North Carolina Division of Marine Fisheries

Recognizing and Preventing Marine Environmental Hazards

Updated 2013
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Introduction

Many Division of Marine Fisheries staff work in and around the water on a daily basis. Sorting fish or shrimp on the deck of a boat, shucking oysters or clams, collecting data in a fish house, diving on reefs, cleaning buoys or boat hulls, or water sampling exposes you to potential hazards that for the most part, exist naturally in the marine environment. While serious injuries are not common, bacteria can enter even very small scratches or punctures causing infection. Recognizing hazards that exist within this environment is an important step to protect you from potentially serious injury or infection.

This guide has been developed to help inform field staff of some of the more common or serious hazards found in the marine environment and ways to reduce or lessen the risk of injury and infection. This document is not intended as medical advice although basic first aid for some injuries is covered. When seeking professional medical attention or advice it is very important to inform the physician that you were working in the marine environment. Some marine pathogens listed here culture at different temperatures than more common terrestrial bacteria such as Staphylococcus sp. and can be miss-diagnosed without complete case information.

Prevention

The best way to avoid injuries and infection from most of the marine hazards listed here is to prevent them from happening in the first place. Two simple preventative methods are discussed here; hand washing and personal protective equipment (PPE). These are habits that have to be developed and followed in the field. Many incidents within the DMF over the past several years could have been either reduced in scope or prevented by the use of PPE. Thousands or perhaps millions of infections and illnesses could be prevented in the United States each year with proper hand washing.

A Word about Hand Washing and Sanitizing:

Hand washing is mentioned several times in this guide as a prevention method. While washing our hands before preparing food or after using the restroom is second nature (or should be), many times in the field we neglect this simple but highly effective way to prevent possible infection. During or after field sampling, you should thoroughly wash your hands and arms, and irrigate and clean any cut, scrape or wound, with soap and warm water. Wash thoroughly for at least 20 seconds and then rinse. If soap and water is not available, alcohol based hand cleaners are the “next best thing”. For them to be effective, your skin needs to stay “wet” for 20 seconds or more while you rub the gel with your hands. So you need to use a liberal amount of product. Purell® now makes a 70% alcohol based hand cleaner that is reportedly very effective against most pathogens.

Personal Protective Equipment:

If you have spent any reasonable amount of time in the field, you have probably been spined, stung, pricked, pinched or stuck by some sort of marine life. Some of you may have developed an infection from those injuries. Many of these types of injuries could be prevented through the use of proper PPE, and especially protective gloves. Protective gloves are now available that provide a high degree of dexterity. If at all possible, you should consider wearing protective gloves when working with marine animals, on the deck of a boat or even diving. Eye protection is also important especially when in a high spray or splash area. Splash or spray from a fish or other marine animal can contain bacteria which can enter the body through the eye. Good fitting, non-skid boots can also provide protection from marine hazards. Make sure they fit well and wear them with socks. There have been numerous cases of commercial fishermen developing bacterial infections in heel blisters from poorly fitted and wet boots. Finally, if you have cuts and scrapes, wash thoroughly and apply an appropriate antibiotic ointment and cover them with a good bandage. Try to keep them covered and prevent contact with water, fish or other marine organisms. Watch for signs of infection.
**Bacteria and Other Microorganisms**

**Wound and Contact Infections**

**VIBRIOS/V. vulnificus and V. parahaemolyticus**

With the exception of “01” cholera, most Vibrio bacteria are naturally present in warm estuarine waters and many can cause foodborne illness or infection. *Vibrio vulnificus* and *Vibrio parahaemolyticus* are probably the most important to public health professionals.

*Vibrio vulnificus* or Vv, poses a rare but serious threat to at-risk individuals both from consumption and wound infections. For healthy individuals, a wound infected with Vv may not cause any symptoms or is self-limiting. However, for AT-RISK individuals or those with weakened immune systems Vv can cause rare but serious wound infections and even death. For those who develop septicemia with Vv, (the bacteria infects the blood stream), the fatality rate is 50% or greater. It should be emphasized that this is a rare occurrence. In the U.S. each year there are approximately 50-60 septicemia cases annually from wounds and consumption, but half result in death. So if you are an at-risk individual, you should take precautions and be aware of this pathogen. (Note: At-Risk individuals should not eat raw or undercooked molluscan shellfish as well.)

**WHO IS AT RISK?**

You are at an increased risk for a serious infection if you have one or more of the following at-risk conditions:

- Liver disease
- Diabetes
- Alcoholism
- Cancer
- Kidney disease or failure
- HIV/AIDs
- Stomach disorders
- Iron overload disease
- Weakened immune system

*People without these conditions are NOT at-risk for a serious Vv infection*

**WHAT ARE THE SYMPTOMS?**

Symptoms of a *Vibrio vulnificus* infection usually develop rapidly (within 3-48 hours) and may include:

- Rapid swelling, pain, reddening of skin around the wound
- Fever/chills
- Nausea/stomach pain/vomiting/diarrhea
- Large blisters, sometimes blood-filled (bullae) usually on the extremities
- Bacterial infection in the bloodstream (sepsis)
- Rapid drop in blood pressure (shock)
- Death

*IF YOU HAVE ONE OR MORE AT-RISK CONDITIONS AND DEVELOP SYMPTOMS, SEEK IMMEDIATE MEDICAL TREATMENT.*

- Vv is one of the fastest growing bacteria
- Immediate medical treatment is vital

Blood filled blisters with severe *V. vulnificus* infection
HOW CAN I LESSEN MY RISK?

- Do not expose wounds to seawater or raw seafood
- Wear protective gloves and eyewear
- Do not eat raw or undercooked oysters, clams or mussels
- Thoroughly wash any wound with soap and water

*Vibrio parahaemolyticus* is also found naturally in warm salt waters and can affect normal healthy individuals. While normally associated with foodborne gastrointestinal illness from shellfish, it can also cause wound infections, ear infections and on rare occasions septicemia, mostly in at-risk individuals.

For more information on Vibrios go to the following links:


**MYCOBACTERIA**

Mycobacteria are a large group of bacteria which includes the species causing tuberculosis. For those working around the water however, one species in particular, *Mycobacterium marinum*, a fish pathogen, can cause a rare but potentially serious marine wound infection in humans. Like most bacteria, it enters the body through a wound. Wounds do not have to be large to become infected. Fin pricks, small scrapes or even ant bites can become infected.

**WHO IS AT RISK?**

Anyone can become infected with *Mycobacterium marinum*. Those individuals with compromised immune systems may be at a higher risk of developing more serious infections. **If an infection is suspected in such persons, a health care provider should be promptly consulted.**

**WHAT ARE THE SYMPTOMS?**

After exposure, symptoms usually appear within 2 to 4 weeks. Some reported cases have developed symptoms after 2 to 4 months or longer due to the *slow-growing* nature of this bacterium.

- Slowly appearing raised nodule(s) or bump at the site of the injury
- Usually on the hand, upper arm, over a bony prominence such as a knuckle or elbow (it likes cooler temperatures)
- Enlarging sore or ulcer
- Swelling of lymph nodes
- A physician should be consulted if a skin nodule or reddened sore (ulcer) develops following direct skin contact with fresh or salt water or after handling or processing fish. **Be sure to tell your physician that you were working on the water, aquariums, etc. as this bacteria cultures at lower temperatures than most and can be overlooked if not cultured properly.**
HOW CAN I LESSEN MY RISK?

- Wear waterproof gloves when cleaning aquariums, fish tanks, cutting boards, display tanks, etc. Wash hands and forearms thoroughly with soap and warm water after cleaning the tank, even if gloves were worn.
- Wear protective gloves while handling, measuring, cleaning or processing fish, or working with any marine fouling (buoys, boat hulls, etc.). Wash hands thoroughly with soap and water after fish processing or use a waterless cleanser.
- Cover open cuts, scrapes and sores and avoid contact with water, especially if you are immune compromised.
- When fish are infected with *M. marinum*, they may have skin nodules and/or ulcers. Avoid bare hand contact with these fish.
- Ensure adequate chlorination in swimming pools.

OTHER MARINE BACTERIAL PATHOGENS

Other infections may occur from bacteria in the environment. Two in particular are noted below. If you notice any of the symptoms below you should consult your physician, especially if you have any immune compromised conditions.

- *Aeromonas hydrophila* is found in fresh water environments and some brackish water and is associated with diseases mainly found in fish and amphibians. While it is not as pathogenic to humans as to fish, some strains can cause serious infections including cellulitis and sepsis (blood poisoning).
  - It can affect anyone but those who have compromised immune systems are more at-risk for serious infections.
  - Avoid bare hand or skin contact with fish that have visible disease: tail or fin rot, ulcers, etc.
  - Always wash hands thoroughly with soap and water after handling marine animals.
  - Thoroughly clean and irrigate wound.

*Cellulitis from A. hydrophila*
• *Erysipelothrix rhusiopathiae* is most commonly seen as a self limited skin infection known as *Erysipeloid*.
  o It can affect anyone.
  o Typically from handling infected domesticated animals but also marine animals
  o Wear gloves when possible when handling marine animals
  o Wash hands thoroughly with soap and water after handling.

**POLLUTION RELATED HAZARDS:**

Waters in North Carolina are, for the most part, clean and unpolluted. However, you have a greater risk of being exposed to pathogenic bacteria, viruses, parasites and micro-organisms in areas with point source discharges, such as treated wastewater or flowing stormdrains, or in areas that receive high amounts of stormwater runoff. Heavy rains and the resultant runoff transport these pathogens to surface waters where they may be viable for days or weeks. Runoff from development, pets, animal farms, dog kennels, wildlife, birds, and failing septic systems may be sources for potentially serious pathogens.

  o Care should be taken near wastewater outfalls and after storms or heavy rain events to prevent wound exposure, ingestion and contact with the eyes, ears, nose and mouth from water or marine life.
  o Avoid direct contact with water after algal blooms, fish kills, or spills
  o Wear PPE when working in these areas as necessary.
  o Cover and prevent any wounds from being in contact with water or marine life in these areas
  o Thoroughly wash any affected area with soap and warm water
Marine Aquatic Stings

“SEA LICE”

Sea Lice is a term used to describe the dermatitis or rash like symptoms that occur after contact with a variety of marine organisms. “Sea Lice” can be caused by, but not limited to the following:

- Broken tentacles from jellyfish
- A variety of zooplankton
- Jellyfish and Anemone larvae
- Cymothoids/Isopods

WHAT ARE THE SYMPTOMS?

Sea Lice symptoms may vary depending upon the organism and will occur within several minutes to hours after exposure to the water:

- Small raised reddish bumps, welts or blisters on the skin. Often only under clothing such as a bathing suit where larvae can become trapped.
- Itching
- Burning

HOW CAN I LESSEN MY RISK: (see also; Jellyfish)

- A wetsuit or tight fitting rash guard will provide some protection since most sea lice “stings” occur under clothing like a bathing suit. (Some rash guards also provide excellent SPF protection)
- Avoid swimming or wading after storm events.

JELLYFISH & PORTUGUESE MAN OF WAR

Many jellyfish species do not pose any health threat to humans. In a few NC species however, jellyfish stings can range from mild to severe and are caused when the tentacles trailing from the jellyfish body discharge microscopic barbed stingers (nematocysts) that release venom into your skin. This happens when you brush against the tentacles, or even parts of tentacles on drifting or beached jellyfish. Portugese Man of War are not true jellyfish but a colony of several organisms but still can deliver a potent sting.
WHAT ARE THE SYMPTOMS?

- **Sea Nettle (Chrysaora quinquecirrha)**
  - Moderate and sometimes severe stings and burning
  - Can occur in large numbers especially in the sounds during certain times of the year
- **Moon Jelly (Aurelia marginalis)**
  - Mild burning
- **Lion’s Mane (Cyanea capillata)**
  - Moderate burning
- **Sea Wasps (Chiropsalmus quadrumanus and Tamoya haplonema)**
  - Severe dermatitis, wheals, burning pain
  - May require medical treatment
- **Portuguese Man-of-War (Physalia physalis)**
  - Blue float on top of water
  - Severe shooting pain described as a shock-like sensation, and intense joint and muscle pain. Pain may be accompanied by headaches, shock, collapse, faintness, hysteria, chills, fever, nausea and vomiting
  - May require medical treatment

An excellent site for Jellyfish can be found at the SC Marine Resources site:
http://www.dnr.sc.gov/marine/pub/seascience/jellyfi.html

HOW CAN I LESSEN MY RISK:

- Application of product such as Safe Sea® may be effective for prevention of many types of “Sea Lice” and jellyfish stings; http://www.buysafesea.com/index.php
- Good fitting neoprene wetsuit or tight weave rash guard and gloves provide a level of protection.
- Carefully remove jellyfish tentacles from the skin.
- Rinse area with salt water. Fresh water may actually activate more stinging cells that have not discharged.
- Avoid the water when hazardous jellyfish are visible in large numbers.
- Apply cold pack to reduce pain and swelling
- Seek medical attention if necessary
STINGRAYS

Stingrays are very common in North Carolina and may be encountered during various Division activities from Trawl Sampling to Beach Water Monitoring. The typical injury occurs when the ray is inadvertently stepped on, causing the animal to reflexively strike the person with its tail. However, they can also strike when on the deck of a boat or when caught in a net. The stinger-barb often injects a protein-based toxin into the wound, causing immediate intense pain in the victim. Injury may occur without envenomation and is still very painful.

HOW CAN I LESSEN MY RISK:

- Do the “Sting Ray Shuffle”; instead of stepping, shuffle your feet forward when you wade
- Do not swim/scuba dive directly over a stingray
- If hit, Apply pressure or staunch wound to control bleeding if necessary
- Gently remove obvious pieces of spine.
- Do not remove pieces of spine from the neck, chest, or abdomen; SEEK IMMEDIATE MEDICAL ATTENTION for injuries in these areas.
- If available soak affected area with hot potable water (as hot as you can stand without scalding)
- Thoroughly cleanse the wound a apply loose dressing
- Seek medical attention. Often these are deep wounds and secondary infection may be a concern.
MARINE MAMMAL STRANDINGS

Marine mammals (whales, dolphins, porpoises, seals) are sometimes found sick, injured or dead, floating or stranded along our beaches. They can also become entrapped or disoriented and unable to return to their natural habitat without assistance. Marine mammals can be dangerous and also may carry disease. There have been numerous cases of marine mammals that stranded since 2010 that have died from brucellosis. *Brucella sp.* is a zoonotic pathogen that is transmissible to humans. Common routes of infection include:

- Breathing aerosolized bacteria
- Entry through a wound
- Entry through the eyes, nose or mouth

HOW CAN I LESSON MY RISK:

- If you find a stranded marine mammal **CALL (252) 241-5119** as quickly as possible
- DO NOT attempt to push the animal back into the water
- DO stay with the animal until trained rescuers arrive
- USE CAUTION especially with live animals.
- If you are assisting in the rescue personnel wear Personal Protective Gear and Clothing including:
  - Closed foot wear
  - Disposable Gloves
  - Face shields or goggles
  - Rain Gear or other protective outerwear
- Thoroughly wash hands and affected areas after rescue and wash and disinfect outerwear

CONCLUSION:

Working on or near the coastal waters of North Carolina can pose risks that are uncommon but unique to the marine environment. Although awareness and detection is improving, many professionals in the medical field are not familiar with some of the marine pathogens. **If you are injured on or around the water, please be sure to inform your physician of the circumstances.** Prior to starting field operations, discuss potential hazards and take common sense approaches to reduce or prevent injury and illness.