



UNIVERSITY OF
SASKATCHEWAN

College of Agriculture
and Bioresources

Bovine Leukemia Virus, the Tip of the Iceberg

Department of Animal and Poultry Science

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ANSC 492.3 Undergraduate Thesis 2019

My Background



What is Bovine Leukemia Virus (BLV)?

- ▶ ‘Leukosis’ (Gillet et al. 2007).
- ▶ First discovered in 1871 – discovered yellow nodules on an enlarged spleen (Gillet et al. 2007).
- ▶ Bovine Leukemia Virus affects B-lymphocytes (Bojarojć-Nosowicz and Kaczmarczyk 2006; Nekouei et al. 2016; Wrathall et al. 2006).
- ▶ Mainly found in cattle but are also in sheep and goats (Gillet et al. 2007).

What is the Big Concern?

- ▶ Non-curable
- ▶ High prevalence in Canada
- ▶ It is contagious
- ▶ Decreases milk production – Up to 10 kg per cow per day
- ▶ Decreases longevity
- ▶ Increases incidence of mastitis
- ▶ Hard to detect and most cows are subclinical
- ▶ Human Health

Persistent Lymphocytosis

- ▶ Lymphocytosis is an increased number of abnormal lymphocytes in the blood stream (Western College of Veterinary Medicine Petrie 2019).
- ▶ Lymphocytosis results in a suppressed immune function (Michigan State University 2019).
- ▶ Estimated 5% of infected cattle develop lymphoma (tumors) (Michigan State University 2019).
- ▶ Tumors in cattle originate from abnormal B-lymphocytes (Michigan State University 2019).
 - ▶ Tumors can be found in several organs and lymph nodes (Michigan State University 2019).

BLV and immune suppression

- ▶ B- cells develop antibodies from disease and vaccination (Michigan State University 2019).
 - ▶ BLV decreases the ability to protect itself from disease, as a large amount of abnormal B-lymphocytes circulate the body (Michigan State University 2019).
- ▶ Thus, protection from disease is reduced (Michigan State University 2019).
- ▶ Increased cull rate

Lymph Nodes locations in Cattle

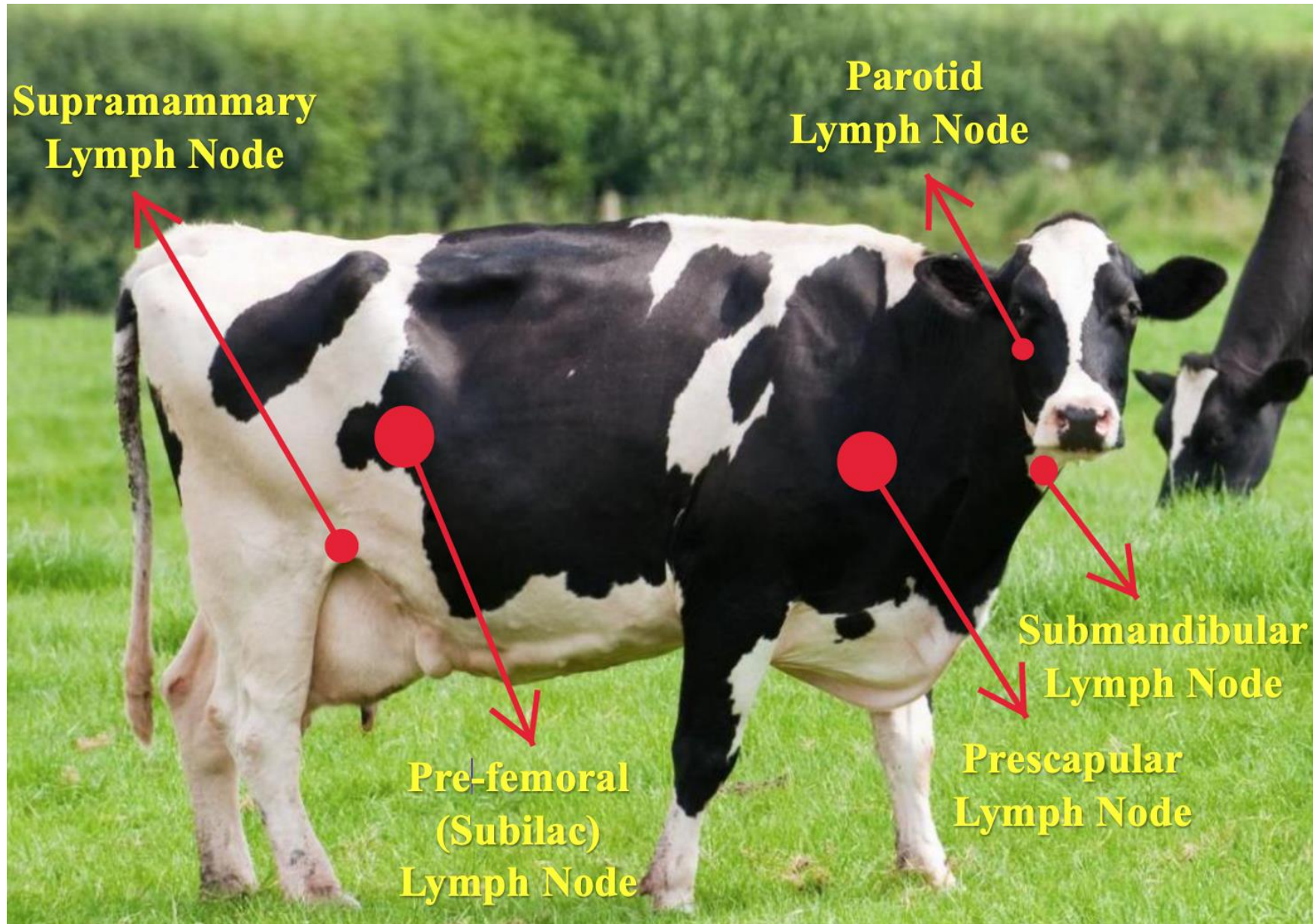


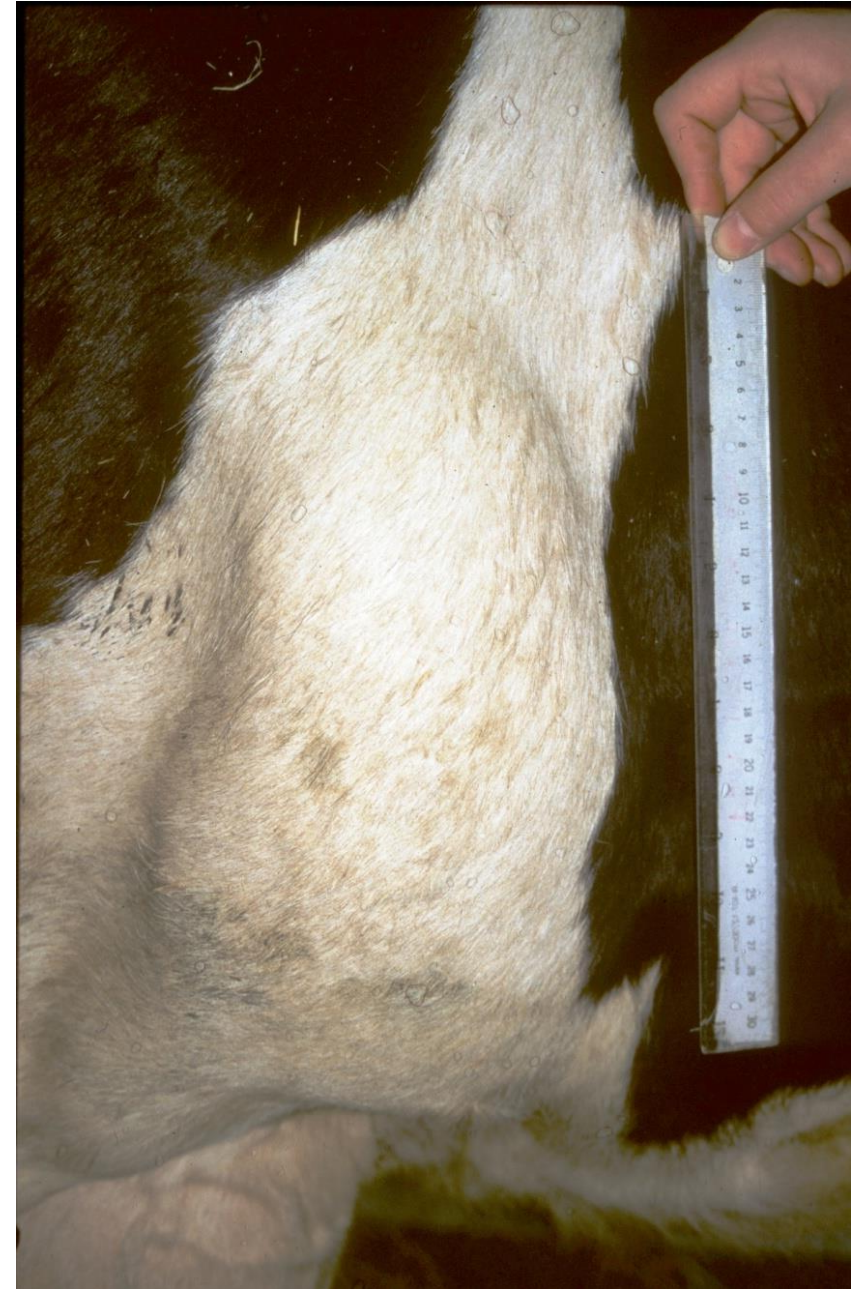
Image adapted from, (https://www.reddit.com/r/Cows/comments/7p1mmb/dairy_cow/).

Enlarged supramammary lymph nodes



Adapted from, (Western College of Veterinary Medicine Petrie 2019).

Enlarged prefemoral lymph node



Adapted from, (Western College of Veterinary Medicine Petrie 2019).

Non- Viral Sporadic Juvenile Lymphosarcoma of the Thymic gland



Adapted from, (Western College of Veterinary Medicine Petrie 2019).

Natural bred heifer with Cutaneous Lymphosarcoma



Adapted from, (Western College of Veterinary Medicine Petrie 2019).

Persistent Lymphocytosis tumorous kidney



Adapted from, (Western College of Veterinary Medicine Petrie 2019).

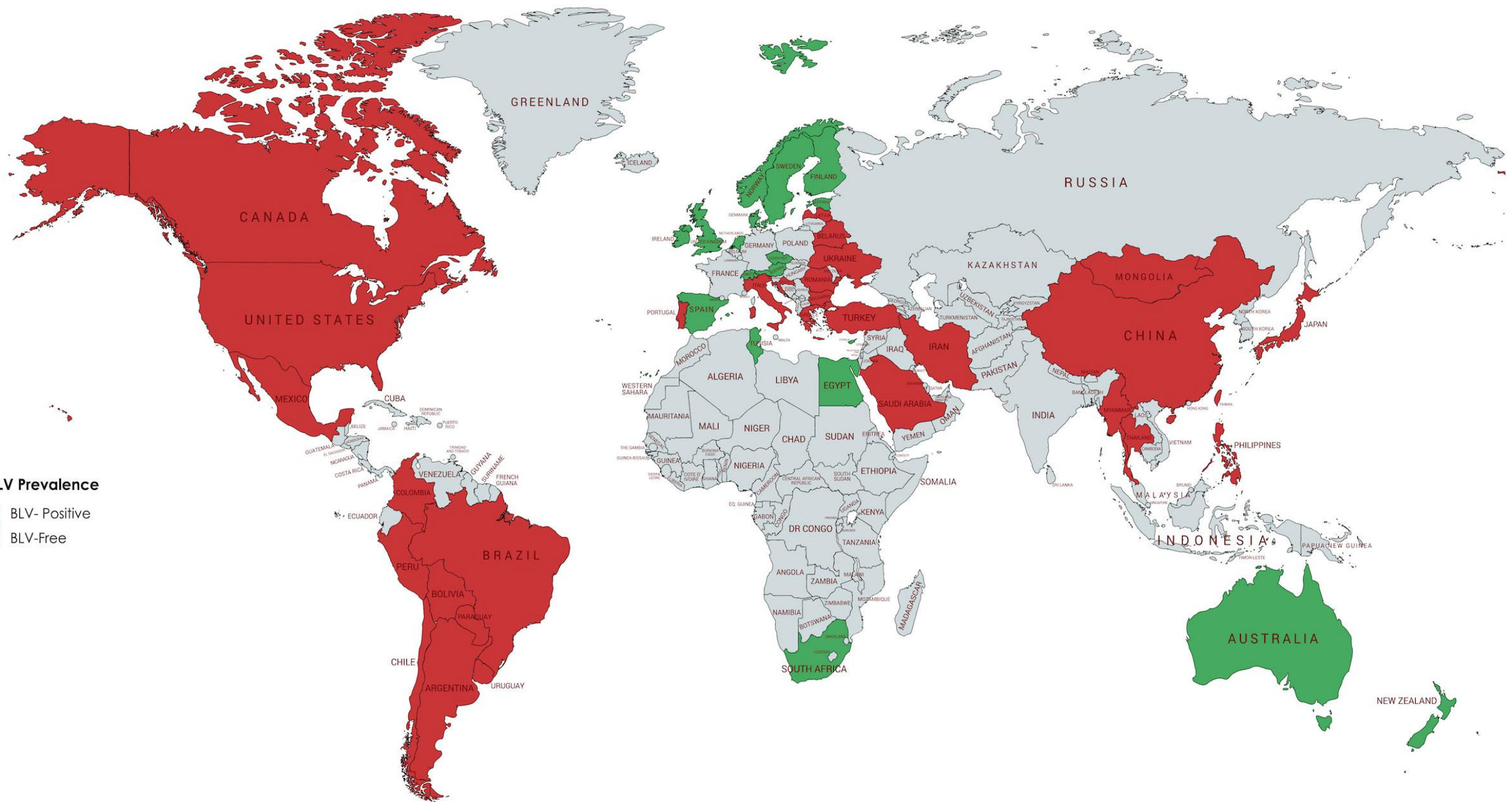
Bovine Leukemia Virus Transmission

- ▶ BLV is transferred through blood and body fluids
- ▶ Horizontal Transmission (Wrathall et al. 2006).
 - ▶ Natural mating
 - ▶ Saliva
- ▶ Vertical Transmission (Wrathall et al. 2006).
 - ▶ Colostrum
- ▶ Through shared equipment (Gillet et al. 2007; Drankhan 2018).

Bovine Leukemia Virus Prevalence

State/Province	Percentage of Herds Infected	Percentage of Infected Cows within BLV Positive Herds
Michigan	87	23-46
Saskatchewan	89	37
Manitoba	97	61
New Brunswick	77	29
Prince Edward Island	63	17
Nova Scotia	70	16
Alberta	87	27

Adapted from, (Michigan State University 2019).



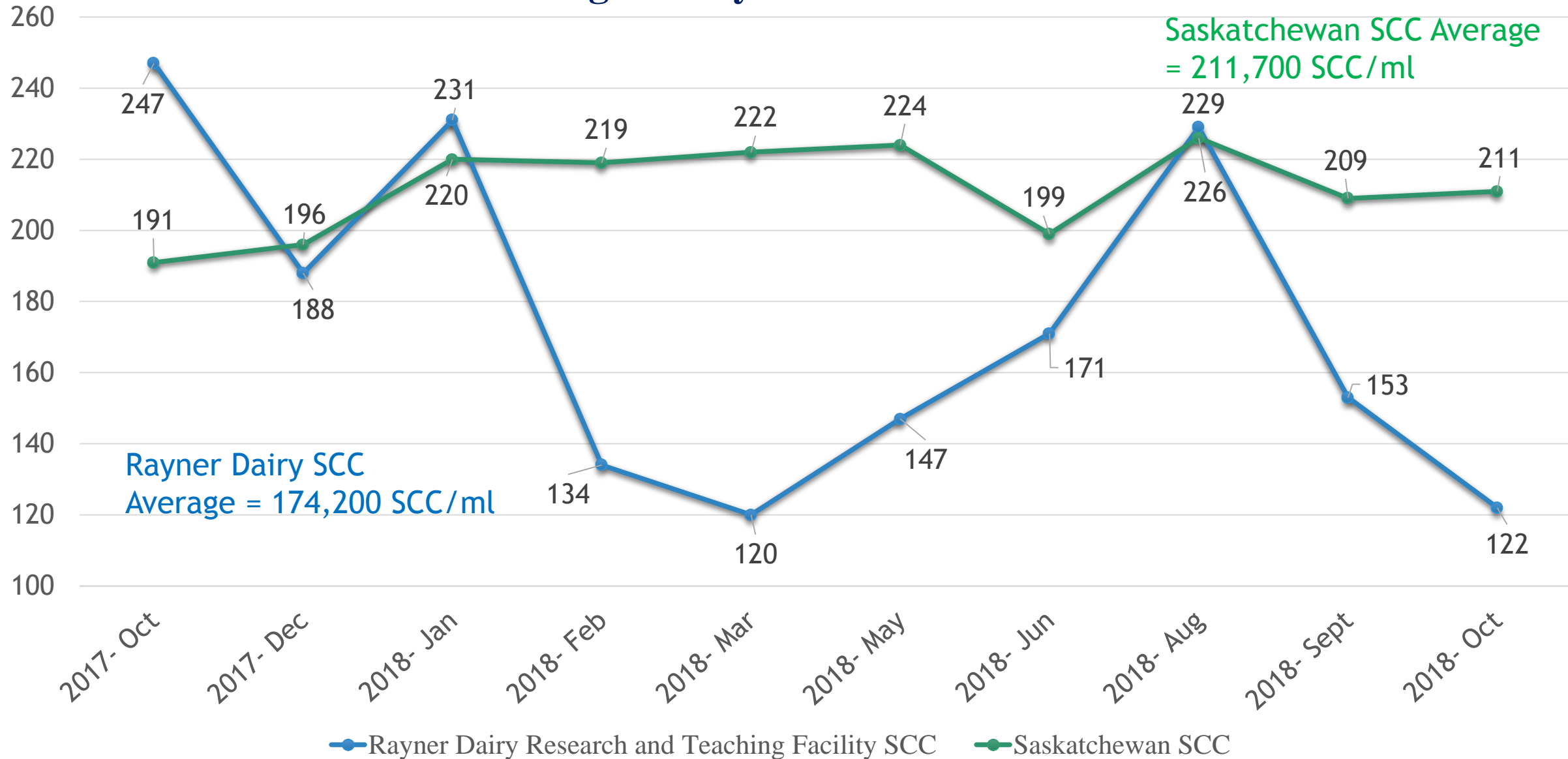
Data collected from, (Polat et al. 2017).

Economic Impacts of BLV

- ▶ Inhibits cows to reach peak milk production
- ▶ Decreases longevity
- ▶ Increase incidence of mastitis
- ▶ Increased culling

Inputs	
Number of animals in your herd	350
Percentage of your milking animals that are ELISA-positive for BLV on milk or serum test	53%
Average slaughter value of a cow from your milking herd	\$1,054 CAD
Value of an average animal in your milking herd. Think of the lowest price you would accept to sell an average cow from your milking herd	\$2,150 CAD
In the last 12 months, how many of your cows were condemned at slaughter for lymphoma so that you received nothing for the sale?	2
Rolling herd average milk production – kilograms per cow per year	11,793
Price of milk – per hl	\$72 CAD
Any additional cost to control BLV: supplies, testing, etc.	\$1,000 CAD
Outputs	
Milk production loss	\$153,405.19 CAD
Cost of decreased longevity per year for your entire herd	\$28,589.12 CAD
Condemnation loss per year for your herd	\$2,108.00 CAD
Any additional cost to control BLV	\$1,000.00 CAD
Total: Estimated yearly herd BLV impact (your herd)	\$185,102.31 CAD
Total: Estimated yearly herd BLV impact per 100 cows	\$52,886.37 CAD

Somatic Cell Count (SCC) comparison between Rayner Dairy Research and Teaching Facility to Saskatchewan



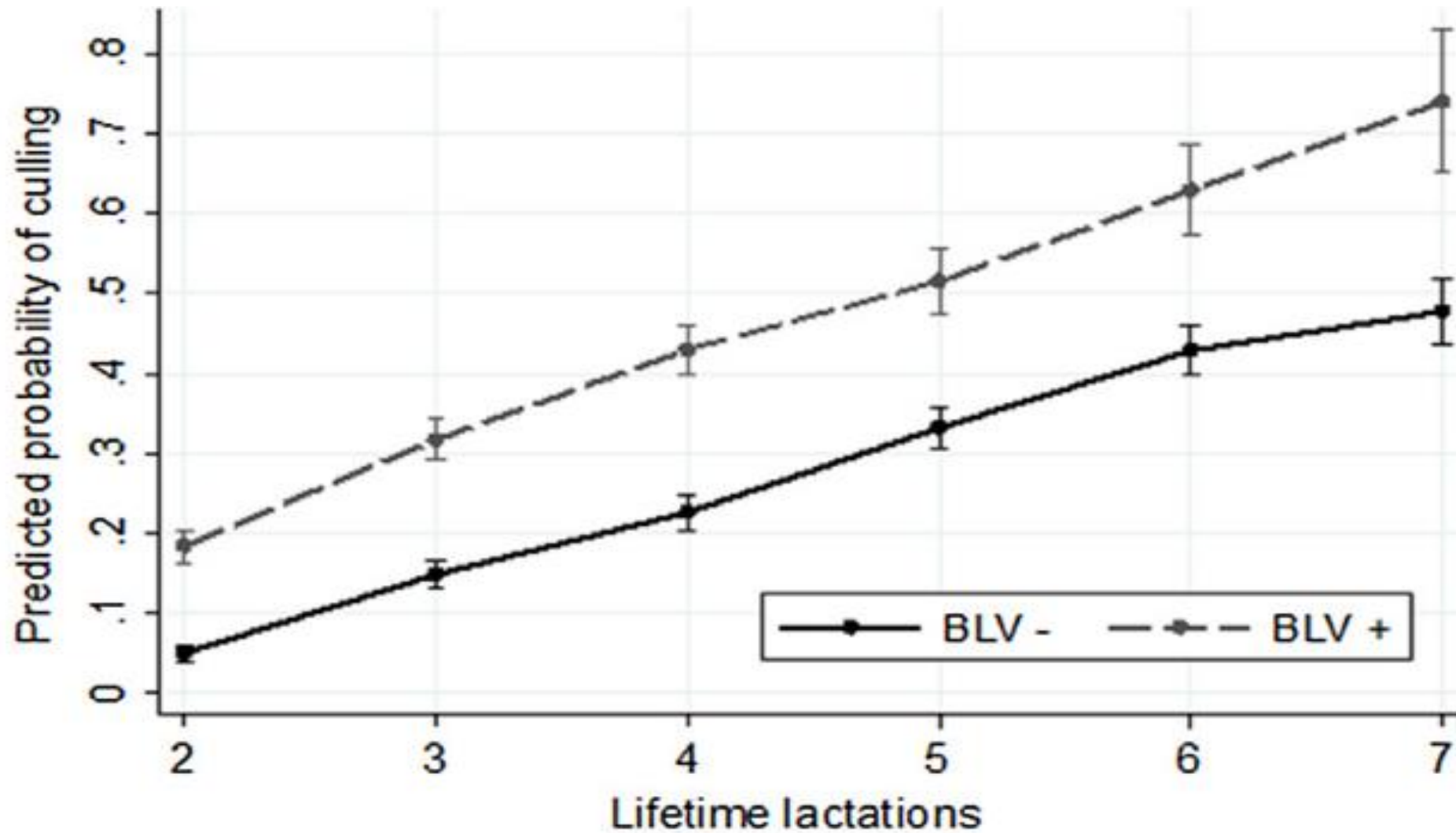
Colostrum

- ▶ Commercial dried colostrum
- ▶ Inactivates BLV
- ▶ Provides BLV antibodies
- ▶ Prevents transmission
- ▶ Contains several inactivate antibodies

Bovine Leukemia Virus and Human Health

- ▶ BLV is from the *Deltaretrovirus* family (Martinez Cuesta et al. 2018b).
- ▶ The same family Human immunodeficiency virus (HIV), human T-cell lymphotropic virus types I and II (HTLV-I and -II), and simian T-cell lymphotropic virus (STLV) is also from (Martinez Cuesta et al. 2018b).
- ▶ Studies suggest BLV is linked to breast cancer

The Probability of Culling for BLV-infected cows



Bovine Leukemia Virus Testing and Cost

- ▶ Prairie Diagnostic Services (PDS)
 - ▶ Saskatoon, Saskatchewan
 - ▶ \$ 12.50 per cow
 - ▶ More accurate results
 - ▶ Enzyme- Linked Immunosorbent Assay (ELISA)
- ▶ Dairy Herd Improvement (DHI)
 - ▶ \$ 8 per cow as a client
 - ▶ \$ 9 per cow as a non-client
 - ▶ ELISA

Recommendations

- ▶ Use of commercial colostrum
- ▶ Increasing the biosecurity standards on the farm.
- ▶ Prevention of transmission within the farm
- ▶ Bovine Leukemia Virus herd testing

Eradication

- ▶ Isolation of positively infected cows
- ▶ Gradual culling

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Questions?



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