

# Nutrition of Replacement Ewe

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Experience from cattle...

# **RUMEN DEVELOPMENT**

# At Birth

- The rumen, reticulum and omasum are
  - Undeveloped
    - No rumen papillae
    - Insignificant blood network
  - Nonfunctional
    - Poor musculature
  - Smaller than the abomasum
  - Significantly disproportionate relative to a mature ruminant

# Development

- Significantly affected by
  - Diet
  - Dietary changes
- Varying responses are effected by different stimuli
  - Papillae growth and development by some factors
  - Rumen muscle and size development by other factors

# Rumen Papillae Development

- In order for rumen to function, absorption of nutrients (like VFAs) is essential
- Absorption acts via rumen papillae
- A major stimulant of development are VFAs
  - butyrate > propionate > acetate
  - Diet (milk vs. grain vs. forage) effect development differently



# Milk and Milk Replacers

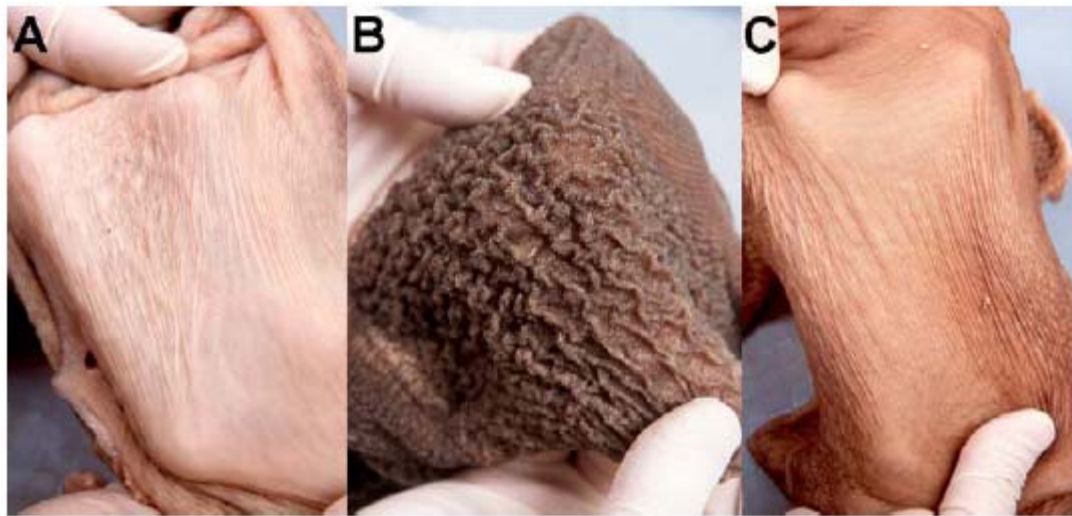
- Most by-passes the rumen via esophageal groove
- Can stimulate growth of rumen
- Does not stimulate development of rumen
  - A study showed that switching from dry feed back to milk resulted in a regression of rumen development
- Leads to fast and efficient growth of young ruminant but poor preparation to be a ruminant

# Solid Feeds

- Directed toward rumen
- Stimulate microbial activity
  - Which produces VFAs
    - Which stimulates rumen development
- Grain
  - Stimulates butyrate and propionate production
  - Steam-flaked corn resulted in greater rumen development than dry-rolled and whole corn
- Forage
  - Stimulates acetate production

# Solid Feeds

- Figure shows papillae development in 6 week old calves fed either only: A) milk, B) milk and grain or C) milk and dry hay





# It is more complicated...

- If pH drops too low in rumen the rumen wall gets tougher (to protect itself)
- This process
  - Is called “parakeratosis”
  - Leads to poor absorption of nutrients
  - Reduction in rumen papillae
- Parakeratosis is caused by
  - Small particle size of the feed
  - Poor abrasive value of feed (ability to scratch off keratin and dead cells)

# Rumen Musculature and Volume

- Rumen musculature
  - Is necessary for mature ruminant's ability to mix/move feed to ensure adequate
    - Buffer delivery
    - Rumination of large particles
    - Passage of fine particles on beyond rumen
- Rumen volume
  - Is necessary for increasing “factory size” for working microbes

# Rumen Musculature and Volume

- Feed physical structure more important than feed nutrient content
  - Particle size
  - Effective fibre
  - “Bulk”
- Stimulates rumen wall
  - Stimulates rumen motility
    - Stimulates rumen muscle development & volume

Completely indigestible toothbrush bristles were found to increase development of rumen musculature and volume

Body Growth

Rumen Papillae  
Development

**BALANCE**

Rumen Musculature  
and Volume  
Development

Cost Efficient Gain

# Some data to consider

- Feeding hay to calves given higher quantities of milk improved feed intake, rumen development without affecting growth
  - Khan et al. 2011 (J.Dairy Sci.)

# Water Before Weaning

- Offering water as of day 3 from birth in calves
  - Increases weight gain
  - Increases calf starter intake
  - Reduces scours
- Can lambs get access to water?

Mammary Development

Frame Development

# **BODY COMPOSITION**

# The “Ideal” Market Lamb

- Alive
- Growth
  - Fast
  - Efficient
- With finish
  - “eye-ball finish”
  - little to no value given to measurable meat quality



# The “Ideal” Replacement Ewe

- Alive? **YES**

# The “Ideal” Replacement Ewe

- Alive
- Growth
  - Fast? **NO**

# Moderate vs. Accelerated Growth

	Moderate growth	Accelerated growth	Comment
Weaning to breeding gain, lb/d	0.26	0.44	Moderate is 60% of accelerated
Weight at breeding, lb	97.4	136.4	No economics reported on extra feed
Wither height at breeding, inches	24.1	25.3	Frame size did not appear to be affected much
Weight to height ratio, lb:inches	4.0	5.4	Differences in ratio correlated to differences in body fat (135%)
Conception rate	95%	96%	
Lambing rate, #	1.1	1.4	127% lambs born
Milk production, lb/d	3.43	2.85	83% of milk production
Alveoli, #	Higher	Lower	

Umberger et al. 1985 (North Carolina)

# Isometric vs. Allometric Growth: Mammary Glands

- At different stages of growth the mammary glands grow at different rates
- Isometric
  - Grow at same rate as rest of body
  - “Iso” – equal
- Allometric
  - Grow at faster rate than rest of body
  - “Allo” – other

# Time Frame

- Isometric
  - Birth to 4 wks
- Allometric
  - 4 wks to 20 wks
- Isometric
  - 20 wks to pregnancy
- Allometric
  - Pregnancy

# Time Frame

(Tolman and McKusick, 2001)

	Rearing Treatment					Stat Signif
	L	H	LL	LH	HL	
	4 to 20 wks		20 to 36 wks			
Daily gain, kg (lb)	0.12 (0.26)	0.22 (0.49)	0.11 (0.24)	0.21 (0.46)	0.11 (0.24)	
Age at slaughter	20	20	36	36	36	
Live wt, kg (lb)	23.7 (52)	33.2 (73)	36.1 (80)	48.9 (108)	47.7 (105)	*
Trimmed fat pad, g	14.7	30	46	86.7	70.3	*
% fat pad occupied	65%	27%	53%	46%	44%	*
Parenchyma, mg	844	623	1580	2496	1883	*
Total epith. DNA, mg	32	26	61	91	73	*
Live wt at puberty, kg (lb)			33.4 (74)	43.3 (95)	45.7 (101)	***
Age at puberty, d			233	240	235	NS

# Time Frame

- High energy during allometric growth appears to be the issue
  - For dairy sheep recommendation is energy should be reduced to 65-75% of full-feed
  - Most significant negative impact is 4 – 6 wks
- Early puberty decreases mammary development in accelerated ewe lambs
- Increasing feed levels after 20 wks
  - Has no negative impact on mammary development
  - Can improve live weight at breeding

# Spooner Study: Dairy Ewes

- Basic protocol
  - Fed 70% concentrate from 4-20 wks
  - Full fed both after wk 20
- Ewe weight
  - At wk 20: Restricted ewes were 87% of full fed ewes
  - At breeding: Restricted ewes were 97% of full fed ewes
  - At lambing: Restricted ewes were 103% of full fed ewes
- No impact on
  - Fertility, prolificacy
  - Milk production (volume, fat, protein, lactation length)
- Impact on feed costs
  - In that trial they saved \$6.60/ewe by restricting feed



# Too Slow is Also a Problem

- Trying to catch up on a light ewe after she is pregnant leads to reduction in lamb birth weight and survival

# The “Ideal” Replacement Ewe

- Alive
- Growth
  - Fast
  - Efficient? **YES**
- To be economical, cost is essential
- But as for most long-term projects cheapest is not always best

# The “Ideal” Replacement Ewe

- Alive
- Growth
  - Fast
  - Efficient
- With finish? **NO** (a little bit yes)
- We want condition but not fat
  - Evidence to show that excessive fat leads to poor mammary development

# Good Frame Structure

- I think I am preaching to the choir here
  - The hope is that good structure will lead to
    - Longevity
    - Better productivity
    - More valuable carcass
- Reasonable feed restriction does not appear to effect frame size
  - Measure replacements height to wither vs. market lambs...should be close
- Remember
  - We need to provide nutrients (including vitamins and minerals) to provide for sound structure
  - Some vitamin/mineral deficiencies (like cobalt) during growth have long term unfixable effects

# The Problem

- What is best for rumen development is not best for mammary development

# OMAFRA Recommends

- Replacement ewes should grow at 50% of normal market lamb gains after weaning
- There is plenty time to get ewe lamb to 70% of mature body weight by breeding time

# Recommended Program

- Measure some “typical” mature ewes
  - Weight & height
  - Don’t guess
- Measure your replacement ewes
  - Weigh at various stages
    - How are they developing?
  - Measure height to withers at various stages
    - How are they developing?

# Recommended Program

- Nursing lambs (in creep area)
  - Fresh creep feed by day 7
    - 17-21% CP, 81-85% TDN, 0.84% calcium, 0.40% phosphorus (with Bovatec)
  - Very palatable grass hay (like orchard grass) available at same time
  - Clean fresh water available to lambs
- I'd like to see some trials done feeding alfalfa hay or canola meal (high CP, lower TDN) as creep to lambs for wks 4 to weaning
  - For now rumen development is big
- If you think ewe lambs are fat, back off on creep



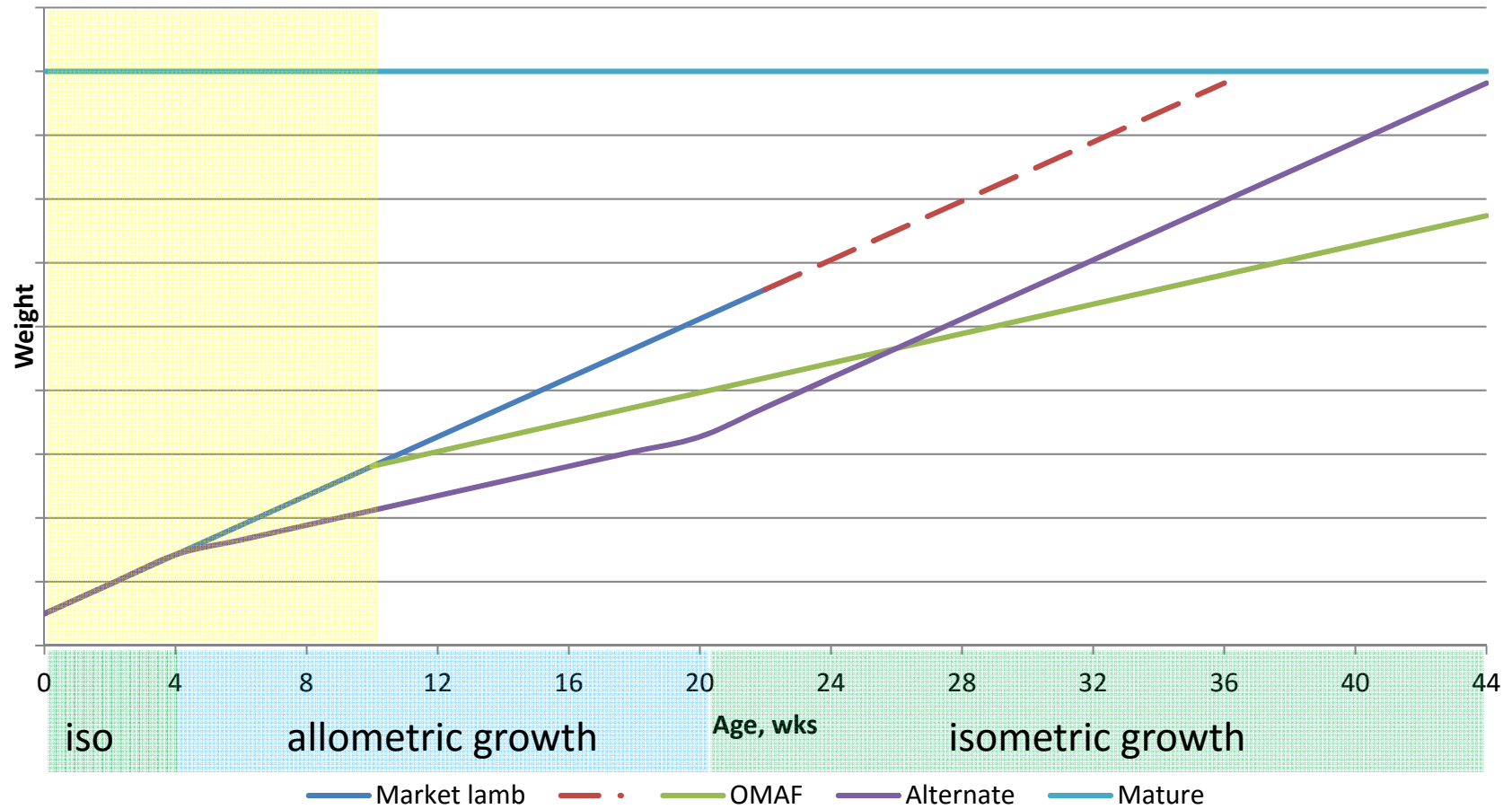
# Recommended Program

- Weaned lamb (to 20 wks)
  - Free choice good quality grass hay (managed pasture is great)
  - If not hitting weights, top dress with 0.5 lb of corn grain
    - I'd like to see some research on canola here too
  - Free choice mineral supplement
    - We want structure to last longer than 180 days
  - Clean water
- Monitor
  - Watch condition
    - If gets to >3, back off on concentrate
  - Make sure weight gain meets targets
    - 50% of market lambs

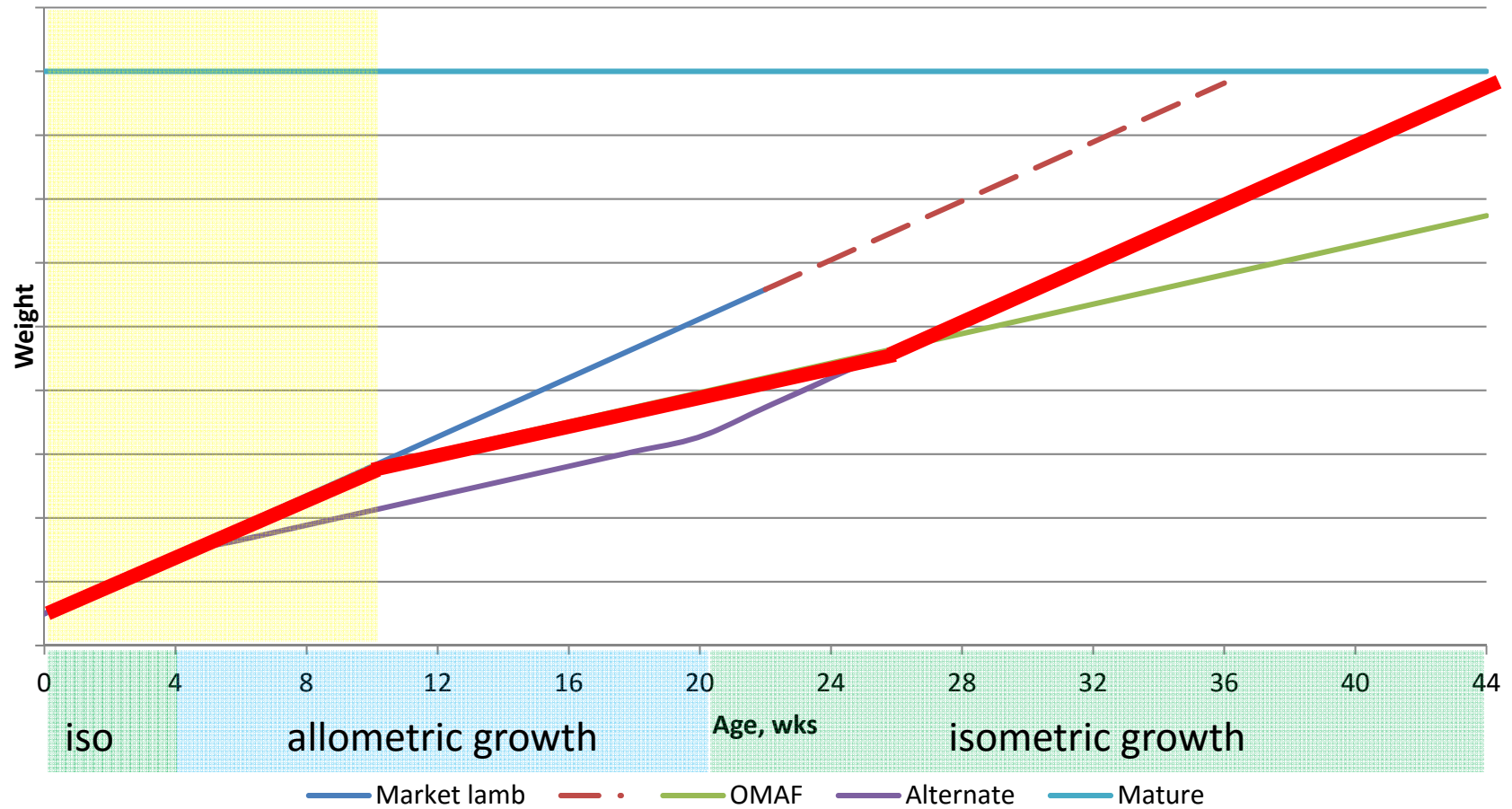
# Recommended Program

- Weaned lamb (20 wks to breeding)
  - Full feed
  - Keep at least 20% eNDF in diet for healthy rumen
  - Additional benefit will be flushing
- Pregnant lamb
  - Back of feed for growth (feed to recommendations)

# Monitor Weights



# Path I Recommend



# DO NOT

- Feed replacements like market lambs
  - Maintain minimum 20% eNDF in ration
  - Watch body condition score!
- Forget Bovatec
- Ignore mineral/vitamin supplements
- Miss vaccines
  - Related to nutrition via enterotoxemia
- Ignore clean water

## At the end of the day, a replacement ewe that...

- Has a large, strong rumen can convert cheaper feed (forages) into lambs
- Has well-developed mammary glands will produce more milk for her lambs
  - Always important
  - More important with prolific breeds
- Has a well-developed structure will hopefully have greater productivity and longevity

# On-line Sheep Nutrition Course

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CHANGING LIVES  
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## Improve Your Sheep Nutrition Management Skills

### Course Information

This general interest online course has been developed for shepherds by Dr. Paul Luimes, researcher at the University of Guelph, Ridgetown Campus, to improve their sheep farm operations.

Topics covered include:

- Feed types
- Nutrients
- Digestive Physiology
- Nutrient Requirements
- Ration Formulation
- Feed Management

### Online Course

**Improve nutrition management** on your sheep farm by learning the fundamentals of nutrition. Use this knowledge to:

- **Optimize profitability**
- **Boost animal health**
- **Improve product (meat) quality**

**Course fee:**  
\$50.00 + HST

**For more information visit:**

[www.ridgetownc.com/ce](http://www.ridgetownc.com/ce)

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