Recent Advances in Beef Cattle Nutrition

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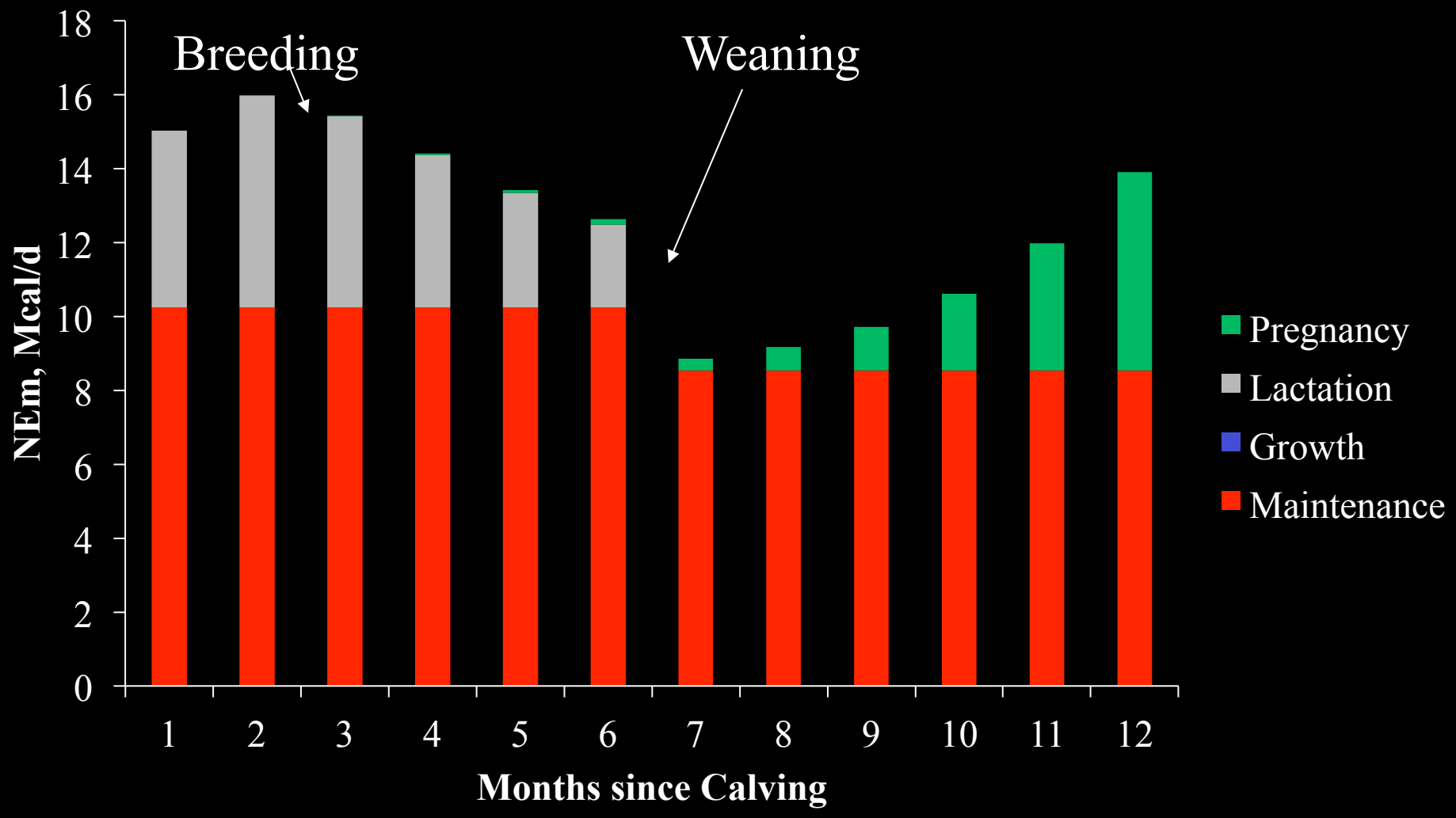
Outline

- Cow nutrition
  - Overview
  - Developmental programming
- Finishing cattle nutrition
  - Overview
  - Beef enrichment
- Feed Efficiency
- Microbiome

Cow Nutrition

NE Requirements (1400 lb mature)

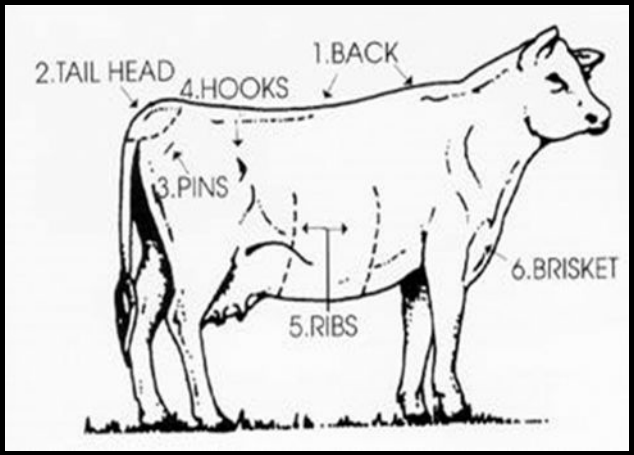


NRC, 1996

Objectives in feeding the beef breeding cow herd

- To produce a 90%-plus calf crop of healthy calves at a **reasonable** cost
- To have cows rebred by 80-85 d postpartum so to produce one calf every year
  - Good heifer development programs get the cow off to a good start
- To produce high quality and a consistent group of calves to be marketed at (or shortly after) weaning or for retained ownership

Nutrition critical in maintaining adequate BCS



BCS	Pregnancy rate, %	Calving interval, d	Calf ADG, lb	Calf weaning weight, lb
3	43	414	1.61	374
4	61	381	1.76	460
5	86	364	1.85	515
6	93	364	1.85	515

Johnson and Funston, 2013

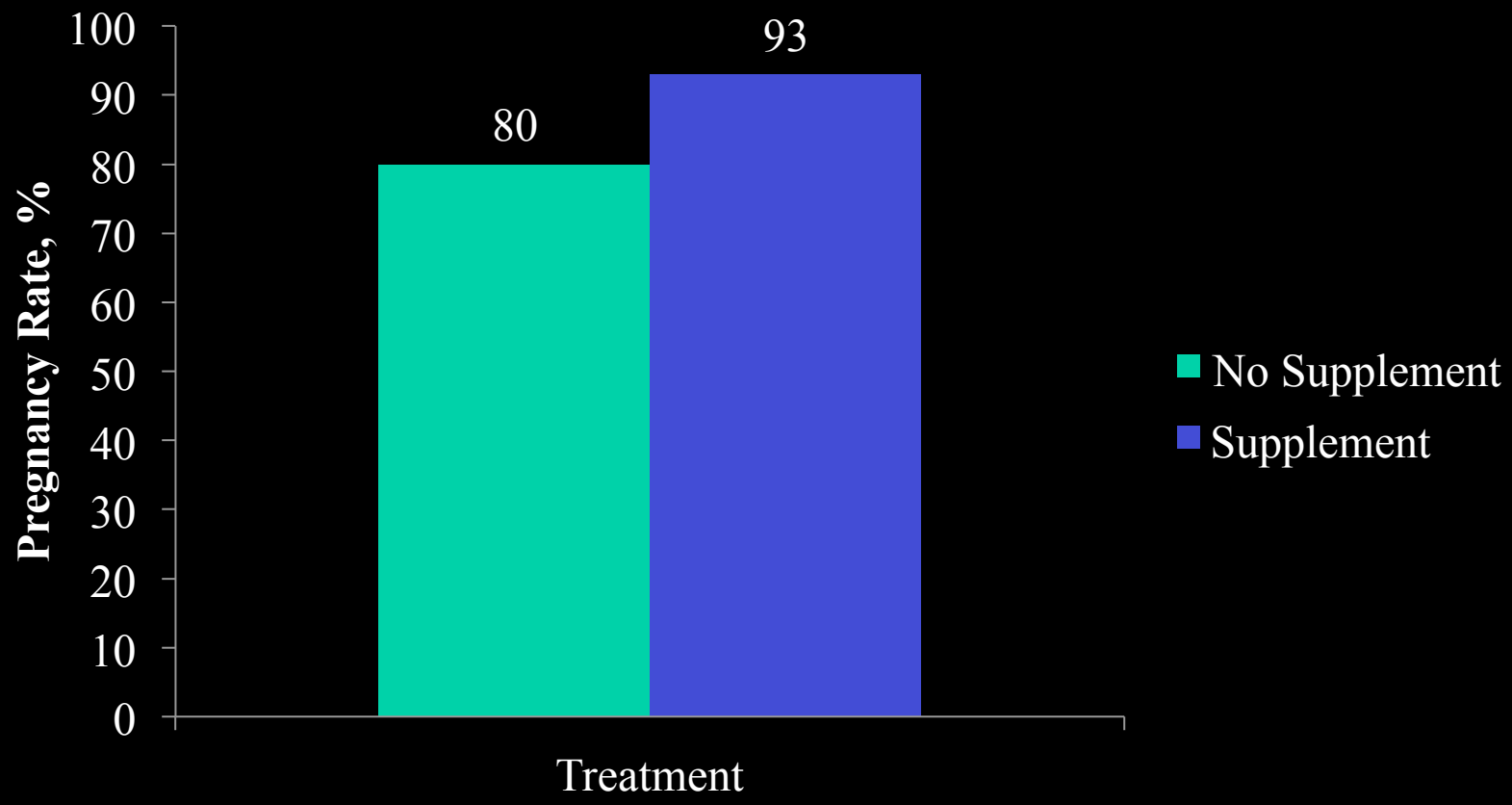
Once you get ‘em bred; no worries?

Programming

- The process through which a ***stimulus*** or ***insult*** establishes a ***permanent*** response

- **Developmental programming hypothesis**
- Exposure during a ***critical period*** in development may influence later metabolic or physiological functions in adult life

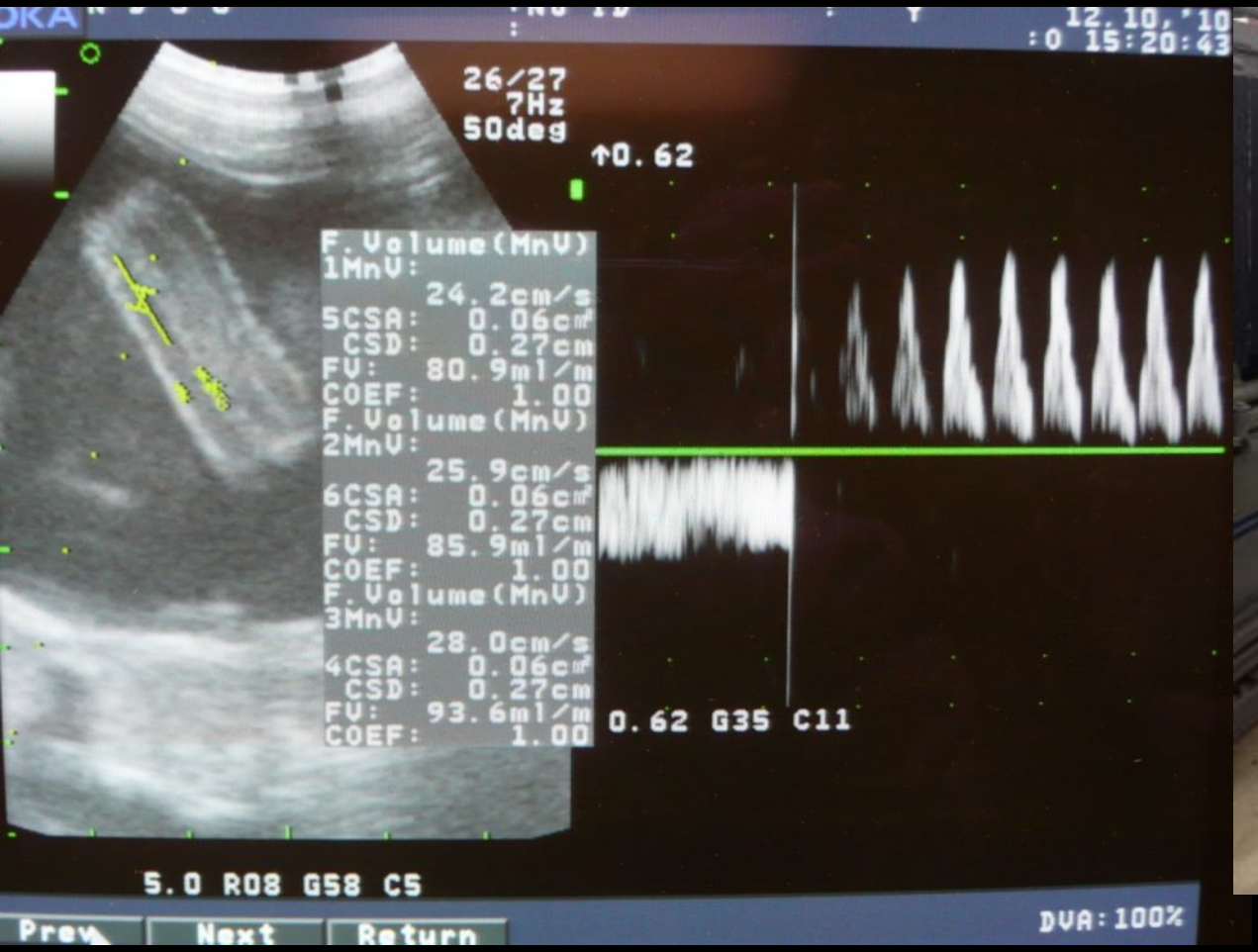
Effects of protein supplementation to the pregnant cow on offspring fertility



- **Cows grazing dormant native range in NE - last trimester**
- **Also greater marbling in steers (Larson et al. 2009)**

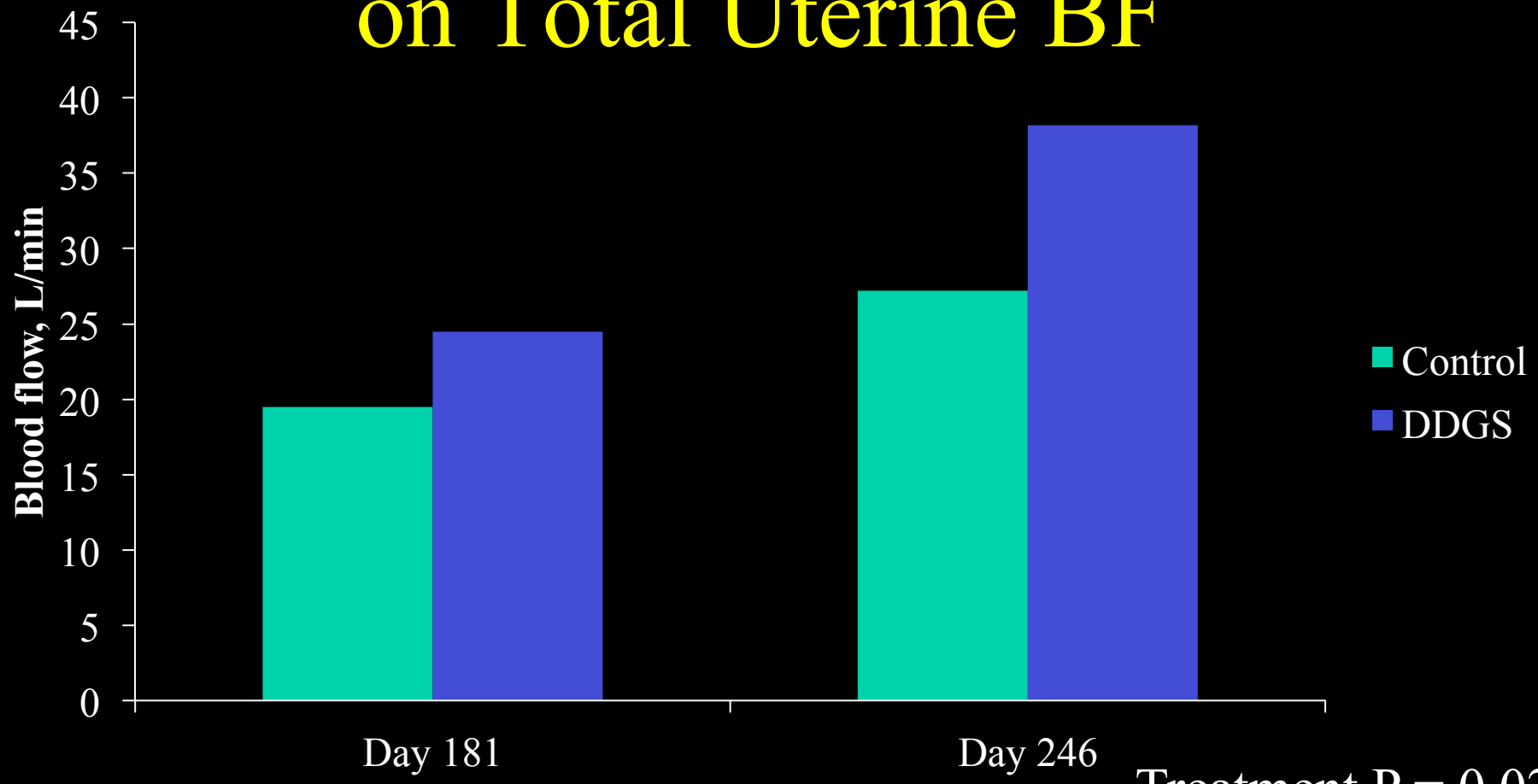
Martin et al. 2007

Doppler Ultrasonography



Kennedy, Vonnahme, Bauer, Swanson, et al.

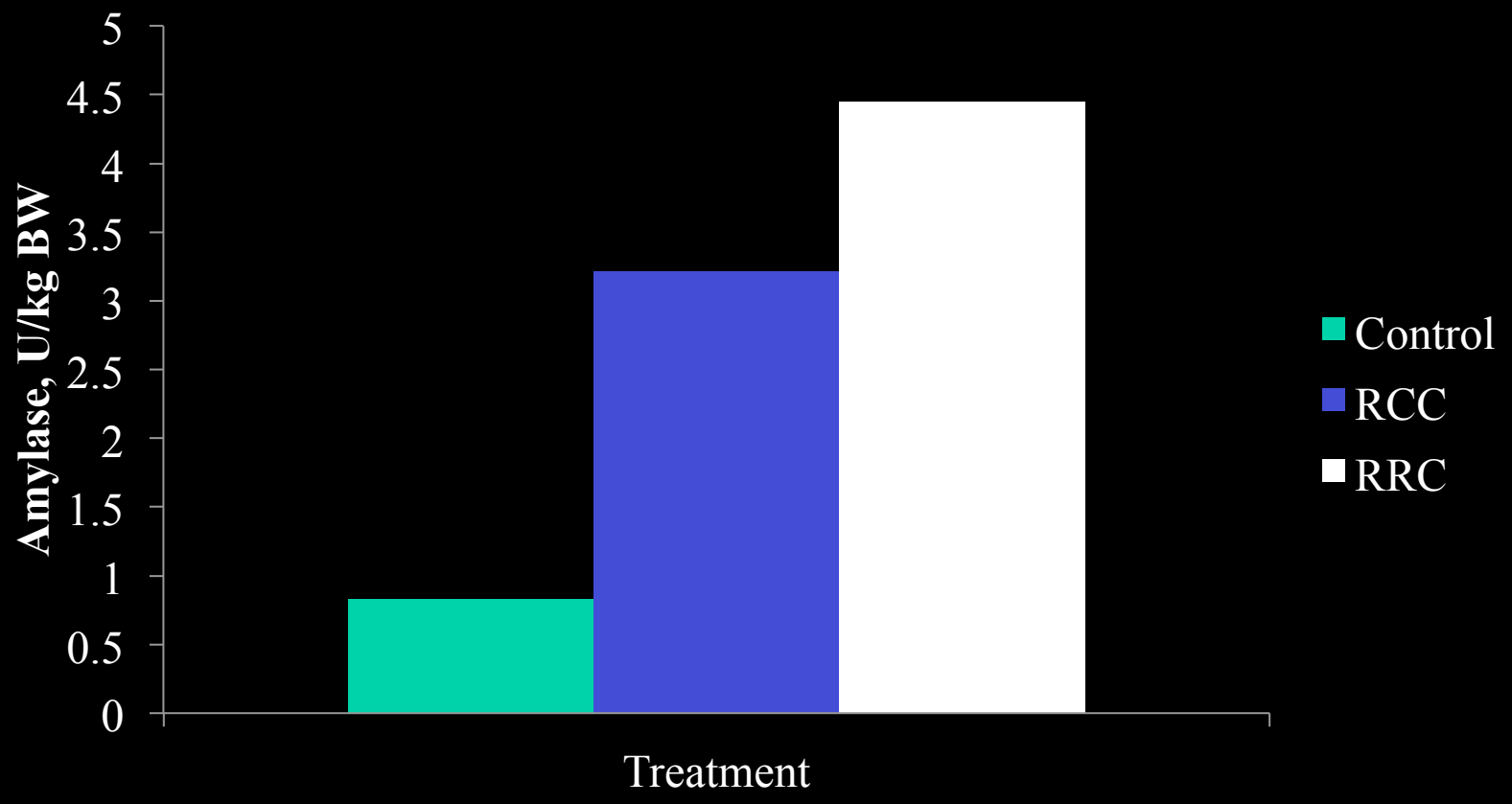
Influence of DDGS Supplementation on Total Uterine BF



Treatment P = 0.02
Day P < 0.01
Trt*Day P = 0.18

Kennedy et al. 2016 (submitted)

Influence of Maternal Dietary Restriction and Realimentation on Fetal Pancreatic Amylase (Day 254)



Keomanivong et al 2016 (in press)

Finishing Cattle

Objectives

- Optimize gain and efficiency
- Optimize feed bunk management and cattle comfort to reduce variability in feed intake
  - Adaptation programs and on full feed
- Maintain ruminal health
- Feed for the production of good quality beef
  - Marbling and lean yield
  - Niche market?

Suggested minimum roughage levels for corn-based diets (with good management)

- Important to adapt to high grain diets (usually over 21 – 28 d)
- Dry whole corn
  - 5% of DM
- Dry rolled or coarsely ground
  - 8% of DM
- High moisture corn
  - 10% of DM

❖Over last 20 years has been shift to feeding more byproducts such as distillers grains in North America

Feed Additives/Implants

- Feed Additives
  - Ionophores
  - Antibiotics
  - Others
    - Direct fed microbials, enzymes, etc.
      - Lots of interest as alternatives to ionophores or antibiotics
- Implants
  - Improve efficiency and lean yield

Beef Enrichment Through Nutrition

- Effects on human health? (also consumer preferences/choices)

- Fatty Acids (omega 3 fatty acids, conjugated linoleic acid, etc.)
  - Higher forage feeding
  - Feeding fish products, flax, others

- Minerals, vitamins, etc.

Lot's of interest in feed efficiency

- Cost of production
  - feed costs: 50 - 80% of production costs
- Feed costs have been volatile

How to reduce feed costs (improve efficiency)?

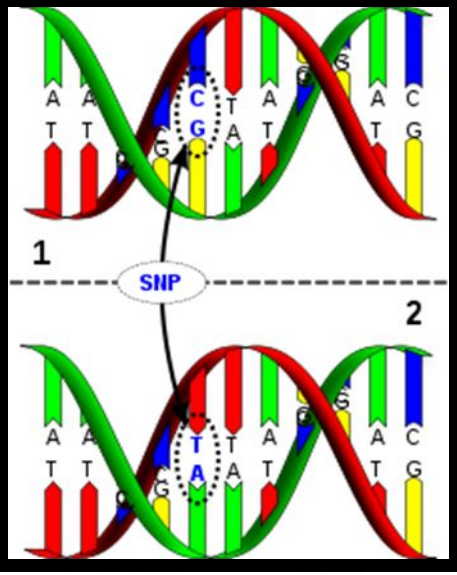
- Nutrition (Feed ‘em better)
  - More accurately feed to meet the requirements
  - Feed processing, nutritional cycling, supplementation strategies, maternal programming, etc.
  - Feed “cheaper” feeds

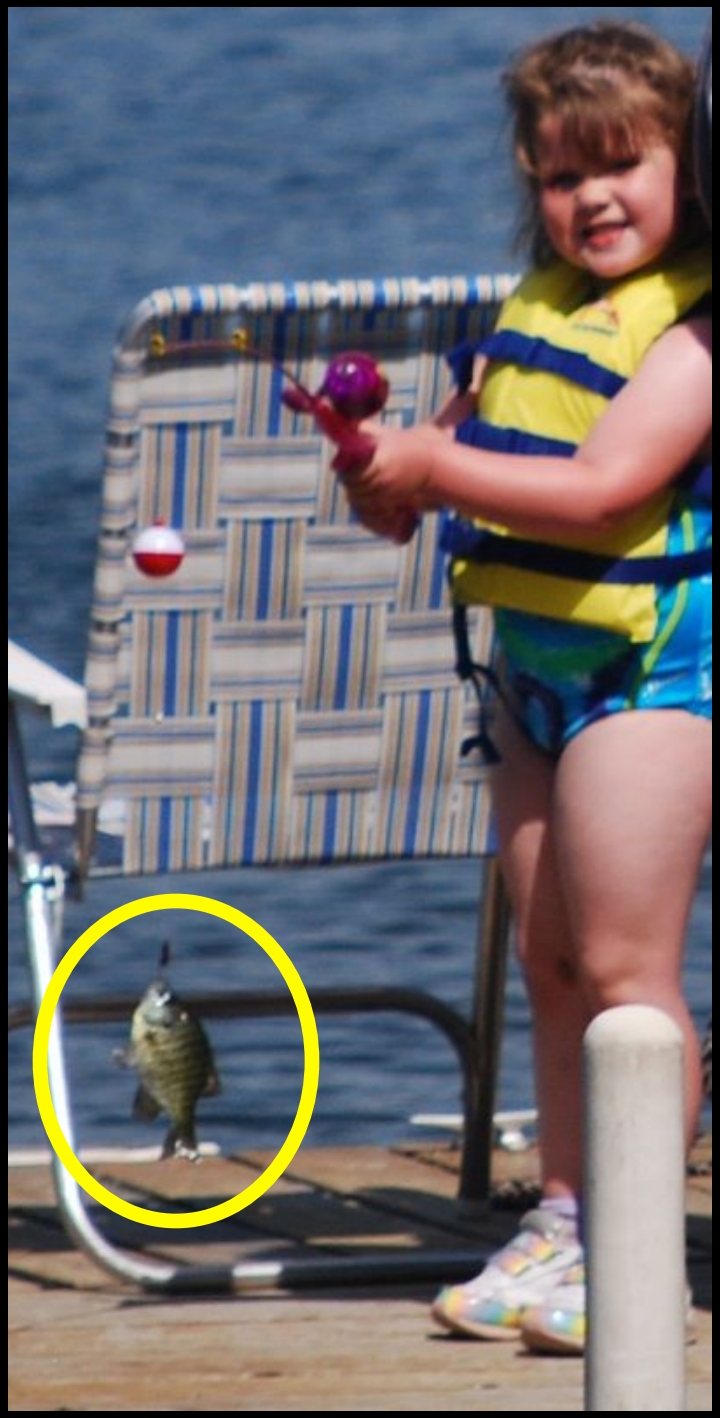
- Genetics (Select more efficient animals)
  - Trait is moderately heritable
  - Animal breeding programs (DNA/SNP approaches)
  - Are there nutritional/physiological markers to help us predict intake or efficiency, or to use in genetic selection programs?

Management Considerations

- Feeding management/nutrition
  - Reduce feed wastage/bunk management
- Health/preconditioning programs
- Cattle comfort
- Precision management and nutrition programs
  - Different types of cattle for different environments and management systems
    - Can genetic or other biomarkers assist with sorting calves for different outcomes?

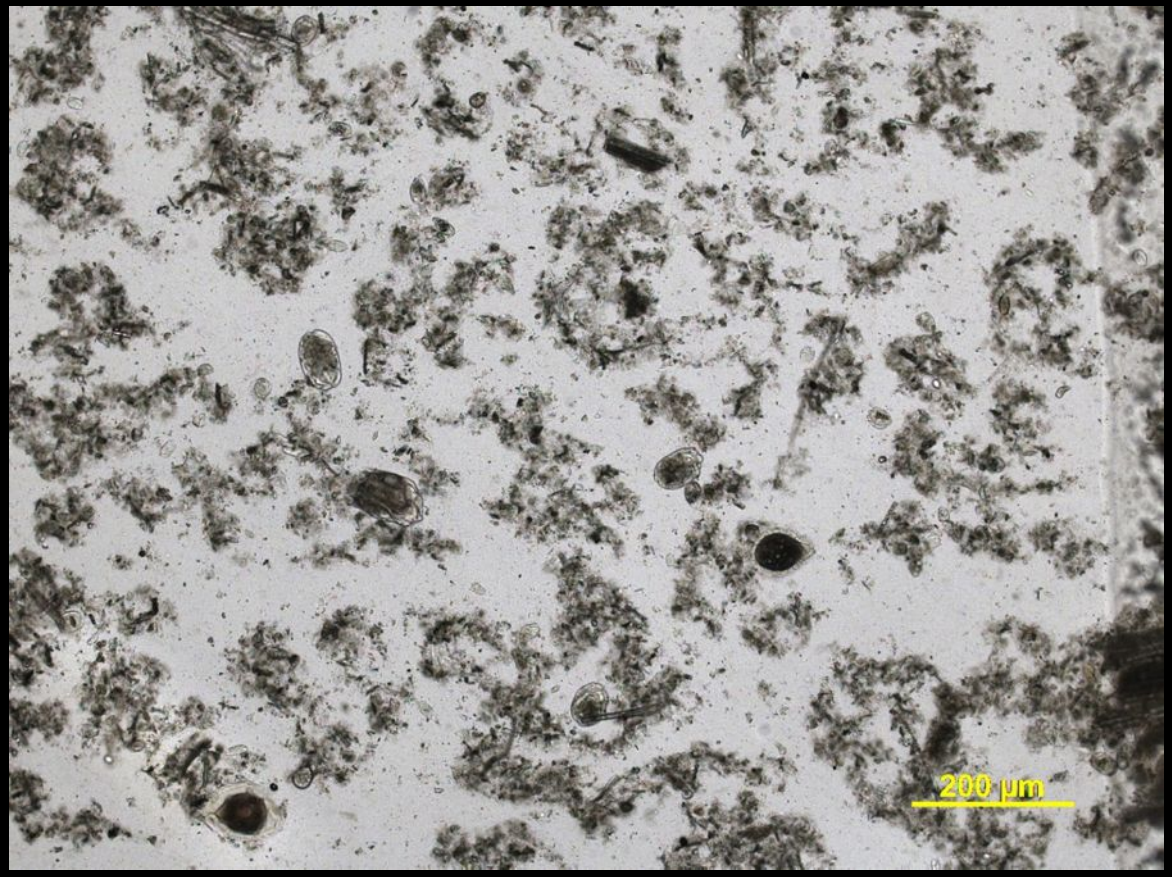
Goin' Fishin'



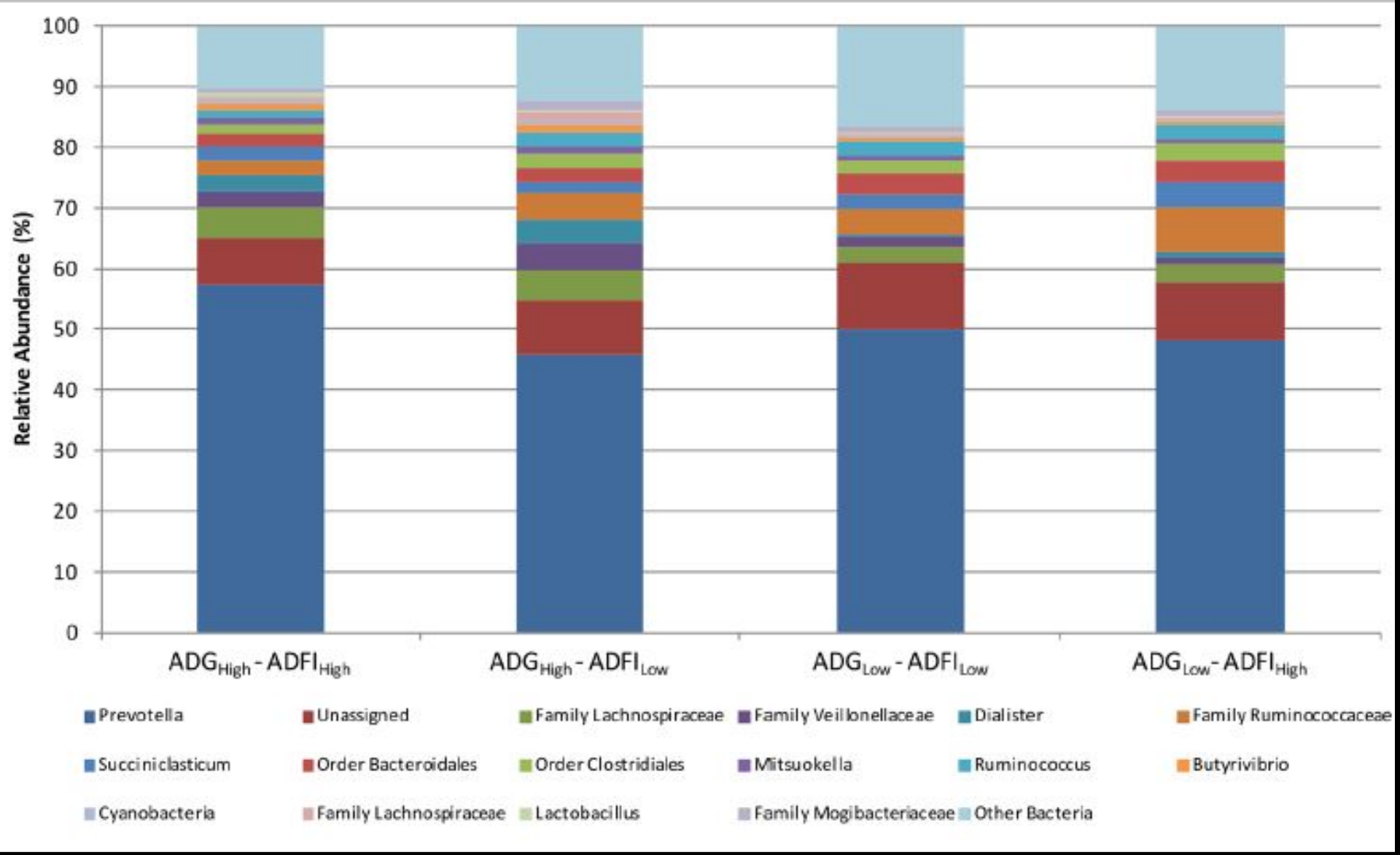


Metagenomics and the Microbiome

- **Over 90% of cells**
- **Symbiotic relationship**
- **Optimal communities**
- **Digestive efficiency**
- **Digestive health**
- **Metabolism**
- **Disease**



•***Should microbial selection be included in animal breeding programs?***



Myer et al 2014

Thanks!

Let food be thy medicine and thy medicine be thy food.

(Hippocrates)