

Disease Transmission Tag Activity

Grade levels: 1st -8th

Objective: Students will demonstrate that wild sheep can acquire highly contagious respiratory infections from domestic sheep.

Materials:

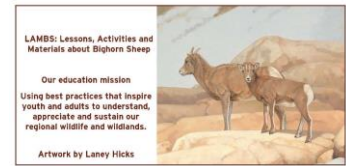
- Several small, soft balls that can be thrown at other students
- Outside playing field

Background:

Wild sheep are susceptible to a variety of diseases that affect herd viability. The most important diseases affecting wild sheep populations are respiratory infections that result in pneumonia. Bacteria of the family *Pasteurellaceae* (*Pasteurella multocida*, *Mannheimia haemolytica* and *Bibersteinia trehalos*), and *Mycoplasma ovipneumoniae* are the most frequently isolated respiratory pathogens from wild sheep with pneumonia. Pneumonia caused by these organisms often results in the mortality of a large proportion of the population across all age classes and is typically followed by endemic disease with multiple years of lamb mortality from pneumonia.

Incidence of pneumonia-related die-offs are frequently associated with the presence of domestic sheep and goats. Controlled research studies have confirmed that both *Mannheimia hemolytica* and *Mycoplasma ovipneumoniae* are transmitted to wild sheep upon contact with, or proximity to, domestic sheep. Domestic sheep and goats commonly carry these disease-causing organisms, which typically cause few deaths and little illness in domesticated adults and lambs. Contact between animals from range use overlap on public land and forays of wild sheep to nearby domestic herds on private in-holdings and visa-versa, is the crux of this wild-domestic animal controversy. While not all outbreaks of pneumonia in wild sheep have confirmed contact with domestic sheep or goats, the preponderance of scientific evidence shows that association with domestic sheep and goats poses a significant threat to the continued conservation and restoration of wild sheep populations.

Management alternatives to reduce the impacts of respiratory disease on wild sheep are limited. There is currently no effective vaccine or treatment for pneumonia in bighorn sheep. Maintaining appropriate and reasonable spatial and temporal separation between wild sheep and domestic sheep and goats is the most effective tool currently available for minimizing risk of disease transmission between species.



Activity:

1. One person is it and holds a soft ball. The ball represents the bacteria, *Mycoplasma ovipneumoniae*, one of the main bacteria leading to die-offs in wild sheep. The person may NOT run while holding the ball, but can throw it at another player or touch the ball to another player. Once thrown, the tagger can run and pick up the ball to throw it again. When another student is hit with the ball, they get a ball and become a second tagger. As more and more students are hit by a ball, they join in as taggers. Continue playing until half the students have converted to taggers.
2. Pull group together to discuss disease transmission issues relating to wild sheep (see background section for content to select from). Explain that this game mimics disease spreading within a herd of wild sheep. Because the bacteria are spread through saliva, nasal secretions and aerosols, they can impact a herd quickly.
3. Play as many rounds as you like.

Evaluation:

- Depending on the grade level, this could include drawing a diagram of a sheep herd and indicating through labels which sheep are infected and which are not, reminding students that the bacteria impacts the young lambs the most.
- Students could create a comic strip showing a herd of sheep over time, with the beginning box of the comic having no wild sheep infected. Then the herd (or a single ram) walking through an area where domestic sheep had recently visited and picks up bacteria. Comic continues to show how bacteria spreads through herd.

Extensions:

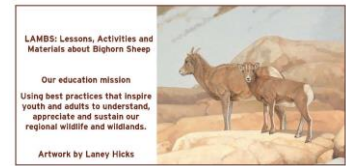
- “Bighorn Sheep with Pneumonia” <https://www.youtube.com/watch?v=fVBD102Z3FY>
- Research at Washington State University “Montana Bighorn: Key to Sheep Pneumonia Research at WSU” https://www.youtube.com/watch?v=C-s6y_Z8sRM
- “Sheep Disease” discusses management issues that go with pneumonia <https://www.youtube.com/watch?v=T9HiTxbqx8>
- “Time Series of Bighorn Sheep Pneumonia, Hells Canyon” Animation of the presence of pneumonia in bighorn sheep populations in the Hells Canyon ecosystem <https://www.youtube.com/watch?v=cxbJUV3aT74>
- Mini-lesson “How do germs get inside your body?” <https://mysteryscience.com/mini-lessons/germs?code=e6a6a181e835354f8c7b2dffec020893#slide-id-8055>

Wyoming Science Curriculum Standards and Connection Ideas

3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

- Discuss how bighorns which are immune to *Mycoplasma ovipneumoniae* bacteria, have a greater chance of surviving.

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.



- Discuss how *Mycoplasma ovipneumoniae* bacteria could be passed on to young bighorns with no immunity.

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

- Discuss how the introduction of *Mycoplasma ovipneumoniae* into bighorn sheep habitat has affected their population over time.