



The Use of D7 to Disinfect Cruise Ships Contaminated with Coronavirus

D7 is an aqueous-based disinfectant effective against virus's similar to Coronavirus on hard non-porous surfaces. The formulation:

- is effective for killing pathogenic organisms including vegetative and spore-forming bacteria, viruses, biofilms, and fungi
- utilizes very mild ingredients
- D7 has a mild pH of 9.8 when wet and 7.5 when dry
- D7 is inherently biodegradable
- D7 can be deployed as a foam, liquid spray, or fog on a wide variety of materials and surfaces

D7 contains surfactants, mild solvents, inorganic salts, a low concentration of hydrogen peroxide (~3.5%), a hydrogen peroxide activator, and water. The surfactants soften the cell walls of pathogens which allows the activated peroxide to penetrate to the interior for complete kill. This unique combination of mild ingredients works synergistically to kill persistent biological and viral pathogens which has been demonstrated in testing at numerous facilities and in many field applications – outperforming formulations that contain much harsher chemicals.

The D7 chemistry is licensed by Decon7 Systems from Sandia National Laboratories, a U.S. Government research and development laboratory, where it was originally developed. Decon7 Systems has greatly expanded its use to many other applications. Recent laboratory testing and field applications have demonstrated that D7 has high efficacy against pathogens of concern to human health, and in agriculture and food processing such as *Listeria*, *E. coli*, *Salmonella*, the Porcine Epidemic Diarrhea Virus, *Salmonella* and *E. coli* biofilms, Avian Influenza, and spores. Most of these tests were conducted in the presence of a high organic or soil loading. These results clearly demonstrate that the use of D7 can significantly improve both human and animal health.

D7 can effectively inactivate coronaviruses. D7 has demonstrated effectiveness against viruses similar to Coronavirus or COVID-19 on hard, non-porous surfaces. Therefore, D7 can be used against COVID-19 when used in accordance with the directions for use against Norovirus on hard, non-porous surfaces. Refer to the CDC website at <https://www.cdc.gov/coronavirus/2019-ncov/index.html> for more information. D7 can effectively be used to disinfect facilities such as hospitals, railway stations, and airports against coronaviruses and other pathogenic organisms – even in areas with high organic or soil loads. **D7 is currently being used in large volumes to disinfect medical facilities and factories in China as well as quarantine areas and vehicles in other countries impacted by the virus outbreak.**

D7 can be easily deployed by a variety of methods to handle any situation. It can be dispersed as a highly stable foam through existing foam generating equipment. When deployed as a foam, it clings to vertical and downward facing surfaces for 30 minutes or more to achieve long contact times against persistent toxic materials including biofilms. It can also be deployed as a liquid spray either through large-scale sprayers or from a hand-held spray can (i.e., BDAS+) which enables rapid deployment within seconds. **D7 can also be deployed as a fog (or mist) from aerosol-generating devices primarily for interior disinfection – which is the ideal deployment method for large spaces potentially contaminated with coronaviruses.** Finally, D7 can also be deployed by wetting microfiber towels and wiping touch points (e.g., doorknobs, handrails, escalator rails, etc.) where bacteria or viruses likely reside. Once D7 comes into contact with bacteria or viruses either in the air or on surfaces, these pathogens are quickly killed or inactivated reducing the risk of infections to people in the area. **Most importantly, when D7 is**



deployed using any one of these methods, it eliminates bacteria and virus pathogens even when those pathogens are embedded in soil, organic material, and bodily fluids which renders other disinfectants ineffective.

Decon7 Systems has previous experience in disinfecting large cruise ships (primarily for Norovirus outbreaks) and has developed an effective process for this application. The disinfection process on cruise ships contaminated with coronavirus will be conducted by a team of former CBRN Marine Corp veterans from Decon7 Systems who are highly trained disinfection/decontamination experts. The team will conduct all operations in the appropriate personal protective equipment (PPE) including HAZMAT suits, gloves, face masks, and respirators. The disinfection process on the ship will include the following activities:

- The team will systematically disinfect all areas of the ship using the highly effective D7 product.
- D7 will be deployed as a fog in all rooms, cabins, and common areas of the ship. In addition to disinfecting the rooms, the fogging process will also enable D7 to penetrate into the HVAC system on the ship to eliminate the coronavirus in those hard-to-reach areas.
- All touch points (e.g., handrails, doorknobs, faucet handles, escalator rails, slot machine handles, elevator buttons, etc.) will be wiped with microfiber towels wetted with D7. This will provide an additional level of protection for those areas where the coronavirus is most likely to reside.
- All PPE and disinfection equipment will be disinfecting at the end of the process to prevent the spread of the virus to uncontaminated areas.

This process, conducted by the highly trained experts at Decon7 Systems, will enable a complete disinfection of the ship and allow the ship to be returned to service.

¹Bieker et al., Rapid Inactivation of SARS-like Coronaviruses, Sandia National Laboratories, SAND2004-1120, <https://prod-ng.sandia.gov/techlib-noauth/access-control.cgi/2004/041120.pdf>.

Dr. Mark D. Tucker recently retired from a 35-year career at Sandia National Laboratories in Albuquerque, NM where he was a Distinguished Member of the Technical Staff. While at Sandia, his research was focused on the development of innovative technologies for the decontamination of chemical and biological warfare agents and other toxic chemical and biological materials. He is a co-inventor of the original Sandia Decontamination Foam technology and the inventor of the modified and enhanced D7 formulation. Mark currently holds eighteen U.S. patents related to decontamination and other technologies. While at Sandia, Dr. Tucker also led or was a primary technical contributor on several large projects funded by the US Department of Homeland Security and/or the US Department of Defense that focused on the development and implementation of processes, procedures and technologies to rapidly restore critical infrastructure, critical assets, and urban areas following the release of a chemical or biological warfare agent or other highly toxic materials. Dr. Tucker was also the project lead and/or primary technical contributor for the development of several software-based modeling and simulation applications focused on the analysis of recovery options and resource requirements following the release of chemical, biological, or radiological agents. Dr. Tucker holds a Ph.D. in Civil Engineering from the University of New Mexico (1997), a M.S. in Civil Engineering from the University of New Mexico (1993), a



M.S. in Mechanical Engineering from the University of Texas at Austin (1983) and a B.S. in Engineering from Purdue University (1980).

Decon7 Systems Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) Specialists

CBRNE Specialists are primarily responsible for defending against the threat of CBRNE weapons and Weapons of Mass Destruction (WMD).

JOB DUTIES

- Assist in the establishment of CBRNE defense measures
- Provide training advice and supervision regarding CBRNE equipment and operations
- Train military and civilian personnel on CBRNE response operations
- Operate and maintain CBRNE detection and decontamination equipment
- Operate CBRN Decontamination, Defense, Detection and Monitoring Equipment
- Perform Decontamination Operations

Joe Hill is a CBRNE Technical and Industry Specialist with 10 years of active duty service in the US Marine Corps and 16-years of industry experience. He deployed multiple times in support of Operations Enduring and Iraqi Freedom and has worked in various aspects of industry including logistics, operations, training, technical services, project management and business strategy. During his active duty career in the Marine Corps, Joe planned, employed, and coordinated CBRN defense systems in support of operations including CBRN reconnaissance systems, biological agent detection systems, decontamination systems, and other CBRN hazard detection and warning systems. In addition, coordinated assets and efforts for WMD force protection programs, CBRN defense support to civil authorities, vulnerability analysis, CBRN sensitive site assessment/exploitation, WMD elimination, CBRN reconnaissance, and CBRN decontamination. He has received Commendations for accomplishments under fire during overseas combat zone service from supervising, coordinating, and assisting in conducting security, installation security/defense, and CBRN Defense during Operation Enduring and Iraqi Freedom for over 15,300 Marines and Sailors deployed to 20 bases in 3 countries and aboard 10 ships. He currently serves as a technical expert and Senior Vice President of Safety, Security, & Defense for Decon7 Systems.

Mike Elwood is a CBRNE Technical and Industry Specialist with 20 years of active duty service in the US Marine Corps as a CBRN Specialist and Acquisitions Specialist. He deployed multiple times in support of Operations Enduring and Iraqi Freedom and conducted numerous CBRN related missions to include Chemical Munitions and Site Exploitation and complex decontamination operations. Elwood last served with Marine Corps Systems Command as a Project Officer for Shield, Sustain. He currently serves as

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technical expert and as the Defense Business Development and National Sales Manager for Decon 7 Systems.

Stephen Audet is a CBRNE subject matter expert in both military and civilian sectors. His military experience includes Decontamination and Sampling Operations Instructor apart of a no-notice response Technical Escort Unit with the US Army. Led a section of soldiers in the recovery, mitigation, and destruction of over 414 Chemical and Biological munitions during OIF/OEF deployments. Analyzed over 50 improvised explosive devices and prepared samples with reports for the Combined Explosive Cell (CEXC) resulting in multiple insurgent arrests. Civilian experience: 10-Years as Regional Contract Logistics Support Lead Trainer for the USMC and with Decon7 LLC. Highly specialized in Operational and Technical Decontamination operations. Developed, coordinated, and delivered training to USMC CBRNE and Explosive Ordnance Disposal (EOD) units. Subjects include, decontamination techniques of personnel, buildings, equipment, protective posture equipment (PPE), detection and analytical equipment. He currently serves as technical expert and as the Sales Development Representative for Decon7 Systems.