



COVID-19 Cleaning and Disinfection

Safe Work Australia and the Australian Government Department of Health have provided official advice for Non-Healthcare organisations on how best to clean and disinfect environments to prevent the spread of Coronavirus disease (COVID-19). This advice can be adapted as follows to effectively clean and disinfect Backpacks, Tents and Clothing used for Outdoor Education.

CLEANING AND DISINFECTION

As defined by the Australian Government Department of Health

Cleaning and disinfecting are two different processes:

Cleaning means physically removing germs, dirt and organic matter from surfaces.

Disinfecting means using chemicals to kill germs on surfaces. It's important to clean before disinfecting because organic matter and dirt can reduce the ability of disinfectants to kill germs.

A **combination** of cleaning and disinfection will be most effective in removing the COVID-19 virus. Cleaning reduces the soil load on the surface, allowing the disinfectant to work and kill the COVID-19 virus. Disinfectant may not kill the virus if the surface has not been cleaned with a detergent first.

ROUTINE CLEANING OF EQUIPMENT FOR OUTDOOR EDUCATION

Cleaning frequency can be defined by School / Outdoor Education Department.

The Australian Department of Health recommends that for routine cleaning, disinfectants are usually only necessary if a surface has been contaminated with potentially infectious material. For this reason, when and how often a workplace should undertake disinfection as part of routine cleaning will depend on the likelihood of contaminated material being present at the workplace. In an Outdoor Education setting, there is less likelihood of contamination from contact with commonly touched surfaces (example: doors / desks), as these surfaces are not present. Shared equipment can be limited to cooking/sleeping pairs/groups. **Social distancing** within cooking/sleeping pairs/groups is not possible, due to close proximity and shared equipment. Adaptations made to equipment to promote social distancing within sleeping pairs (for example a retrofitted barrier within a tent to separate occupants) are functionally ineffective due to permeability of inner tent canopy fabrics, and mixing of surfaces when tents are packed.

HOW TO CLEAN AND DISINFECT

Identical cleaning practices cannot be applied across all Backpacks, Tents and Clothing used for Outdoor Education, as diverse textiles are used. Please follow this guide when cleaning your equipment:

Synthetic Backpacks made from Nylon or Polyester (Outbreak, Pack 101 and Nullaki models): Using a soft brush, clean thoroughly with neutral detergent (pH between 6 and 8) and warm water. DO NOT machine wash. Allow to dry completely before storage/reuse. Synthetic Backpacks may also be disinfected using methylated spirits (see below).



Canvas Backpacks (Breakout and Nornalup models): Canvas MUST NOT be cleaned using detergents or soaps as these surfactants will remove the proofing treatments (waxy polymers) and which would then need restoration. Disinfect using methylated spirits applied with a spray bottle. Allow to dry completely before storage/reuse. Clean Canvas with warm water and a soft brush. DO NOT machine wash. Dry thoroughly.



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HOW TO CLEAN AND DISINFECT

Tents and Shelters made from Nylon or Polyester (i-Explore, i-Shadow, Space, Arrow, Overhang tarp models): Using a cloth, clean thoroughly with neutral detergent (pH between 6 and 8) and warm water. DO NOT machine wash. Allow to dry completely before storage/reuse. Tents and Shelters can be disinfected using methylated spirits; and may also be soaked in a very weak (1:1,000) bleach solution for five minutes, and then thoroughly rinsed.



Outdoor Clothing Rainwear of Nylon or Polyester base fabrics and a moisture-vapor-permeable, waterproof lamination (Deluge Jacket, Raindance Overpant): Warm wash (40 degrees) in a front-loading washing machine (domestic or commercial) a small amount of neutral detergent (pH between 6 and 8), then rinse twice. Allow to dry completely before storage/reuse. Note: DO NOT use a water temperature setting above 40 degrees. High temperatures soften seam tape adhesives and will result in delamination of the tape. Also, DO NOT wash waterproof garments using soap, as a soapy residue will be left behind, unable to be completely rinsed out. This will negatively affect the performance of the garment. All breathable waterproof clothing may be disinfected with methylated spirits applied with a spray bottle. Machine washing is probably less trouble but it does add to the accumulated wear and tear on any garment.

Outdoor Clothing Warmwear made from Polyester fleece and trims, no lamination, (Cold Snap Pullover): Warm wash (40 degrees) in washing machine (domestic or commercial) with neutral detergent (pH between 6 and 8). Allow to dry completely before storage/reuse. Note: DO NOT wash garments warmer than 40 degrees or use bleach, as this may negatively affect the garment. Warmwear may be disinfected using methylated spirits but this is a less practical option.



NOTES ON OUR RECOMMENDATIONS

We recommend using detergent to clean outdoor equipment (except Canvas items) in normal (non COVID-19) times. Detergent is a surfactant and so breaks down the interface between water and oils (and dirt), allowing for their release and removal. For cleaning in times of COVID-19 this recommendation stands, as surfactants act upon COVID-19 in the same way they work on oils, attacking the fatty shell of the virus. The chemical bonds of the virus are relatively weak, and so it becomes water soluble and disintegrates. The detergent does not simply "wash the virus off" the backpack/tent/garment, but actively destroys it. Further, the use of a neutral detergent with a pH between 6-8 aligns with the Australian Government Department of Health guidelines

Methylated Spirits works in the same way as detergent; if you soak the virus in alcohol the alcohol breaks down the fatty lipid bilayer which holds the virus together. Thoroughly air dry until all the methylated spirit has evaporated. The surface being disinfected must be saturated to break the virus down, as the methylated spirits must remain on the surface for at least 30 seconds before evaporating to ensure complete destruction of the virus. Do NOT dilute the methylated spirits more than four parts meths to one part water. No dilution is best.



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NOTES ON OUR RECOMMENDATIONS CONT.

We are recommending the use of detergent for cleaning and methylated spirits for disinfecting, as both of these products should already be in common use for outdoor education equipment fleet management (in the case of detergent) and outdoor education activities (in the case of metho: Trangia stoves). These products are also readily available from general retailers and hardware stores. There is no need to use specialist suppliers as with other cleaning/disinfecting agents. Their common use means that outdoor education practitioners will likely already have an understanding of materials handling, storage, and disposal.

AN EVALUATION OF CHEMICAL DISINFECTANTS

Descriptions of Chemical Disinfectants are from "Disinfection 101" – by the Centre for Food Security and Public Health (Iowa State University). Evaluation of use with Outdoor Education Equipment is our own. This forms an explanation of why we have recommended Methylated Spirits, Neutral Detergent, and Bleach.

Name	Description	Appropriate for Disinfecting COVID-19 on Equipment for Outdoor Education?
Acids	Acidic disinfectants function by destroying the bonds of nucleic acids and precipitating proteins. Acids also change the pH of the environment making it detrimental to many microorganisms. Concentrated solutions of acids can be caustic, cause chemical burns, and can be toxic at high concentrations in the air. These characteristics limit their use. The antimicrobial activity of acids is highly pH dependant. Acids have a defined but limited use as disinfectants.	NO , acids destroy Nylon, a fundamental material in equipment for Outdoor Education. Not supported by Australian Government recommendations.
Alcohols (examples: ethanol, isopropanol)	Alcohols are broad spectrum antimicrobial agents that damage microorganisms by denaturing proteins, causing membrane damage and cell lysis. Alcohols are used for surface disinfection, topical antiseptic and hand sanitizing lotions. Alcohols are considered fast-acting capable of killing most bacteria within five minutes of exposure but are limited in viricidal activity and are ineffective against spores. [Ethanol is considered viricidal; isopropanol is not effective against non-enveloped viruses.] An important consideration with alcohols is the concentration used, with 70-90% being optimum. Alcohols evaporate quickly but leave behind no residue. The activity of alcohols is limited in the presence of organic matter. Alcohols are highly flammable, can cause damage to rubber and plastic, and can be very irritating to injured skin.	YES , alcohol destroys COVID-19 and has no negative affect on outdoor equipment. Supported by Australian Government recommendations



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AN EVALUATION OF CHEMICAL DISINFECTANTS CONT.

Name	Description	Appropriate for Disinfecting COVID-19 on Equipment for Outdoor Education?
Aldehydes	Aldehydes are highly effective, broad spectrum disinfectants, which typically achieve sterilization by denaturing proteins and disrupting nucleic acids. The most commonly used agents are formaldehyde and glutaraldehyde. Aldehydes are effective against bacteria, fungi, viruses, mycobacteria and spores. Aldehydes are non-corrosive to metals, rubber, plastic and cement. These chemicals are highly irritating, toxic to humans or animals with contact or inhalation, and are potentially carcinogenic; therefore their use is limited. Personal protective equipment (i.e., nitrile gloves, fluid resistant gowns, eye protection) should be worn if using these chemicals.	NO , highly irritating / toxic, and very strict usage techniques. Not supported by Australian Government recommendations
Alkalis	Alkaline agents work by saponifying lipids within the envelopes of microorganisms. The activity of alkali compounds is slow but can be increased by raising the temperature. Alkalis have good microbicidal properties, but are very corrosive agents and personal protection precautions should be observed. ¹⁵	NO , alkalis destroy Polyester, a fundamental material in equipment for Outdoor Education. We use Sodium Hydroxide in shelter development to assess fabric quality, because of the way it affects polymers. Highly caustic. Not supported by Australian Government recommendations
Biguanides	Biguanides are detrimental to microorganisms by reacting with the negatively charged groups on cell membranes which alters the permeability. Biguanides have a broad antibacterial spectrum, however they are limited in their effectiveness against viruses and are not sporicidal, mycobacteriocidal, or fungicidal. Biguanides can only function in a limited pH range (5-7) and are easily inactivated by soaps and detergents. These products are toxic to fish and should not be discharged into the environment.	NO , have limited effectiveness against viruses. Easily inactivated by soaps and detergents, and difficult to dispose of due to toxicity. Not supported by Australian Government recommendations
Halogens (example: chlorine)	Halogen compounds are broad spectrum compounds that are considered low toxicity, low cost and easy to use. They do lose potency over time and are not active at temperatures above 43 degrees or at high pHs(>9). Since these compounds lose activity quickly in the presence of organic debris, sunlight and some metals, they must be applied to thoroughly cleaned surfaces for disinfection. Chlorine compounds function through their electronegative nature to denature proteins and are considered broad spectrum, being effective against bacteria, enveloped and non-enveloped viruses, mycobacteria and fungi. At elevated concentrations, chlorine compounds can be sporicidal. Sodium hypochlorite (NaOCl) is one of the most widely used chlorine containing disinfectants. [Commercial chlorine bleach contains 5.25% sodium hypochlorite in aqueous solution and 50,000 ppm available chlorine]. Biocidal activity is determined by the amount of the available chlorine of the solution. Low concentrations (2 to 500 ppm) are active against vegetative bacteria, fungi and most viruses. Rapid sporicidal action can be obtained around 2500 ppm, however this concentration is very corrosive so should be limited in its use. High concentrations are also irritating to the mucous membranes, eyes and skin. Chlorine compounds are rapidly inactivated by light and some metals so fresh solutions should always be used. Hypochlorites should never be mixed with acids or ammonia as this will result in the release of toxic chlorine gas.	YES , shelters can be soaked in a weak bleach solution (1:1,000 ratio) for 5 minutes and then thoroughly rinsed. Supported by the Australian Government recommendations. Can be disposed of in waste water, but must not be introduced in to natural water bodies.



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AN EVALUATION OF CHEMICAL DISINFECTANTS CONT.

Name	Description	Appropriate for Disinfecting COVID-19 on Equipment for Outdoor Education?
Oxidizing Agents	Oxidizing agents are broad spectrum, peroxide based compounds that function by denaturing the proteins and lipids of microorganisms. Peroxygen compounds vary in their microbiocidal range, but are considered effective on hard surfaces and equipment. In their diluted form, these agents are relatively safe but may be irritating and damage clothing when concentrated.	NO , damaging to textiles
Phenols	Phenols are broad spectrum disinfectants that function by denaturing proteins and inactivating membrane-bound enzymes to alter the cell wall permeability of microorganisms. Phenols can be coal-tar derivatives or synthetic formulations and usually have a milky or cloudy appearance when added to water, as well as a strong pine odor. Phenols are typically formulated in soap solutions to increase their penetrative powers and at 5% concentrations are considered bactericidal, tuberculocidal, fungicidal and viricidal for enveloped viruses. Phenols are not effective against non-enveloped viruses and spores. Phenols do maintain activity in hard water and in the presence of organic matter and have some residual activity after drying. Phenolic disinfectants are generally safe for humans but prolonged exposure to the skin may cause irritation. Concentrations over 2% are highly toxic to all animals, especially cats.	NO , effective concentration to be viricidal is highly toxic to all animals
Quaternary Ammonium Compounds	Also known as "quats" or QACs, these compounds are cationic detergents that are attracted to the negatively charged surfaces of microorganisms, where they irreversibly bind phospholipids in the cell membrane and denature proteins impairing permeability. QACs can be from different "generations" depending on their chemistry, with later generations being more germicidal, less foaming and more tolerate to organic loads. QACs are highly effective against Gram positive bacteria, and have good efficacy against Gram-negative bacteria, fungi and enveloped viruses. They are not effective against non-enveloped viruses or mycobacteria and are considered sporostatic but not sporocidal. QACs have some residual effect, keeping surfaces bacteriostatic for a brief time. They are more active at neutral to slightly alkaline pH but lose their activity at pH less than 3.5. QACs are considered stable in storage but are, in general, easily inactivated by organic matter, detergents, soaps and hard water (this may vary with the "generation"). QACs are toxic to fish and should not be discharged into water sources (i.e., streams, ponds, lakes).	NO , easily inactivated by organic matter, detergents, soaps and hard water. Toxic to fish, residual on surfaces.



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BLEACH DILUTION RECOMMENDATION

Sodium hypochlorite %	Bleach Solution Ratio	Bleach Dilution	ppm (available chlorine)	Comments **Always use on cleaned surfaces
0.025%	1:200	5ml bleach per 1 litre water	250 ppm	Common household use
0.1%	1:50	20ml bleach per 1 litre water	1000 ppm	Australian Government recommendation for cleaning to prevent the spread of COVID-19
0.5%	1:10	100ml bleach per 1 litre water	5000 ppm	This is a very strong solution and should be used on a limited basis

REFERENCE MATERIALS (WHAT THIS IS BASED ON)

Disinfection 101: <http://www.cfsph.iastate.edu/Disinfection/Assets/Disinfection101.pdf>

Cleaning to prevent the spread of COVID-19 - Fact Sheet: <https://www.safeworkaustralia.gov.au/doc/cleaning-prevent-spread-covid-19-fact-sheet>

Infection control advice for COVID-19 environmental cleaning in non-healthcare settings (home and workplace): https://ww2.health.wa.gov.au/~/_media/Files/Corporate/general%20documents/Infectious%20diseases/PDF/Coronavirus/COVID19-Environmental-Cleaning-for-workplaces.pdf

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