

# Biosecurity Disinfection- Recommendations & Best Practices

## Recommendations for Disinfecting and Biosecurity Protocols

Further information to aid in the enhancement of Operator-specific Biosecurity Standard Operating Procedures (SOPs)

### General

1. Anything that touches the ground must be fully scrubbed with water and brushes to remove guano, dirt, seeds, insects, larvae, etc. **before using a disinfectant**. If not, the ability of the disinfectant to work is decreased.
2. Footwear that is provided to and/or used by passengers must be regularly inspected for normal wear and tear that could result in both particles shedding in the environment and increased solids remaining within the soles.
3. The area(s) where biosecurity is conducted must be regularly checked for the following risks:
  - a. Drainage of disinfectant spillage anywhere other than a greywater storage and treatment system
  - b. Particles from towels, brushes, sponges, or other material breaking off to contaminate the boot bath and/or be transported into the Antarctic environment.
4. Containers of disinfectant solution must be deep enough for boots and other equipment to be fully submerged (e.g. entire surface area of the foot (top, sides, and bottom included). See Best Practices section for examples.
5. Due to risk of foreign materials and bacteria on ship floors – including mudrooms – footwear will need to be disinfected every time they leave the vessel.
6. Any solution that contains chemicals should not flow directly into the Antarctic marine environment. Remember to:
  - a. Seek clarification from your National Competent Authority on waste storage/disposal and document in Operator permit/authorisation.
  - b. For smaller vessels, where possible organise storage onboard until proper disposal facilities are reached at a port facility. For larger vessels, at a minimum the solution and any spilled liquid must be directed to the appropriate holding tank, greywater storage, or treatment system.

### Small boats and equipment

1. Primary cleaning must be done to first remove as much organic debris as possible (e.g. pressure washing with raw or fresh water, brushing off debris from textured areas).
2. Apply disinfectant with a low pressure sprayer [to minimize the risk of skin and/or airway contact] and allow its proper contact time to elapse
  - a. Generally, 1 hour is sufficient for appropriate effect/disinfecting.
3. All small boats and equipment should be decontaminated after each landing to mitigate any potential introduction of non-native species or cross contamination.
  - a. A thorough biosecurity decontamination must be done between all gateways, the interior of Antarctica, and maritime regions (including but not limited to the Falkland Islands (Islas Malvinas), South Georgia, the Antarctic Peninsula, and the Ross Sea).



## Virkon® S Preparation and Use

1. Staff or crew that are preparing the Virkon® S solution must at minimum have all skin covered and should wear eye protection. Preparation should take place in a well-ventilated area (or wearing appropriate respiratory PPE).
2. 1% concentration is appropriate for biosecurity needs. Follow appropriate measuring instructions accompanying the powder.
3. Bright pink hue indicates activity of solution.
4. Container of Virkon® S solution should be opaque or clear to enable evaluation of colour of solution.
5. Time for the solution to dry should be allowed for after stepping in Virkon® S solution, with a preference of at least 1 hour drying period before next use of footwear/equipment.

## Best Practices & Lessons Learned from the Field

### Brands of footwear

1. **Muck Boots:** the logos on the sole and sides of the arch contain many tight indents for organic material to get lodged.
2. **Bogs:** the outermost layer of the sole of the boot may start peeling away after extensive disinfecting for multiple seasons.

### Considerations for materials brought to shore

1. Items used to create traction on surfaces (towels on snow, bar mats or towels on slippery rock) must be thoroughly decontaminated.
  - a. Bar mats or similar will be easiest non-slip surface to clean; rinsing and spraying with disinfectant can be similar to methods for tarps, kayaks, small boats, etc.
  - b. Fabric towels must be washed with hot soapy water.
2. Scrub brushes for initial removal of mud and organic debris may shed plastic bristles into the environment that must be removed.
3. Towels and/or bar mats may shed particles into the environment that must be removed.
4. All persons involved in cleaning any materials from shore must use PPE or thoroughly decontaminate any body parts that come in contact with potentially contaminated materials before continuing to clean other items.

### Containers of solution for submerging/covering footwear and equipment

1. 5-gallon bucket or paint bucket is useful for walking poles/sticks.
2. Spray bottles work well for tarps, followed by hanging to air dry.

### Different types of boot bath: pros and cons

1. Step-through
  - a. **Pros:** can easily visualize contaminants and bright pink hue
  - b. **Cons:** can create slip hazard in the stepping or surrounding areas with spillage.
2. Sponge within container
  - a. **Pros:** can minimize slip hazard, can minimize excess waste created
  - b. **Cons:** additional material that can break apart and contaminate the environment, difficulty visualizing bright pink hue.
3. Holed bar liner insert within container, or grates in floor of surrounding area
  - a. **Pros:** removes slip hazards
  - b. **Cons:** requires appropriate sizing of materials for stepping container.
4. Virkon® S solution mixed into water in automatic boot washer
  - a. Not recommended; if removal of organic debris before contact with Virkon® S is incomplete, the ability of the disinfectant to work is decreased.
  - b. Alternative: use only raw or fresh water in industrial boot washer, after which footwear is inspected by staff or crew before Virkon® S application.

**Having extra crew or staff to individually inspect footwear after biosecurity process is highly recommended, especially upon return to the vessel.**

## Notes on Disinfecting from SCAR and COMNAP

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1. Use of 70% ethanol, vaporized hydrogen peroxide, or Virkon® S is recommended for field equipment disinfection (Scientific Commission on Antarctic Research (SCAR)).
2. Washing issued clothing according to manufacturers' instructions and cleaning footwear with a brush and a biocide such as Virkon® or diluted bleach will remove some seeds and the majority of soil and organic material that may pose an invasion risk. However, washing at these temperatures is unlikely to kill seeds and these will need to be removed manually. Cleaning of equipment and tools carried by expeditioners is also important (Council of Managers of National Antarctic Programs (COMNAP)).

Please refer to this season's Biosecurity Instructions (FOM Section 2) and Operator-specific SOPs for further information.

## Definitions

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**Disinfectant:** a chemical substance or compound used to inactivate or destroy microorganisms on inert surfaces.

**Greywater:** wastewater without faecal contamination.

**Microorganism:** an organism of microscopic size, such as bacteria, viruses, fungi, protozoa, yeast, or mould.

**Oxidizing agent:** peroxide-based compound that functions by denaturing proteins and lipids of microorganisms.

## Sources

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### Virkon® S directions and safety sheets

1. Virkon® S Chemical Disclosure and Safety Data Sheet
2. Virkon® S
3. Fact Sheet on Different Types of Disinfectants

## Studies on Virkon S

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1. Amass, S.F., Schneider, J.L., and Gaul, A.M. Evaluation of current and novel protocols for disinfection of airplane passenger footwear under simulated conditions. *Preventative Veterinary Medicine*. 71 (2005) 127-134.
2. Bartlett, J.C., Radcliffe, R.J., Convey, P., Hughes, K.A., and Hayward, S.A.L. The effectiveness of Virkon S disinfectant against an invasive insect and implications for Antarctic biosecurity practices. *Antarctic Science*. (2020).
3. Curry, C.H., McCarthy, J.S., Darragh, H.M., Wake R.A., Churchill, S.E., Robins, A.M., and Lowen, R.J. Identification of an agent suitable for disinfecting boots of visitors to the Antarctic. *Polar Record* 41 (216): 39 – 45 (2005).
4. Rumpf, S.B., Alsos, I.G., and Ware, C. Prevention of microbial species introduction to the Arctic: The efficacy of footwear disinfection measures on cruise ships. *NeoBiota*. 37 (2018) 37-49.

## SCAR and COMNAP papers referenced

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1. Barbosa, A., Varsani, A., Morandini, V., Grimaldi, W., Vanstreels, R.E.T., Diaz, J.I., Boulmier, T., Dewar, M., Gonzalez-Acuna, D., Gray, R., McMahon, C.R., Miller, G., Power, M., Gamble, A., and Wille, M. Risk assessment of SARS-CoV-2 in Antarctic wildlife. *Science of the Total Environment* 755 (2021) 143352.
2. Inter-continental Checklists for supply chain managers of the National Antarctic Programmes for the reduction in risk of transfer of non-native species (version May 2019). [comnap.aq/handbooks-manuals-operational-guidelines](http://comnap.aq/handbooks-manuals-operational-guidelines).