Developing efficient, multi-pathogen tests for common cattle diseases

Project Title:
Development of a fully-automated DNA microarray-chip for multiplex detection of bovine pathogens

Researchers:
Aruna Ambagala, Ph.D. and Oliver Lung Ph.D.

Aruna Ambagala (Ph.D.) and Oliver Lung (Ph.D.), Centres for Animal Disease, Canadian Food Inspection Agency, Lethbridge, Alberta, Dale Godson, Ph.D. (Prairie Diagnostic Services), John Gilleard, Ph.D. (University of Calgary), Trevor Alexander, Ph.D. (Agriculture and Agri-Food Canada) and Tomy Joseph, Ph.D. (Manitoba Agriculture, Food and Rural Initiatives)

Background

Respiratory and enteric diseases are the most common and costly diseases in beef cattle. Both are multi-factorial disease complexes involving several viruses and bacteria. Effective control of these diseases can benefit from rapid and cost-effective diagnostic tests that can simultaneously detect all relevant pathogens in a single assay. Current diagnostic tests for these diseases are primarily single pathogen tests and are thus inefficient and require separate tests for each pathogen. DNA microarrays, combined with multiplex PCR, are capable of highly sensitive detection and differentiation of multiple pathogens in a single sample.

Objectives

To develop two cost-effective microarray chips that can be used on a new fully-automated technology platform - one for rapid identification of bovine respiratory disease pathogens and one for bovine enteric pathogens.

What they will do

First, sequence databases of the targeted pathogens will be created from available genetic information. The databases will be used to design pathogen-specific primers for amplification of target genes, as well as microarray capture probes for pathogen detection and differentiation. Amplification procedures will be developed and optimized separately for respiratory and enteric pathogens. Pathogen-specific capture probes will be screened for their sensitivity and specificity, and the probes with the highest sensitivity and specificity will be used in a user-friendly, fully-automated Rheonix Encompass MDx Workstation that does not require user intervention after sample introduction. The amplification procedures and two bovine microarray chips will be validated using
laboratory and clinical samples from the CFIA, AAFC, MAFRI and PDS.

**Implications**

The two user-friendly automated assays for simultaneous detection and differentiation of important bovine respiratory and enteric pathogens will allow efficient use of samples and significantly reduce the cost, labour and time required for multi-pathogen detection. These assays will facilitate nation-wide surveys of disease prevalence and enhance biosecurity in the cattle industry.

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For More Information Contact:
Beef Cattle Research Council  
#180, 6815 - 8th St. NE  
Calgary, AB T2E 7H7  
Tel: (403) 275-8558 Fax: (403) 274-5686  
info@beefresearch.ca

For More Information Visit:
www.beefresearch.ca

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