

Seroprevalence of *Trichinella* Antibodies in Alberta Wild Pigs



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Introduction

Wild Pigs in Canada:

- Invasive wild pigs are spreading through Canadian Prairie provinces¹
- They have potential to negatively impact ecosystems and agriculture¹
- Wild pigs carry diseases like Trichinosis, posing risks to humans and livestock²



Figure 1. Wild pig captured on wildlife camera 2023. Credit: Government of Alberta (GoA)

Understanding Trichinosis:

- Trichinosis is caused by *Trichinella* parasites, primarily transmitted through undercooked pork or wild game meat³

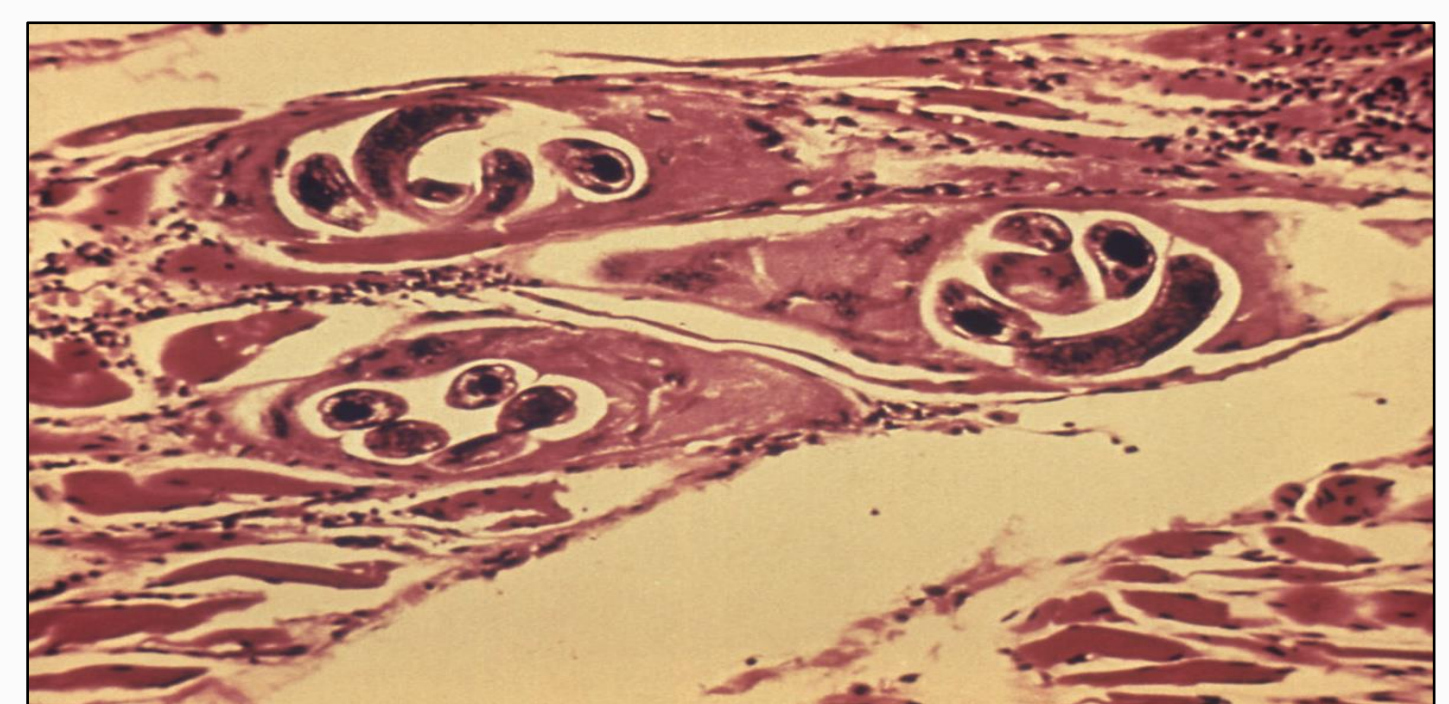


Figure 2. Developing *Trichinella* cysts within human muscle tissue. Credit: Public Health Image Library, Public Domain

Trichinosis in Canada:

- Canada's biosecurity measures have eliminated commercial swine *Trichinella* infection⁴
- Sporadic cases of Trichinosis in Canada linked to wild game consumption or backyard-raised pigs fed infected meat^{5,6}

Research Goal:

- Recent information regarding the *Trichinella* status in Alberta wild pigs remains scarce
- Our research aims to assess the prevalence of *Trichinella* antibodies in wild pigs in Alberta

Methods

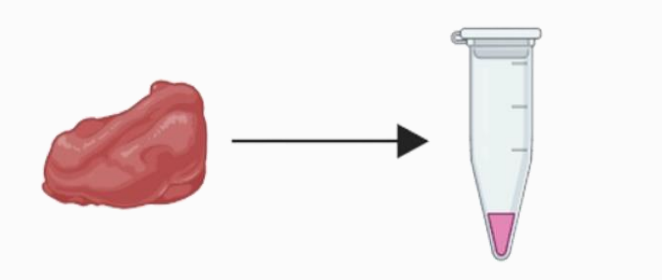
1. Sample Collection

- 225 wild pig diaphragm were collected over a six-year period from 8 sites in 4 counties:
 - Strathcona County
 - Two Hill County
 - Woodland County
 - Lac Ste Anne County



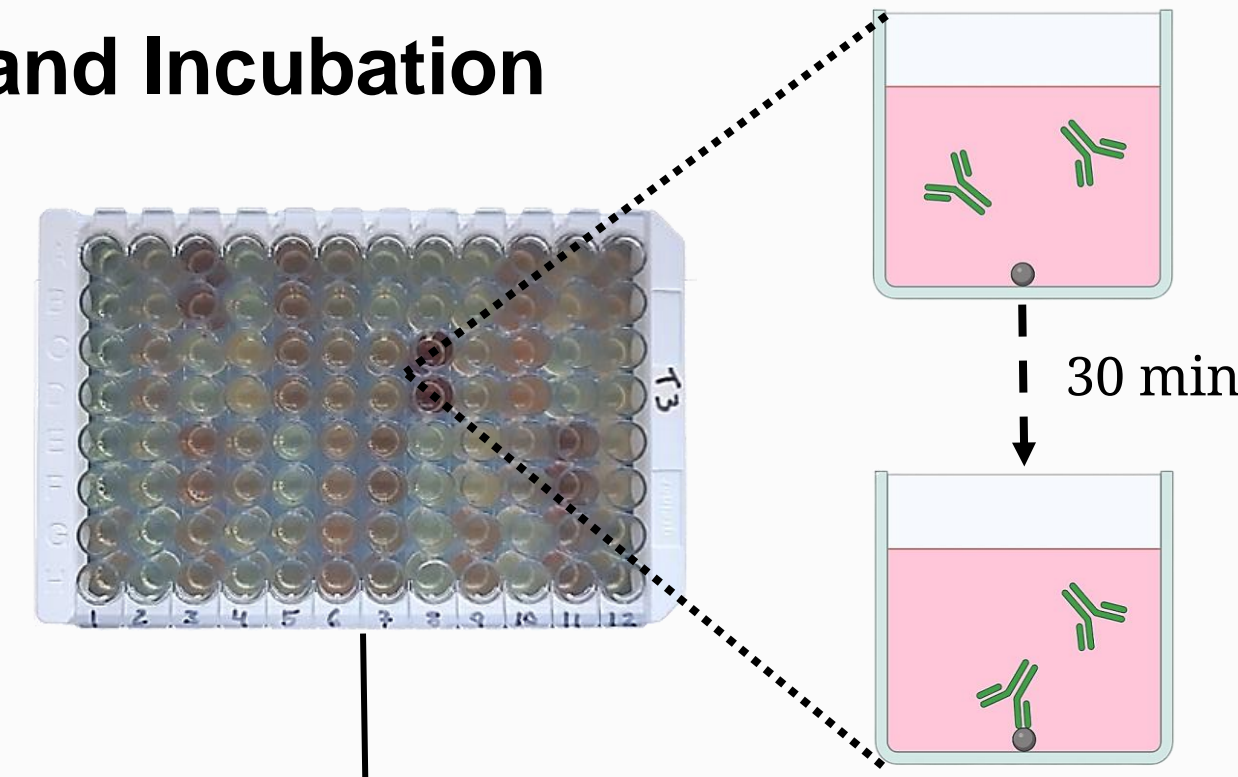
2. Sample Prep

- Tissue fluid was collected from thawed samples for ELISA antibody analysis



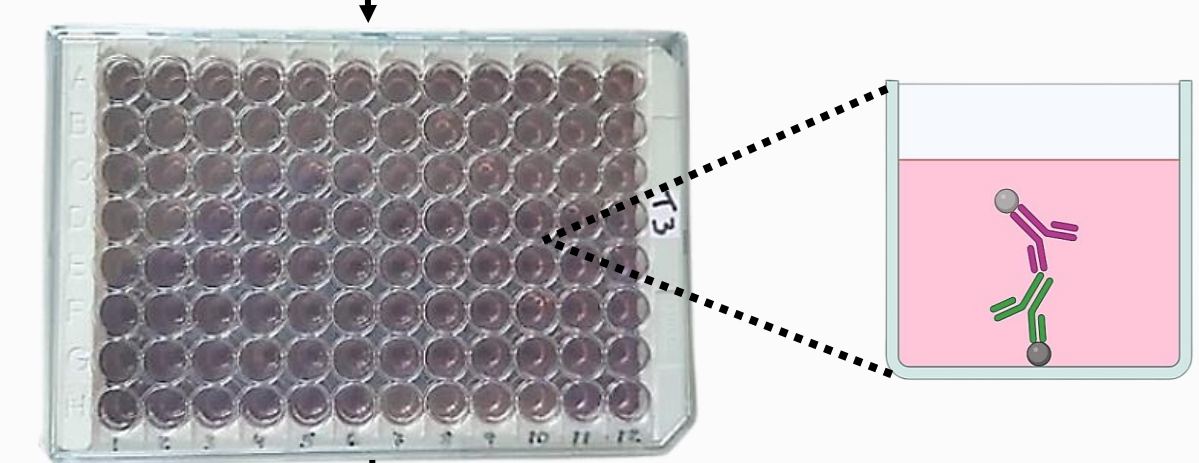
3a. ELISA: Sample Prep and Incubation

- Controls and samples added in duplicate to *Trichinella* E/S antigen coated test plate (PrioCHECK™ Porcine *Trichinella* Ab Strip Kit)
- Incubated 30 minutes
- Washed 4x with wash fluid



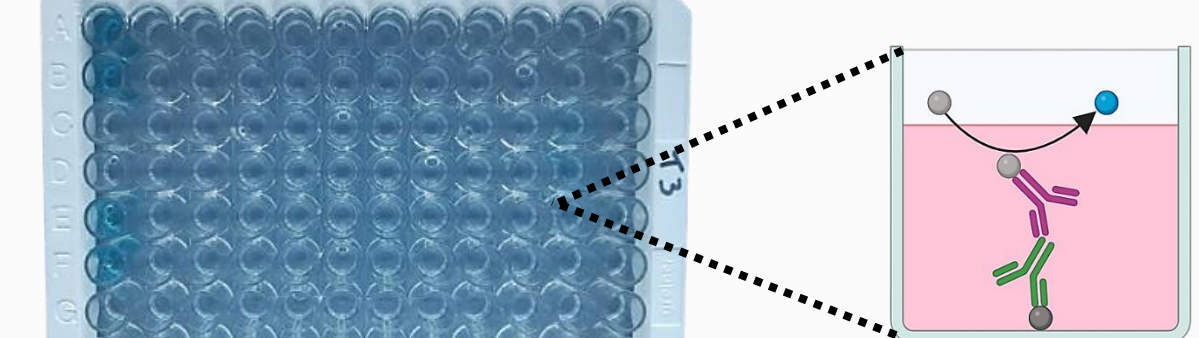
3b. ELISA: Conjugate Incubation

- Added conjugate
- Incubated 30 minutes
- Washed 4x with wash fluid



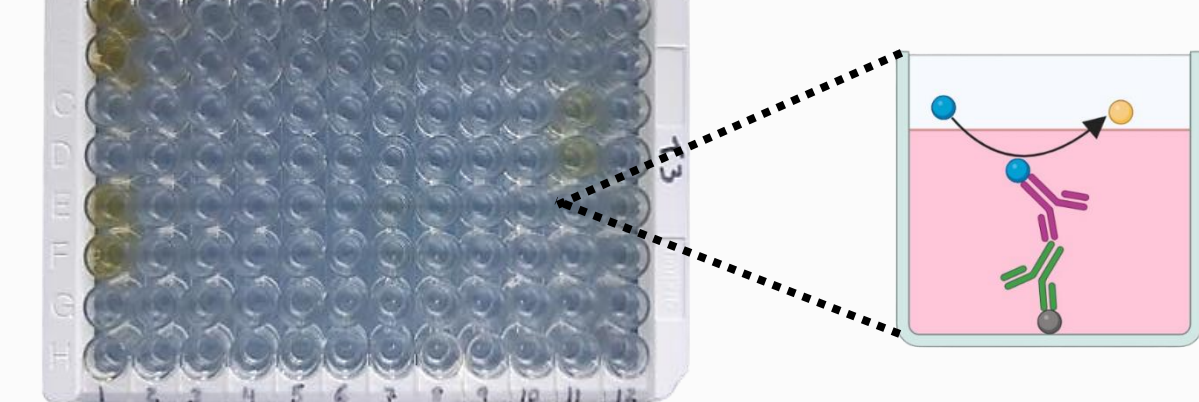
3c. ELISA: Substrate Incubation

- Added chromogen (TMB) substrate
- Incubated 15 minutes



3d. ELISA: Detection

- Added stop solution
- Read plate (@ 450nm) within 15 minutes



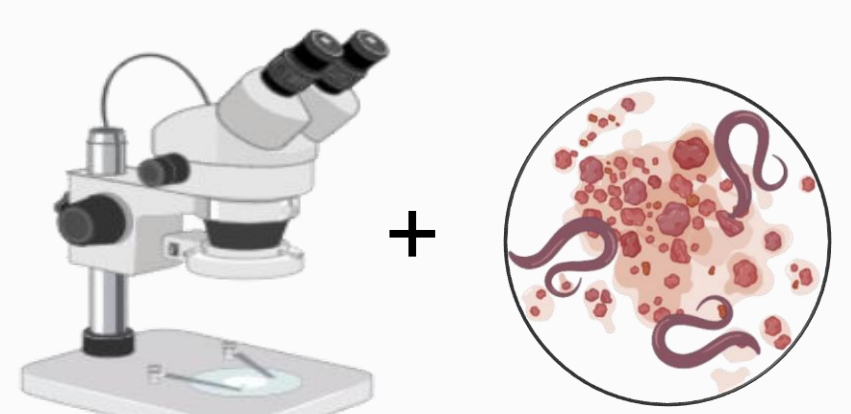
Future Work

True Prevalence

- Sensitivity and specificity to calculate true prevalence with Bayesian method

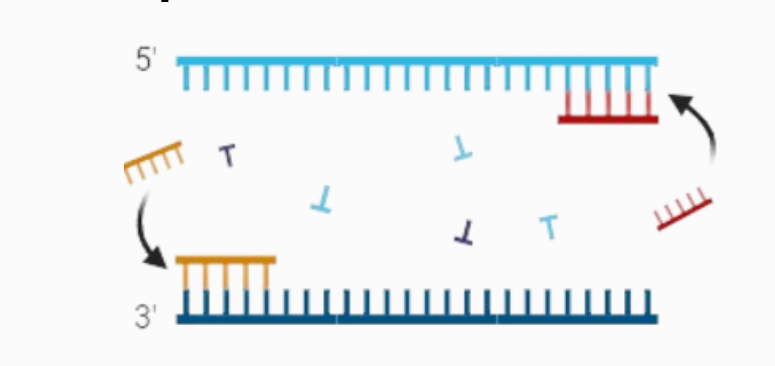
Artificial Digestion

- Identify larvae burden and confirm ELISA



Polymerase Chain Reaction (PCR)

- Identify *Trichinella* species



Results

- Our results represent the first evidence of *Trichinella* infection in Canadian wild pigs
- 7 positive individuals from the 225 sampled
 - Apparent seroprevalence of 3.11% (95% CI: 1.26-6.30) using the epiR package in R

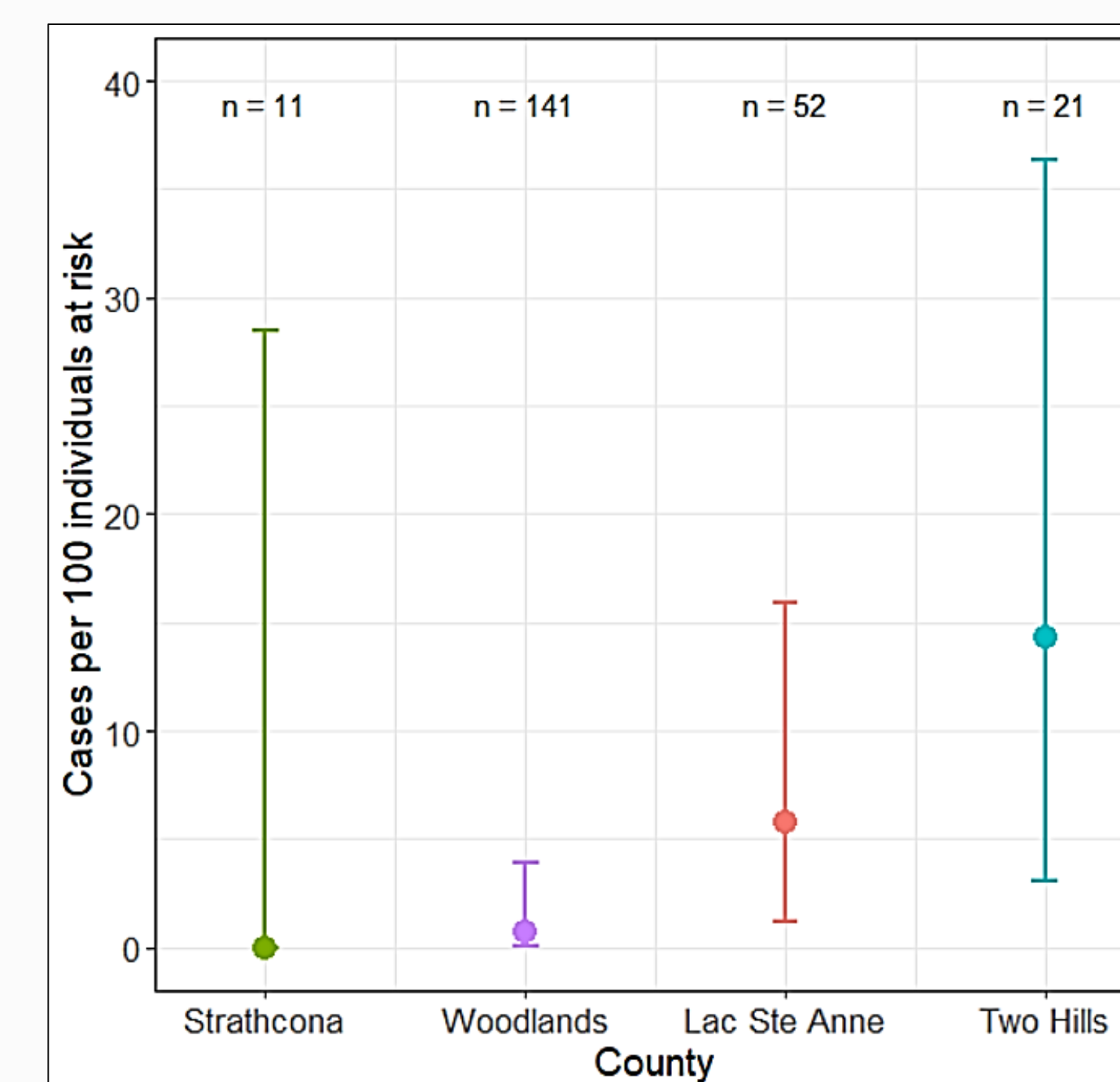


Figure 3. Anti-*Trichinella* seroprevalence in wild pigs across four Alberta counties. A statistically significant difference in seroprevalence between the four counties was found following Chi-squared analysis ($\chi^2 = 12.97$, $df=3$, p -value = 0.0047).

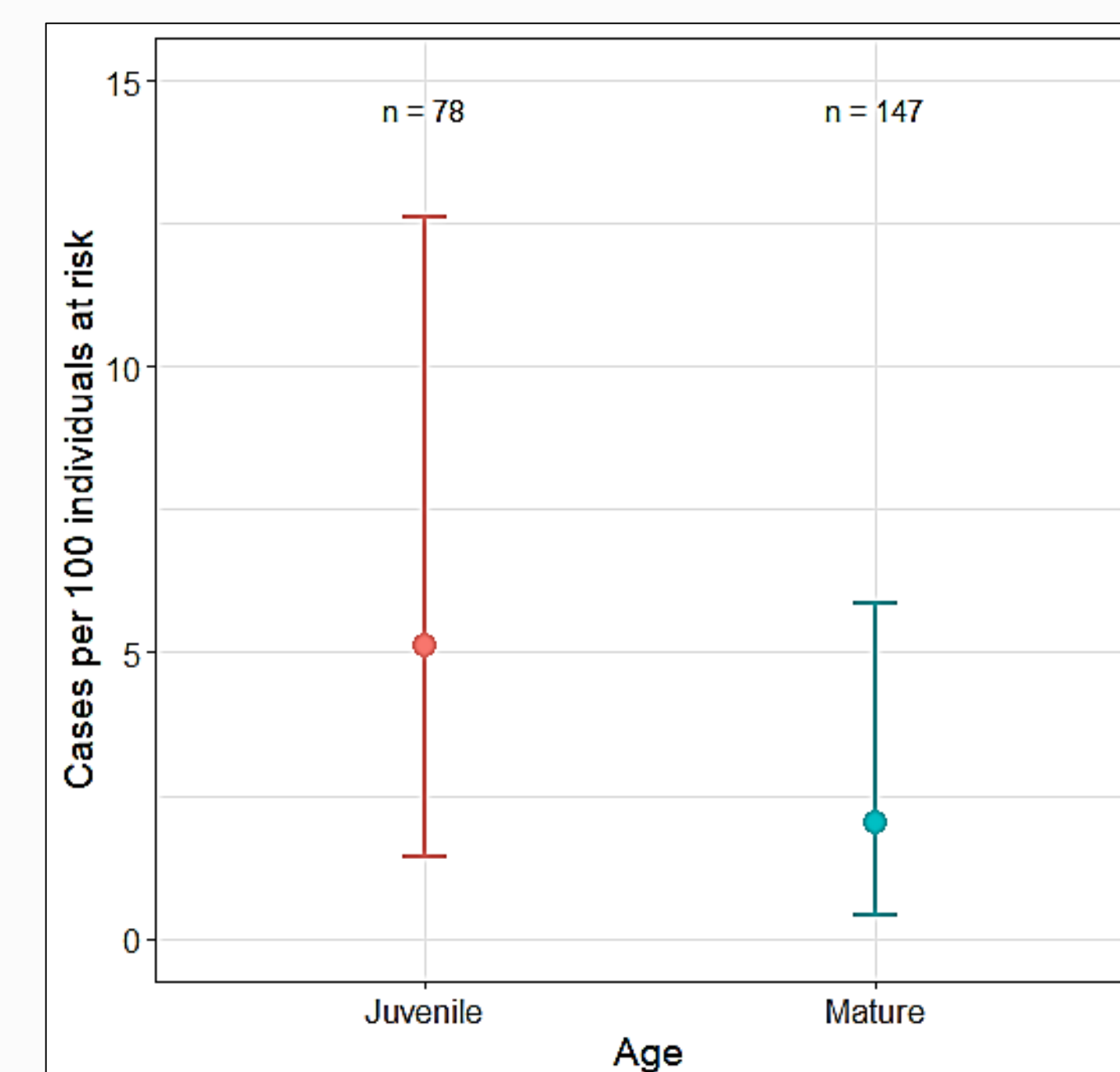


Figure 4. Anti-*Trichinella* seroprevalence in Alberta wild pigs according to age group. There was no statistically significant difference in age groups and seroprevalence following Chi-Square analysis ($\chi^2 = 0.74998$, $df=1$, P -value = 0.3865).

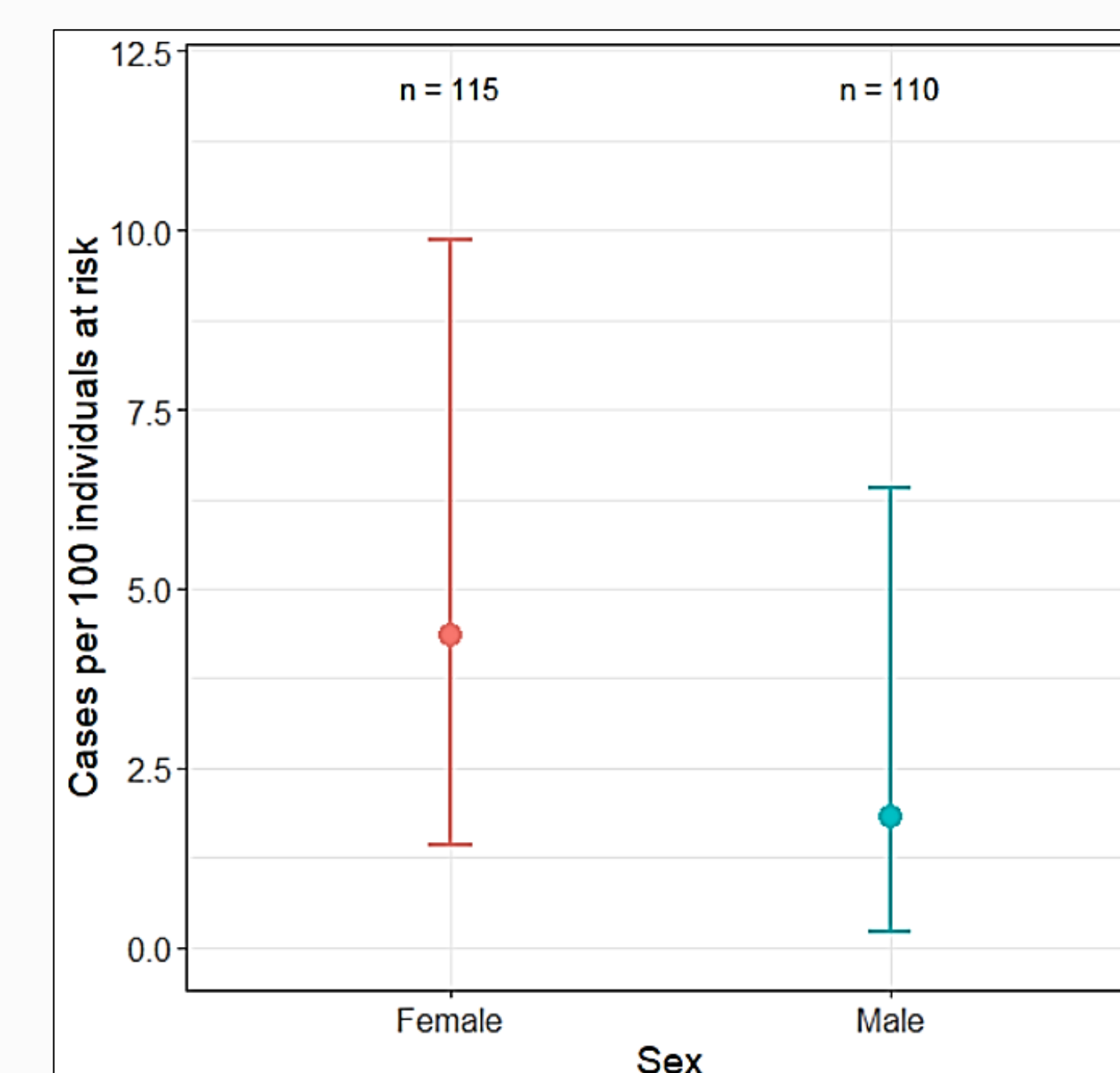


Figure 5. Anti-*Trichinella* seroprevalence in Alberta wild pigs according to sex. There was no statistically significant difference in sex and seroprevalence following a Chi-squared analysis ($\chi^2 = 0.50185$, $df = 1$, P -value = 0.4787)

Discussion

Global Wild Pig Seroprevalence:

- Estimated 6% globally (1997-2015), 9% in the USA (2002-2010)⁷
- Previous Canada estimates:
 - 1993: Ontario outbreak from farmed wild pigs⁸
 - 1996: 0% in Canadian farmed wild pigs⁹
 - 2014: 0% in Saskatchewan wild pigs¹⁰

Risk to domestic cycle:

- Increasing overlap between wild pig habitats and farms in North America, with 58% increase in co-occurrence of domestic swine farms²
- Backyard pigs present obvious concern; horses, cattle, and deer are also extremely rare carriers³

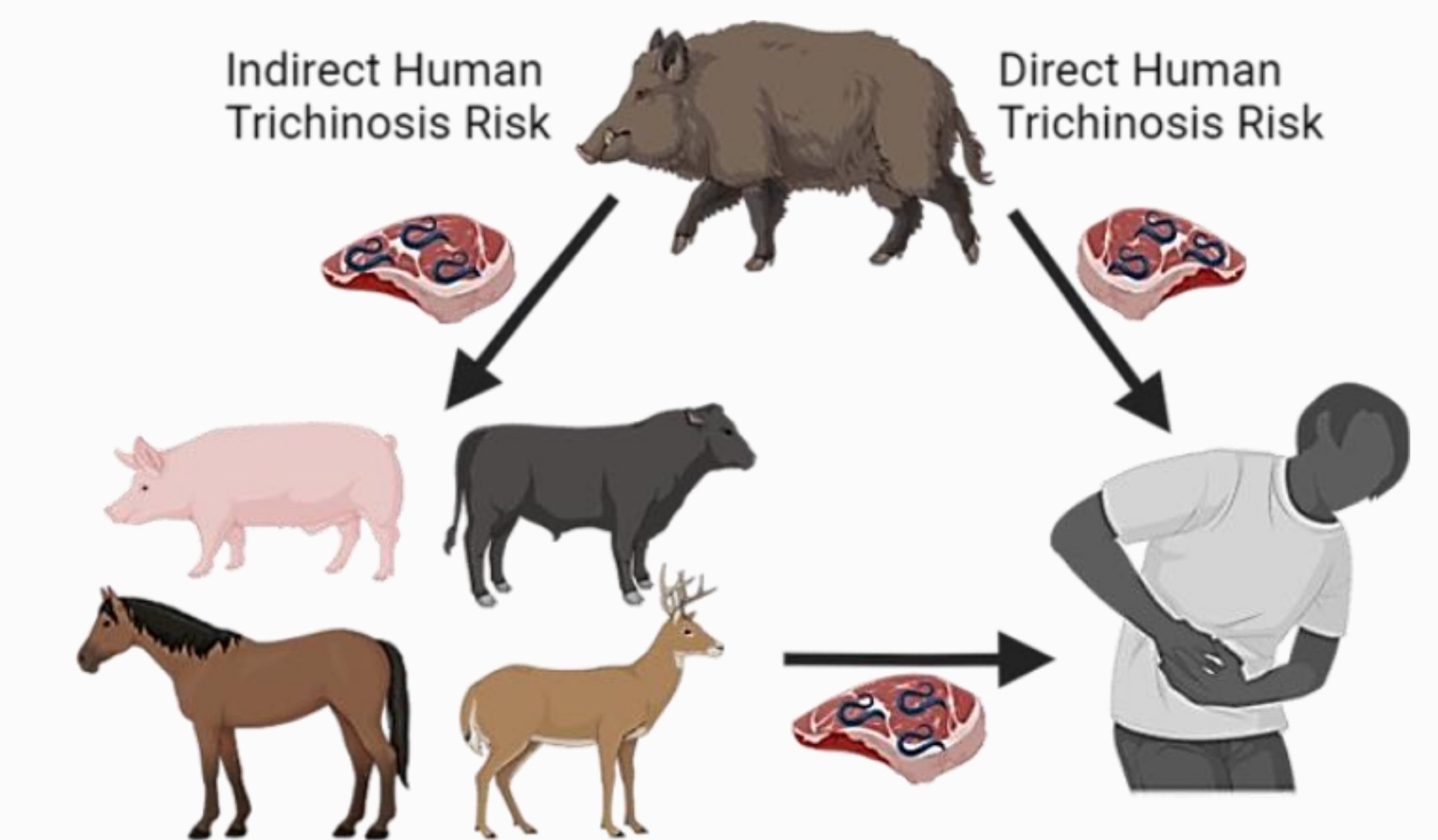


Figure 6. Diagram demonstrating wild pigs' potential of direct and indirect transmission of Trichinosis to humans

Conclusion:

- This new evidence of *Trichinella* infection in Alberta wild pigs highlights the need for education and prevention strategies for wild game consumers and at-risk livestock

Acknowledgements

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Works Cited

- Aschim, R. A. & Brook, R. K. Evaluating cost-effective methods for rapid and repeatable national scale detection and mapping of invasive species spread. *Sci Rep* 9, 7254 (2019).
- Miller, R. S. et al. Cross-species transmission potential between wild pigs, livestock, poultry, wildlife, and humans: implications for disease management in North America. *Sci Rep* 7, 7821 (2017).
- Rostami, A. et al. Meat sources of infection for outbreaks of human trichinellosis. *Food Microbiol* 64, 65-71 (2017).
- Appleby, G. et al. National serologic survey for trichinellosis in swine in Canada 1998-1997. *Can Vet J* 43, 271-273 (2002).
- Cheung, M. et al. The Brief Case: an Infectious Hazard of Hunting. *Journal of Clinical Microbiology* 61, e00620-22 (2023).
- Newman, A. Investigation of a human case of trichinellosis on a farm in southwest Ontario. *Environ. Health Rev.* 57, 93-96 (2014).
- Rostami, A. et al. A systematic review and meta-analysis on the global seroprevalence of *Trichinella* infection among wild boars. *Food Control* 91, 404-411 (2018).
- Greenbloom, S. L. et al. Outbreak of trichinosis in Ontario secondary to the ingestion of wild boar meat. *Can J Public Health* 88, 52-56 (1997).
- Gajadhar, A. et al. Status of *Trichinella spiralis* in domestic swine and wild boar in Canada. *Can J Vet Res* 61, 256-259 (1997).
- McGregor, G. et al. Disease risks associated with free-ranging wild boar in Saskatchewan. *Can Vet J* 56, 839-844 (2015).