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Sandia National Laboratories has developed, demonstrated, and commercialized an aqueous-based decontamination technology (DF-200) that is:

- Effective for neutralizing chemical (CW) and biological (BW) warfare agents, biological pathogens, biological toxins, and many toxic industrial chemicals.
- Environmentally benign (non-toxic/non-corrosive/biodegradable).
- Applicable on a number of anticipated material surfaces.
- Capable of being incorporated into various carriers (foams, liquid sprays, mists, fogs) that satisfy a wide variety of operational objectives.

DF-200 is considered to be the best available decontamination technology by the US Department of Defense (DOD) and was staged in the Middle East as part of Operation Iraqi Freedom. An earlier version of the technology (DF-100) was used to successfully remediate portions of the U.S. Capitol Hill office buildings and office buildings in New York City following the anthrax incidents of October 2001. It has also been used for many commercial applications including mold remediation and methamphetamine lab clean-up.

DF-200 is highly effective against Chemical and Biological Warfare (CBW) agents. Live agent and simulant tests on several CW agents have been conducted at independent and government laboratories. A list of CW agents that DF-200 has been demonstrated to be effective against or is expected to be effective against (due to similar chemical structures to tested compounds) is shown in **Table 1** below.

Chemical Warfare Agents	
Nerve Agents	Result
Tabun (GA)	Expected - Similar to Sarin (GB) and Soman (GD)
Sarin (GB)	Tested - by US DoD and Independent Lab
Soman (GD)	Tested - by US DoD and Independent Lab
Cyclosarin (GF)	Expected - Similarity to Sarin (GB) and Soman (GD)
VX	Tested - by US DoD and Independent Lab
Blister Agents	Result
Sulfur Mustard (HD)	Tested - by US DoD and Independent Lab
Lewisite (L)	Tested - by US DoD
Phosgene Oxime (CX)	Expected – rapid hydrolysis in DF-200 type chemistry

Blood Agents	Result
Hydrogen Cyanide (AC)	Tested – by Sandia National Laboratories
Choking Agents	Result
Phosgene (CG)	Tested – by Sandia National Laboratories

Table 1: Chemical Warfare Agents Tested or Expected to be Neutralized by Sandia DF-200

DF-200 is also effective against many biological warfare (BW) agents, other biological pathogens, and toxins. The ability of DF-200 to kill many of these agents and pathogens has also been evaluated in laboratory testing as well as its ability to neutralize toxins. A list of BW agents and pathogens that DF-200 has been demonstrated to be effective against or is expected to be effective against (due to similarity to tested organisms) is shown in **Table 2** below. In addition, a list of toxins is also shown.

Biological Warfare Agents and Pathogens	
BW Agent	Result
Bacillus anthracis spores (Anthrax)	Tested - by US DoD
Yersinia pestis (Plague)	Tested - by independent laboratory
Variola major (Smallpox)	Expected – simulant tested by independent laboratory
Francisella tularensis (Tularemia)	Expected – simulant tested by independent laboratory
Biological Pathogen	Result
Vibrio cholerae (Cholera)	Expected – simulant tested by independent laboratory
Aphtae Epizooticae (Foot & Mouth Disease)	Tested - by independent laboratory
Bovine Coronavirus (BCV)	Expected – simulant tested by independent laboratory
Escherichia coli (E. coli)	Tested – by independent laboratory
Salmonella enterica (Salmonella)	Tested – by independent laboratory
Staphylococcus aureus (Staphylococcus)	Tested – by independent laboratory
Saccharomycetales Fungi	Tested – by independent laboratory
Various Mold Species	Tested – by independent laboratory
Xanthomonas axonopodis (Citrus Canker)	Tested – by independent laboratory
Toxin	Result
Ricin	Tested - by US DoD
Botulinum	Tested - by US DoD

Table 2: Biological Warfare Agents, Pathogens, and Toxins Tested or Expected to be Killed by Sandia DF-200

DF-200 is also effective against many toxic industrial chemicals (TICs). The ability of DF-200 to neutralize many of these chemicals has also been tested in laboratory experiments. A list of TICs that DF-200 has been demonstrated to be effective against or is expected to be effective against (due to similar chemical structures to tested compounds) is shown in **Table 3** below.

Toxic Industrial Chemicals	
Chemical	Result
Ammonia (NH ₃)	Tested – by Sandia National Laboratories
Carbon Disulfide (CS ₂)	Tested – by Sandia National Laboratories
Formaldehyde (HCHO)	Expected – due to peroxide-based chemistry of DF-200
Hydrogen Fluoride (HF)	Expected – due to alkaline and buffering chemistry of DF-200
Hydrogen Cyanide (HCN)	Tested – by Sandia National Laboratories
Sodium Cyanide (NaCN)	Tested – by Sandia National Laboratories
Phosgene (CCl ₂ O)	Tested – by Sandia National Laboratories

Table 3: Toxic Industrial Chemicals Tested or Expected to be Neutralized by Sandia DF-200