Trueperella pyogenes, a Lethal Pathogen for Farmed White-Tailed Deer (*Odocoileus virginianus*) in Florida

An-Chi Cheng[1,2], Ting Liu[3,4], Joao Bittar[1], Kwangcheol Casey Jeong[3,4], Kuttichantran Subramaniam[2,3,5], Samantha M. Wisely[2,3,6], Juan M. Campos Krauer[1,2,6]

1. Department of Large Animal Clinical Sciences, College of Veterinary Medicine, University of Florida
2. Cervidae Health Research Initiative (CHeRI), University of Florida
3. Emerging Pathogens Institute, University of Florida
4. Department of Animal Sciences, College of Agriculture and Life Sciences, University of Florida
5. Department of Infectious Diseases and Immunology, College of Veterinary Medicine, University of Florida
6. Department of Wildlife Ecology and Conservation, College of Agriculture and Life Sciences, University of Florida

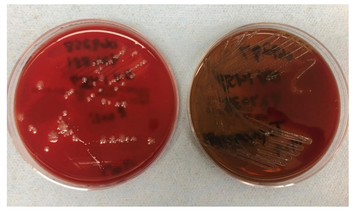
Introduction

- White-tailed deer (*Odocoileus virginianus*) farming is an emerging agricultural industry in Florida.
- Bacterial infections and viral hemorrhagic diseases are significant sources of mortality in farmed white-tailed deer in Florida, causing important production loss.
- The University of Florida Cervidae Health Research Initiative (CHeRI) provides free diagnostic services to Florida deer farmers to identify and monitor the pathogens and causes of death.
- *Trueperella pyogenes* is a gram-positive, facultative anaerobic bacteria, with genome size of 2.3 Mbp. It is a zoonotic pathogen and can cause a variety of purulent infections, such as mastitis and pneumonia.
- **Aim**: To understand the characteristics of *Trueperella pyogenes* in farmed Florida white-tailed deer.
- **Objective 1**: Examine the prevalence/hotspot of *T. pyogenes* in farmed white-tailed deer in Florida.
- **Objective 2**: Compare sequences of *T. pyogenes* among white-tailed deer from different Florida zones.
- **Objective 3**: Examine antimicrobial sensitivity of *T. pyogenes* in Florida farmed white-tailed deer.

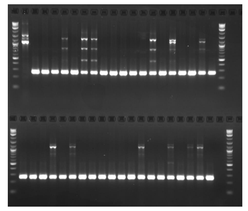
Materials and Methods

- CHeRI conducted on-site white-tailed deer necropsies and accepted shipped field-samples from Florida deer farms.
- Fresh tissue samples from major organs (lung, heart, liver, kidney, spleen) were collected.
- Bacterial pathogens from fresh tissue samples were aerobically cultured and isolated in the clinical microbiology lab in UF Veterinary hospital.
- DNA of the *T. pyogenes* isolates were extracted with DNeasy blood & tissue kit. cPCR targeting pyolysin gene was conduced to confirm the species of the isolate.
- Miseq whole genome sequencing were performed for phylogeny construction, virulence factors and antimicrobial resistance genes annotation.
- Antimicrobial disk diffusion test with 9 common antibiotics for deer were performed.

Picture 1. Field necropsy of a *Trueperella pyogenes* infected farmed white-tailed deer buck fawn. (Credits: UF IFAS CHeRI)



Picture 2. *Escherichia coli* (left) and *Trueperella pyogenes* (right) isolated from white tailed-deer lung tissue samples. (Credits: An-Chi Cheng)



Picture 3. cPCR bends of pyolysin protein (270bp). (Credits: An-Chi Cheng)

Results

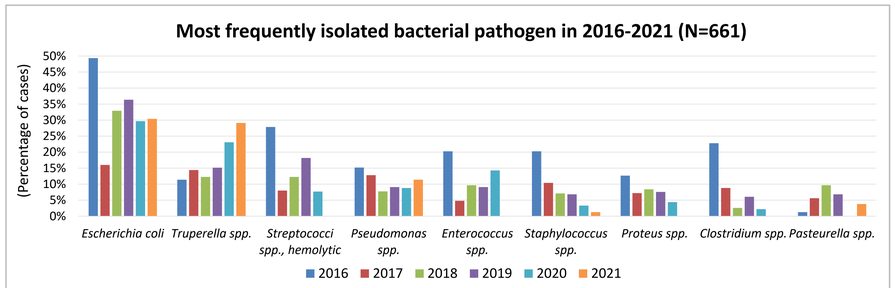


Figure 1. Most frequently isolated bacterial pathogen from Florida farmed white-tailed deer in 2016-2021. Only the bacterial pathogens with prevalence more than 5% were included in this study.

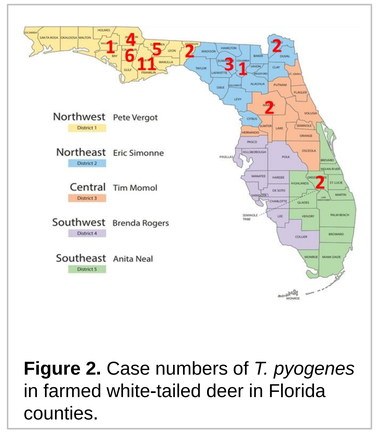


Figure 2. Case numbers of *T. pyogenes* in farmed white-tailed deer in Florida counties.

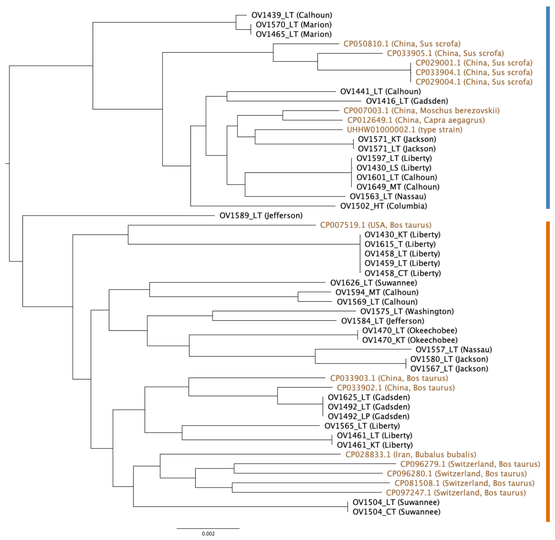


Figure 3. Whole genome sequence phylogeny of *T. pyogenes* in this study (black) and from NCBI database (brown) grouped into two clades.

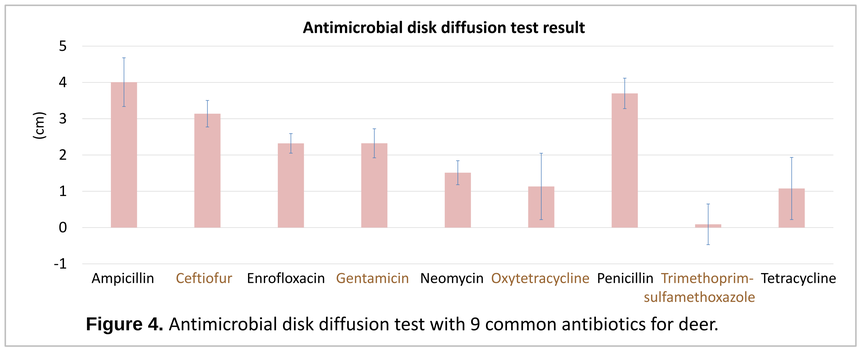


Figure 4. Antimicrobial disk diffusion test with 9 common antibiotics for deer.

Conclusion

- *Trueperella* spp. remained the second most frequently isolated bacterial pathogen in farmed deer from 2016 to 2021, with the percentage of cases increasing since 2018. *T. pyogenes* showed a much higher prevalence in North Florida. *T. pyogenes* has a significant association with severe pneumonia in white-tailed deer.
- Whole genome sequence data showed the *T. pyogenes* in Florida farmed white-tailed deer have high diversity, indicating the possibility of multiple origins and transmission routes of the bacterial infection.
- Most isolates have numerous antimicrobial-resistant genes, such as tetracycline resistance genes, and the antimicrobial disk diffusion test showed the isolates have different levels of susceptibility to the antibiotics, suggesting that antimicrobial resistance could play a significant role in the high mortality of Florida farmed white-tailed deer by *T. pyogenes*.
- Our results will provide valuable information to improve preventative measures and clinical management of Florida white-tailed deer, improve herd health, and reduce mortality.
- Future works aim to identify the spatial heterogeneity of the *T. pyogenes* serotypes affecting white-tailed deer, and eventually develop better diagnosis and treatment strategies for *T. pyogenes.*

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Acknowledgements

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