Chemical Causes of Pig-house Odour

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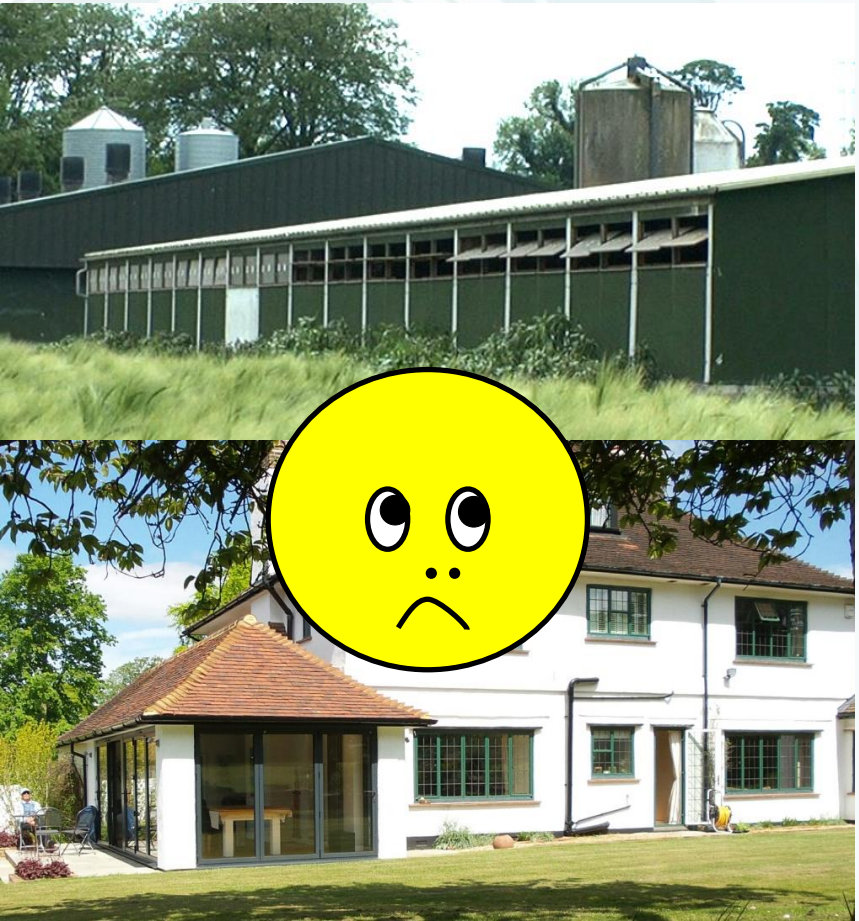
The problem with pig-houses is ....



... the neighbours!

- Tight legislative / environmental requirements
- Restrictions on industry development
- Ammonia cited as main culprit
- Review requested ...

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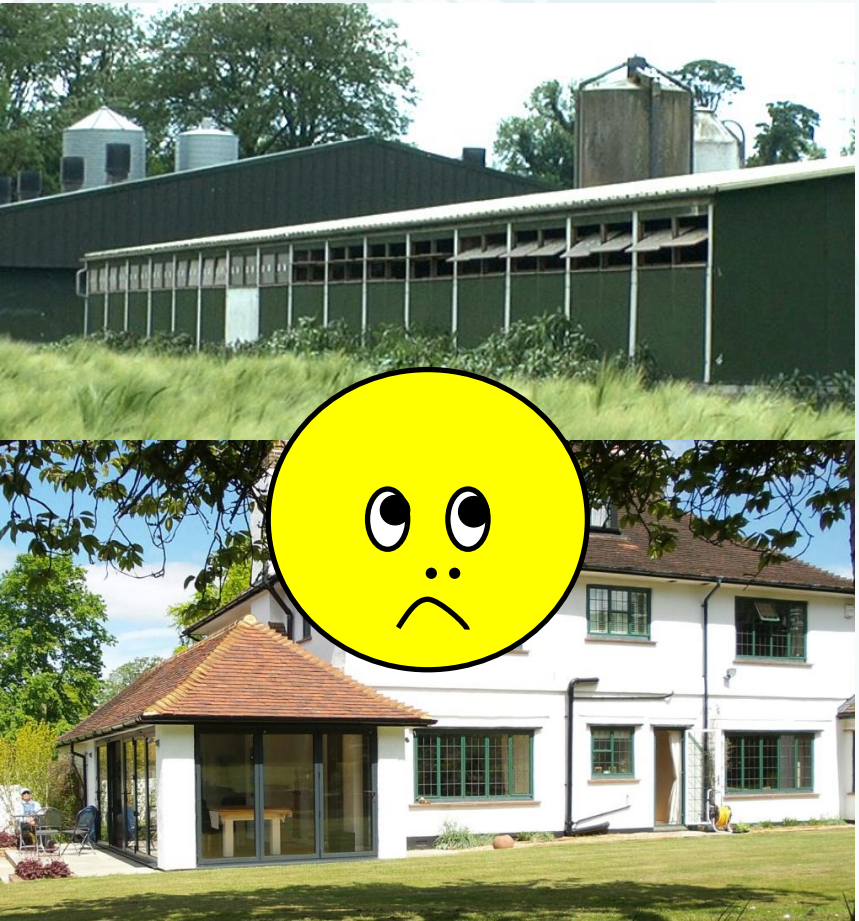

... the neighbours!

Review to ...

- list methods ... reduce the level of ammonia and odour emitted from pig houses
- provide an understanding of the factors and conditions creating ... odour in pig housing

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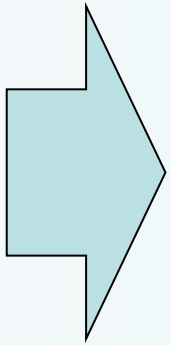
Odours from pig-houses
Literature

- Number of papers = 89
- Number of compounds reported = 500
- Only some researchers give concentrations in air
- Compounds contributing to noxious odour not clear!



Use Odour Activity Values

“Odour activity values”

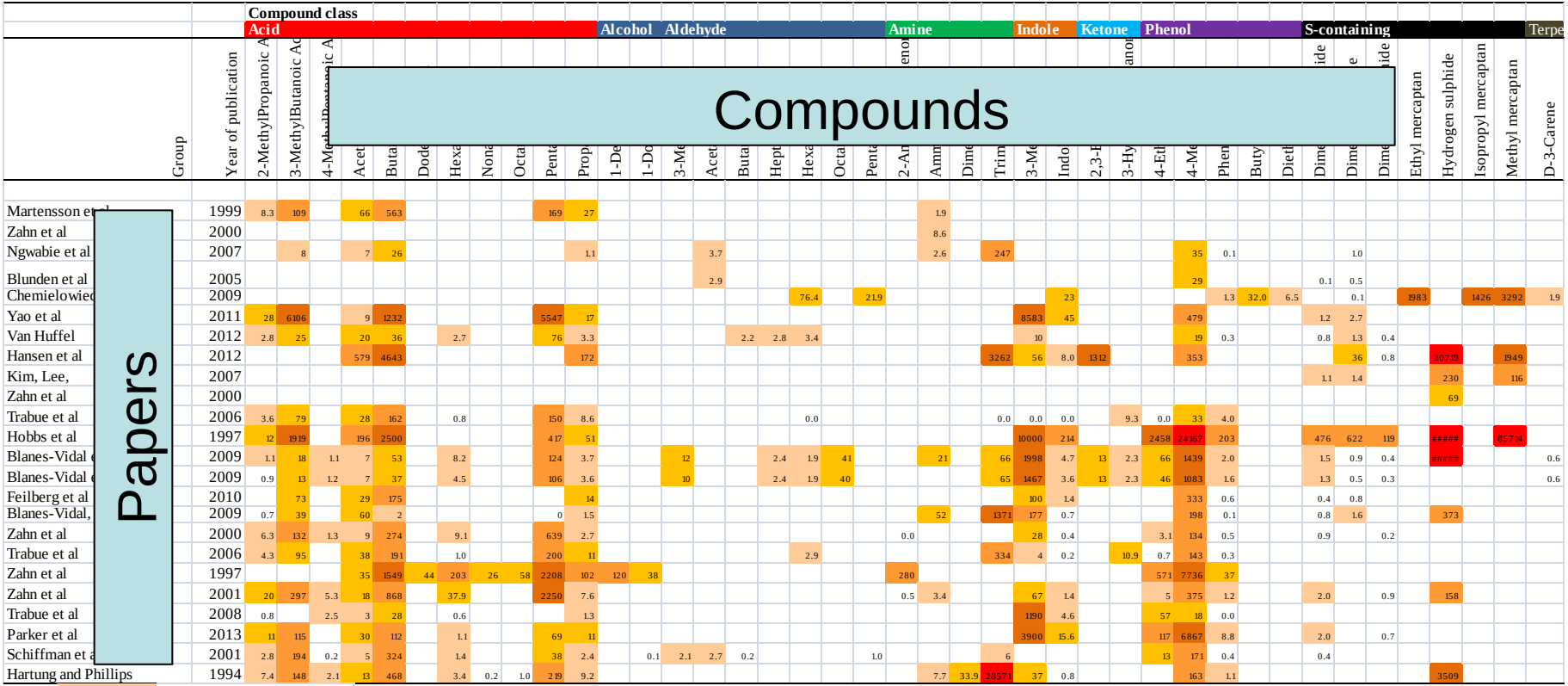
- Usually used for flavour studies
- Odour activity value (OAV) =
  concentration /odour threshold
- **Odour threshold** = concentration in air at which 50% people detect an odour

Method

- Collated data on concentrations in air
  - 136 compounds, 21 papers
  - Different analysis methods, sampling techniques
    - ‘Tedlar bag’ versus ‘thermal desorption’
- Inconsistent odour threshold data
  - Compiled “consistent” sets:
  - Devos et al. 1990 and Nagata 2003

Devos, M., Patte, F., Rouault, J., Laffort, P., and Gemert, L. J. (1990); Nagata, Y. (2003)

OAVs for main compounds, 21 papers

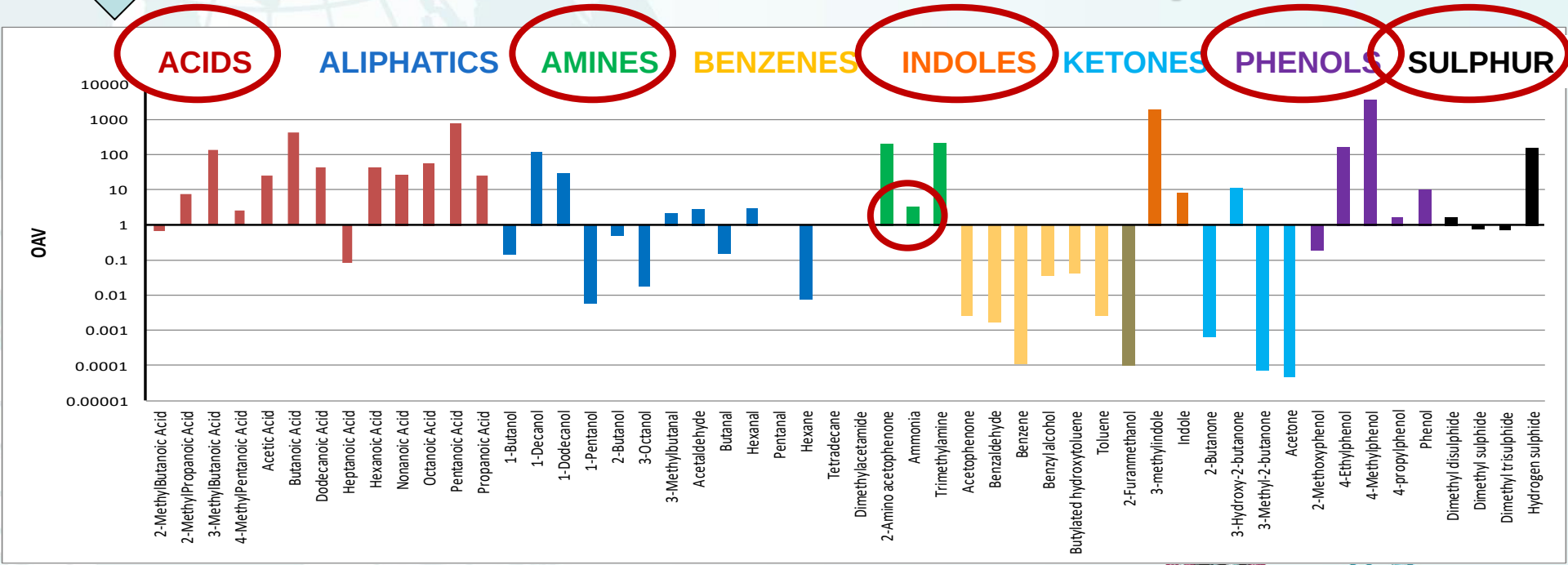


Thresholds: Nagata+

OAV>1 = above threshold

Results

Main odours - Thermal desorption



Probable additive effects

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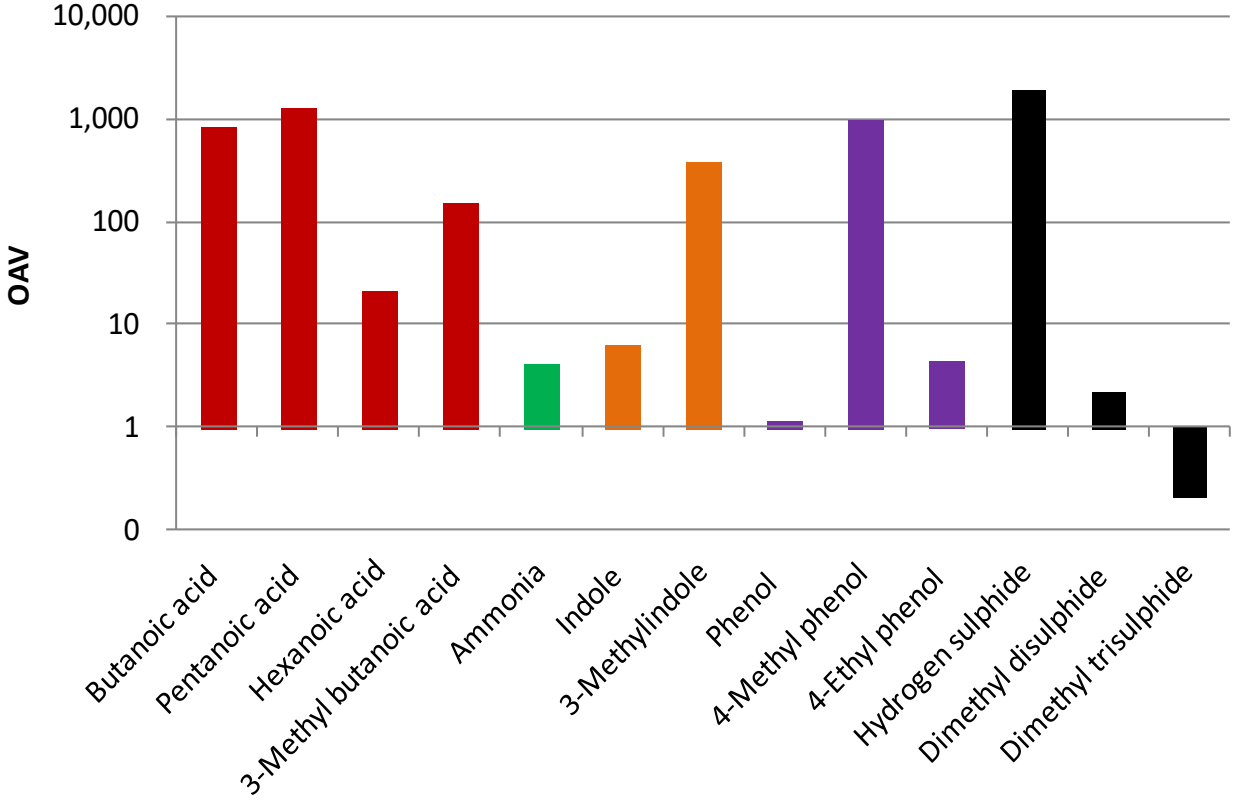
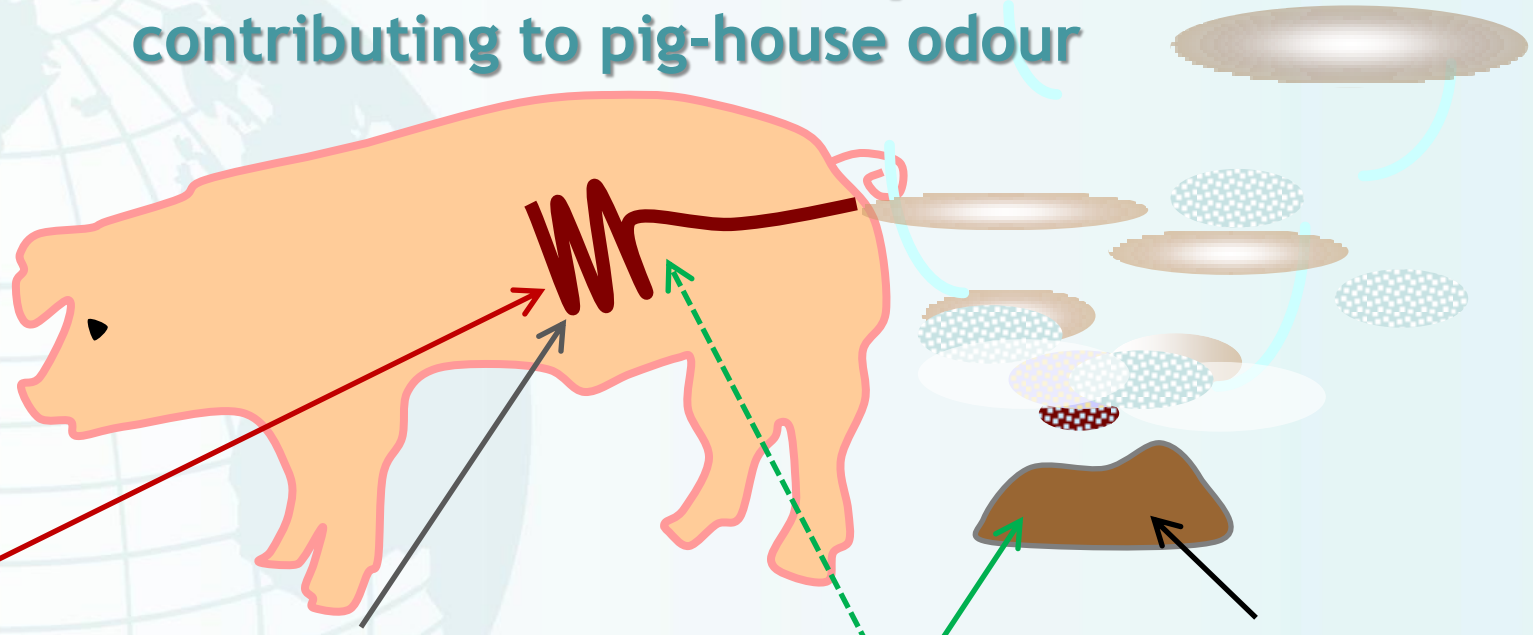
AFBI analyses
- main odorous compounds in pig houses

- OAVs high
  - as expected!
- Main odour compounds:
  - **Hydrogen sulphide**
  - **Acids**
  - **4-methylphenol (p-cresol)**
  - **3-methylindole (skatole)**



Classes of odour compounds

contributing to pig-house odour



ACIDS
- from proteins and carbs
- large intestine
- manure
- anaerobic

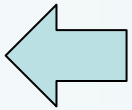
PHENOLS , INDOLES
- intestine
- microbial fermentation
- tyrosine and phenylalanine
- tryptophan

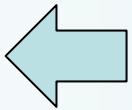
AMMONIA & AMINES
- urea, urine
- manure
- less from intestine

S COMPOUNDS
- in manure
- anaerobic bacteria

Which factors affect the impact of odour compounds?

- Individual papers on different factors
- Applied OAVs
- Effect of
  - Age group of pigs
  - (Distance downwind)
  - Type of slurry tank
  - Covering slurry tanks
  - Pig diets





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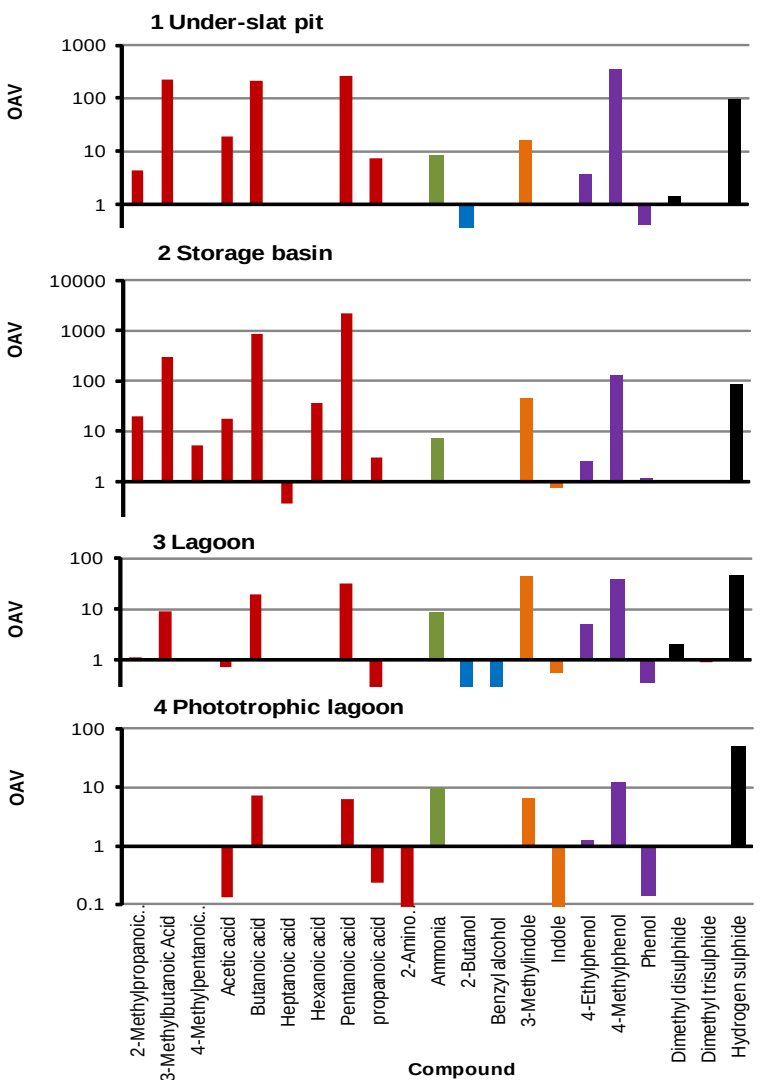
Effect of
Type of slurry tank

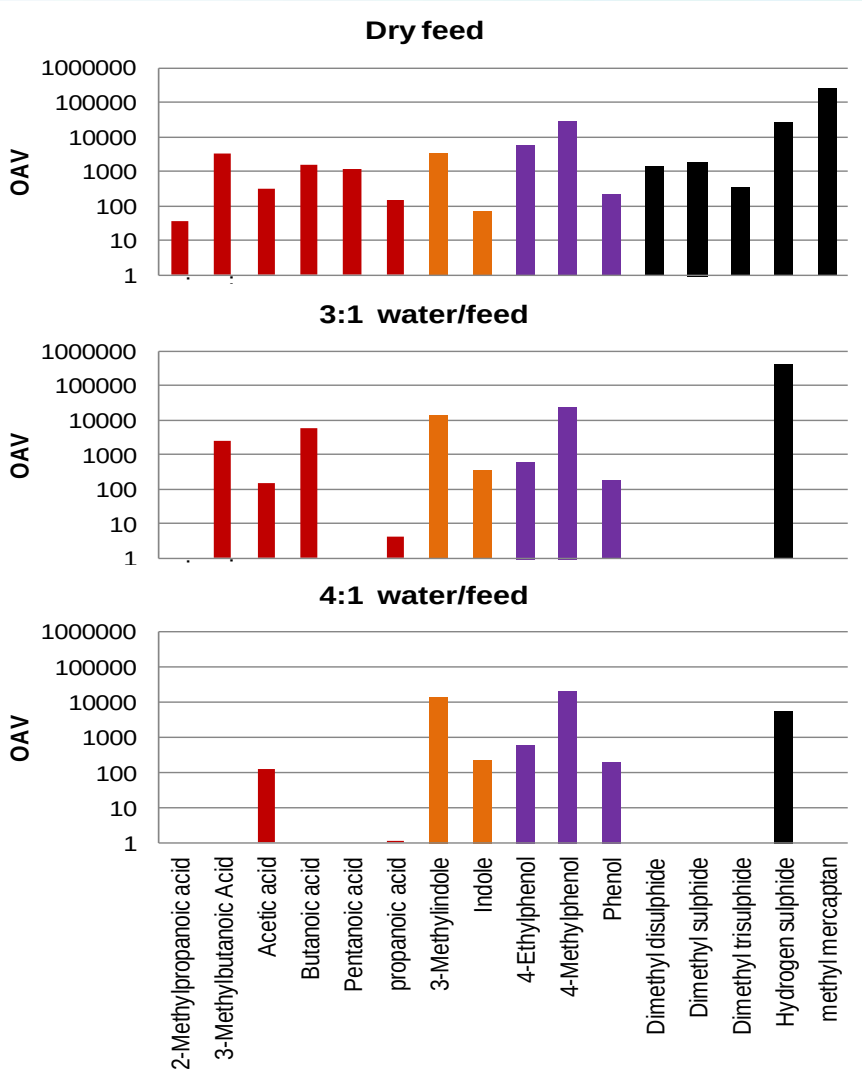
- **Acids** and **phenols** decreased in lagoons
- **Ammonia**, **skatole** and **S-compounds** not much decreased



Zahn et al 2000

Effect of Type of diet

- Most acids (**red**) and S compounds (**black**) decreased with liquid diets
- Phenols (**purple**) and skatole/indoles (**orange**) were not decreased



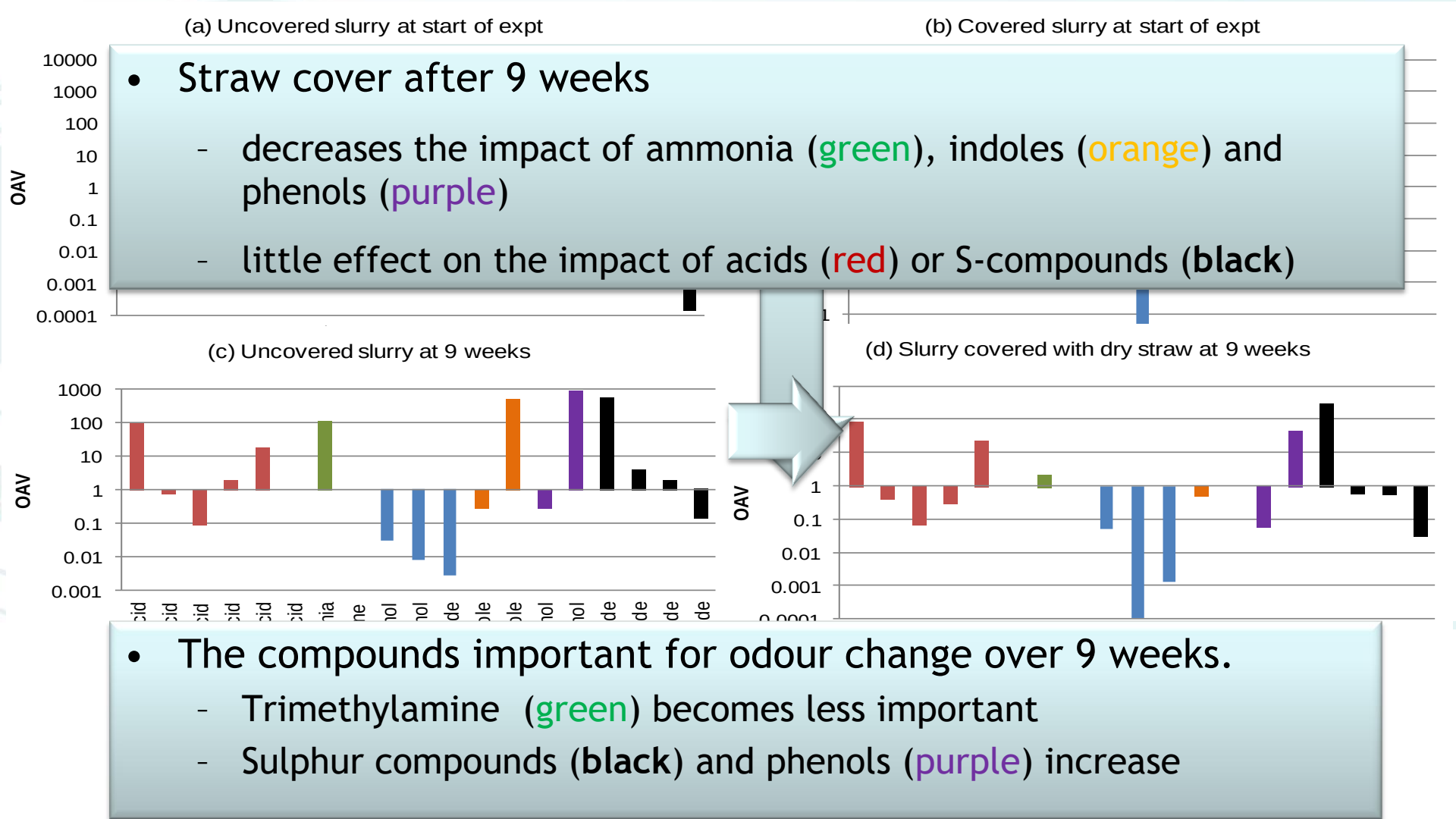
Hobbs et al., 1997

Gaps in knowledge

- Combination abatement treatments
- Compound classes important for downwind odour
  - **Few analyses and few compounds measured**
- Impact of diet on gut microflora
  - **… and odour formation**
  - **Fat content?**
- Effect on off-flavours in meat?

Conclusions

- Acids, sulphur compounds, indoles, phenols and amines contribute to pig-house odour
  - Ammonia is not the most important
- No single treatment appears to reduces all odour compound classes
  - BUT some treatments reduce some odour compounds
- Could help to devise new combined strategies for abatement

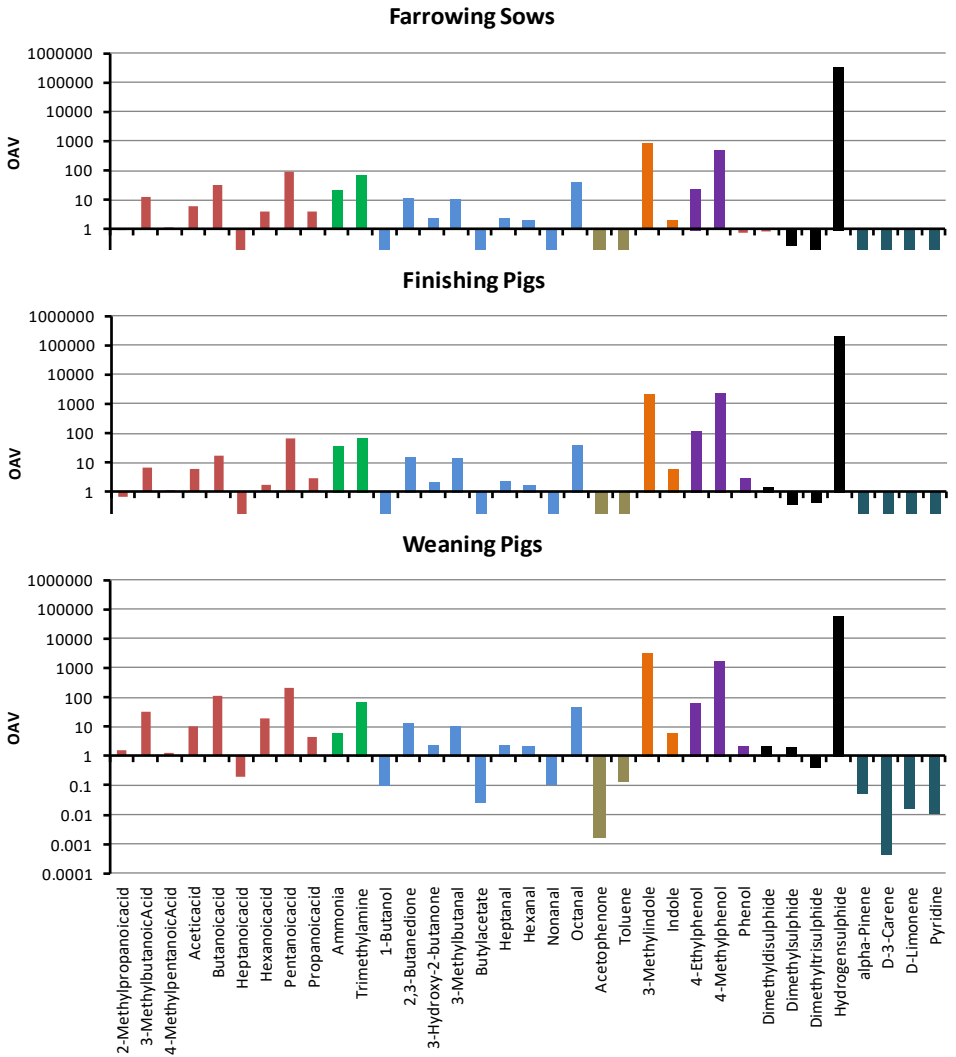


- Straw cover after 9 weeks
  - decreases the impact of ammonia (green), indoles (orange) and phenols (purple)
  - little effect on the impact of acids (red) or S-compounds (**black**)

- The compounds important for odour change over 9 weeks.
  - Trimethylamine (green) becomes less important
  - Sulphur compounds (**black**) and phenols (purple) increase

Effect of Age group of pigs

- Not much effect



Blanes-Vidal et al., 2009