

Veterinary pharmaceuticals on farms

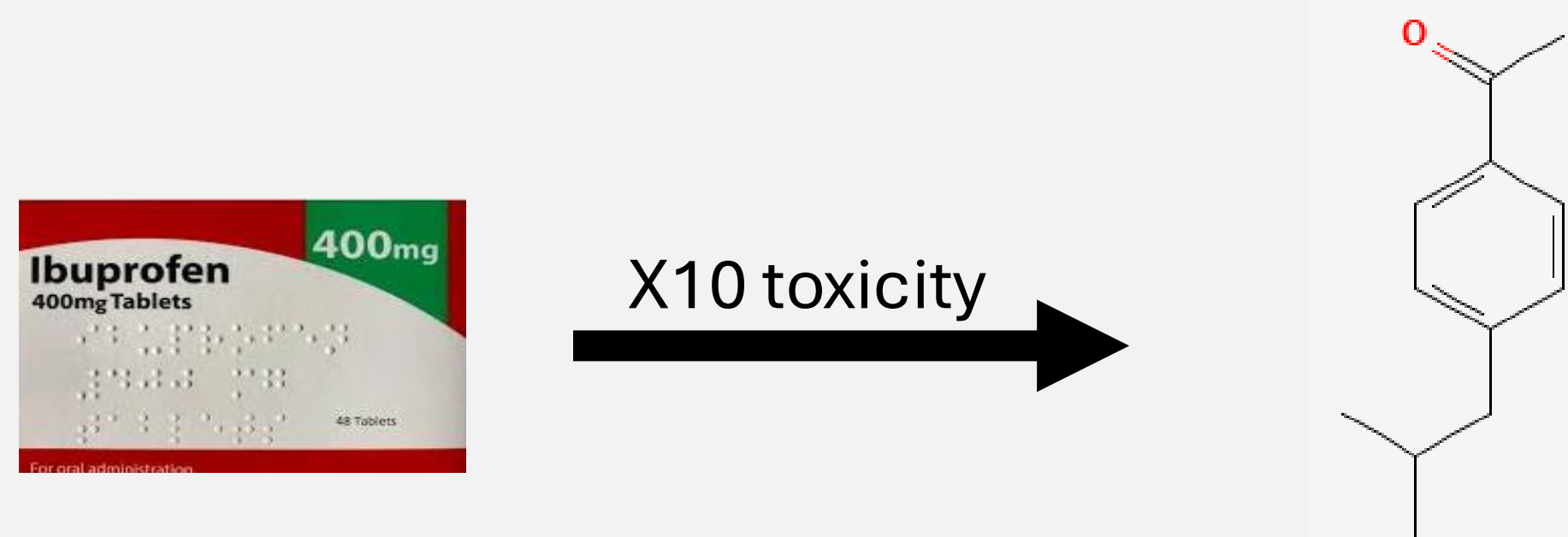
- Veterinary medicines are vital for treating diseases on farms
 - Veterinary medicine pollution threatens water quality, soil and animal health
- Pathways into the environment:

 1. Spread to land via manure and slurry¹
 2. Wash-off (if topical)²
 3. Spillages / incorrect disposal³

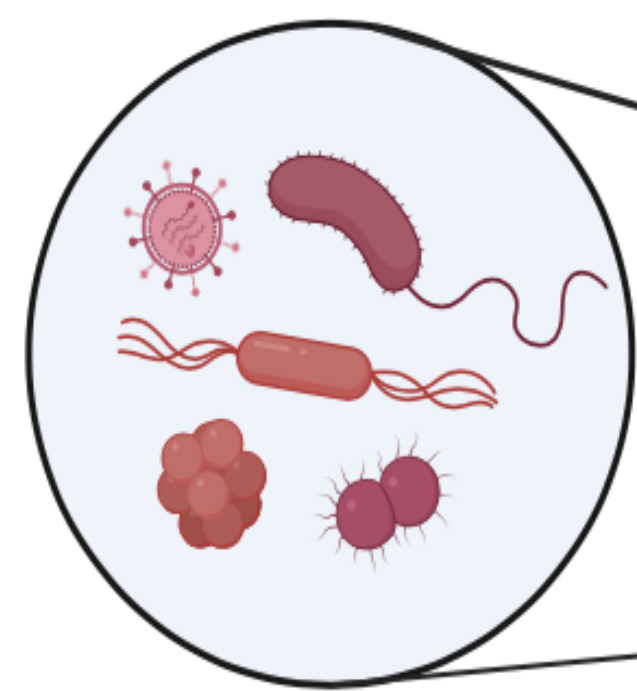

- Solutions needed to prevent release of veterinary medicines from farms
 - On farm treatment technology must be sustainable and affordable

Pharmaceuticals pose a heightened risk:

- 1 Low dosage effects - Pharmaceuticals designed to be effective at low concentrations
- 2 Off-target impacts - Pharmaceuticals designed to be effective at low concentrations
- 3 Metabolites and degradants - Active ingredients metabolised by the body or environment can become more toxic



Pollutants bind to soil - degraded by microbes



Biobeds – A Nature-based solution

Nature-based solutions (NbS)

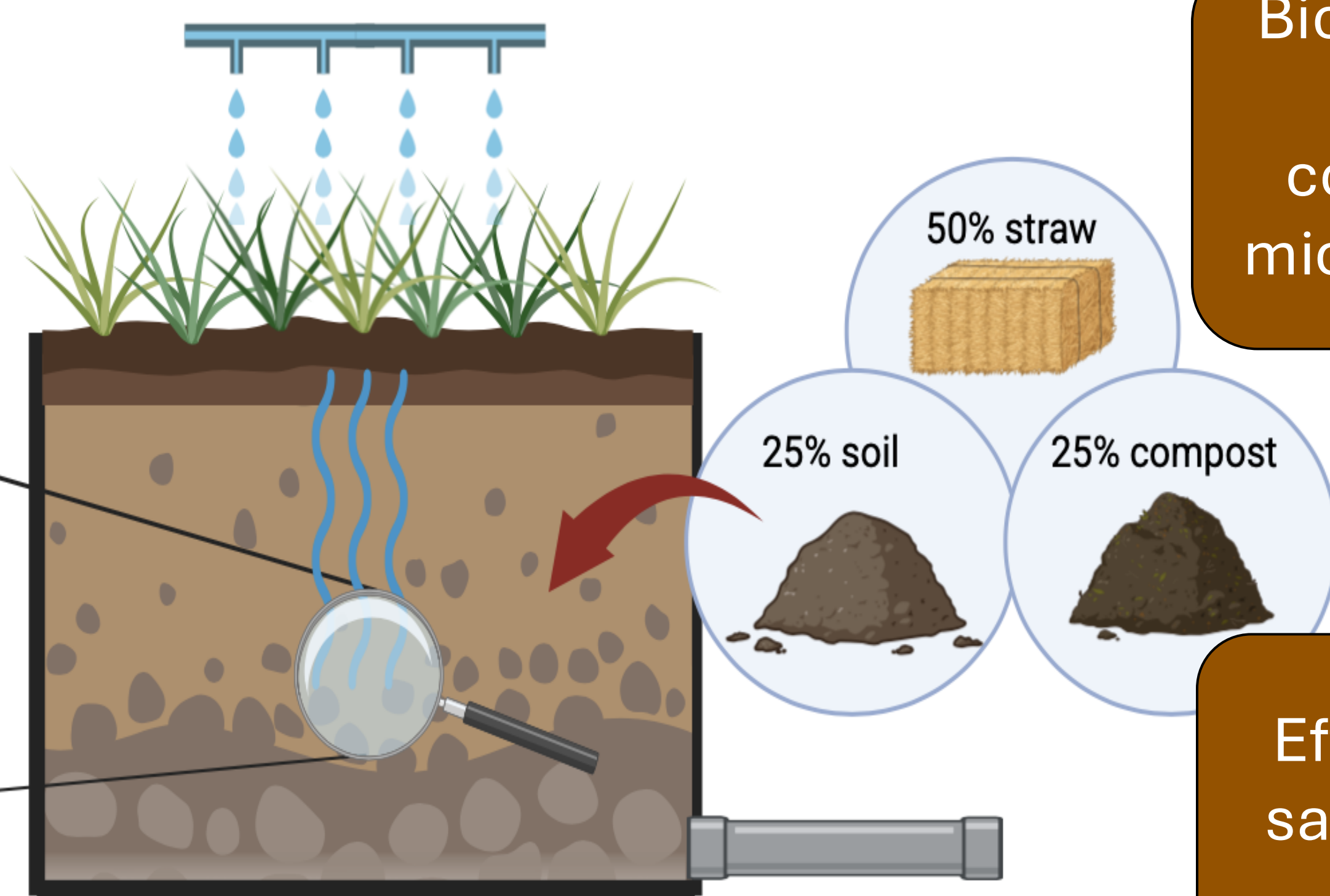
- NbS utilise natural processes to address socio-environmental issues
- Constructed wetlands show promise for treating wastewater but require large land areas

Benefits of a Biobed

- Long term, on-farm method for wastewater treatment
- Low cost for set up & minimal maintenance
- Requires small land areas – customisable dependant on farm needs
- Proven method for treating pesticide washings on farms

Pesticides in wastewater reduced by x100,000⁴

Biobed structure



Biomix provides optimal conditions for microbial growth

Effluent can be safely disposed

Proposal for Biobeds – Sheep dip

Background

- Sheep scab = major source of economic loss and threatens sheep welfare
- Diazinon Dipping – an organophosphate pesticide
- Need - sustainable and environmentally safe waste disposal option



Scab mites are increasingly resistant to the injectable treatment

Current waste removal options

1 Removal to waste treatment facility

- Transport infrastructure is poor
- Financially unsustainable



2 Spread to land

- Permit required by NRW – no longer issued
- Long-term plan to phase out completely
- Pollution of rivers is increasing

Freshwater rivers in Wales

PNEC: 0.01 ug/L

Mean conc: 0.00612 ug/L

Max conc: 0.866 ug/L

?

Current aims: Testing the efficacy of Biobeds

- Proof of concept: laboratory testing to assess the efficacy of Biobeds at degrading diazinon
- How might biological matter such as lanolin alter the microbial composition?

References

1. Gros et al. (2019) *Sci. Total Environ.* 654: 1337-1349. 2. Capleton et al. (2006) *Toxicol. Lett.* 163: 213-223. 3. Obimakinde et al. (2017). *ESPR.* 24: 3274-3279. 4. Fogg et al. (2003) Cranfield Centre for EcoChemistry Research Report No. JA3763E