

## Investigating what makes *Staphylococcus chromogenes* the most prevalent staphylococcus species in milk

Mohamed Ghanduri, De Buck Lab, University of Calgary; [Mohamed.ghanduri@ucalgary.ca](mailto:Mohamed.ghanduri@ucalgary.ca)

Milk, cheese, and butter are common food items in the average Canadian's diet. They provide much of the daily servings of fats, proteins, vitamins, and minerals to keep us healthy. Milk production is also one of Canada's most important agricultural sectors in seven out of ten provinces. Canada prides itself on its high standard and quality of milk. Bovine mastitis is a disease caused by a bacterial infection in the udders of milk-producing cows, which leads to inflammation and lower qualities and quantities of milk produced. *Staphylococci* bacteria (bacterial group) infections are commonly associated with Bovine mastitis. *Staphylococcus chromogenes* is the most found species in cases of subclinical mastitis (a less intense, more chronic type of bovine mastitis). Our goal is to understand what genes in *S. chromogenes*' DNA are the most relevant in infecting and multiplying in cow udders. We can do that by first deleting random genes in *S. chromogenes*, thus creating many distinct mutants. Then we will test those mutants for virulence and survivability in an udder environment. By sequencing the DNA of the mutants before and after putting them through the udder environment, we can compare which genes were important in the mutants' ability to infect and adapt to the environment. These genes will give us insight into how *S. chromogenes* spreads and how we might be able to stop it from spreading, hence ensuring the future of high-quality Canadian milk and increasing milk production.

**Take home message:** This research will be essential to scrutinizing the significant virulence factors involved in the udder-adapted *S. chromogenes*. By creating random mutants and then testing them in an udder environment, we can pinpoint important virulent genes to develop a solution to lower the impacts of bovine mastitis.

## Histology and kinetics of IgG transport in the neonatal bovine small intestine during the first 24 hours of life

R.L. Hiltz<sup>1</sup>, D. Vine<sup>1</sup>, D.R. Barreda<sup>1</sup>, A.H. Laarman<sup>1</sup>

<sup>1</sup>Department of Agricultural, Food, and Nutritional Science, University of Alberta, T6G 2R3, Edmonton. Email: [rhiltz@ualberta.ca](mailto:rhiltz@ualberta.ca)

At birth bovine calves require absorption of colostrum to obtain transfer of passive immunity. Relatively little is known about the location and kinetics of immunoglobulin transport in the bovine neonate. This study focused on the effect of time after colostrum feeding on IgG transport kinetics and histological features in bovine small intestine in the first 24 hours of life. Holstein-Angus calves (n=30) were assigned to one of five harvest times after birth (1.5, 6, 12, 18, or 24hrs of life) and all except 1.5 hr calves were fed colostrum replacer within 1 hour of life. At harvest, a blood sample was taken for serum IgG analysis and segments of the small intestine were taken for histological analysis and for Ussing chamber experiments. The mucosal buffer in the Ussing chamber contained 120 mg/mL IgG and 10 mg/mL biotinylated IgG (B-IgG); serosal appearance of IgG and BlgG were measured for 3 hours. Additionally, tissue from harvest was analyzed via periodic acid-Schiff stain and size and abundance of PAS positive vesicles were measured. Serum IgG peaked at 12 hrs (1,314 mg/dL IgG,  $P < 0.001$ ) and remained constant thereafter. The site of maximal IgG absorption was distal jejunum and it was greatest at 6 hrs of life (6 hr  $18.6 \pm 8.52$ ; 12 hr  $3.22 \pm 6.19$ ; 18 hr  $-0.43 \pm 4.46$ ; 24 hr  $5.45 \pm 5.05$  mg/hr x cm<sup>2</sup>). Histologically, vesicle density was highest in 12 hr calves ( $P < 0.001$ ; 6hr  $9.59 \pm 0.42$ , 12hr  $13.58 \pm 0.59$ , 18hr  $4.3 \pm 0.46$ , 24hr  $7.8 \pm 0.46$  vesicles/villi. Vesicle size increased with time ( $P < 0.001$ ) was different per tissue type ( $P < 0.01$ ), with an interaction of time x tissue type ( $P < 0.01$ ). IgG flux indicated maximal IgG absorption occurred at 6 – 12hrs of life; vesicle parameters indicated that jejunum may be the site maximal absorption.

**Take home message:** Feeding colostrum early allows natural absorptive processes to occur to their maximum capacity; by 6 hours of life, some physical and physiological traits of absorption are already peaking.