Risks and Benefits of Milk vs. Milk Replacers for

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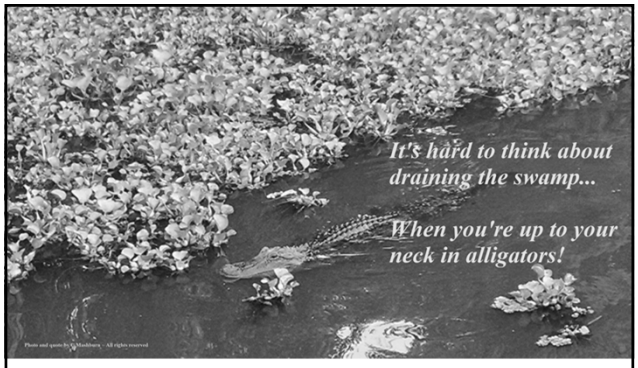
- Low milk prices????
- Incentive to lower SCC?
  - Divert milk from high SCC cows to feed calves?



What's the goal of the calf program? Short term? Long term?

The newborn calf

Impact of the following?

- Stress of calving
- Calving environment
- Delay in nutrient intake
- Body composition of the calf - % body fat??

Impact on nutrient status of the calf???

Dorothea Baker photo

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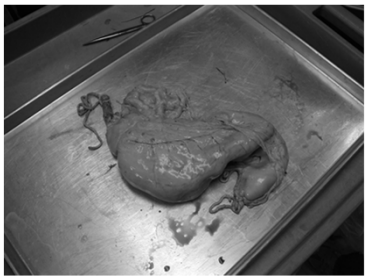
Newborn calf digestive system



Limited digestive enzymes in the calf – 2 – 4 weeks of age

- Lactase
- Renin – forms clot
- Pepsin – digests casein and whey proteins
- Limited ability to digest until 3 weeks of age.
  - Starch
  - Vegetable proteins

- Calf milk replacers
  - Best growth with all milk ingredients for the 1st 3 – 4 weeks
    - Whey proteins, lactose, digestible fat sources
  - Not the time to feed a low cost milk replacer.

Biology of the calf

- Requirements for maintenance
  - Environmental temperature
  - Environment – moisture, wind, hair coat?
- Requirements for growth?
  - How much should a calf grow? Week 1, 2, 3……?
  - What is growth? Body composition?

The pros and cons of feeding milk!

- Duh!!! That's what it's made for – feeding calves, not making cheese or feeding people!

Preweaning growth and health of MN dairy calves fed equal volumes of pasteurized waste milk or 20:20 milk replacer (>400 calves)

	Past. Waste Milk	20:20 Milk Replacer
Ave. Daily Gain	1 lb.....	.77 lb.....
Proportion treated	11.6%	32.1%
Proportion died	2.2%	12.1%
Energy allowable gain	.8 lb.....	.4 lb.....

WASTE MILK CALVES RECEIVED MORE DM, ENERGY AND PROTEIN/DAY.

(Godden et al. JAVMA, 2005)

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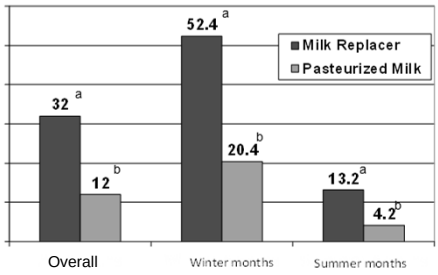
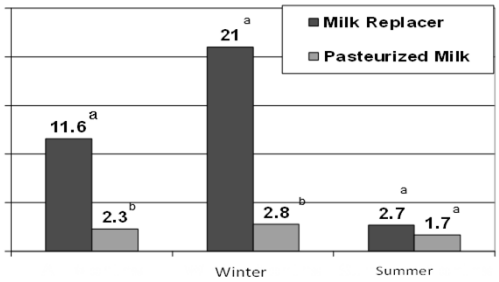
Preweaning Treatment Rate (%)



Reduction in scours and pneumonia for all months

(Godden et al. JAVMA, 2005)

Preweaning Death Loss (%)



(Godden et al. JAVMA, 2005)

What is the message of this research???

What is nutrient content of whole milk ?

Milk	DM%	Fat%	Prot%	Lactose	Ash%
Holstein	12.3	3.6	3.0	5.0	.7
Jersey	14.5	5.0	3.8	5.0	.7

Nutrient content on DM Basis		
	Fat%	Protein%
Holstein	29.3	24.4
Jersey	34.5	26.2
20:20 CMR	20?	20 ?

What milk to feed calves?

- Tank milk?
- "Waste milk"?
- What is waste milk?

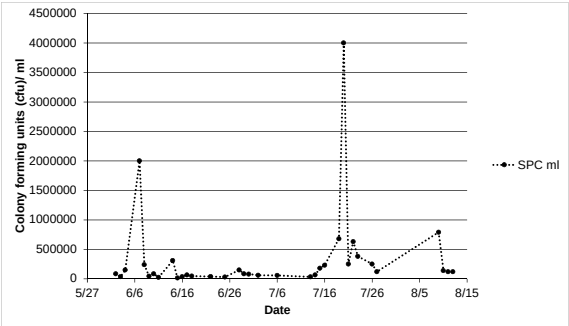
Waste milk on CA operations

	mean	minimum	maximum
Fat (%)	3.8	1.1	5.3
Protein (%)	3.7	2.9	4.7
Total Solids (%)	12.7	8.9	15.3
SCC (cells/ml)	2,072,727	1,000,000	4,500,000
SPC (cfu/ml)	1,681,869	3,000	5,900,000
Volume (L/calf/d)	5.25	3.67	7.57

Least squares means of pasteurized waste milk (PWM) and balancer (Bal) components (Machado – 2012)

Milk parameter, (%, on liquid basis)	Least squares means	SD	Minimum	Maximum
PWM solids (%)	11.64	1.066	9.02	13.18
PWM protein (%)	3.12	0.303	2.27	3.56
PWM fat (%)	3.51	0.585	1.94	4.66
Bal solids (%)	13.64	1.238	10.22	15.09
Bal protein (%)	3.87	0.445	2.90	5.09
Bal fat (%)	2.89	0.386	2.16	3.65

Standard plate counts



Mean SPC: 332,171 ± 733,487 cfu/ mL

What are the goals for waste milk?

- SPC (bacteria count) < 20,000 cfu/ml
- SCC ?????
- Total solids level - 12 – 13%
- Key factors for success with waste milk!
  - Treat waste milk for calves just as you would "sold" milk!
  - Receiving containers, cool or feed immediately
  - Sanitation

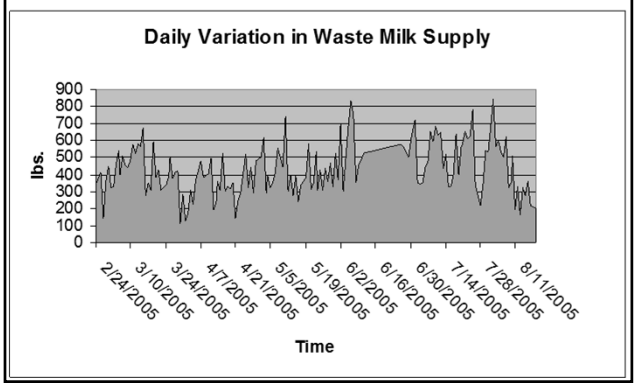
Challenges of feeding milk

- Bacterial growth between harvest and feeding.
  - It grows bacteria – clean receiving containers
  - Timing between milking and feeding - feed immediately or cool
- Does your herd have:
  - Mycoplasma
  - Johne's
  - BVD?

Challenges cont'd

- Pasteurizer
  - Initial cost, maintenance and utility cost
  - Labor involved in operating and cleaning.
  - Monitor SPC - frequency
- Consistency supply of waste milk

Supply of Waste Milk on one 1200 dairy



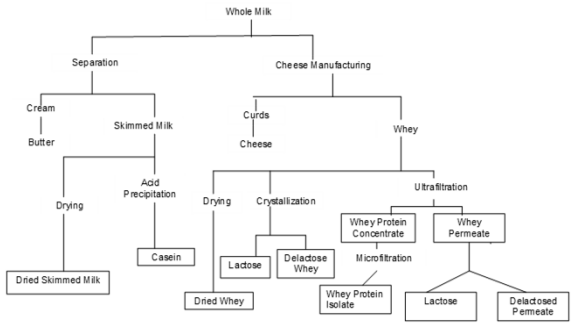
How much milk do you need to feed your calves.

- "Average" herd – 200 cows
- How many calves? 35 – 40 on milk
- How much to feed? 16 lb. / day
- 560 lb. required.
- How many cows ~ 11 cows @ 50 lb. / day.
- Should you have this many "hospital" or fresh cows?

The pro's and con's of feeding milk replacer

- Quality control - IF purchased from reputable manufacturer.
  - Digestibility of protein and fat sources
  - Low bacteria count
  - No disease risk
- Opportunity for more consistency
  - Weigh water and powder
  - Measure temperature

MILK FRACTIONATION



Alternative (Non-Dairy) Proteins

- Soy Flour is the finely powdered material resulting from the screened and graded product after removal of most of the oil from selected, sound, cleaned and dehulled soybeans by a mechanical or solvent extraction process. It must contain not more than 4.0% crude fiber. (AAFCO definition)

	Typical Analysis
Protein (N x 6.25)	50 – 53%
Fat	1.0 – 1.5%
Fiber	2.5 – 3.3%
Moisture	5.0 – 6.5%

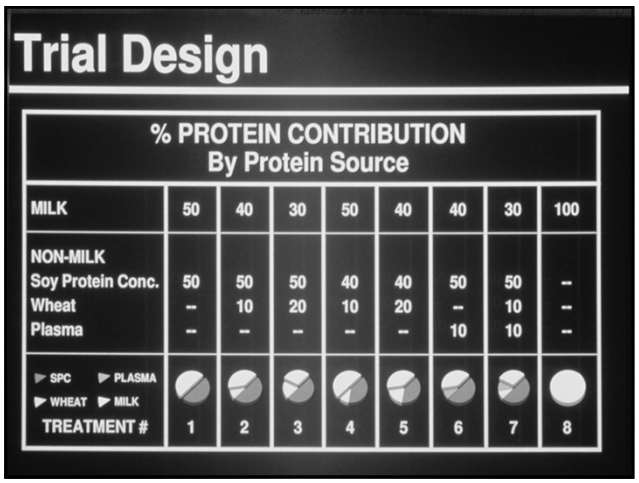
- Soy Protein Concentrate

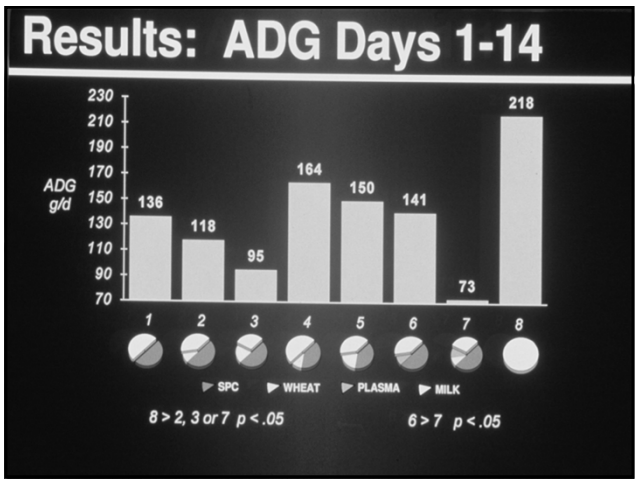
  Soy Protein Concentrate is prepared from high quality sound, clean, dehulled soybean seeds by removing most of the oil and water soluble non-protein constituents and must contain not less than 65% protein on a moisture-free basis. (AAFCO definition)

	Typical Analysis
Protein (N x 6.25)	66 - 70%
Fat	1 – 2%
Fiber	<4.5%
Moisture	4 – 6%
Ash	4 – 7%

- Hydrolyzed Wheat Protein (Gluten)

	Typical Analysis
Protein (N x 6.25)	79 - 81%
Fat	5 - 7%
Fiber	<0.5%
Moisture	3 – 5%
Ash	<1.0%





MR Ingredient Digestibilities

Ingredient	Mean Digestibility
Skim Milk	92.4
Whey Protein Concentrate	87.0
Whey Protein Isolate	91.4
SPC (42d of age& >)	87.4
SPC (< 21d of age)	58.7
Modified Soy Flour (>21 d of age)	72.0
Soy Flour	63.0
Soy Isolate	60.5
Casein	84.8
Skim & Casein	83.0

Are alternative protein source recommended for calves <3 weeks old?

Energy allowable gain whole milk vs. 20:20 CMR Week 1

Calf	Whole milk		20:20 Milk	
	68 F	32 F	68 F	32 F
80 lb..... calf – week 1 1 lb..... DMI	.85 lb/day	.19 lb/day	.64 lb/day	No gain
80 lb..... calf week 1 1.5 lb..... DMI	1.68 lb/day	1.15 lb/day	1.15 lb..... / day	.85 lb..... /day

Additional challenges influencing nutrient requirements?
- Temperature < 32F
- Bedding adequacy?

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Whatever you select you must feed more solids from milk or milk replacer

gms of protein and fat provided by…..

Amount of DM intake	500g (1.1 lb.....)	1000g (2.2lb)	500g	1000g
	g of protein		g of fat	
20:20 milk replacer	100	200	100	200
28:20 milk replacer	140	280	100	200
Whole milk 4L@ 12.5% DM)	130	260	150	300

Take home message - Intake is more important than%

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Calves will grow well on either milk or milk replacer

Calf Feeding Trial

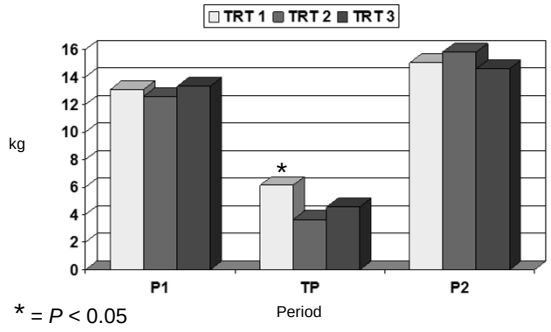
- Objective
  - Evaluate a possible strategy to supplement waste milk with 28:20 milk replacer

M. C. Scott – M.S. research

Calves

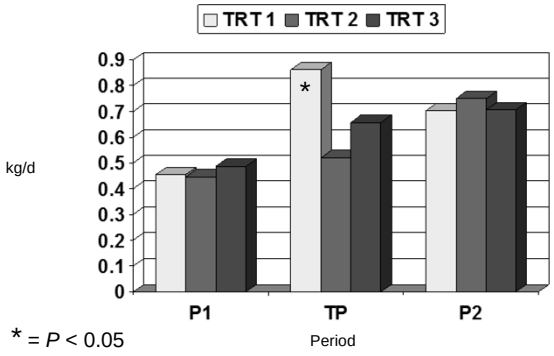
- 62 calves (45 heifers, 17 bulls)
  - Holstein heifers – 20
  - Holstein bulls – 13
  - Jersey heifers – 7
  - Crossbred heifers – 18
  - Crossbred bulls – 4
- Born 3/21 – 10/10 2005
- Feeding rates – determined at birth

Body weight gain



* = $P < 0.05$

Average daily gain



* = $P < 0.05$

Cost of milk or milk replacer

- Assumptions – 2.155 lb. of solids
  - 2 gallons of whole milk, 28:20 CMR, 20:20 CMR @ 12.5% solids

Diet	Lb protein	Lb fat
Whole milk	.55	.66
28:20 CMR	.60	.43
20:20 CMR	.43	.43

Cost of milk / milk replacer

Diet	Energy allowable gain	Protein allowable gain	$/lb of DM	$/lb of protein allowable gain
Whole milk	2.2	1.86	$1.20 / $1.60	$1.39/1.85
28:20 CMR	1.94	2.09	$1.07	$1.02

Whole milk - $15/cwt = $1.20/ lb of DM ; $20/cwt = $1.60/lb of DM

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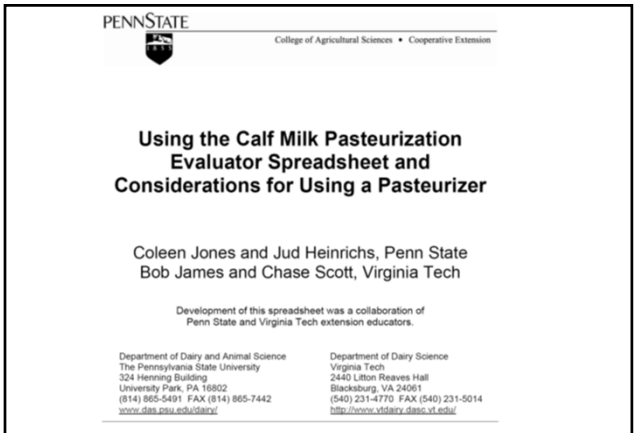
What is the value /cost of waste milk???

Weighing the alternatives

- Calf Milk Replacer
  - Lower cost / lb of gain
  - Less risk of disease
  - Quality control
  - Opportunity for consistency
    - Temperature?
    - Solids level?

- Whole milk
  - Nature's most nearly perfect food
  - Higher digestibility and utilization ????
  - Risk of disease transmission
  - Need to pasteurize.
  - Handling and managing the transfer from parlor to the calf.
  - Must consider use of pasteurizer and manage it for success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Using the Calf Milk Pasteurization Evaluator Spreadsheet and Considerations for Using a Pasteurizer

Coleen Jones and Jud Heinrichs, Penn State
Bob James and Chase Scott, Virginia Tech

Development of this spreadsheet was a collaboration of Penn State and Virginia Tech extension educators.

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Take home message

- Consider all the facts
- If you have enough waste milk to feed all your calves……. You have a herd health problem!!
- Improve herd health and reduce size of hospital string
- Feeding high quality milk at high rates promotes calf growth
- Manage risk well.
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