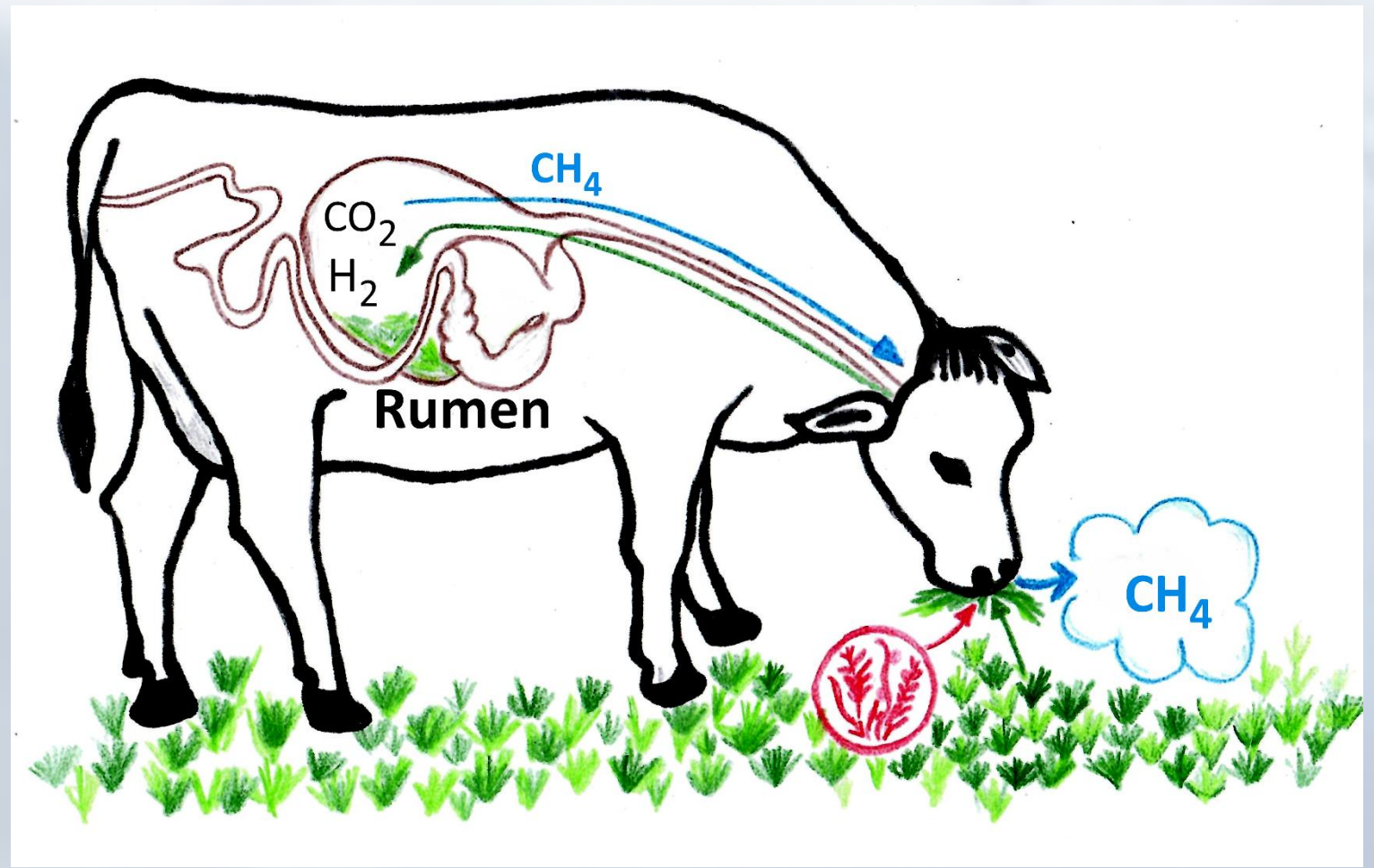
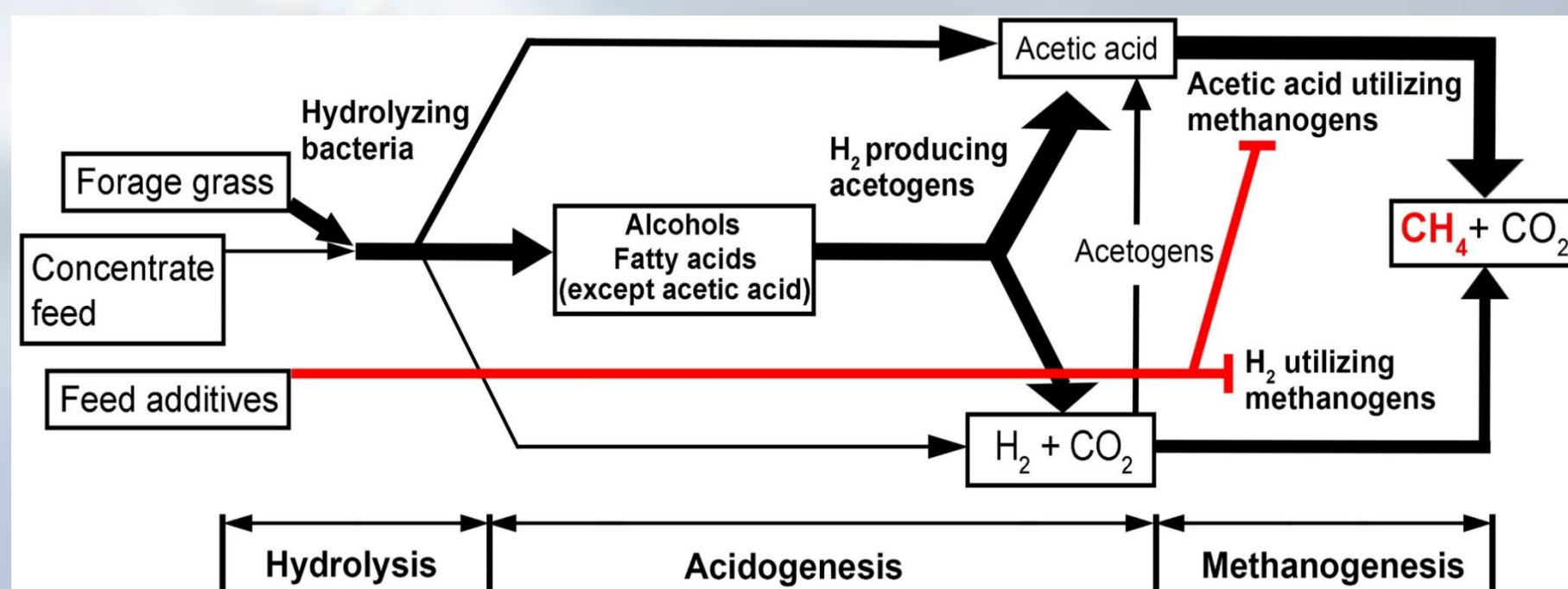


Food from grass: Genetics and Digital Twins to optimize sustainability



Cows do not directly use grass for growth: the microbes in their rumen produce enzymes that break down grass cell wall components like fibre and cellulose to a form that can be absorbed. Some products of the digestion are converted by the microbes to methane, a potent greenhouse gas.



About 7% of the energy a cow eats from grass is lost as methane. Can we reduce this methane production – reducing the environmental impact of cows and saving feeding costs?

Genetics is important for reducing methane:
Feed, Animal and Microbes all contribute and interact



Feed Genetics

- Cell wall components of grass can be changed to increase digestibility
- Oil content and simple carbohydrates can be increased in grasses bred for higher energy supply and digestibility



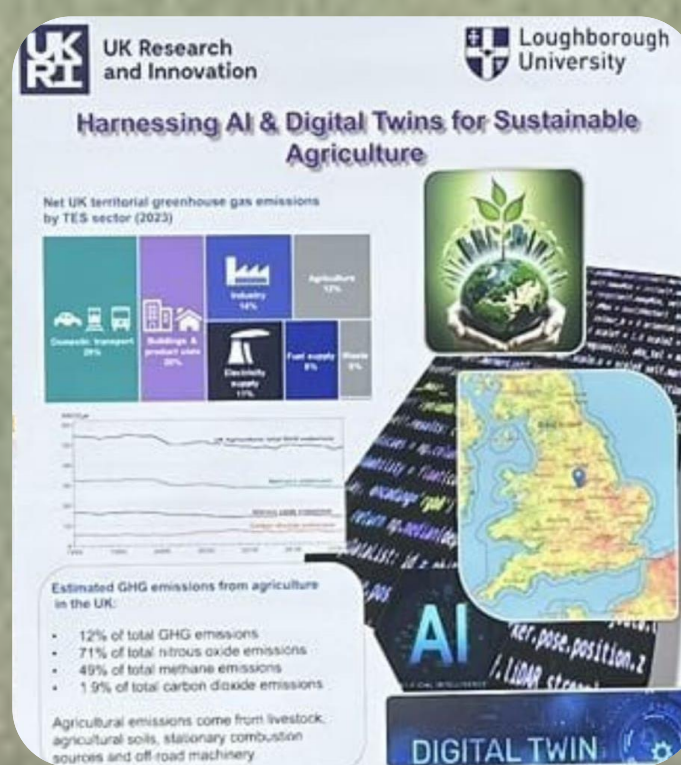
Animal Genetics

- Alteration and interactions with microbiome to reduce methane
- Faster growth, high fertility, and higher yield, using feed more efficiently
- Improved digestion of grasses



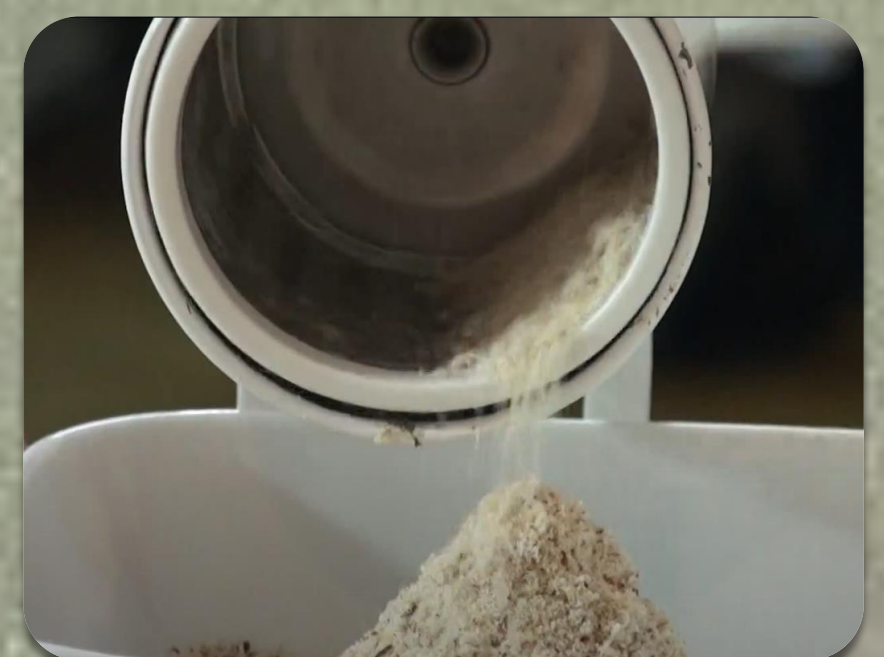
Microbiome Genetics

- Environmental factors and animal genetics influencing microbiome composition
- Considering metabolites and by products
- Reduction of methane producing substrates and methanogenic enzymes



Digital Twins

- Virtual model using real-world data to show methane production
- Allows optimization of approaches to produce food while minimizing environmental impact

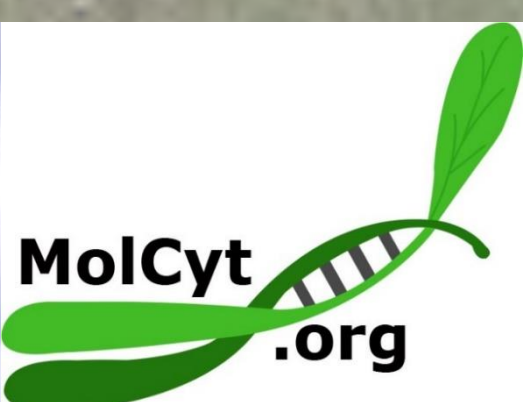


Feed additives

- Inhibit microbial methane production
- Red Algae (like the seaweed *Asparagopsis*)
- Drug enzyme inhibitors like 3-NOP (3-nitrooxypropanol)
- Essential oils, organic acids, probiotics and antimicrobial compounds can inhibit methane production



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