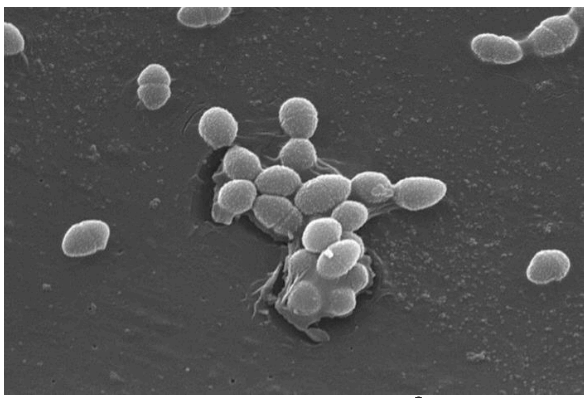
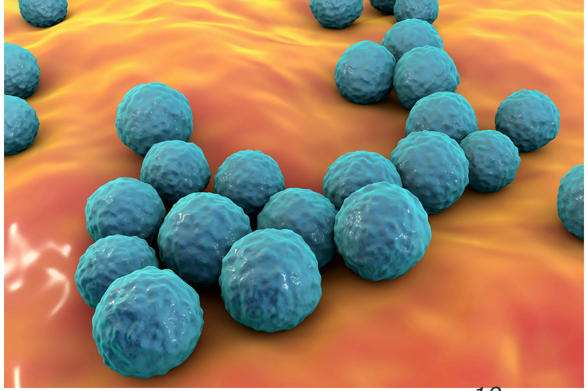
Enterococcus: Friend or Foe?



Picture 1: *Enterococcus spp*[9]

Enterococcus comprises a genus of Gram-positive, facultative anaerobic bacteria commonly found in the gastrointestinal tracts of humans, mammals, and birds. Though most species, including *E. faecalis*, *E. faecium*, and *E. cecorum*, are often considered normal members of the gut microbiota, they have also gained attention as opportunistic pathogens. The dual nature of *Enterococcus* spp. as both commensal and disease-causing organisms is an intriguing paradox that requires us to assess whether they are more of a friend or a foe, depending on the situation.

Enterococcus as a Friend



Picture 2: *Enterococcus faecium*[10]

In its natural environment of the gastrointestinal tract, *Enterococcus* plays a beneficial role in maintaining microbial balance and supporting host health. It contributes to nutrient metabolism, particularly the fermentation of carbohydrates and the production of lactic acid, which supports gut homeostasis.[1] Additionally, *Enterococcus* may play a role in defense against harmful pathogens. Some strains can produce bacteriocins, antimicrobial peptides that inhibit the growth of competing or harmful bacteria.[2] Compared to many lactic acid bacteria, *Enterococcus* have a broader tolerance to pH and temperature fluctuation. These characteristics have led to the use of certain strains of *Enterococcus* as probiotics for livestock, with a number of studies reporting positive impacts on health and performance.[3] However, recent concerns over the prevalence of virulence factors and antibiotic resistance genes harbored by many *Enterococcus* strains have raised safety questions on its use as a feed additive.

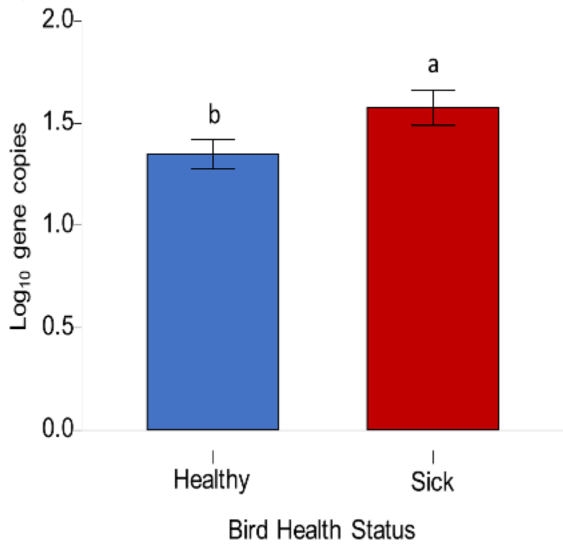
Enterococcus as a Foe

Picture 3: *Enterococcus cecorum*[11]

United Animal Health and Microbial Discovery Group have investigated *Enterococcus* species in broiler ceca of healthy (n=268) and sick (n=213) birds in a PathKinex™ surveillance of 41 farms. Sick birds (here defined as birds exhibiting inactivity, retarded growth, leg or foot problems, coughing, or signs of clinical disease upon necropsy) harbored higher quantities ($P<0.05$, ANOVA) of an *E. cecorum* marker than healthy/average age-matched birds,

Despite its beneficial role, some *Enterococcus* species also pose significant animal production risks, often in secondary infections. In swine, the continuous use of antibiotics has been linked to *E. hirae* infection in the small intestine of piglets, resulting in diarrhea.[4] In dairy cattle, *E. faecalis* and *E. faecium* are among the pathogens responsible for bovine mastitis.[5] *Enterococcus* also poses challenges in poultry when it escapes from the gastrointestinal tract and moves into other tissues. In hatcheries, *E. faecalis* can be transmitted through egg or fecal contamination, leading to either late embryonic death or failure to hatch. Early infection of the bird—potentially *in ovo*—can result in acute septicemia, causing initial mortality and sepsis. Survivors of acute infection may develop chronic conditions, exhibiting symptoms such as listlessness, lameness/mobility issues, and head tremors. *E. cecorum*, a significant concern in birds four weeks of age and older, is associated with skeletal disease, but can also cause extraintestinal infection in internal organs resulting in increased mortality/condemnation rates and poor production.[6] *Enterococcus* has also recently been associated with pododermatitis.[7]

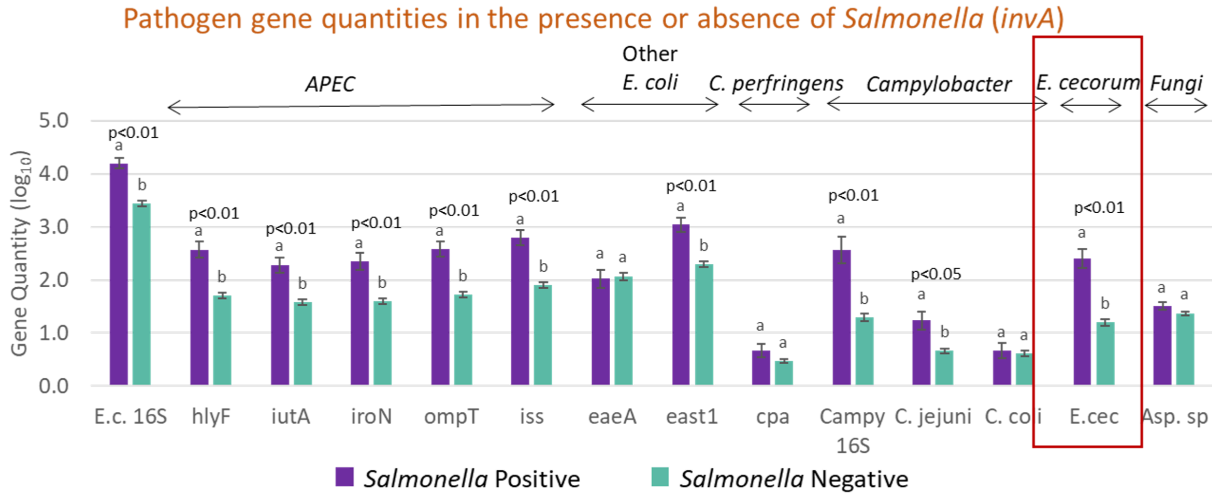
supporting its role as a contributing factor or indicator of compromised health.



Enterococcus in Coinfection

Coinfections involving *Enterococcus* and other pathogens, such as *Escherichia coli*, can exacerbate disease outcomes. For instance, in poultry, the presence of *Enterococcus faecalis* alongside avian pathogenic *Escherichia coli* (APEC) significantly elevates mortality rates compared to infections caused by APEC alone.[8] Understanding the dynamics of such coinfections is crucial for developing effective treatment and prevention strategies.

A recent PathKinex™ meta-analysis of broiler ceca data also suggests a role for *Enterococcus* in coinfection. In this analysis of 702 samples from 122 different farms, *E. cecorum* was one of several opportunistic pathogens that were elevated in the presence of *Salmonella* infection. This co-occurrence suggests that disruption of the gut microbiome may create an environment that favors the overgrowth of multiple other opportunistic pathogens. Further investigation into the interactions between these pathogens could provide insights into their combined role in *Enterococcus* disease progression.



Conclusion

Enterococcus serves as both a beneficial commensal organism and a potentially harmful pathogen. In healthy gastrointestinal environments, it supports animal gut health and shows potential as a probiotic, emphasizing its role as a "friend". However, under certain conditions, where intestinal integrity has been compromised or dysbiosis is present, *Enterococcus* can shift to a dangerous "foe", leading to the development of various diseases. Managing the dual nature of *Enterococcus* requires a careful balance of promoting its beneficial properties while mitigating its pathogenic potential, particularly through strategies aimed at reducing coinfection and preventing gastrointestinal damage.

Question to consider:

Do your customers and veterinary collaborators perceive *Enterococcus* as a friend or a foe?

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Helpful Links:

Effect of Novela ECL on Pododermatitis in Broiler Chickens
https://unitedanh.seismic.com/Link/Content/DCh2cJpgXM7W8GhCp4H6dVHMgj8B

A DNA-based microbial surveillance platform can provide insights into on bacterial interactions leading to coinfections in broiler chickens (IPPE 2024)
https://unitedanh.seismic.com/Link/Content/DCqfMB63c7Bq789TcRFdj8mf2mVj

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