Low frequency aeration of pig slurry affects slurry characteristics and emissions of greenhouse gases and ammonia

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“A short term, low frequency aeration of slurry may reduce NH₃ emissions”
Hypothesis

Feeling?

- Is it true or not?
- Understand the mechanisms

Objectives:

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What could we expect?

$NH_3$ increases with:
- $\uparrow$ pH
- $\uparrow$ Temperature
- $\uparrow$ Wind speed
- $\uparrow NH_3/NH_4^+$ content
- $\downarrow$ Crust

Aireation causes

Mixing
- $\downarrow$ surface pH
- $\downarrow$ crust formation
- $\downarrow$ Temperature
- Releases $CH_4$

Aerobic degradation
- $\uparrow$ bulk pH
- $\uparrow$ temperature
- Inhibits $CH_4$

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What we did

Pig farm
Fattening pigs
6 m³ slurry

6 tanks, 1 m³ each
- 3 control
- 3 aeration

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What we did

Aeration

2 minutes every 6h
(3, 9, 15, 21h), 10 m3/h

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**Phase 1**
No aeration

**Phase 2**
Aeration

**Phase 3**
No aeration
What we found

**NH₃**
- Increases
- Reduces CH₄

**CO₂**
- Increases NH₃
- Reduces CH₄

Aeration:

*How and Why?*

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Surry changes

Phase 1
No aeration

Phase 2
Aeration

Phase 3
No aeration

pH

pH raises + No crust formation

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Slurry changes

No significant effect on temperature

During the aeration!!!???

3 am Raises

3 pm Drops

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For NH₃

Phase 1
No aeration

Phase 2
Aeration

Phase 3
No aeration

NH₃ emission (g m⁻³ day⁻¹)

08/06 18/06 28/06 08/07 18/07

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For CH$_4$

Phase 1
No aeration

Phase 2
Aeration

Phase 3
No aeration

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NH₃ in detail

Aeration 2 minutes

Aeration 2 minutes
For CH$_4$

Log scale!

Aeration 2 minutes
To summarize

Aeration increases $\text{NH}_3$  ↓ surface pH

crust formation  ↑ bulk pH

$\text{CH}_4$ release  Aeration Decreases $\text{CH}_4$

$\text{CH}_4$ inhibition

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