

# Disease Transmission Tag Game

**Grade levels:** 1<sup>st</sup> -8<sup>th</sup>

**Objective:** Students will be able to generalize that wild sheep can get respiratory infections from domestic sheep through playing a tag style game.

**Materials:**

- At least 1 soft ball 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 trehalosi*), 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 (referred to as an all age epizootic or die-off) and is typically followed by enzootic disease with multiple years of lamb mortality from pneumonia. This pattern of pneumonia in wild sheep has been documented in more than 70 peer-reviewed scientific publications.

Incidences 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.

**Procedures:**

1. Some of the best science follows the ABCs of science, having an Activity Before Content. For this reason, it is suggested to simply begin the first round as a round of tag. One person is it and holds the soft ball. The student 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 join as a second tagger. Now, two students can work as a team to toss it between them (can't run with the ball) to move quicker towards other players. As more and more students are hit by the ball, they join in as taggers, creating an approach of tossing the ball from tagger to tagger to get closer to students before throwing the ball at one of them. 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 viruses are spread through airborne means, it can impact a herd quite quickly.
3. Explain that they will play another round, with the ball representing the virus *Mycoplasma ovipneumoniae* (M. ovi for short), one of the main viruses leading to die offs in wild sheep. As the virus (ball) spreads to sheep (students). If you have more than one soft ball, you can add a second and third as more and more students become taggers, representing more carriers of the virus, which can lead to greater chance of spreading virus.
4. Play as many rounds as you like.

**Evaluation:**

- Depending on 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 virus impacts the young lambs the most.
- 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 virus. Comic continues to show how virus spreads through herd

**Extension:**

Search online (or use recommended ones below) for “wild sheep pneumonia” videos to extend the learning through visual means

- One of the videos that shows the coughing is titled “Bighorn Sheep with Pneumonia” on YouTube found at <https://www.youtube.com/watch?v=fVBD102Z3FY>
- A video showing the science research at Washington State University is titled Montana bighorn key to sheep pneumonia research at WSU and found at [https://www.youtube.com/watch?v=C-s6y\\_Z8sRM](https://www.youtube.com/watch?v=C-s6y_Z8sRM)
- A video called “Sheep Disease” on YouTube discusses management issues that go with pneumonia. Found at <https://www.youtube.com/watch?v=T9HiTAbqx8>
- A video titled “Time Series of Bighorn Sheep Pneumonia, Hells Canyon” shows an animation of the presence of pneumonia in bighorn sheep populations in the Hells Canyon ecosystem, United States (1995-2011) and is found at <https://www.youtube.com/watch?v=cxbJUV3aT74>