

# Best Practices: Emergency Medical Management of Hydrazine Exposure

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## Background

Hydrazine is an industrial chemical that is highly flammable, toxic and carries significant health risk.<sup>1</sup> It is commonly used in aerospace technologies as a propellant fuel source for rockets and aircraft.

## Purpose

To perform a comparative analysis of the emergency algorithms at United States Air Force (USAF) installations where occupational hydrazine exposure may occur and create a best practices approach for medical responders.

## Methods

After review of current Occupational Safety and Health Administration standards and Agency for Toxic Substances and Disease Registry requirements for hydrazine, six United States Air Force Medical Group installation (MDGI) response protocols were analyzed and compared to each other and to current medical treatment recommendations.<sup>2</sup> Figure 1 shows a flowchart of the study methods.

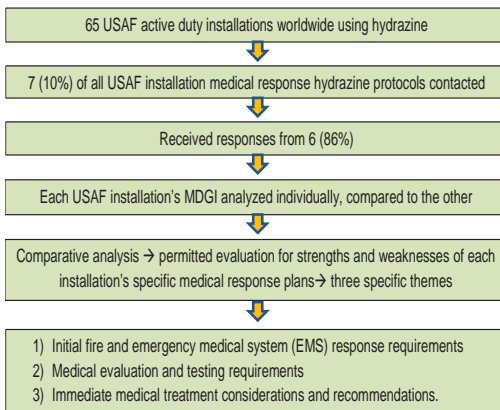


Figure 1. Flowchart of study methods.

## Results

Initial first responder emergency response tasks by fire departments and emergency medical services had many similarities across the majority of domains (see Table 1).

Table 1. Analysis of Emergency Response Tasks by Installation for Response to Hydrazine Exposure

Emergency Response Tasks	United States Air Force Military Installation					
	(1)	(2)	(3)	(4)	(5)	(6)
Fire Department Response with Personal Protective Equipment?	YES	YES	YES	YES	YES	YES
Gross decontamination by Fire Department?	YES	YES	YES	YES	YES	YES
Physician evaluation required?	YES	YES	YES	YES	YES	YES
Hydrazine Response Team responds if hydrazine confirmed?	YES	YES	YES	YES	YES	YES
Severe exposure requires immediate Emergency Room evaluation?	YES	YES	YES	YES	YES	YES
Occupational Safety and Health Administration documentation?	NO	YES	NO	YES	YES	YES

Approximately 33% of installations do not require a medical history and physical evaluation of an exposed individual (see Table 2).

Table 2. Analysis of Core Medical Evaluation Tasks by United States Air Force installation

Medical Evaluation Tasks	United States Air Force Military Installation					
	(1)	(2)	(3)	(4)	(5)	(6)
Vital Signs (BP, Pulse, RR)	YES	YES	NO	YES	YES	NO
CVS exam	YES	YES	NO	YES	YES	NO
Pulm exam	YES	YES	NO	YES	YES	NO
Neuro exam	YES	YES	NO	YES	YES	NO
Skin exam	YES	YES	NO	YES	YES	NO
Initial PFT	YES	YES	NO	NO	YES	YES
CBC w/ diff	YES	YES	YES	YES	YES	YES
CXR	YES	YES	NO	NO	YES	YES
24 HR Follow-up exam	YES	YES	YES	YES	YES	YES

## Discussion and Conclusion

**Discussion:** Emergency response tasks were similar among USAF installations. However, 33% of installations do not mandate documentation of exposure as required per federal law. Only 66% of installations require a medical history and physical examination. Given risk of respiratory complications, it is notable that only 66% of installations recommend a chest radiograph and pulmonary function testing. The most plausible reason for this lack of requirements is the 'assumption' that first responders will automatically perform the appropriate examination and testing based on their existing protocols. Using these best practice tasks, I created a protocol which can be implemented to ensure a safe and appropriate response to a hydrazine event.

There are limits to this study as only six USAF installations were analyzed. Obtaining civilian industry and other federal agency response protocols would improve the generalizability of these best practice recommendations.

**Conclusion:** Though rare, occupational hydrazine exposure may lead to significant health consequences. Ensuring medical providers are able to both quickly and appropriately evaluate and treat exposure is critical. Hydrazine is commonly encountered at United States Air Force bases and these findings could be utilized to standardize response procedures across all installations. As future studies and case reports clarify risk hazards, monitoring and updating of this protocol will be required.

## References

1. National Institute for Occupational Health and Safety (NIOSH). (2007). *NIOSH Pocket Guide to Chemical Hazards*. Retrieved 4 January, 2016 from <http://www.cdc.gov/niosh/npg/npgd0329.html>
2. Agency for Toxic Substances & Disease Registry (ATSDR). (1997). *Toxicological Profile for Hydrazines*. Retrieved 4 January, 2016 from <http://www.atsdr.cdc.gov/substances/toxsubstance.asp?toxid=89>

## Disclaimer

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