Mycobacterium thermoresistibile: Extrapulmonary Infection in a Cat

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Received 24 July 1984/Accepted 1 February 1985

The first evidence of the potential pathogenicity of Mycobacterium thermoresistibile in cats is presented. This
mycobacterium was isolated repeatedly from intra- and subcutaneous nodules, aspirated fluid from fluctuating
skin lesions, and lymph nodes. The distinctive characteristics of the cultured organisms matched those of M.
thermoresistibile.

Feline cutaneous mycobacteriosis, usually caused by Mycobacterium bovis, is characterized by a granulomatous
or pyogranulomatous reaction which has little tendency toward caseous necrosis and by a few acid-fast, culturable
bacilli (4, 5). Mycobacteria other than M. tuberculosis (1), such as M. fortuitum, M. xenopi, M. ulcersans, and M.
lepraerium, also have been reported to cause a similar granulomatous dermatitis (4). This is the first report describ-
ing the isolation of M. thermoresistibile from a cat with nodular cutaneous lesions.

Case report. A 10.5-year-old, ovariohysterectomized, domes-
tic short-haired cat was admitted to the State University of
Utrecht Small Animal Clinic because of skin lesions that
had been present in the lumbarosacral area for 10 months. In
the 2 weeks before admission the cutaneous lesions had
become larger. Treatment with ampicillin had had no effect.
Physical examination revealed a lazy, moderately groomed,
well-nourished cat. Except for the skin changes no physical
abnormalities were found.

In the skin of the lumbar and sacral region there were
numerous fluctuating nodules of variable size (up to 3 cm).
The fluid-filled nodules were located intra- and subcutane-
ously and were well circumscribed. A clear, yellowish fluid
or creamy exudate could be aspirated from most of the
lesions.

Hematological and biochemical examination showed a
leukocytosis (27.0 × 10⁹/liter), a raised erythrocyte sedimenta-
tion rate (42 mm during the first hour), and elevated β1 and
β2 protein globulin fractions in serum (14 and 19 g/liter,
respectively). The Coombs antiglobulin test and the lupus
eythematosis cell test were negative, whereas the antinu-
clear antibody test showed a speckled pattern at a 1:10
dilution. The results revealed no evidence for immuno-
compentence. A direct smear of the aspirated fluid (Ziehl-Neelsen
stain) showed a small number of acid-fast bacteria. In
consultation with the owner, euthanasia and necropsy were
performed.

Histopathology. In addition to the skin lesions, necropsy
findings included enlargement of the spleen and the left
axillary lymph node. Histological examination of the skin
lesions revealed extensive infiltration of the dermis and
subcutis by histiocytes and neutrophilic granulocytes. Some-
times the central area of inflammation was necrotic. In
the spleen there was follicular hyperplasia, and the red pulp
contained many neutrophils; the axillary lymph node also
contained hyperplastic follicles. No fungi or acid-fast bacilli
were found in periodic acid-Schiff- and Ziehl-Neelsen-
stained sections.

Bacteriology. The fluid content of two skin lesions, the
wall of a fluctuating nodule, and a local lymph node were
cultured on Löwenstein-Jensen media with and without
pyruvic acid, and luxuriant growth of yellow-pigmented
colonies was observed after approximately 10 days. On
subculture, rough and flat scotochromogenic colonies were
obtained in 14 days at 24°C, in 7 days at 30°C, and in 4 days
at 37°C. Growth at 45°C took 14 days for isolates from the
fluid content of two skin lesions and 4 days for the isolates
from the wall of the fluctuating nodule and the local lymph
node. All other test results were the same for all four strains.

MICS on Löwenstein-Jensen media were as follows: strep-
tomycin, 5 mg/ml; p-aminosalicylic acid, >100 μg/ml; isoni-
azide, 100 μg/ml; thiactetazon, 50 μg/ml; and ethiamidase,
50 μg/ml. The biochemical characteristics of the isolate and
of reference strains of M. thermoresistibile, M. vaccae, M.
phlei, and M. flavescens (1) are given in Table 1.

Growth at 52°C is a distinctive feature of M. thermoresis-
tibile and M. phlei. In addition to thermotolerance, identifi-
cation must also rely on other tests (6, 8). The isolate was
allocated to the group of rapidly growing mycobacteria
because of its ability to grow within 7 days. Biochemical
characteristics of the isolate fitted those of M. thermoresis-
tibile ATCC 19527. The isolate and M. thermoresistibile
could be differentiated from other rapidly growing scotochro-
mogenic mycobacteria such as M. vaccae, M. phlei, and M.
flavescens, which can also grow at 45°C. M. thermoresis-
tibile could be differentiated from M. vaccae by its negative
14-day arylsulfatase test, high catalase activity (semiqualita-
tive), thermoresistance of catalase, negative iron uptake
test, growth on media containing 5% sodium chloride, and
its amidase and sugar fermentation pattern. Differentiation
from M. flavescens was based on the negative 14-day
arylssulfatase test, growth on media containing 5% sodium
chloride, and the sugar fermentation pattern. M. thermoresi-
tibile differed from M. phlei by its high catalase activity
(semiqualitative), thermoresistance of catalase, negative β-
galactosidase test, and sugar fermentation pattern.

Several tests used in this study were also used by
Tsukamura et al. (9). The results of the corresponding tests
were the same. Tsukamura (7) found no acid production by
M. thermoresistibile from the sugars listed (Table 1), except
dulcitol, fructose, and sucrose; we also found this, although
we used a different incubation time. The incubation time
used by Tsukamura (7) was 2 weeks; in this study the
incubation time was 4 weeks. It can be concluded that the

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TABLE 1. Biochemical characteristics of the isolate and of mycobacteria reference strains

<table>
<thead>
<tr>
<th>Test</th>
<th>Isolate (ATCC 19527)</th>
<th>M. thermoresistibile (ATCC 19527)</th>
<th>M. vaccae (ATCC 25950)</th>
<th>M. phlei (ATCC 11758)</th>
<th>M. flavescens (ATCC 23035)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colony pigmentation in the dark</td>
<td>+</td>
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<tr>
<td>Growth after 4 days at:</td>
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<td>24°C</td>
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<td>30°C</td>
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<td>37°C</td>
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<td>45°C</td>
<td>+</td>
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<tr>
<td>Growth on glycerol agar 37°C (4 days)</td>
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<td>+</td>
<td>+</td>
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<tr>
<td>Nitrate reduction (2 h)</td>
<td>TR&lt;sup&gt;a&lt;/sup&gt;</td>
<td>TR</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Arylsulfatase (14 days)</td>
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<td>-</td>
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<tr>
<td>Catalase</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
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<tr>
<td>Catalase resistance 68°C, 20 min</td>
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<td>+</td>
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<td>Tween 80 hydrolysis (14 days)</td>
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<td>+</td>
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<tr>
<td>Iron uptake</td>
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<td>-</td>
<td>+</td>
<td>+</td>
<td>ND&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td>β-Galactosidase</td>
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<td>+</td>
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<td>Growth on media containing:</td>
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<td>Para-Aminobenzoic acid (3 mg/ml)</td>
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<td>NH&lt;sub&gt;4&lt;/sub&gt;OH - HCl (0.25 mg/ml)</td>
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<td>Picric acid (0.2%)</td>
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<td>Sodium chloride (5%)</td>
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<td>+</td>
<td>+</td>
<td>ND&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>Urease</td>
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<td>Capronamidase</td>
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<td>Allantoinase</td>
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<td>Acid production from:</td>
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<td>Glucose</td>
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<td>Arabinose</td>
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<td>Dulcitol</td>
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<td>+</td>
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<td>Fructose</td>
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<td>Galactose</td>
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<td>Inositol</td>
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<tr>
<td>Mannitol</td>
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<tr>
<td>Rhamnose</td>
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<tr>
<td>Sorbitol</td>
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<td>Sucrose</td>
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<td>Trehalose</td>
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</table>

<sup>a</sup> TR, Trace; ND, not done.
<sup>b</sup> ATCC 19527 and ATCC 11758 are type strains; ATCC 25950 and ATCC 23035 are typical representatives, closely resembling type strains.

four organisms isolated from the cat belong to the species *M. thermoresistibile*.

*M. thermoresistibile* was thought to be nonpathogenic (6), but recently two cases were described in which this mycobacterium caused disease with symptoms similar to those of tuberculosis (10). *M. thermoresistibile* was cultured from sputum and lung tissue, and histological examination revealed numerous microabscesses and granulomata with giant cells of the Langhans type. In the second case, *M. thermoresistibile* was cultured from a lung nodule with granulomas and giant cells but without caseous necrosis (2). These cases provided evidence of the potential pathogenicity of *M. thermoresistibile* in humans. The present report describes an infection with *M. thermoresistibile* in a cat.

In cats it is not possible to discriminate between different forms of cutaneous mycobacteriosis on the basis of clinical manifestations (3, 4). In general, *M. lepraemurium*, *M. xenopi*, *M. ulcerans*, *M. fortuitum*, and *M. thermoresistibile* are soil and vegetation inhabitants and are opportunistic contaminants of various wounds (4, 7). However, in the present case there was no history of previous trauma, and *M. thermoresistibile* was isolated in pure culture from closed lesions with characteristics generally found in feline cutaneous mycobacteriosis (3, 4). Although *M. thermoresistibile* has been thought to be limited to the Far East (10), the cat described here had not been out of the Netherlands. This case is the third indication of the pathogenicity of *M. thermoresistibile* and is the first in which extrapolmonary infection was found.

We are indebted to L. van Beek for his expert technical assistance.

**LITERATURE CITED**

5. Snider, W. R. 1971. Tuberculosis in canine and feline popula-


