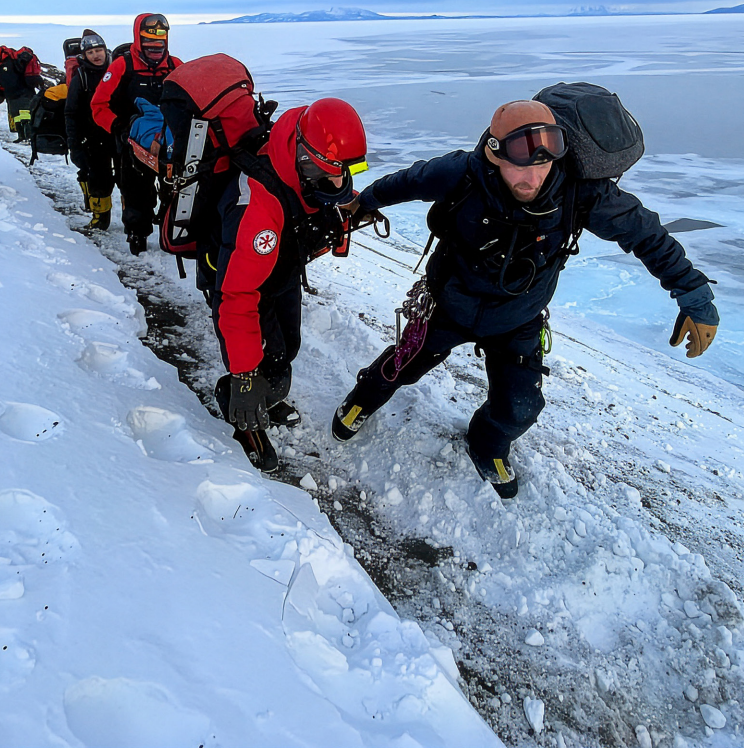
UNITED STATES ANTARCTIC PROGRAM

Field First Aid



This manual was prepared for the U.S. National Science Foundation (NSF) Office of Polar Programs by Antarctic Support Contract field area and other personnel. It brings together decades of first-hand field experience in Antarctica with the United States Antarctic Program.

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Please send suggestions and corrections to DEN-FieldSafety@usap.gov.

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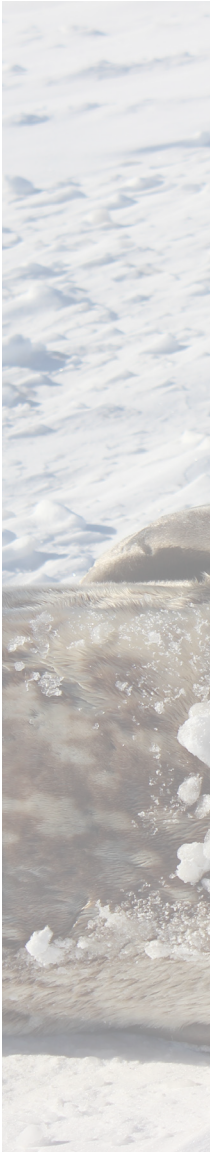

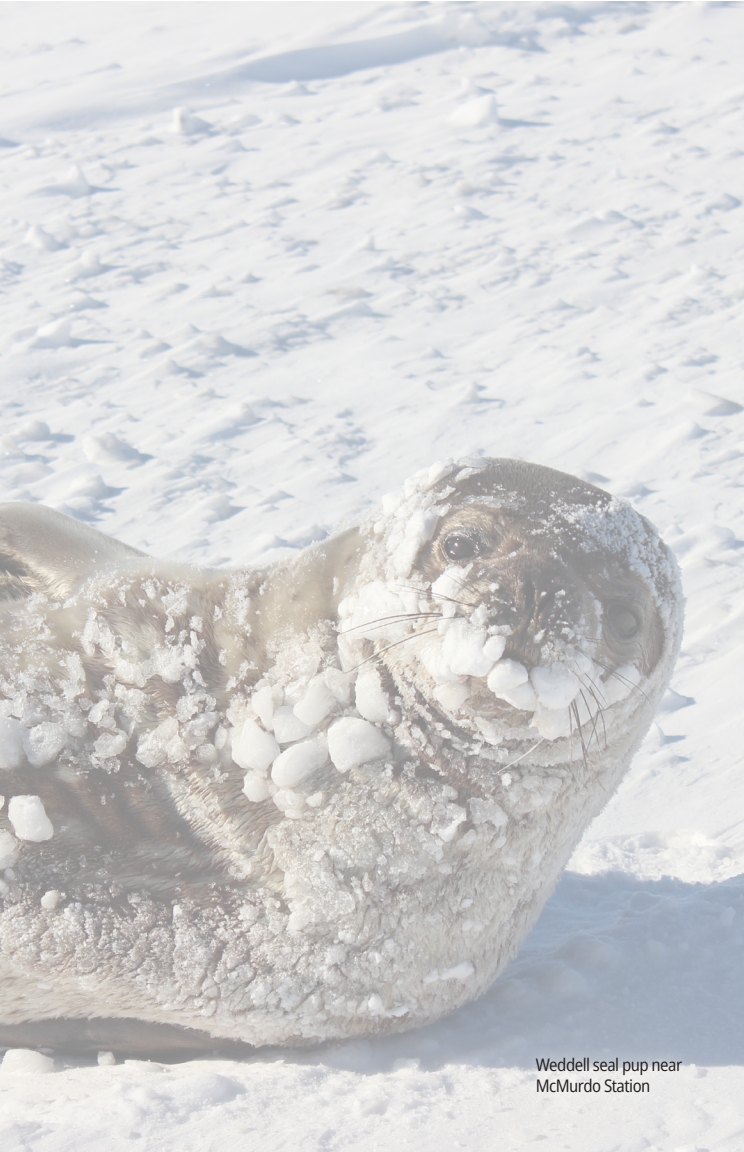

Weddell seal pup near
McMurdo Station

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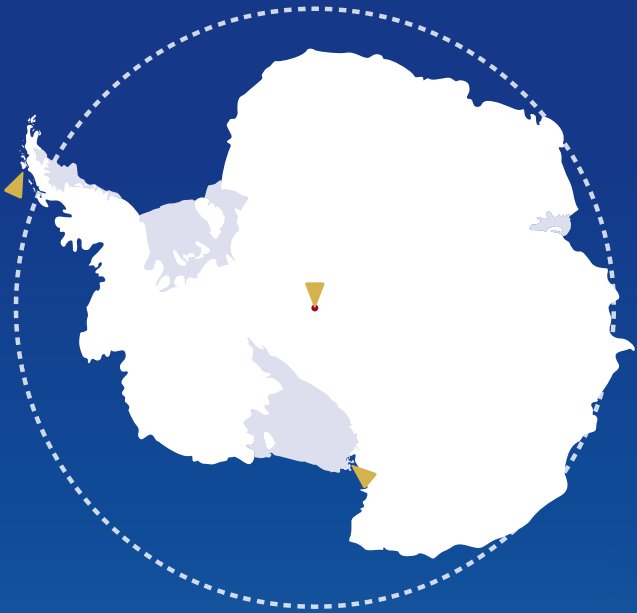
FIRST AID



Introduction

The “United States Antarctic Program Field First-Aid” manual describes medical issues that may be encountered in an Antarctic field environment. This is not an exhaustive manual but a guide for persons with a limited medical background so they can help treat their companions. Read this in advance to help field team members recognize dangerous situations and prevent injuries from occurring or worsening.

Antarctica is an inherently risky environment. Participants are often dehydrated, mildly hypothermic and sleep deprived. This can lead to an increase in accidents. It is essential that all team members slow down, assess each task and ensure the safety of the team.

A variety of medical kits are provided to teams depending on their activities, locations and needs. Team members should familiarize themselves with the contents of a kit before there is a need to use it.

Hygiene

Occasionally, people deploying to the deep field use the remote environment as an excuse to abstain from normal hygiene and sanitation. Extreme cold temperatures, lack of running water and communal living make bathing, brushing teeth and basic hygiene a chore. However, it is important to continue with a normal hygiene routine to avoid painful and distracting issues, such as dental abscesses, gum pain, yeast infections, skin rashes, cracked skin and trench foot.

Wet-wipe and sponge baths are the norm. If wet wipes are preferred, personnel should bring enough for the anticipated time in the field. Blanket partitions can be set up in large tents to create a semi-private space.

Sprains and Strains

Sprains and strains are the most common injuries in Antarctica. People must work carefully, thoughtfully and deliberately to avoid them. A sprain is an injury that involves

tearing the ligaments that help keep joints intact. A strain involves overstretching a muscle.

Signs and Symptoms

Sprains and strains will manifest as pain at the site of the injury that may radiate outward. There will also be swelling and discoloration.

Treatment

R **Rest:** Stop activity, make the patient comfortable, and set up shelter if necessary.

I **Ice:** Cool down the affected area with water, snow or ice for about 15 minutes. Do not apply it directly to the skin.

C **Compression:** Wrap the affected area with an elastic bandage.

E **Elevation:** Keep the affected limb raised to reduce swelling.

Immobilize the Joint

Fingers

Place gauze between the injured finger and the uninjured finger next to it. Buddy-tape the fingers in two places, but not over a joint, so the fingers can be flexed and extended.

Wrist

If swollen, splint it using a SAM Splint or materials on hand. If it is not swollen, or when the swelling subsides, bandage it from the hand to below the elbow with an elastic (e.g., ACE) bandage. The patient should exercise the fingers, elbow and shoulder regularly.

Knee

If it is very swollen, suspect a more serious injury. With the knee in a neutral position (slightly bent, between full extension and flexion) wrap a thick layer of cotton wool around the leg from mid-calf to mid-thigh. Apply a SAM Splint on the back of

the leg to keep it in position, and hold the splint in place with an elastic bandage.

Ankle

Remove the boot. Place the foot in a position of comfort. Using an elastic or tape bandage, wrap from the toes to just below the knee, keeping the foot up and covering all the skin. If the ankle is very swollen, especially on both sides, then a more severe injury should be suspected.

Do not wrap bandages too tightly. Toes must remain warm and pink and have feeling.

External Bleeding and Wounds

Treatment

Stop the bleeding with a gloved hand or finger(s), using direct, well-aimed pressure. Once bleeding has been controlled, clean the wound with mild soap and potable water, or use Hibiclens or povidone iodine. Remove any obvious debris with tweezers or forceps, and irrigate the wound copiously with high-pressure irrigation. If high-pressure irrigation is unavailable, continue to flush the wound until no debris is seen. Never use alcohol to clean a wound. Once the wound is clean, apply an antibiotic ointment, cover the wound with a clean dressing (sterile if possible) that extends well beyond the edges of the wound, and tape it in place.

Small wounds can be taped together with Steri-Strips or BAND-AIDs. Dry the edges of the wound, squeeze together, and stick the bandage across the wound. Several may be needed to hold the cut together.

All wounds should be cleaned twice a day, with a new, clean dressing applied. If a wound is contaminated and there is concern about infection, medical personnel should be notified.

Impaled Objects

Impalements to the head, face, trunk and other core parts of the body are usually left in place. Focus primarily on bleeding

control, with secondary efforts to stabilize the object in place with sterile bulky dressing. Minimizing movement of the impalement will help to reduce subsequent damage. In some cases when the impalement is from a larger object, consider reducing the size of the object to facilitate evacuation.

Impalements to the eyes get special attention. No objects impaled in an eye should be removed. Instead, both eyes should be patched, and padding should be placed around the injured eye to support it and decrease movement until it can be safely removed in a controlled environment.

Wilderness medicine guidelines suggest that impalements to the extremities can be removed too, but it is ideal to remove only objects that cannot be stabilized, will fall out easily or will prevent transportation. If needed because of one of the above criteria, prior removal of the impaled object can help. Proper wound management will help minimize the risk of infection. In some cases, extremity impalements remain stabilized in place.

Carbon Monoxide Poisoning

Carbon monoxide (CO) can be produced by burning anything containing carbon, including fuel in open flames, gas cookers or engines. CO poisons by attaching itself to the hemoglobin in the blood. It does so about 200 times as readily as oxygen, easily displacing inhaled oxygen. When enough hemoglobin is compromised, the remainder cannot carry sufficient oxygen to the rest of the body. Oxygen starvation of the brain will cause permanent damage, even if the patient is revived. CO toxicity also increases with altitude.

Signs and Symptoms

Often there are no signs or symptoms of CO poisoning. However, the following may occur:

Early Symptoms

- Slight headache
- Dizziness

- Nausea
- Fatigue

Progressed Symptoms

- Shortness of breath
- Confusion
- Panting
- Chest pains
- Dimming of vision/blurry vision
- Loss of consciousness
- Ringing in the ears

In Later Stages / Rarer Symptoms

- Patients with darker skin can appear dusky, darker than usual or purplish.
- Patients with lighter skin will appear pink to cherry red in the face, though the red and yellow polar tents will make it difficult to notice skin color change.
- Unconsciousness and death are often rapid.

Treatment

1. Immediately move the patient to fresh air or an uncontaminated tent.
2. Provide the patient with 100% oxygen if available.
3. Contact Medical, and describe the incident and symptoms.
4. Keep the patient quiet and resting for at least eight hours. Early exertion may cause cardiac arrest.
5. If breathing stops, commence cardiopulmonary resuscitation (CPR).

Prevention

Field parties must utilize the issued CO detector. Team members must ensure there is adequate ventilation at all times in all buildings, shelters and vehicles. Tents or other shelters must be thoroughly ventilated during cooking and before personnel go to bed each night.

Hypothermia

Hypothermia occurs when a person's core temperature is reduced to a level where normal brain and body functions are impaired. Hypothermia progressively affects a person's judgment, perception and coordination.

Wind greatly increases the chilling effect of cold. The faster the air moves, the more heat it can drag away. The cooling effects of air are shown in the wind chill chart in the References section of the "United States Antarctic Program Field Manual."

Wet clothes, from sweating, marine dampness or precipitation also cause chilling. Fatigue reduces people's ability to protect themselves and diminishes their physiological capacity to thermoregulate and maintain a proper core temperature.

Prevention

Hypothermia is prevented by wearing proper clothing and supporting and regulating the body's heat production. Good nutrition and hydration also help, and adequate rest is critical. Exhaustion promotes the onset of hypothermia and precedes its development in almost all cases. The tendency to "press on" has led to many unnecessary deaths.

A layered clothing system should be employed, with layers added or removed as needed. Field team members should not allow themselves to get either cold or hot and sweaty.

Signs and Symptoms

Hypothermia manifests in three stages.

Mild

This stage includes shivering and personality changes. A person may become withdrawn, apathetic or irritable or lose fine motor control. Field party members should always be on the alert for a team member displaying any of the "umbles": stumbles, mumbles, fumbles and grumbles.

Moderate

At this stage, hypothermia progresses to violent shivering, altered mental states and disorientation. Moderate hypothermia also manifests as a loss of gross motor skills, such as balance and coordination (i.e., ataxia).

Severe

In this stage, shivering stops and the level of responsiveness drops. A person becomes unresponsive and may appear dead, with very slow and weak pulse and respiration rates. They will appear cold and blue and may have associated frostbite. Cardiac arrest is possible.

Treatment

The essential and immediate treatment for hypothermia is to insulate the body to prevent further heat loss. If any member of a field party shows signs of developing hypothermia, the person must be moved into shelter immediately.

Mild hypothermia may be turned around quickly. Do the following for persons experiencing this condition:

- Help them into additional clothing layers and feed them quick-energy carbohydrates and warm, sweet drinks, such as hot chocolate or warm electrolyte beverages.
- Encourage them to run in place or perform another exercise.
- Provide them dry clothes, if necessary, and external heat sources, such as hot pads or water bottles filled with warm fluid.

If moderate to severe hypothermia is suspected, contact Medical immediately. The patient should be placed in a hypothermia wrap, which is a bundle made of sleeping bags and reflective sheeting, with warm heat sources on the patient's neck, armpits and groin. Body-to-body rewarming in a sleeping bag is of limited usefulness and may result in two cold people.

Frostbite

Frostbite is freezing of body tissue. Areas most at risk are the extremities and exposed skin (e.g., ears, nose, face).

Risk Factors

The following raise the risk for frostbite:

- Previous frostbite injury
- Cold temperatures and wind
- High altitude
- Overexertion (e.g., fatigue dehydration)
- Touching metal or super-cooled liquid fuel
- Poor circulation
- Constrictive clothing or footwear
- Underlying medical problems
- Hypothermia

Prevention

Frostbite is often avoidable. A buddy system should be established to observe any whitening on the face or ears of a companion. If any whitening or tingling of the face, ears, feet or hands occurs, these areas should be warmed immediately. Socks and boots should fit snugly, with no points of tightness. Glove liners should be worn so that skin is never exposed when performing work that cannot be done in heavy gloves.

If the body's core gets too cold, the body will restrict blood flow to the extremities to prevent damage to internal organs.

This restriction increases the chance of frostbite. Strenuous exercise should be avoided in extreme cold, particularly at high altitudes. Very cold air brought too rapidly into the lungs will chill the body's core. Perspiration under conditions of extreme cold should be avoided. Perspiration evaporates, chilling the body.

Plenty of food should be consumed to produce maximum output of body heat. In cold weather, seek quick-energy food items first (i.e., those containing mainly fats and carbohydrates), followed by proteins. Personnel should also drink two to three liters of water per day to stay hydrated.

Avoid the following to prevent frostbite:

- Smoking
- Alcohol
- Excessive coffee and tea
- Excessive fatigue
- Improper or inadequate eating habits
- Unnecessary medication
- Exposure to fuel, especially on bare skin

Signs and Symptoms

Mild Frostbite (Pre-thaw)

There is an uncomfortable sensation of coldness, followed by numbness and skin anesthesia. In superficial frostbite (frost nip), lighter skin turns red, then pale or waxy white. Darker skin will appear lighter than usual. In partial-thickness frostbite, the skin becomes cold and frozen on the surface but remains soft and pliable when gently pressed.

Full-thickness Frostbite (Pre-thaw)

The skin is waxy white. Toes and fingers become solid, like a piece of chicken from the freezer. The digits feel wooden, and the skin cannot be rolled over the bone.

Full-thickness Frostbite (Post-thaw)

The entire hand or foot swells, which limits the mobility of the injured toes or fingers. Blue, violet or gray (the worst) discoloration appears. After two days, the patient suffers severe throbbing and shooting pains. Huge blisters form, usually between the third and seventh day. These usually dry up, blacken and slough off, leaving an exceptionally sensitive, thin, red layer of new skin.

Treatment

Frostbite should not be rubbed, as this will cause additional tissue damage from the ice crystals within. Treatment in the field for anything beyond superficial frostbite is challenging and increases risk to the patient. Thawing frostbite can be extremely painful. Consultation from Medical is recommended to provide direction on pain management. Prevention is paramount.

Superficial Frostbite aka Frost Nip

Superficial frostbite can be treated effectively in the field. If noticed promptly, it can usually be treated with the firm, steady (no rubbing) pressure of a warm hand or by blowing onto the frostbitten area with warm breath. Superficially frostbitten feet are best treated by removing the patient's footwear the moment there is any suspicion of danger and rewarming the feet immediately. After warming is complete, the affected feet should be covered with dry socks. If footwear is replaced, it should be done loosely to ensure adequate circulation and warmth is maintained.

Partial-thickness Frostbite

Partial-thickness frostbite of a small body area should be reheated in water that is between 42°C and 43°C (107°F and 109°F). Water at higher temperatures can burn the skin. The injury should then be treated to prevent infection, bandaged for protection and kept warm. Refreezing must be prevented, as this will cause major additional damage. Medical personnel should be consulted if necessary.

Full-thickness Frostbite

Because of limited resources in the field, full-thickness frostbite is a major medical emergency. Medical personnel should be contacted immediately for consultation and to discuss evacuation plans. Rewarming should not be attempted in the field if there is any possibility that the affected part may refreeze. In such cases, the affected part must be kept frozen until it can be rewarmed rapidly under controlled conditions.

If rewarming is recommended, remove jewelry (especially rings) if possible. Immerse the injured part in 42°C to 43°C (107°F to 109°F) water, continually adding water and stirring it to maintain a constant temperature, until the digital tips (i.e., ends of fingers or toes) turn pink or burgundy red. This takes approximately 20 minutes to one hour and is extremely painful. When adding water, ensure it is not more than 44°C (111°F) and is not poured directly over the injured body part.

Significant pain, swelling and blistering will develop after rewarming. Do not puncture the blisters, and do not allow the injury to refreeze.

Protect the thawed injury with sterile, soft, fluffy dressings. Separate toes and fingers with cotton wool. Wrap the whole body part lightly with gauze bandages. Do not change dressings unless they get dirty, and never rub the skin. Keep the patient and the injured body part warm. Pain medication will be needed, and medical personnel will advise on the specific type and dose. Also do the following:

- Elevate the injured limb(s).
- Commence antibiotic treatment per instruction from the medical team.
- Keep the patient absolutely still and lying down.
- Evacuate to a medical facility as quickly as possible.

Immersion Foot

Immersion foot aka trench foot is caused by prolonged exposure to cold, damp and unsanitary conditions.

Prevention

Feet should be kept warm and dry by wearing protective footwear, and they should be checked frequently during wet and cold conditions. Footwear should not be constricting, and it should be cleaned and dried at every opportunity. In the field, extra pairs of dry socks should be carried next to the abdomen under the shirt. Wet socks can be dried by placing them next to the abdomen, either inside or outside the shirt.

If feet get wet, they should be dried as soon as possible. They can be warmed by the hands. Foot powder should be applied, and dry socks put on. If it is necessary to wear wet socks and footwear for any length of time, then the feet should be exercised at regular intervals by wriggling the toes and bending the ankles.

Signs and Symptoms

The area becomes cold, swollen, waxy white and mottled with burgundy to blue splotches. The skin becomes numb, deep sensation is lost, and moving the affected area grows difficult.

If allowed to continue untreated, the area becomes red, hot and swollen and blisters appear. The victim experiences constant throbbing and a burning sensation. Skin numbness is aggravated by heat and relieved by cold.

Treatment

Remove wet footwear. Gently and rapidly rewarm the affected foot by immersing it in warm water of about 40°C (104°F). Once the foot is warmed, dry it completely and elevate it in a warm room. Swaddle it with clean bandages or cloth to keep it warm and clean.

The injury must not be rubbed or massaged. Blisters should be kept clean and dry. Do not apply ointments. Two 200-milligram (mg) ibuprofen tablets every four hours may be administered for pain if required. Evacuate the victim to a medical facility.

Tent Eye

Antarctica's extreme low humidity may cause the film of tears protecting the eye to dry up, making the cornea susceptible to damage from stove fumes in the tent. The condition can be treated by applying Chlorsig ointment to the eye when it occurs and before going to sleep.

Snow Blindness

Snow blindness is caused by ultraviolet (UV) light burning the eyes. The danger of snow blindness is greatest not on clear, bright days but on dull, cloudy (e.g., whiteout) days, when crystalline snow mist is present. There is no warning that damage has been done until the symptoms begin to appear two to 12 hours after exposure.

Signs and Symptoms

Snow blindness manifests as intensely painful, red, watering eyes that are sensitive to light. The victim will also feel as though there is grit in their eyes.

Treatment

A single episode of snow blindness may last up to five days, even while being treated. The eyes should be rested for at least 24 hours. That means closing them and covering them with a non-fluffy pad. If the temperature is above freezing, a cold compress may be placed over the affected eyes to relieve pain. Medical should be contacted for treatment recommendations and possible medications. Medical personnel may recommend providing the victim two 200 mg tablets of ibuprofen every four hours, as required, or putting Chlorsig ointment on the eyes every three hours.

Prevention

Snow blindness must be avoided, as it is a crippling injury that may seriously delay a field party. Team members should wear dark, UV-protective glasses or goggles with the appropriate

lenses (not yellow) at all times when in the field, especially on overcast days.

Sunburn and Windburn

Direct exposure to the sun, especially when it is very windy or the body is wet with sweat, can result in a sunburn and chaffed skin. Because the Antarctic air is cleaner and thinner, there is greater UV penetration, so sunburn can occur even on overcast days. If sunburn occurs, apply aloe vera gel to the burn and provide the victim 400 mg of ibuprofen every four hours, as necessary, to relieve pain.

Prevention

Prevent sunburn by applying sunscreen ChapStick to the lips and regularly applying sunscreen to other areas of exposed skin. Covering the face with a balaclava will prevent both sunburn and windburn to this frequently exposed area.

Dental Health

Oral hygiene can be inconvenient in the field, but it is just as important as bodily hygiene. Failure to maintain good oral hygiene may result in increased tooth decay (especially around the edges of fillings) and gingivitis. Ideally, teeth must be brushed after every meal, with snow if no water is available. Use toothpicks or waxed dental floss to clean gaps between the teeth that are hard to clean with a toothbrush.

Controlled Medications

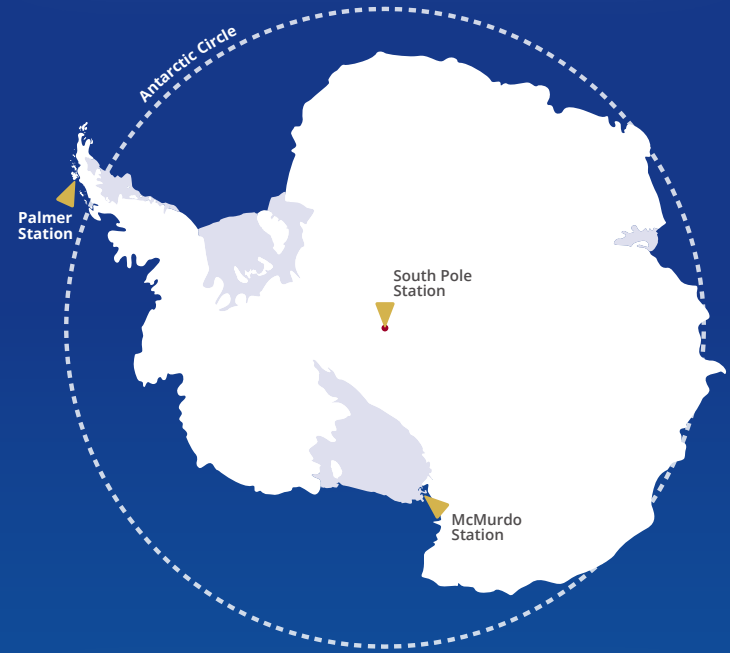
Restricted Drugs

The Peninsula field supervisor issues a field medication kit containing over-the-counter, prescription and controlled (i.e., restricted) medications to each designated field party medical lead. This individual is responsible for the kit. The medical lead or any United States Antarctic Program (USAP) participant must contact a station doctor for consultation and authorization before administering any prescription

medication. Over-the-counter medication can be given without consultation from the doctor, yet the doctor always remains available for consult if there are questions. Always check for any known allergies before administering drugs.

Chain of Custody

The prescribing doctor, who is typically the Palmer Station doctor, will create a chain-of-custody form and provide it to the field medical lead via the vessel captain and Peninsula field supervisor. The lead must account for all controlled substances when the kit is checked out, weekly, and when the kit is returned. If the field medical lead departs before the end of the season, they must complete a new chain-of-custody form and count the medications before transferring the kit to another person. At the end of the season, the medical kit, controlled medications, and a completed chain-of-custody record must be returned to the prescribing doctor. Any shortage or shortfall in the chain of custody is a breach of licensure and could threaten USAP's ability to issue controlled substances to other groups in the future.


Antarctic Circle
Palmer Station
South Pole Station
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