


**The
Future is
Here**



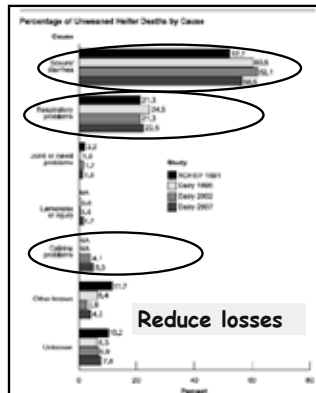
- Intensive
- Challenging
- Expensive
- Opportunity
 - Grow from within
 - Make genetic process
 - Improve productivity
 - Minimize biosecurity risks

Calf Costs Are High
(From WI 2007 Study)

- Labor and management (47%)
 - Efficiencies with custom operations
- Feed cost (34%)
 - Ave weaning age
 - Number of days on feed
 - Source of liquid feed
- Variable cost

- \$5.31/day (\$3.16-5.78)
- After weaning \$2.04/day (\$1.31-2.93)

Health problems haven't changed much.



Reduce costs by lowering weaning age

b. Heifer average age at weaning (weeks):

NDHEP 1991		Dairy 1996		Dairy 2002		Dairy 2007	
Heifer Avg.	Std. Error	Heifer Avg.	Std. Error	Heifer Avg.	Std. Error	Heifer Avg.	Std. Error
8.2	(0.1)	8.7	(0.1)	8.4	(0.1)	8.6	(0.1)

- \$5.31/day (\$3.16-5.78)
- After weaning \$2.04/day (\$1.31-2.93)

Opportunity: Reduce deaths that occur within 48 hours of birth.
(8.1% of calves born in 2006)



- 78.6% born dead
- 21.4% born alive, die within 48-hr

Reducing Losses in First 48-hours

- Transition cow management
 - Supervision prior to and during calving
 - Vaginal delivery is important for survival
 - Proper procedures for assisting delivery
 - Timing
 - Methods
- <http://www.cvmb.colostate.edu/ilm/proinfo/calving/notes/whentocallforhelp.htm>
- Resuscitation protocols
 - Calling before it's too late

Calving Assistance is Bad!

- Reduced calf survival
- Calf injury
- Increased odds for calf disease
- Lower milk production in first 60-days

Assist when needed, not to speed up delivery.
problems in cow

Moderate Calving Assistance



- | | |
|-----------------------------------|--------------------------------|
| • Thoracic and abdominal bleeding | • Yellow staining |
| • Fractured ribs | • Aspiration of amniotic fluid |
| • Torn diaphragm | • Delayed brain development |
| • Ruptured liver | • FPT |
| • Swollen head and tongue | • Increased disease |
| | • Death |

Lower Dystocia Risks

- Monitor body condition scores
- Monitor dry matter intake
- Optimize sire selection
- Age at first calving
- Dry period length
- Stall comfort and bunk space
- Reduce stress
- Herd testing for NEFA's



Know Normal Calf Behavior

- Head righting in minutes
- Sitting in 5 minutes
- Attempts to stand within 15 minutes
- Standing within 1 hour
- Temp high at birth, declines to 101-102 by 1 hour
- Suckling within 2 hours



Mark High Risk Calves

- Complete exam
- Regular health screening
 - Prolonged time standing after feeding
 - Appetite change
 - Temperature change more than 1.5°F
 - Calf health scoring system
 - Navel exam



•Anti-inflammatory drugs
•Antibiotics
•Oral fluids

Time, training
and a process
for regular
health
screening

Calf Health Screening Chart				
Rectal temperature		1		2
Normal		100.0-101.0		101.0-102.0
Cough		None	Intermittent coughs	Intermittent coughs or occasional spontaneous coughs
Nasal discharge		None	Intermittent watery or mucous discharge	Intermittent watery or mucous discharge
Nasal discharge		Normal amount of watery discharge	Intermittent watery or mucous discharge	Intermittent watery or mucous discharge
Eye		Normal	Small amount of watery discharge	Intermittent watery or mucous discharge
Eye		Normal	Small amount of watery discharge	Intermittent watery or mucous discharge
Ear		Normal	Small amount of watery discharge	Intermittent watery or mucous discharge
Ear		Normal	Small amount of watery discharge	Intermittent watery or mucous discharge
Milk		Normal	Small amount of watery discharge	Intermittent watery or mucous discharge
Milk		Normal	Small amount of watery discharge	Intermittent watery or mucous discharge

Healthy Calves



The Basic Care Package For Calves



The immune status of the cow impacts calf health.

- Vaccination or disease exposure
- Colostrum production - 15 days pre-fresh
 - Genetic and hormonal influences on variation in production and transfer of antibodies



Colostrum quality and quantity

- Antibodies
- Maternal immune cells
- Nutritional, growth and development factors

Colostrum Composition

	Average	Minimum	Maximum
Fat (%)	6.7	2.0	26.5
Protein	14.9	7.1	22.6
Lactose	2.5	1.2	5.2
Total Solids	27.6	18.3	43.3

IgG (mg/ml)

- Milk early
- Don't discard heifers

PA survey by Heinrichs, et. al.

It's not just the antibodies

- Immunoglobulins - antibodies
- Growth factors
 - Immune regulation
 - Development of the intestinal tract
 - Mammary development
- Maternal cells in colostrum selectively absorbed and functional

Proper Use of Esophageal Feeder

- Calf standing or sitting
- Nose below the ears
- Gentle and slow
- 4-qt container for colostrum



Colostrum Equipment



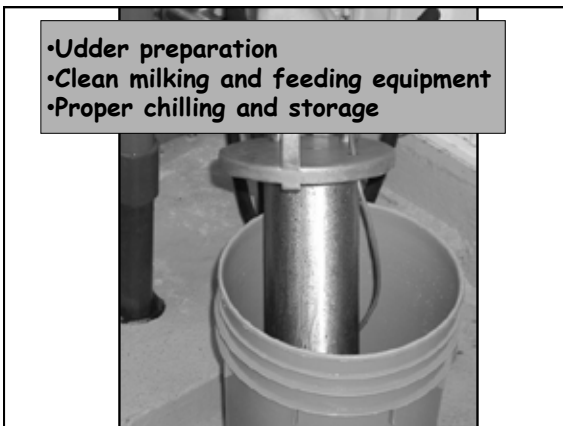
Colostrometer Use

- Calves need 150-200 gm IgG
- Poor quality is poor quality
- > 1.070 to insure 50 gm/L
- Warm underestimates IgG

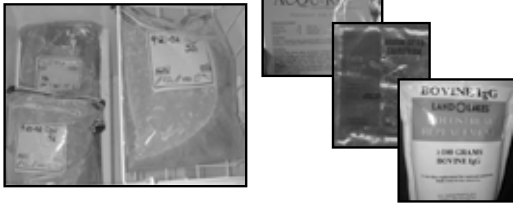








**If there isn't enough colostrum,
there must be a back up plan**



150-200 gm of IgG

You don't know until you test!

Herd Testing Protocol

- Measure serum protein concentration in 10-12 calves
 - < 7 days
 - > 18 hours from feeding
- Separate non-hemolysed serum
- Serum at room temperature (65-75 F)
- Goal:
 - 90% are above 5.2 g/dl
 - 80% are above 5.5 g/dl



Colostrum Summary

- Calves need 150-200 gm of IgG
- Colostrum should test at 50 gm IgG/L
- Fresh colostrum is best for all the nutritional and
- If the esophageal feeder is used, give 4 qt
- 3 qt may be ok if calf sucks all of it
- Bacteria in colostrum inhibit absorption of

IgG status of calves is most important variable in predicting health, growth and feed efficiency

Improvements Still Needed

- Accurate, affordable field tool to measure IgG concentration in colostrum
 - Animal variation
 - Colostrum milking time
 - Water dilution effects
- Better equipment for colostrum delivery
 - 4 qt esophageal feeders (single passage)
 - 3 qt bottles for suckling colostrum
- Preservation of colostrum quality without loss of the nutritional, developmental and immune factors
- Effective colostrum replacement
 - IgG delivery
 - Packaging, cost, volume fed
 - Other immune, nutritional and developmental components

The Basic Care Package For Calves



- Colostrum
- Calories
- Consistency
- Cleanliness
- Comfort

A Basic Care Package



- Colostrum
- Nutrition

Feeding Calves Has Changed



Growth Objectives

- Double birth weight by 56 days
 - 90 lb calf is 180 lb by 56 days
 - Equals 1.6 lb per day average!
- Decrease liquid feed days 49-56 by 50%
- No liquid feed after 56 days
- 6-10 days to recover starter intake
- Forages fed at 5 lb starter intake
- TMR before 5 months must be done with care

With more milk consumed, calves have fewer health problems

Comparing Liquid Feeds

	Protein	Fat	Total Solids
Whole milk	27%	30%	12.7% (1.1 lb/gal) (0.285 lb prot/gal) (0.317 lb fat/gal)
Milk replacer	20%	20%	11.4% (1lb/gal) (0.190 lb prot/gal) (0.190 lb fat/gal)
Milk replacer	28%	20%	15% (1.25 lb/gal) (0.333 lb prot/gal) (0.238 lb fat/gal)

Traditional Calf Feeding 80 lb Calf

Minimum Mixing/ Feeding

- Fed at 8% body weight
- Mixed at 10% solids
- 0.64 lb mr solids/day

Maximum Mixing/ Feeding

- Fed at 12% body weight
- Mixed at 12.5% solids
- 1.2 lb mr solids/day

87.5% increase in daily solids
from minimum to maximum

Dairy Calves Eating < 0.5 lb Starter are the Problem

1-wk, 86 lb calf, 4 qt whole milk/day, 0.1 lb starter

	65 F	32 F
Energy for gain (lb)	0.98	0.35
Protein for gain (lb)	0.98	0.89

Winter feeding: 6 qt per day by day 3
8 qt per day by 2 weeks

Dairy Calves Eating < 0.5 lb Starter are the Problem

1-wk, 95 lb calf, 20:20 all milk mr
Goal: 0.8-1 lb/day gain

	60 F	32 F
Powder (oz)	24 oz	28 oz
Water (vol)	6 qt	7 qt

Cold Weather Feeding



- Add another meal of the same mix 2 extra meals if 0°F
- Increase total solids 15-18% (requires adjustment of 1% per day)
- Add additional fat
- Calves still need water and deep straw bedding
- Always have fresh, clean starter in front of the calf to encourage intake

Feeding Consistency

- Total solids
- Osmolality
- Sodium
- Temperature
- Measuring, mixing and



Total Solids

- < 1% change per day
- Never > 18%

minutes of milk or before sleeping



Watch the Total Solids Variation

Calculate

- 10 oz powder = 0.625 lb
 - 2 qt water = 4.17 lb
- $$\frac{0.625}{0.625 + 4.17}$$
- = 13% solids

Measure



Variability in MR Diet – Total Solids

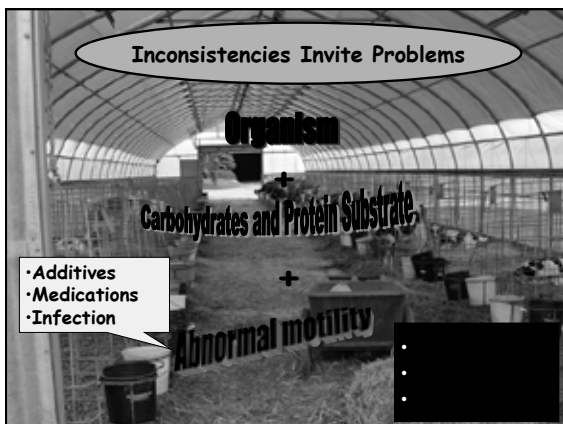
Days	28:20 - weight	22:18 - volume
1	12.2	15.6
2	11.5	17.0
3	12.5	19.3
4	8.8	16.0
5	10.9	14.4

Koepnick and McGuirk, 2010

MR Winter Feeding – Percent Solids Increased

	Day 1	Day 2	Day 3	Day 4	Day 5
Calf 1	16	19	21	19	18
Calf 2	17	17	19	18	20
Calf 3	20	18	18	22	17

- No more than 1% per day
- Never over 18%



Other Nutrition Issues

- Salt poisoning
- Added ingredients may affect abomasal emptying, intestinal transport or intestinal flora
- Bovatec (Lasalocid) > 2X
- Electrolyte powder in milk or mr
- Limited water in cold weather



The Basic Care Package For Calves



- Colostrum
- Calories
- Consistency
- Cleanliness
- Comfort

A Basic Care Package



- Colostrum
- Nutrition
- Environment

Cleanliness Reduces Exposure

- Maternity pen
- Cows in maternity pen
- Transport cart
- People moving and handling calves
- Warming, holding or drying area
- Calf housing
- Feeding equipment
- Feeds



Time and Management Between Occupants



15% more pens than calves at maximum occupancy

During Occupancy: Remove feed refusals







Find the Site of Exposure...





- By-pass
- Dilute
- Distance them from it.

Calf Warming Rooms



Bedding Contamination Can Be Measured

Location	Coliforms	<i>Salmonella</i>	Total cfu/ml)
Maternity	1,000	Negative	576,000
Holding pen	500	Negative	150,825
Truck	6,900,000	Positive	6,921,750
Clean hutch	750	Negative	11,500
5-day hutch			7,500
Repeat test	• Bacterial types and numbers Univ MN Laboratory for Udder Health • <i>Salmonella</i> culture		75,000
Goals:			
Clean pen			5,000
Occupied pen	< 500,000	Negative	< 2,000,000

Housing Factors

- Seasonal challenges
- Individual or group pens
- Indoor or outdoor
- Pen design, size, number
- Bedding type
- Filling and emptying patterns



Comfort



- Straw for newborns
 - Critical temperature range is 55-75 F
 - Use less energy to stay warm and have more to grow and fight disease
- Deep, dry bedding, deep enough to cover the legs when calf is lying down

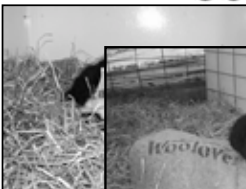
Deep Bedding

Distances calves from exposure

Reduces prevalence of respiratory disease and scours



Comfort



Blankets help.

Comfort



Calves should be sleeping 75% of the day.

Housing Changes that Reduce Respiratory Disease

- Decrease calf to calf contact
 - Barriers between calves
- Increase nesting score
- Decrease aerosol bacteria
 - Increase pen size > 24 sq ft
 - Limit barriers surrounding the calf
 - Colder temperatures
 - Supplemental outside air



The deeper the straw, the less respiratory disease



- Calories not diverted to warming but used to fight infection

Solid Panel Between Calves But Not Boxed In



Remove feed refusals from calf housing area



Calf Housing Solutions

- Naturally ventilated barns in winter (Lago, 2006)
 - Solid panels between calves
 - Increased bedding depth
 - Low airborne bacterial counts
- Group pen housing
 - Small, stable groups
 - Preconditioned period
 - At least 28 sq ft / calf
 - Increased milk allowance or ad-lib feeding
 - All in-all out management

Group Housing

Resting Space



Feeding Space and Water



Space Requirement: Bedded Pack with Feeding Area

Weight (lb)	135	220	330	440	660
Area/heifer (sq ft)	21	25	29	37	45
Bedded area/heifer (sq ft)	17	21	24	29	35



Other Topics

- Vaccinations
- Dehorning
- Screening for health problems
- Treatment protocols

Goals of a Calf Vaccination Program

- Protect from disease or agents that they are likely to encounter before they are challenged
 - Septicemia at birth
 - Scours 3-14 days
 - Respiratory disease 3 weeks to 4 months
- Cost efficient (cost vs risk vs protection)
- "At least do no harm!"

Septicemia

- Infection before, during or shortly after delivery
- Gram negative bacteria
- Cows vaccinated - J Vac, J5, Endovac Bovi, Salmonella SRP
- Clean colostrum before exposure

Scours Protection

- Primer and booster in lact 1 and an annual booster in older cows
 - Vaccinate dry cows: ETEC, Rota, corona, Clostridium perfringens C, Salmonella
 - Scour Guard 4KC
 - Guardian
 - Scour Bos
 - Salmonella SRP
 - Vaccinate newborns
 - Calf Guard
 - Provide monoclonal antibodies
 - First Defense - ETEC, coronavirus
 - Ecolizer + C
 - Timing: booster needs to be at least 3 weeks pre-fresh, meaning that primer has to go at 75 to 60 days pre-fresh

Respiratory Disease Protection

- Colostrum
- Nutrition
- Housing
- Intranasal vaccine to protect calves with maternal antibodies
 - Birth
 - 3 weeks
 - Before group housing

Proper timing for IN and booster


























Avoid Calf Vaccination Pitfalls

- Vaccinating sick/stressed calves
- Multiple vaccines at once
- Gram negative bacterial components
 - *Pasteurella* and *Mannheimia*
 - *Salmonella*
- *Mycoplasma bovis*
- Half-dose vaccinations


Dehorning: Pick the right time and dehorn with pain management



Screening for Health Problems

 U of H Health Spring 2020s				
0	1	2	3	
General description				
100-150 µm	150-100 µm	150-100 µm	100 µm	
	elastic shape (rough)			apoptotic shape (rough)
Visual description				
				
Normal cell	Small amount of cellular vacuolation	Extensive cellular vacuolation	Cytotoxic cellular shrinkage	
Cell nucleus				
				
Normal	Small amount of nuclear shrinkage	Extensive amount of nuclear shrinkage	Nuclear nuclear shrinkage	
Cell nucleus				
				
Normal	Small amount of nuclear shrinkage	Extensive amount of nuclear shrinkage	Nuclear nuclear shrinkage	
Cell nucleus				
				
Normal	Small amount of nuclear shrinkage	Extensive amount of nuclear shrinkage	Nuclear nuclear shrinkage	
Cell nucleus				
				
Normal	Small amount of nuclear shrinkage	Extensive amount of nuclear shrinkage	Nuclear nuclear shrinkage	
Cell nucleus				
				
Normal	Small amount of nuclear shrinkage	Extensive amount of nuclear shrinkage	Nuclear nuclear shrinkage	

Detection depends on...

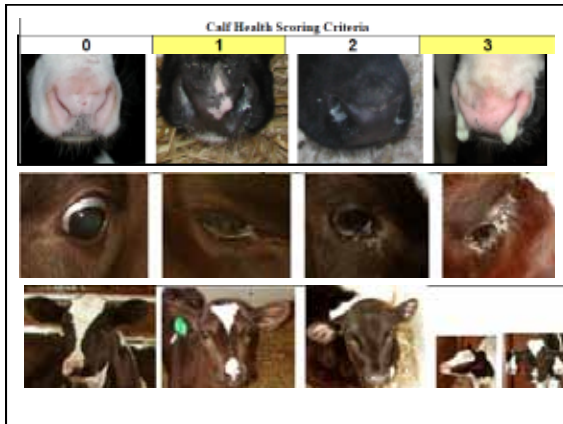
- Plane of nutrition
 - Management
 - Housing type
 - Group size
 - Timing of exam
 - Type and quality of screening
- 

[illegible]

From Outside of the Calf Pen



- Nasal Discharge
- Eyes
- Ears
- Spontaneous coughing



Inside the Pen – Calf Contact

0	1	2	3
Rectal temperature 100-100.9	101-101.9	102-102.9	≥103
Cough None	Induce single cough	Induced repeated coughs or occasional spontaneous cough	Repeated spontaneous coughs

Determine a Respiratory Score

Calf Screen		(Total respiratory score: 4 = watch, 5 or more = treat)				Temperature	Total respiratory score
Animal ID	Age	Nasal discharge	Eye or ear (highest number)	Cough = spontaneous or induced			

Calves with total respiratory score ≥ 5 have more than 2 signs of respiratory disease and are treated.

One Time Treatment Protocols 5-Days of Coverage

- Baytril (Enrofloxacin)
- Draxxin (Tulathromycin)
- Excede (Ceftiofur)
- Nuflor Gold (Florfenicol)

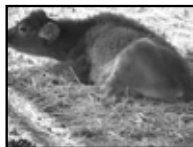
Work with your veterinarians

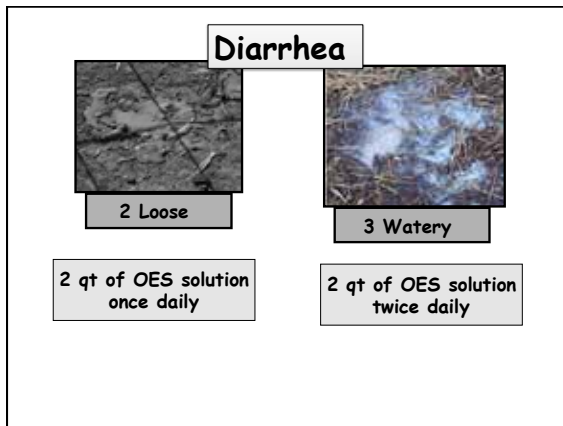
More Than One Dose Protocols 5 Days of Coverage

- Adspec (Spectinomycin)
- Baytril (Enrofloxacin)
- Excenel or Naxcel (Ceftiofur)
- Nuflor Gold (Florfenicol)

Work with your veterinarians

Signs of Detection Problems





Diarrhea Treatment

- Feed them
- Oral electrolyte solution
 - Fecal score 2: 2 qt OES once daily
 - Fecal score 3: 2 qt OES twice daily

Sick Calves Get Antibiotics

- High temp (> 103); Low temp (< 100)
- Reduced intake or feed refusal
- Arched back, hair standing up
- More than a streak of blood
- Another body system involved – lungs, navel or joints

Diarrhea Treatment

- Feed them
- Oral electrolyte solution
 - Fecal score 2: 2 qt OES once daily
 - Fecal score 3: 2 qt OES twice daily
- Antibiotics
 - *Salmonella* suspects or “sick” calves
 - 3 days of coverage
 - Gram negative spectrum
 - Consult your veterinarian

