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**MYCOBACTERIUM XENOPI ISOLATION FROM CLINICAL  
SPECIMENS IN THE FLORENCE AREA: REVIEW OF 46 CASES**

E. TORTOLI\*, M.T. SIMONETTI\*, C. LABARDI\*\*, A. LOPES PEGNA\*\*,  
E. MELI\*\*, N. STANFLIN\*\* and S. SUSINI\*\*

\*Bacteriological and Virological Laboratory.

\*\*Department of Pneumology - Careggi Hospital - Viale Pieraccini, 24 - 50139 Florence - Italy.

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The occurrence of *Mycobacterium xenopi* (MX) isolates is not homogeneous in various geographic zones. In the Florence area, between 1975-1989, strains of MX from 64 different patients have been isolated. The review of bacteriological and clinical data of 46 of them, from whose sputum MX had been grown, allowed to diagnose for 26% the commensal nature of this finding, for 41% the concomitance with a tubercular infection and for the remaining 33% the pathogenicity of this microorganism.

The increased occurrence of MX isolates, their high rate of pathogenicity and the remarkable homogeneity of their biochemical, cultural and antimicrobial sensitivity patterns seem to suggest the hypothesis of an endemic focus of this species in the Florence area.

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**INTRODUCTION**

*Mycobacterium xenopi* (MX), first isolated in 1959 from a toad (26), is a species whose finding in clinical (1, 2, 3, 5, 7, 12, 17, 19, 23, 24, 30, 35, 37, 38, 39) and environmental specimens (6, 15, 16, 20, 40) is frequently reported in the literature.

Even if the isolation of MX is not a rare event this species is usually less frequent than other "not tuberculous mycobacteria" (MOTT) like members of *Mycobacterium avium* and *Mycobacterium fortuitum* complexes and species *Mycobacterium kansasii* (9, 10, 13).

In some geographic areas, the increased occurrence of MX isolates from clinical specimens is also reported (4, 5, 11, 19, 28). In Italy, the isolation of MX seems to be somewhat rare: no strain was isolated in the Milan area from 1977 to 1983 (18) and none are

reported from a four year study of mycobacterial isolates in Bergamo (14).

The clinical significance of MX in biological specimens is not yet completely determined; its role of potential pathogen is, however, widely accepted (8, 19, 27, 31, 39).

As MX is frequently isolated in our laboratory (Fig. 1) we tried to evaluate the clinical significance of this finding.

**MATERIALS AND METHODS**

MOTTs isolated in our laboratory have been identified using 23 biochemical and cultural features (29, 37) (Fig. 2). The 64 MX isolates were identified, with probability ranging from 0.97 to 1.00, using a computerized evaluation of test data (32, 33).

As chromogenic strains of the *Mycobacterium avium* complex share many features with MX that may be misleading, the identification has been indirectly

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confirmed by performing on 11 strains, with results invariably negative, the DNA hybridization test using *M. avium* and *M. intracellulare* probes (Gen-Probe, San Diego, CA).

Antimicrobial susceptibility was performed by the proportion (10% resistance) method using Middlebrook 7H10 agar plates with impregnated disks (36).

Sputum and urine were the clinical specimens from which MX was prevalently isolated (Fig. 3).

To evaluate whether pulmonary disease could be attributed to MX, radiological and clinical reports of 46 patients hospitalized in the department of pneumology of Careggi Hospital have been reviewed.

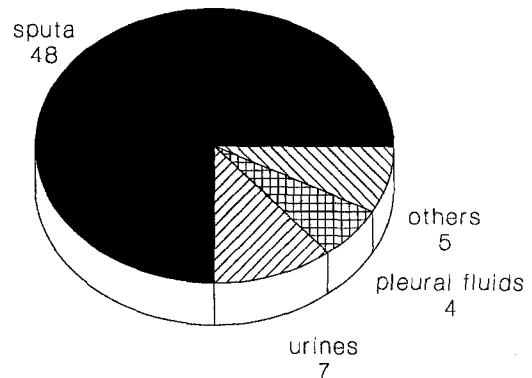


Figure 3. - Source of isolation of *Mycobacterium xenopi* from 64 patients (1975-1989).

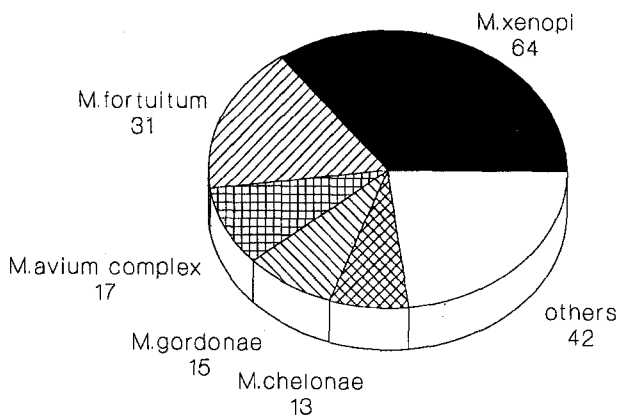


Figure 1. - Patients from whom MOTTs have been isolated, from 1975 to 1989.

**RESULTS**

MX with 64 isolates is the most frequently identified MOTT (32%) in the Florence area from clinical specimens (Fig. 1).

The pattern of features tested for the identification showed a remarkable homogeneity of the strains, also for the properties that are usually variable in this species (Fig. 2).

The antimicrobial susceptibility of 18 strains tested was also homogeneous (Fig. 4). In these data, which substantially agree with those reported in the literature (4, 8, 27, 28), the 100% sensitivity to streptomycin and ethionamide and the 100% resistance to ethambutol stand out.

The examination of microbiological, radiological and clinical data allowed us to divide the 46 patients, whose mean age was 61.3 years, into 3 groups (Table 1).

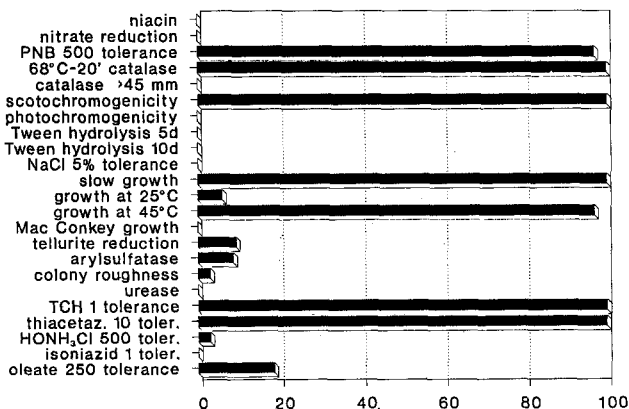


Figure 2. - Positivity percentages of biochemical and cultural features of 46 *Mycobacterium xenopi* isolates.

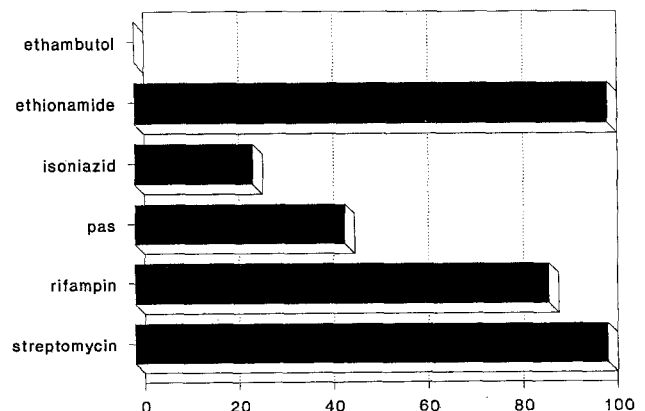


Figure 4. - Antimicrobial susceptibility percentages of 18 isolates of *Mycobacterium xenopi*.

TABLE 1. - Percentages (referred to each group of patients) of bacteriological and clinical features of 46 patients from whom *M. xenopi* (MX) has been isolated.

|   | colonized patients (12)<br>% | patients with active or previous TB (19)<br>% | patients with mycobacteriosis due to MX (15)<br>% |
|---|------------------------------|---|---|
| Repeated isolations of MX                                 | 0                            | 5   | 60  |
| Isolation of numerous colonies                            | 0                            | 36  | 53  |
| Lung cavitations  | 8                            | 58  | 67  |
| Radiological shadowings                                   | 42                           | 26  | 47  |
| Other radiographic abnormalities                          | 50                           | 84  | 87  |
| Increase in symptomatology in relation to isolation of MX | 25                           | 21  | 53  |

12 of the 46 patients (26%) have been included in the first group. For these patients the features of chest radiograph, not consistent with mycobacteriosis, the symptoms, and a single finding of a few colonies of MX supplied no evidence of pulmonary disease due to MX and this microorganism was considered a contaminant.

For 19 (41%) of the remaining 34 patients, active or previous pulmonary tuberculosis, bacteriologically confirmed in 7 of them and unconfirmed in the others, had been diagnosed before the isolation of MX. In this group MX was isolated once (twice only in a case). For these patients, radiographic abnormalities were considered due to pulmonary tuberculosis even if for some of them a secondary infection of the pre-existing tuberculous cavities could not be excluded (34).

The remaining 15 patients (33%), all without previous history of tuberculosis, had pulmonary abnormalities consistent with mycobacteriosis in the absence of other pathogens in the sputum.

The presence of at least 3 of the following criteria allowed the diagnosis of infection due to MX: a) repeated isolations (60%, from 2 to 9 isolates in a period ranging from 1 to 6 years), for some patients only one sample could be examined; b) growth of numerous colonies (53%); c) pulmonary cavitation (67%); d) nodular or mass shadows (47%); e) other radiographic abnormalities as infiltration, bullae, pleural thickening (87%); f) correlation of MX isolation with an increase in symptomatology (53%); g) growth of MX from resected lung (7%).

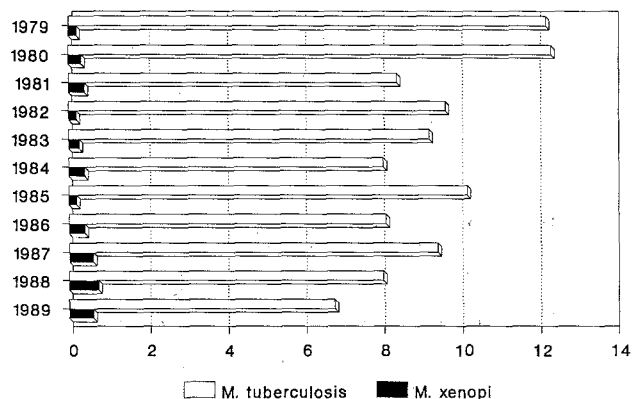


Figure 5. - Frequency (per 100,000 inhabitants) of patients from whose fluids *Mycobacterium tuberculosis* and *Mycobacterium xenopi* have been isolated in areas of central Tuscany (total population served by the Department of Pneumology of Careggi Hospital: 1,440,000).

## DISCUSSION

The percentage of patients from whose fluids MX has been isolated, in the Florence area in the last 12 years, ranges, if compared with *M. tuberculosis* positives (Fig. 5), from 1.7% (1979) to 8.1% (1988). The rate of these prevalences, particularly if correlated with the trend of the isolation of these microorganisms, almost constantly increasing, does not seem to be consistent with that of other regions of Italy.

Other salient data resulting from this research are the high percentage of the clinical significance of the isolates and the homogeneity of their features. Isolation rates of MX consistent with ours have been reported in various regions in Europe and in Canada (5, 21, 22, 28, 31).

The elevated incidence of pathogenicity of MX, even if higher than in other reports, is not different from that described by Marks and Schwabacher (19), Bretey and Boisvert (5), Smith and Citron (28) and Simor, Salit and Vellend (27); it is, moreover, justified if we consider that all the patients examined here were part of a selected sample, being they all hospitalized in pneumological departments and all suffering from pulmonary disease.

The homogeneity of biochemical and cultural features and of antibiotic susceptibility patterns, in conjunction with the area of residence of the majority of patients (70% from the Florence area, and 26% from central Tuscany) seems to suggest the hypothesis of an endemic focus of MX.

If the hypothesis of sea birds as a reservoir of MX can not be supported in this case (Florence is about 100 kilometres from the sea), the role of pigeons, which are particularly numerous in the city, should be investigated and a meticulous search in the water should be performed.

Only the follow up of MX isolates in next years will make clear whether this microorganism is going to become "a pathogen of the future" as hypothesized by Rahman and Sinclair (25).

## REFERENCES

1. Ausina V., Barrio J., Luquin M., Seambeat M.A., Gurgi M., Verger G. and Prats G. (1988): *Mycobacterium xenopi* infections in the acquired immunodeficiency syndrome - Ann. Intern. Med. 109: 927-928.
2. Beck A. and Stanford J.L. (1968): *Mycobacterium xenopi*: a study of sixteen strains - Tubercle 49: 226-234.
3. Bellamy J., Leroy-Terquem E., Duhamel J.P., Choffel C., Fraboulet G., Tobelem G. and Verdoux P. (1987): Infection a *Mycobacterium xenopi* dans des bulles d'emphysème. A propos de 4 cas opérés - Rev. Mal. Respir. 4: 261-264.
4. Boisvert H. (1965): *Mycobacterium xenopi* (Marks et Schwabacher 1965), mycobactérie scotochromogène, thermophile, dysgonique, éventuellement pathogène pour l'homme - Ann. Inst. Pasteur Microbiol. 109: 447-453.
5. Bretey J. and Boisvert H. (1969): *Mycobacterium xenopi*, agent d'affections pulmonaires et "contaminant" - Rev. Tuberc. Pneumol. 33: 337-348.
6. Bullin C.H., Tanner E.I. and Collins C.H. (1970): The isolation of *Mycobacterium xenopi* from water taps - J. Hyg. 68: 97-100.
7. Chiner E., Marin J., Blanquer R., Camarena J.J. (1988): *Mycobacterium xenopi*: a proposito de un caso pulmonar - Rev. Clin. Esp. 182: 55-56.
8. Costrini A.M., Mahler D.A., Gross W.H., Hawkins J.E., Yesner R. and D'Esopo N.D. (1981): Clinical and roentgenographic features of nosocomial pulmonary disease due to *Mycobacterium xenopi* - Am. Rev. Respir. Dis. 123: 104-109.
9. David H.L., Lèvy-Frèbault V., Feuillet A. and Grandry J. (1986): Mycobacteria identified in the Pasteur Institute (Paris) during 1978-1984, 290-294. In: Casal M. (Ed.): Mycobacteria of clinical interest - Elsevier Science Publishers - Amsterdam.
10. David H., Lèvy-Frèbault V. and Thorel M.F. (1989): Méthodes de laboratoire pour mycobactériologie clinique - 1-87 - Institut Pasteur - Paris.
11. DesBordes-Lize J., Fouye G. and Lelieur G.M. (1970): Contribution à l'étude de *Mycobacterium xenopi*, à l'occasion d'une importante endémie hospitalière - Poumon Coeur 26: 1141-1182.
12. Engbaeck H.C., Vergmann B., Baess I. and Will D.W. (1967): *M. xenopi*. A bacteriological study of *M. xenopi* including case reports of Danish patients - Acta Pathol. Microbiol. Scand. 69: 576-594.
13. Good R.C. (1980): Isolation of nontuberculous mycobacteria in the United States, 1979 - J. Infect. Dis. 142: 779-783.
14. Grigis A., Moioli F., Minola E., Lorenzini N., Michetti G., Rubini A., Penati V. and Lacchini C. (1989): Diagnosi microbiologica di micobatteriosi: considerazioni su una casistica di quattro anni - Microbiologica Medica 4: 150-154.
15. Gross W.M., Hawkins J.E. and Murphy D.B. (1976): Origin and significance of *Mycobacterium xenopi* in clinical specimens. I. Water as a source of contamination - Bull. Int. Union. Tuberc. Lung. Dis. 51: 267-269.
16. Horak Z., Polakova H. and Kralova M. (1986): Waterborne *Mycobacterium xenopi*, a possible cause of pulmonary mycobacteriosis in man - J. Hyg. Epidemiol. Microbiol. Immunol. 30: 405-409.
17. Kubin M., Slosàrek M., Stanková M. and Dolecková V. (1988): The participation of *Mycobacterium xenopi* in a fatal case of AIDS - 9th Meeting European Soc. Mycobacteriology, Lisboa.
18. Mandler F., Penati V. and Lacchini C. (1985): Frequenza ed identificazione dei micobatteri non tubercolari. Valutazione su 70063 colture - Medicina Toracica 7: 205-208.
19. Marks J. and Schwabacher H. (1965): Infection due to *Mycobacterium xenopi* - Br. Med. J. 1: 32-33.
20. McSwiggan D.A. and Collins C.H. (1974): The isolation of *M. kansasii* and *M. xenopi* from water systems - Tubercle 55: 291-297.
21. Millet M., Korsak T. and Hennebert A. (1966): Commentaires sur les mycobactéries "atypiques" - Acta Tuberc. Pneumol. Belg. 57: 346-352.
22. Pattyn S.R. (1970): *Mycobacterium xenopi*, its frequent source in the diagnostic laboratory - Rev. Tuberc. Pneumol. 34: 69-72.
23. Price A.B., Owen R., Sowter G., Weinberg J. and Smith H. (1985): Disseminated *Mycobacterium xenopi* infection (letter) - Lancet 2: 383.
24. Prosser A.J. (1986): Spinal infection with *Mycobacterium xenopi* - Tubercle 67: 229-232.
25. Rahman A.F.M.S. and Sinclair A.L. (1984): *Mycobacterium xenopi*, pathogen of the future? (letter) - Lancet 2: 1467.
26. Schwabacher H. (1959): A strain of mycobacterium isolated from skin lesions of a cold blooded animal, *Xenopus levis*, and its relation to atypical acid-fast bacilli occurring in man - J. Hyg. 57: 56-67.
27. Simor A.E., Salit I.E. and Vellend H. (1984): The role of *Mycobacterium xenopi* in human disease - Am. Rev. Respir. Dis. 129: 435-438.
28. Smith M.J. and Citron K.M. (1983): Clinical review of pulmonary disease caused by *Mycobacterium xenopi* - Thorax 38: 373-377.

29. *Sommers H.M. and Good R.* (1985): *Mycobacterium*, 216-248. In: Lennette E.H., Balows A., Hausler W.J.Jr., Shadomy H.J. (Eds): *Manual of clinical microbiology*. 4th ed. American Society for Microbiology - Washington.
30. *Stewart C.J., Dixon J.M.S. and Curtis B.A.* (1970): Isolation of mycobacteria from tonsils, nasopharyngeal secretions and lymph nodes in East Anglia - *Tubercle* 51: 178-183.
31. *Thomas P., Liu P. and Weiser W.* (1988): Caractéristique de la pathologie par *Mycobacterium xenopi* - *Bull. Int. Union. Tuberc. Lung. Dis.* 63: 12-13.
32. *Tortoli E.* (1990): Computer aided identification of mycobacteria: a prototype of software to interpret the results of cultural and biochemical tests - *Microbiologia Medica* 5: 60-63.
33. *Tortoli E. and Lacchini C.* (1991): Ulteriore valutazione di un programma computerizzato per l'identificazione dei micobatteri - *Medicina toracica* (in press).
34. *Tsukamura M.* (1986): Diagnosis of non-tuberculous mycobacteriosis, 251-262. In: Casal M. (Ed.): *Mycobacteria of clinical interest* - Elsevier Science Publishers - Amsterdam.
35. *Tsukamura M., Sekine K., Yokota A., Kuze A., Shibata M. and Sato K.* (1984): Lung infection due to *Mycobacterium xenopi*: report of the first case in Japan - *Microbiol. Immunol.* 28: 123-127.
36. *Wayne L.G. and Krasnow I.* (1966): Preparation of tuberculosis susceptibility testing mediums by means of impregnated discs - *Am. J. Clin. Pathol.* 45: 769-771.
37. *Wayne L.G., Krichevsky M.I., Portyrata D. and Jackson C.R.* (1984): Diagnostic probability matrix for identification of slowly growing mycobacteria in clinical laboratories - *J. Clin. Microbiol.* 20: 722-729.
38. *Weinberg J.R., Dootson G., Gertner D., Chambers S.T. and Smith H.* (1985): Disseminated *Mycobacterium xenopi* infection - *Lancet* 1: 1033-1034.
39. *Wolinsky E.* (1979): Nontuberculous mycobacteria and associated diseases - *Am. Rev. Respir. Dis.* 119: 107-159.
40. *Wright E.P., Collins C.H. and Yates M.D.* (1985): *Mycobacterium xenopi* and *Mycobacterium kansasii* in a hospital water supply - *J. Hosp. Infect.* 6: 175-178.