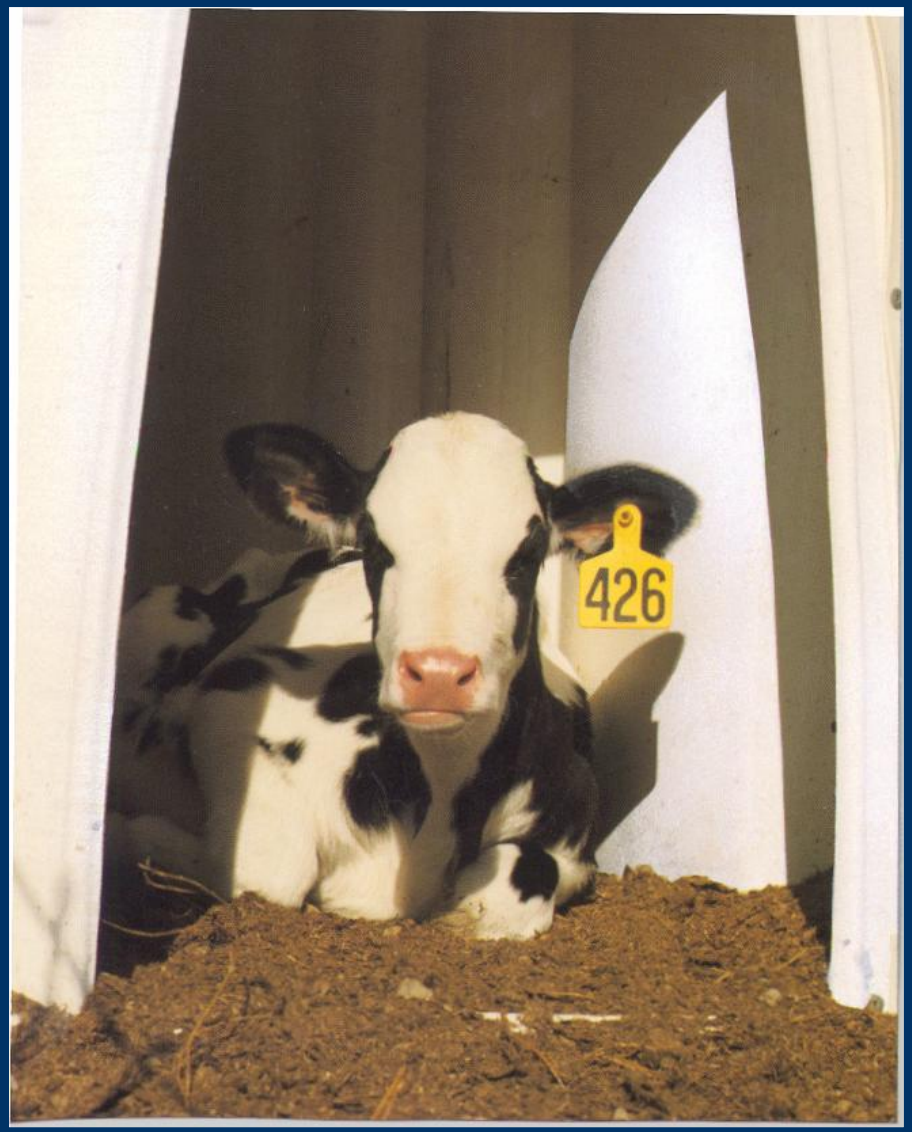

Developing The Rumen- Developing The Heifer

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Dairy & Livestock Agents
Sheboygan & Outagamie Counties

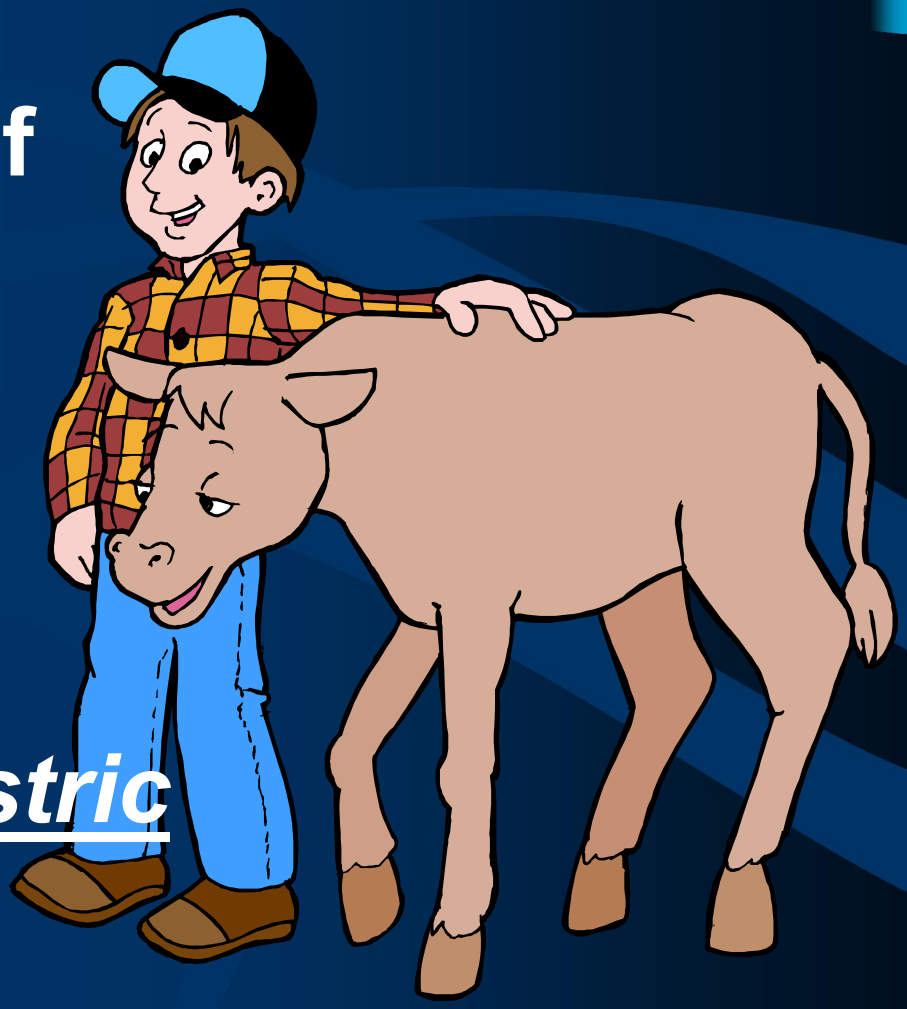
Northeast District

"Start Them Right…Raise Them Right" Calf Management Meeting
September 7-8, 2000

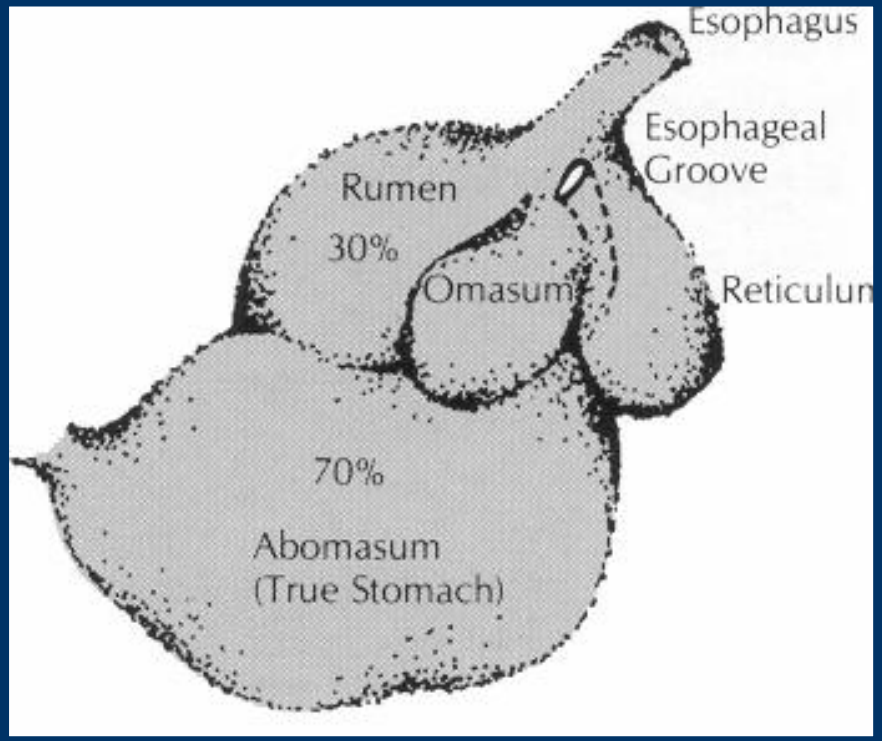
Question…

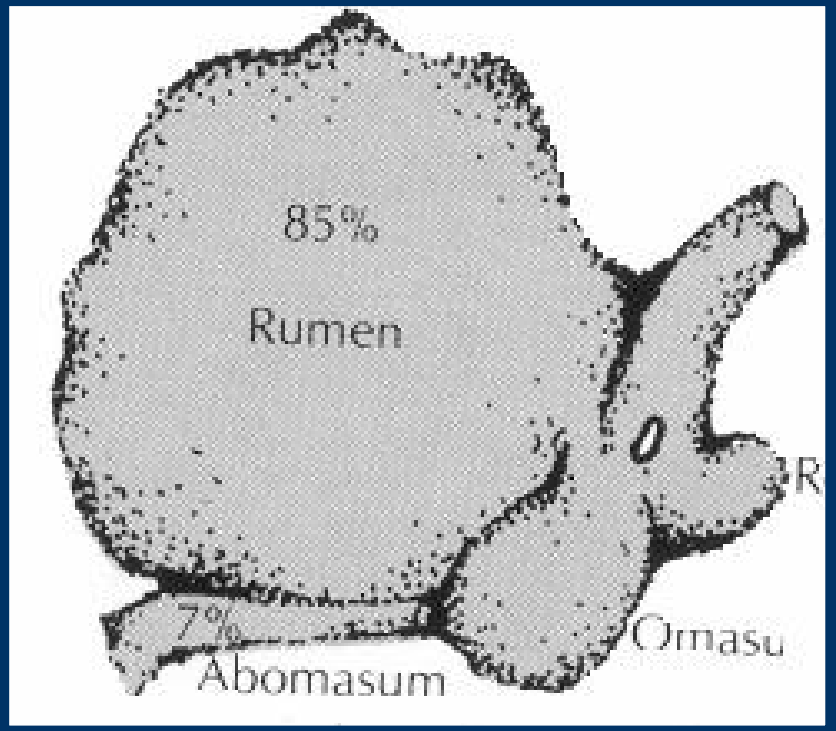
- Is a new born calf a ruminant or a monogastric animal?

She is a ***monogastric*** animal.



Calf versus Adult Rumen

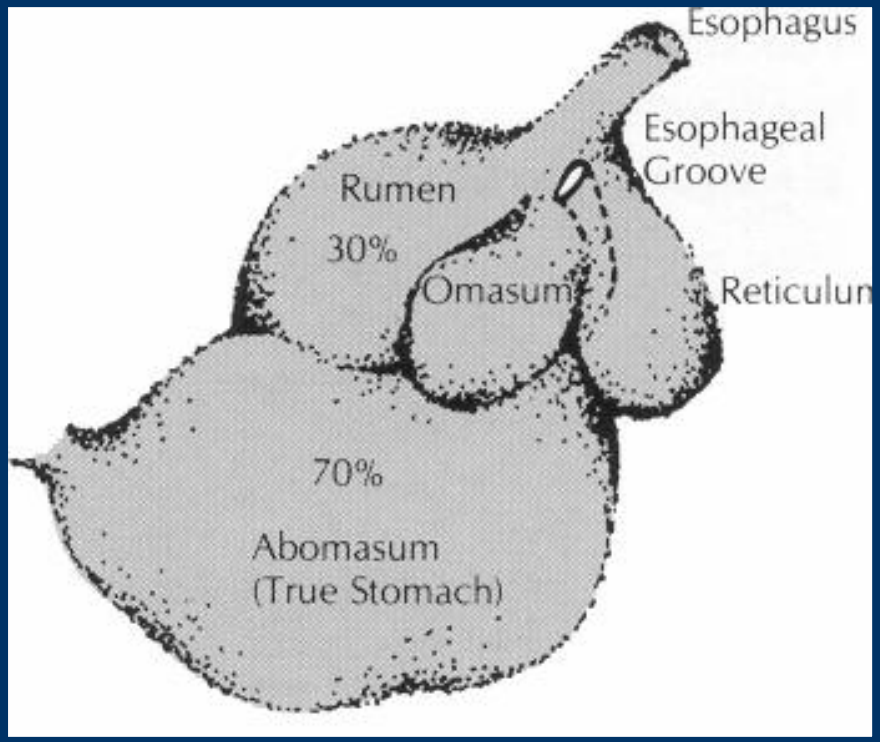




Calf
0.5 : 1 Volume Ratio
Rumen : Abomasum

Adult
10:1 Volume Ratio
Rumen : Abomasum

Pre-Ruminant Phase



- O to 3 weeks of age.
- The calf's rumen is non-functional.
- The abomasum, the main compartment of digestion, makes up ***70%*** of all compartments.
- May last longer if dry feed is not offered.

Development of the Digestive System

- Occurs during the first 4-8 weeks of a calf's life.
- Development is chemical *not* physical.
- Prior to weaning, most of energy and amino acid needs of calf derived from intestinal digestion of milk.
- When calf consumes water and starter, bacterial fermentation is initiated.

Bacterial Fermentation

- Bacterial fermentation produces large amounts of volatile fatty acids:
  - Acetate
  - Butyrate
  - Propionate
- Production of VFA responsible for rapid rumen tissue development.

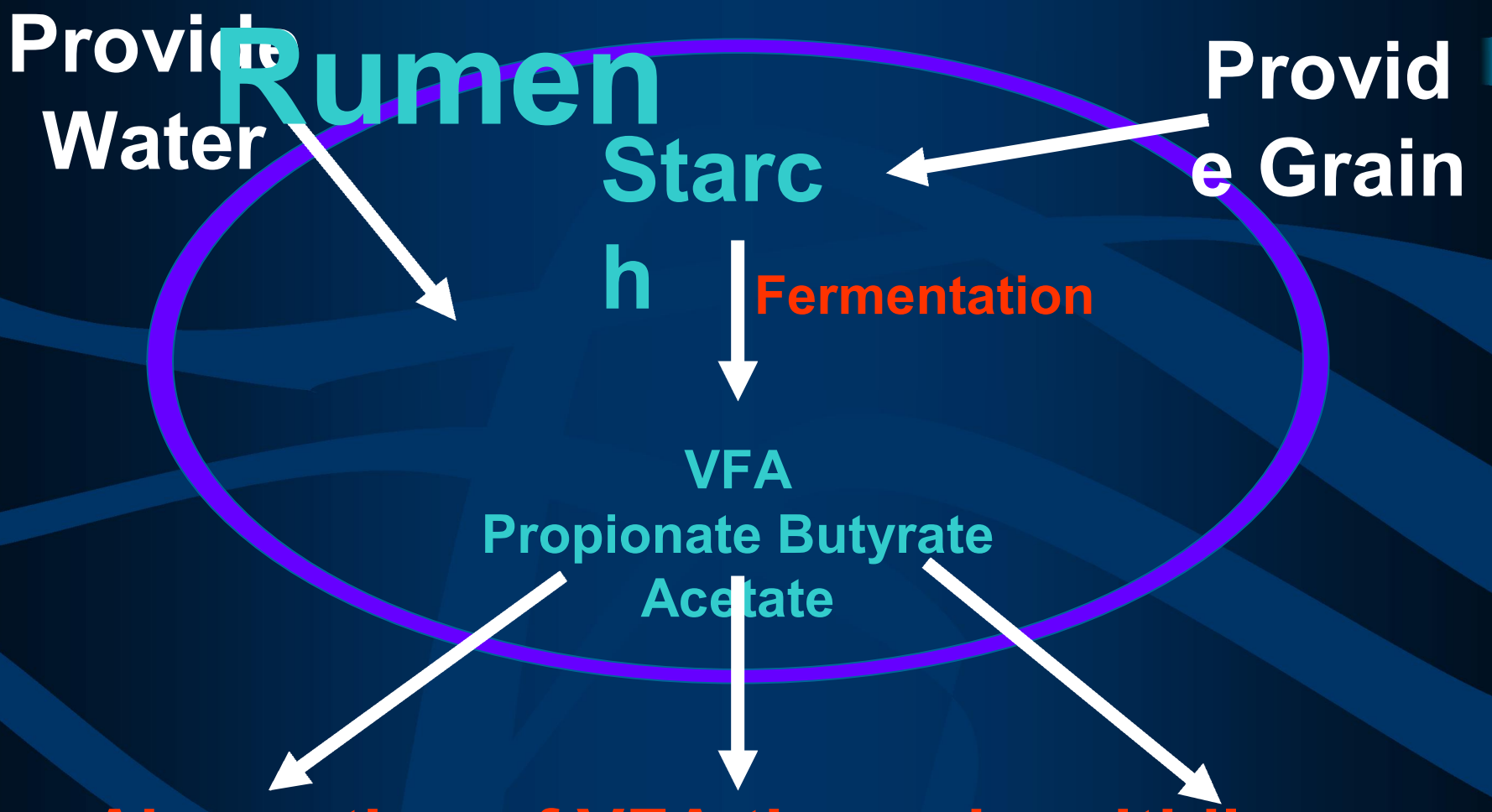
Why chemical and not physical?

- **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	-

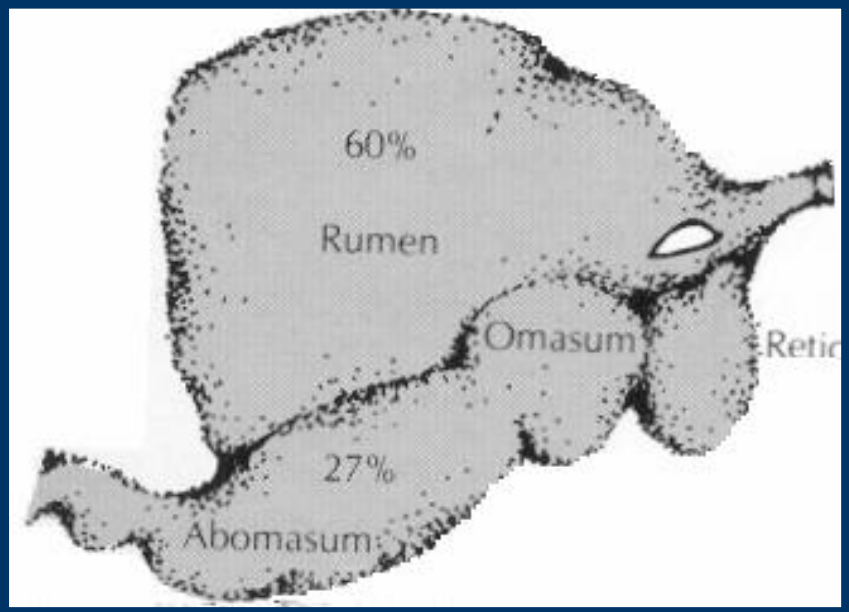
Source: Calf Notes. J. Quigley. 1999.

Inside the Rumen



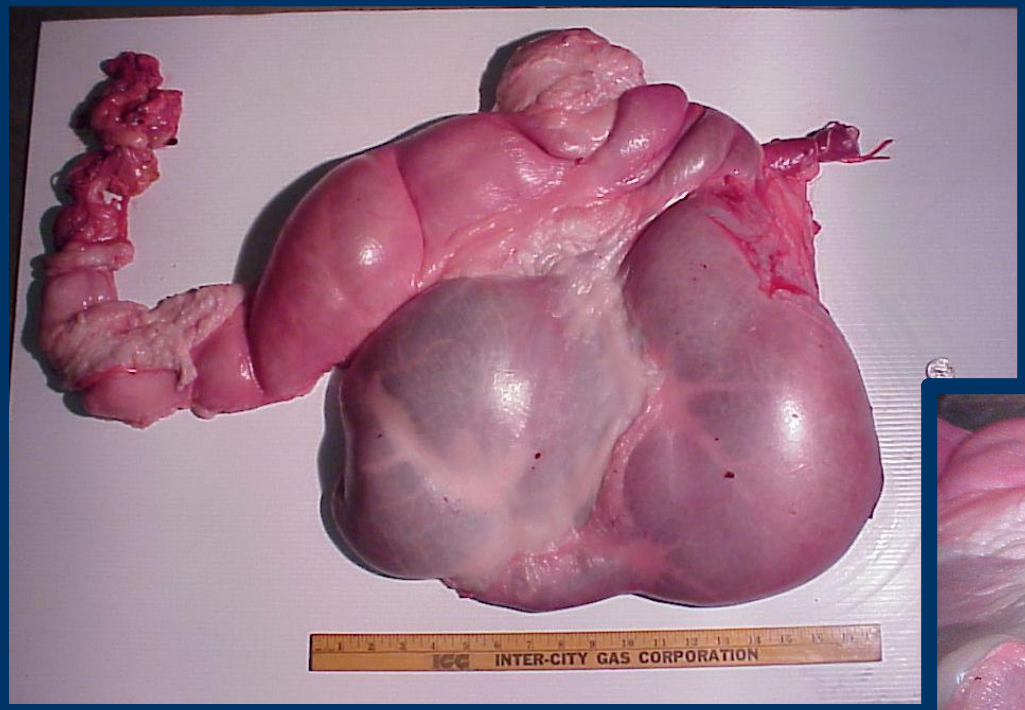
Absorption of VFA through epithileum stimulates rumen development

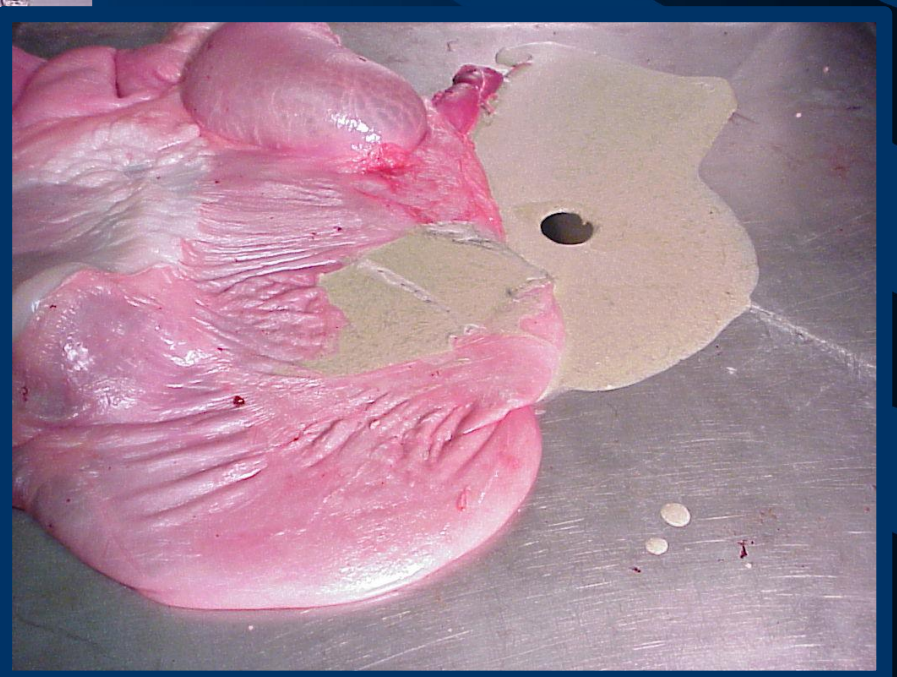
Transition Phase



- 4 to 8 weeks of age.
- Rumen begins to take over main digestion of feed.
- Growth of papillae and rumen is stimulated by dry feed intake.
- Will continue as long as milk is fed.

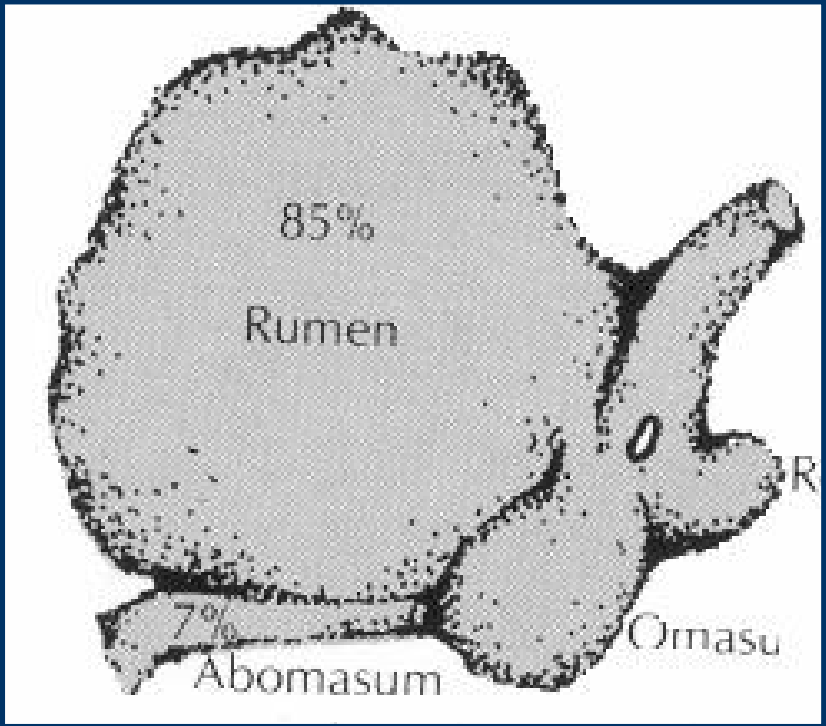
Veal Calf's Stomach





18 pounds
Rumen 18 x 11”
Abomasum 12 x 5”

Ruminant Phase



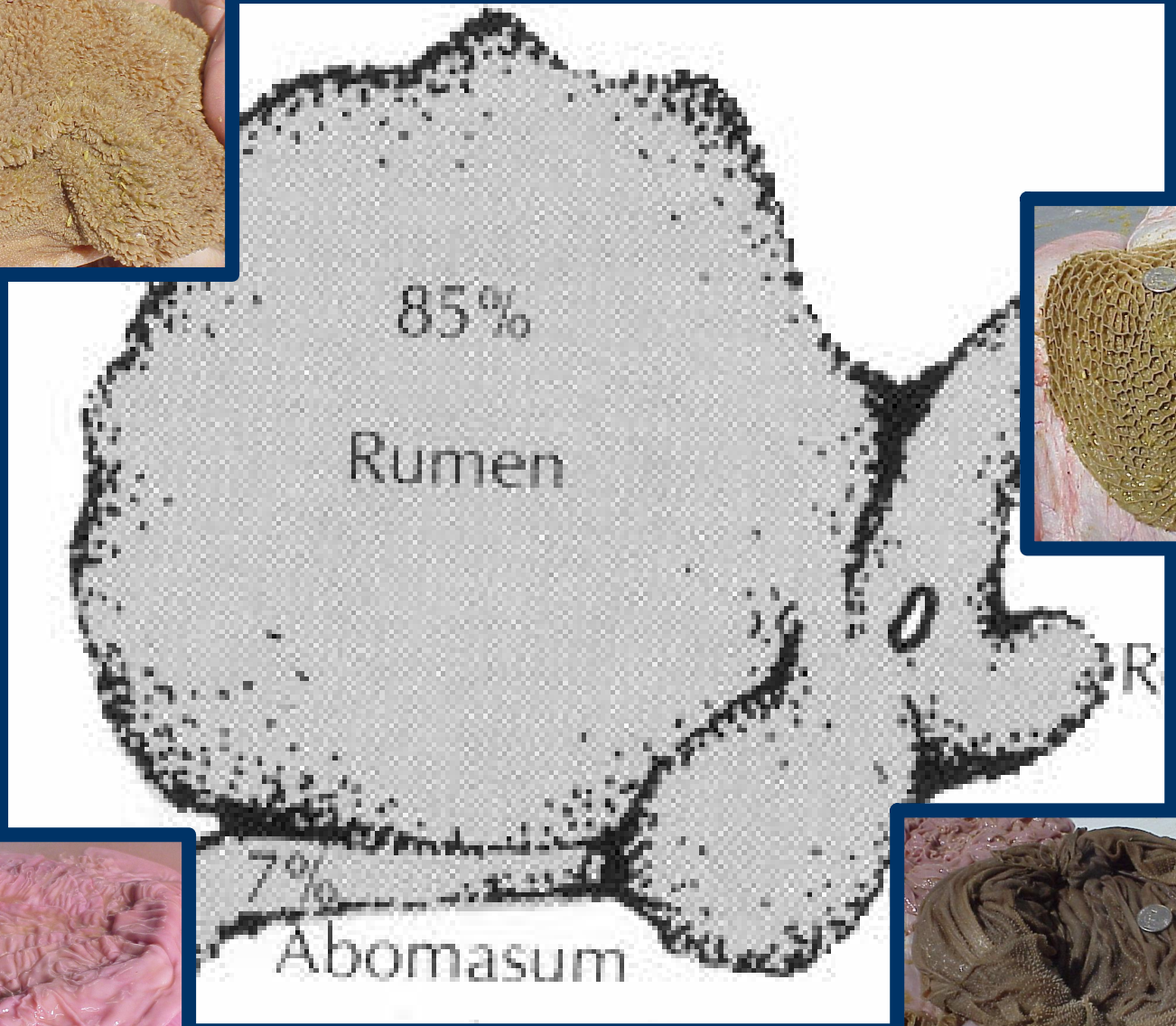
- Over 8 weeks of age.
- Functional ruminant.
- Dry feed is the sole source of feed.
- Rumen makes up 85% of all compartments.

Dairy Calf's Stomach

70 pounds

Rumen 24 x 22"

Abomasum 16 x 4"


85%
Rumen
7%
Abomasum

Ingredients to Initiate Rumen Development

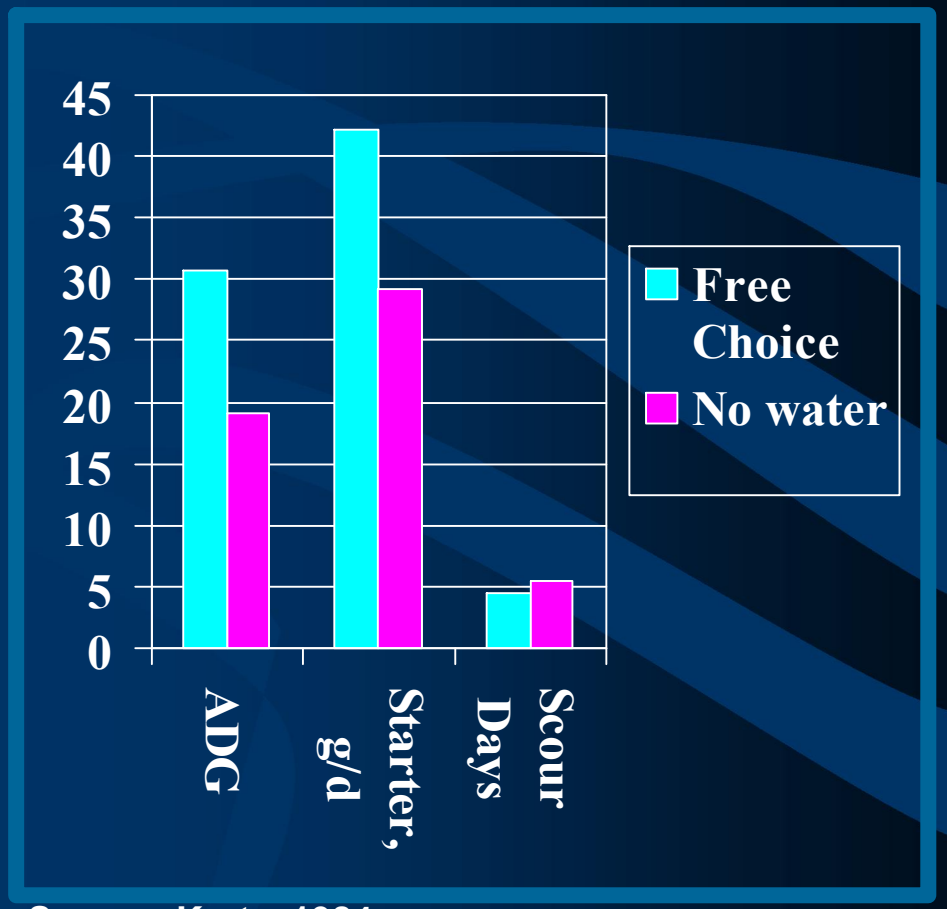
- Bacteria
- Liquid in the rumen
- Muscular movement
- Absorptive ability of the tissue
- Availability of feed stuff in the rumen

Bacteria

- Bacteria are non-existent in the rumen at the time a calf is born.
- Bacteria are introduced into the rumen at the time the calf begins to consume calf starter.
- Bacteria help with the digestion process.
- End products of digestion causes the changes in the rumen.

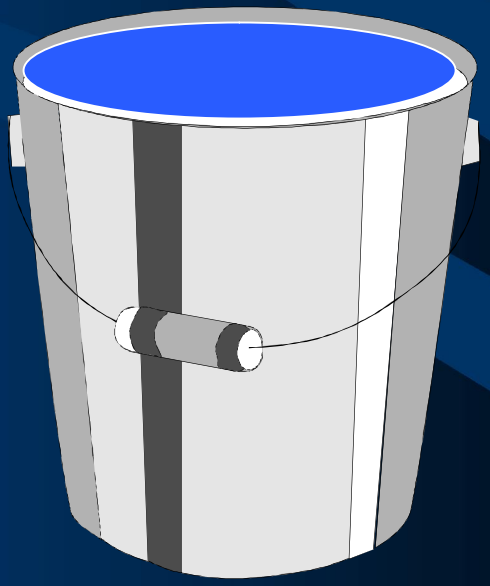
Liquid in the Rumen

- Offering water from 3 days after birth has shown to:
  - Increase weight gain.
  - Promote starter intake.
  - Reduce incidences of scours.



Source: Kertz, 1984.

- Liquid in rumen provides environment for rapid bacterial growth.
- Milk does not provide sufficient amounts of liquid because it by-passes the rumen.
- However, even small amounts of liquid entering the rumen promote bacterial growth.



Muscular Movement

- Muscular movement encourages mixing feedstuffs in the rumen and necessary for passage through the rumen.
- Types of movement:
  - Rumen pressure
  - Rumen contraction
  - Cud chewing
- Little activity at birth.
- Contractions increase as feed intake increases.

Absorption

- **Two layers of the rumen:**
  - **Muscular (responsible for contractions)**
  - **Epithelium (responsible for absorption)**
- **At birth, epithelium layer does not have absorptive ability.**
- **VFA absorption stimulates epithelium development, which increases surface area.**
- **Epithelium elongates into "*finger-like projections*" called papillae.**

A Look at the Papillae

Heads or Tails?

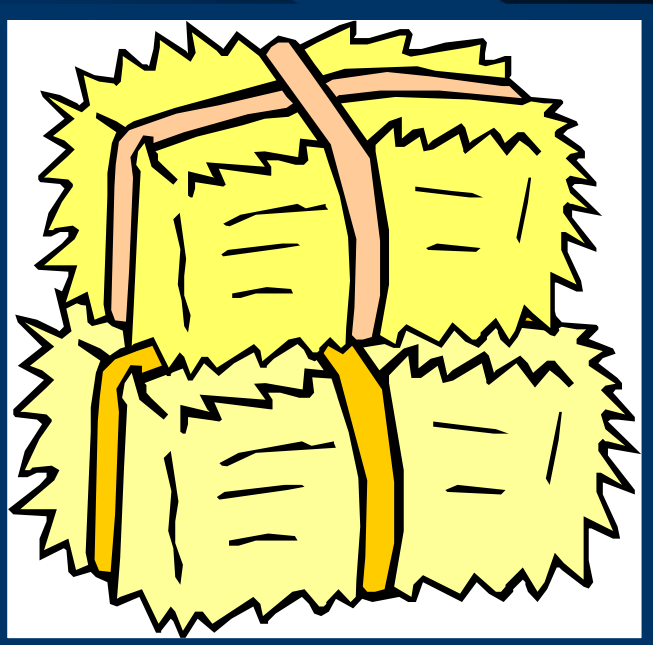
Availability of feedstuff

- **Offer clean, fresh calf starter at Day Three.**
- **Should met NRC recommendations.**
- **Palatability**

Nutrient Recommendations For Dairy Calves	
Nutrient	**Amount**
% DM	18.0
% Fat	3.0
% TDN	80.0
Mcal Energy	3.11
% Ca	0.60
% P	0.40
Vitamin A (IU/kg)	2200
Vitamin D (IU/kg)	300
Vitamin E (IU/kg)	25

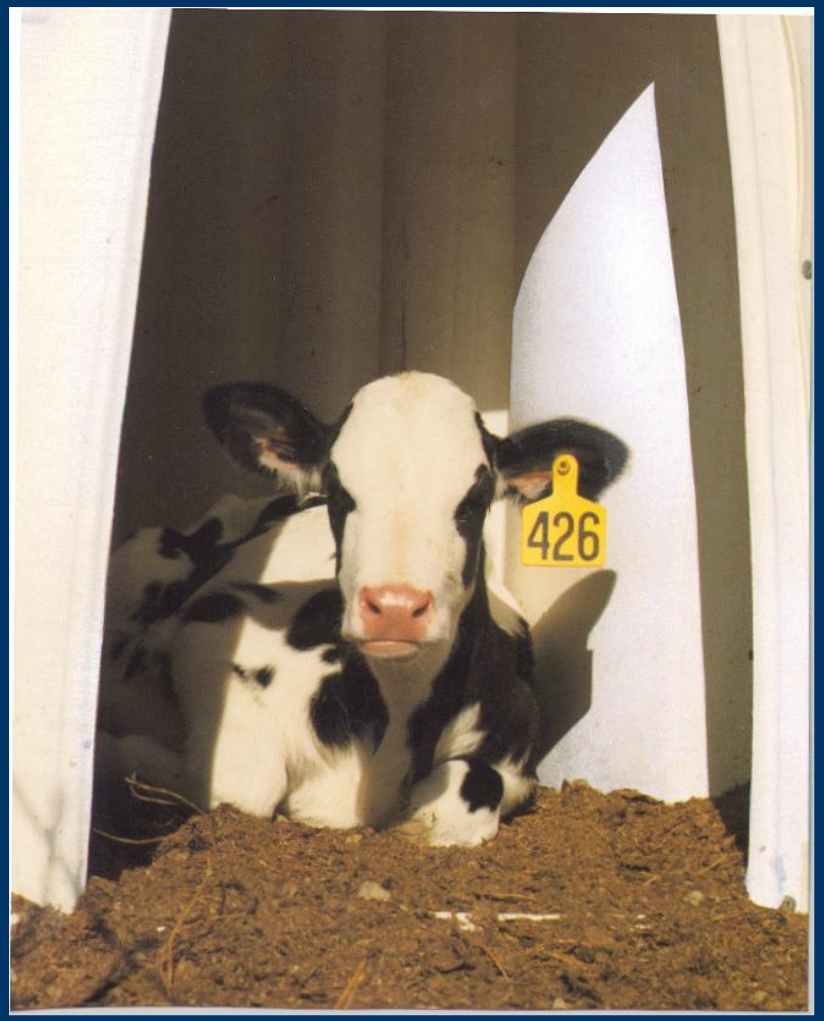
What about hay?

- 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.



Conclusion

- Newborn calf is a monogastric with a non-functional rumen.
- Milk by-passes rumen.
- Rumen development is chemical.
- Free choice water & calf starter needed.
- Feed hay after weaning.



Start 'Em Right... Raise 'Em Right

2000 Calf Management Meeting