

# Real Herds...Real Heifers

## Ways to Optimizing Calf Health



**Tina Kohlman, Dairy & Livestock Agent  
UW-Extension Sheboygan County  
World Dairy Expo and The Babcock Institute's  
International Dairy Short Course  
Monday, September 29, 2008  
Concourse Hotel, Madison, Wisconsin**

# Heifers...An Investment in the Future Dairy Herd

- Provides high quality replacements for improving genetic progress.
- Heifer raising is the second largest expenditure on the dairy farm.



What defines a successful  
calf raising program?

Calves are alive  
Calves are healthy  
Calves are growing well

# Calf Mortality

Percent

7.8 %

Scour

problem  
Lameness

Other known

Other Unknown

Goal for death loss  
should be  
less than 5%

Unexplained

12.6

6.5

Loss in

12.8

4.3

9.9

7.8

14.6





# Building Better Heifers

Pneumonia  
Scours  
Days on  
milk  
Death

**Colostrum**  
**Sanitation**  
**Isolation**  
**Environment**  
**Nutrition**  
**Immunization**  
**Medication**

Live Calf  
Healthy  
Growing

**Successes**

**Failures**



# Focus on Calf Health

## It Start's on Day 1

- Colostrum
- Pathogen Control
- Nutrition
- Housing

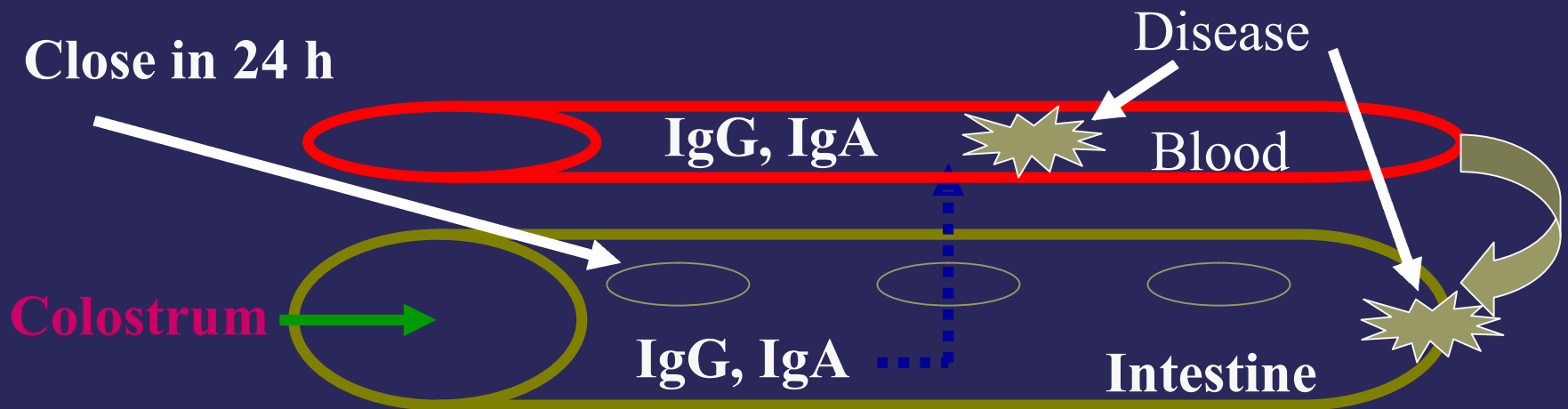


# Passive Transfer – 101

Calves are born without an immune system.

Immune function is passed from the cow to the calf via proteins (immunoglobulins) in the colostrum.

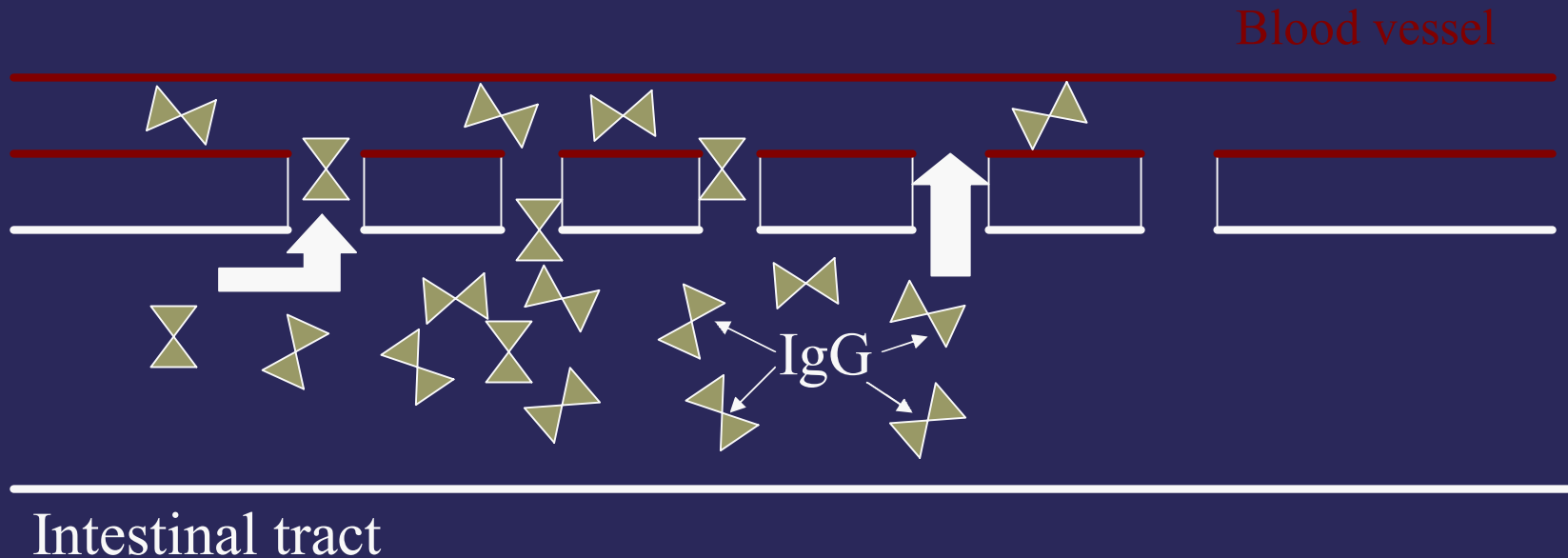
Immunoglobulins are disease-specific and therefore must be robust.



Source: Pat Hoffman, UW-Extension Dairy Replacement Specialist, 2005

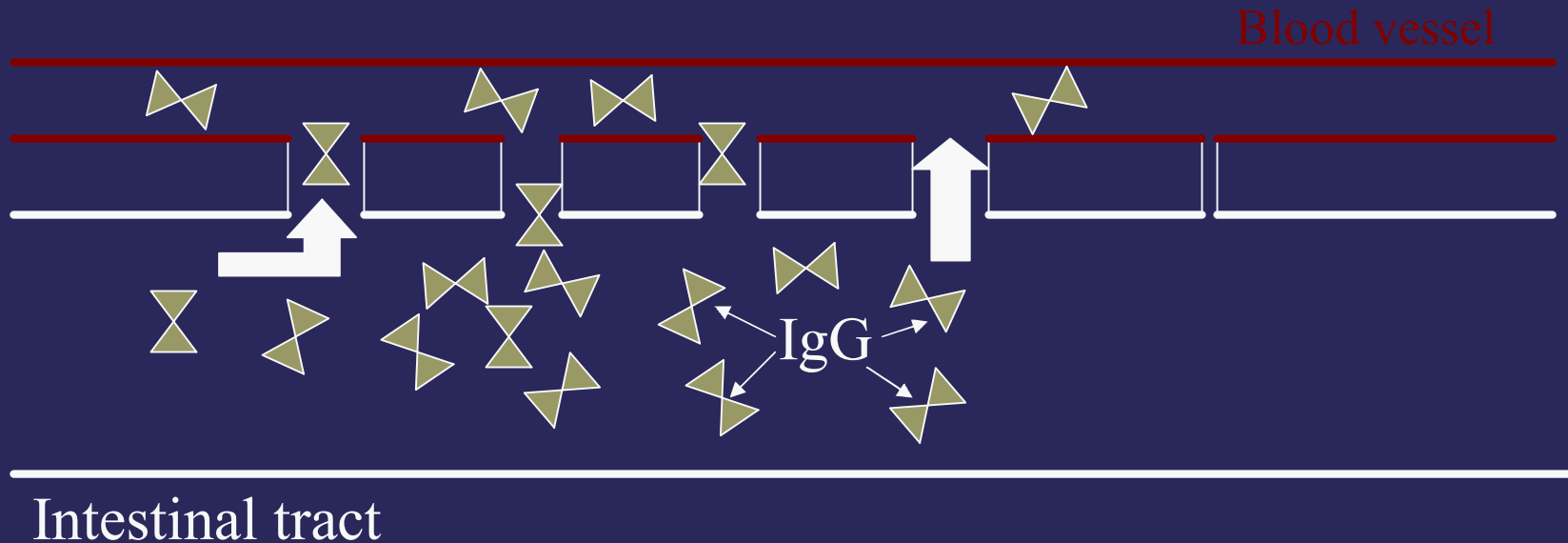


# Colostrum Absorption (within 2 hours of birth)



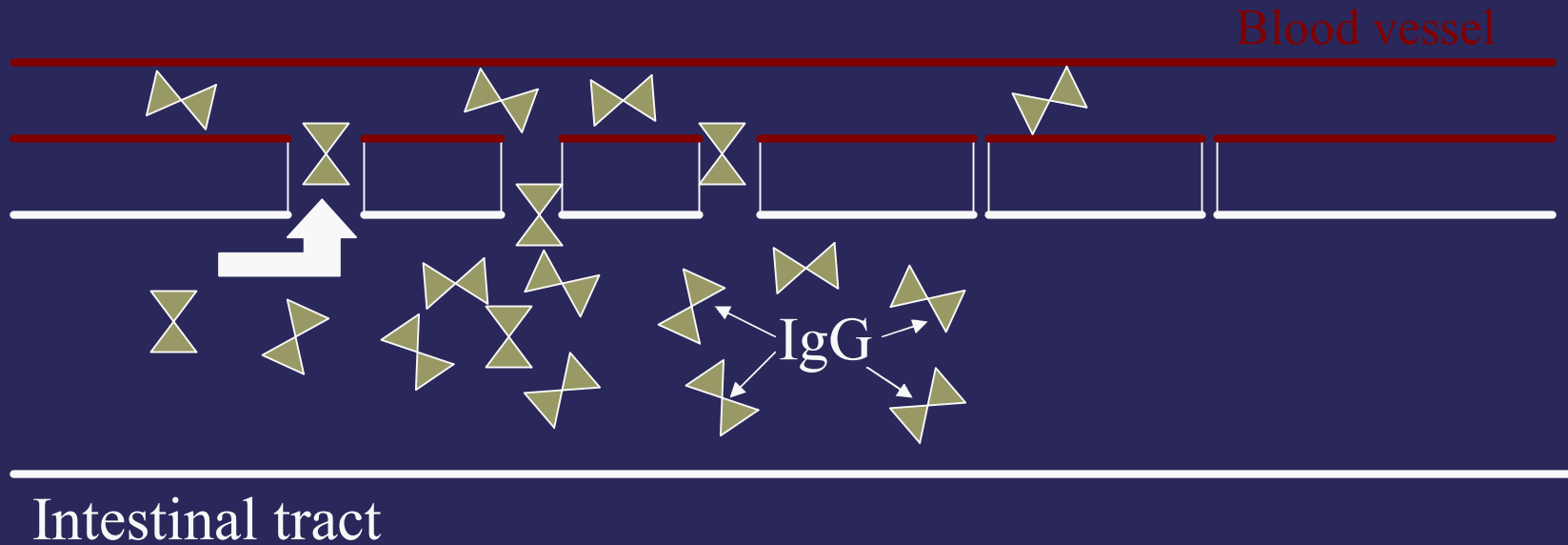
Source: Steve Hayes, Technical Veterinary Services, APC

# Colostrum Absorption (~4 hours of age)



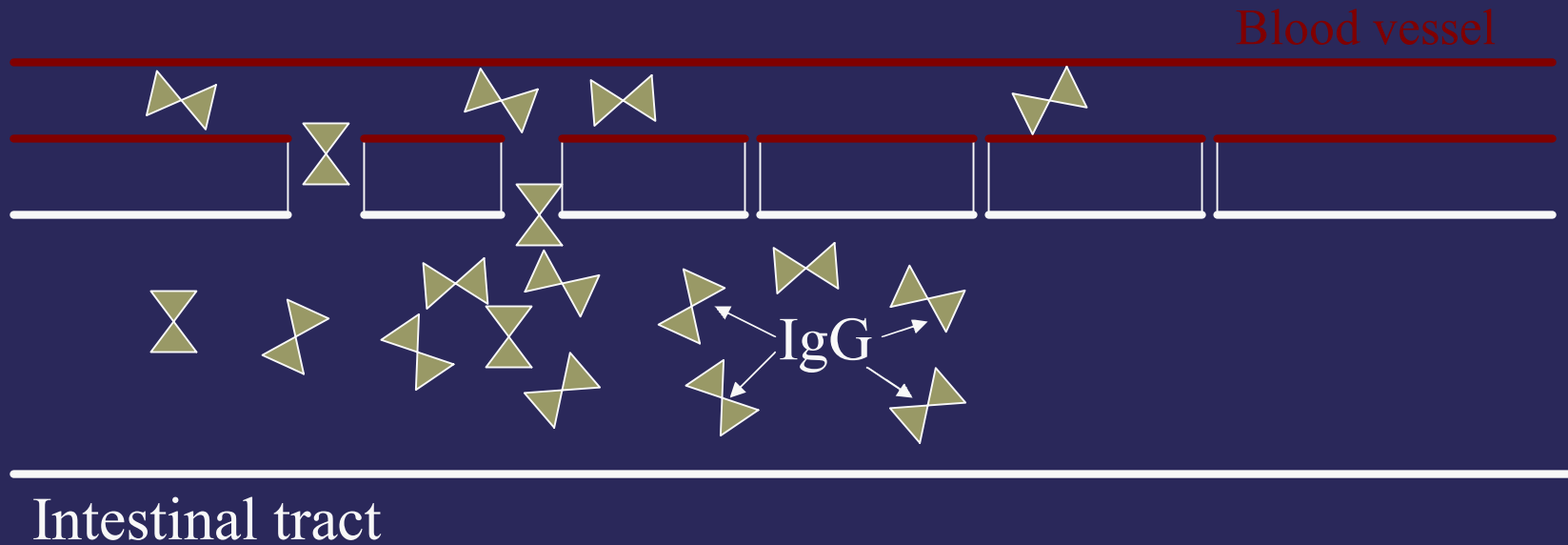
Source: Steve Hayes, Technical Veterinary Services, APC

# Colostrum Absorption (~10 hours of age)



Source: Steve Hayes, Technical Veterinary Services, APC

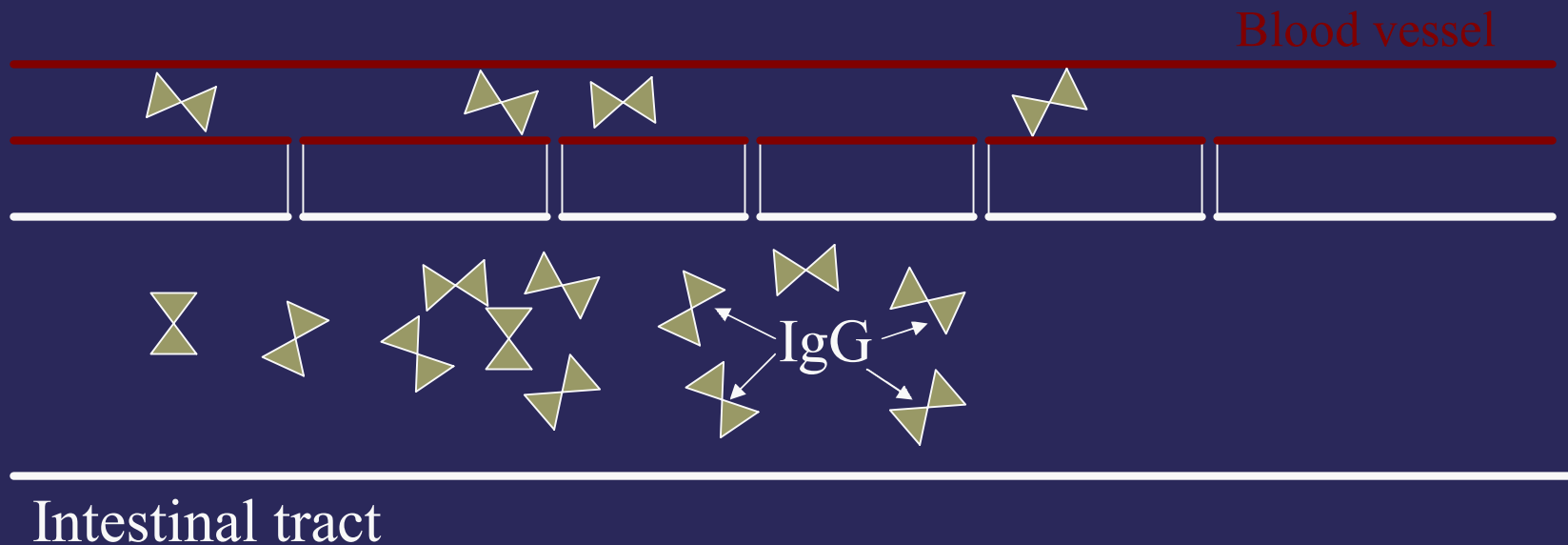
# Colostrum Absorption (~16 hours of age)



Source: Steve Hayes, Technical Veterinary Services, APC



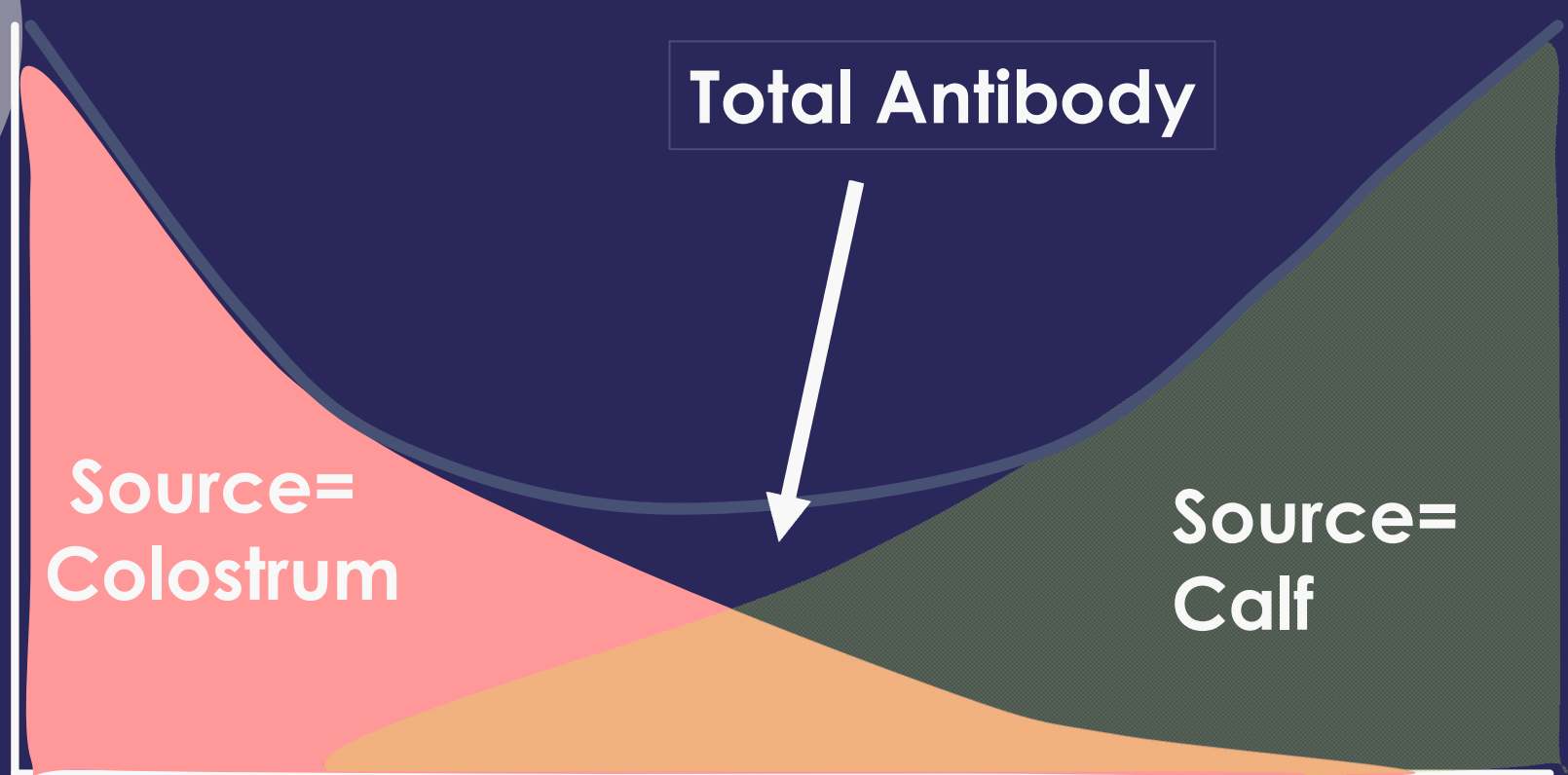
# Colostrum Absorption (after 24 hours of age)



Source: Steve Hayes, Technical Veterinary Services, APC

# Protecting Your Calf

Blood antibodies



Total Antibody

Source=  
Colostrum

Source=  
Calf

Age in Weeks

Source: Steve Hayes, Technical Veterinary Services, APC



# Achieving Passive Immunity:

## The 3 Q's of Colostrum Management

- Quantity
- Quality
- Quickly



# Quantity

## How much colostrum is fed?

Amount	% Operations	% Heifer Calves*
2 quarts or less	23.3	16.8
More than 2 quarts but less than 4 quarts	45.8	43.1
4 quarts or more	30.9	40.1

\*Born during 2006 and alive at 48 hours  
Source: USDA APHIS 2007 NAHMS



# Quantity

## More is Better!

<b>Amount of Colostrum Fed</b>	<b># herds</b>	<b>% Mortality</b>
1 to 2 qts	18	15.3
3 to 4 qts	16	9.9
4 to 5 qts	26	6.5

*Source: Hugh Chester-Jones, University of MN, 2003*

# How is colostrum fed?

Delivery Method	% Operations	% Heifer Calves*
During first nursing of dam	36.3	26.5
Hand-fed with bucket or bottle	59.2	59.6
Hand-fed using esophageal feeder	4.3	13.7
Did not receive colostrum	0.2	0.2

\*Born during 2006 and alive at 48 hours  
Source: USDA APHIS 2007 NAHMS



# Percent of Operations that Evaluated Colostrum Quality

Herd Size (Number of Cows)			
Small (Fewer than 100 cows)	Medium (100-499 cows)	Large (500 or more cows)	All Operations
7.6	19.8	45.2	13.0

USDA APHIS 2007 NAHMS





# Testing Colostrum Quality

Primary Method	Percent Operations
Colostrometer	43.7
Visual Appearance	41.6
Volume of first milking (pounds)	9.7
Other	5.0

USDA APHIS 2007 NAHMS



# Colostrum quality

**Good**

**$> 50$  g/L**

**Moderate**

**20-50 g/L**

**Poor**

**$< 20$  g/L**

# IgG Levels and Calf Performance

	Passive Transfer				
Item	Poor	Fair	Average	Good	Excellent
Number of Calves	51	85	126	195	176
Serum Ig, mg/mL	0-5	5-10	11-15	16-25	>25
4-Week Gain, pounds per day	0.73	0.81	0.85	0.90	0.92
Feed conversion, pounds feed per pound gain	2.9	2.6	2.5	2.0	1.9
Scour, days	8.7	6.1	4.7	5.0	4.0
Mortality, percent	33	11	7	3	4
Veterinary Costs, dollars	\$12.50	\$9.85	\$7.40	\$7.70	\$6.20



Source: Data adapted from M.A. Fowler, 19999 PDHGA Proceedings, by P.C. Hoffman, University of Wisconsin

# Operations that Monitor for Passive Transfer

<b>Herd Size (Number of Cows)</b>	<b>% of Operations</b>
Small (Fewer than 100 cows)	1.1
Medium (100 to 499 cows)	2.4
Large (500 or more cows)	14.5
All Operations	2.1



# Factors affecting colostrum quality

- Dam's age
- Disease history
- Pathogen exposure
- Prepartum milking
- Leaking of milk from udder prior to calving
- Pooling of colostrum

# When do calves receive their first colostrum feeding?

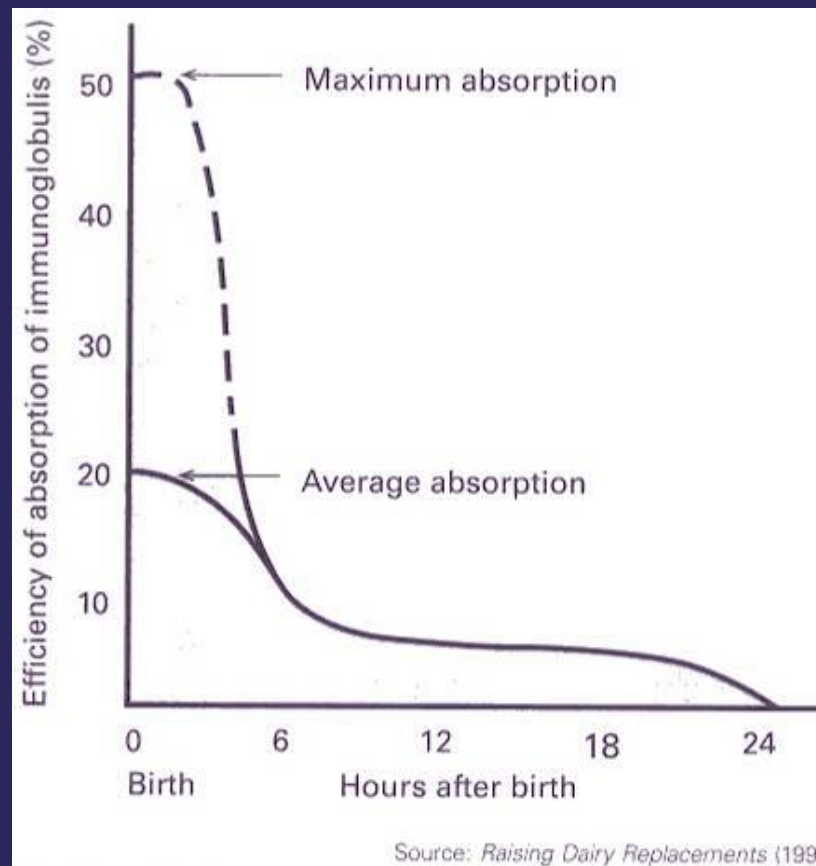
Herd Size (Number of Cows)		
Small Less than 100 cows	Medium (100-499 cows)	Large (500 or more cows)
3.4 hours	3.3 hours	2.8 hours

USDA APHIS 2007 NAHMS



# Timing is Everything!

- Lose 5% of immunoglobulin absorption every hour
- 0% absorption by 24 hours





# Importance of Colostrum

- Studies have shown failure of passive transfer
  - Increased calf morbidity and mortality
  - Reduced calf growth rate and efficiency
  - Decreased first and second lactation milk production in heifers

USDA APHIS 2007 NAHMS



# Colostrum...the key to calf health

- Be prepared to feed colostrum 24 hours per day, 365 days per year
  - Use Fresh Colostrum
  - Have Colostrum Replacer Available
  - Have Frozen Colostrum Available
  - Have Refrigerated Colostrum Available
- Treat colostrum like gold!

# Storing Method of Colostrum

Primary Method	Percent of Operations by Herd Size			
	Small (Fewer than 100 cows)	Medium (100-499 cows)	Large (500 or more cows)	All Operations
Stored without refrigeration	4.4	2.8	3.0	3.9
Stored in refrigerator	6.0	15.2	50.5	11.1
Stored in Freezer	24.8	36.2	34.7	28.2
Not Stored	64.8	45.8	11.8	56.8

# Manage Colostrum...Intensively

## Before feeding.....

- **Harvest clean colostrum immediately**
- **Avoid using colostrum from cows that are milked prefresh/leaked**
- **Discard colostrum contaminated with mastitis and blood**
- **Avoid pooling colostrum**
- **Do not store colostrum at room temperature**
- **Use a Colostrometer® to exclude poor colostrum**

# Manage Colostrum...Intensively

## At Feeding.....

- **Use sanitary equipment (gloves)**
- **Feed 3-4 quarts within 1-3 hours of birth**
- **Feed 2 quarts of colostrum 10 to 12 hours after birth**
- **Use a tube feeder if necessary**
- **Use a colostrum replacer when necessary**
- **Excess colostrum:**
  - **Immediately divide into small portions to enhance cooling**
  - **Refrigerate if to be used within 5 days**
  - **Freeze excess high quality colostrum for future needs**





# ...If colostrum is limited

- Never mix colostrum supplement or replacement products with colostrum
- If using colostrum supplement/replacement, feed colostrum first, then feed replacement 2 hours later



# Focus on Calf Health

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# Disease on the Calf Operation



**IMMUNITY**

(Calf's ability to  
fight off disease)

**vs.**

**PATHOGEN  
LOAD**

(Number of disease-  
causing bacteria and  
viruses presented to  
the calf)

# How Diseases Spread to Your Herd

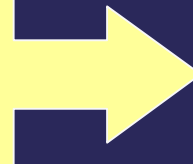
Contact with  
Affected Animals



Contact with Manure,  
Milk, Blood or Tissue  
from Affected Animals



On-Farm  
Sources



Off-Farm  
Sources



Susceptible Animals

?



Contact with  
Infected humans



# Minimizing Transmission of Infectious Disease

- **On Farm Sources**
  - Feeding waste milk
  - Contaminated calving pens
  - Contact between healthy and sick cows
  - Farm personnel work practices
  - Feed contaminated with manure



# Isolation of sick calves

- **Isolate calves:**

- **Air**
- **Water**
- **Feed**

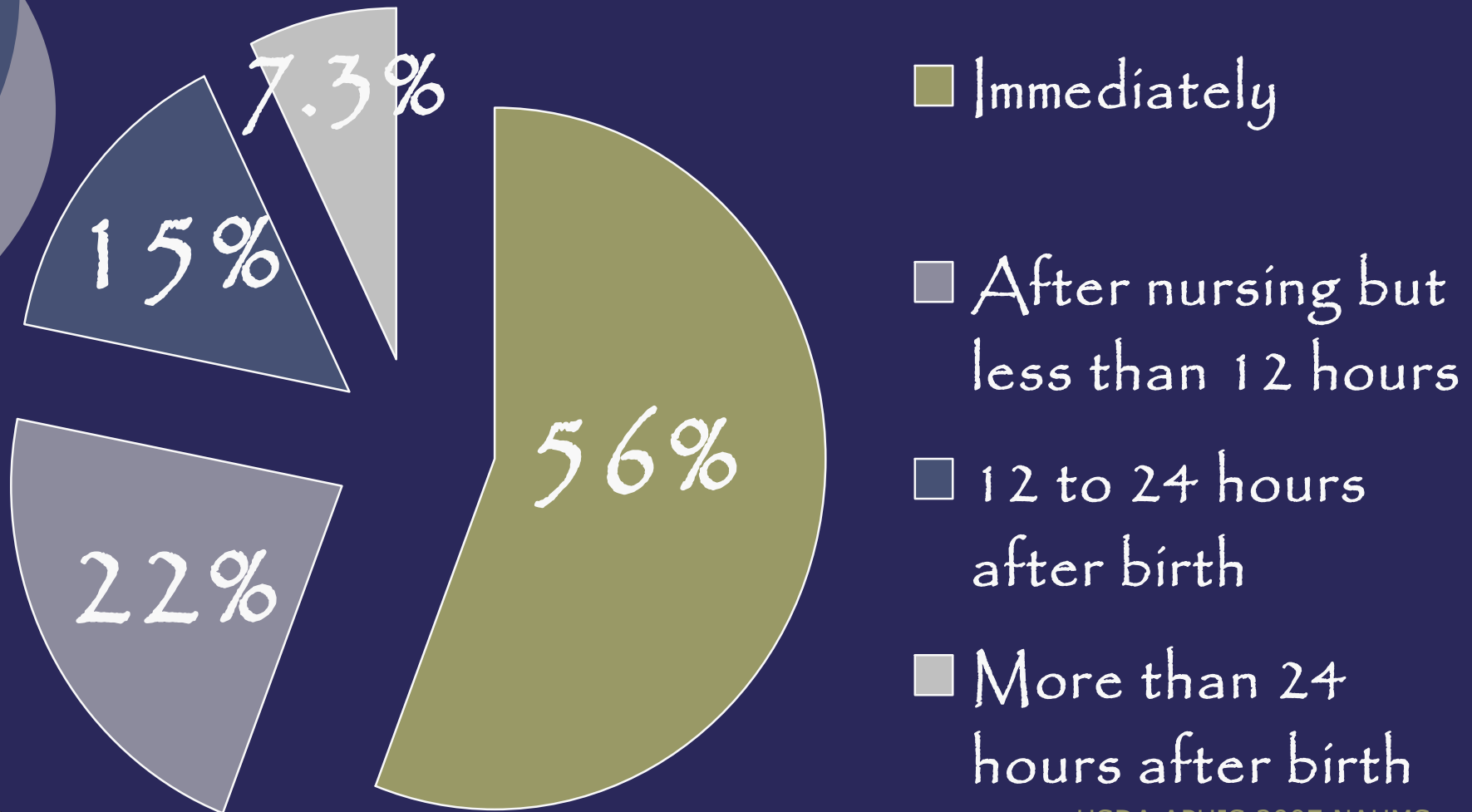


# Isolate calf from cow

(To avoid dam to calf disease transfer...)

- Nose dive into bedded pack (*E. coli*)
- Sucking on cow's (manure-laden) brisket, belly, legs or teats (*E.coli*)
- Ingestion of contaminated colostrum (Multiple diseases)
- Remove calf before it can stand up

# Time Operations Removed Calf From Dam



USDA APHIS 2007 NAHMS





# Time with Cow Increases Mortality

<b>Time with dam after birth</b>	<b># herds</b>	<b>% Mortality</b>
2-6 hrs	13	5.2
7-12 hrs	35	9.3
13-24 hrs	32	10.7
25-48 hrs	24	20.5
48+ hrs	35	14.4

Source: Hugh Chester-Jones, University of MN, 2003



# Immediately Separate Calves from Dam

- Allowing calf to acquire colostrum directly from the dam at first nursing presents problems:
  - Increase risk calf does not receive adequate amount of colostrum
  - Impossible to estimate quantity of antibodies and quality of colostrum ingested
  - Increase risk of disease transmission via “manure meals”



# Restriction of Movement

- Do visitors wear disposable plastic boots?
- Do visitors wash boots prior to going into barn or before leaving the farm?
- Visitors may be bringing in new diseases onto your farm from places they have been previously.



# Sanitation

- Sanitation is critical to breaking the disease cycle!
- Sanitation breaks
- Disinfect
  - Choose the right disinfectant for the job
  - Thoroughly clean boots before applying disinfectant
  - Read and follow the label



# Milk House ~ Cleaning

# Frequency of Cleaning and Disinfection of Bottle, Buckets & Nipples

Frequency	Percent of Operations by Herd Size			
	Small (Fewer than 100 cows)	Medium (100-499 cows)	Large (500 or more cows)	All Operations
Between Calves	21.4	30.9	39.1	24.4
Daily	59.8	55.9	51.8	58.5
Weekly	7.0	5.2	1.2	6.4
Monthly	3.8	1.4	2.2	3.2
Other	8.0	6.6	5.6	7.5



# Keep Everything Clean and Dry

## Feeding Equipment Storage



# Sanitation and Calf Housing

All in -all out vs. continuous flow?



# Focus on Calf Health

## It Start's on Day 1

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# Goals in Calf Nutrition

- Health
- Growing
- Rumen Development





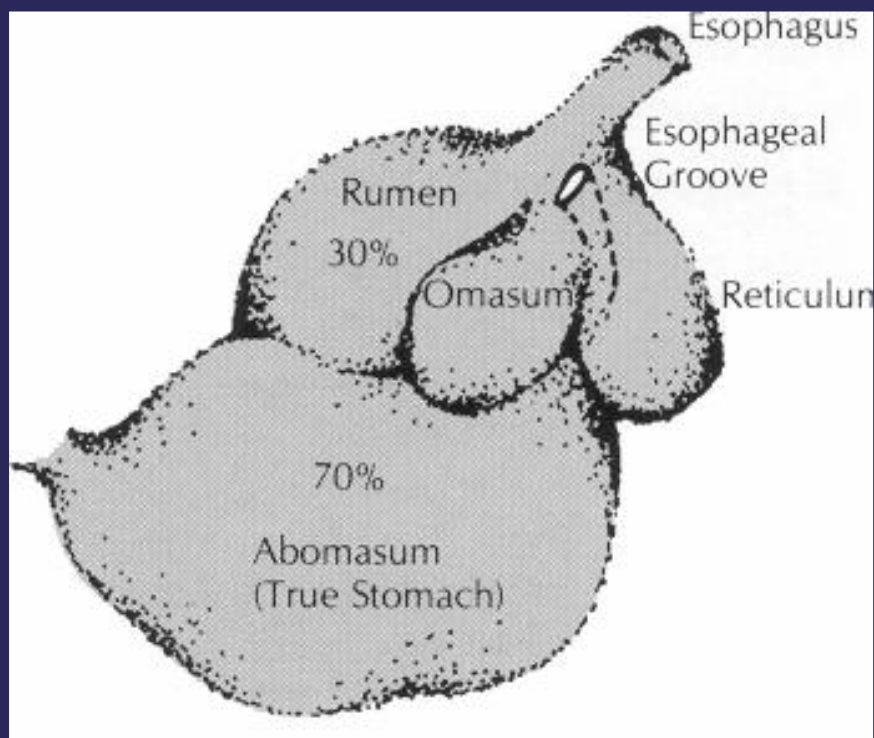
# Question...

- Is a new born calf a ruminant or a monogastric animal?

She is a monogastric animal.



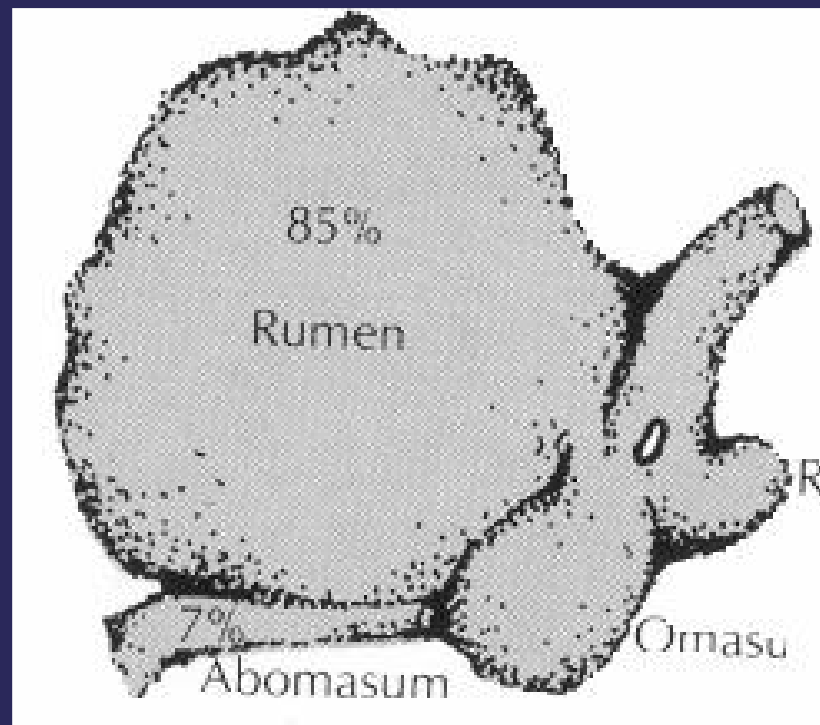
# Calf versus Adult Rumen



**Calf**

**0.5 : 1 Volume Ratio**

**Rumen : Abomasum**



**Adult**

**10:1 Volume Ratio**

**Rumen : Abomasum**

# Inside the Rumen

Provide  
Water

Provide  
Grain

Starch

Fermentation

VFA

Propionate Butyrate  
Acetate

Absorption of VFA through epithelium  
stimulates rumen development



# Why chemical and not physical?

- Research results show rumen development stimulated by VFA's- *not “scratch factor”*.
- Milk, hay and grain fermented to produce VFA.
- Sponges did not contribute VFA for rumen development-added “scratch”.

Material	Effect on Rumen Development
Milk	++
VFA Salts	
Acetate	++
Propionate	+++
Butyrate	++++
Grain	+++
Hay	++
Plastic	-
Sponges	
Inert Particles	-

Source: Calf Notes. J. Quigley. 1999.

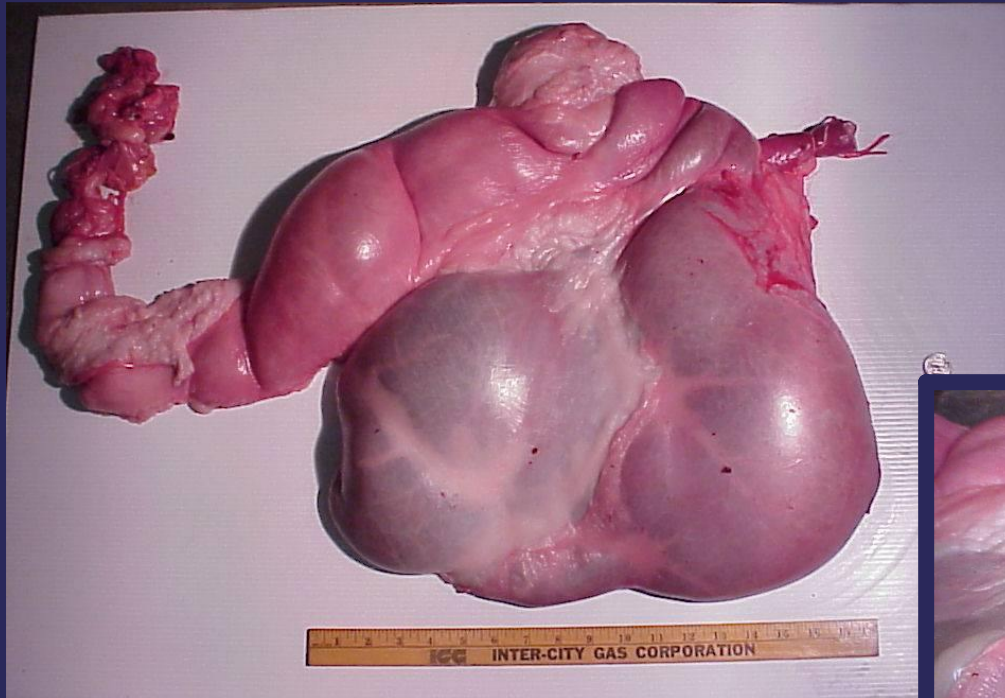


# Ingredients to Initiate Rumen Development

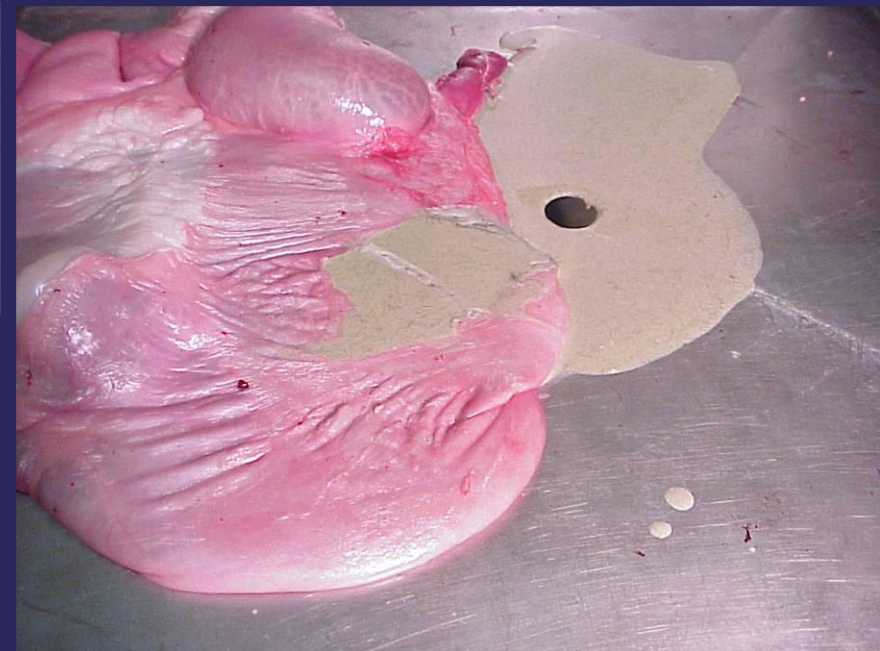
- **Bacteria**
- **Liquid in the rumen**
- **Muscular movement**
- **Absorptive ability of the tissue**
- **Availability of feed stuff in the rumen**



# Veal Calf's Stomach



**18 pounds**  
**Rumen 18 x 11"**  
**Abomasum 12 x 5"**





# Dairy Calf's Stomach

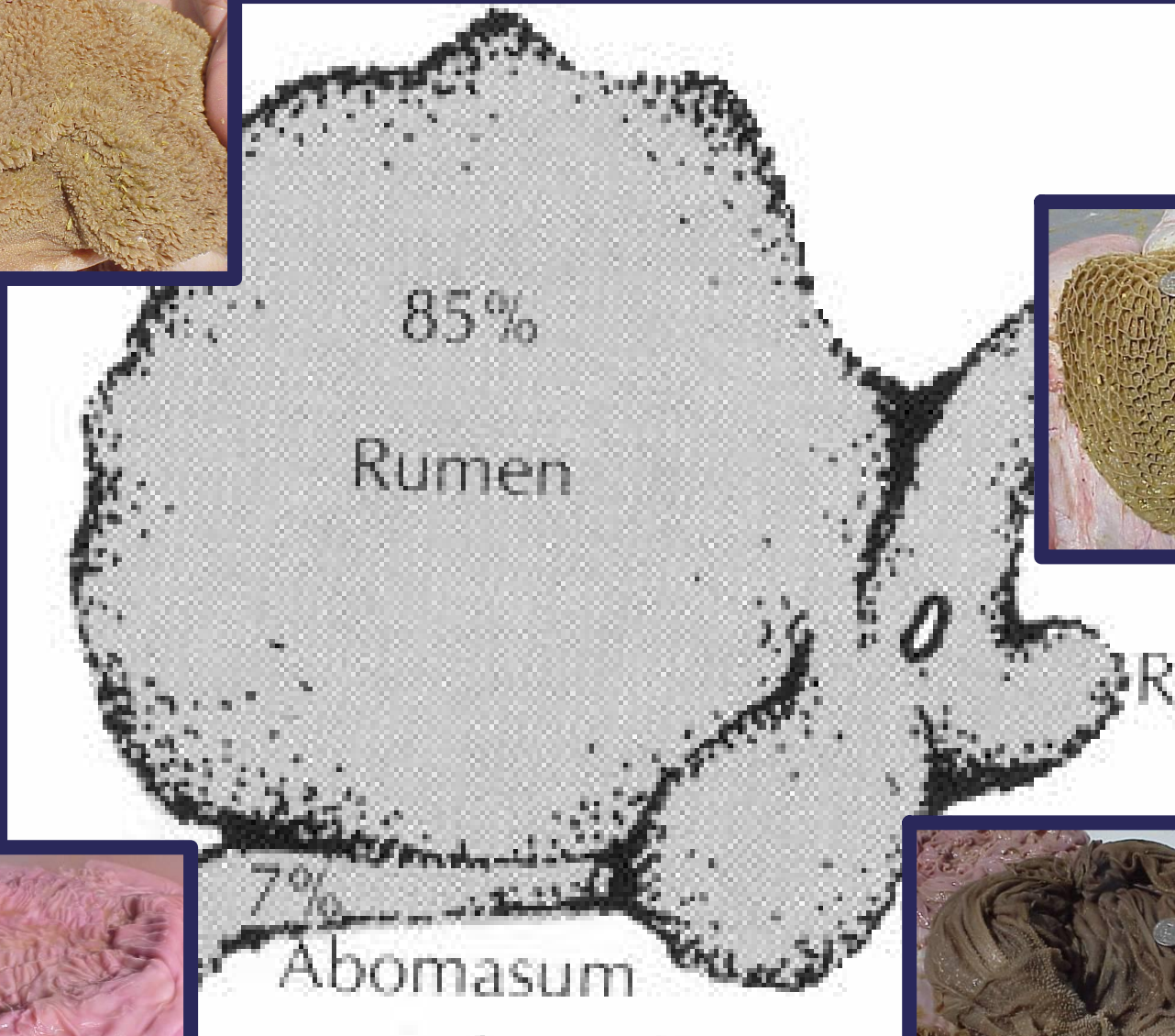


**70 pounds**

**Rumen 24 x 22"**

**Abomasum 16 x 4"**







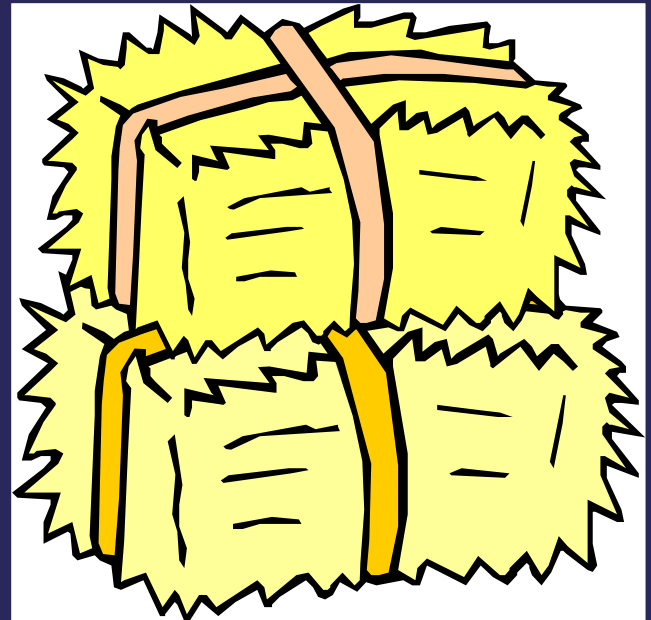
# A Look at the Papillae



## Heads or Tails?

# What about hay?

- Digestion of hay provides acetic acid.
- Acetic acid is less crucial for rumen development.
- Hay provides a “*scratch factor*” to promote healthy growth of papillae.
- Hay should be offered 0-4 weeks after weaning.



# Focus on Calf Health

## It Start's on Day 1

- Colostrum
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# Preventing Pneumonia

- Provide well ventilated facilities
- Keep calves dry and well-bedded
- Feed enough milk
- Avoid nose-nose contact
- Keep age groups separate
- Avoid buying calves
- Prevent aspiration pneumonia
- Minimize weaning stress
- Vaccinate dams
- Give an immunity boost

# Industry's Preferred Housing ...Calf Hutches







But who wants to  
feed in outside  
during the winter?

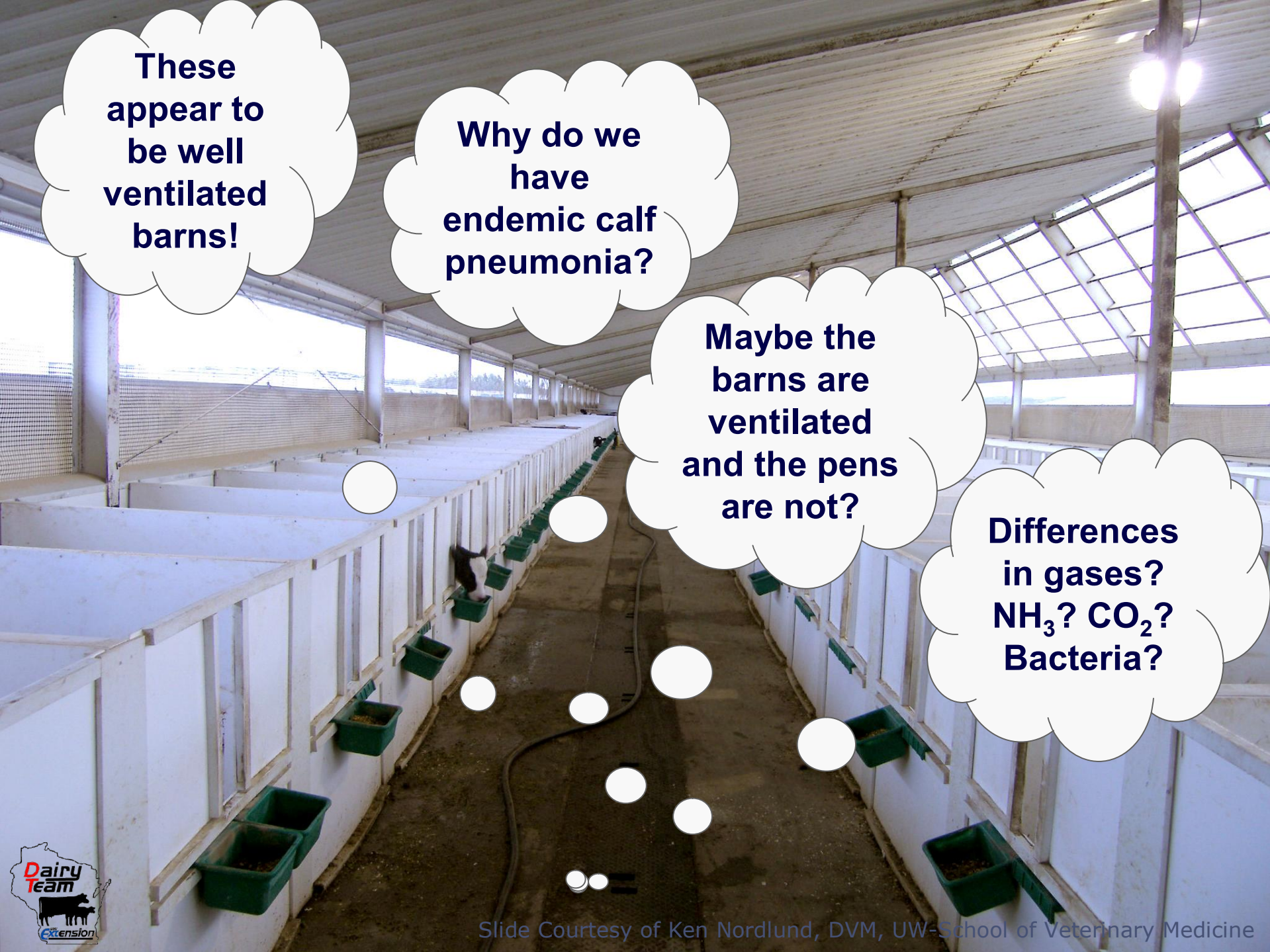






Slide Courtesy of Ken Nordlund, DVM, UW-School of Veterinary Medicine





**These  
appear to  
be well  
ventilated  
barns!**

**Why do we  
have  
endemic calf  
pneumonia?**

**Maybe the  
barns are  
ventilated  
and the pens  
are not?**

**Differences  
in gases?  
 $\text{NH}_3$ ?  $\text{CO}_2$ ?  
Bacteria?**



These  
appear to  
be well  
ventilated  
barns!

- Median barn ventilation rate was 5.5 changes per hour (range 0-93) \*

\* assistance of Brian Holmes and David Kammel

- Pen air  $\text{NH}_3$  average 2 ppm (0-4)
- Alley  $\text{cfu/m}^3$  associated with barn ventilation rate  $P < .0001$
- Pen  $\text{cfu/m}^3$  were NOT associated with barn ventilation rate
- Pens are microenvironments within the barn

*Lago et.al., J Dairy Sci 89:4014, 2006*





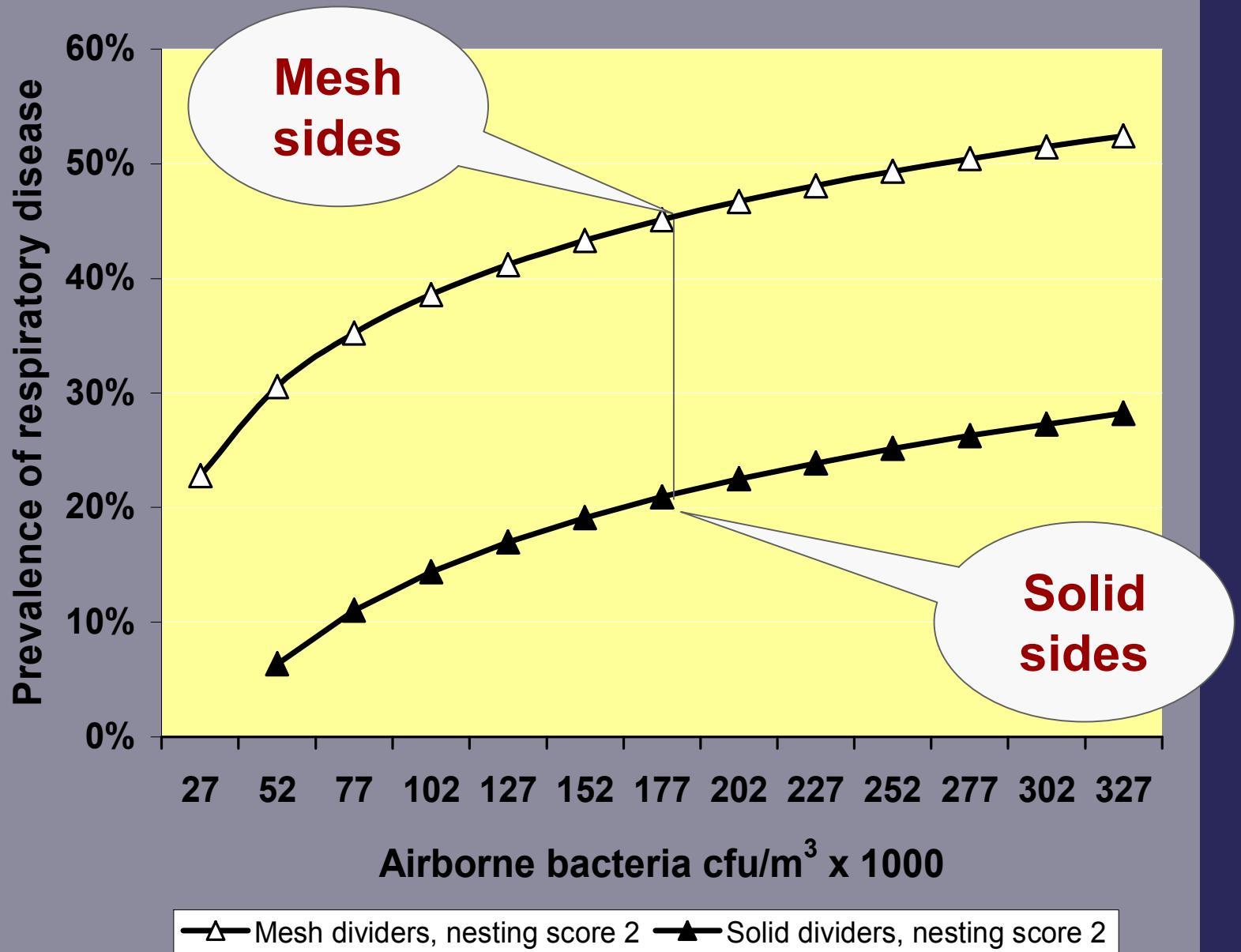
# Key Factors in Respiratory Health



Solid Wall Between Calves



Deep Bedding for Nesting

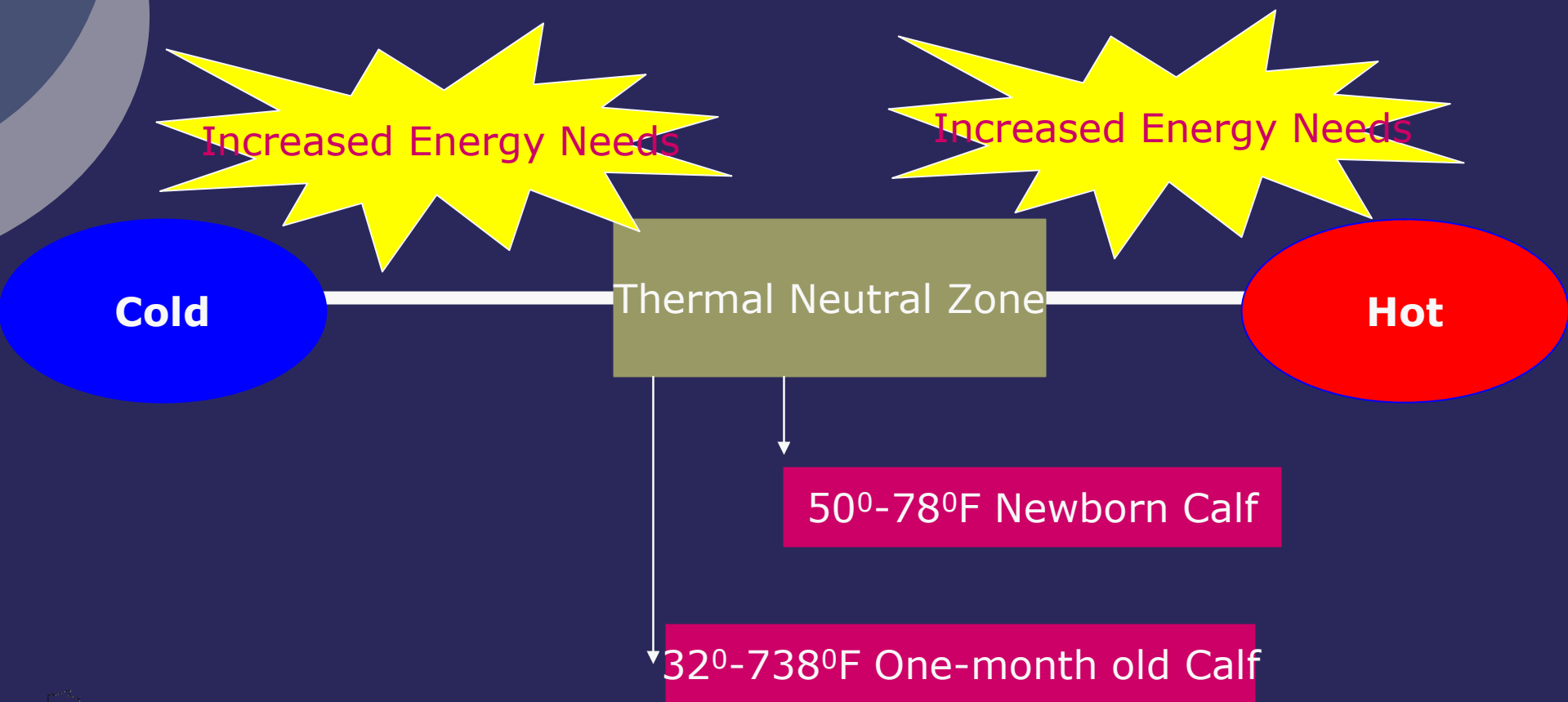


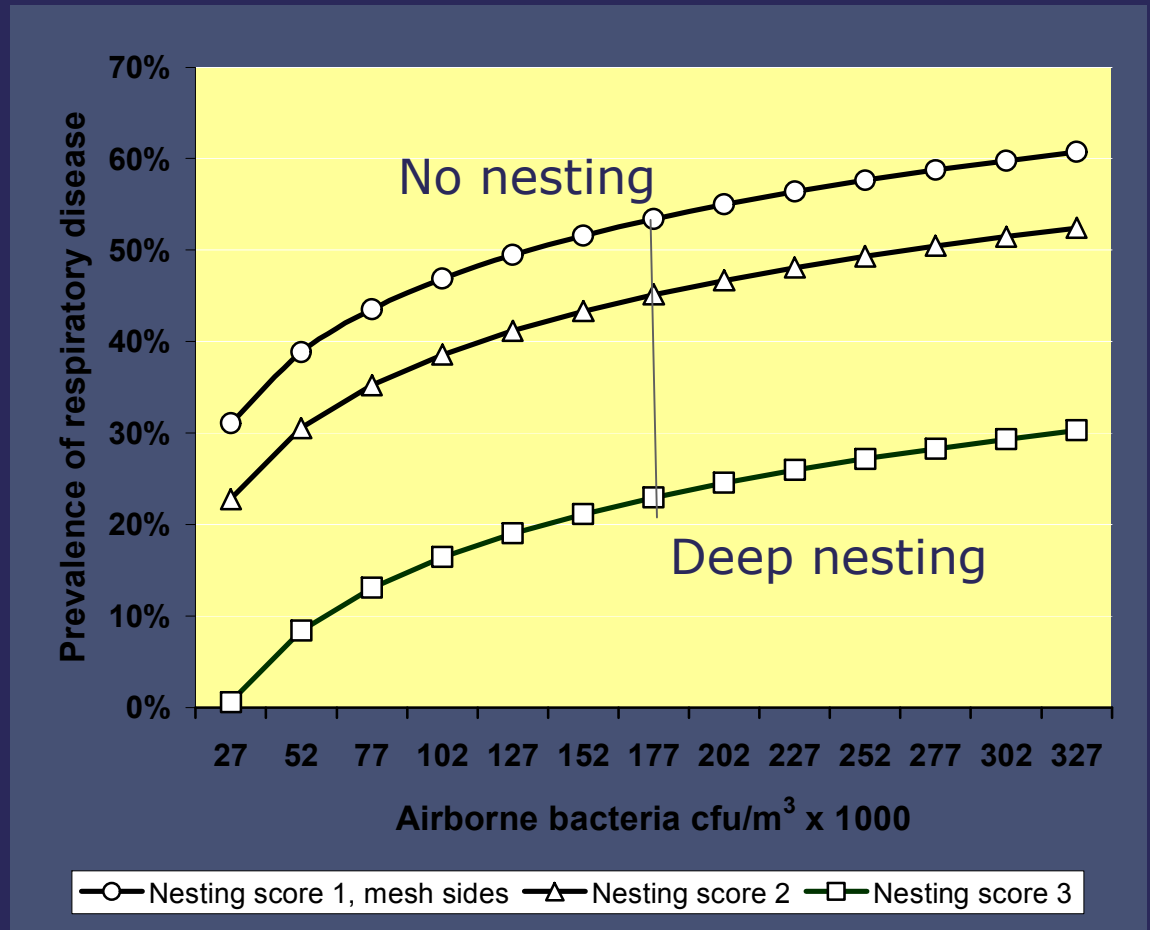
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Slide Courtesy of Ken Nordlund, DVM, UW-School of Veterinary Medicine



# Environmental Influence on Growth





*Lago et.al., J Dairy Sci 89:4014, 2006*

Slide Courtesy of Ken Nordlund, DVM, UW-School of Veterinary Medicine



# Calf Pens can be Microenvironments





# Factors to decrease pathogens in pens


- Lower temperature
- Larger pens
- Fewer solid walls



# The Ideal Calf Pen Concept



- Solid partitions between calves
- Open front and back
- Sides extend out 12 inches from front
- 12 to 18 inches solid back wall
- Deep bedding



Location	August 2004 investigation	Feb. 2005 after tube
Pens, cfu/m3	177,453	42,807
Alleys, cfu/m3	26,459	16,716

**After supplementation, respiratory  
disease treatments estimated to be  
25% of previous years**

Slide Courtesy of Ken Nordlund, DVM, UW-School of Veterinary Medicine

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Calves are growing well



# Building Better Heifers

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Scours  
Days on  
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# Thank You!

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<http://shegboygan.uwex.edu/ag/dairy/heifermanagement>