Procedures for the Inactivation and Safe Containment of Toxins

adapted from a presentation by:

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Table 1. Complete inactivation of different toxins with a 30 minute exposure to various concentrations of sodium hypochlorite (NaOCl) with and without sodium hydroxide (NaOH).

Toxin	2.5% NaOCl + 0.25 N NaOH	2.5% NaOCl	1% NaOCl	0.1% NaOCl
T-2 mycotoxin	yes	no	no	no
brevetotoxin	yes	yes	no	no
microcystin	yes	yes	yes	no
tetrodotoxin	yes	yes	yes	no
saxitoxin	yes	yes	yes	yes
palytoxin	yes	yes	yes	yes
ricin	yes	yes	yes	yes
botulinum	yes	yes	yes	yes
staphylococcal enterotoxin	yes (?)	yes (?)	yes (?)	yes (?)

Table 2. Complete inactivation of different toxins by autoclaving or 10 min exposure to various temperatures of dry heat.

Toxin	Autoclaving	Dry Heat (^{o}F)			
		200	500	1000	5000
T-2 mycotoxin	no	no	no	no	yes
brevetotoxin	no	no	no	no	yes
microcystin	no	no	yes	yes	yes
tetrodotoxin	no	no	yes	yes	yes
saxitoxin	no	no	yes	yes	yes
palytoxin	no	no	yes	yes	yes
ricin	yes	yes	yes	yes	yes
botulinum	yes	yes	yes	yes	yes
staphylococcal enterotoxin	yes (?)	yes (?)	yes (?)	yes (?)	yes (?)

Recommendations:

1. For T-2 mycotoxin and brevetoxin, it is recommended that, for complete inactivation, all liquid samples, accidental spills, and nonburnable waste be soaked in 2.5% sodium hypochlorite with 0.25% N sodium hydroxide for 4 hrs.

2. It is further recommended that cages and bedding from animals exposed to T-2 mycotoxin or brevotoxin be exposed to 0.25% sodium hypochlorite and 0.025 N sodium hydroxide for 4 hrs.

3. Exposure for 30 minutes to 1.0% sodium hypochlorite is an effective procedure for the laboratory (working solutions, equipment, animal cages, working area and spills) for the

inactivation of saxitoxin, tetrodotoxin, microsystin, palytoxin, ricin, botulinum toxin or staphylococcal enterotoxins.

4. All burnable waste from toxins should be incinerated at temperatures in excess of 1500^{o}F (815^{o}C).

5. Autoclaving can be used with the protein toxins (ricin, botulinum toxin and staphylococcal enterotoxin), but should not be used with the low molecular weight toxins.

6. Tap water with normal chlorination is **not** useful for inactivation of any of these toxins.

7. Stability at high and low pHs varies with the toxin used and is not a universal procedure for inactivation of toxin waste.

8. If the skin is accidentally exposed to toxins, it is recommended that it be washed immediately with soap and water.

9. Procedures should be used to prevent contamination of personnel and equipment with these toxins.

References:

1. Department of Defense-Department of Army, 32CFR Part 627, The Biological Defense Safety Program - (Technical Safety Requirements) - DA Pamphlet 385-69; Final Rule.

2. Army Regulation 385-BIO, The Biological Defense Safety Program, Headquarters Department of the ARMY, Washington, DC.

3. USAMRIID SOP, 9 November, 1990, The Handling of Toxic Biological Compounds from Plant, Animal or Microbial Organisms.

4. USAMRIID SOP, 29 March, 1985, The Handling of Small Quantities of Botulinal Toxins in "Cold" Laboratories.

5. USAMRIID SOP, 17 April 1985, The Handling of Botulinal Toxins in "Hot" Laboratories.

6. NIH Guidelines for Research Involving Recombinant DNA Molecules, http://www4.od.nih.gov/oba/rac/guidelines/guidelines.html

7. Biosafety in Microbiological and Biomedical Laboratories, Appendix I, http://www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm