RESEARCH FACTS

UNIVERSITY OF SASKATCHEWAN
Livestock and Forage Centre of Excellence
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IN PROGRESS

Development of vaccine efficacy and diagnostic tests for bovine tuberculosis in bison

PROJECT TITLE

Development of vaccine efficacy and diagnostic tests for bovine tuberculosis in bison

In progress:

Results expected in December 2021

RESEARCHERS

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Collaborators: VIDO-InterVac, Canadian Bison Association, Canadian Food Inspection Agency (CFIA), PBD BioTech, ChemBio Diagnostics Inc.

Background:

Parks Canada and the Vaccine and Infectious Disease Organization-International Vaccine Centre (VIDO-InterVac) will assess the efficacy of various diagnostic tests for bovine tuberculosis in bison. Potential vaccines will also be assessed for their effectiveness in preventing infection with bovine tuberculosis in experimentally infected bison. This work will take place in a highly specialized biocontainment level three laboratory which can contain bison (VIDO-InterVac) on the University of Saskatchewan campus in Saskatoon, Sask. Dr. Todd Shury and Dr. Nelson Marreros will lead this initial research in collaboration with VIDO InterVac staff (Dr. Jeff Nelson). Better diagnostic tests and potential vaccines will allow potential management solutions to be found to the issue of diseased bison in northern Canada in the area in and around Wood Buffalo National Park. Bison calves for this project are born and housed at the LFCE Specialized Livestock Research Facility.

Objectives:

1. Validate and determine validity of an aerosol challenge model for bison using the strain of bovine tuberculosis (Mycobacterium bovis) endemic to wild bison populations in northern Canada

2. Determine the efficacy of newer diagnostic tests for determining infection status of bison with bovine tuberculosis

3. Determine the efficacy of vaccines in preventing infection with bovine tuberculosis in bison.

What They Will Do:

Trial 1 (completed March 2020) – 18 bison calves from the LFCE will be moved to InterVac and challenged with bovine tuberculosis at two different doses to determine which one better mimics natural infection in bison. Lesion scoring at necropsy and quantitative bacteriology will be used to determine efficiency of infection between different doses. Four different diagnostic tests for bovine tuberculosis will also be evaluated for their ability to detect this disease in bison.

Trial 2 (Nov. 2020 to April 2021) – 24 bison calves will be used in three experimental groups (heat inactivated vaccine, BCG Danish, control group) to determine how effective these vaccines might be to protect against experimental infection in bison. The immune responses to both vaccine and challenge will also be determined in this trial.

Implications:

Current diagnostic tests for bovine TB have not been well validated in bison and do not perform well in determining which animals are truly infected. It is hoped that this research will lead to diagnostic tests which can differentiate bison infected with bovine TB from those which have been vaccinated to prevent the disease. This will allow for limited bison handling on bison ranches in Canada because they would only require handling once.

The research also plans to evaluate current vaccines developed to protect cattle against bovine TB perform in bison. Major scientific advancements in the past 20 years in cattle and other wildlife species such as European badgers and brush-tailed possums have given us a much better understanding of how TB infects animals. Oral vaccines have been shown to be quite effective for badgers and brush-tailed possums and we feel we can build on this foundation and develop an effective vaccine against bovine TB for bison as well.

A goal of this research is to develop better diagnostic tests that can tell if a bison is infected with bovine TB or not, allowing wildlife management agencies to test and better manage infected animals. This will help protect nearby disease-free bison herds as well as prevent bovine TB from spilling over into Canada's cattle herd.

This research also aims to develop bovine TB vaccines specifically for bison in order to help manage the disease in and around Wood Buffalo National Park to support conservation of this "threatened" species in Canada and remove the threat of transmission to domestic livestock.

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