

Reducing transmission risk of livestock disease

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The risk of transmitting the livestock virus PPRV, which threatens 80 percent of the world's sheep and goats, increases with certain husbandry practices but not herd size. A new study, led by researchers at Penn State, investigated how transmission of PPRV might change at different scales and identified specific husbandry practices associated with

increased odds of infection—including the introduction of sheep and goats to the herd, sheep or goat attendance at seasonal grazing camps, and the sales or gifting of goats from the herd.

The sheep and [goat](#) plague virus, formally known as peste des petits ruminants virus (PPRV) and now known as small ruminant morbillivirus (SRMV), produces a highly infectious and often fatal disease. This study, which appears online Aug. 24 in the journal *Viruses*, is the third from an international team of researchers who hope to inform strategies for the global campaign to eradicate the virus.

"If we can identify behaviors that increase transmission risk, we can better inform how we allocate resources to manage the virus," said Catherine Herzog, epidemiologist and Huck postdoctoral scholar at the Center for Infectious Disease Dynamics at Penn State and first author of the paper.

The researchers previously found that transmission risk of PPRV was greater among herds in pastoral villages, where people rely almost solely on livestock for their livelihood, compared to herds from agropastoral villages, where people rely on a mix of livestock and agriculture. However, the factors driving these differences were unclear.

Because pastoral villages typically have much larger herds than agropastoral villages, the researchers first investigated whether herd size was related to the rate at which animals become infected—the force of infection. One might expect the rate of infection to increase with herd size, because an animal in a larger herd would have the potential to closely interact with more individuals.

"We hypothesized that the force of infection would increase with herd size—a pattern known as density-dependent transmission—but interestingly this is not what we observed," said Ottar Bjørnstad,

Distinguished Professor of Entomology and Biology and J. Lloyd and Dorothy Foehr Huck Chair of Epidemiology at Penn State and a member of the research team.

Instead, Bjornstad explained that at the level of an individual compound, which might contain animals from multiple households living together in a herd, the data suggest that transmission is not related to herd size—a pattern known as frequency dependent transmission. The researchers believe this is due to the formation of social cliques, whose size is unaffected by the overall herd size.

"Having a clear understanding of this relationship and if it varies across geographic scales will improve how we model the disease," he said.

Transmission risk, however, did increase with specific husbandry practices such as the attendance of sheep or goats at seasonal grazing camps, where many herds come to aggregate, and introduction of livestock to the herd. Introductions occur when animals are purchased from or returned home from the market after a failure to sell, or if they returned from being loaned to another herd for breeding opportunities or milk production. Transmission risk also increased when cattle or goats were recently removed from the [herd](#), through gifting, sale, or death.

The researchers hope their ongoing work will help clarify the ecological mechanisms driving PPRV transmission.

"Now that we have evidence that these husbandry practices are associated with higher rates of infection in the Tanzanian setting, we can take a closer look at these practices and recommend improvements or modifications that could help mitigate the [transmission](#) risk," said Herzog. "For example, we could explore quarantine procedures around the introduction of animals from sales or gifting, and the return of animals from seasonal grazing camps. We could also focus our

veterinary care on settings or events where risk is the highest."

More information: Catherine M. Herzog et al, Peste des petits ruminants Virus Transmission Scaling and Husbandry Practices That Contribute to Increased Transmission Risk: An Investigation among Sheep, Goats, and Cattle in Northern Tanzania, *Viruses* (2020). [DOI: 10.3390/v12090930](https://doi.org/10.3390/v12090930)

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