Cultivating Caution: A Monthly Guide to Farm Safety & Health

Manure Storage Safety

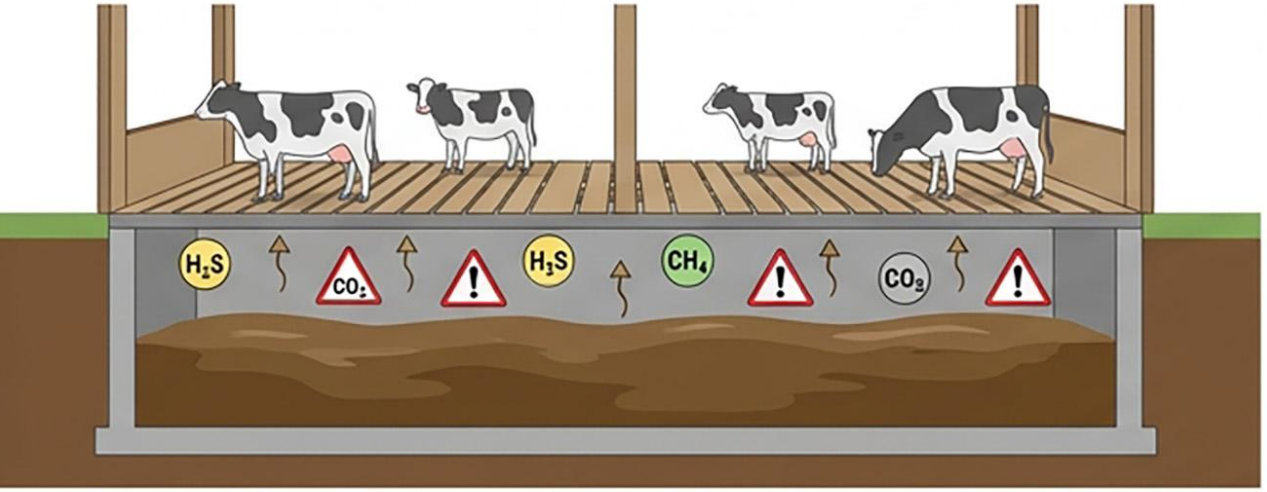
Salah Issa & Bill Fulton



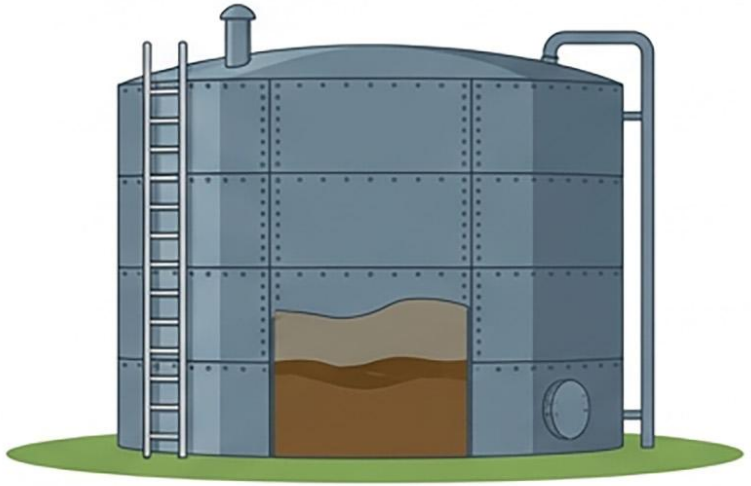
What We Will Cover Today

- Types of Manure Storage Systems
- Gasses produced by manure systems
- Fires/Explosions and other hazards
- How First Responders Handle these scenarios
- Preventative and Response recommendations.

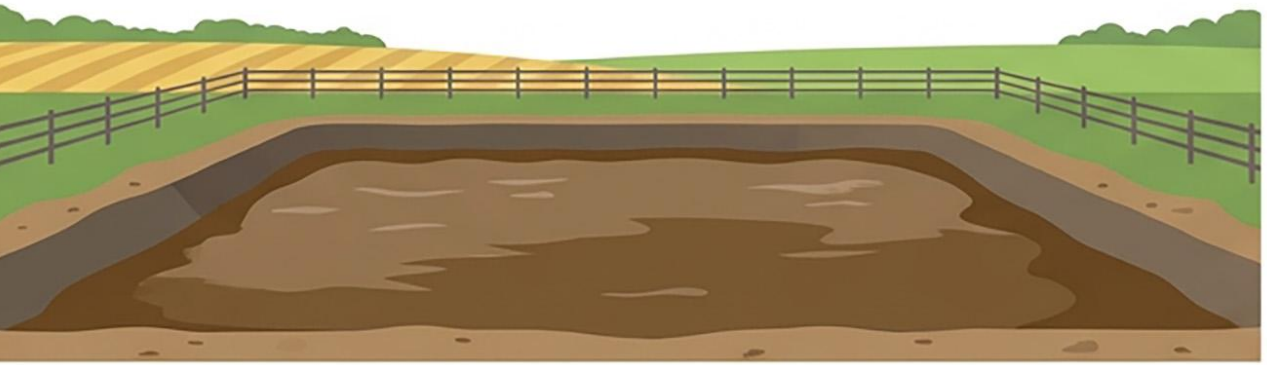
Know Your Storage — Know Your Risk



Below ground pit



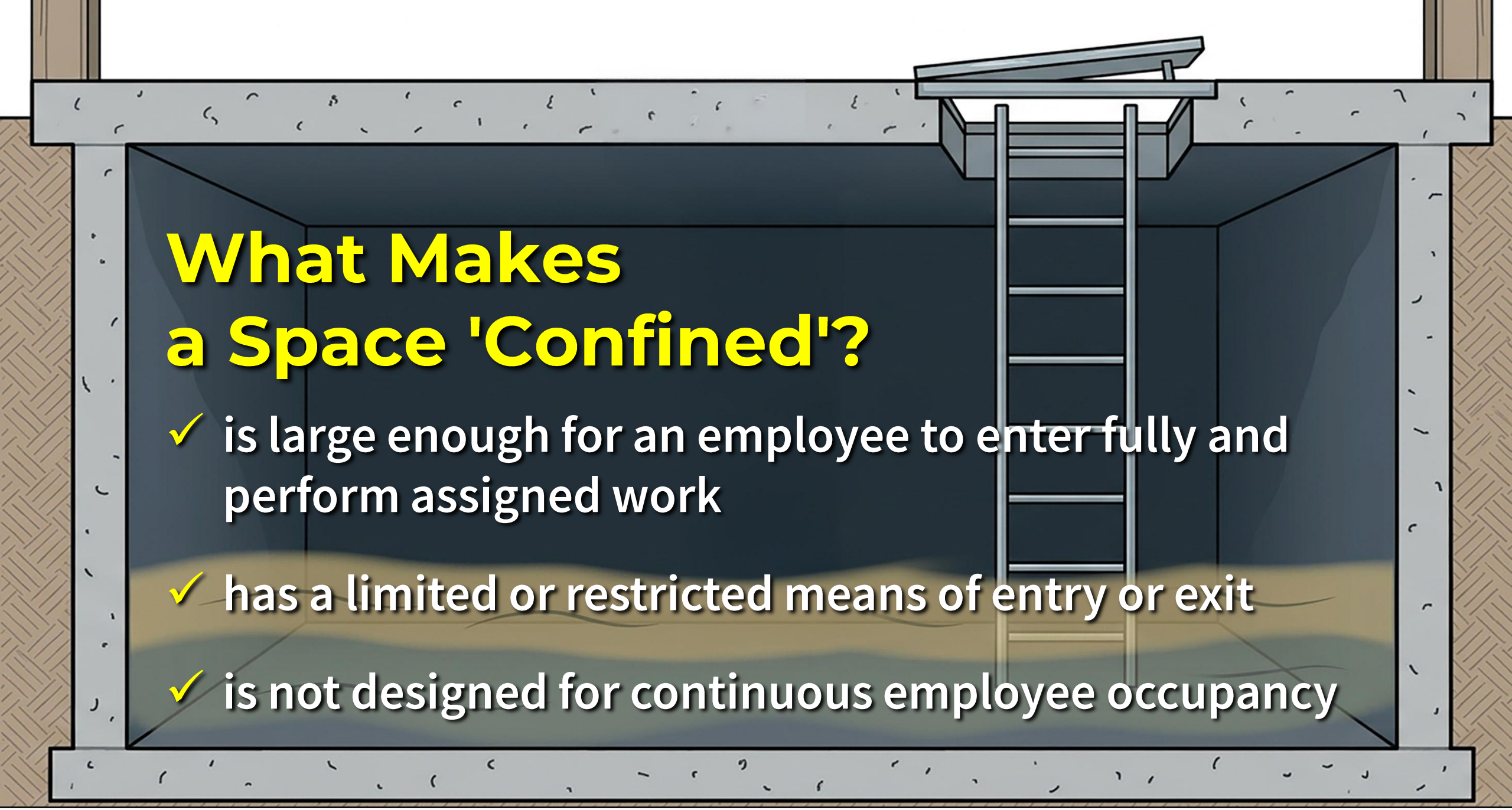
Above ground storage tank



Lagoon



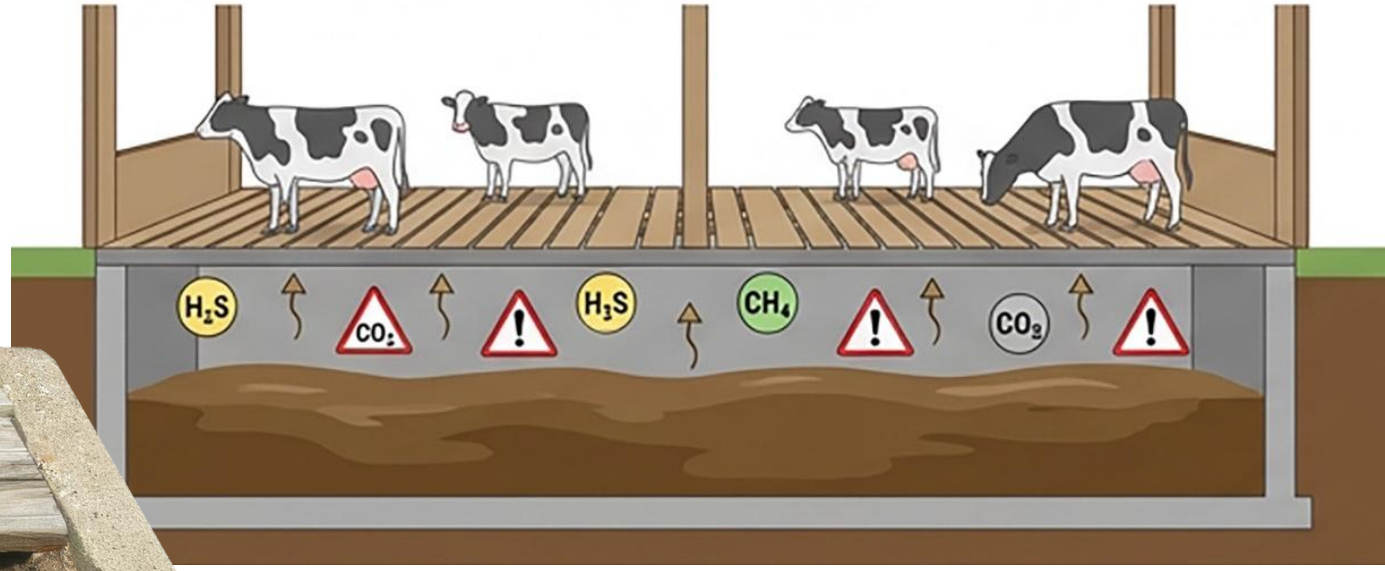
Manure transport tank/vehicle


What Makes
a Space 'Confined'?
✓ is large enough for an employee to enter fully and perform assigned work
✓ has a limited or restricted means of entry or exit
✓ is not designed for continuous employee occupancy

Know Your Storage — Know Your Risk

Below ground pit





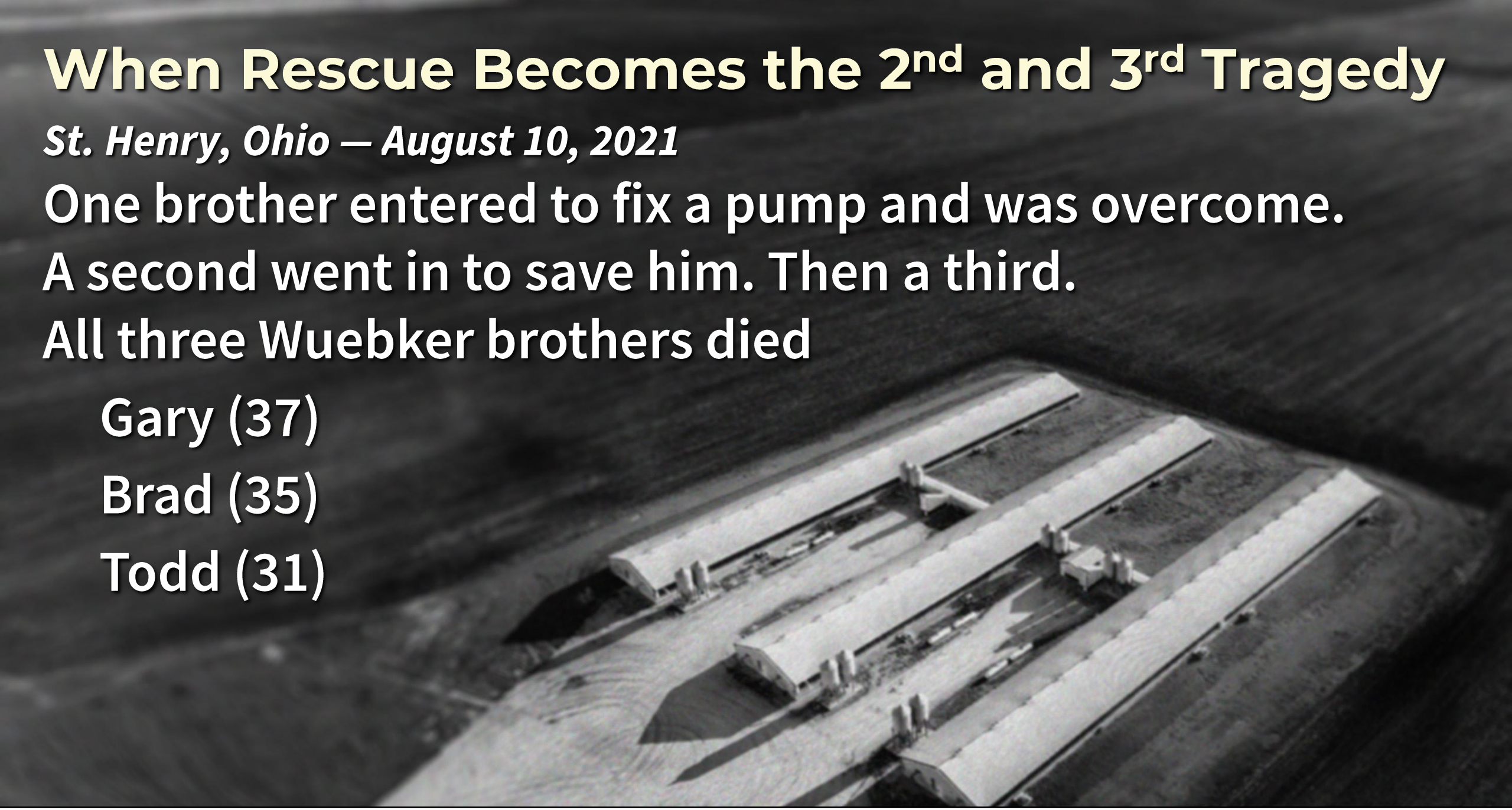
Enclosed below-ground pit under a barn floor; gases build up to lethal levels, especially when disturbed.

When Rescue Becomes the 2nd and 3rd Tragedy

St. Henry, Ohio — August 10, 2021

One brother entered to fix a pump and was overcome.
A second went in to save him. Then a third.
All three Wuebker brothers died

- Gary (37)
- Brad (35)
- Todd (31)



Know Your Storage — Know Your Risk

Above ground storage tank

Large vertical storage structure with access hatches; gases can accumulate inside the tank headspace.



Know Your Storage — Know Your Risk

Lagoon



Large open-air storage pond with a liner; gases disperse into the atmosphere but risks remain during agitation.

Tipping over into the lagoon is a common hazard



Deaths of farmworkers in cow manure ponds put oversight of dairy farms into question

https://www.thebullvine.com/news/deaths-of-farmworkers-in-cow-manure-ponds-put-oversight-of-dairy-farms-into-question/

Ohio dairy farmer dies in manure lagoon after tractor tips over

https://www.farmersadvance.com/story/news/2025/03/11/ohio-dairy-farmer-dies-in-manure-lagoon-after-tractor-tips-over/82275821007/

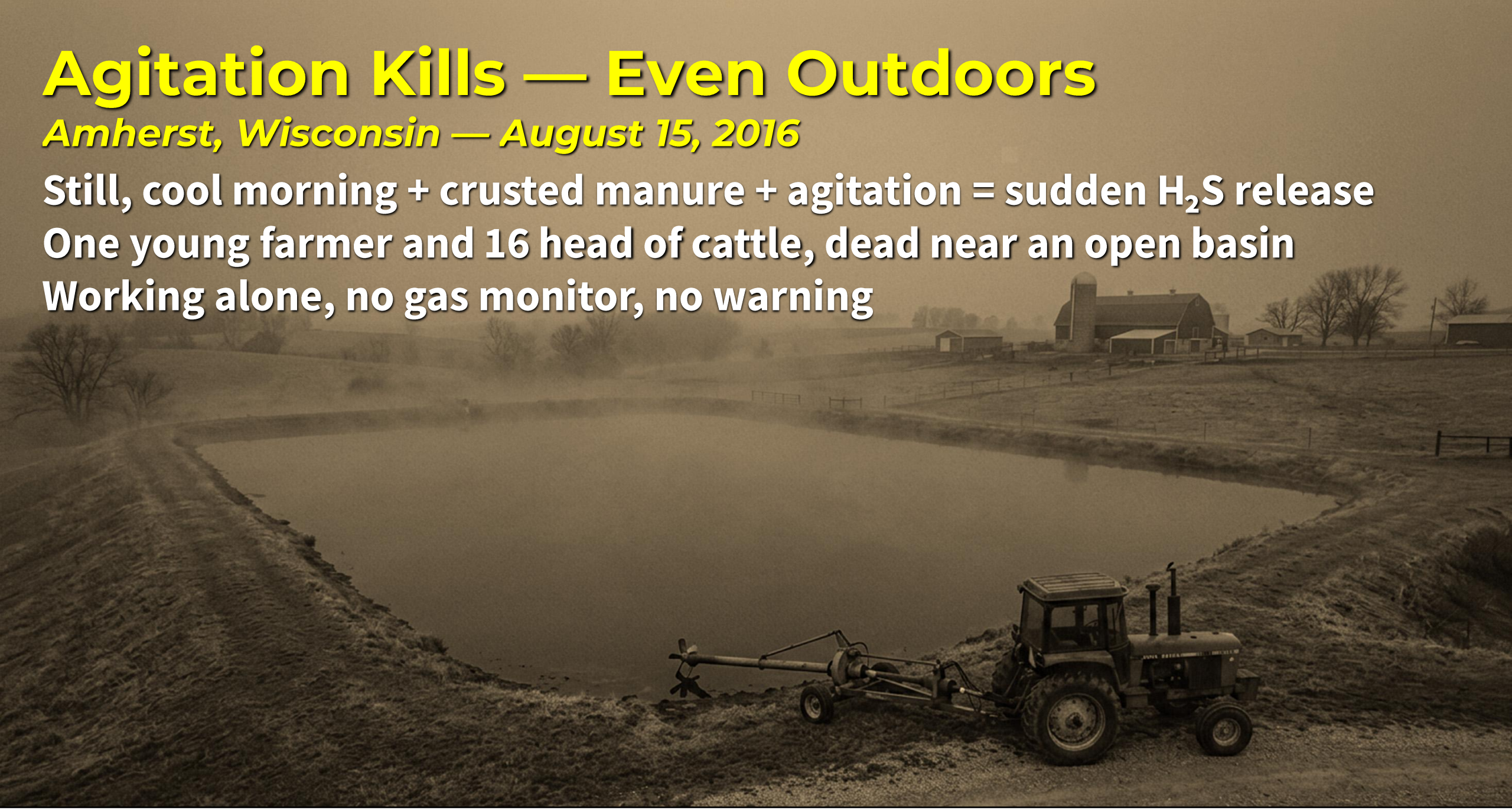
Agitation Kills — Even Outdoors

Amherst, Wisconsin — August 15, 2016

Still, cool morning + crusted manure + agitation = sudden H_2S release

One young farmer and 16 head of cattle, dead near an open basin

Working alone, no gas monitor, no warning



Know Your Storage — Know Your Risk

Manure transport tank/vehicle

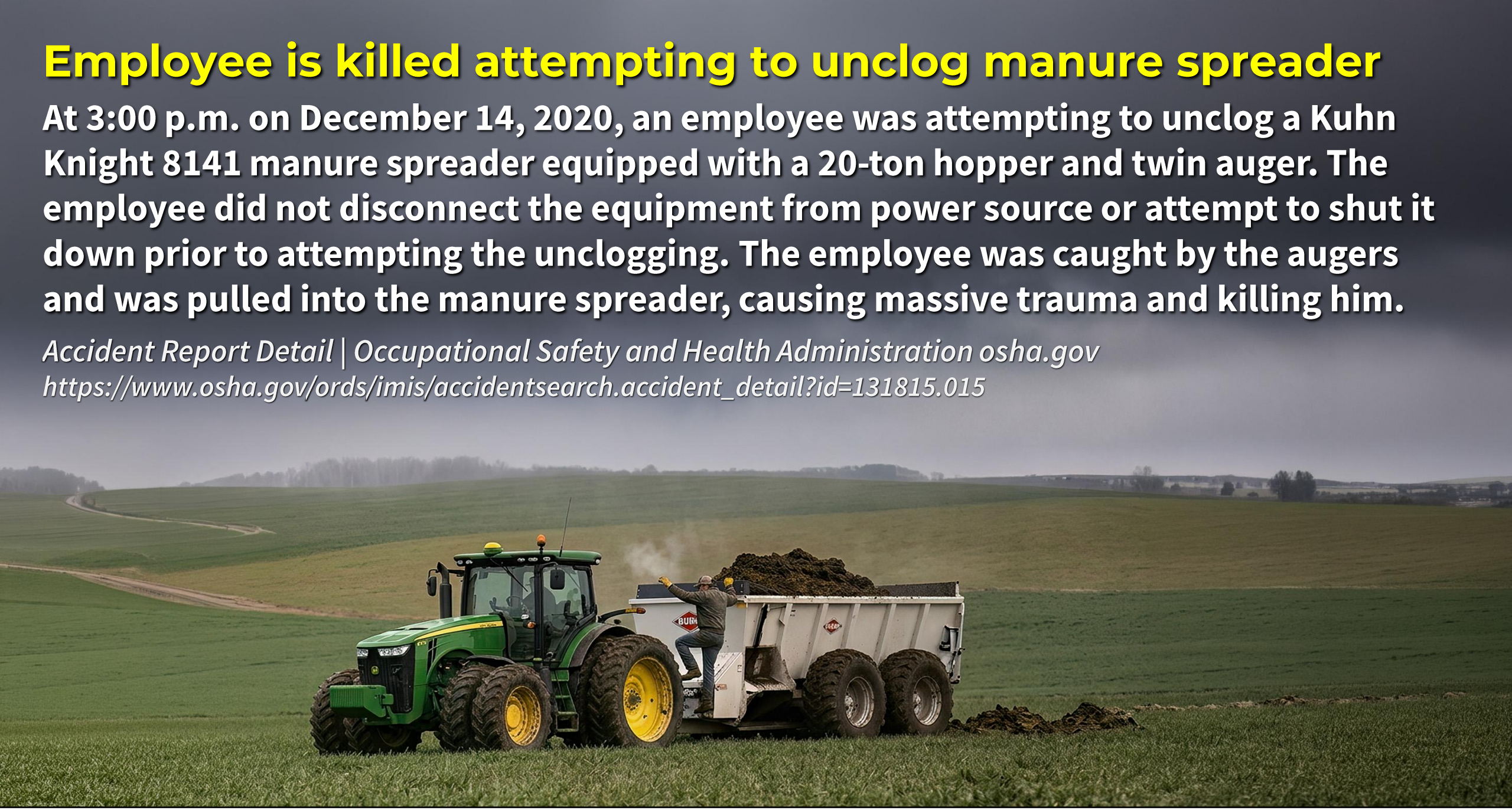
**Mobile tanker for hauling and applying manure;
gases build up inside during transport and agitation.**



Employee is killed attempting to unclog manure spreader

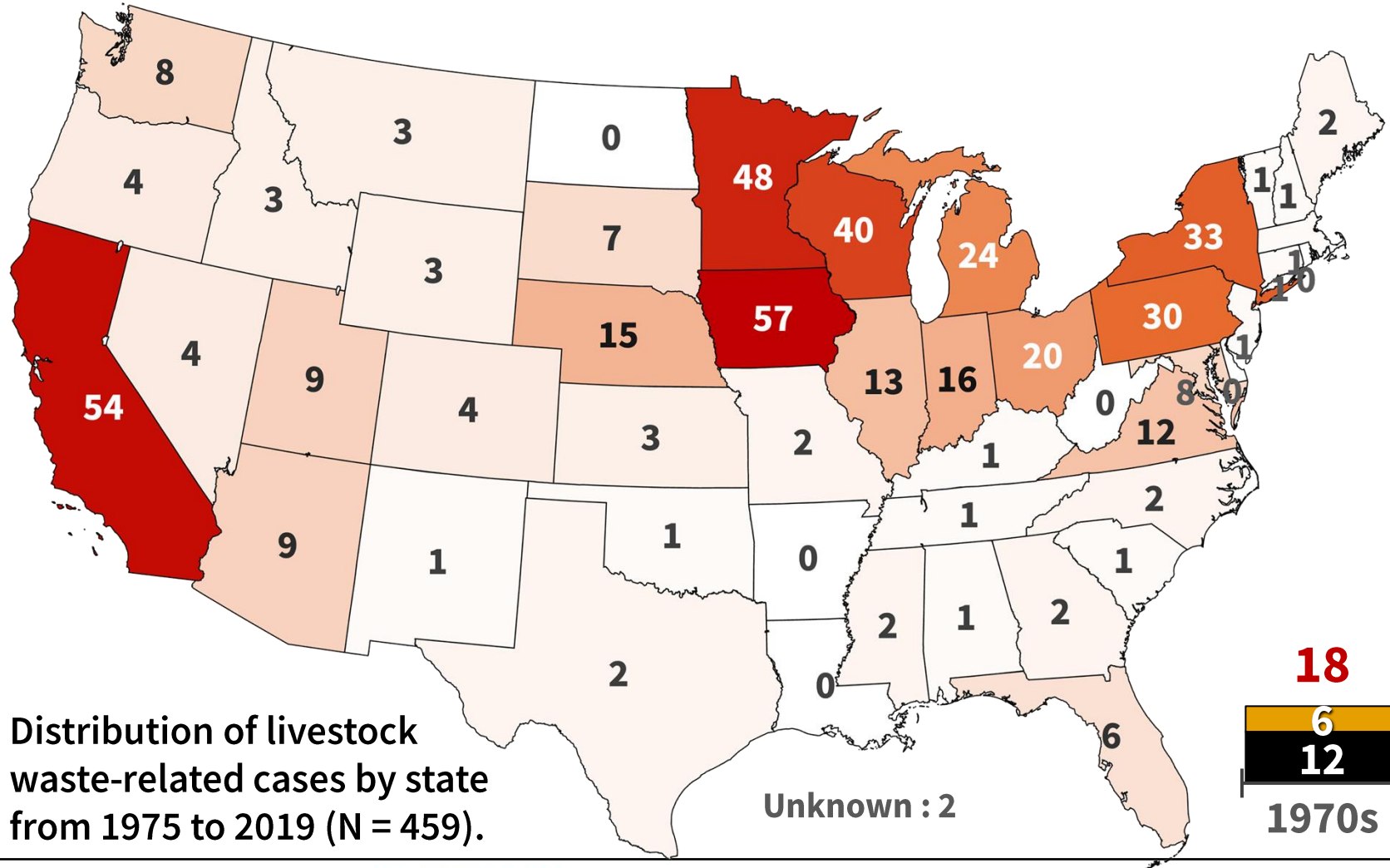
At 3:00 p.m. on December 14, 2020, an employee was attempting to unclog a Kuhn Knight 8141 manure spreader equipped with a 20-ton hopper and twin auger. The employee did not disconnect the equipment from power source or attempt to shut it down prior to attempting the unclogging. The employee was caught by the augers and was pulled into the manure spreader, causing massive trauma and killing him.

Accident Report Detail | Occupational Safety and Health Administration osha.gov
https://www.osha.gov/ords/imis/accidentsearch.accident_detail?id=131815.015

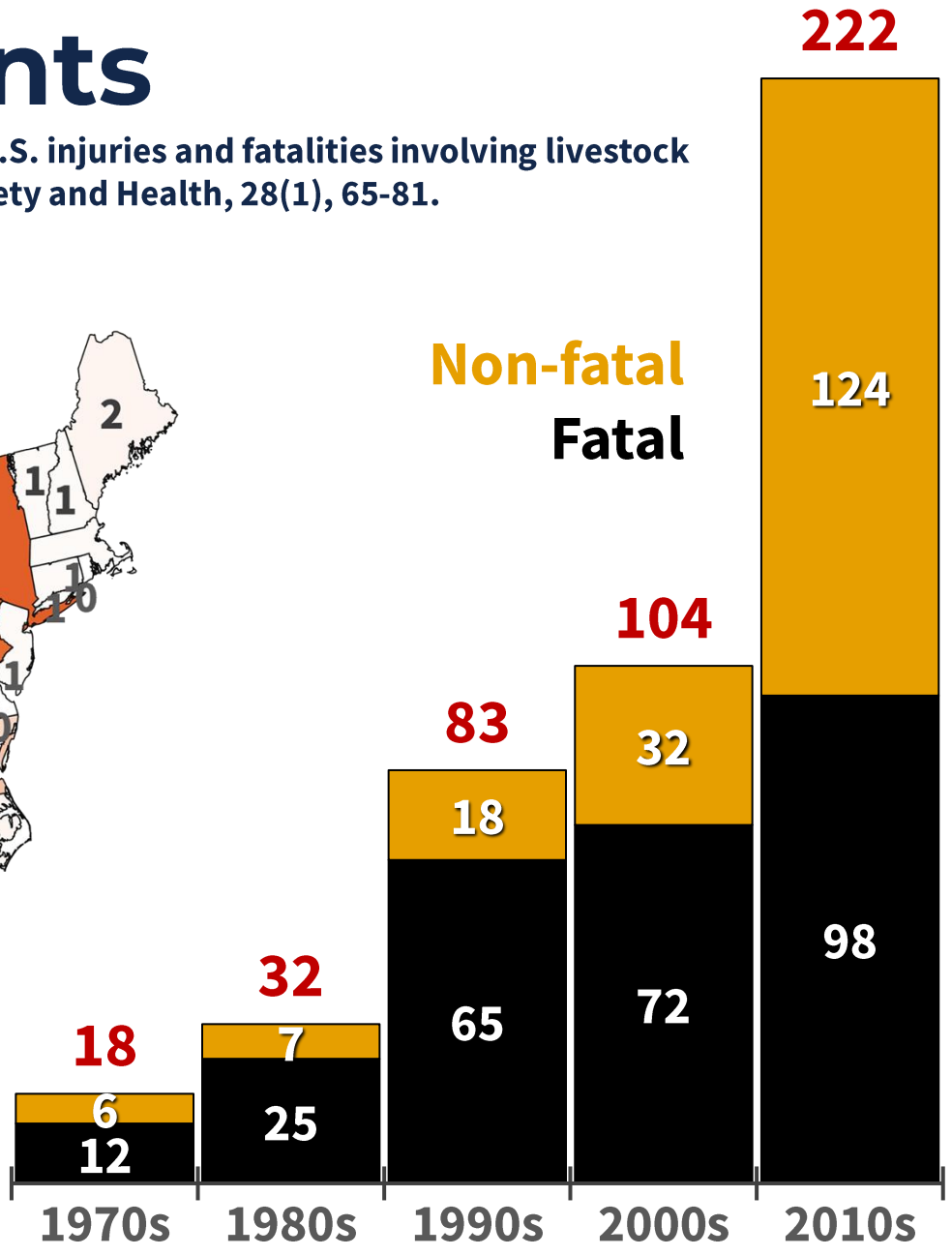


Frequency of these incidents

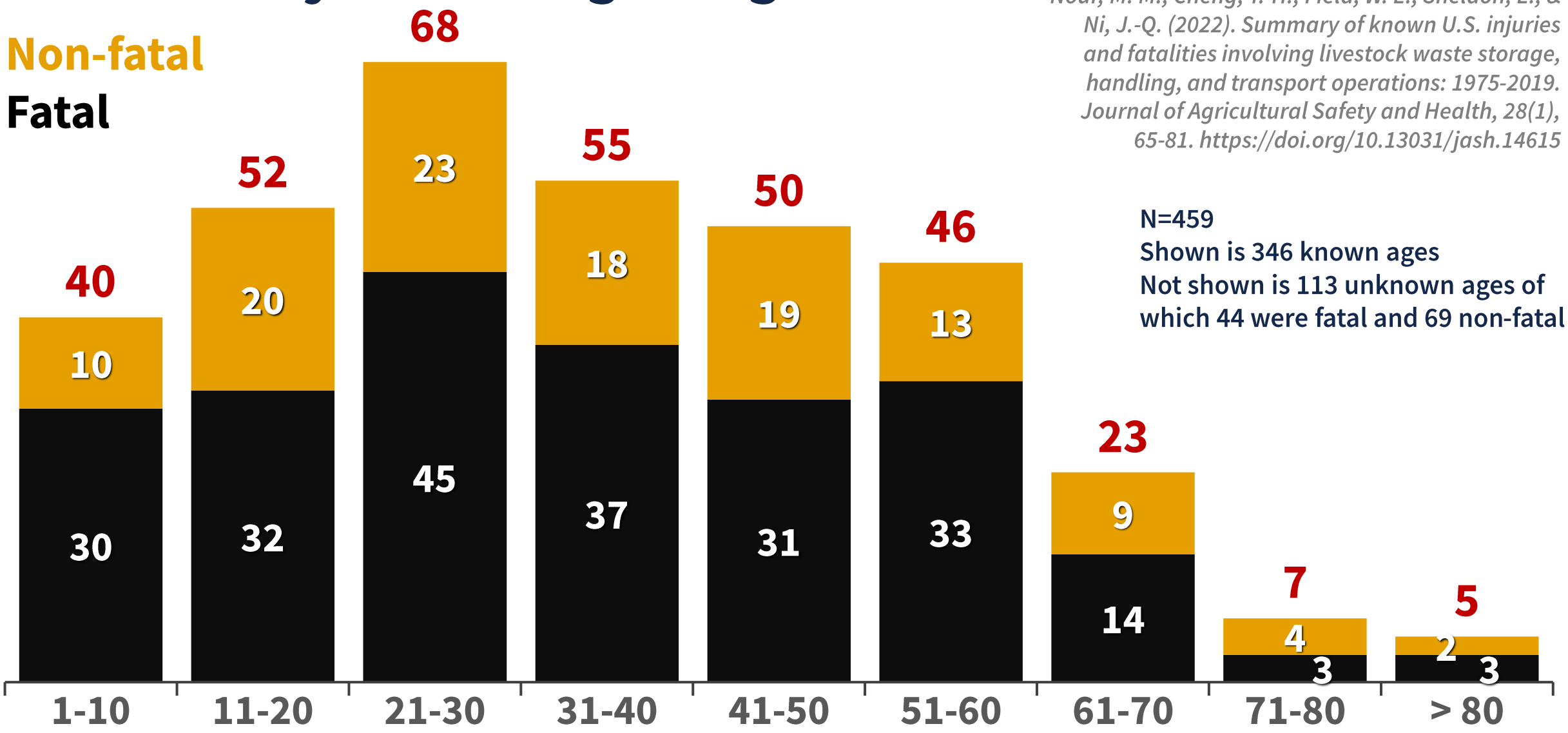
Nour, M. M., Cheng, Y.-H., Field, W. E., Sheldon, E., & Ni, J.-Q. (2022). Summary of known U.S. injuries and fatalities involving livestock waste storage, handling, and transport operations: 1975-2019. Journal of Agricultural Safety and Health, 28(1), 65-81. https://doi.org/10.13031/jash.14615



Distribution of livestock waste-related cases by state from 1975 to 2019 (N = 459).



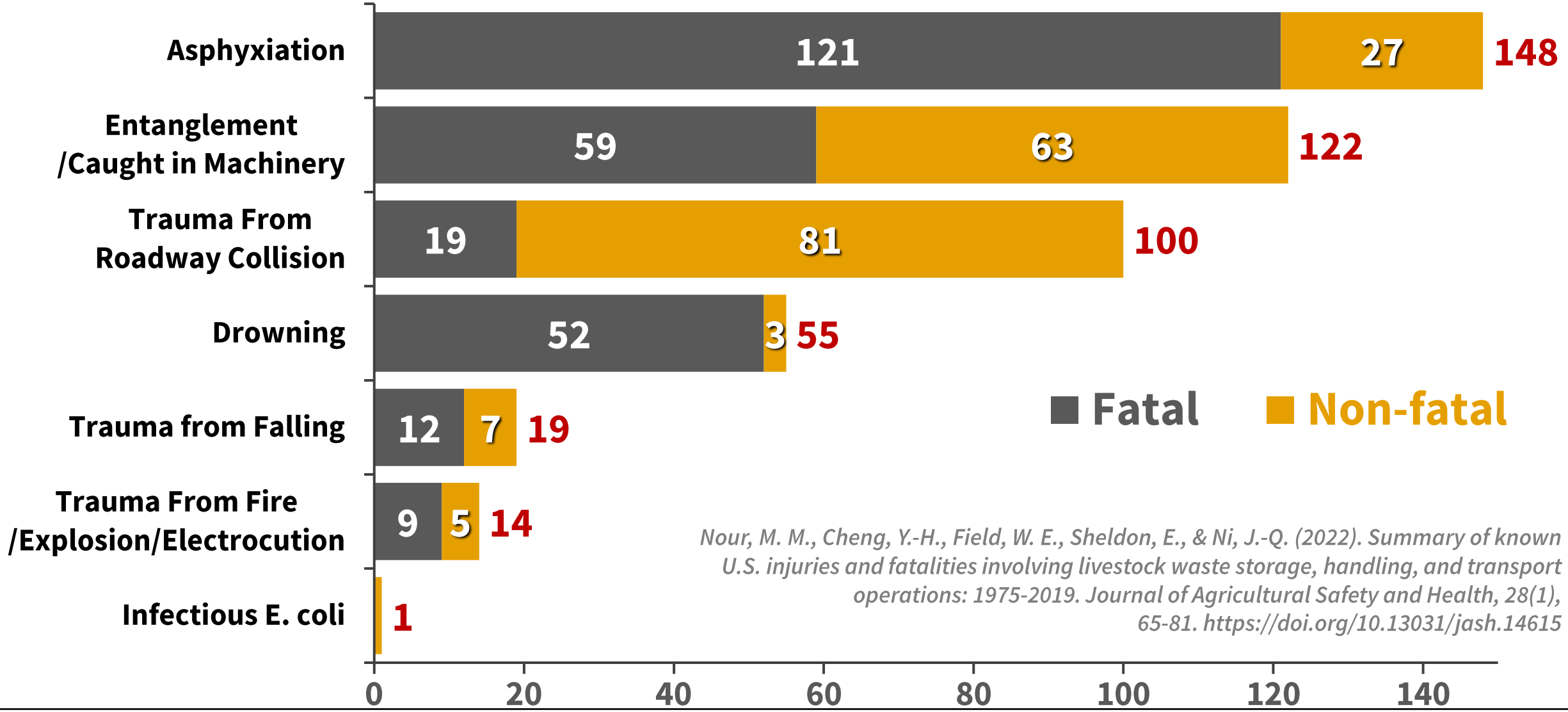
Distribution of livestock waste-related cases in the U.S. by victim's age ranges



Nour, M. M., Cheng, Y.-H., Field, W. E., Sheldon, E., & Ni, J.-Q. (2022). Summary of known U.S. injuries and fatalities involving livestock waste storage, handling, and transport operations: 1975-2019. Journal of Agricultural Safety and Health, 28(1), 65-81. https://doi.org/10.13031/jash.14615

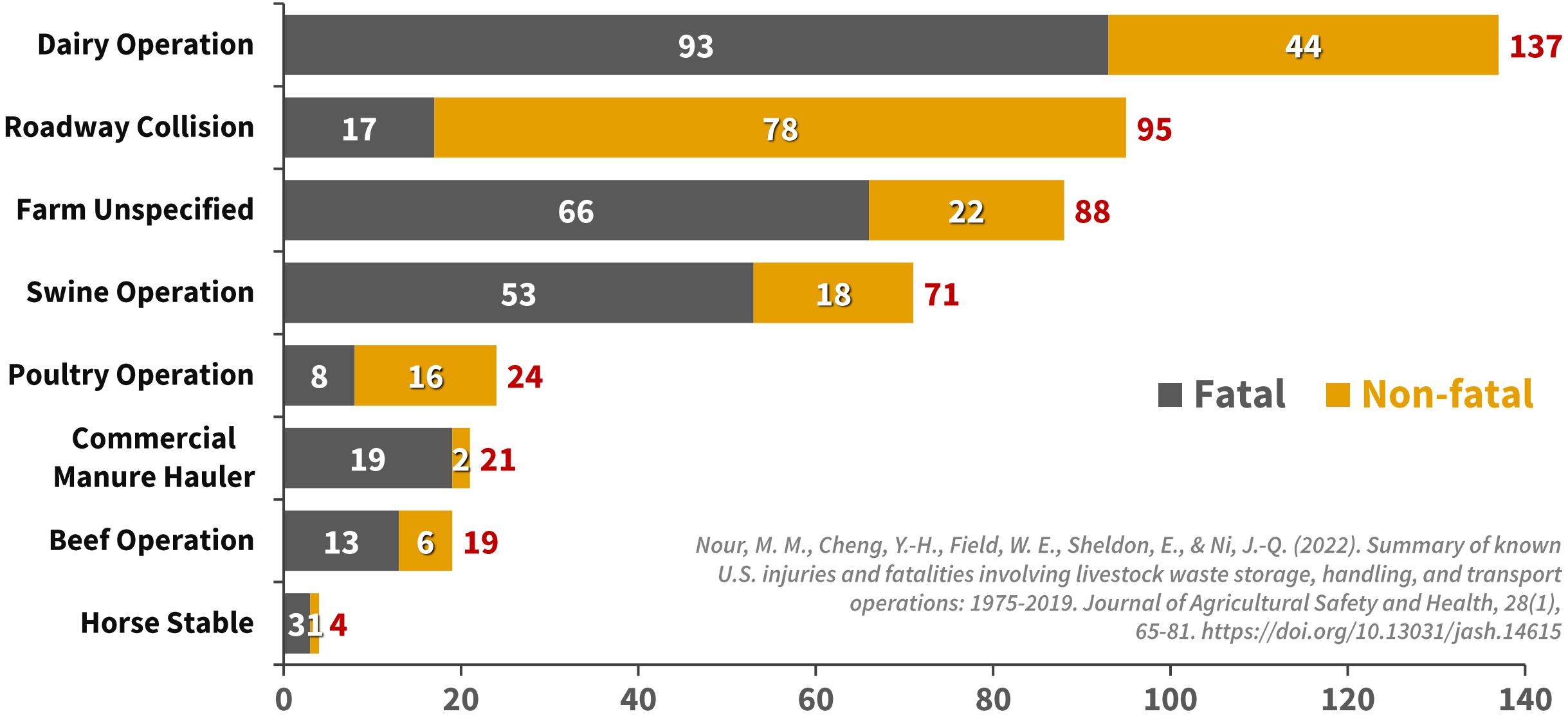
N=459
Shown is 346 known ages
Not shown is 113 unknown ages of which 44 were fatal and 69 non-fatal

Distribution of livestock waste-related cases in the U.S. by cause of injury



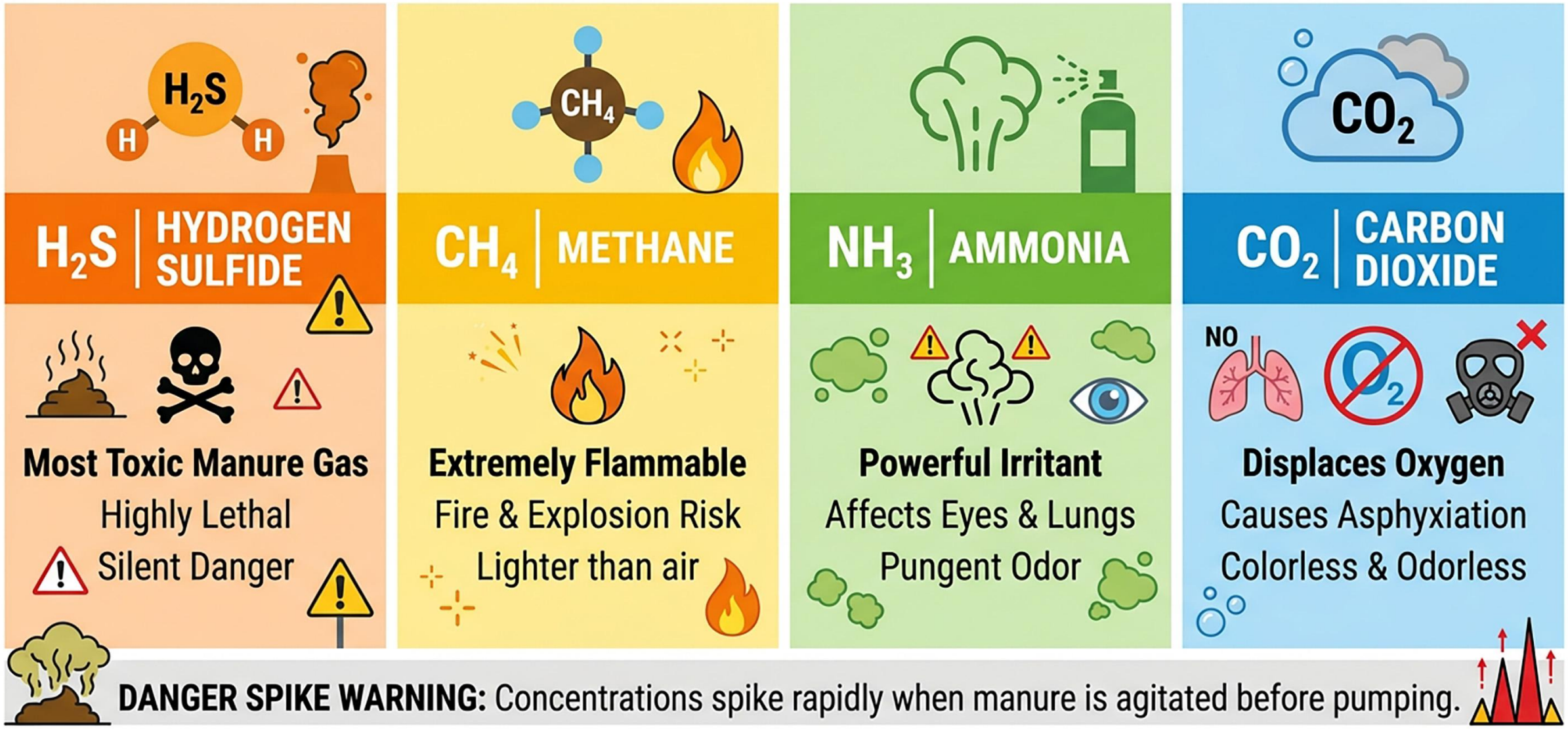
Nour, M. M., Cheng, Y.-H., Field, W. E., Sheldon, E., & Ni, J.-Q. (2022). Summary of known U.S. injuries and fatalities involving livestock waste storage, handling, and transport operations: 1975-2019. Journal of Agricultural Safety and Health, 28(1), 65-81. https://doi.org/10.13031/jash.14615

Distribution of livestock waste-related cases in the U.S. by incident location



Nour, M. M., Cheng, Y.-H., Field, W. E., Sheldon, E., & Ni, J.-Q. (2022). Summary of known U.S. injuries and fatalities involving livestock waste storage, handling, and transport operations: 1975-2019. Journal of Agricultural Safety and Health, 28(1), 65-81. https://doi.org/10.13031/jash.14615

The Four Deadly Gases



Beyond the Gas

Other Pit Dangers

Drowning

even a few inches is deadly

once you collapse

Fire/explosion

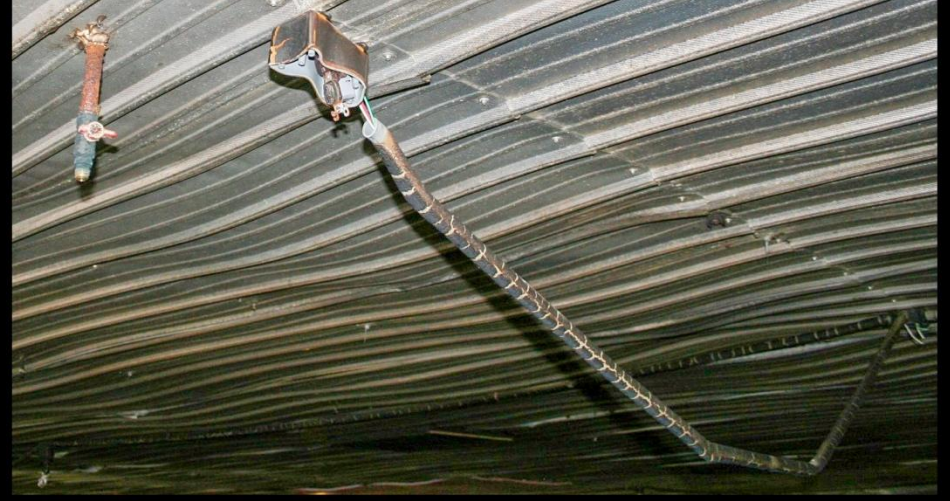
methane ignites

Electrocution/Entanglements

wet repairs + equipment







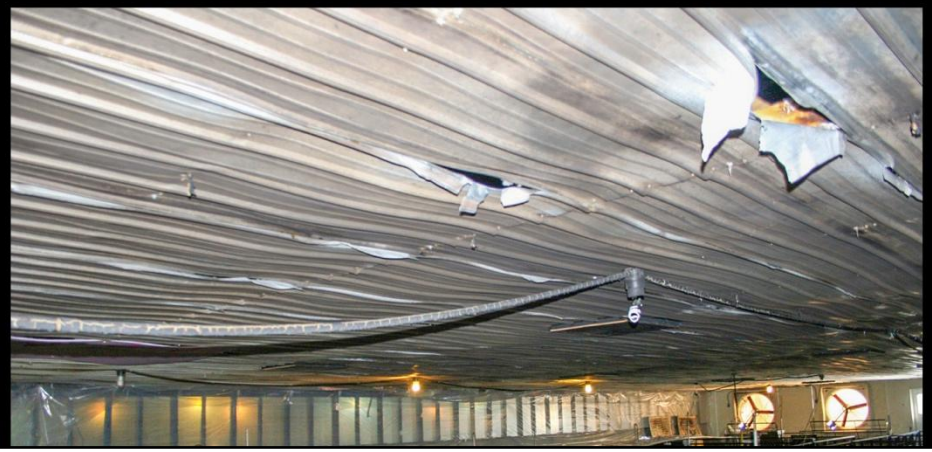




Dewight Pit Fire and Explosion









What the Gases Do to Your Body

Hydrogen Sulfide (H_2S)

eye/throat burn → dizziness → collapse ("knockdown")

⚠️ High H_2S has no smell — your nose fails you

Ammonia

burning eyes, nose, throat

Methane/CO_2

headache, drowsiness, suffocation

What do you do if this happens to you

- Call 911 .. EMS
  - Location
  - If there is no big identifier.
    - Need to know which one they are in.
    - Example naming each building by state or number or alphabet
  - Wait outside --- direct when they arrive.
- If you have ventilation, start them up.
- NEVER ENTER CONFINED SPACE.

Minnesota — August 1992

In two separate incidents, 4 farm workers died entering manure pits

Incident 1

Death by hydrogen sulfide poisoning

A 27-year-old entered to fix a pump, was overcome. 46-year-old uncle went in to help and also died.

Incident 2

Death by asphyxiation due to hypoxia

A 43-year-old dairy farmer was overcome clearing a blockage in an under-barn pit. 23-year-old son died trying to save him.

Warned about the gas. Entered anyway!

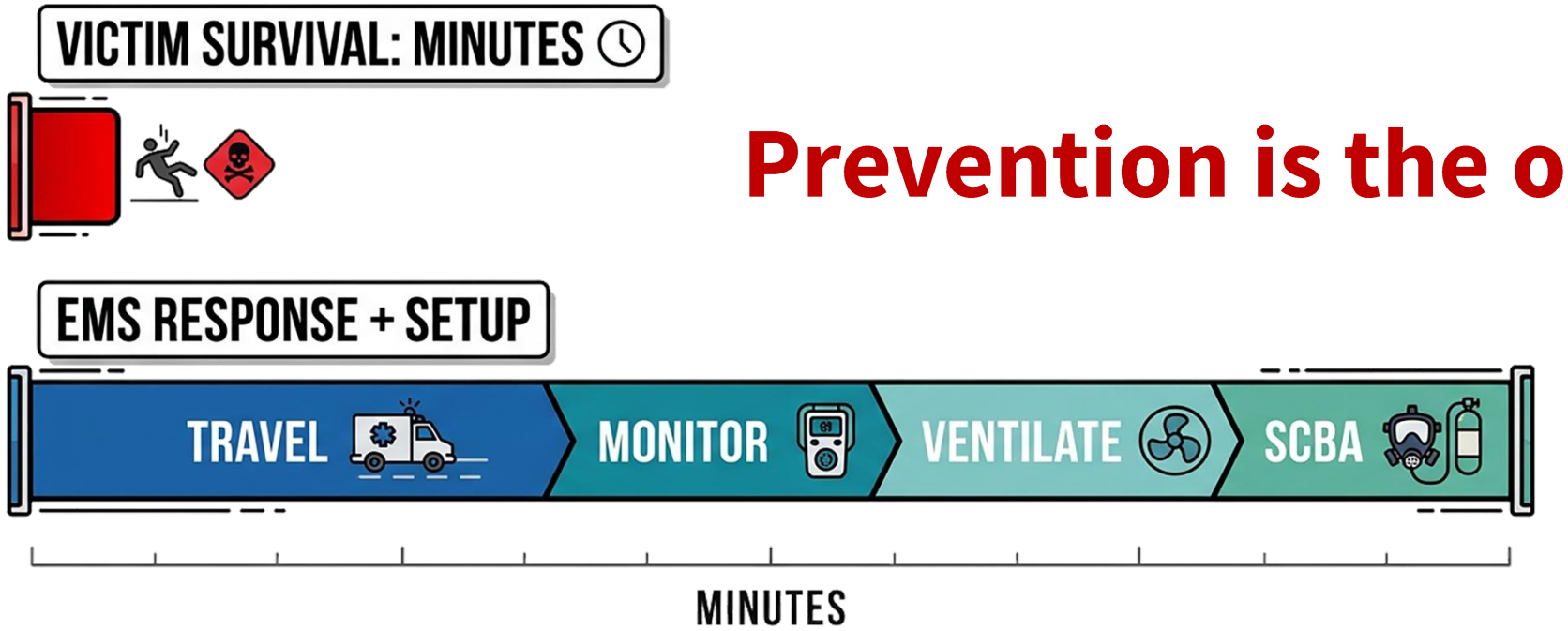
How Responders Work a Pit Call

- Test the air (what did the victim breathe?)
- Ventilate
- Lockout/tagout pumps & agitators
- Enter only on SCBA or recover from outside



The Hard Math of Time

- Rural EMS may be 10+ minutes out
- Then: set up monitors, purge, re-test, suit up
- Hydrogen Sulfide knockdown kills in minutes

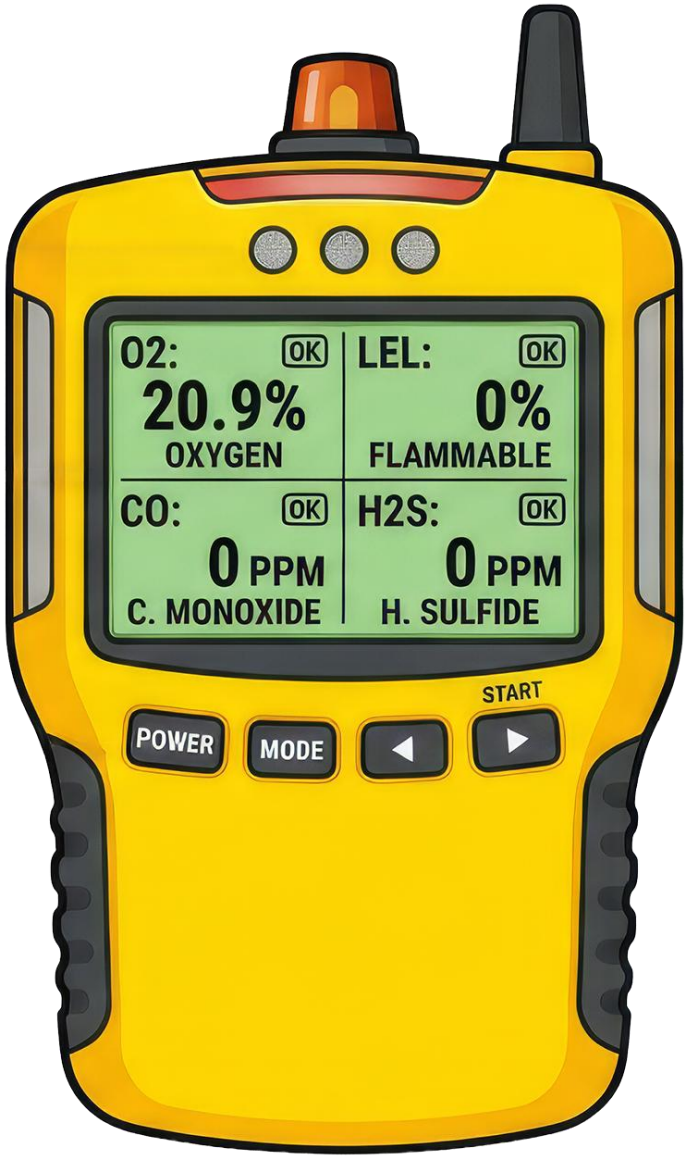


Prevention is the only real rescue!

Your Two Best Defenses

Detect & Ventilate

- Use a 4-gas monitor: O_2, LEL, CO, H_2S
  - Test & calibrate it regularly
- Ventilate every time before entry — especially winter
- Never trust your nose



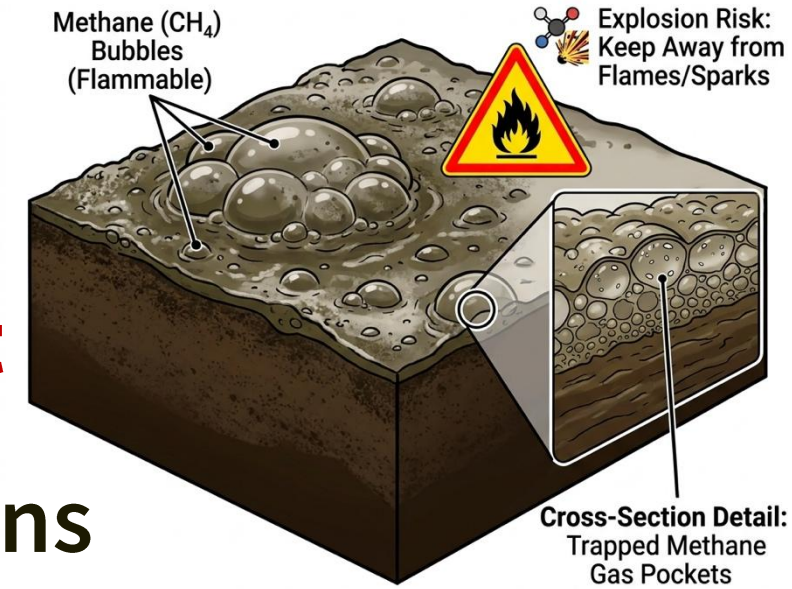
Pump-Out Day = Peak Danger

- Agitation releases the highest gas levels
- Remove all animals and people from the barn
- Secure the perimeter — no entry
- Max ventilation before, during & after

Foaming Manure: A Hidden Bomb

Foaming Manure = Trapped Methane

- Foam traps methane bubbles (50–70%)
- Burst foam → methane dilutes to **explosive 5–15%**
- A spark, pilot light, or heater **can ignite it**
- Foam also clogs pit fans





If a fire starts

Bring down the curtains (open the windows)

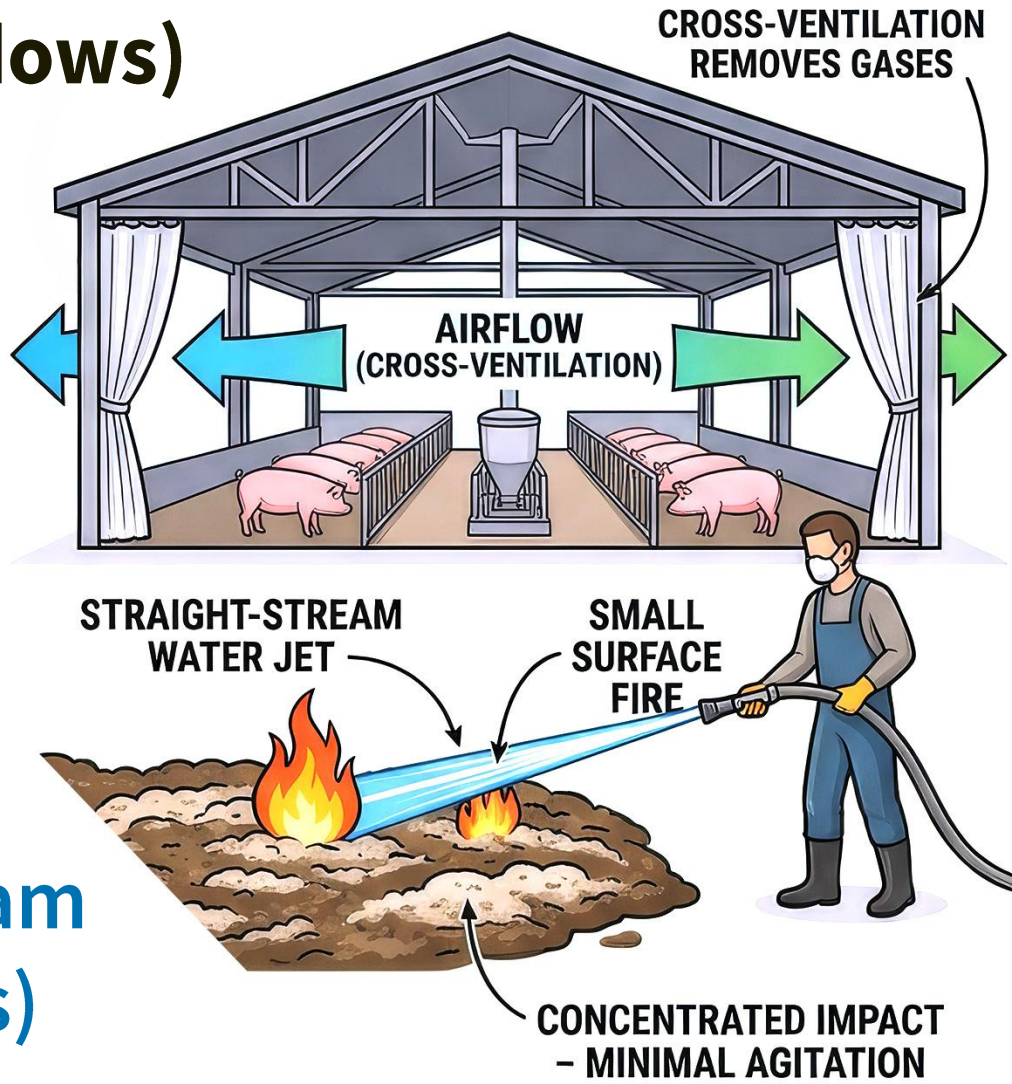
Get cross winds to blow methane out

Keep ventilation system going

Watch to make sure fire is
not going into ventilation

Put out the fire with a hose

Need to use straight stream (nozzle) ,
not a combination nozzle or broken stream
(basically lets us not break more bubbles)



Managing Foam Risk

Diet

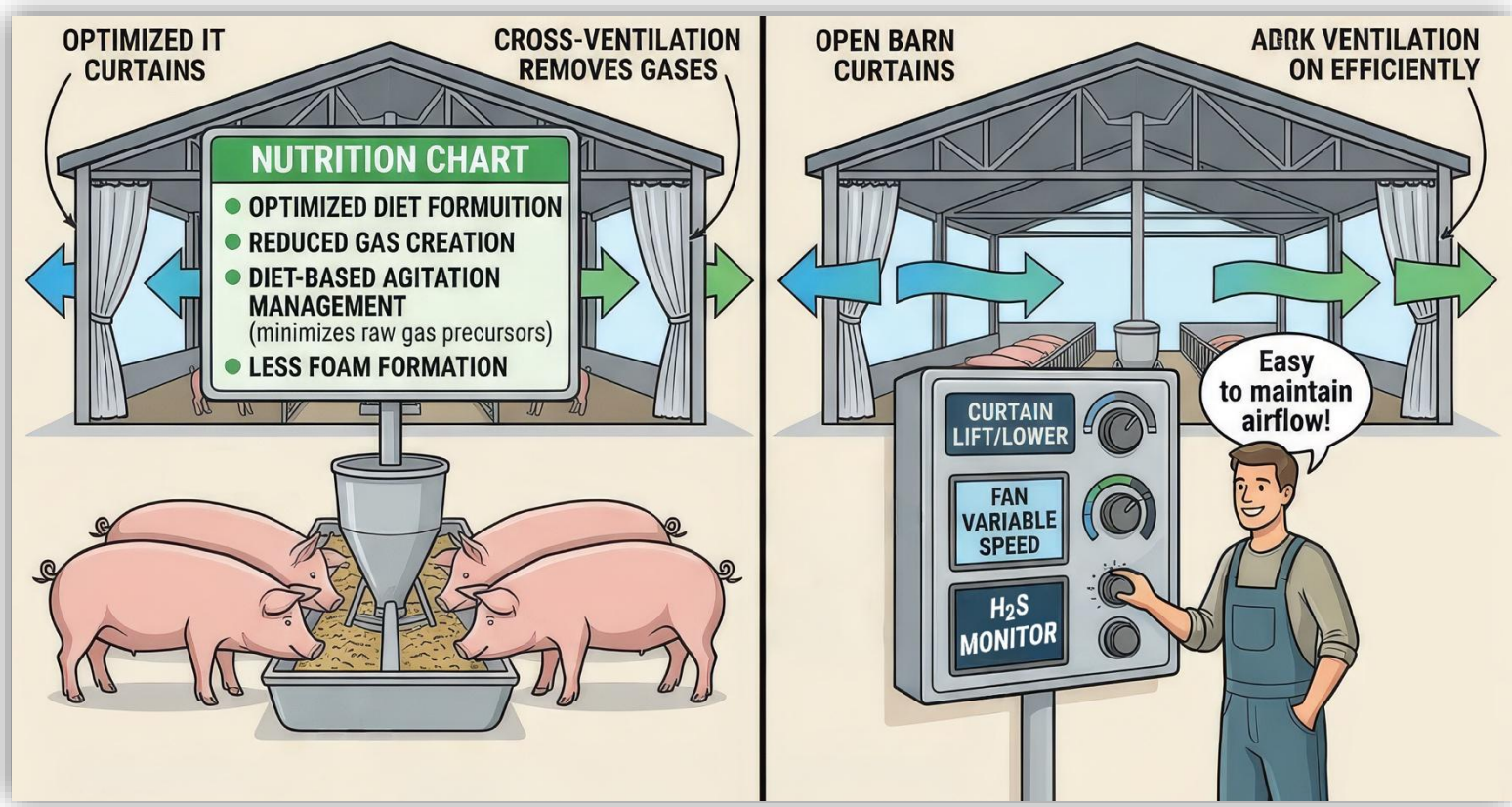
foaming is linked to feed ration — work with a nutritionist

Access

place ventilation/curtain controls near entrances for quick response

Monitoring

track foam buildup before it's a problem



Summary

- ✓ Manure Systems are a very hazardous locations.
- ✓ Biggest mistake is trying to save someones life by jumping after them.
- ✓ Prevention is the most important step you can take
  - Monitor gasses & foams
  - Ventilate



https://go.illinois.edu/ISSA-lab

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