

## Consistency is key when it comes to feed consumption in dairy cows!



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## The problem is...

- There is more than one ration found on every farm!
  - There is the one formulated by the nutritionist
  - There is the one that is delivered to the cows

## Is the feed delivered the same as what was formulated?

## In a recent study of herds in Canada the average TMR fed...

- Exceeded TMR formulation for
  - $NE_L$  (+0.05 Mcal/kg)
  - NFC (+1.5%),
  - ADF (+0.5%),
  - Ca (+0.1%),
- Underfed TMR formulation for:
  - CP (-0.4%)
  - NDF (-0.7%)
  - Na (-0.2%)

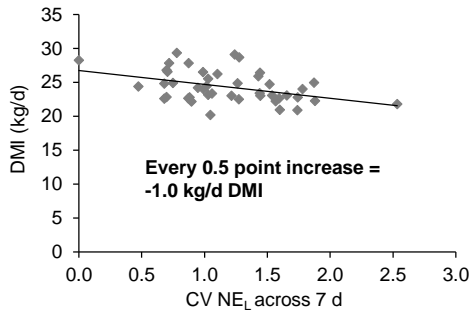
*Sava et al. 2014, J. Dairy Sci. 97:562-571*

## First step in ensuring cows eat the right ration:

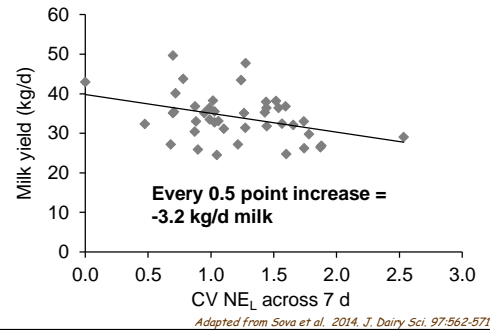
- Ensure that feed delivered mixed matches that which was formulated
  - How often is feed DM checked?
  - How often are feed components analysed and rations re-formulated?

## How precisely (consistent) are the rations being delivered?

### More variability in ration energy content = lower DMI



### More variability in ration energy content = lower milk yield



### Another step in ensuring cows eat their feed consistently...

- Make sure feed is mixed and delivered the same way each day

### Ensure cows are delivered their ration consistently

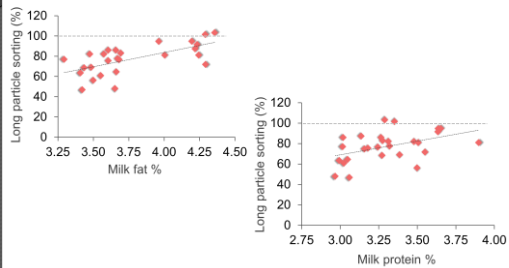
- Tools?
  - SOPs and training
  - TMR management programs
  - Automated feeding systems

### The problem is...

- There is more than one ration found on every farm!
  - There is the one formulated by the nutritionist
  - There is the one that is delivered to the cows
  - **There is the one that is consumed by the cows**

### Need to ensure cows eat feed as it is delivered

## More sorting at a cow level = lower milk components



Miller-Cushon and DeVries, 2015, J. Dairy Sci., E-Suppl. 2 98:13

## More sorting at a herd level....

- Every 2% refusal of long particles =
  - -0.9 kg/d 4% fat corrected milk
  - 2% decrease in production efficiency

Sova et al. 2013, J. Dairy Sci. 96:4759-4770

## The problem is...

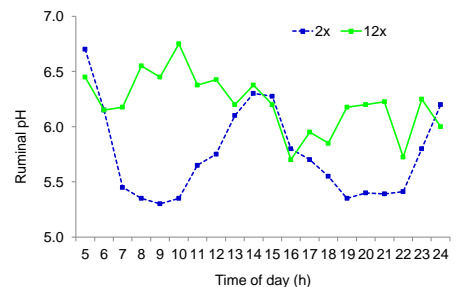
- There is more than one ration found on every farm!
  - There is the one formulated by the nutritionist
  - There is the one that is delivered to the cows
  - There is the one that is consumed by the cows
  - **There is the one that is digested by the cows**

## How the cow eats her feed has an impact on how she digests it...

## How do cows eat?

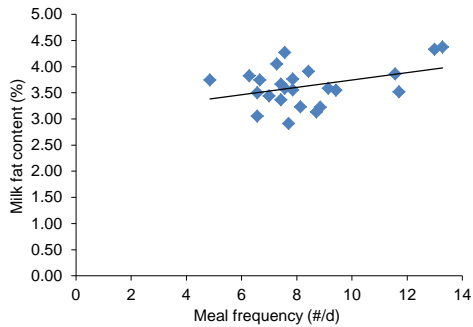
- The way cows consume their feed can have a direct impact on rumen digestion, health, and productivity
  - Fewer, larger meals
    - Risk of sub-acute ruminal acidosis
  - Longer feeding times, slower feeding rate
    - More stable rumen environment

## Having more frequent meals reduces variability in rumen fermentation patterns!

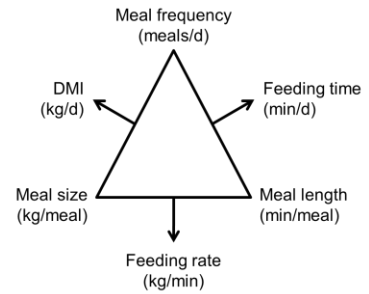


Adapted from French and Kennelly, 1990, J. Dairy Sci. 73:1857-1863

## More meals = greater milk fat %



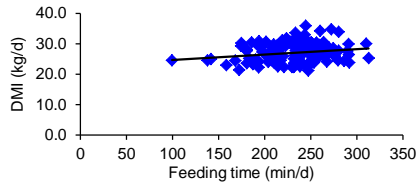
## Also remember....DMI relies on eating behavior...



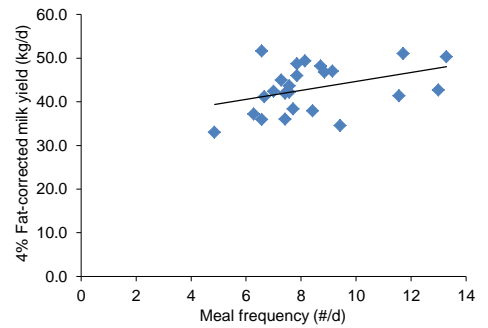
Nielsen, B. L. 1999, *Appl. Anim. Beh. Sci.* 63:79-91

## More time and meals at the bunk = greater DMI

- DMI was associated with:
  - feeding time (+0.02 kg/min)
  - meal frequency (+0.2 kg/meal)



## More meals = greater 4% FCM yield

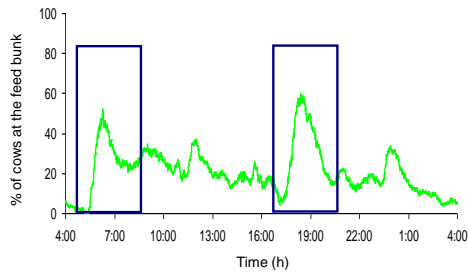


## How do we use this knowledge to ensure consistent intake?

- Ensure dairy cows...
  - Are stimulated to access feed throughout the day
  - Have access to the ration formulated for them throughout the day

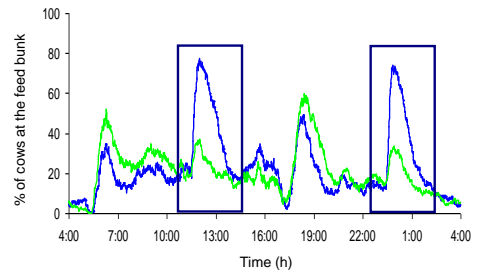
## What stimulates cows to go to the bunk?

## Feed delivery at the same time as milking



DeVries and von Keyserlingk, 2005; J. Dairy Sci. 88: 3553-3562

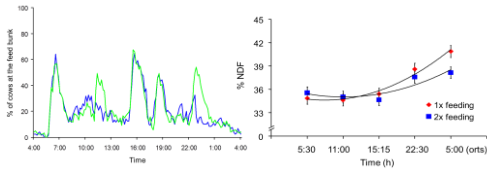
## Feed delivery 6 hours after milking



DeVries and von Keyserlingk, 2005; J. Dairy Sci. 88: 3553-3562

## How do we stimulate cows to access their feed throughout the day?

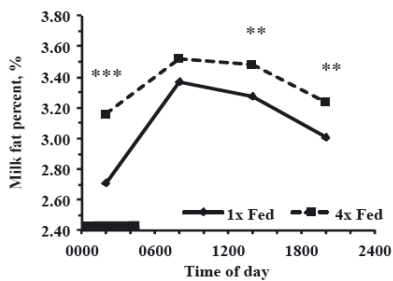
- Deliver feed more often...
  - More time at the bunk
  - Less feed sorting



DeVries et al., 2005; J. Dairy Sci. 88: 3553-3562

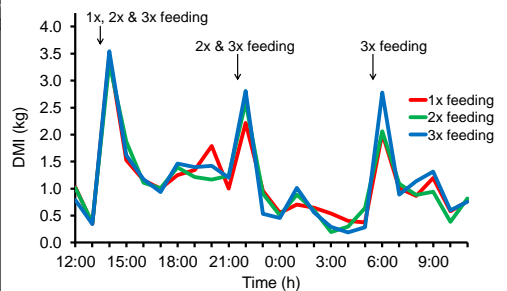
Delivering feed more frequently... ensures cows are stimulated to eat and have access to the ration formulated for them throughout the day!

## More frequent feed delivery = improved milk fat %



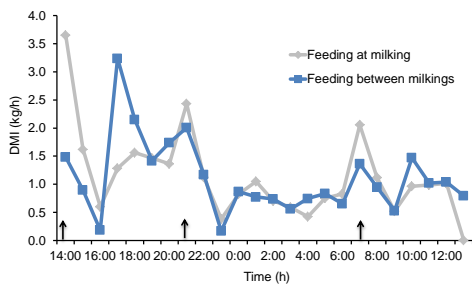
Rottman et al., 2014. Physiological Reports 2:1-12

## Feeding 3x/d improved intake...but did not benefit feeding patterns!



Hart et al., 2014. J. Dairy Sci. 97:1713-1724

Providing more stimulation to feed across the day by staggering milk and feeding = improved efficiency by 7%



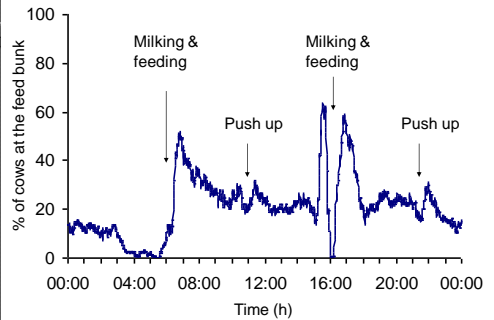
↑ = milking

King et al. 2016, J. Dairy Sci. 99:1471-1482

Innovative ways to provide fresh feed more often throughout the day are available...

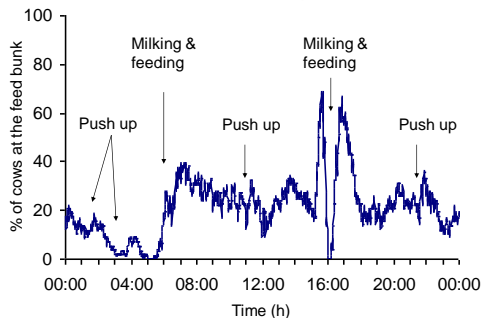
In between feedings...ensure feed is pushed in and within reach!

Does feed push-up stimulate cows the same as feed delivery?



DeVries et al. 2003, J. Dairy Sci. 86:4079-4082

Does feed push-up stimulate cows the same as feed delivery?



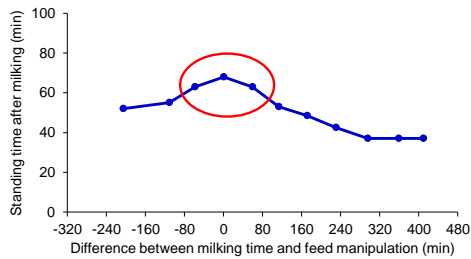
DeVries et al. 2003, J. Dairy Sci. 86:4079-4082

Ensuring feed is available allows cows to use their time efficiently!

- 13 robotic milked herds in Western Ontario
  - Frequency of feed push ups: (average = 2.1x/d; range= 0 to 5.5):
    - + 0.4 h/d lying duration per extra push-up

Deming et al. 2013, J. Dairy Sci. 96:344-351

### Effect of feed manipulation on standing time after milking – robotic milking



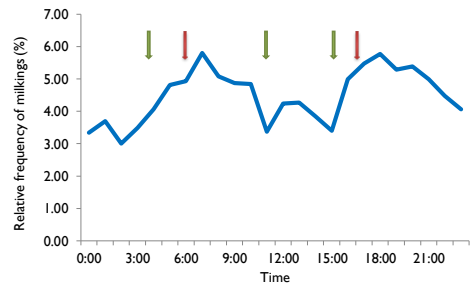
*DeVries et al. 2011, J. Dairy Sci. 94 :3845-3855*

### Benefits of feed push-up...

- Ensures feed is in the bunk when the cows go there
- Pushing up feed helps provide a more consistent product in the bunk

### Why is frequent feed delivery and push up so important for robotic dairies?

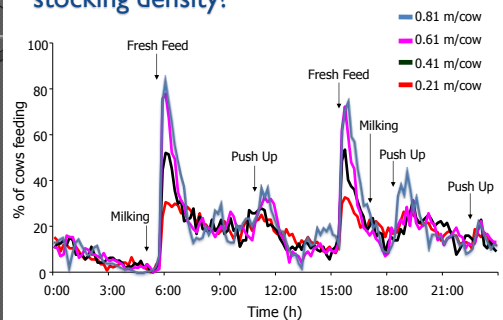
### Milking times are often linked to management events...



*Data adapted from Demina et al. 2013, Can. J. Anim. Sci. 93:427-433*

### Minimize competition at the feed bunk!

### What happens when we increase stocking density?



*Huzzey et al., 2006, J. Dairy Sci. 89:126-133*

## Results from study of parlor milked, free-stall herds in Canada

- Mean = 0.56 m/cow (range 0.36 to 0.99 m/cow)
- For every 10 cm (4 inch) increase in feed bunk space...
  - +0.06% milk fat
  - -13% SCC

*Sava et al., 2013, J. Dairy Sci., 96:4759-4770*

## Results from 2011 study of robotic milked cows in Ontario...

- Mean = 0.7 m/cow (range 0.3 to 1.0 m/cow)
- For every 10 cm (4 inch) increase in feed bunk space...
  - + 1.7 kg/d milk yield
  - + 0.39 h/d lying duration

*Deming et al., 2013, J. Dairy Sci., 96:344-351*

## Can we get 'away' with less space at the feed bunk in robotic barns?

- There is no scientific evidence to suggest we can!
- Situations where less space may be more manageable...
  - High frequency of feed delivery – automated systems?
  - Guided traffic barns
  - Only forage is provided at the bunk

## Take home messages:

- Allow cows to eat consistently!
  - Ensure feed is delivered as formulated and precisely!
  - Ensure feed is consumed as delivered and in a healthy manner

## Take home messages:

- Allow cows to eat consistently!
  - Keep feed in front of cows!
    - Feed multiple times per day
    - Push up feed frequently
  - Give cows space to eat!

## Questions???



Thank you to NSERC, Dairy Farmers of Canada, Agriculture and Agri-Food Canada, the Canadian Dairy Commission, Dairy Farmers of Ontario, Westgen, the Investment Agriculture Foundation of British Columbia, the Canadian Bovine Mastitis Research Network, the Ontario Ministry of Agriculture, Food, and Rural Affairs, the University of Guelph, and the University of British Columbia Animal Welfare Program for their financial support.