	5	0	0	7
1972	8	2	0	13
1973	8	0	0	9
1974	6	0	1	9
1975	7	8	4	5
1976	4	10	1	0
1977	8	7	1	2
1978	6	9	1	9
1979	7	6	0	1
1980	2	8	1	1
Total	101	92	9	89

^a *M. avium-intracellulare* complex

TABLE 3. Numbers of patients with positive AFB cultures for more than one year.

Years positive ^a	TB	NTM
2	107	22
3	50	4
4	38	9
5	19	4
6	15	2
7	6	1
8	8	2
9	5	0
10	2	0
11	3	0
12	1	1
13	1	1
14	1	0
15	3	0
16	1	0
17	2	0
Total	262	46

^a Number of years from first to last positive AFB culture

est combined number and proportion of patients with positive cultures followed by April-June, July-September and October-December, respectively.

DISCUSSION

This report summarizes mycobacterial culture results, from a Veterans Administration Medical Center, over a 21-year period. During this period, major advancements have occurred in the disposition and treatment of patients with tuberculosis. Improved chemotherapy has resulted in more efficient control of tuberculosis, thus eliminating the need for tuberculosis sanatoriums and special hospital wards. Indeed, the number of reported tuberculosis (TB) cases decreased from 55,494 to 27,749 in the United States and from 542 to 333 in Oklahoma from 1960 to 1980 (T. Greener, personal communication). This is a 39% reduction in Oklahoma and a 50% reduction in the USA. However, our VAMC experienced a 60% reduction during the same period, a decrease which was more similar to that seen in USA. This greater reduction at the VAMC than in Oklahoma may be related to patient population. The VAMC primarily serves adult male patients, a population more commonly harboring *M. tuberculosis* (T. Greener, personal communication). Therefore it is reasonable that the increased effectiveness of tuberculosis treatment and elimination of TB wards affected this institution more than most other hospitals that serve the general public (different sexes and ages). This can be further illustrated in the fact that in 1960, 15.8% of the reported TB cases in Oklahoma were from the VAMC, but in 1980 only 10.2% were from this institution.

Our clinical microbiology laboratory personnel are handling fewer AFB isolates each year. In 1960, 10% of all AFB cultures were positive compared to only 4.2% in 1980. This suggests that many hospital laboratories, especially VAMCs, will spend less time and money identifying mycobacteria in the future. Laboratories may also become less proficient in AFB identification in the future, but there should be a decrease in laboratory-acquired mycobacterial infections owing to reduced exposure. The involvement of laboratories in mycobacterial culture processing has indeed been discussed elsewhere (15).

The role of NTM as infectious agents is becoming more important. Determining the pathogenicity of these organisms is often difficult since many are saprophytic colonizers (16). Even though tuberculosis has decreased, NTM disease has remained constant (17). At this institution, *M. kansasii* and *M. avium-intracellulare* complex comprise 61% of the NTM from patients. This is in agreement with other studies which also noted these two organisms

and *M. fortuitum-chelonei* complex to be the most predominant of the NTM in Texas (2) and nearby states (18, 19). It would be interesting to compare the incidence of various NTM isolates from different institutions around the USA and world over a period of years.

Another interesting subject is positive culture results on a patient for different years. Of 1498 different patients with positive AFB cultures, 308 (20.5%) had positive cultures in more than one calendar year. This emphasizes the need to keep AFB culture results for many years, thus enabling one to "follow" a patient, many who will return to the hospital. We prepared an alphabetized list of patients, with the date and organism identification, with positive cultures from 1960 to 1980 and distributed this information to several sites (pulmonary clinic, ambulatory care, and infectious diseases) throughout the medical center. It is hoped that this will provide better access of results to physicians and reduce incoming telephone calls regarding old AFB culture results.

Why was January the most common month for positive AFB cultures? The answer is not clear, but perhaps concerns colder weather or patients who delay coming to the hospital until after Christmas or New Year's Day.

Tuberculosis is still an important infectious disease because of its common occurrence and serious nature; however, it is much less prevalent in this medical center, state, and the USA than it was in 1960.

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