

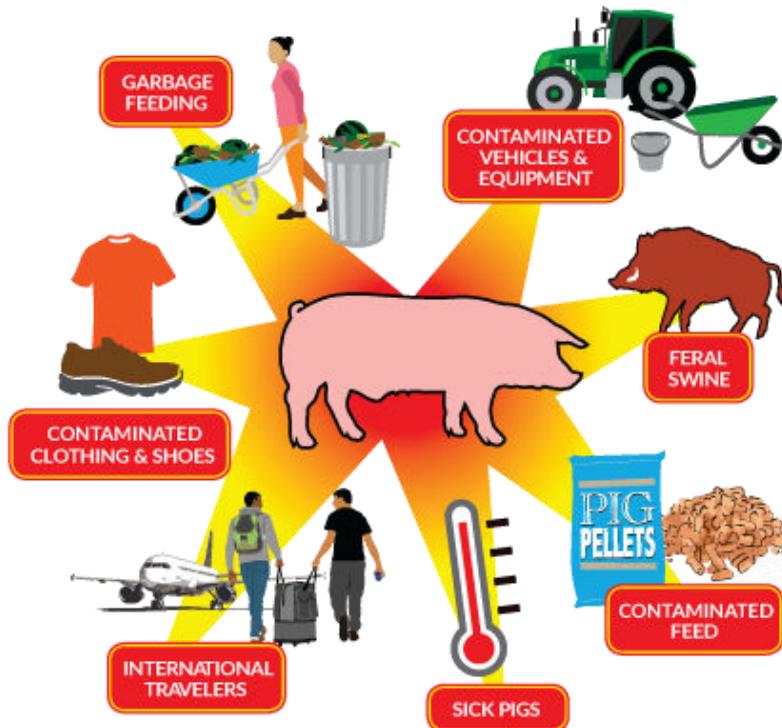
Effect of particle size and H₂O₂/PAA concentration on the efficacy of an aerosol decontamination system for items entering swine farms



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Why do we use aerosol decontamination systems?



- Biosecurity Enhancement
- Risk Mitigation
- Safer Supply Entry*

What we know about foggers today...

- Goals
 - To quickly and completely disinfect items entering swine farms.
 - Reduce risk of pathogen entry.
- Reality
 - Commercial foggers result in incomplete disinfectant contact to all sides of objects.
 - Manipulation of objects is required for complete disinfectant contact.



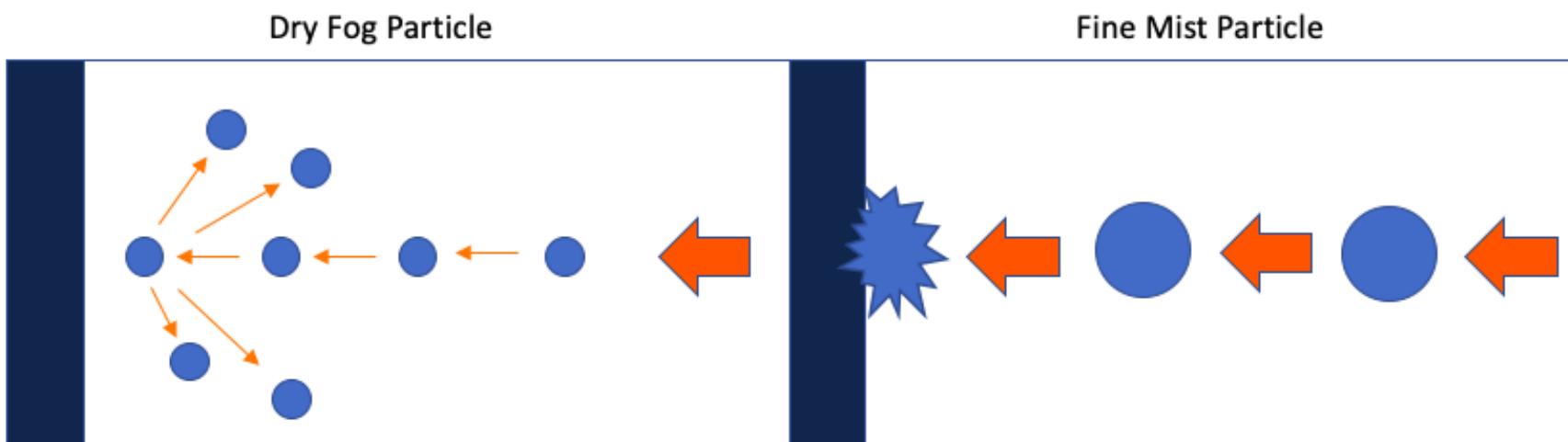
There are 2 aims of the study...

- Does aerosol particle size impact fumigation practices?
- What effect does composition of disinfectant have on efficacy?
 - Hydrogen Peroxide (H₂O₂)
 - Peracetic Acid (PAA)

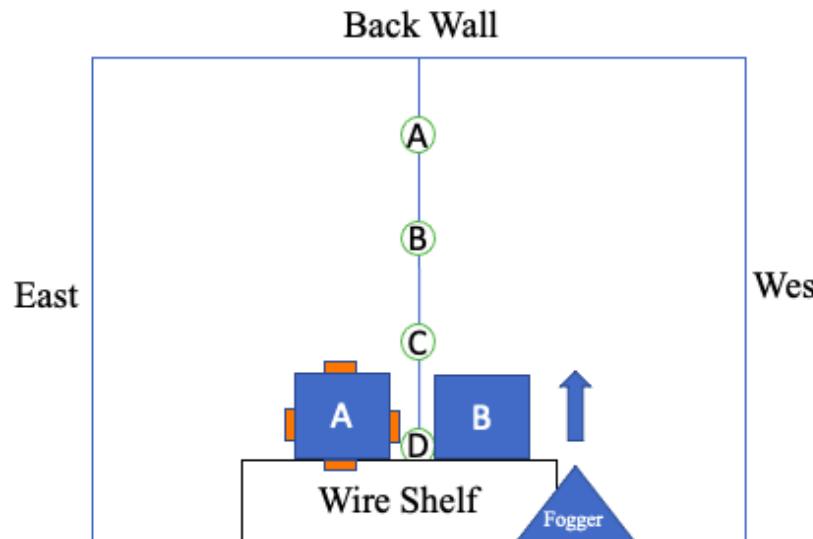
Significant differences in droplet size...



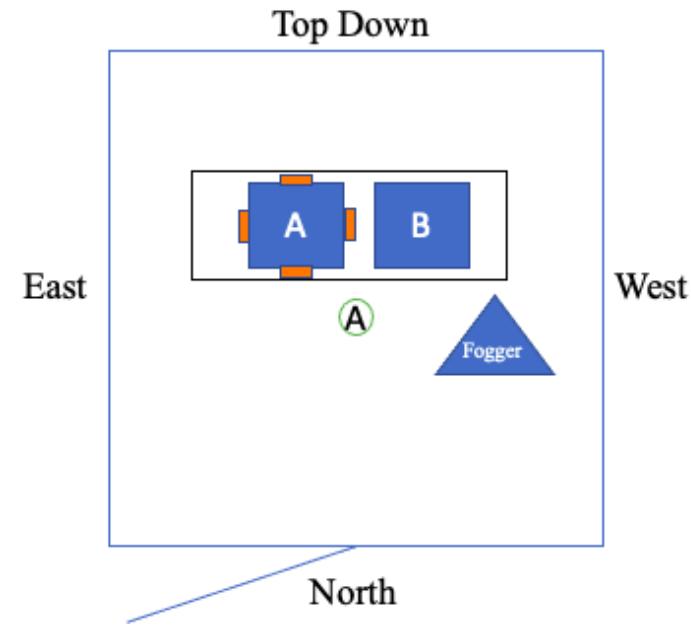
Dry fog droplet actions...



The treatment room model...



West



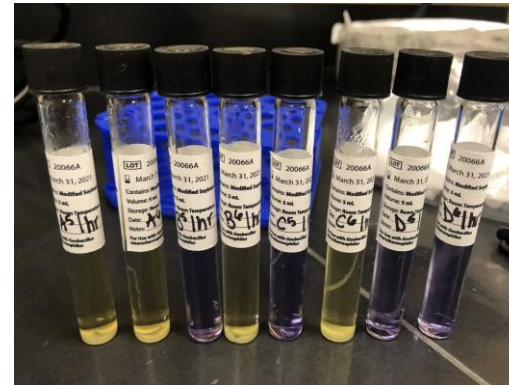
Increasing liquid sterilant concentrations



	Actril 200ml	Minncare 9.5ml	Minncare 19 ml	Intervention 117.5 ml
H2O2 %	1.0%	1.0%	2.0%	2.0%
PAA %	0.08%	0.21%	0.42%	0%

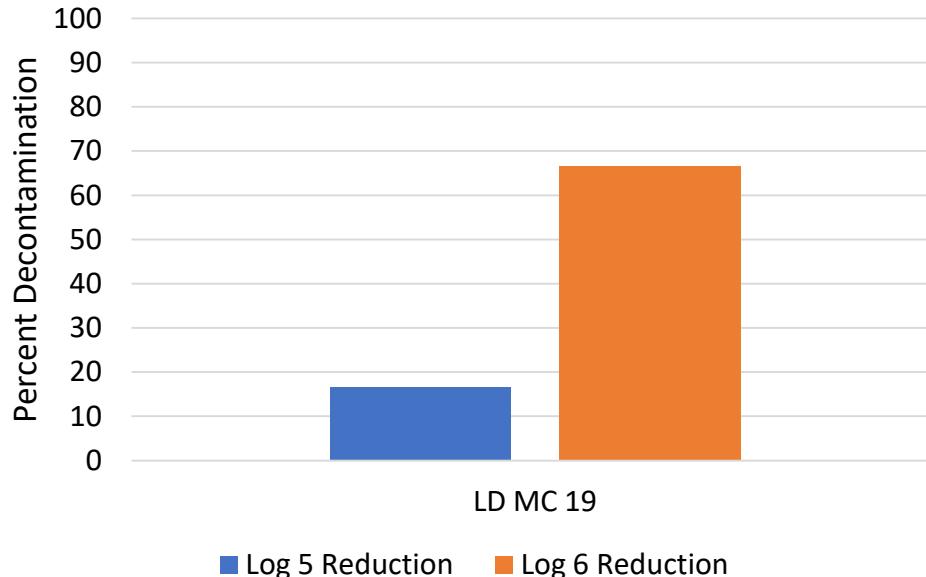
The standard validation sampling process:

- Log 5 & Log 6 Geobacillus Biological Indicator Strips placed on box and subject to treatment.
- Room remained sealed for 1 hour.
- BI Strips were transported to the lab for culture & incubation.



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Large droplets do not permeate...



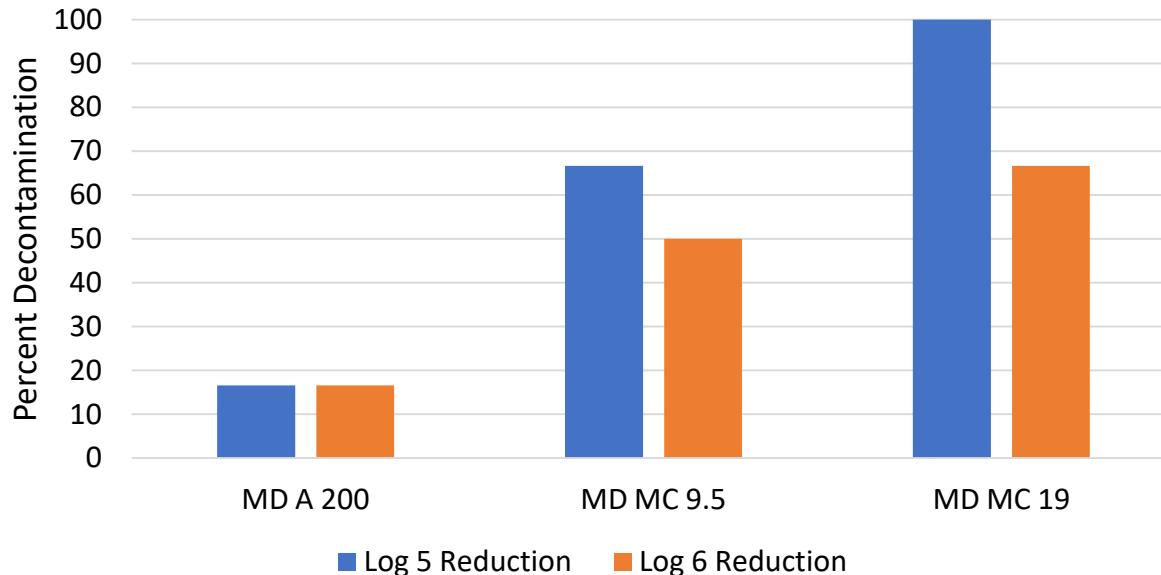
SD – Dry fog nozzle (5.9 um droplet)
MD – Hurricane fogger (14 um droplet)
LD - Hurricane fogger (26 um droplet)

A – Actril
I - Intervention
MC – Minncare



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Medium droplets can permeate better...

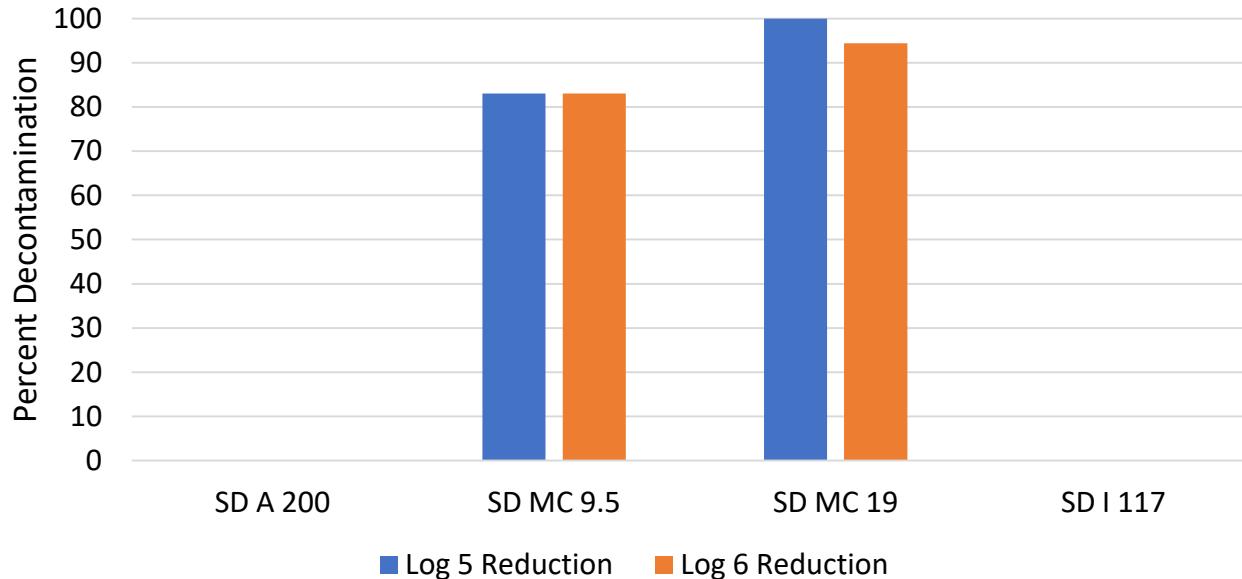


SD – Dry fog nozzle (5.9 um droplet)
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Small droplets and high concentrations achieve decontamination...

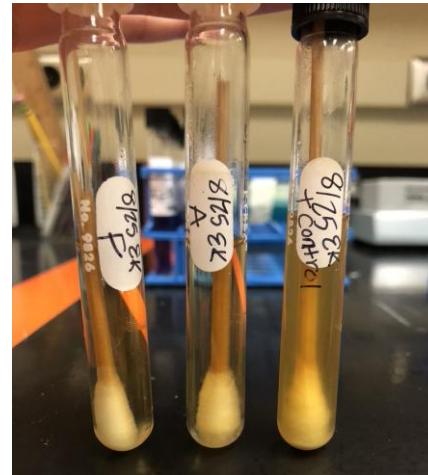


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Log 5 reductions = PRRS inactivation and disinfected manure...

- PRRS MLV
 - Direct spray
 - MD fog treatment
 - Viral inactivation
- Organic Material
 - Manure slurry
 - MD fog treatment
 - Neg. for bacterial growth



The benefits of H2O2/PAA...

- **Fully biodegradable**
 - Dissociates to vinegar (acetic acid), oxygen and water
- **Human and food safe**
 - No toxic aldehyde vapors
- **Less corrosive** than aldehyde-based products
- **No detergent residue** on items.
- **Registered by the EPA** for use in pharmaceutical clean rooms.



The benefits of using a Dry Fog System...

- **No electrical** requirement at the room.
 - No fogger or fan outlets to maintain.
- Use an **easy to service air compressor** unit.
 - Familiar equipment for any maintenance team.
- **No residue or liquid pooling** present after treatment.
 - Easy clean up between uses.
- Can be scaled and implemented to **any room size**.



Promising conclusions

- **Effective aerosol decontamination** of items entering swine farms **is possible** without item manipulation during treatment.
- Complete object disinfection requires droplet sizes less than 14 μm .
- **Optimal disinfectant** droplet size is **less than 6 μm (Dry Fog)**.
- H₂O₂ and PAA concentrations should be used **above 4.2 and 0.13 ppm**.

References:

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Acknowledgements

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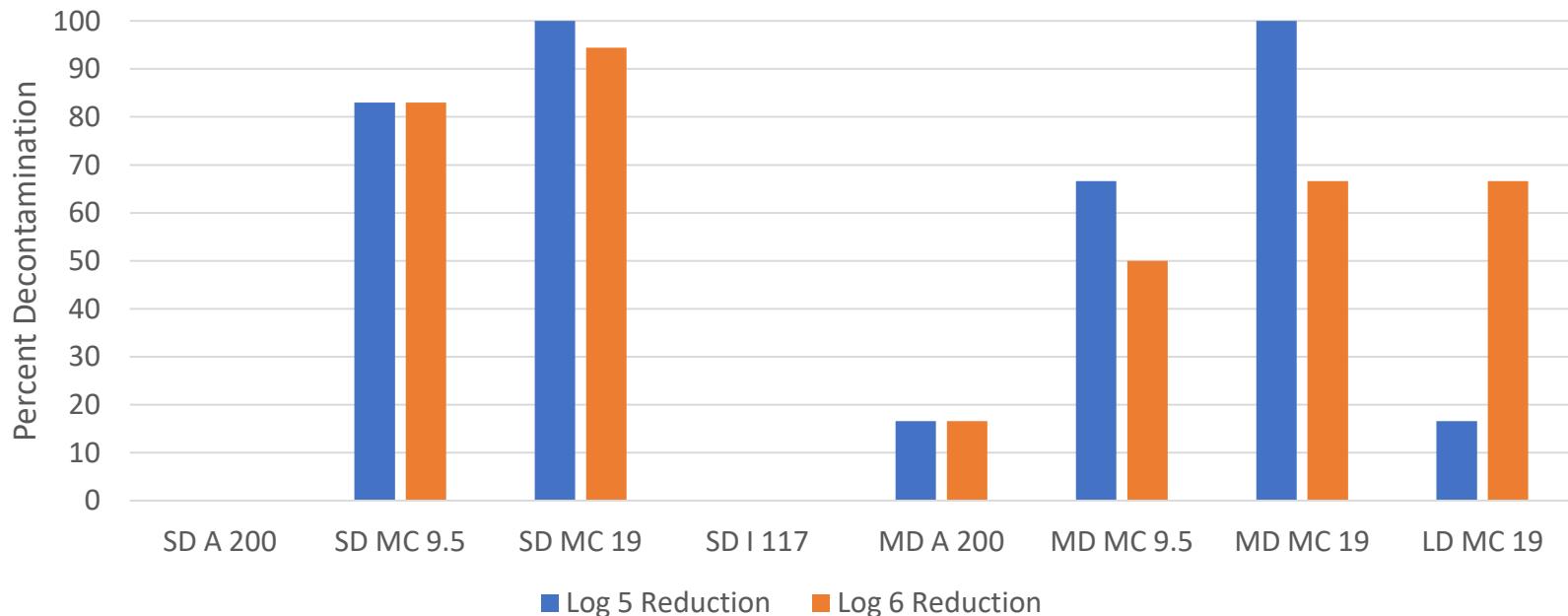


Thank You

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Percent Log 5 & 6 Reductions...



SD – Dry fog nozzle (5.9 um droplet)

MD – Hurricane fogger (14 um droplet)

LD - Hurricane fogger (26 um droplet)

A – Actril

I - Intervention

MC – Minncare



Log 5 Box Side Reductions...

	Front	Side Between	Back	Side Outside	Top	Bottom	Total
Treatment	A	B	C	D	E	F	Pos
SD A 200 r1	+	+	+	+	+	+	6
SD A 200 r2	+	+	+	+	+	+	6
SD A 200 r3	+	+	+	+	+	+	6
SD MC 9.5	-	-	-	-	-	+	1
SD MC 19 r1	-	-	-	-	-	-	0
SD MC 19 r2	-	-	-	-	-	-	0
SD MC 19 r3	-	-	-	-	-	-	0
SD I 117 r1	+	+	+	+	+	+	6
SD I 117 r2	+	+	+	+	+	+	6
SD I 117 r3	+	+	+	+	+	+	6
MD A 200	+	+	+	+	-	+	5
MD MC 9.5	-	+	-	-	-	+	2
MD MC 19 r1	-	-	-	-	-	-	0
MD MC 19 r2	-	-	-	-	-	-	0
MD MC 19 r3	-	-	-	-	-	-	0
MD MC 19 r4	-	-	-	-	-	-	0
LD MC 19	-	-	-	-	-	+	1



Log 6 Box Side Reductions ...

	Front	Side Between	Back	Side Outside	Top	Bottom	Total
Treatment	A	B	C	D	E	F	Pos
SD A 100 r1	+	+	+	+	+	+	6
SD A 200 r2	+	+	+	+	+	+	6
SD A 200 r3	+	+	+	+	+	+	6
SD MC 9.5	-	-	-	-	-	+	1
SD MC 19 r1	-	-	-	-	-	-	0
SD MC 19 r2	-	-	-	-	-	+	1
SD MC 19 r3	-	-	-	-	-	-	0
SD I 117 r1	+	+	+	+	+	+	6
SD I 117 r2	+	+	+	+	+	+	6
SD I 117 r3	+	+	+	+	+	+	6
MD A 200	+	+	+	+	-	+	5
MD MC 9.5	+	+	-	-	-	+	3
MD MC 19 r1	+	-	-	+	-	-	2
MD MC 19 r2	-	-	+	-	-	+	2
MD MC 19 r3	-	-	+	+	-	+	3
MD MC 19 r4	-	-	-	-	-	+	1
LD MC 19	-	-	+	-	-	+	2

