Progress Report 2012-2013

1. Prevent transmission of Lkt-positive *M. haemolytica* from DS to BHS.

Animal studies in domestic sheep during the past year have given encouraging results. Inoculation of *B. trehalosi* into the nasopharynx of domestic sheep reduced the number of *M. haemolytica* in them. However, reduction in the numbers of *M. haemolytica* was not uniformly high in all the DS. Currently we are working on strategies to enable *B. trehalosi* to more effectively colonize the tonsils of domestic sheep thereby inhibit the growth and shedding of *M. haemolytica* more effectively. Along this line, we have identified an antibiotic that eliminates *M. haemolytica* from the tonsils of domestic sheep. It is very likely that *B. trehalosi* will effectively colonize the tonsils of antibiotic-treated domestic sheep, and prevent subsequent invasion and colonization by *M. haemolytica*.

2. Vaccinate BHS to make them resistant to Lkt-positive *M. haemolytica* transmitted by DS.

During the past year, we have identified a mutant virus for this study. One bighorn sheep was inoculated with this virus and the inoculated bighorn sheep was commingled with another bighorn sheep which was not inoculated with the virus. The un-inoculated bighorn sheep acquired the virus from the inoculated animal demonstrating that the vaccine virus from the vaccinated bighorn sheep is likely to be acquired by the un-vaccinated bighorn sheep in the wild. Studies during the past year have also demonstrated that this virus remains inside the animal in an inactive form. This finding suggests that the vaccine virus will continue to remain inside the animal, eliminating the need for booster inoculations.

Additional studies that were conducted during the past year, that were not listed in the proposal last year: Understanding the reasons for poor lamb recruitment in the herds that suffered pneumonia die-off.

When a pneumonia die-off occurs, initially, bighorn sheep of all ages die. In subsequent years, the adult bighorn sheep rarely die, but the lambs continue to die year after year, and hence the herds do not grow in numbers. We are working on understanding the reasons underlying this phenomenon.

We obtained few bighorn sheep that survived the 2010 outbreak in Nevada, and commingled them with naïve (uninfected) bighorn ewes from our captive herd. These ewes got infected. The lambs born to these ewes also got infected, developed pneumonia and died. *Photographs of these 'carrier' rams from Nevada, and our captive pregnant ewes commingled with them, and the lambs born to them are attached.* We are currently working on 'finger-printing' the organisms isolated from the Nevada survivors, and the commingled ewes from our herd, and the lambs born to them. This information will clearly tell us whether the survivors carry the harmful organisms and transmit to their lambs.

The survivor ewes may have immunity to the harmful organisms, but it may not be adequate to pass on to their lambs. We are also working on determining the levels of

immunity carried by the survivor ewes and the lambs before they died. For the information to be meaningful, we should study survivor ewes from different geographical locations. Therefore, we are also working on another group of survivor ewes from Colorado, now housed in Sybille, WY. Our efforts to study another group of survivors from Montana did not pan out due to the difficulty in capturing the animals, but we will be able to do it next year. This study should provide information useful in designing management strategies.

In another study to be performed in the coming year, we will intra-venously administer *M. haemolytica*-specific antibodies from DS into bighorn lambs, and determine their ability to survive commingling with carrier BH ewes. For this purpose, we are hand-raising bighorn lambs born this spring. *Photographs of these lambs are attached.*

Srikumaran's research team consists of three PhD graduate students, one research associate and one research assistant professor.

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SSrikumaran. July 18,2013

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Photographs appear in the next two pages.


Rams from Nevada
that survived the die-off (carriers)


Ewes from our captive herd commingled
with the survivors from Nevada


Hand-raised Lambs, 2013


Hand-raised Lambs, 2013