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Role of the glycome-microbiome axis on susceptibility to bovine viral infections and on animal welfare

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Bovine respiratory disease complex (BRDC) is prevalent and highly prioritized by the EU. It causes economic losses and impacts animal health and welfare. Addressing BRDC and promoting positive behaviors are crucial for maintaining animal well-being. The mucus layer in the respiratory tract acts as a physical barrier. It contains mucins and a microbial ecosystem, helping prevent pathogens entry. However, many pathogens use cell and mucin glycans (glycome) for binding and subsequent infection, leading to discomfort, illness, and compromised welfare. We will thus assess the dynamic relationship between airway mucin glycome, microbiome, and behavior of infected calves and whether perturbations of the microbiome can increase pathogen infectivity and animal distress. As a model, we will infect calves after antibiotic treatment with 2 major BRDC viruses (influenza D and bovine corona-viruses, both able to bind to similar glycan receptors), and *Mycoplasma bovis*, acting synergistically with those 2. Microbiome, glycome, health, welfare, and behavioral indicators will be monitored to i) **characterize the temporal patterns of respiratory and digestive microbiota (lung-gut axis), glycome, and behavior in healthy individuals compared to their challenged counterparts**, ii) **find glycome, microbial or behavioral fingerprints after challenge that predict disease severity and animal distress or resilience**, and iii) **address the impact of antibiotics on resistome and polymicrobial infection risk**.