Calves: Birth to Weaning

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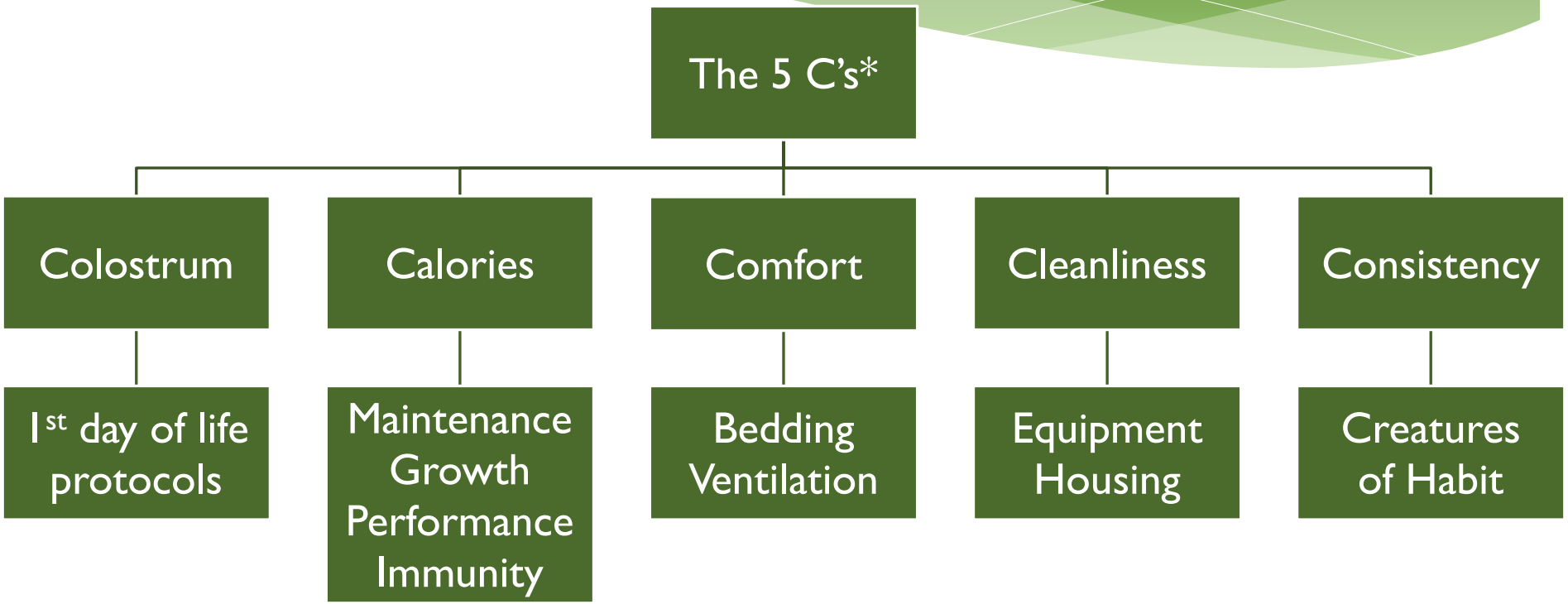


Calf Rearing (Farming) is a Fine-Tuned Balancing Act

Lance Fox, DVM Diamond V

What To Do With a Newborn Calf?

56% removed ASAP, 36% allowed calf to nurse (2007 NAHMS)

Calf Hauling (Animal Welfare)

Entry to barn/pen

* Transport humanely – careful lifting and shifting onto trailer and pens

The Newborn Calf

Temperature regulation

Often overlooked **Jersey!!!!!**

* Poor ability to control body temperature for the first 24 hours of life
* Hypothermia can be rapid
  * Drops blood sugar levels and increases time to first suck
* Dry calves, avoid wind and cold concrete

Types of Warming Units

Colostrum

The first feeding of colostrum is the MOST important meal of a calf's life!

University of AZ Colostrum Study

	2 Liters	vs.	4 Liters
Veterinary cost per calf	$24.51		$14.77
ADG	1.76# (0.8 kg)		2.27# (1.03 kg)
First-lactation yield	19,739# (8972 kg)		21,845# (9930 kg)
Second-lactation yield	21,261# (9664 kg)		24,903# (11,320 kg)

Faber, S.N., N.E. Faber, T.C. McCauley, and R.L. Ax. 2005. Effects of colostrum ingestion on lactational performance. The Professional Animal Scientist. 21:420-425.

Colostrum vs. Milk

- Colostrum
  - Total solids 23.9%
  - Fat 6.7%
  - Protein 4.8%
  - Calcium 0.26%
  - Vitamin A 295
  - Vitamin E 84
  - IgG 48mg/ml
  - Immunological active cells
  - Lactoferrin
- Milk
  - Total solids 12.5%
  - Fat 3.6%
  - Protein 3.2%
  - Calcium 0.13%
  - Vitamin A 34
  - Vitamin E 15
  - IgG 0.6mg/ml

Colostrum

* **Timing of collection**
* Cleanliness
* Timing of feeding
* Volume
* Method
* IgG concentration (IgG)

Cleanliness

Culture of Colostrum

* <100,000 cfu/mL total bacteria
* <10,000 cfu/mL fecal coliforms
* Heat treatment of colostrum

Volume and Method

Colostrum should be fed within ___hours after birth? (*Quick)*

ASAP (within 3 hours of birth)

How much should be feed? (*Quantity)*

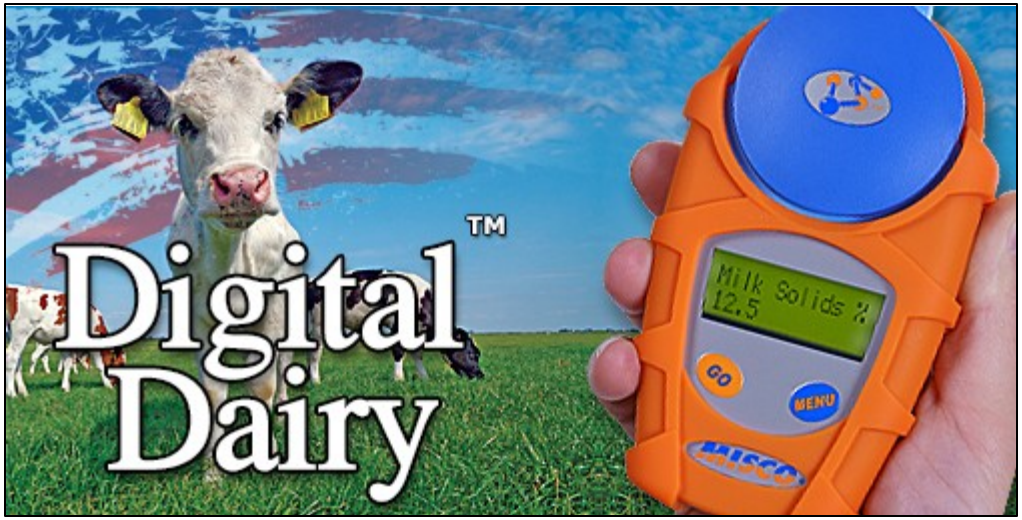
10% of BW

# of IgG's needed for passive transfer? (*Quality)*

- **200 grams of IgG**

IgG Concentration: Colostrum Quality Assessment

* Colostrometer (Green)
* Brix Refractometer (≥ 22%)



Colostrum Absorption Assessment

Total Protein

	Deaths	Total	Odds Ratio
≥ 5.5	36	714	1.81
5-5.49	89	1350	1.31
< 5.0	78	857	1

Goal ≥ 80%

P=0.002

Dr. Dale Moore, Washington State University

2012

Southwest Center	
77.8%	Overall
63.6%	1st calf Heifers
84.0%	Mature cows

When a calf nurses from a cow, it consumes an unknown quantity of an unknown quality of colostrum!

Colostrum
Collecting, Storing (if not feeding)

Goal: <45° F (<7.2° C) ASAP

Refrigerated--- 7 days

Frozen--- 12 months

Calories

Sources of Milk

* Colostrum
  * Essential for first day of life
  * Preferable for first 3 days
  * Rich in nutrients, good for gut bacteria
* Whole milk
  * Perfect food for calves
  * Calves less prone to scours, but don't feed milk from mastitis cows
  * Pasteurizer
* Calf milk replacer
  * Usually consistent quality
  * Can move rearing away from the parlor

NRC Nutrient Requirements of Dairy Cattle - Default Simulation

File Go To... Help

Inputs Feeds Ration Reports Help

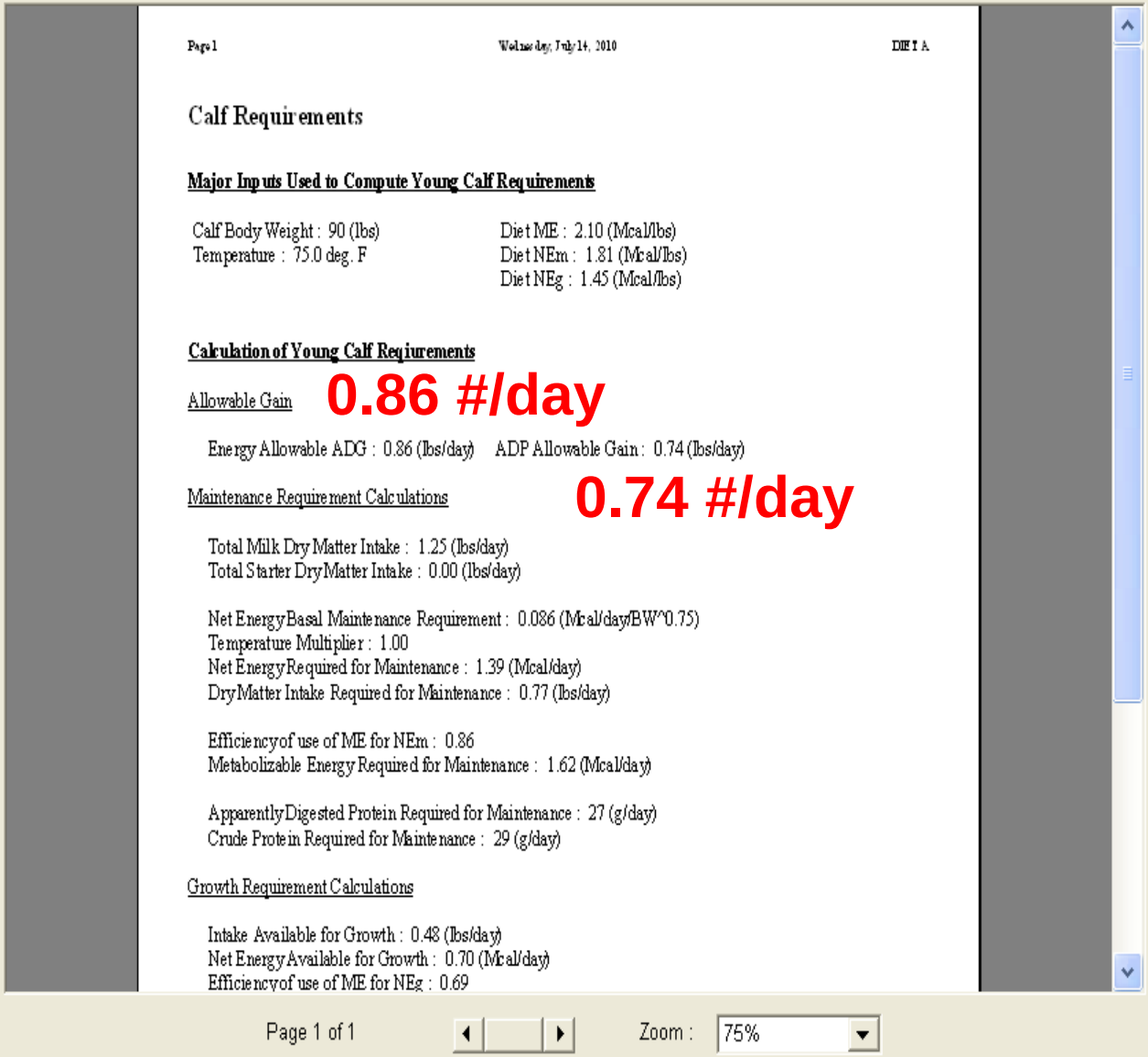
Report Components

- [x] Calf Requirements
- [ ] Mineral Requirements

View Report

Print Report

Printer Setup



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Calf Requirements

Major Inputs Used to Compute Young Calf Requirements

Calf Body Weight : 90 (lbs)
Temperature : 75.0 deg. F

Diet ME : 2.10 (Mcal/lbs)
Diet NEm : 1.81 (Mcal/lbs)
Diet NEg : 1.45 (Mcal/lbs)

Calculation of Young Calf Requirements

Allowable Gain **0.86 #/day**

Energy Allowable ADG : 0.86 (lbs/day) ADP Allowable Gain : 0.74 (lbs/day)

Maintenance Requirement Calculations **0.74 #/day**

Total Milk Dry Matter Intake : 1.25 (lbs/day)
Total Starter Dry Matter Intake : 0.00 (lbs/day)

Net Energy Basal Maintenance Requirement : 0.086 (Mcal/day/BW^0.75)
Temperature Multiplier : 1.00
Net Energy Required for Maintenance : 1.39 (Mcal/day)
Dry Matter Intake Required for Maintenance : 0.77 (lbs/day)

Efficiency of use of ME for NEm : 0.86
Metabolizable Energy Required for Maintenance : 1.62 (Mcal/day)

Apparently Digested Protein Required for Maintenance : 27 (g/day)
Crude Protein Required for Maintenance : 29 (g/day)

Growth Requirement Calculations

Intake Available for Growth : 0.48 (lbs/day)
Net Energy Available for Growth : 0.70 (Mcal/day)
Efficiency of use of ME for NEg : 0.69

Page 1 of 1 Zoom : 75%

NRC Nutrient Requirements of Dairy Cattle - Default Simulation

File Go To... Help

Inputs Feeds Ration Reports Help

Report Components

- [x] Calf Requirements
- [ ] Mineral Requirements

View Report

Print Report

Printer Setup

Calf Requirements

Major Inputs Used to Compute Young Calf Requirements

Calf Body Weight : 90 (lbs)
Temperature : 32.0 deg. F

Diet ME : 2.10 (Mcal/lbs)
Diet NEm : 1.81 (Mcal/lbs)
Diet NEg : 1.45 (Mcal/lbs)

Calculation of Young Calf Requirements

Allowable Gain **0.16 #/day**

Energy Allowable ADG : 0.16 (lbs/day) ADP Allowable Gain : 0.74 (lbs/day)

Maintenance Requirement Calculations

Total Milk Dry Matter Intake : 1.25 (lbs/day)
Total Starter Dry Matter Intake : 0.00 (lbs/day)

Net Energy Basal Maintenance Requirement : 0.086 (Mcal/day/BW^0.75)
Temperature Multiplier : 1.54
Net Energy Required for Maintenance : 2.14 (Mcal/day)
Dry Matter Intake Required for Maintenance : 1.18 (lbs/day)

Efficiency of use of ME for NEm : 0.86
Metabolizable Energy Required for Maintenance : 2.49 (Mcal/day)

Apparently Digested Protein Required for Maintenance : 27 (g/day)
Crude Protein Required for Maintenance : 29 (g/day)

Growth Requirement Calculations

Intake Available for Growth : 0.07 (lbs/day)
Net Energy Available for Growth : 0.09 (Mcal/day)
Efficiency of use of ME for NEg : 0.69

NRC Nutrient Requirements of Dairy Cattle - Default Simulation

File Go To... Help

Inputs Feeds Ration Reports Help

Report Components

- [x] Calf Requirements
- [ ] Mineral Requirements

View Report

Print Report

Printer Setup

Calf Requirements

Major Inputs Used to Compute Young Calf Requirements

Calf Body Weight : 80 (lbs)
Temperature : 55.0 deg. F

Diet ME : 2.20 (Mcal/lbs)
Diet NEm : 1.89 (Mcal/lbs)
Diet NEg : 1.52 (Mcal/lbs)

Calculation of Young Calf Requirements

Allowable Gain **1.84 #/day**

Energy Allowable ADG : 1.86 (lbs/day) ADP Allowable Gain : 1.84 (lbs/day)

Maintenance Requirement Calculations

Total Milk Dry Matter Intake : 1.88 (lbs/day)
Total Starter Dry Matter Intake : 0.00 (lbs/day)

Net Energy Basal Maintenance Requirement : 0.086 (Mcal/day/BW^0.75)
Temperature Multiplier : 1.13
Net Energy Required for Maintenance : 1.44 (Mcal/day)
Dry Matter Intake Required for Maintenance : 0.76 (lbs/day)

Efficiency of use of ME for NEm : 0.86
Metabolizable Energy Required for Maintenance : 1.67 (Mcal/day)

Apparently Digested Protein Required for Maintenance : 26 (g/day)
Crude Protein Required for Maintenance : 28 (g/day)

Growth Requirement Calculations

Intake Available for Growth : 1.12 (lbs/day)
Net Energy Available for Growth : 1.69 (Mcal/day)
Efficiency of use of ME for NEg : 0.69

What Are the Advantages of Accelerated Growth?

* Increased Average Daily Gain (ADG) pre-weaning
* Mixed results in yearling and calving weights
* Majority of studies indicate decreased breeding and calving age
* Majority of studies cite significant or tendency to have an increased first lactation milk yield

What Defines an Accelerated Milk Replacer

* High protein (26-28% crude protein)
* Moderate fat (15-20% crude fat)
* Increased amounts of milk replacer and water with weaning at a "younger" age (~6-7 weeks of age)

MU Southwest Center Study: Objectives

* Determine if intensified milk feeding in small framed dairy heifers will result in:
  * Younger weaned calves at similar weights as traditionally fed calves
  * Decreased breeding and calving age
  * Increased milk production in first lactation

VELOCITY 2

Active Drug Ingredient	
Neomycin Sulfate	1300 grams/ton
Oxytetracycline (from oxytetracycline dihydrate base)	1300 grams/ton
Guaranteed Analysis	
Crude Protein, min	**28.50%**
Crude Fat, min	**15.00%**
Crude Fiber, max	0.15%
Calcium, min	0.75%
Calcium, max	1.25%
Phosphorus, min	0.60%

MILK FORMULA 1
Calf Milk Replacer

Active Drug Ingredient	
Neomycin Sulfate	1600 grams/ton
Oxytetracycline (from oxytetracycline dihydrate base)	1600 grams/ton
Guaranteed Analysis	
Crude Protein, min	**20.0%**
Crude Fat, min	**20.0%**
Crude Fiber, max	0.15%
Calcium (Ca), min	0.75%
Calcium (Ca), max	1.25%
Phosphorus (P), min	0.7%

Parameters

* 16 Holstein, Jersey or Crossbred heifers assigned to Milk Formula 1 as the traditional milk replacer program
* 21 Holstein, Jersey or Crossbred heifers assigned to Velocity as the accelerated feeding program
* Calves were assigned as groups of 8 and "mob-fed" using 10 nipple feeders
* Birth weight:
  * MF1 = 70.6 #
  * Velocity = 69.0 #
* Average age at start of treatment
  * MF1 = 9.7 days
  * Velocity = 7.0 days

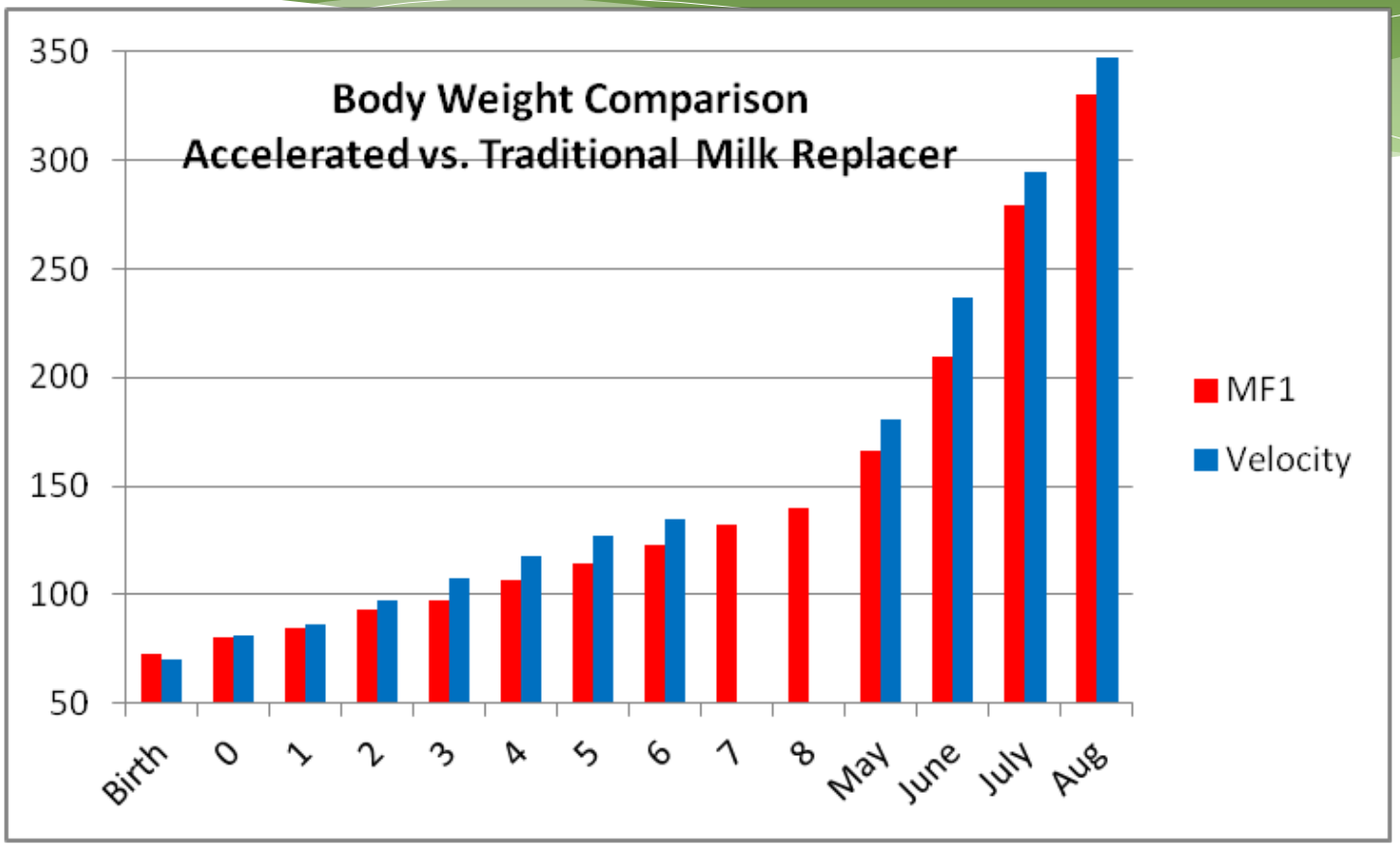
Protocol for Feeding Traditional vs. Accelerated Milk Replacers

Milk Formula 1- traditional MR								
	week 1	week 2	week 3	week 4	week 5	week 6	week 7	week 8
Oz powder/feeding	7.5	10	10	10	10	10	10	10
warm water (Pints)/feeding	3	4	4	4	4	4	4	4
Milk Formula 1-traditional milk replacer – 68#								
Velocity- accelerated MR								
Oz powder/feeding	7.5	12.5	15	15	15	10		
warm water (pints)/feeding	3	5	6	6	6	4		
Velocity-accelerated milk replacer – 66#								

Approximate Cost of Each Program

	Velocity (Accelerated)			MF1				
		Cost/Unit	Total Cost		Cost/Unit	Total Cost	Difference	Period Fed
Milk	66	$1.90	$125.40	68	$1.43	$97.24	$28.16	to weaning
Starter	315	$0.28	$88.20	292.5	$0.28	$81.90	$6.30	3 days to April 30
Grower	450	$0.27	$121.05	450	$0.27	$121.05		May 1-July 31
Developer	675	$0.25	$167.40	675	$0.25	$167.40		Aug 1 to end of December
Total Per Calf			**$502.05**			**$467.59**	**$34.46**	

Southwest Center



Stacey Hamilton, PhD University of Missouri

Conclusions

* Average Daily Gain increased in heifers fed Velocity
* Weaning weight same at 6 weeks vs. 8 weeks
* Numerical advantage in weights throughout
* Intangibles
  * Calf health
  * Labor and time
* Stay tuned for:
  * Breeding/calving age (95.2% vs 87.5% PR, and 2/8/14 vs 2/11/14 calving date)
  * Milk yield

Project sponsored by Hartville Feed and Milk Specialties Global Animal Nutrition

Comfort and Cleanliness

Dip Navels
7% Iodine

Cleanliness (Soaking ≠ Drying)

Cleanliness (DRY)

Bloat

* Feed milk at what temperature? (~105° F/40° C)
* Bottle Fed Operations:
  Out with the old, in with the new
* Thoroughly mix milk replacer
* History of Pneumonia?

Individual or Group

Calves and Mob Feeders

What else?

* Water
* Grain
* Forage?

Relationship between Water and Grain

Free Choice vs. No Water

ADG Increase	0.678# (0.31 kg)	0.399# (0.18 kg)
Starter Increase	0.927# (0.42 kg)	0.643# (0.29 kg)
Scour Days	4.5 days	5.4 days

(Kertz, et al 1984)

Impacting Rumen Development: Hay vs Grain

A.J. Heinrichs, The Pennsylvania State University

UNIVERSITY OF MISSOURI Extension

Lance Fox, DVM Diamond V

Ideal Criteria for Weaning?

* Age
* Space Availability
* Daily Grain Intake

A calf that is eating ~2 lbs (0.9 kg) of starter/day for several consecutive days is ready for the weaning process.

Thermo Neutral Zone is ~50-75° F (10-24° C) (calves <1 month old)

* **Good Rule of Thumb:**
  * For every 1°F drop in ambient temperature below the TNZ, *maintenance* energy increases by 1%
  * 25°F (-3.8°C) 25% increase
  * 0°F (-17°C) 50% increase

Dairy Calf and Heifer Association

* Gold Standards for raising heifers

Deaths

Mortality

1-60 days of age	< 5%
61-120 days of age	< 2%
121-180 days of age	< 1%
6-12 months	< 1%
12 months to calving	< 0.5%

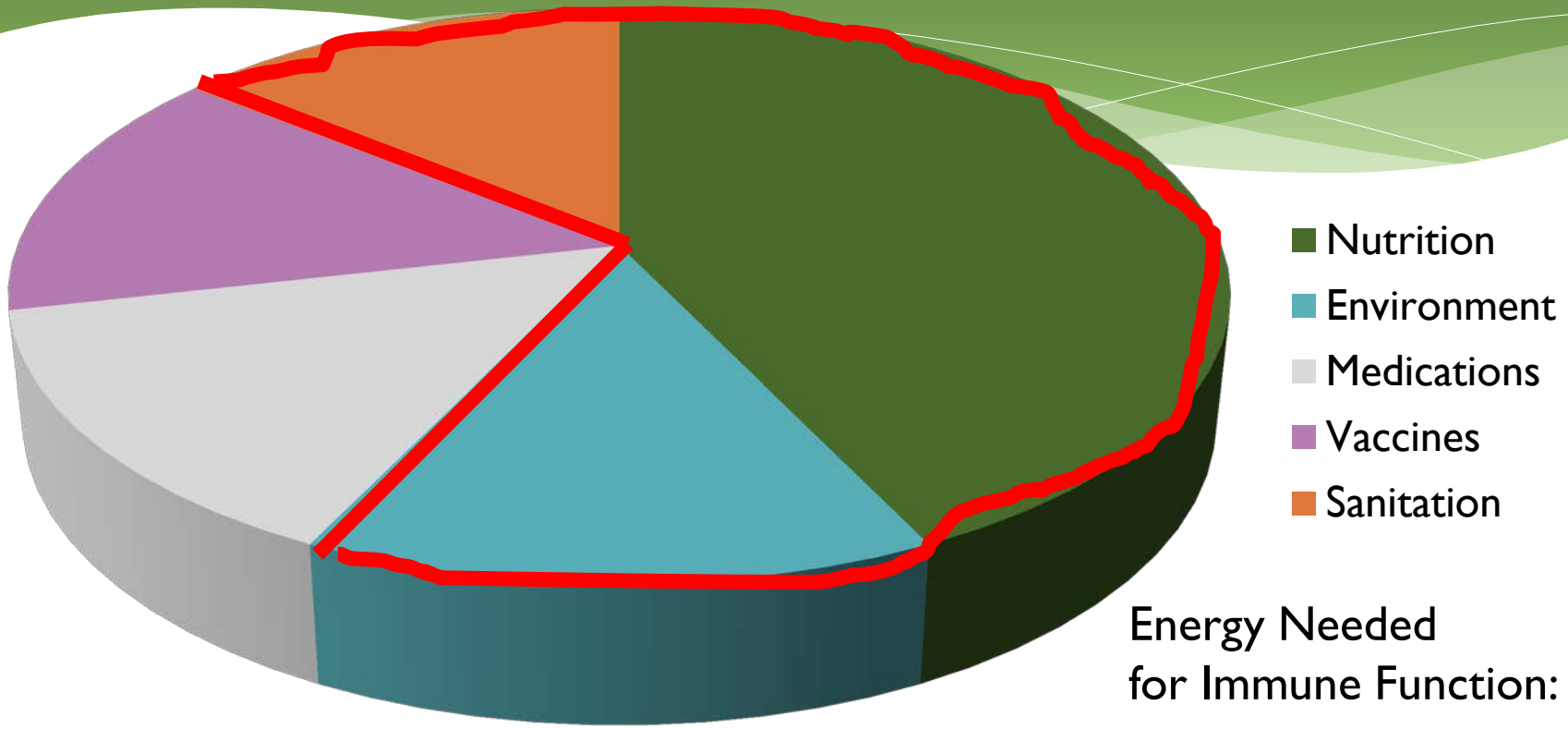
Disease Incidence

Scours	
< 60 days of age	< 25%
61-120 days of age	< 2%
121-180 days of age	< 1%

Pneumonia	
< 60 days of age	< 10%
61-120 days of age	< 15%
121-180 days of age	< 2%
6-12 months	< 3%
12 months to calving	< 1%

Other diseases	
6-12 months	< 4%
12 months to calving	< 2%

Pieces of the Disease Management Pie



Energy Needed
for Immune Function:

* 25-30%

* Lochmiller, R.L. and Deerenberg, C. 2000. Trade-offs in evolutionary immunology: just what is the cost of Immunity? Oikos 88: 87-98.

When problems persist, don't get caught chasing zebras.

Lance Fox, DVM Diamond V


Now
What
?