Meds In The Muck: Assessing Pharmaceutical Breakdown In Slurry Storage

Jake Henn*, Stephen Cheung, Jo Cable, Ben Ward, Devin Sapsford. Email: hennj@cardiff.ac.uk

Dairy cattle and veterinary medicines

Dairy farms use a range of chemicals for disease control

- Antibiotics
- Painkillers

- Cleaning agents
- Anti-parasites

50% antibiotic reduction since 2014[1]

- Vet medicines and pathogens may be excreted and enter with cleaning agents into slurry

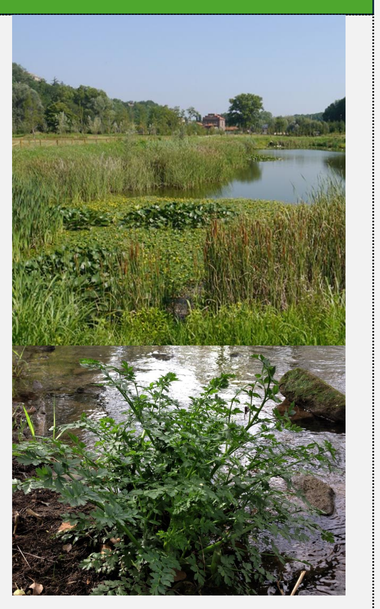
Slurry storage - is it enough?

- Washings and animal waste from farm buildings typically end up here.
- Structure supports degradation in set reaction conditions
- 3 week minimum between spreads – most spread twice a year

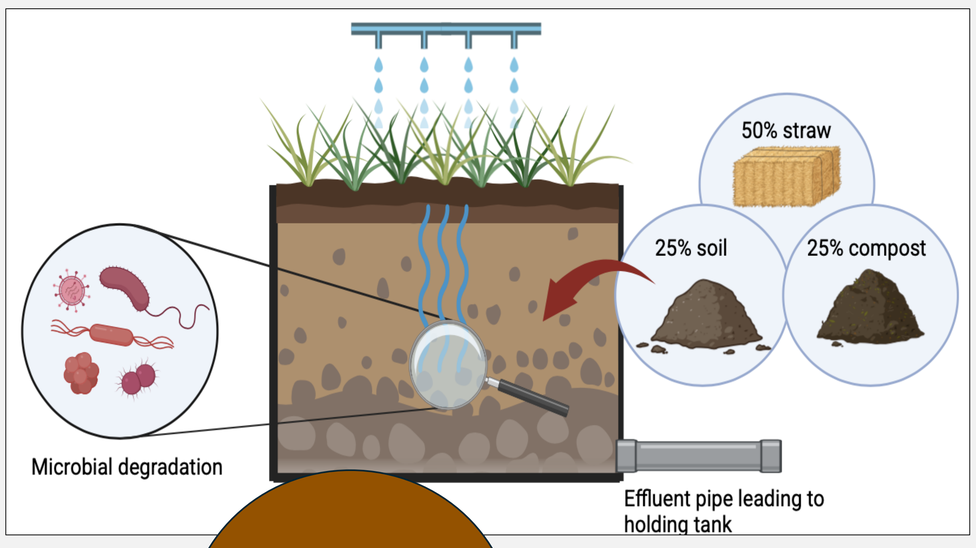
- **<u>Nature based solutions hold promise for chemicals that would otherwise be sprayed on the field</u>**

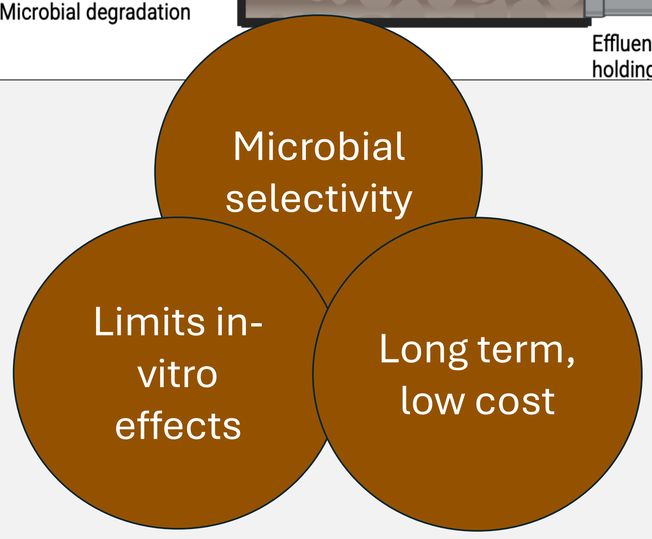
Nature-based solutions in action

- Constructed wetlands effective at reducing pharmaceutical pollution[2]
- However, large land requirements so poor option in certain locations
- Also, wetland introduces a habitat for snails, and water dropwort – disease risk[3]



Biobeds are a nature-based solution:





- Biobeds provide point source treatment for contaminated water
- Proven efficacy against pesticides[4]

Non Steroidal Anti Inflammatory Drugs case study and research aims

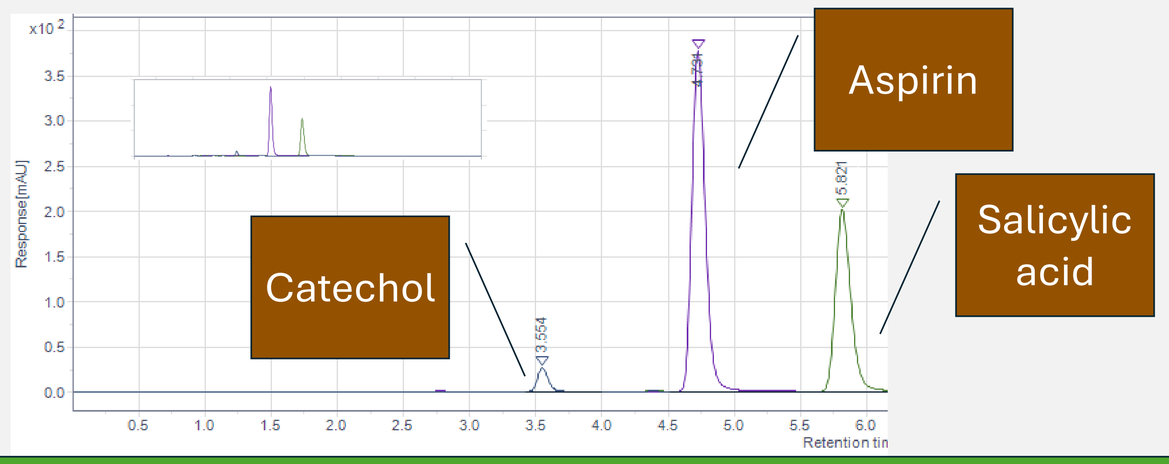
Aspirin selection:

- Commonly detected in trace quantities
- Lack of regulated usage has prompted health warnings[5]

To judge effectiveness of biobed type system:

- Will analytes bind, or be degraded by soil?
- What is the saturation limit and rate of degradation?

HPLC separation and retention time of the target analytes



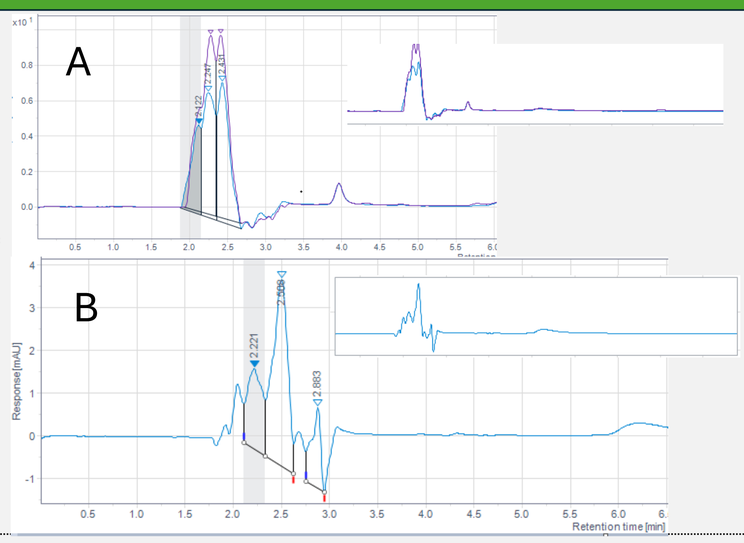
Solid phase extraction allows aspirin detection down to 1.24 µg

Aspirin in water (concentrations from 0.1 - 0.01 mg/ml) was dosed onto soil

After 1 week:

A) No analytes detected in water, indicating degradation or binding

B) No analytes detected after extraction indicating degradation alone



Research next steps:

- Chemically and biologically complex soils
- Analytes with less susceptibility to degrade

References
1 Sutherland, N., Coe, S. and Balogun, B. (2023) *The UK's use of antibiotics*. UK Parliament Commons Library, 17 January. 2 Li et al. 2014. *Science of the Total Environment 468*: 908. Agriculture and Horticulture Development Board (AHDB). (n.d.). *Beef diseases directory*. 4 Castillo et al. 2008. *Journal of Agricultural and Food Chemistry 56*: 6206. 5 Global Ag Media (2024) 'FDA warns against use of unapproved aspirin in lactating dairy cattle', *The Cattle Site*, 24 October.