ACCELERATED CALF FEEDING AND SUBSEQUENT PRODUCTION

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COLOSTRUM

- Colostrum
  - essential for first day of life
  - rich in nutrients

- 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

WHOLE MILK

- Whole milk
  - Nature's food for calves
  - Pasteurizer
- Bulk Tank---29.9-32.7% Fat, 24.2-27.8% Protein (DM)
- Waste Milk---11.5-55.5% Fat, 20.6%-34.9% Protein (DM)

MILK REPLACER

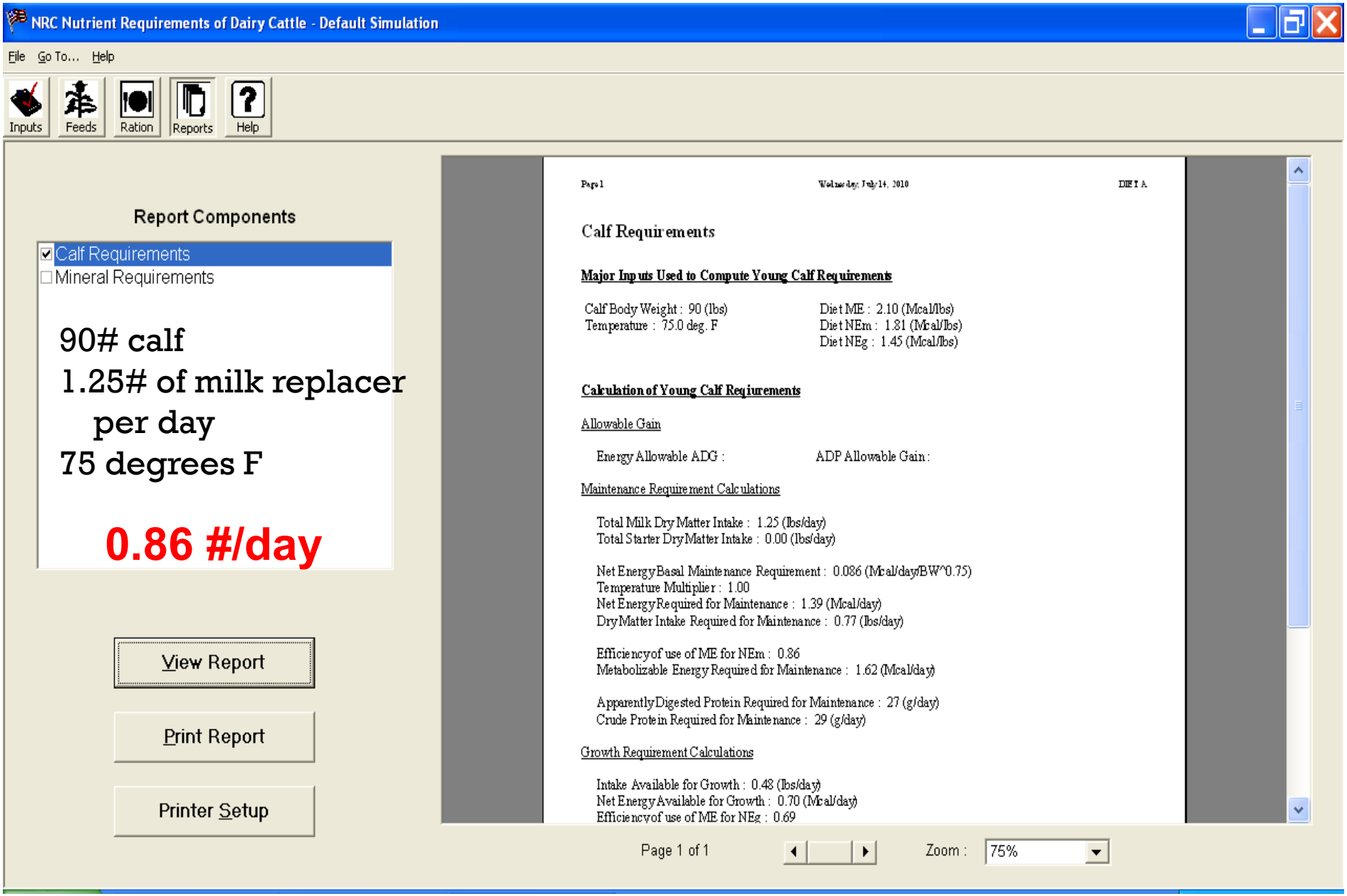
- Calf milk replacer
  - Usually consistent quality
  - 20-28% Protein
  - 15-25% Fat
  - 0.15% Crude Fiber

WHY INVESTIGATE?

- Intensified feeding of calves for accelerated growth is a hot topic in calf management (10 years).
- These programs involve feeding more milk replacer than in conventional programs, such that calves 1.5-3X the dry milk replacer solids.
- Calves will grow faster (lean muscle and skeletal growth) and attain breeding size earlier, and may even produce slightly more milk.
- Dairy Calf and Heifer Association (DCHA) Gold Standard is to double the weight of the calf from birth to 60 days of age
- Holsteins ~ 1.5# per day
- Jerseys ~ 1# per day

WHY INVESTIGATE?

- 1) Maintenance (Metabolizable Energy) is not small
- 2) For calves to grow fast they need to consume more (milk or starter)
- 3) Calf protein (amino acid) needs are low for maintenance but increase rapidly for growth
- 4) Protein needs for growth plateau around 28%, in regard to milk or milk replacers
- 5) Simply feeding more 20/20 will not provide enough protein and will have relative excess energy, which can lead to fat accumulation.


NRC Nutrient Requirements of Dairy Cattle - Default Simulation
File Go To... Help
Inputs Feeds Ration Reports Help
Report Components
Calf Requirements
Mineral Requirements
90# calf
1.25# of milk replacer per day
75 degrees F
0.86 #/day
View Report
Print Report
Printer Setup
Page 1 Wednesday, July 14, 2010 DIET A
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
Energy Allowable ADG :
ADP Allowable Gain :
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 : 1.00
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

90 # calf
1.25 # of milk replacer per day
32 degrees F

0.16 #/day

View Report

Print Report

Printer Setup

Page 1 Wednesday, July 14, 2010 DIET A

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

Energy Allowable ADG ADP Allowable Gain :

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

Page 1 of 1 Zoom : 75%

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Accelerated Milk Replacer

THERMONEUTRAL ZONE FOR CALVES

- < 3 weeks of age
- 59-77 degrees F
- > 3 weeks of age
- 41-77 degrees F

WHAT'S THE DIFFERENCE?

Conventional

- Protein – 20-22%
- Fat – 15-**20**%
- Feed 1-1.25#/day or 8-10 ounce per feeding
- 2 quarts volume
- Free choice water and grain (20-22% protein)
- Maximize starter intake

Accelerated

- Protein – 26-28%
- Fat – **15**-20% (Jersey 25%)
- Feed 1.88-2.5#/day or 15-20 ounces per feeding
- 3-4 quarts volume
- Free choice water and grain (20-22% protein)
- Varying amount of milk replacer depending on age
- Maximize milk/milk replacer

HOW DO YOU IMPLEMENT?

- As you increase solids, you must be **increased fluid**
- Use only high protein milk replacers
- Mix one batch of liquid for all calves (no individual bottles) to avoid errors in weighing and allow for more thorough mixing.
- For large breed heifers, feed 2 to 2 ½ quarts per feeding (twice a day) for week one.
- Feed 3 to 4 quarts per feeding twice a day from week two to 1-2 weeks before weaning.
- Decrease the amount fed the last 1-2 weeks of feeding milk or milk replacer.
- Water and starter feed should be available free choice at all times starting at day two.

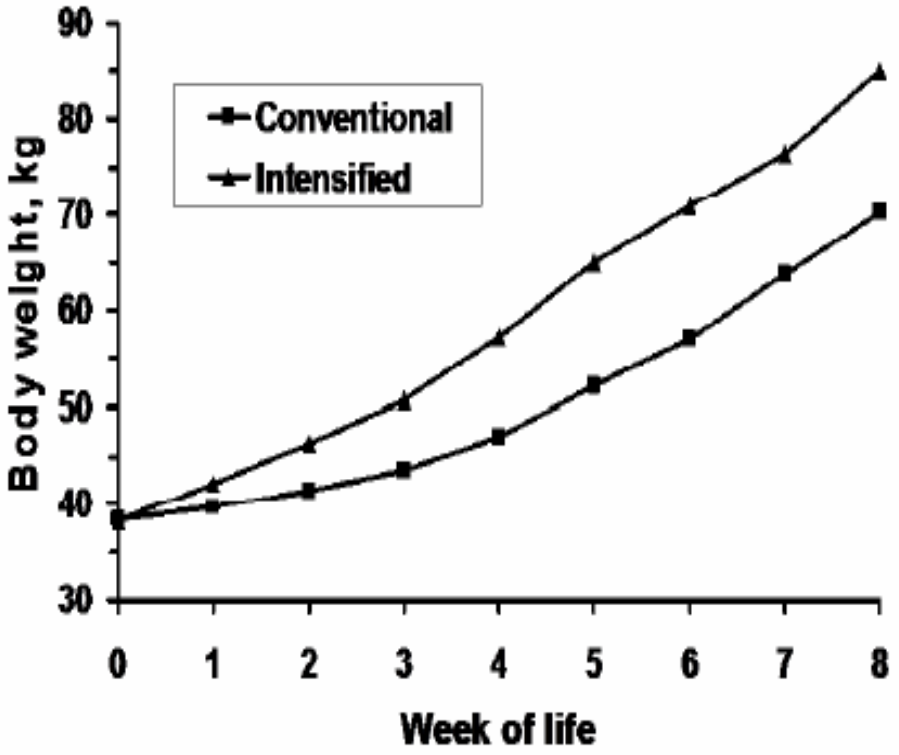
IMPACTING RUMEN DEVELOPMENT: GRAIN EFFECT

A.J. Heinrichs, The Pennsylvania State University

Lance Fox, DVM Diamond V


Missouri State Fair
Missouri State Fair
Missouri State Fair
Missouri State Fair
Missouri State

WHAT HAVE RESULTS BEEN WITH HOLSTEINS ON CONFINEMENT DAIRY FARMS?



The major difference in growth rate is in the first 2-3 wk of life, and after that growth rates generally are parallel.

Katie TerMeer

WHAT HAVE RESULTS BEEN WITH HOLSTEINS ON CONFINEMENT DAIRY FARMS?

- **Reproduction**

- reach puberty at a younger age
- age at conception lower
- age at calving (14-27.5 days)

WHAT HAVE RESULTS BEEN WITH HOLSTEINS ON CONFINEMENT DAIRY FARMS?

- **Health**

- University of Minnesota (whole milk)
- decreased death loss during winter (2.8% vs 21%)
- Cornell University (Milk replacer)
- Cryptosporidia
- maintained hydration better, less days of diarrhea, grew faster, and feed efficiency was better
- Other studies
- some show increased immune system

WHAT HAVE RESULTS BEEN WITH HOLSTEINS ON CONFINEMENT DAIRY FARMS?

- **Milk Production (1st lactation)**

- 1000-2000# of increased milk in fist lactation
- Parent adjusted milk was greater
- Most studies showed an advantage with over ½ statistical or a trend

WHY INVESTIGATE FOR PASTURE-BASED SYSTEMS?

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

WHAT DID WE DO?

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%
Vitamin A, min	7500 IU/lb
Vitamin D_3, min	2500 IU/lb
Vitamin E, min	50 IU/lb

MILK FORMULA 1	
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%
Vitamin A, min	30,000 IU/lb
Vitamin D_3, min	10,000 IU/lb
Vitamin E, min	150 IU/lb

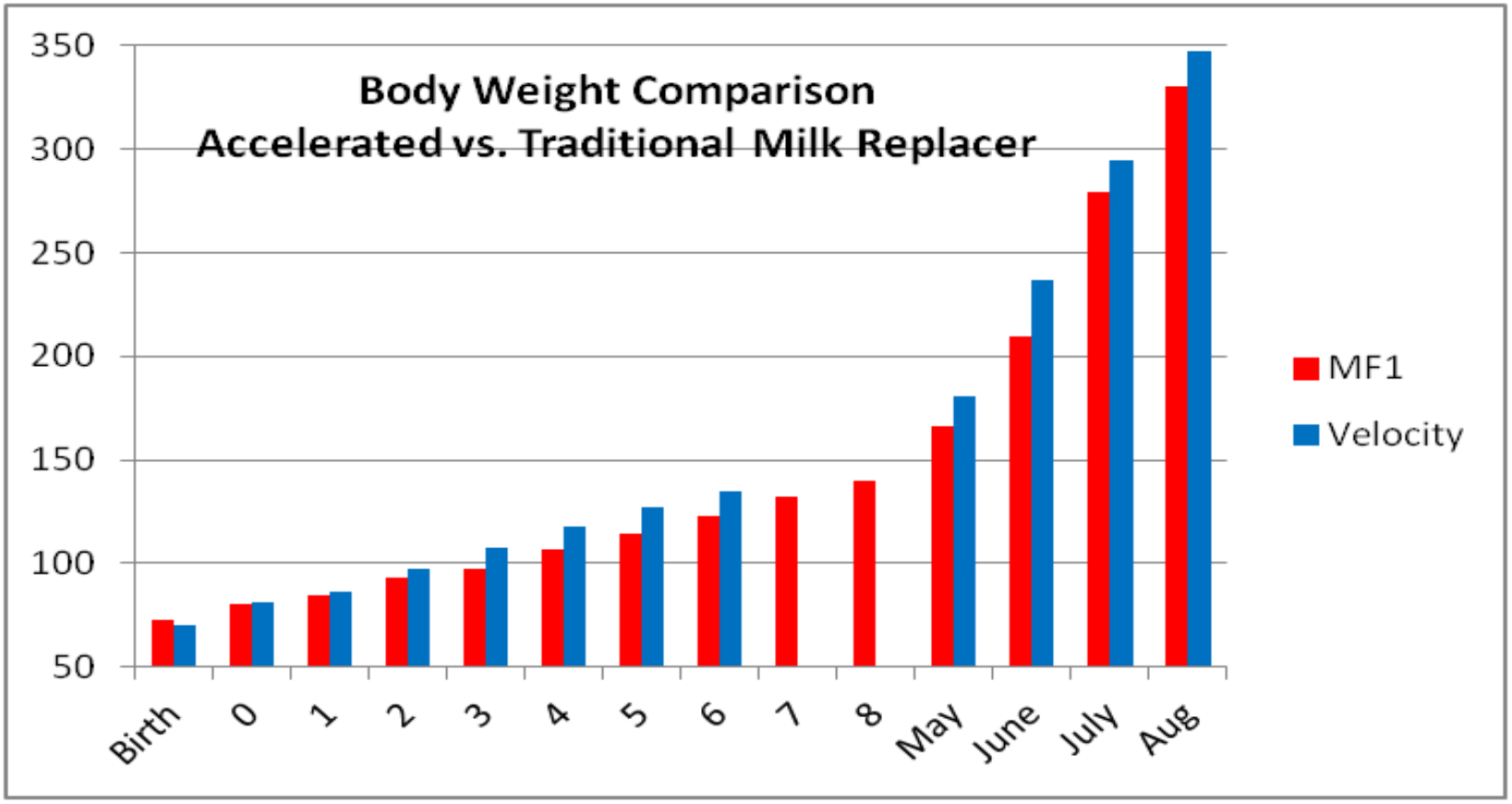
PARAMETERS

- 32 Holstein, Jersey or Crossbred heifers assigned to Milk Formula 1 as the traditional milk replacer program
- 43 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 of 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#								

SOUTHWEST CENTER 2012 BORN CALVES



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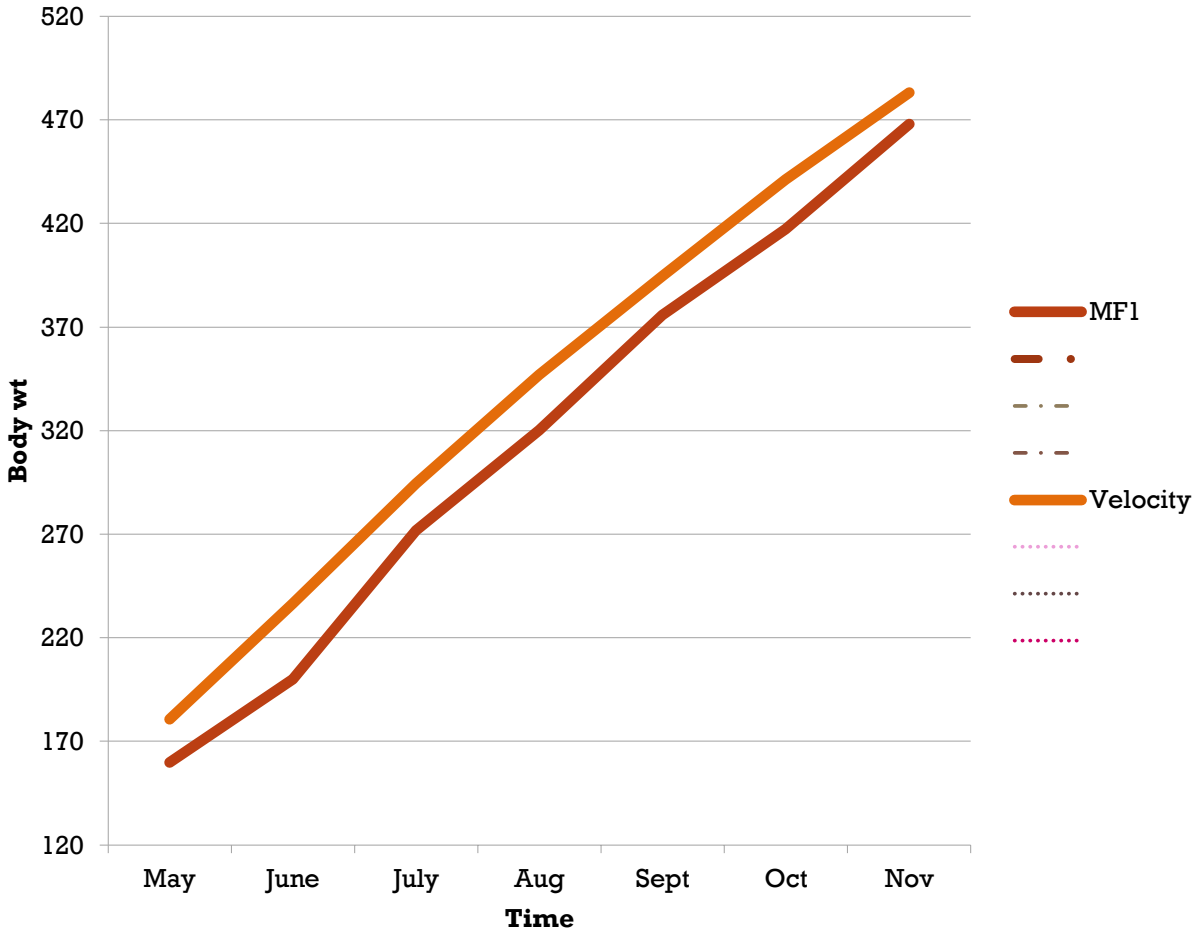
BODY WEIGHT DIFFERENCES AFTER WEANING BETWEEN HEIFERS FED ACCELERATED OR TRADITIONAL MILK REPLACER: 2012 BORN CALVES



WHAT WERE THE RESULTS AT THE SOUTHWEST CENTER?

- **Growth**

- Same advantage as with the confinement Holsteins for preweaning
- Variable at breeding and calving (depending on year)

WHAT WERE THE RESULTS AT THE SOUTHWEST CENTER?

- **Reproduction** (year of breeding)

	2013 and 2014 combined			
	MF1		Velocity	
	32 heifers		43 heifers	
First Service	21	65.6%	32	74.4%
Second Service	5	15.6%	7	16.3%
Third Service	6	18.8%	4	9.3%
Cull	6	18.8%	5	11.6%

WHAT WERE THE RESULTS AT THE SOUTHWEST CENTER?

- **Reproduction**

	Cows in 2014			
	MF1		Velocity	
	12 Cows (16)		19 Cows (21)	
	# Preg	%	# Preg	%
First service	5	41.7%	11	57.9%
Second Service	6	50.0%	5	26.3%

WHAT WERE THE RESULTS AT THE SOUTHWEST CENTER?

- **Health**
- No advantage
- Historically, calf health was excellent when dairy personnel raised the calves.

WHAT WERE THE RESULTS AT THE SOUTHWEST CENTER?

- **Milk Production (1st lactation)**

Year of Birth	Treatment	ME305 FCM
2012	Milk Formula 1	14,400
2012	Velocity	14,877
2013	Milk Formula 1	15,766
2013	Velocity	16,760
Total	Milk Formula 1	15,110
Total	Velocity	15,871

WHY INVESTIGATE FOR PASTURE-BASED SYSTEMS?

- Determine if intensified milk feeding in smaller framed dairy heifers will result in:
  - Younger weaned calves at similar weights as traditionally fed calves
    - **YES!**
  - Decreased breeding and calving age
    - **Yes, appears to be better reproduction**
  - Increase milk production in first lactation
    - **Yes, appears to be better production**

WHAT ARE DISADVANTAGES/NEGATIVES?

- **Health**

- Feces
- "milk scours"

WHAT ARE DISADVANTAGES/NEGATIVES?

- **Clostridial disease**

- Clostridium perfringens C & D (maybe B)
- Antitoxin (10 cc subQ shortly after birth)
- Colorado Serum
- Clostridium perfringens types C&D antitoxin
- Boehringer Ingelheim
- C & D Antitoxin
- Novartis (Elanco)
- Clostratox BCD Antitoxin

APPROXIMATE COST OF EACH PROGRAM

- Intensified feeding programs will cost about $35 to $55 more in milk replacer and starter than traditional programs.

	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**	

WHAT ARE DISADVANTAGES/NEGATIVES?

- Intensive management required for program success
- Increased costs during the milk feeding period ($30- $50 per calf)
- Delayed rumen development and poor transition at weaning
- Jerseys need more fat than Holsteins

SUMMARY OF POSITIVES

- **Increased lean growth in pre-weaning stage**
- **Potential health benefits**
- **Earlier age at first calving**
- **More potential production in first lactation**