Evaluation of a CO$_2$ laser scalpel for disbudding Holstein calves, a pilot study

M. Kleinhenz$^1$, DVM, PhD; A. Curtis$^2$, MS; M. Weeder$^2$, BS; B. Johnson$^3$, MS, DVM; D. Springfield$^2$, BS; M. Lou$^2$, MS; A. Viscardi$^2$, PhD; J. Coetzee$^2$, BVSc, Cert CHP, PhD, DACVCP, DACAW, DECAWSEL

$^1$Department of Clinical Sciences, College of Veterinary Medicine, Kansas State University, Manhattan, KS 66506; $^2$Department of Anatomy & Physiology, College of Veterinary Medicine, Kansas State University, Manhattan, KS 66506; $^3$Department of Diagnostic Medicine/Pathobiology, College of Veterinary Medicine, Kansas State University, Manhattan, KS 66506

Introduction
Refinement of the disbudding procedure on dairy farms using a CO$_2$ laser scalpel may improve calf welfare. The objective of this project was to test the utility of a CO$_2$ laser scalpel in bovine disbudding; and to compare healing and pain measures to cautery hot-iron disbudding.

Materials and methods
Twelve Holstein bull calves, aged 6 to 39 days of age were enrolled in the study. Calves were randomly assigned to either be disbudded with a CO$_2$ laser scalpel (Laser, n = 6) or cautery hot-iron (Hot-iron, n = 6). Calves were sedated with xylazine; given oral meloxicam and a cornual lidocaine block prior to the procedure. Outcome measures were maximum surface temperature by infrared thermography (IRT), mechanical nociception threshold (MNT), and digital images for wound healing. The IRT and MNT measures were collected prior to disbudding and out to 72 h post-procedure. Images for wound healing were collected at baseline, 6, 24, 72 h, and 7, 14, 28, 42 days post-disbudding.

Results
No differences in overall maximum surface temperatures (Laser 35.3 ± 0.3°C vs. Hot-iron 36.0 ± 0.3°C; $P = 0.10$) or MNT (Laser 2.28 ± 0.19 vs. Hot-iron 2.42 ± 0.19 kgf; $P = 0.59$) were noted. All 6 calves in the Laser group were completely healed by day 42, whereas only 4/6 of the Hot-iron calves were fully healed.

Significance
These results suggest calves disbudded using a CO$_2$ laser scalpel may be painful based on the outcomes measured. Laser calves healed faster than cautery disbudded calves. Future research is needed to assess pain in unsedated calves at later time points.