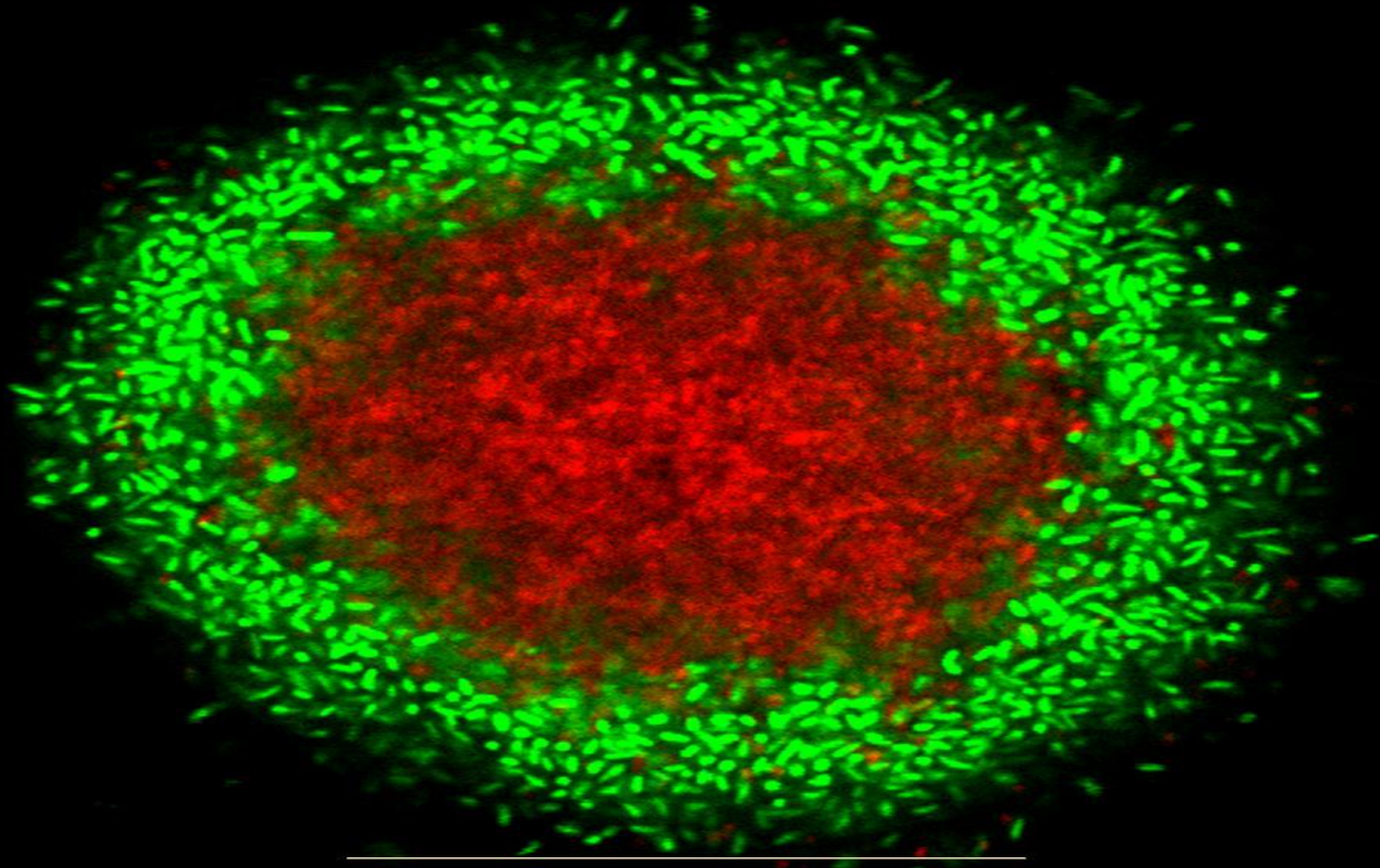




Resistance of Mycobacterium in Water Treatment Processes

Ricardo Santos





150 *Mycobacterium* Species

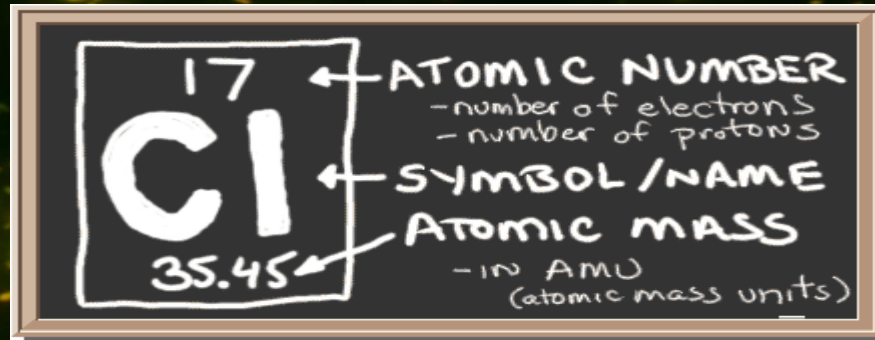
1. Strictly Pathogenic (*Mycobacterium tuberculosis* complex)
2. Environmental Possible pathogenic (*Mycobacterium kansasii*...)

Environmental Reservoirs

- Water
- Soils
- Animals
- Plants
- Protozoa

Water - Persistence

High Resistance to Chlorine and biocides



Water - Persistence

High Resistance to Chlorine and biocides



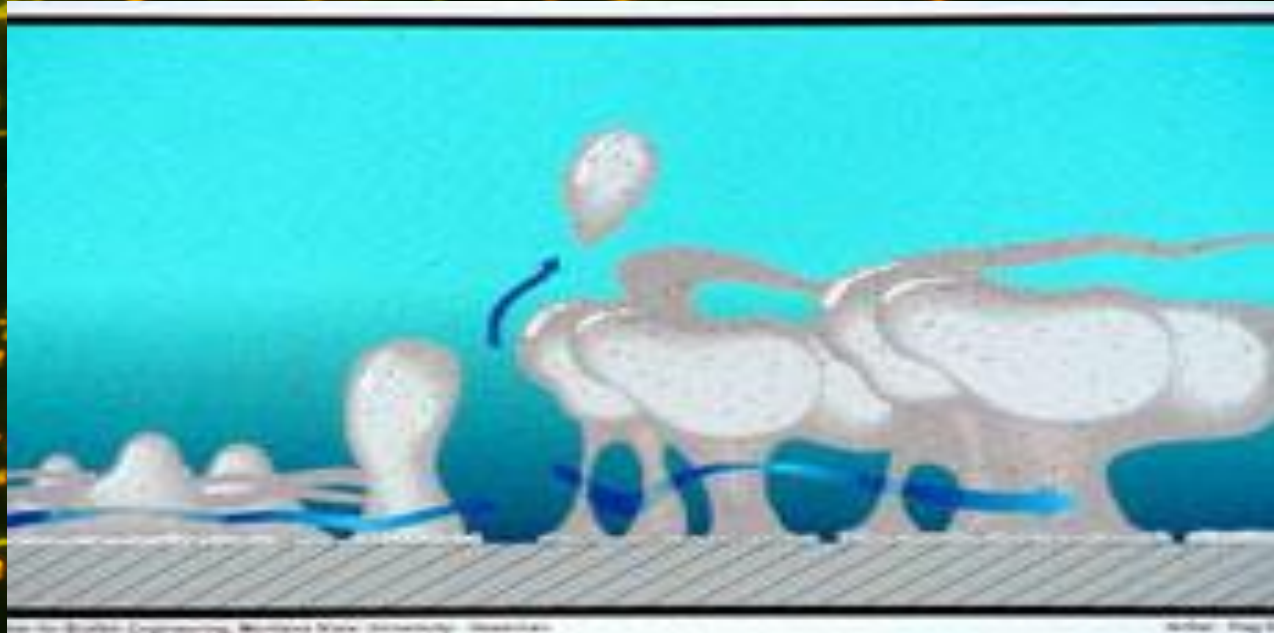
Water Treatment



Removal of Microbial Contaminants

Water - Persistence

Biofilms



Water - Persistence

Biofilms

- Increased Resistance to Aggressions
- Allows permanence in flowing systems although the slow growth rate

Water - Persistence

Lack of Nutrients



Water - Persistence

Lack of Nutrients

- *M. intracellulare*: survive 1,5 years
without loss in viability in sterile destiled
water

Water - Persistence

Amoeba



Human infection





ELSEVIER

***Mycobacterium xenopi* Infection After Heart Transplantation: An Unreported Pathogen**

E. Bishburg, M.J. Zucker, D.A. Baran, and L.H. Arroyo

ABSTRACT

Mycobacterial infections are a well-known, potentially serious, albeit infrequent complication of solid-organ transplantation. Nontuberculous mycobacteria generally account for less than 50% of all such isolates in this patient population. *Mycobacterium xenopi*, an environmentally ubiquitous organism and common contaminant of hospital hot water systems, is a particularly uncommon isolate after transplantation and has never been reported in heart allograft recipients. We report the occurrence of cavitary *M. xenopi* infection in an immunocompromised heart transplant recipient in which all the diagnostic criteria of the American Thoracic Society were met. To our knowledge, this is the first such case in a heart transplant recipient described in the literature. Despite therapy, to which the isolates were sensitive in vitro, the patient developed extensive lung cavitation and nodules and succumbed 5 months later to allograft rejection, chronic allograft vasculopathy, and pneumonia.

Non-tuberculous Mycobacterial Disease Following Hot Tub Exposure

By: **Gwen Huttli,¹ Dennis Letawsky,¹ James Bebee,¹ Ann Bailey,¹ U.S. Madhav P. Rau,¹ Kurt D. Albracht,¹ and Mitchell A. Tucker,¹ Denver Center for Public Health and Environment, Denver, Colorado, USA; Boulder County Health Department, Boulder, Colorado, USA; Boulder County Health Department, Boulder, Colorado, USA; and Centers for Disease Control and Prevention, Atlanta, GA, USA**

Non-tuberculous (NTM) have been recognized as an important cause of immunocompromised hosts. Outbreaks of NTM disease following hot tub exposure have been reported in several states. A family of five identified an NTM-related disease

The Study

In October, 1998, the Boulder County Health Department and the Tuberculosis Program, Colorado Department of Public Health and Environment, began an investigation into an apparent cluster of the same radiograph at the family home. This patient was treated over the subsequent 18 months with a series of antibiotics consistent with the radiograph. The patient was treated and preceded by a course of rifampin without apparent improvement. During the course of treatment, the patient was noted to have a consistent, but early, light, over the entire body. This was consistent with early light over the entire body. The patient was treated and preceded by a course of rifampin without apparent improvement. During the course of treatment, the patient was noted to have a consistent, but early, light, over the entire body. This was consistent with early light over the entire body.

CASE REPORTS

Mycobacterium mageritense Associated with Baths at a Nail Salon

Yuen Hammock,² Lina Nadiminti,¹ Jonathan T. May, Mitchell A. Yakrus,³ Sean Torney,³ Britte J. Jensen,⁴ T. Coughlin,⁵ and Frederick S. Nolte,^{2,7*}
¹Department of Medicine,² and Division of Infectious Disease, Department of Public Health, Georgia Department of Human Resources, STD and TB Laboratory Research,³ Epidemiology and Prevention Centers for Disease Control and Prevention,⁴ and ⁵Georgia Department of Health, ⁶Georgia Department of Health, ⁷Georgia

November 2003/accepted 28 December 2004

Mycobacterium mageritense. Both patients were treated with rifampin and isoniazid. Isolates by pulsed-field gel electrophoresis.



Available
February 2005

Mycobacteriosis and the disease

Deconster, K. H.

¹University of Minnesota, Minneapolis, MN, USA
²University of Minnesota, Minneapolis, MN, USA
Received 3 February 2003; accepted in revised form 10 March 2003

Mycobacterium mageritense is a slowly growing, non-tuberculous mycobacterium. It is a fastidious organism that requires a rich, nutrient-containing medium for growth. It is characterized by its long, thin, filamentous cells and its ability to form a thick, waxy capsule. The organism is highly resistant to environmental stresses and has a long survival time in the environment. It is a common cause of opportunistic infections in immunocompromised individuals.

Use of Home Bath with a Circulating Water System to Avoid *Mycobacterium mageritense* Infection in an Immunocompetent Aged Patient

Katsutoshi Saruta,¹ Toshio Kano,¹ Michiyo Aiyoshi,¹ Tomoko Fujino,¹ Yayoi Osaka,¹ National Vishi-Kojo Hospital, International Medical Center, of Japan, Toyama 1-27-1, Shinmachi, Toyama 926-8655

(Accepted February 3, 2003)

Unsuitable management of bath water occasionally causes waterborne infectious diseases, such as infections due to non-tuberculous mycobacteria (NTM). A 65-year-old female consulted for some deters in regard to productive cough and general fatigue. She was a non-smoker. She had hypertension and hyperlipidemia. She ran on an electrical treatment table with her husband. The spumant were bacteriologically confirmed at that time whether the bacilli were *Mycobacterium mageritense* or not. She was referred to the National Vishi-Kojo Hospital for treatment of pulmonary tuberculosis in October 1999 at chest radiograph revealed an infiltration shadow in the lower part of the left lung (Fig. 1a). Sputum examination was repeatedly negative for both AFB smear and culture. She was treated with combination of rifampin and isoniazid for 6 months, and with isolated clarithromycin, rifampin, and ethambutol was started immediately. The sputa remained positive for MAC in culture and after 15 months of treatment, her symptoms and chest radiograph improved.

The patient and her husband used a bath with a circulating filtering water system in their home. Her husband was healthy. His sputum was AFB culture-negative and his chest radiograph showed no abnormality. The bath water and filter pellets showed no abnormality. PCR-based diagnosis revealed that the MACs from the bath water and from the filter were both *M. mageritense*. These isolates were identical to those from two isolates derived from the patient, two from the water, and one from the filter, analyzed by IS724 restriction fragment length polymorphism (RFLP) typing (Fig. 3b) and IS727 RFLP typing (5) (Fig. 3c).

Unsuitable management of bath water occasionally causes waterborne infectious diseases, such as infections due to non-tuberculous mycobacteria (NTM). A 65-year-old female consulted for some deters in regard to productive cough and general fatigue. She was a non-smoker. She had hypertension and hyperlipidemia. She ran on an electrical treatment table with her husband. The spumant were bacteriologically confirmed at that time whether the bacilli were *Mycobacterium mageritense* or not. She was referred to the National Vishi-Kojo Hospital for treatment of pulmonary tuberculosis in October 1999 at chest radiograph revealed an infiltration shadow in the lower part of the left lung (Fig. 1a). Sputum examination was repeatedly negative for both AFB smear and culture. She was treated with combination of rifampin and isoniazid for 6 months, and with isolated clarithromycin, rifampin, and ethambutol was started immediately. The sputa remained positive for MAC in culture and after 15 months of treatment, her symptoms and chest radiograph improved.

Objective. The purpose of the study was to investigate the water quality in the hot tub and to identify the source of the infection. **Design.** The study was a case report. **Setting.** The study was conducted in a private hot tub. **Subjects.** The study involved a patient and her husband. **Measurements and Main Results.** The water quality was poor and the source of the infection was identified as the hot tub. **Conclusions.** *Mycobacterium mageritense* was identified as the cause of the infection. The water quality in the hot tub was poor and the source of the infection was identified as the hot tub.

Key Words: *Mycobacterium mageritense*; hot tub; water quality; infection; case report.

Introduction. Non-tuberculous mycobacteria (NTM) are a diverse group of organisms that can cause a variety of infections in humans. They are often found in water, soil, and air. NTM infections are more common in immunocompromised individuals and in those with chronic lung disease. The most common NTM infection is nocardiosis, which can affect the lungs and other organs. Other NTM infections include skin infections, sinusitis, and osteomyelitis.

Case Report. A 65-year-old female presented with a 2-month history of productive cough and general fatigue. She had hypertension and hyperlipidemia. She was a non-smoker. She had been treated with rifampin and isoniazid for 6 months for pulmonary tuberculosis. Her symptoms did not improve. A chest radiograph showed an infiltration shadow in the lower part of the left lung. Sputum examination was repeatedly negative for both AFB smear and culture. She was treated with a combination of clarithromycin, rifampin, and ethambutol. The sputa remained positive for MAC in culture. After 15 months of treatment, her symptoms and chest radiograph improved.

Discussion. This case highlights the importance of water quality in hot tubs. NTM infections are often associated with hot tubs, swimming pools, and other recreational water facilities. Poor water quality can lead to the growth of NTM, which can then be inhaled or ingested. Regular testing and maintenance of hot tub water quality can help prevent NTM infections.

Conclusion. The water quality in the hot tub was poor and the source of the infection was identified as the hot tub. The patient and her husband used a bath with a circulating filtering water system in their home. Her husband was healthy. His sputum was AFB culture-negative and his chest radiograph showed no abnormality. PCR-based diagnosis revealed that the MACs from the bath water and from the filter were both *M. mageritense*. These isolates were identical to those from two isolates derived from the patient, two from the water, and one from the filter, analyzed by IS724 restriction fragment length polymorphism (RFLP) typing (Fig. 3b) and IS727 RFLP typing (5) (Fig. 3c).

References. 1. Saruta K, Kano T, Aiyoshi M, Fujino T, Osaka Y, et al. Use of home bath with a circulating water system to avoid *Mycobacterium mageritense* infection in an immunocompetent aged patient. JAMA 2003; 290: 1813-1817.

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Conflict of Interest Statement: No competing financial interests were declared.

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Isolation of non-tuberculous mycobacteria in treated dental unit waterlines

N. B. Rodrigues,¹ BDS, MPH,¹ S. W. Reddine,² DDS, and J. H. Jorgensen,¹ PhD,³ San Antonio, Texas

Objective. The purpose of the study was to investigate the water quality in dental unit waterlines (DUWLs) and to identify the source of the infection. **Design.** The study was a case report. **Setting.** The study was conducted in a dental clinic. **Subjects.** The study involved a patient and her husband. **Measurements and Main Results.** The water quality was poor and the source of the infection was identified as the DUWL. **Conclusions.** *Mycobacterium mageritense* was identified as the cause of the infection. The water quality in the DUWL was poor and the source of the infection was identified as the DUWL.

Key Words: *Mycobacterium mageritense*; dental unit waterline; water quality; infection; case report.

Introduction. Non-tuberculous mycobacteria (NTM) are a diverse group of organisms that can cause a variety of infections in humans. They are often found in water, soil, and air. NTM infections are more common in immunocompromised individuals and in those with chronic lung disease. The most common NTM infection is nocardiosis, which can affect the lungs and other organs. Other NTM infections include skin infections, sinusitis, and osteomyelitis.

Case Report. A patient presented with a 2-month history of productive cough and general fatigue. She had hypertension and hyperlipidemia. She was a non-smoker. She had been treated with rifampin and isoniazid for 6 months for pulmonary tuberculosis. Her symptoms did not improve. A chest radiograph showed an infiltration shadow in the lower part of the left lung. Sputum examination was repeatedly negative for both AFB smear and culture. She was treated with a combination of clarithromycin, rifampin, and ethambutol. The sputa remained positive for MAC in culture. After 15 months of treatment, her symptoms and chest radiograph improved.

Discussion. This case highlights the importance of water quality in dental unit waterlines. NTM infections are often associated with dental unit waterlines, swimming pools, and other recreational water facilities. Poor water quality can lead to the growth of NTM, which can then be inhaled or ingested. Regular testing and maintenance of dental unit waterline water quality can help prevent NTM infections.

Conclusion. The water quality in the dental unit waterline was poor and the source of the infection was identified as the dental unit waterline. The patient and her husband used a bath with a circulating filtering water system in their home. Her husband was healthy. His sputum was AFB culture-negative and his chest radiograph showed no abnormality. PCR-based diagnosis revealed that the MACs from the bath water and from the filter were both *M. mageritense*. These isolates were identical to those from two isolates derived from the patient, two from the water, and one from the filter, analyzed by IS724 restriction fragment length polymorphism (RFLP) typing (Fig. 3b) and IS727 RFLP typing (5) (Fig. 3c).

References. 1. Rodrigues NB, Reddine SW, Jorgensen JH. Isolation of non-tuberculous mycobacteria in treated dental unit waterlines. JAMA 2004; 291: 2780-2783.

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Conflict of Interest Statement: No competing financial interests were declared.

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Nontuberculous Mycobacterial Disease Following Hot Tub Exposure

Ellen J. Mangione,* Gwen Huitt,† Dennis Lenaway,‡ James Beebe,* Ann Bailey,‡
Mary Figoski,§ Michael P. Rau,* Kurt D. Albrecht,* and Mitchell A. Yakrus¶

*Colorado Department of Public Health & Environment, Denver, Colorado, USA; †University of Colorado Health Sciences Center, Denver, Colorado, USA; ‡Boulder County Health Department, Boulder, Colorado, USA; §University Family Medicine, Boulder, Colorado, USA; and ¶Centers for Disease Control and Prevention, Atlanta, GA, USA

Nontuberculous mycobacteria (NTM) have been recognized as an important cause of disease in immunocompromised hosts. Pulmonary disease caused by NTM is increasingly recognized in previously healthy persons. Investigation of pulmonary disease affecting a family of five identified an indoor hot tub as the source of NTM-related disease.

ous mycobacteria (NTM) are an important
e in the United States, with the number of

The Study

In October 1998, the Boulder County H

Piscine mycobacteriosis: a literature review covering the agent and the disease it causes in fish and humans

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Received 5 February 2003; received in revised form 23 July 2003; accepted 23 July 2003

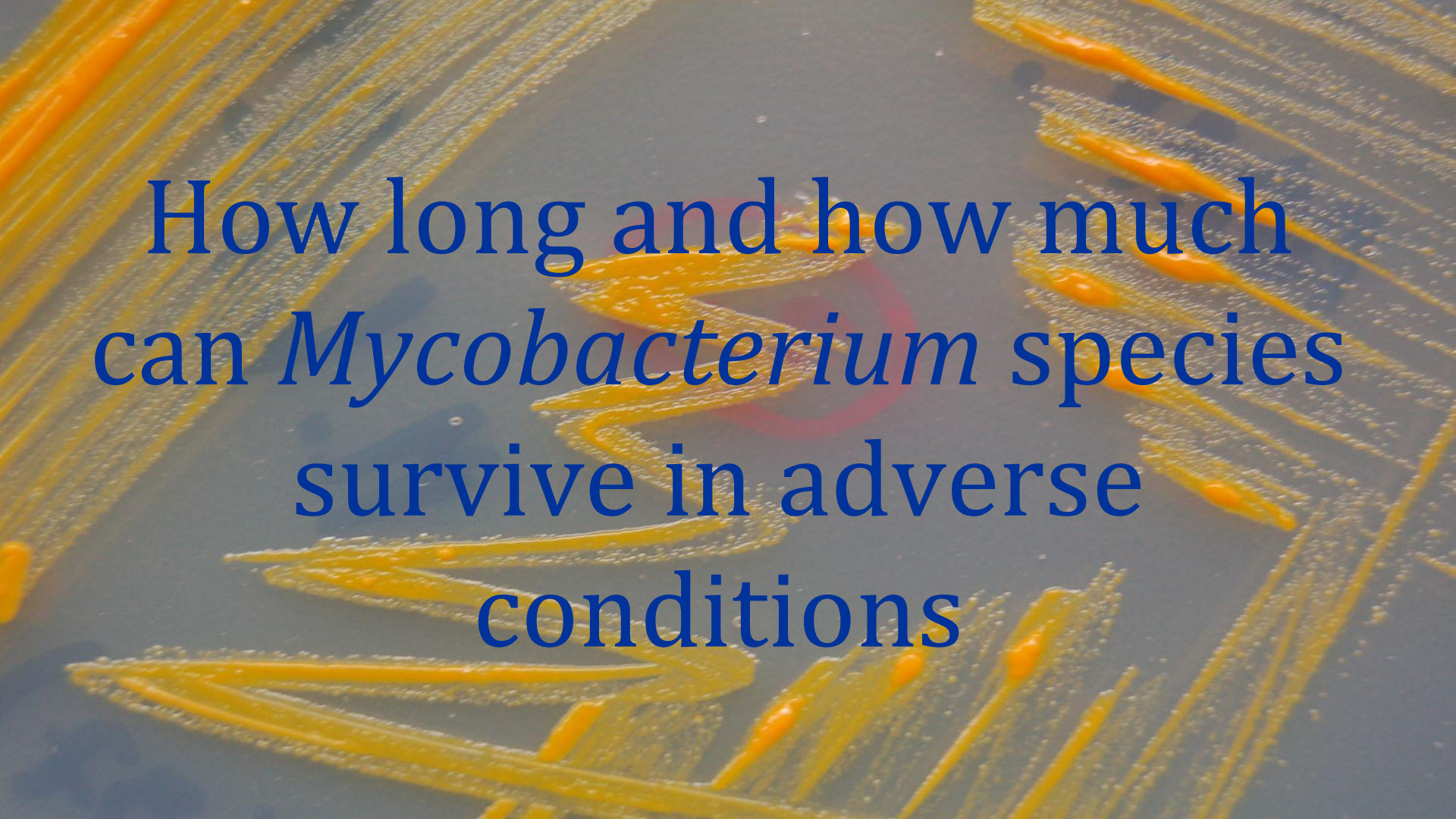
Abstract

Mycobacterium marinum, *M. fortuitum* and *M. chelonae* are the etiological agents of fish mycobacteriosis. Fish mycobacteriosis is a disseminated infection reported in more than 150 fish species and is usually accompanied by emaciation and death over a period of months to years. Granulomas are formed both externally and scattered throughout the internal organs. Treatment is in most cases unsatisfactory and the overall recommendation is to destroy the diseased stock, particularly since these pathogens are capable of affecting man as well as fish. Especially fish handlers and aquarium hobbyists are infected and the disease is mostly confined to the superficial, cooler body tissues, most often the extremities. Dissemination is apparently rare but has been reported. © 2004 Elsevier B.V. All rights reserved.

Keywords: Piscine mycobacteriosis; Granulomas; Zoonosis

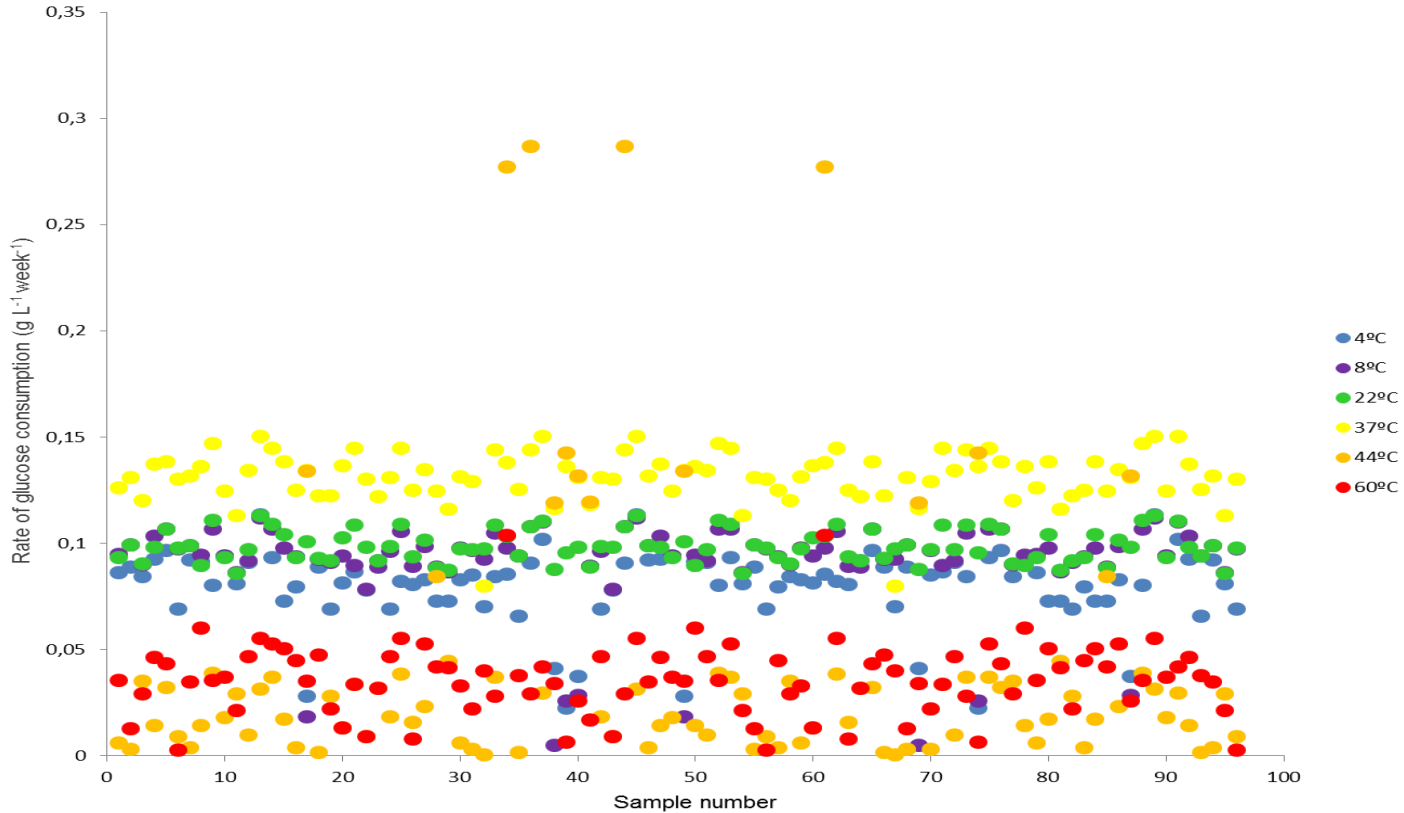
1. Introduction

research group named the carp isolate *Mycobacterium piscium* on the basis of its derivation (Bataillon et al.

A petri dish containing a grey agar surface with numerous yellowish-orange bacterial streaks. The streaks are of varying lengths and thicknesses, some showing a more confluent growth pattern. The background is a light blue-grey color.

How long and how much
can *Mycobacterium* species
survive in adverse
conditions

Survival: Temperature



Survival: pH and Chlorine

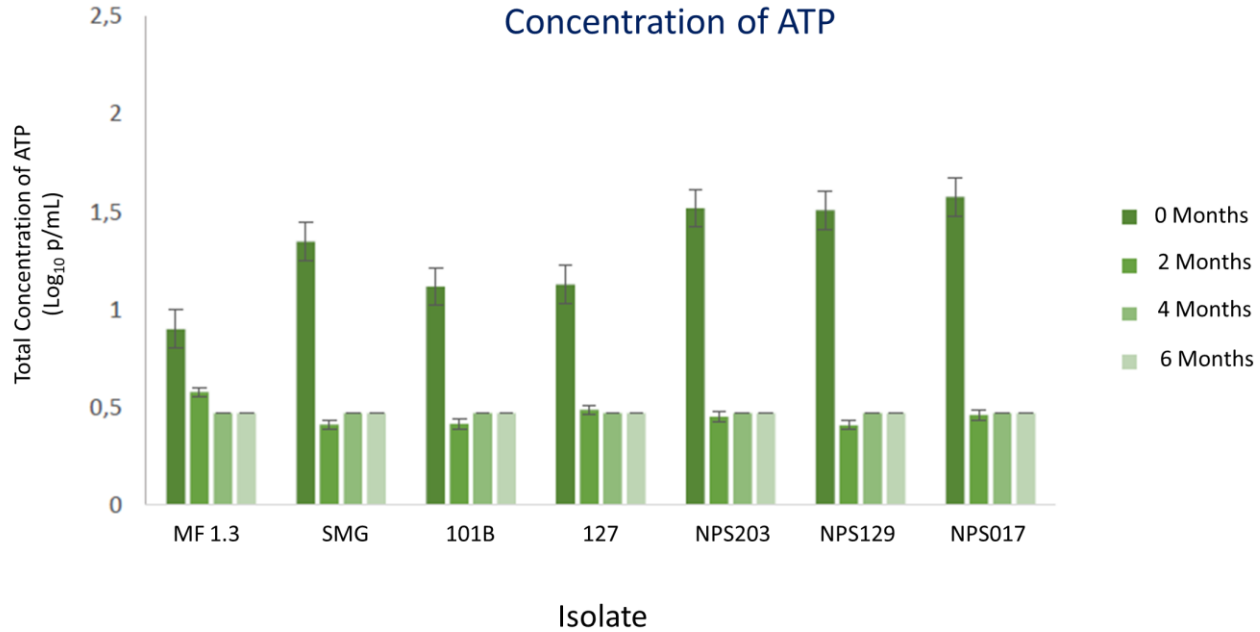
RESULTS

Limits of pH

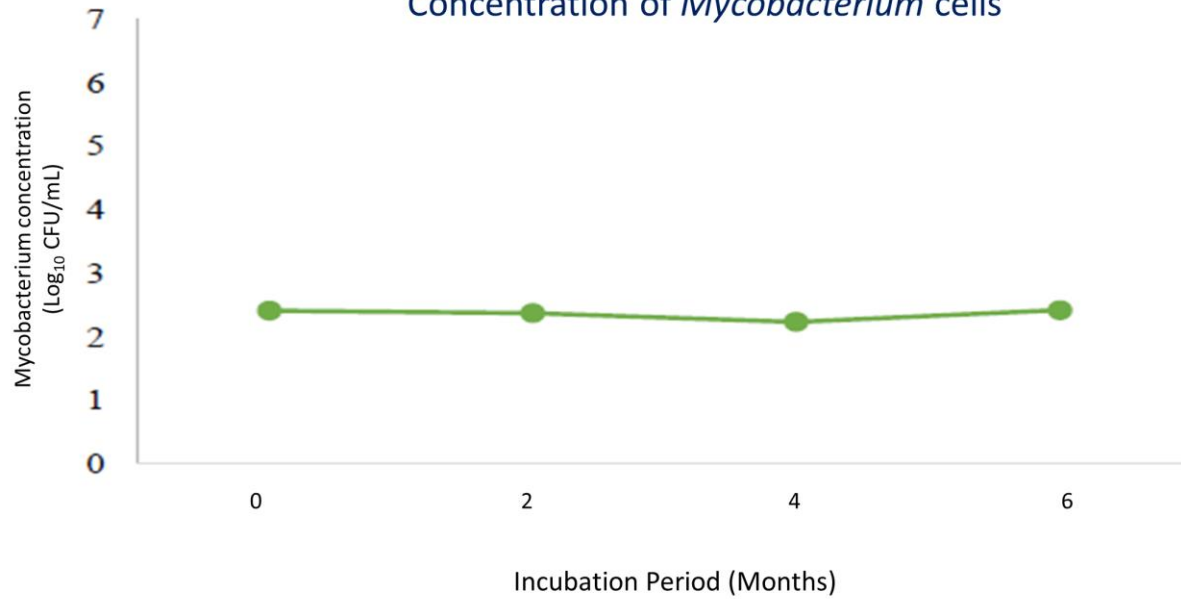
Limits of Chlorine
(ppm)

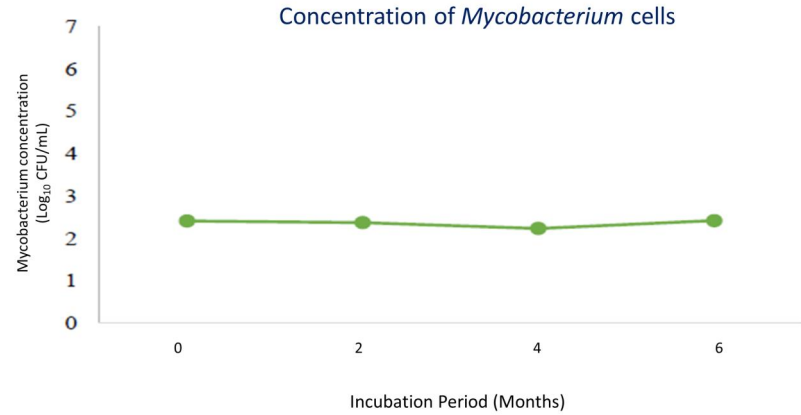
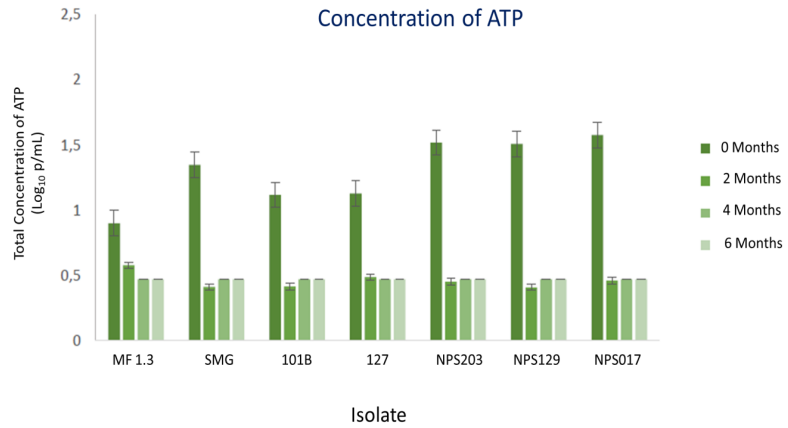
MF 1.3	0-14	10
SMG	1-14	7
101B	0-14	3
127	0-14	3
NPS203	0-14	2
NPS129	1-14	2
NPS017	0-14	5

Persistence



Concentration of *Mycobacterium* cells





1. Growth over a wide temperature range

2. Able to grow and withstand pH shifts

3. Able to persist for long periods without nutrients

Mycobacterium is one of the most successful microorganisms in water distribution system and after colonization it is very difficult to eradicate from the system

The background features a light blue-grey gradient with numerous dynamic, yellow brushstrokes of varying thickness and direction, creating a sense of movement and energy. The strokes are most prominent in the upper and lower corners, with some extending towards the center.

THANK YOU!

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