Understanding the Mechanism of Action for Hydrazines and Subsequent Impact on the Warfighter

Julia E. Morgan, Antonia N. Santoro, John Conrad R. Tan, Jacob Chaney, Hailey M. Thomas, and Justin N. Vignola

US Army Medical Research Institute of Chemical Defense 8350 Ricketts Point Road Aberdeen Proving Ground – Edgewood Area, MD 21010

Defense Health Agency
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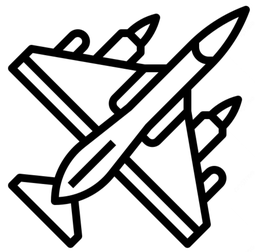
Hydrazines



Rocket fuel, pesticides, pharmaceuticals

1. **Hydrazine**
2. **Methylhydrazine**

Risks to Service Members

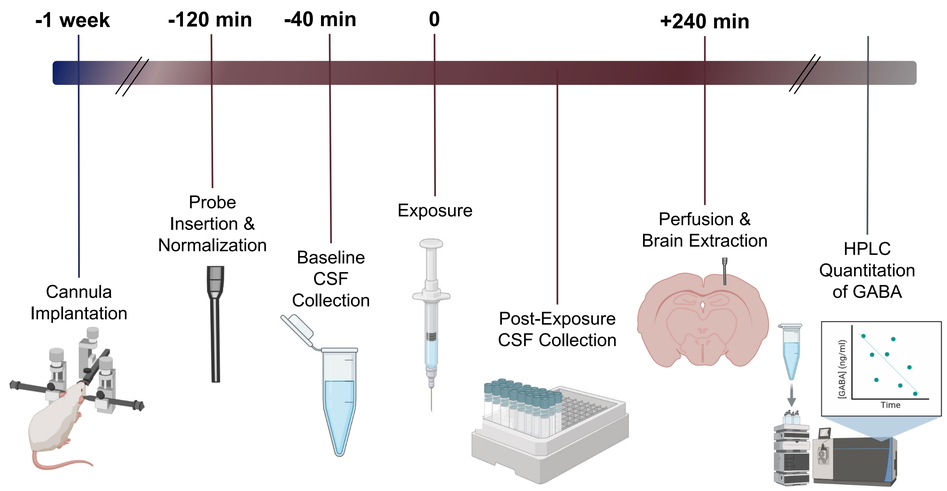
- Hydrazines, including **hydrazine** and **methylhydrazine (MH)** are severely toxic, highly reactive chemicals used in military, aviation, and aerospace fuels. Personnel in these industries are at risk of acute exposure through vapor inhalation, skin contact, or accidental ingestion.
- Exposure to a hydrazine compound causes rapid impact on multiple organ systems. Neurologically, these compounds have the capacity to elicit convulsive seizure activity. It is hypothesized this effect is caused by a deficiency of pyridoxine in the brain, which leads to a disruption in the synthesis of GABA.

Research Questions

What is the mechanism of action for hydrazine-induced seizure activity?

Can we use this mechanism to improve treatment outcomes?

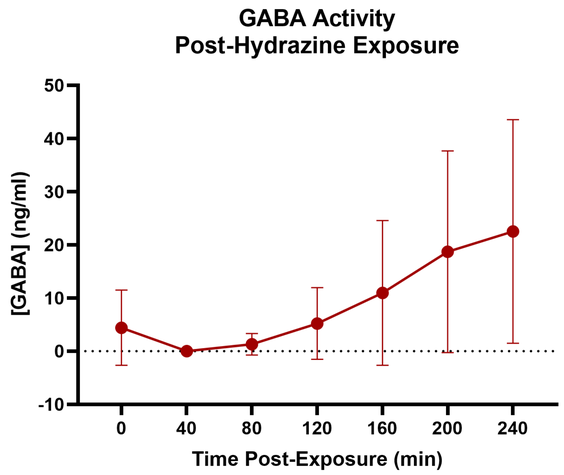
Methodology



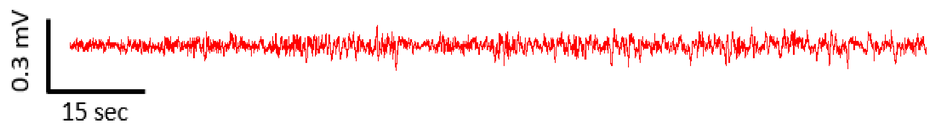
Looking Ahead

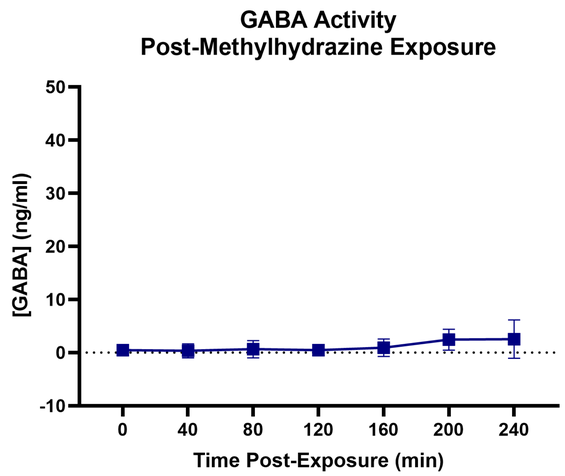
Hydrazine and methylhydrazine (MH) have disparate impacts on GABA activity, suggesting that currently fielded pyridoxine is ineffective at treating toxicity resultant of hydrazine exposure. Identifying the best countermeasure for each compound will allow the service member to more quickly return to duty should a hydrazine or methylhydrazine exposure occur.

Results

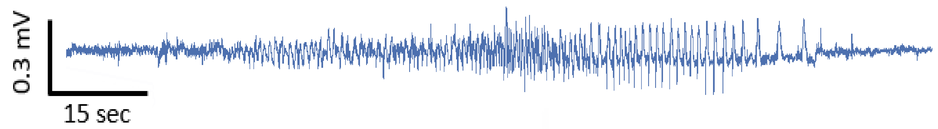


After exposure to hydrazine, GABA increases across time (0-minute *M* = 4.4 ng/mL, 240-minute *M* = 22.52 ng/ml). This finding is the inverse of the published hypothesis of the mechanism of action for seizure activity after exposure to a hydrazine.





GABA activity stays consistently low post-methylhydrazine exposure (0-minute *M* = 0.46 ng/ml, 240-minute *M* = 2.54 ng/mL*)*. GABA is likely lower than the HPLC threshold can detect, supporting the published hypothesis of the mechanism of action for seizure activity after exposure to a hydrazine.



Contact Julia Morgan
julia.e.morgan3.civ@health.mil