

Advancements in automated feeding for calves: Where we are today and where we'll be tomorrow

Michael Steele¹, Jeffrey Rushen² and Anne Marie de Passillé²

¹University of Alberta

²University of British Columbia

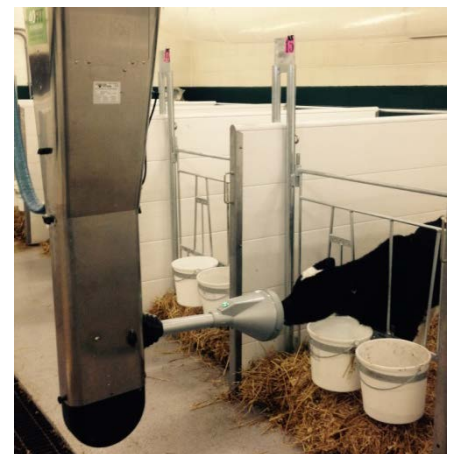
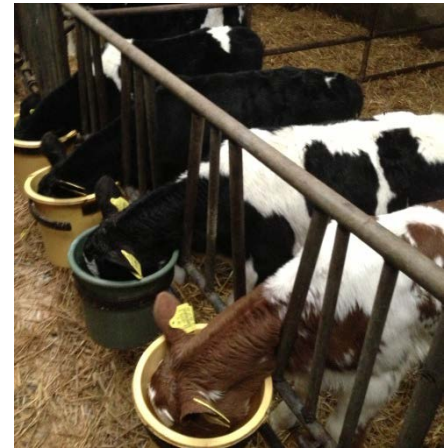
Outline

- A New Style of Feeding Calves
- Why Automated Feeding?
- Considerations for Automated Feeding
- Where will we be Tomorrow?

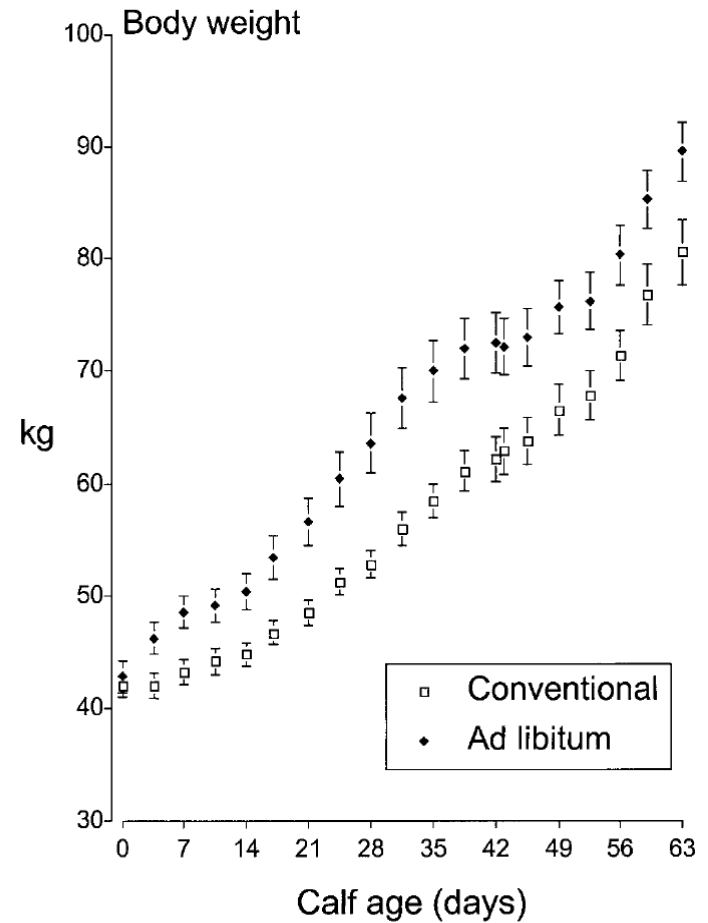
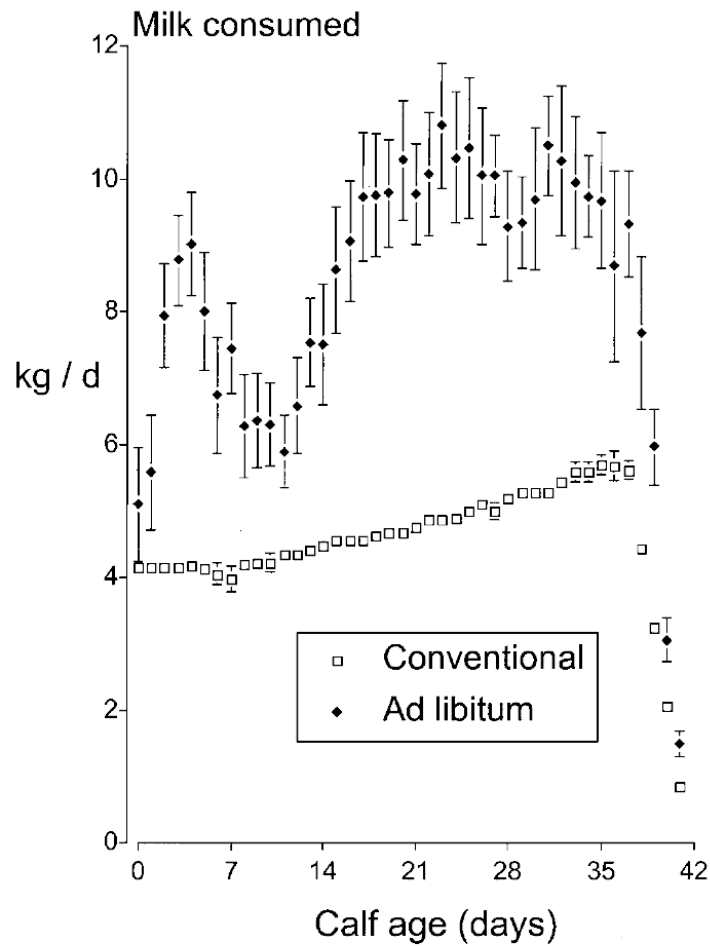


A New Style of Feeding Calves

- Traditionally calves are limit fed milk at 10% of bodyweight
 - Cost
 - “Less diarrhea” – unfounded
- But, calves can consume up to 20% of bodyweight
 - Canadian Code of Practise recommends 20% of bodyweight



Conventional vs. Ad lib Milk Feeding



Why Automated Feeding?

- I. Economics
- II. Calf Biology
- III. Animal Welfare



Labour Efficiency Economics

- **Conventional**

- 10 min per calf per day for 2x feeding
- 200 milking cows, 80 calves per year
- 80 calves x 10 min/d x 64 d x \$20/h

=\$15,000

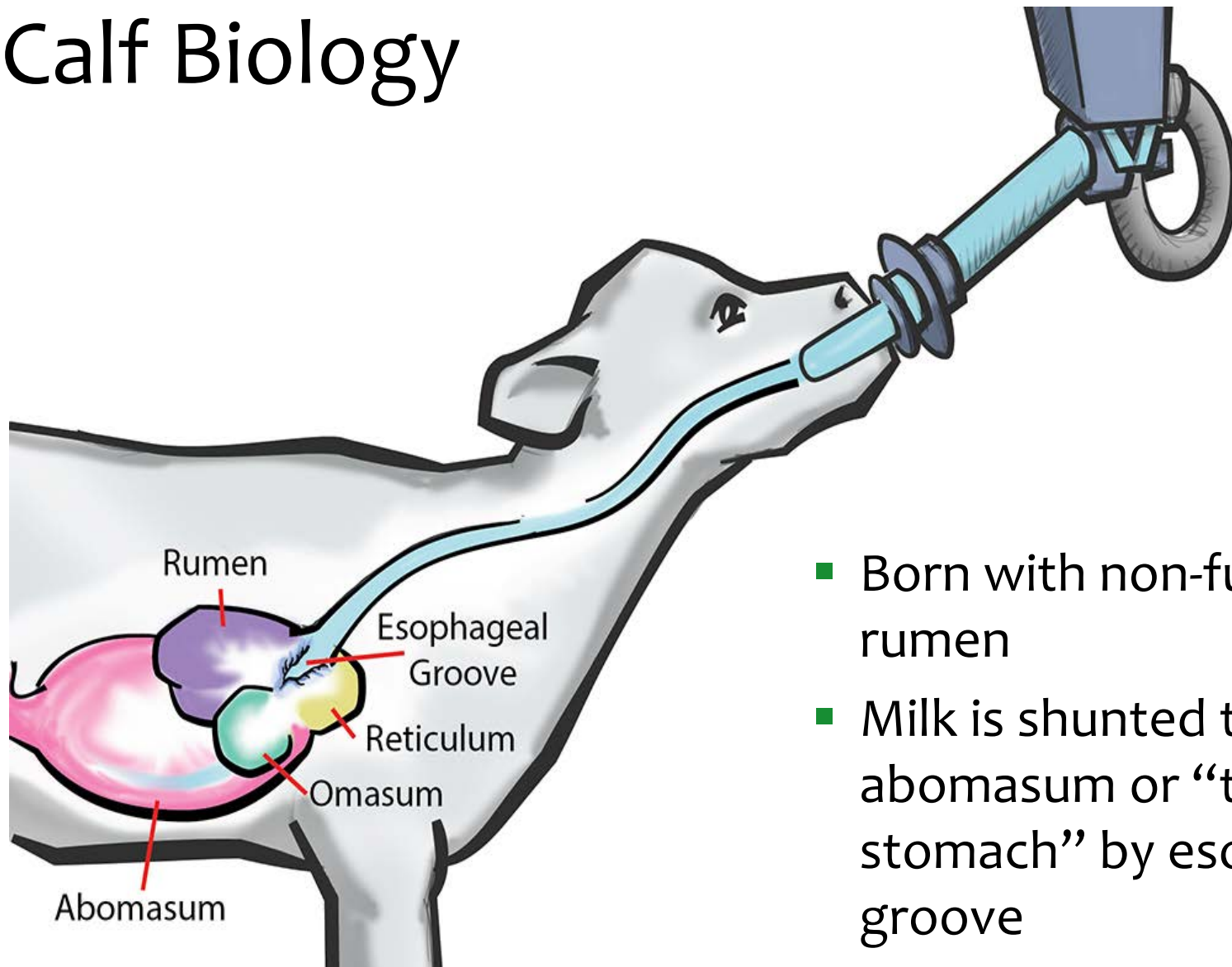
- **Automated Calf Feeding**

- New combi system (milk and replacer)

=\$15,000



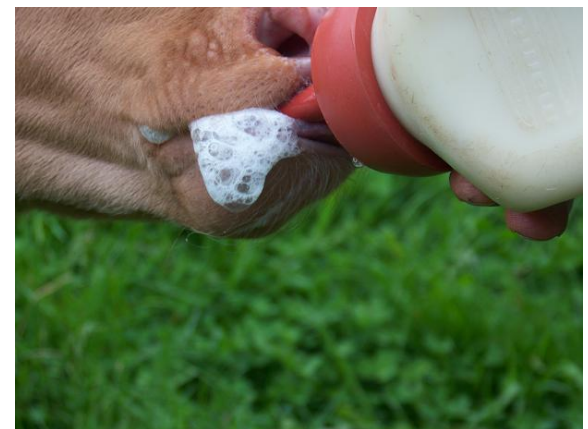
Calf Biology



- Born with non-functional rumen
- Milk is shunted to the abomasum or “true stomach” by esophageal groove

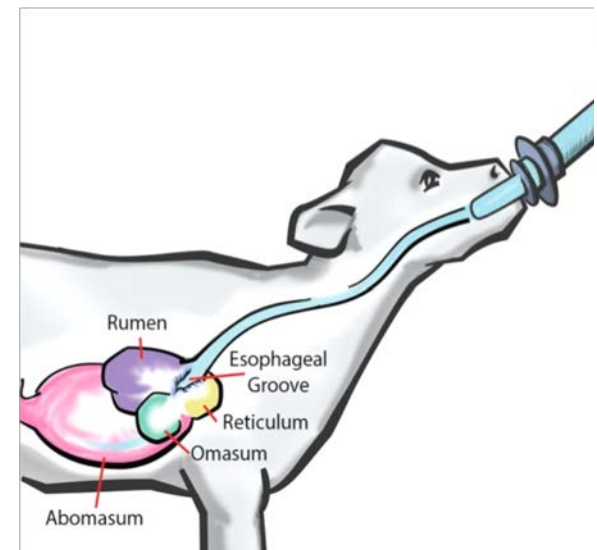
Calf Biology

- All automated milk feeders use a nipple
- Advantage of a nipple
 - Less cross-sucking
 - Increased saliva production
 - Less digestive upsets

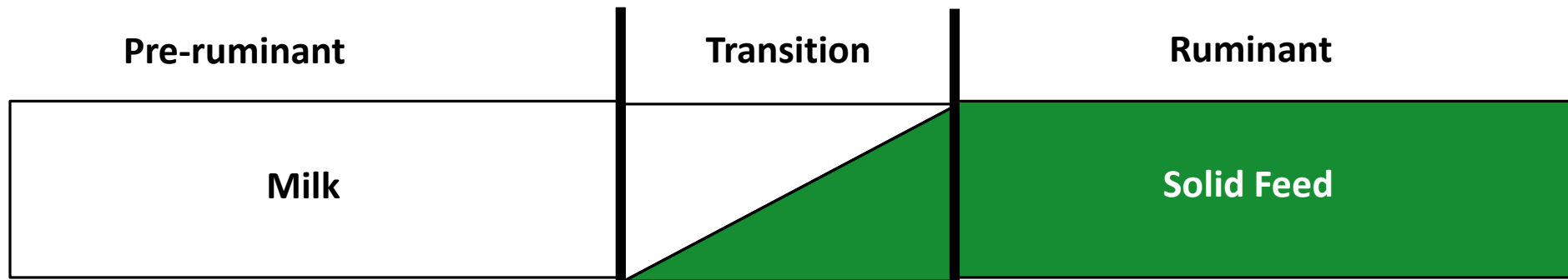


Calf Physiology

- Calves typically nurse 12 times per day in the first weeks of life
- Larger meals fed less frequently increase the risk of abomasal dysfunction
- Referred to as “Ruminal Drinking”
 - Ruminal acidosis, decreased passage rate and digestion



Weaning – Transition to Ruminant



monogastric



ruminant

Weaning – Transition to Ruminant

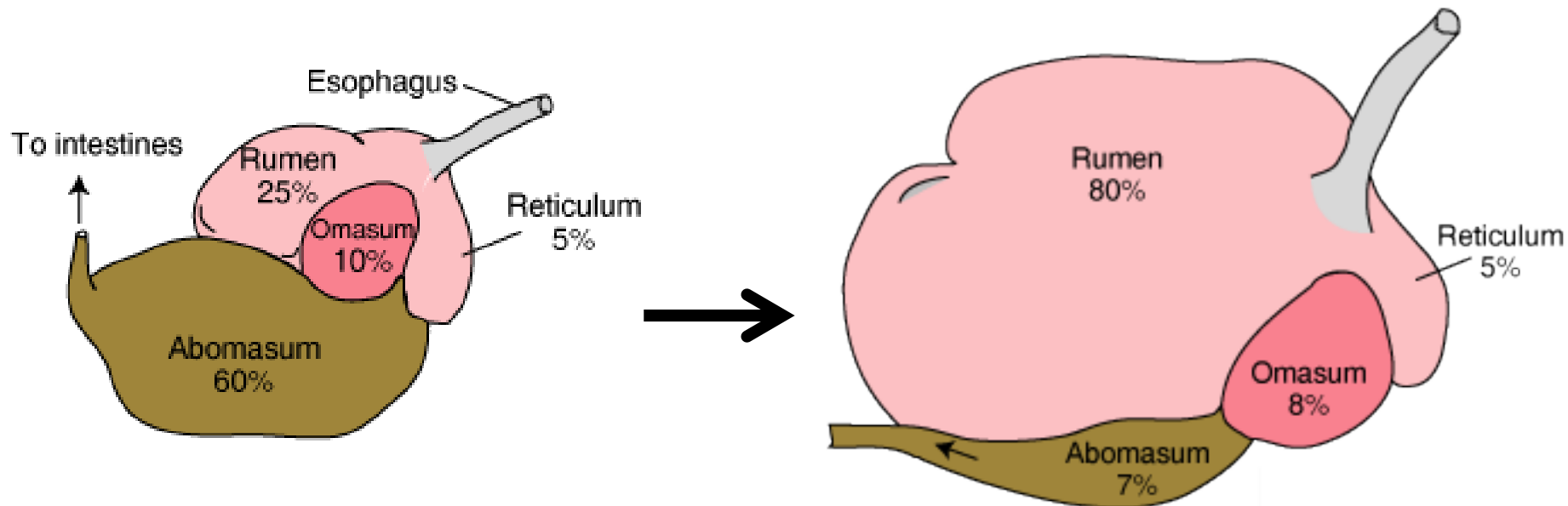
Pre-ruminant

Transition

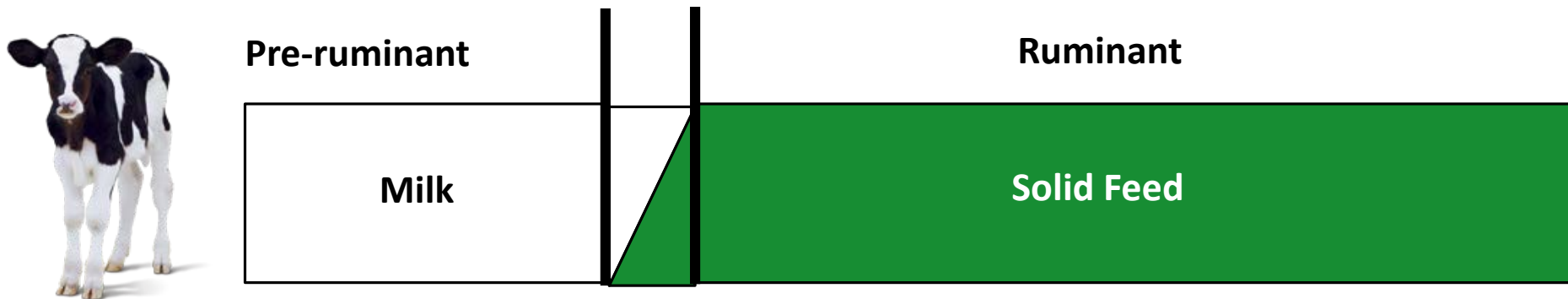
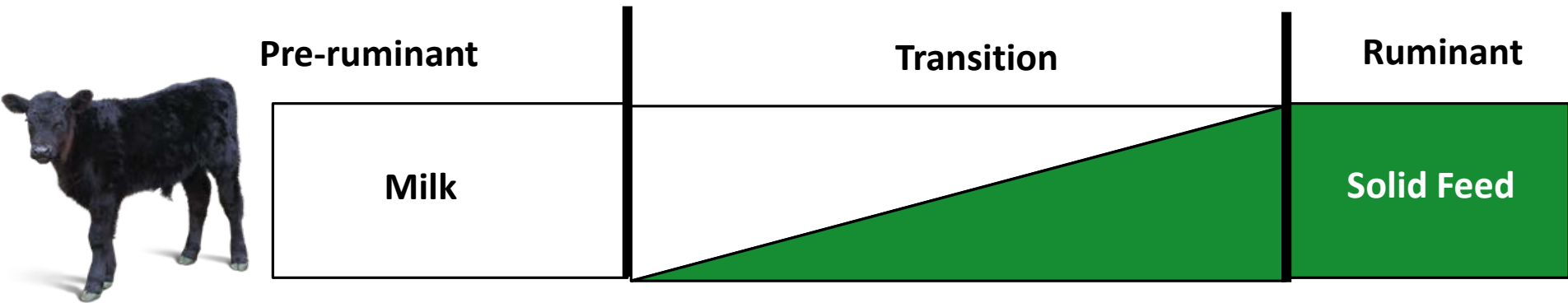
Ruminant

Milk

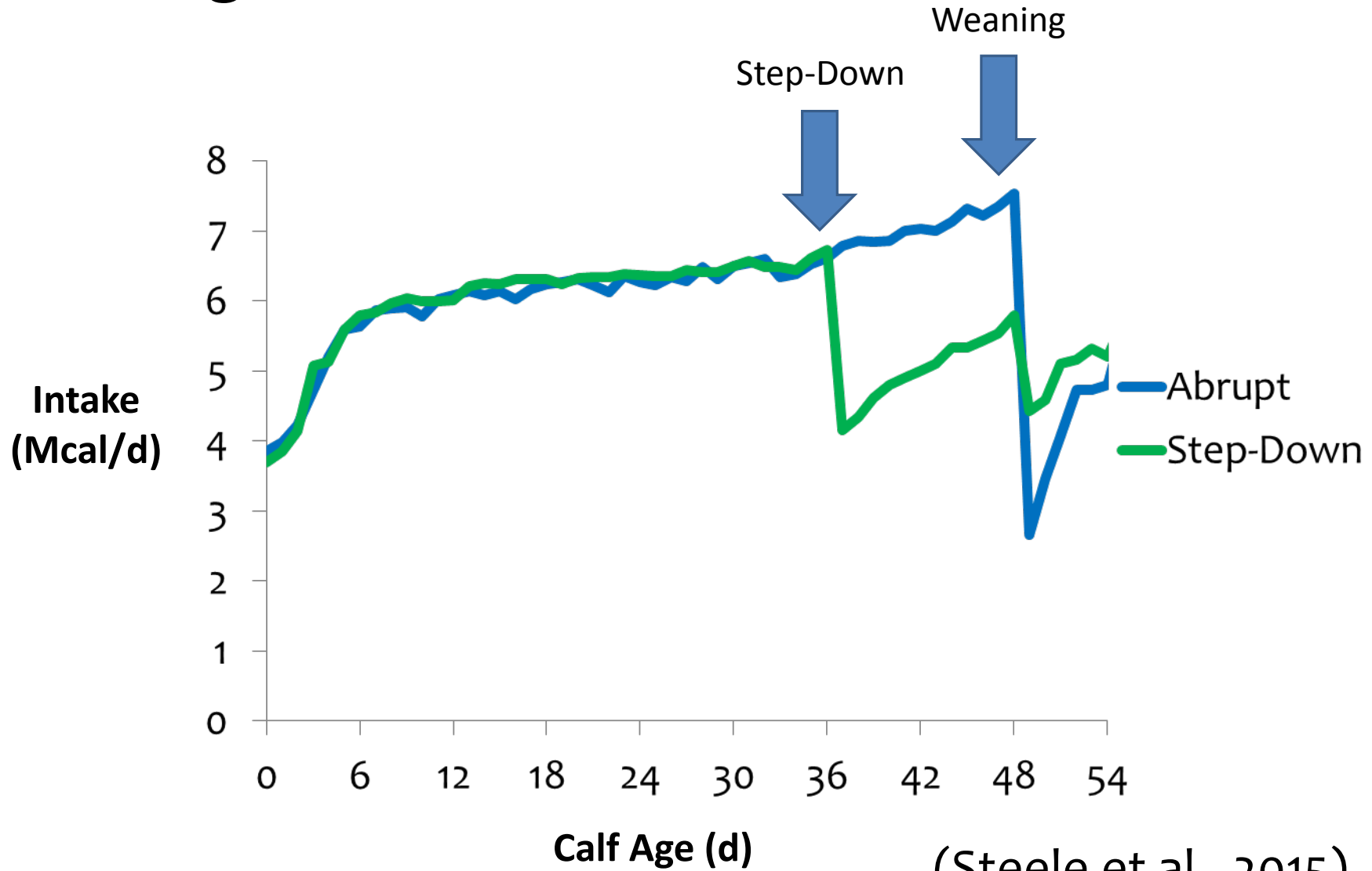
Solid Feed



Weaning Transition

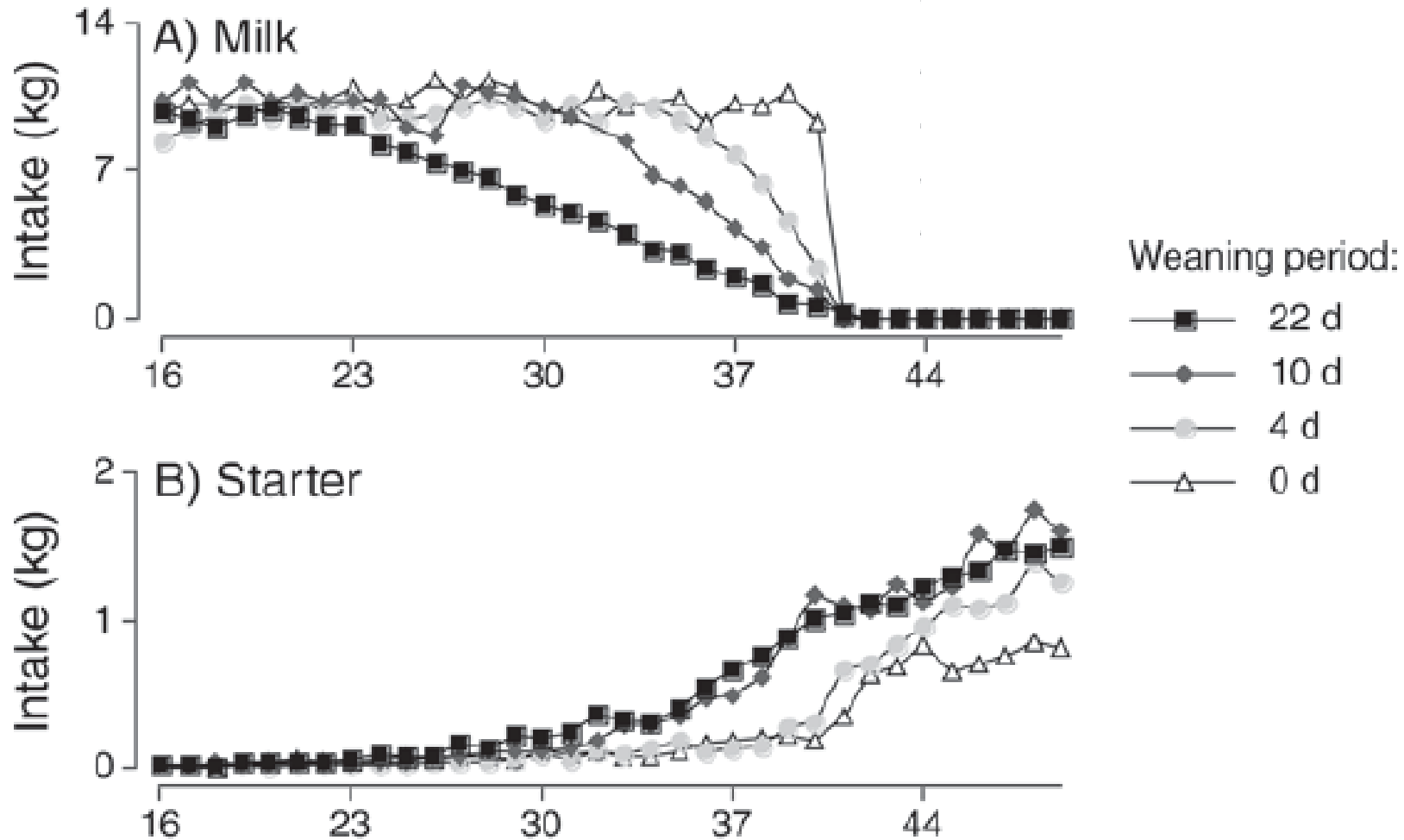


Weaning without an automated feeder

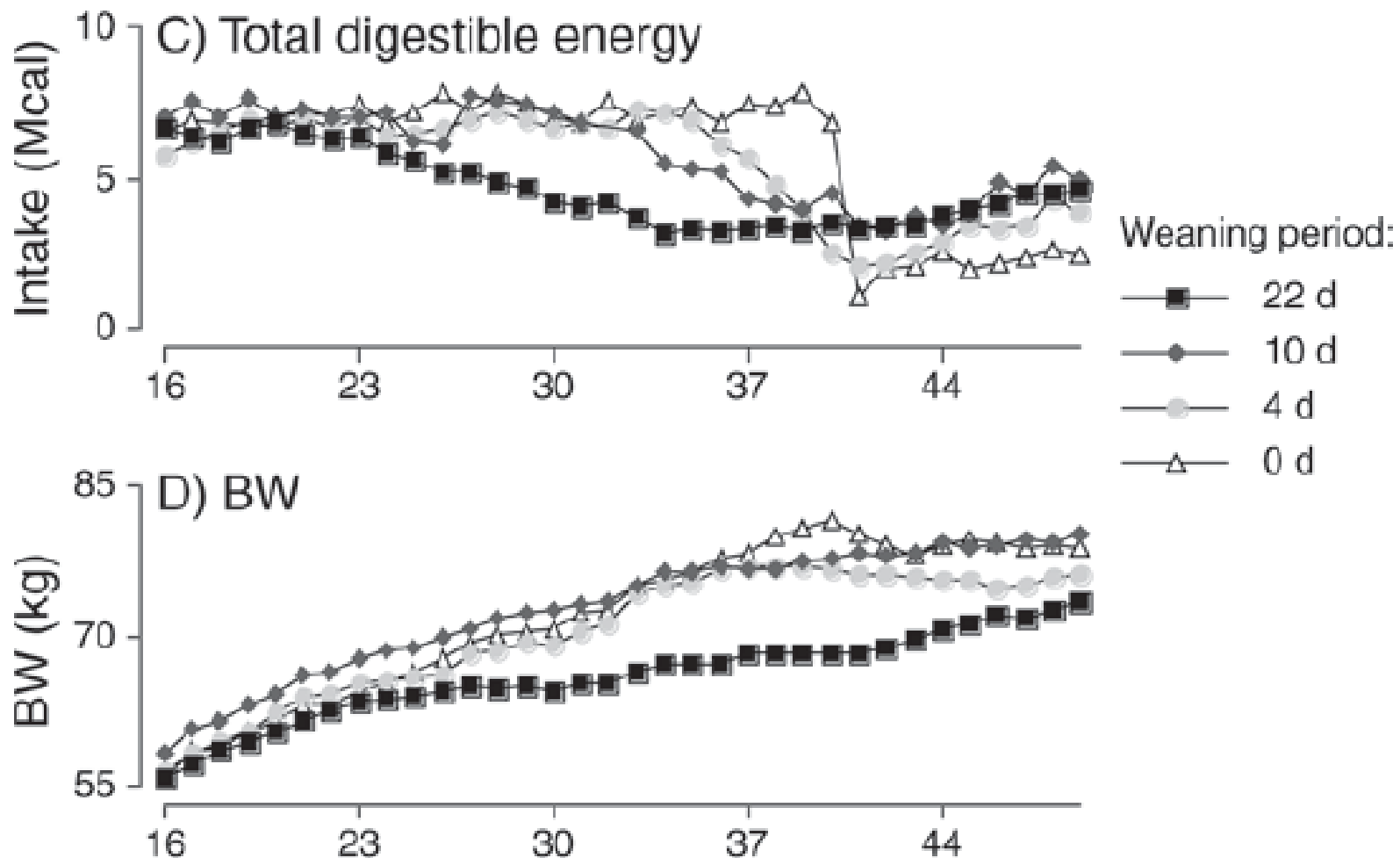


(Steele et al., 2015)

Duration of Step-Down Weaning



Duration of Step-Down Weaning



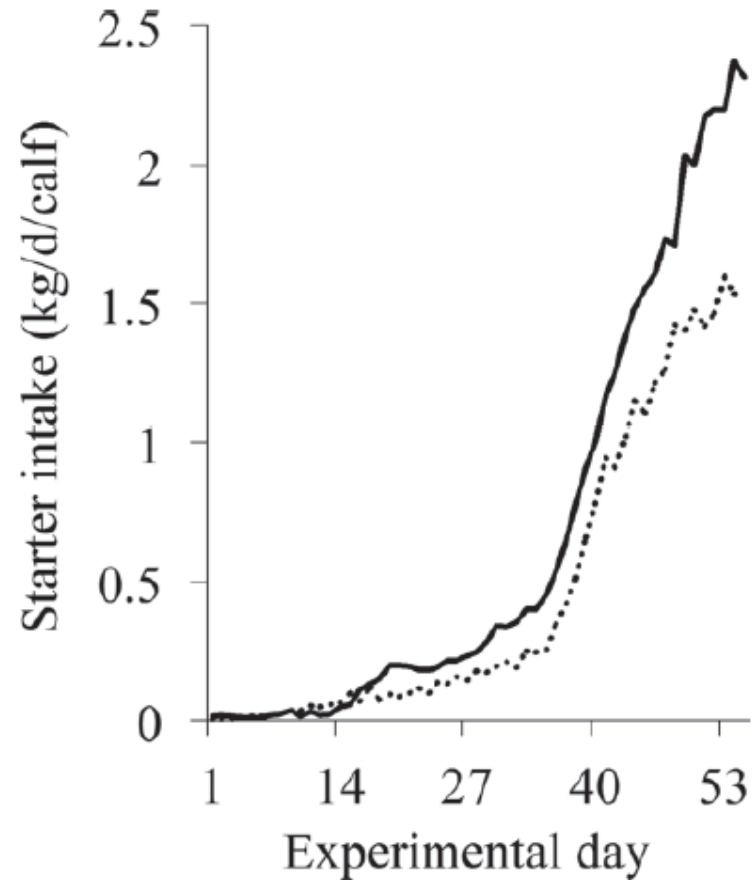
Group Housing

- Calves are often raised with restricted exposure to others
- Is this a welfare concern?
- Calves can learn from one another resulting in increase starter intake (De Paula Viera, 2012)



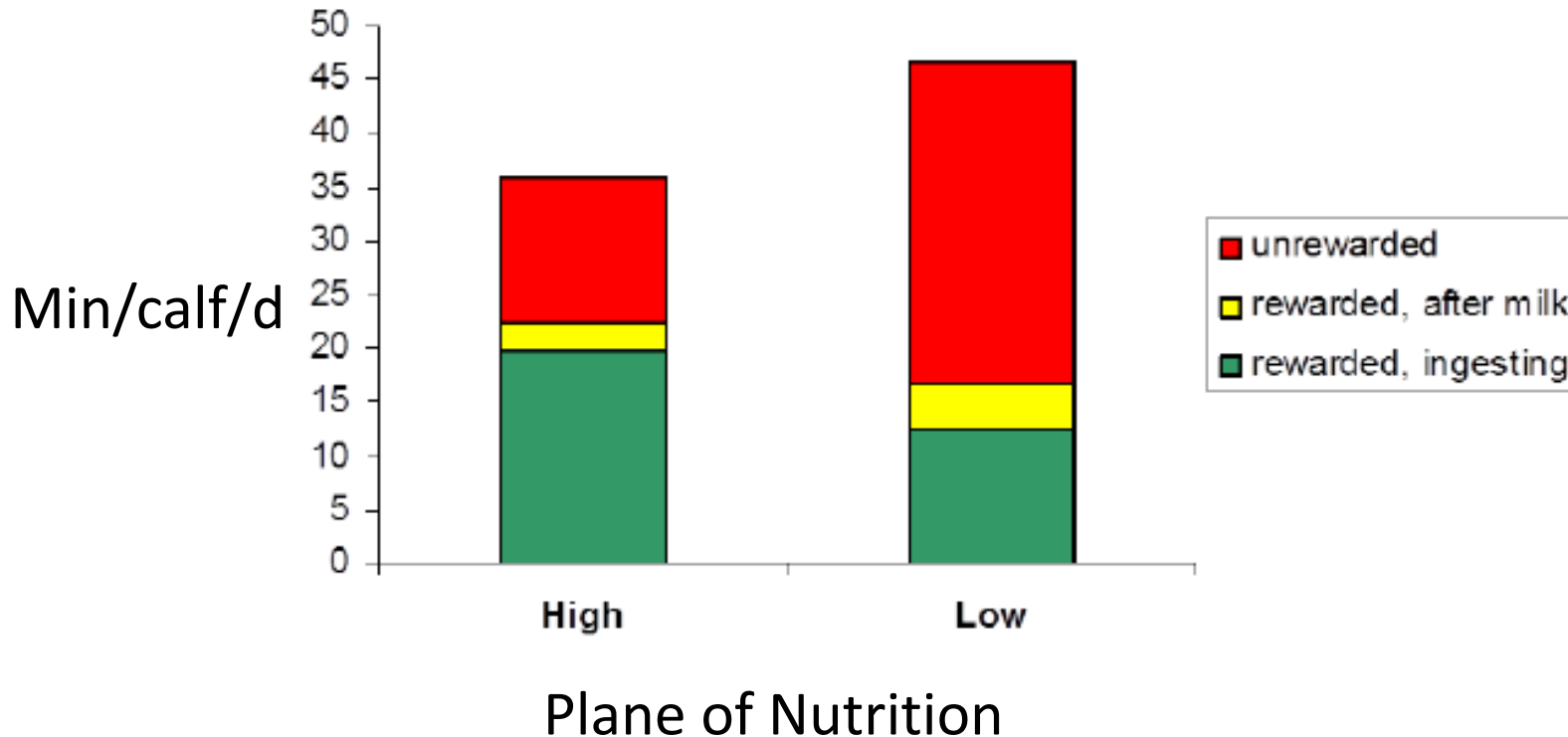
Group Housing

- Calves are often raised with restricted exposure to others
- Is this a welfare concern?
- Calves can learn from one another resulting in increase starter intake (De Paula Viera, 2012)



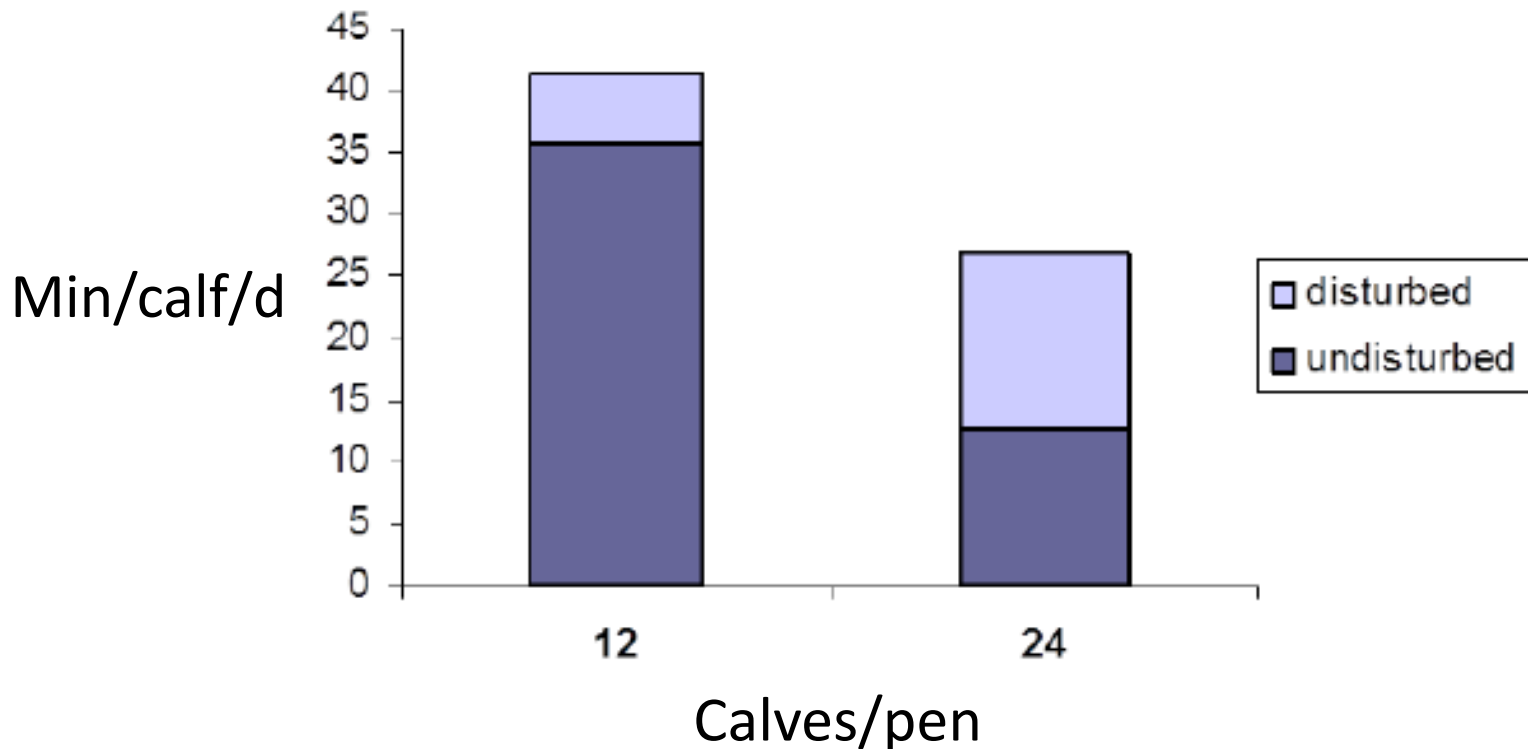
Feed Elevated Planes Nutrition

- Lower milk allowance = more time in feeder + more unrewarded visits



Group Dynamics

- Smaller numbers per feeder are always recommended

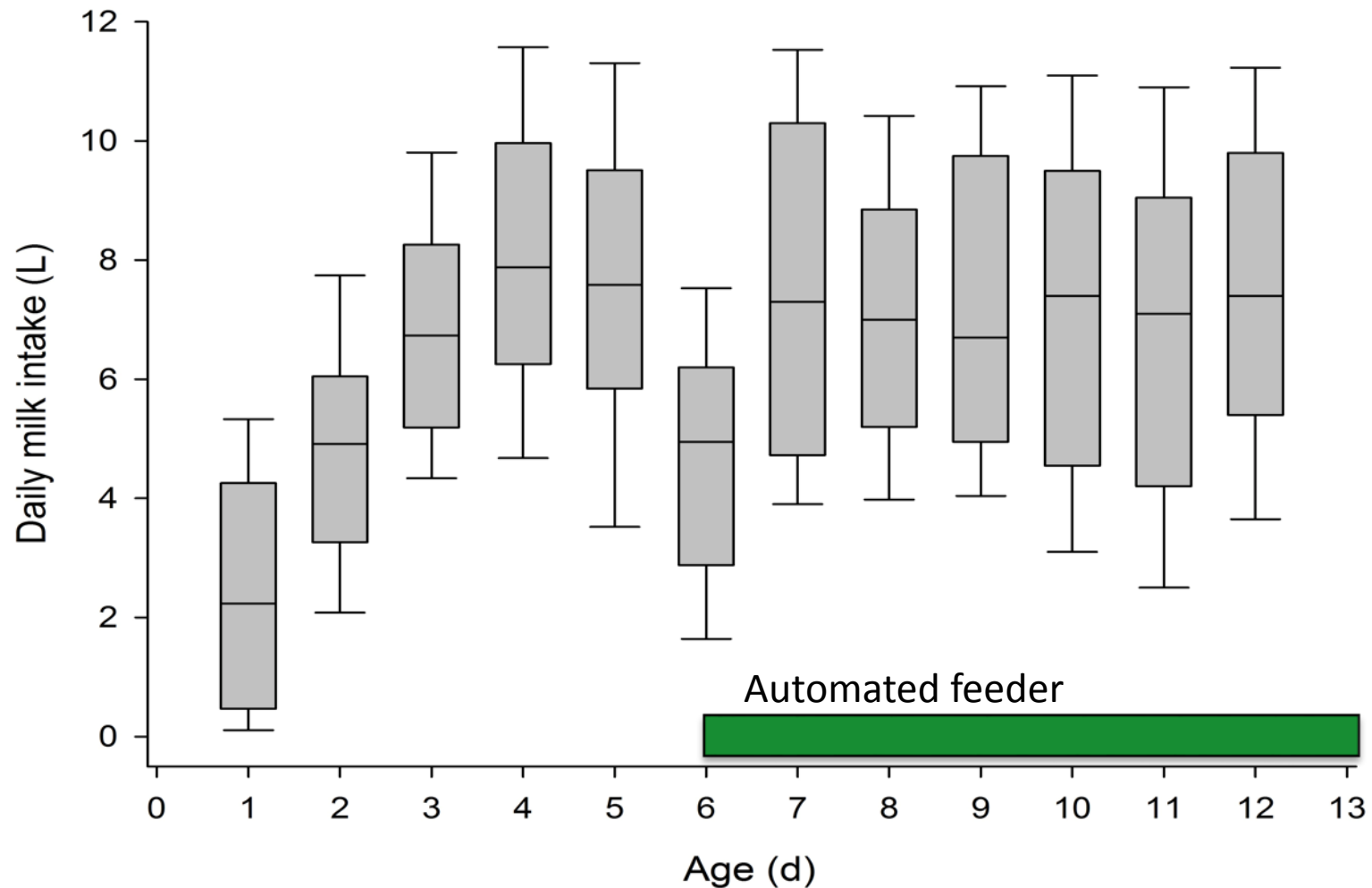


Group Dynamics

- The transition from individual pens to group housing can be a stressful event
 - Discover group mates
 - Find feeder
 - Drink from teat
 - Discover feed availability
 - Discover new pen



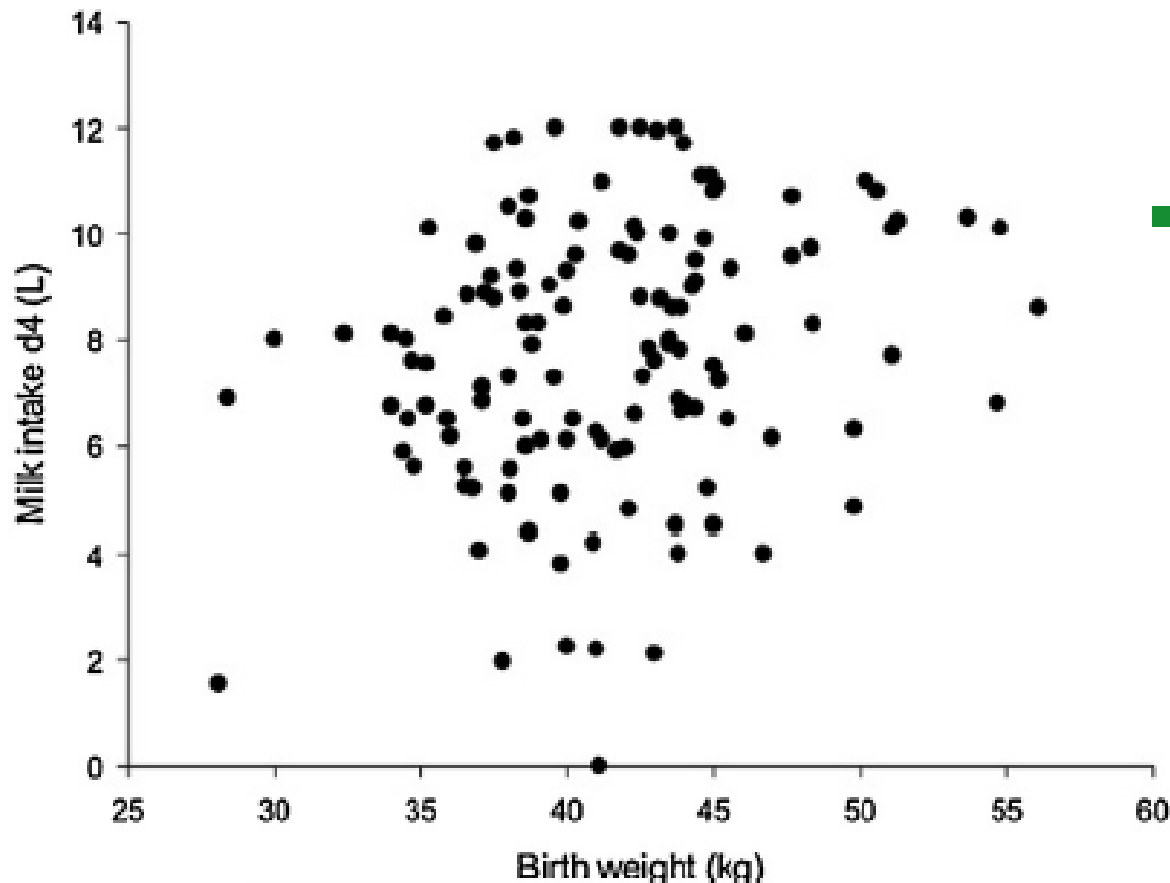
Introducing Calves Will Reduce Intake



(Fujiwara et al., 2014)

Intake variation in calves during first week

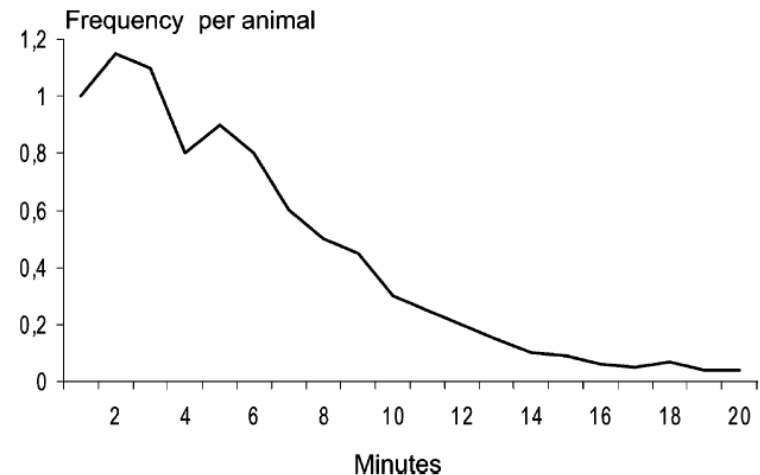
Intake on Day 4 of life



- Calves consuming more milk in early-life are faster to adapt to group housing

Non-nutritive Sucking

- Thought to impact calf behaviour and physiology long-term
- Often occurs immediately after a meal
- What can you do to avoid?
 - Feed more milk
 - Reduce drinking speed
 - Close the stall when drinking
 - Gradual weaning



Jensen et al., 2004



Agassiz, British Columbia



Dairy Research and Technology Centre













Handy

⚠️ 🔋 📶 📶 🔋 15:30

CalfRail

3 / 9	Abruf	Besu.
99112 a A 1	37 ✓	97 ✓+
99101 ↘ A 1	46 ✓	73 ✓+
▶ 99108 ↘ A 1	50 ✓	73 ✓+
99103 ↘ A 1	61 ✓	69 ✓+
99109 ↘ A 1	65 ✓	73 ✓+
99102 a A 1	94 ✓	66 ✓+
99110 → A 1	✓ 54	✓+ ✓+

Auto

1 2 3

4 5 #

Precision Feeding



- Often thought to be unpractical to feed multiple feeds to young calves
- Automated feeding offers the opportunity to feed calves individually
- Extra colostrum in the first week of life

Where will we be tomorrow?

Weaning by dry feed intake

Feeding by bodyweight



Culling based on pre-weaning performance

Phase feeding for first weeks of life



Feeding individualized diets to calves

Feeding individual calves by genotype and functional genotype

Take-home Messages

- I. Feeding more milk favours automated calf feeding
- II. Advantages include labour efficiency, feeding frequency, gradual weaning and improved welfare
- III. Manage the automated calf feeder to minimize competition and non-nutritive sucking
- IV. Automated feeding technologies open the door to new strategies for feeding calves

Acknowledgements

- UofA Dairy Team
- Jen Haisan, Research Coordinator
- UBC Dairy Researchers
- DeLaval and Foerster Technik



UNIVERSITY OF
ALBERTA

masteele@ualberta.ca

Questions?



UNIVERSITY OF
ALBERTA

Current Calf Project at DRTC

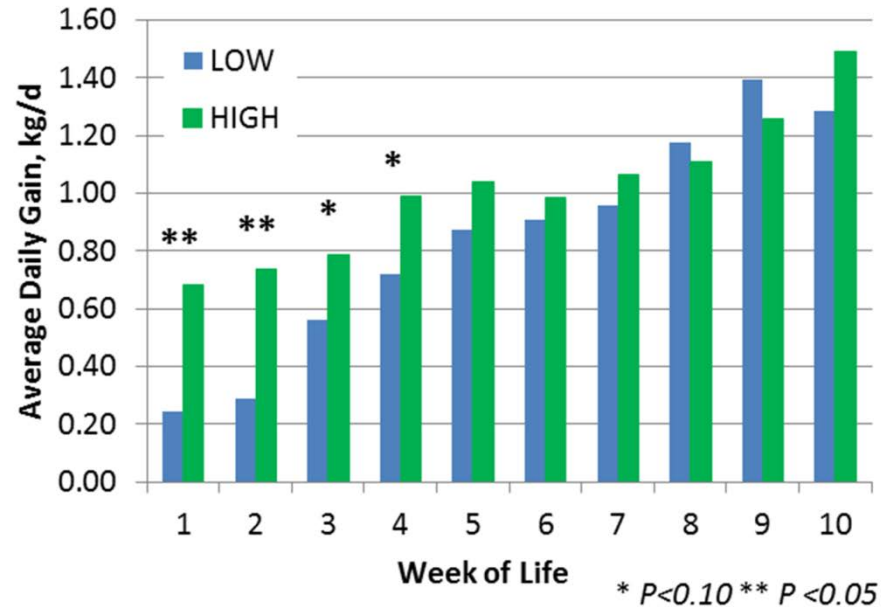
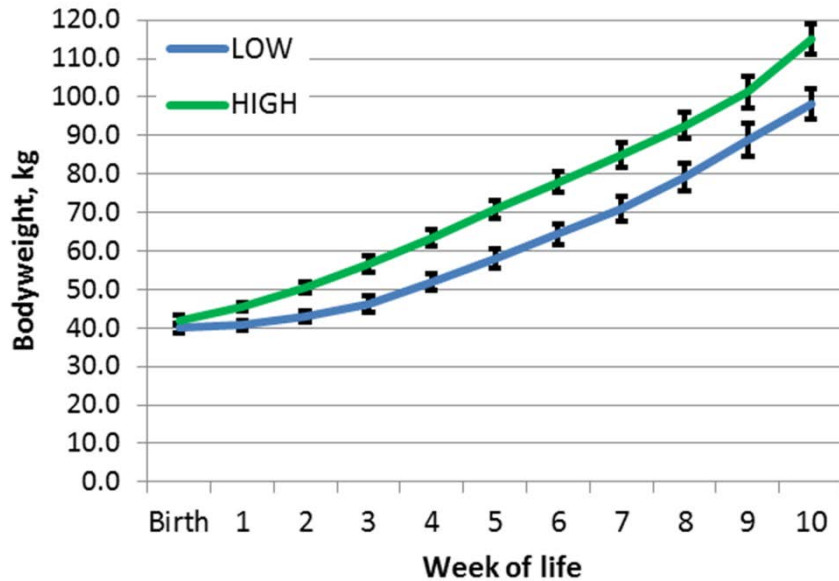
- Feeding a HIGH (10L/d) or LOW (5L/d) plane of nutrition pre-weaning
- Calves weaned at d 58
- Measuring milk and starter intakes daily, BW weekly, blood samples bi-weekly



Body Weight

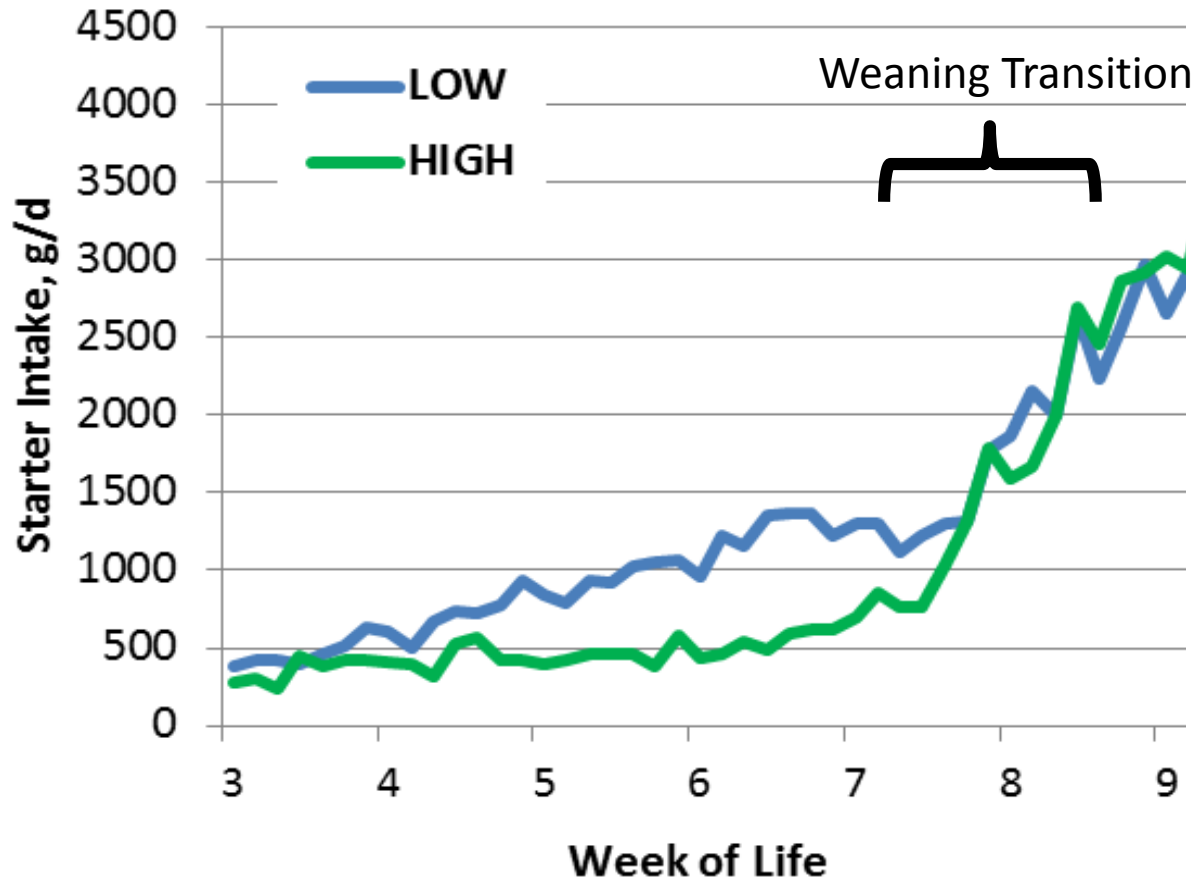


Body Weight

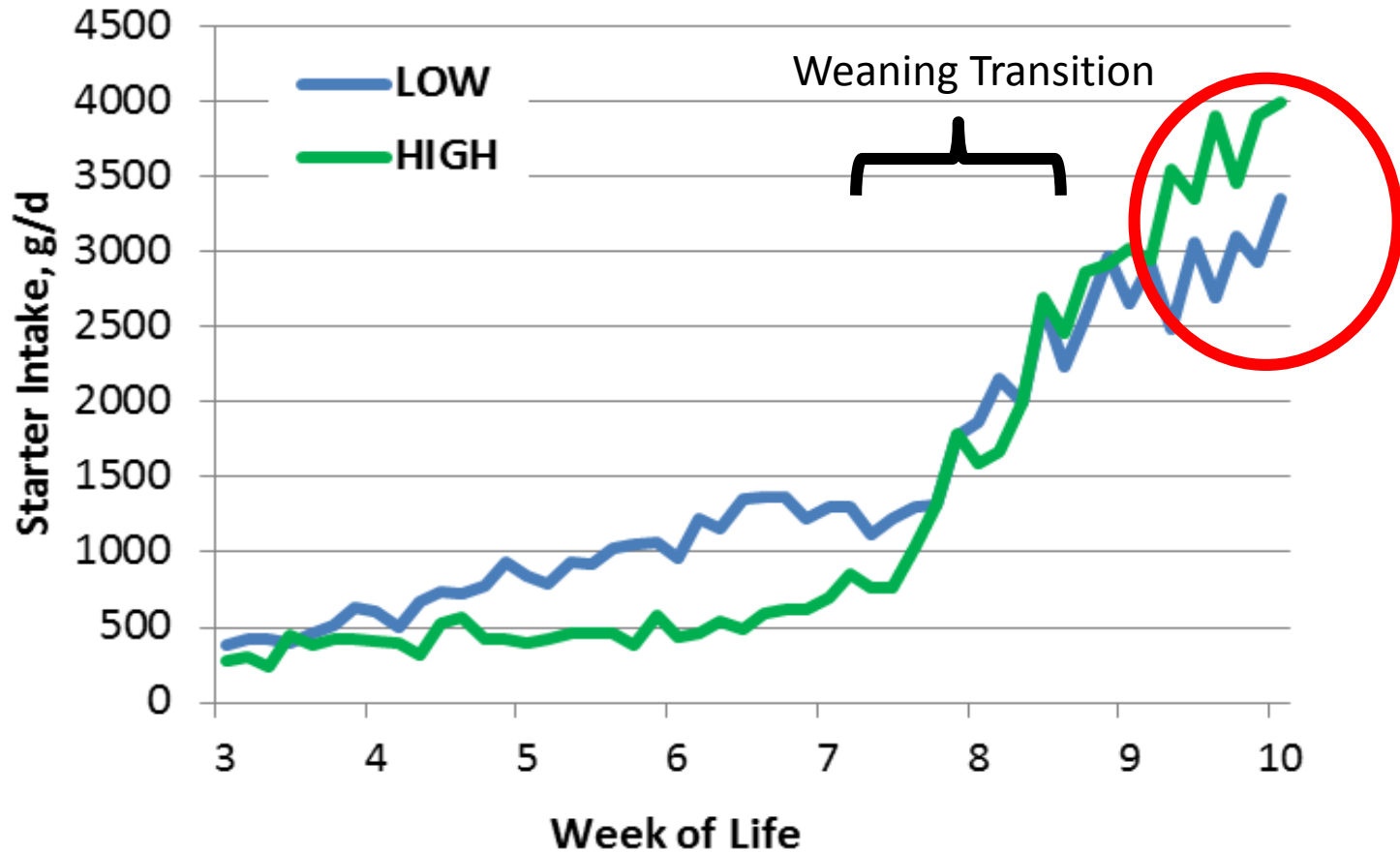


- Overall ADG from birth until d 70 was 1.03 vs. 0.83 kg/d for HIGH vs. LOW calves, respectively

Starter Intake



Starter Intake



Post-Weaning and Beyond

- An area that has not been studied
- Need to integrate pre and post weaning planes of nutrition with lifetime performance

