

Microbe of the month

Breaking The Chain of Infection

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Newsletter

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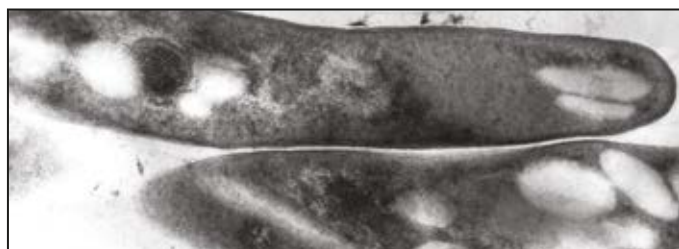
Featured
this
month:

Mycobacterium chelonae

An unusual pathogen implicated in surgical site and soft tissue infections

Hello readers!

The **non-tuberculous mycobacteria** (NTM) are mycobacteria other than *Mycobacterium tuberculosis* and *Mycobacterium leprae* (which cause tuberculosis and leprosy respectively), and have emerged as important **opportunistic pathogens** of human beings in recent years. Also known as “mycobacteria other than tuberculosis” (MOTT), it was with the emergence of the immune deficiency syndrome (AIDS) epidemic that NTM infections in vulnerable patients began to attract attention.



A **transmission electron microscopy (TEM)** image of a Mycobacterium.

This technology is used to observe the features of very small microorganisms by using an accelerated beam of electrons, which passes through a very thin specimen to show up structural and morphological features.

Where do these pathogens come from?

- Non-tuberculous Mycobacteria are **environmental organisms** that can be found in soil, dust, and natural water sources such as lakes, rivers and streams; they are also found in municipal water sources, i.e., tap water and the water used for bathing or showering.
- NTM form difficult-to-eliminate biofilms (i.e., collections of microorganisms that stick to each other and adhere to surfaces in moist environments, such as the insides of plumbing pipes in buildings).
- Unlike *Mycobacterium TB* bacilli, which are very slow growing, ‘non-tuberculous’ mycobacteria divide rapidly and include other species such as *Mycobacterium fortuitum* and *Mycobacterium abscessus*.
- These growth characteristics and the nature of the infections caused have resulted in the separate classification of NTM, which now includes all species of mycobacteria outside of the *Mycobacterium tuberculosis* complex.
- **Note:** Prior to 1992, *M. abscessus* and *M. chelonae* were considered the same organism or subspecies within the ‘*Mycobacterium chelonae-abscessus* group’, but since then, *M. chelonae* has been classified as its own species because it is increasingly implicated in healthcare-associated infections.

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Biofouling and biofilm formation in the lumen of a water pipe!

Biofilm formation on pipe walls protects microorganisms from biocide treatment which can lead to corrosion of equipment and significantly degrades the quality of water coming through the water distribution system.

Mycobacteria grow in distilled water, and some species can tolerate temperatures up to 50°C, which can be problematic for hospitals that reduce hot water temperatures as an energy conservation measure.

They are **hydrophobic** and adhere to surfaces – the cell wall is thicker than other microorganisms and the make-up of its mycolic acids results in **biofilm formation**.

Mycobacteria exhibit high resistant to chlorine and many industrial grade detergents commonly used in hospital settings. **Water heaters** are favourable growth environments owing to water stagnation and continuously elevated temperature.

Clinical relevance?

- *M. chelonae* and *M. abscessus* are considered the **most drug-resistant of the NTM group**, which leads to difficulty when treating infections caused by these organisms.
- Laboratory confirmation that *M. chelonae* is the pathogen behind the infection is very important, while the severity of disease and the patient's underlying risk factors may also adversely affect treatment outcomes.



EPIDEMIOLOGY – who is at risk?

Although anyone can acquire an infection with *Mycobacterium chelonae* [pronounced 'My-kō-bak-tair-ee-yum chell-OH-nay'], it is a known **opportunistic pathogen**, placing certain individuals at increased risk, including those with diabetes mellitus, underlying lung disease or depressed immune systems.

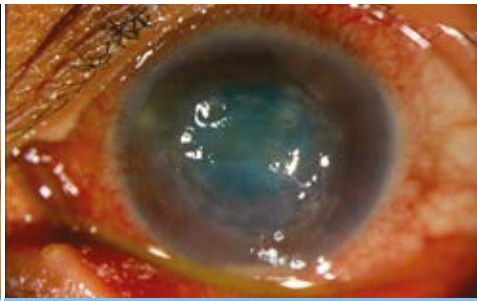
- **Mycobacterium chelonae** most commonly causes infection of the skin and soft tissues. **Healthcare-associated** *M. chelonae* infections (and outbreaks) are seen in post-operative infections of all types - complicating eye, otolaryngologic, thoracic, abdominal, cardiovascular, plastic and reconstructive, and orthopaedic procedures.
- Infections may present as **non-healing post-operative wounds**, localised cellulitis, a subcutaneous abscess, or disseminated disease (i.e., multiple body sites). Lymph node infection (lymphadenitis) occurs most commonly in children.
- Disseminated infection is associated with organ transplants, diabetes mellitus, malignancy, long-term corticosteroid administration and tumour necrosis factor-alpha (TNF- α) inhibitors - commonly referred to as 'biologic therapy' used in conditions such as rheumatoid arthritis and inflammatory bowel disease.
- Accidental penetrating trauma, particularly associated with **beauty salons, pedicures and footbaths** are well-known risk factors for disease.
- *M. chelonae* has also caused outbreaks of skin infections associated with **tattoo parlours** due to contaminated tattoo ink.

Symptoms are usually vague and nonspecific:

- o Fever
- o Weight loss
- o Night sweats
- o Decreased appetite
- o Loss of energy
- o Other symptoms will depend on the site of infection and may include coughing, shortness of breath, blood in the sputum, and skin rashes.



Mycobacterium chelonae surgical site infection following abdominoplasty



Mycobacterial keratitis



Tattoo infection caused by contamination of tattoo ink with *Mycobacterium chelonae*

Clinical relevance?

- Any procedure involving injectable foreign materials, artificial prostheses, or implantable devices (e.g., pacemakers, vascular grafts, prosthetic valves, etc.) places the patient at risk.
- Surgical site infections have ranged from sternal wound infections associated with contaminated bone wax to plastic and reconstructive surgical site infections linked to contaminated water or marking solutions (e.g., Gentian violet).
- The cure of infected implants that cannot be removed is unlikely and will require ongoing antimicrobial suppressive therapy. *M. chelonae* infection following cosmetic implants and procedures can be devastating and disfiguring.
- Aseptic post-operative wound care is critical to minimise the risk for NTM infection. The use of sterile water or sterile saline for wound cleansing is recommended; and **it is prudent to advise patients to avoid municipal water sources for the first 72 hours after a surgical procedure.**
- *M. chelonae* can cause peritonitis in peritoneal dialysis patients; and intravascular catheter infections in immune-compromised and critically ill patients. The root cause of catheter-associated infections and injection site abscesses are **poor aseptic techniques and contamination of diluents and multi-dose vials.**
- *M. chelonae* infections have even been associated with acupuncture and mesotherapy (a non-surgical medicinal cosmetic treatment).
- Unfortunately, these infections are often difficult to diagnose, resulting in major treatment delays.
- ***Mycobacterium chelonae* is not to be confused with the mycobacterium which causes tuberculosis; person-to-person transmission is rare.**



Healthcare facilities that suspect they have a patient with Mycobacterium chelonae or a non-tuberculous mycobacterial infection should contact the Medical Microbiologist for immediate guidance on specimen collection and antimicrobial therapy.

LESSONS LEARNED FOR INFECTION PREVENTION AND CONTROL ^{1,2,4}



1. Non-tuberculous mycobacteria (NTM) form difficult-to-eliminate **biofilms**, which are collections of microorganisms that stick to each other and adhere to surfaces in moist environments such as the insides of pipes and tubing.

From the plumbing system, contaminated water can be spread by:

- Shower heads and taps on sinks
- Hydrotherapy equipment, such as jet therapy baths
- Medical equipment such as ventilators, bronchoscopes and heating-cooling devices
- Ice machines
- Decorative fountains and water features

2. **Healthcare facilities should develop an effective water management and emergency tank treatment programme.**

Proactive biocidal water treatment will reduce the risk of infections from water-related organisms such as NTM, *Pseudomonas*, and *Legionella*, and should be implemented by the maintenance / engineering department in conjunction with the IPC Coordinator and an outsourced water treatment service provider.

3. Implementation of sound infection control practices prevents exposure to non-tuberculous mycobacteria and other water-related organisms – these include:

- ✓ Proactive precautionary measures for patients who are older, immune-compromised, or who have other medical conditions such as diabetes and open wounds - these infections can occur in different healthcare settings and can be related to a variety of sources.
- ✓ Preparation of injections and intravenous fluids away from sinks or other water sources
- ✓ Storage of materials and equipment used in invasive procedures away from water sources (e.g., operating theatres)
- ✓ *Cases have been associated with loan equipment and prosthesis-related trade representatives being in the operating room during surgery* – this reinforces the need for all external personnel entering the OR to undergo training and supervision in appropriate infection control guidelines.
- ✓ Following the manufacturer's instructions for the maintenance and use of medical devices that use water (e.g., hydrotherapy equipment, heating / cooling devices)
- ✓ Avoiding the use of non-sterile ice in invasive procedures
- ✓ Active surveillance and identification of healthcare-associated NTM infections will lead to earlier detection of outbreaks - laboratory identification of the species of NTM is important as it enables the recognition of infections that are potentially related to a common environmental source
- ✓ Facilities should also know and comply with the reporting requirements of their health department, as some health departments have made extrapulmonary NTM reportable in their jurisdiction in order to facilitate outbreak detection.



**Break The Chain
Of Infection!**

Recent and forthcoming Webber teleclass topics

Date	Topic	Format
7 th November 2019	Healthcare-associated pneumonia that is not ventilator-associated: a big problem, but a guideline-free zone.	On-line recording and notes
12 th November 2019	The role of cleaners in infection prevention - neglected front line workers in healthcare facilities.	On-line recording and notes
14 th November 2019	Ahead – a consolidated framework for behavioural infectious risks in acute care – Part 2	On-line recording and notes
18 th November 2019	Minimum requirements for starting the implementation of the World Health Organization Core Components of Infection Prevention and Control Programs: a new approach.	On-line recording and notes
21 st November 2019	Prioritising research areas for antibiotic stewardship programs	On-line recording and notes
5 th December 2019	How to communicate about healthcare-associated infection with x, y and z generations.	On-line recording and notes
18 th December 2019	Cleaning in Healthcare	On-line recording and notes

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and we will do our best to address them in the next issue!



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REFERENCES

1. Lea, A.S., Benwill, J.L.(2018) Mycobacterium chelonae. Medscape 20th December 2018. Available from <https://emedicine.medscape.com/article/222790-overview#a5> 2. Centers for Disease Control and Prevention (August 2019) Nontuberculous Mycobacteria (NTM) Infections. Available from <https://www.cdc.gov/hai/organisms/nontuberculous-mycobacteria.html> 3. Buser, G.L., Laidler, M.R., Cassidy, P.M et al. (2019) Outbreak of Nontuberculous Mycobacteria Joint Prosthesis Infections, Oregon, USA, 2010 – 2016. Emerging Infectious Diseases Vol. 25, No. 5, May 2019. 4. Sehulster, L.M., Chinn, R.Y.W., Arduino, M.J., Carpenter, J., Donlan, R., et al. (2019) Updated Guidelines for environmental infection control in health-care facilities. Recommendations from CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Chicago IL; American Society for Healthcare Engineering/American Hospital Association; 2019.



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* P.J. Stanirowski, et al. Dialkylcarbamoyl chloride-impregnated dressing for the prevention of surgical site infection in women undergoing cesarean section: a pilot study. Arch Med Sci 2016; 12, 2

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