Skin and Soft Tissue Infections (SSTI) associated with Seal Exposure

Introduction:

Bacterial infections following aquatic injuries involve freshwater and/or saltwater exposures.[1] Seal finger (also known as sealer's finger, spekk-finger and blubber finger) is a rare bacterial infection of the fingers and hands acquired by contact with seals. Cases of seal finger have been reported in Scandinavia, Greenland, Canada and USA (New England and Alaska). They mostly occur in subsistence seal harvesters and those handling seals for occupational and research purposes. Prompt diagnosis and treatment are critical to prevent long-term complications.

The intent of this document is to provide information and a standardized approach to the management of seal finger and associated SSTIs in Nunavut.

All cases of suspected seal finger should be promptly discussed with a physician or nurse practitioner.

Background:

- Older seals appear to be more infectious, although seals of all ages can transmit the infectious organism.[2]
- The source of infection may be directly from the bite of a seal, skinning or handling of seals, or handling of seal meat, blubber or unsalted seal skins.[3]
- The bacterium enters the finger through small wounds or scratches in the skin, and the symptoms develop after an incubation period ranging from hours to up to 1-15 days.[2]
- Most reported cases have occurred in the spring, with a peak occurrence in April to early May.
- ***Mycoplasma phocacerebrale*** **and other mycoplasma species** have been reported as causative organisms of seal finger in other parts of North America and in Europe.[4,5] It is not known whether these are the only potentially causative organisms. It is also not known whether *Mycoplasma sp*. is the cause, or a component of the cause, of seal finger in Nunavut.
- Seal finger is primarily a clinical diagnosis, based on the history and physical examination outlined below. However, there is considerable overlap with other clinical conditions. **A history of contact (or probable contact) with a seal is necessary, but not sufficient, for the diagnosis and other etiologies should also be considered as part of the differential diagnosis as discussed below.** If there is no history or probable history of contact with a seal, this guideline does not apply. When treating suspected seal finger in Nunavut, it is important to also cover for organisms that commonly cause SSTIs (e.g., *Staphylococcus aureus* and *Streptococcus* species, including *Streptococcus iniae* (which is found on the skin of many fish) and to consider treating for water-associated organisms (e.g., *Pseudomonas sp*. and *Serratia sp*.).[1]
- Host factors should also be considered when selecting therapy. These include immune status (e.g., diabetes, renal failure, auto-immune conditions, use of immunosuppressive agents, etc), and location of infection (e.g., infections involving the head and neck, or those adjacent to

Approved April 17, 2019 by the
Medical Advisory Committee
Limited Revision October 16, 2019

artificial material). For example, in immunocompromised patients, it may be appropriate to empirically cover for the presence of virulent organisms such as *Pseudomonas sp*., until culture results are available.

Clinical Signs and Symptoms of Seal Finger:

- A small furuncle may form at the site of exposure; 90% of patients recall an inoculation injury.[2,6]
- Initial symptoms:
  - Erythema and pain, which is often described as severe and throbbing and is aggravated by movement.
  - Stiffness of the finger may be present; the middle finger is the most commonly affected digit, followed by the index finger and thumb.[2,7]
  - Swelling is variable, but can spread to involve the entire hand.
  - The pain, swelling and induration limit range of motion of the finger.
- **Fever and lymphangitis, which are rare in uncomplicated cases, are likely associated with super-infections caused by gram-positive bacteria, such as *Staphylococcus* and *Streptococcus sp.***[2,3]
- Without treatment, the joint symptoms may progress for months or years, leading to cellulitis, tenosynovitis, and/or arthritis, which result in pain, decreased function and, in the long term, stiffness and permanent loss of finger joint range of motion.[4]
  - Other long-term consequences:
    - Ankylosis of interphalangeal joints, severe pain on movement or marked sensitivity to cold.
    - Possible amputation.

Differential diagnosis:[7,8,9]

- **Seal pox**[10]
  - Caused by seal pox virus (parapoxvirus).
  - May develop following a seal bite.
  - Incubation period unclear but is less than 7 days.
  - Starts as a papule and progresses to a gray bullous lesion that may resemble orf (a highly contagious, zoonotic, viral infection).

- **Erysipeloid**
  - Caused by the bacterium *Erysipelothrix rhusiopathiae,* which exists ubiquitously in the environment and is found in swine, domestic animals, birds, seals and fish (specifically on the exterior slime of fish).[9]
  - Can result from bites and abrasions.
  - Incubation period is 4-7 days.
  - Presents as a localized cutaneous form (erysipeloid) with local cellulitis. The lesions are characterized by well circumscribed, tender, violaceous edematous plaques on fingers or hands.
  - May also present as a diffuse cutaneous form that progresses to other sites of the body; rarely leads to septicemia and endocarditis.

Approved April 17, 2019 by the
Medical Advisory Committee
Limited Revision October 16, 2019

- **Nontuberculous (previously known as atypical) mycobacterium [NTM]** (e.g., *M. marinum, M. abscessus, M. fortuitum*)
  - NTM SSTIs are less common than those due to other bacterial organisms. They tend to develop more slowly (over days, weeks, or months) than other bacterial infections.[11,12]
  - *M. marinum* (also known as fish tank granuloma) is the most commonly reported causative organism of NTM SSTIs that arise from aquatic injuries.[13]
  - The incubation period is usually less than 4 weeks but can be as long as 9 months.
  - Results in ulcerating or nodular skin lesions that can progress to tenosynovitis, septic arthritis or osteomyelitis, especially if diagnosis is delayed.[14]

Diagnosis:

- Inquire as to history of exposure to seal.
- Always take a swab and/or tissue sample where available for aerobic and anaerobic culture.
  - Mycoplasma cannot be routinely cultured.
  - Do not culture for NTM unless the infection is not responding to initial treatment, or unless the clinical picture is very suggestive of this diagnosis.
  - In cases of suspected erysipeloid, a biopsy of the entire dermis should ideally be taken because the bacterium lies in the deeper layers of the skin.[9] Deep wound cultures should be taken if biopsy is not available.

Blood cultures should be collected for patients who are systemically unwell (e.g., febrile, hypotensive).

Prevention:

- Seal finger is preventable.
- Important preventative measures include good hygiene, wearing protective gloves, and proper care of cuts and abrasions.[6]
- Wounds/cuts should be washed with soap and water.

Approach to Treatment/Prophylaxis:

- Delay in diagnosis or treatment of seal finger can result in permanent stiffness or loss of the affected finger.[15]
- Infections of the hand need to be assessed carefully regarding the need for surgical intervention at the initial and at subsequent follow-up visits. The hand presents regions in which pus can be trapped, such as the digits, or in the tendon sheaths, leading to complications including tissue necrosis and arterial insufficiency. Antibiotics do not penetrate easily into abscesses. Loculated pus usually needs to be drained, and cultures should be collected whenever possible.
- Morbidity is reduced by early initiation of tetracycline.[16]
- If seal finger is suspected and/or a deep bite occurs, a tetracycline antibiotic (e.g., doxycycline), should be considered as part of initial treatment. Doxycycline is the preferred tetracycline due to more convenient twice daily dosing and lack of food-drug interactions.
- Alternate agents to doxycycline have not been reported for the treatment of seal finger. Macrolide antibiotics (e.g., azithromycin) may be effective and are recommended for pregnant patients as tetracyclines are contraindicated in pregnancy.

Prophylaxis (within 24 hours of injury):

- May be considered in cases of a deep bite or injury and before the onset of signs and symptoms of infection.
- The optimal antibiotics and duration of therapy are unknown; however, the following regimens may be considered:

Adolescents/adults		
Non pregnant	Amoxicillin/clavulanate 875/125 mg PO BID + Doxycycline 100 mg PO BID	x 3-5 days
Pregnant	Amoxicillin/clavulanate 875/125 mg PO BID + Azithromycin 500 mg PO daily	x 3-5 days

Treatment:

- Start empiric antibiotics until culture results are available. Antibiotics should cover:
    - *Staphylococcus* and St*reptococcus sp.:*
        - Amoxicillin/clavulanate, cefazolin, cephalexin, clindamycin, levofloxacin, meropenem, piperacillin/tazobactam, trimethoprim/sulfamethoxazole or vancomycin

    AND
    - *Mycoplasma sp*.:
        - Doxycycline
        - Azithromycin, if allergy/sensitivity to doxycycline or patient is pregnant

    AND CONSIDER:
    - In severe infections, cover for *Pseudomonas sp.*:
        - Ciprofloxacin, levofloxacin, meropenem, or piperacillin/tazobactam
    - In cases of dirty wounds, cover for anaerobes:
        - Add metronidazole if patient not already covered by amoxicillin/clavulanate, clindamycin, meropenem, or piperacillin/tazobactam.
- Note: As the beta-lactam antibiotics (e.g., penicillins and cephalosporins) are ineffective against *Mycoplasma*, all of the suggested regimens for non-pregnant patients include doxycycline.
- After culture results are available, adjust antibiotic therapy as appropriate.
- Since *Mycoplasma sp.* cannot be routinely cultured, doxycycline or azithromycin should be continued, even if other organisms are cultured.
- Patient response to treatment should be closely monitored. Typically, a response to treatment with improvement in erythema, pain and tenderness should be expected within 3-5 days.
- If patient not responding to treatment, consider complications (e.g., tenosynovitis) or alternate diagnoses such as nontuberculous mycobacteria.
- **Duration of therapy depends on severity of infection and response to treatment. Therapy is often continued for a minimum of 14 days; longer duration may be required since these infections are often severe and improve slowly.** Once clinically improving, patients receiving parenteral antibiotics can be stepped down to oral therapy to complete the course of treatment.
- Note: For pediatric patients consult with a pediatric specialist.

Approved April 17, 2019 by the
Medical Advisory Committee
Limited Revision October 16, 2019

Empiric antibiotic options:

Adolescents/adults (pregnancy excluded)	
Non-severe, oral therapy	• Amoxicillin/clavulanate 875/125 mg PO BID + Doxycycline* 100 mg PO BID If *Pseudomonas* strongly suspected/confirmed or severe injury: add Ciprofloxacin 750 mg PO BID *Alternate:* • Levofloxacin 750 mg PO daily + Doxycycline* 100 mg PO BID If "dirty" wound and anaerobes suspected: add Metronidazole 500 mg PO BID **OR** • Clindamycin 300 mg PO QID + Doxycycline* 100 mg PO BID If *Pseudomonas* strongly suspected/confirmed or severe injury: add Ciprofloxacin 750 mg PO BID
Severe, parenteral therapy	• Piperacillin/tazobactam 3.375 g IV q6h + Doxycycline* 100 mg PO BID **OR** • Meropenem[1,2] 500 mg IV q6h + Doxycycline* 100 mg PO BID **OR** • Ciprofloxacin 400 mg IV q12h (or Ciprofloxacin 750 mg PO BID if able to tolerate oral antibiotics) + Clindamycin 600 mg IV q8h + Doxycycline* 100 mg PO BID **OR** • Vancomycin IV (Use Vancomycin Order Set to select appropriate weight- and renal-based dose) + Ciprofloxacin 400 mg IV q12h + Doxycycline* 100 mg PO BID If "dirty" wound and anaerobes suspected: add Metronidazole 500 mg PO BID
Pregnant adolescents/adults	
Non-severe, oral therapy	• Amoxicillin/clavulanate 875/125 mg PO BID + Azithromycin 500 mg PO daily
Severe, parenteral therapy (including if *Pseudomonas* strongly suspected/confirmed or severe injury)	• Piperacillin/tazobactam 3.375 g IV q6h + Azithromycin 500 mg PO/IV daily **OR** • Meropenem[1,2] 500 mg IV q6h + Azithromycin 500 mg PO/IV daily

*If allergy/sensitivity to doxycycline, replace with azithromycin.

[1]Meropenem not stocked in Community Health Centres.

[2]Ertapenem should not be used as an alternative to meropenem as it does not cover *Pseudomonas.*

Note: *Recommended doses assume normal renal function. All antibiotics listed require adjustment in patients with renal dysfunction except for the following: Azithromycin, Clindamycin, Doxycycline and Metronidazole.*

Approved April 17, 2019 by the
Medical Advisory Committee
Limited Revision October 16, 2019

References:

1. Diaz JH, Lopez FA. Skin, soft tissue and systemic bacterial infections following aquatic injuries and exposures. *Am J Med Sci* 2015 Mar; 349(3):269-75.
2. Candolin Y. Seal finger (spekkfinger) and its occurrence in the gulfs of the Baltic Sea. *Acta Chir Scandanavica* 1953; 177:1–51.
3. Hartley JW, Pitcher D. Seal Finger – Tetracycline is First Line. *Journal of Infection* 2002; 45:71-75.
4. Baker AS, Ruoff KL, Madoff S. Isolation of Mycoplasma Species from a Patient with Seal Finger. *Clinical Infectious Diseases* 1998; 27:1168-70.
5. Westley BP, Horazdovsky RD, Michaels DL, Brown DR. Identification of a Novel Mycoplasma Species in a Patient with Septic Arthritis of the Hip and Seal Finger. *Clin Infect Dis* 2016; 62:491-3.
6. Olds JM. Seal finger or speck finger. *Can Med Assoc J* 1957; 76: 455-457.
7. White CP, Jewer DD. Seal finger: A case report and review of the literature. *Can J Plast Surg* 2009; 17(4):133-35.
8. Finkelstein R, Oren I. Soft tissue infections caused by marine bacterial pathogens: epidemiology, diagnosis, and management. *Curr Infect Dis Rep* 2011 Oct; 13(5):470-7.
9. Vasagar B, Jain V, Germinario A, Watson HJ, Ouzts M, Presutti RJ, Alvarez S. Approach to Aquatic Skin Infections. *Prim Care* 2018 Sep; 45(3):555-566.
10. Clark C, McIntryre PG, Evans A et al. Human sealpox resulting from a sealbite: confirmation that sealpox is zoonotic. *Br J Dermatol* 2005; 152:791-3.
11. Gonzalez-Santiago TM, Drage LA. Nontuberculous Mycobacteria: Skin and Soft Tissue Infections. *Dermatol Clin* 2015 Jul; 33(3):563-77.
12. Lopez M, Croley J, Murphy KD. Atypical Mycobacterial Infections of the Upper Extremity: Becoming More Atypical? *Hand* 2017; 12:188-192.
13. Hartmark-Hill JR et al. 53-year-old man with a swollen finger. *Mayo Clin Proceedings* 2008; 83:217-220.
14. Johnson MG, Stout JE. Twenty-eight cases of *Mycobacterium marinum* infection: retrospective case series and literature review. *Infection* 2015; 43:655-662.
15. White CP, de Wet F. Sealer's finger. *Can J Rural Med* 2006; 11(2):117-18.
16. Mass DP, Newmeyer WL, Kilgore ES. Seal finger. *J Hand Surg* 1981; 6:610-612.

Additional Information:

1. Lewin MR, Knott P, Lo M. Seal finger. *Lancet* 2004; 364:448.

Prepared By:

Dr. Ameeta Singh, Clinical Professor, Division of Infectious Diseases, University of Alberta and Christine Weatherston, Drug Information and Nunavut Pharmacist, The Ottawa Hospital.

Reviewed by members of the Nunavut Pharmacy and Therapeutics Committee and Nunavut Antimicrobial Stewardship Committee.
A special thank you to Dr. Pam Orr, Professor, Section of Infectious Diseases, University of Manitoba, for her review and comments.

Approved April 17, 2019 by the
Medical Advisory Committee
Limited Revision October 16, 2019