



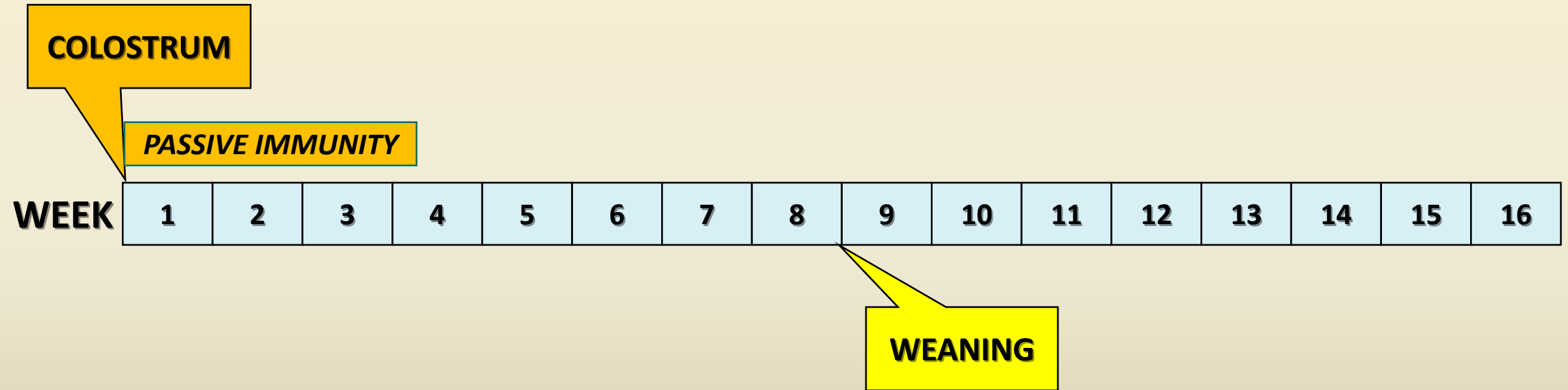
Biochemical predictors of successful transition from milk to solid feed in Holstein Calves

Kazana P.¹, Siachos N.¹, Panousis N.², Arsenos G.¹, Valergakis G.E.¹

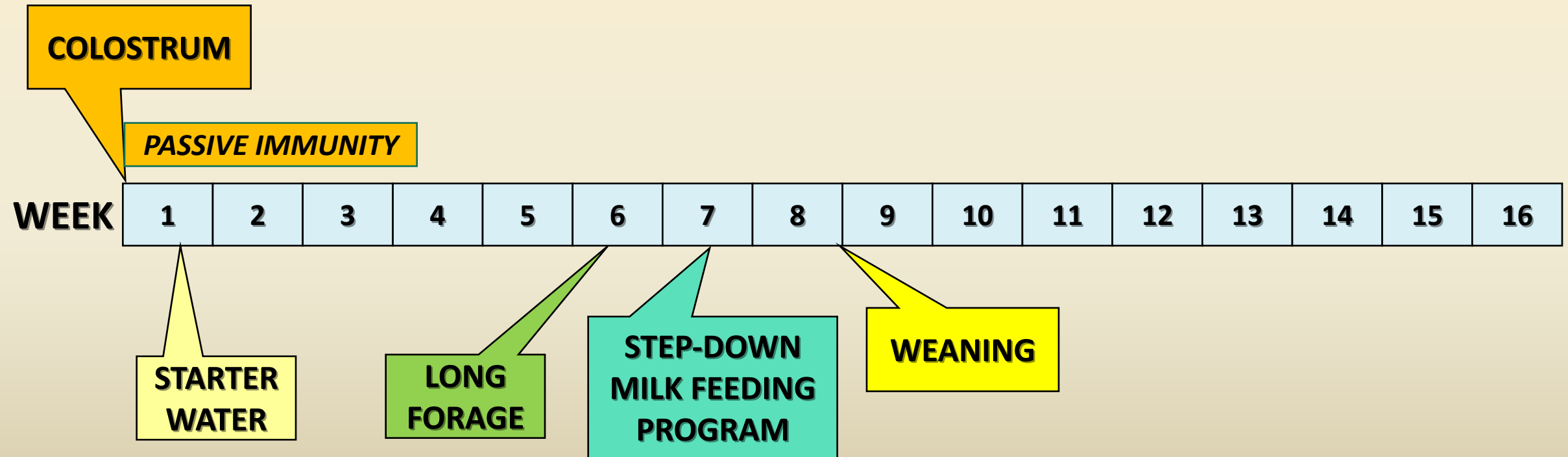
¹Laboratory of Animal Husbandry, ² Farm Animal Clinic,
Faculty of Veterinary Medicine, School of Health Sciences,
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BACKGROUND



BACKGROUND



BACKGROUND

HOUSING CONDITIONS ARE VERY IMPORTANT!

COLOSTRUM

PASSIVE IMMUNITY



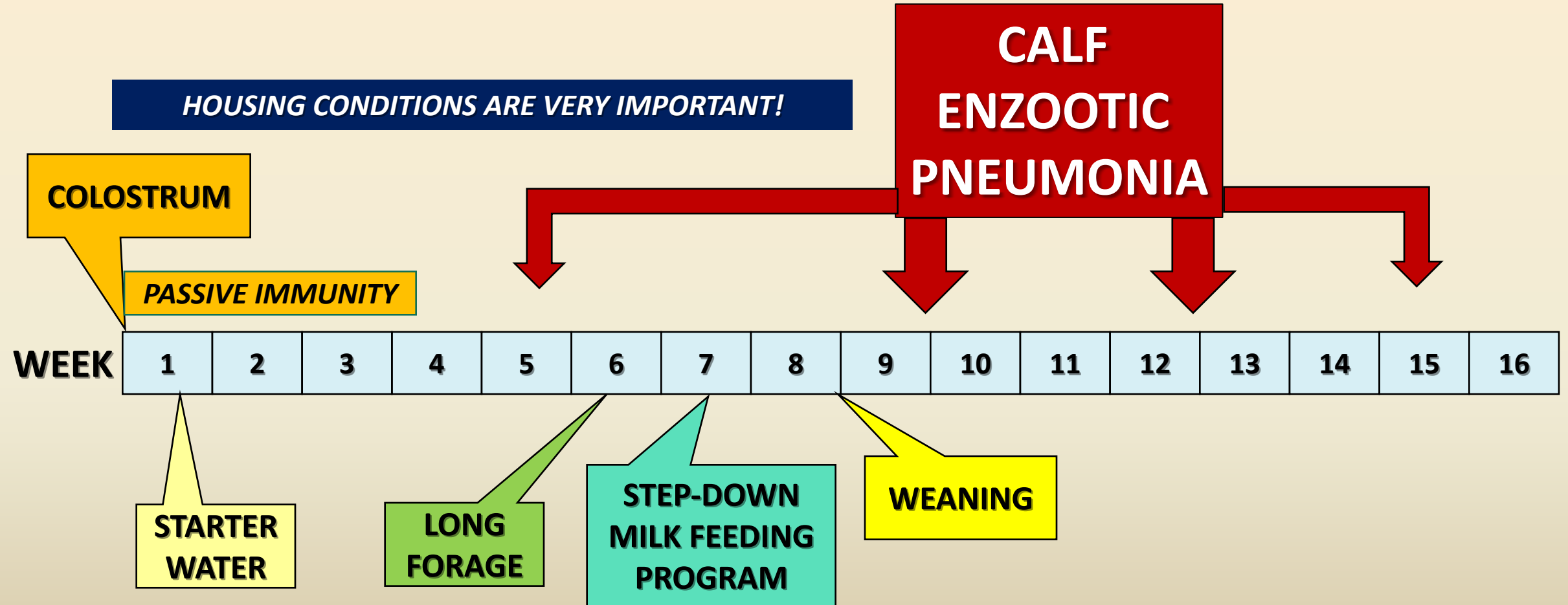
**STARTER
WATER**

**LONG
FORAGE**

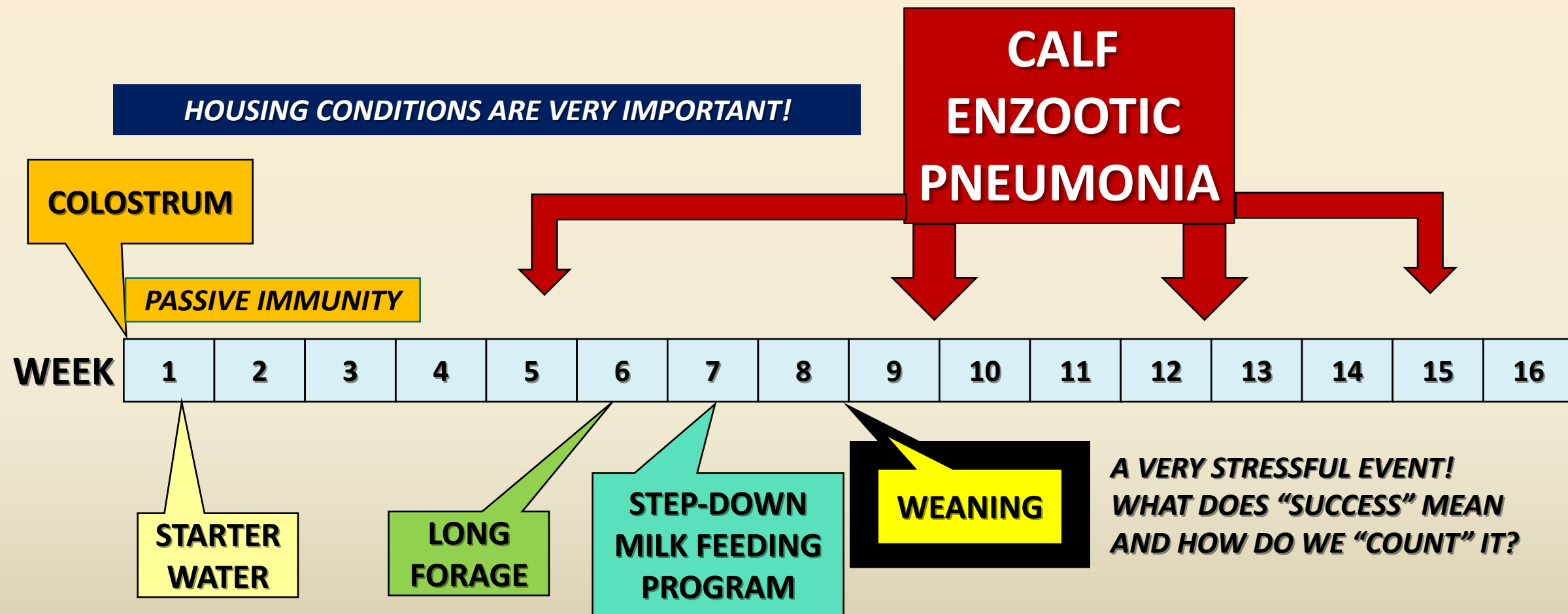
**STEP-DOWN
MILK FEEDING
PROGRAM**

WEANING

BACKGROUND



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- **Weaning is a stressful event for all calves**

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- Weaning is a true, critical, transition period

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Higher age and bodyweight are beneficial!



How much older and how much heavier?

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- **Weaning is a true, critical, transition period**
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How much older and how much heavier?

A high solid feed intake is beneficial!



What level and how practical is it to know?

OBJECTIVE

To establish calf-side clinical tests predicting:

a) which calves are ready to be weaned

so we can start the weaning process!

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To establish calf-side clinical tests predicting:

a) which calves are ready to be weaned

so we can start the weaning process!

b) which (and how many) calves coped successfully

so we can adapt our practices!

MATERIALS & METHODS

DATASET

- 249 healthy Holstein calves from 9 commercial dairy farms
- At three time-points, relative to the day of weaning (-7d, 0d, +7d)
 - a) clinical examination*
 - b) blood sampling (BHBA - photometric determination and NEFA - ADVIA analyzer)*
 - c) rumen fluid (VFA - gas chromatography and pH portable device, on-site)*
- Calf management data individually recorded

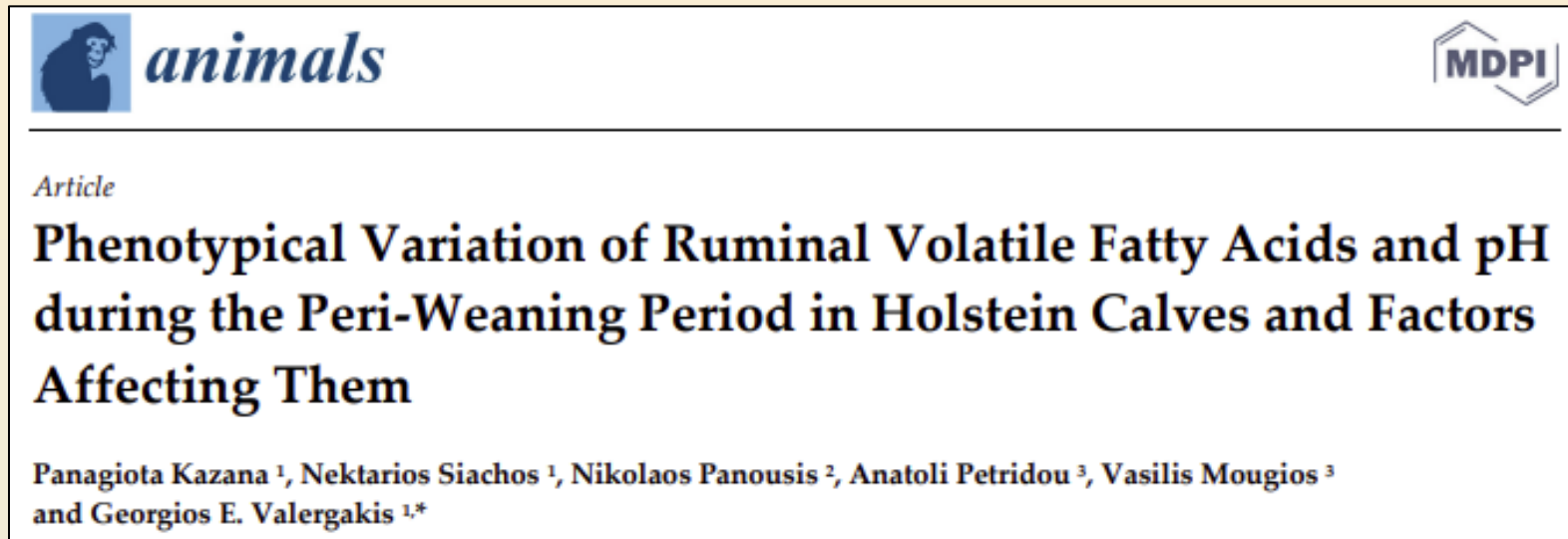
MATERIALS & METHODS

		Farms							
		A	B	D	E	F	G	H	I
	No of Calves	7	34	28	34	40	11	51	31
	Age at weaning (±SD)	68.7 (±14.8)	55.2 (±5.9)	70.5 (±7.7)	80.5 (±7.7)	64.6 (±8.5)	82.6 (±19.9)	64.3 (±6.9)	89.9 (±7.4)
Milk Replacer	Amount (L)	5	6	6	8	6	7	6	4
	CP%	22.0	22.0	21.5	22.0	22.0	21.5	22.5	22.5
	Fat%	18.0	18.0	18.0	18.0	18.0	18.0	22.0	22.0
Starter	CP%	18.4	19.0	17.0	17.2	17.8	17.2	18.1	20.0
	NDF%	18	20	18	21	19	19	20	20
Method of weaning	Abrupt	7	-	28	8	-	-	7	-
	Step-down	-	34	-	26	40	11	44	31
Forage inclusion pre-weaning	No	7	-	9	-	-	-	18	3
	Early	-	-	-	34	40	11	18	28
	Late	-	34	19	-	-	-	14	-
Forage inclusion post-weaning	No	7	-	-	-	-	-	-	-
	Yes	-	34	28	34	40	11	51	31
Housing pre-weaning	Individual	7	34	5	26	40	9	26	-
	Group	-	-	23	8	-	2	25	31
Housing post-weaning	Individual	7	30	3	13	25	9	23	4
	Group	-	4	25	21	15	2	28	27

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MATERIALS & METHODS



Higher age
Higher BW
Late forage feeding
Group housing




POSITIVE EFFECTS

The higher the VFA concentrations, the lower the pH

The lower the pH, the higher the STARTER INTAKE (Khan et al. JDS, 2007)

MATERIALS & METHODS



Contents lists available at [ScienceDirect](#)

Livestock Science

journal homepage: www.elsevier.com/locate/livsci

Effect of weaning on serum biochemistry and establishment of reference intervals for peri-weaning period of Holstein calves

Panagiota Kazana^a, Nektarios Siachos^a, Nikolaos Panousis^b, Emmanouil Kalaitzakis^b, Georgios Arsenos^a, Georgios E. Valergakis^{a,*}

**There are analytes of interest
BHBA, BUN and AST**

AH-07

Assessment of ruminal fluid pH evolution across the weaning period in Holstein calves under field conditions

Panagiota Kazana¹, Nektarios Siachos¹, Nikolaos Panousis², Georgios Bramis¹, Georgios Arsenos¹, Georgios Valergakis¹.

**There are patterns of pH evolution
across the pre- and post-weaning phase**

MATERIALS & METHODS

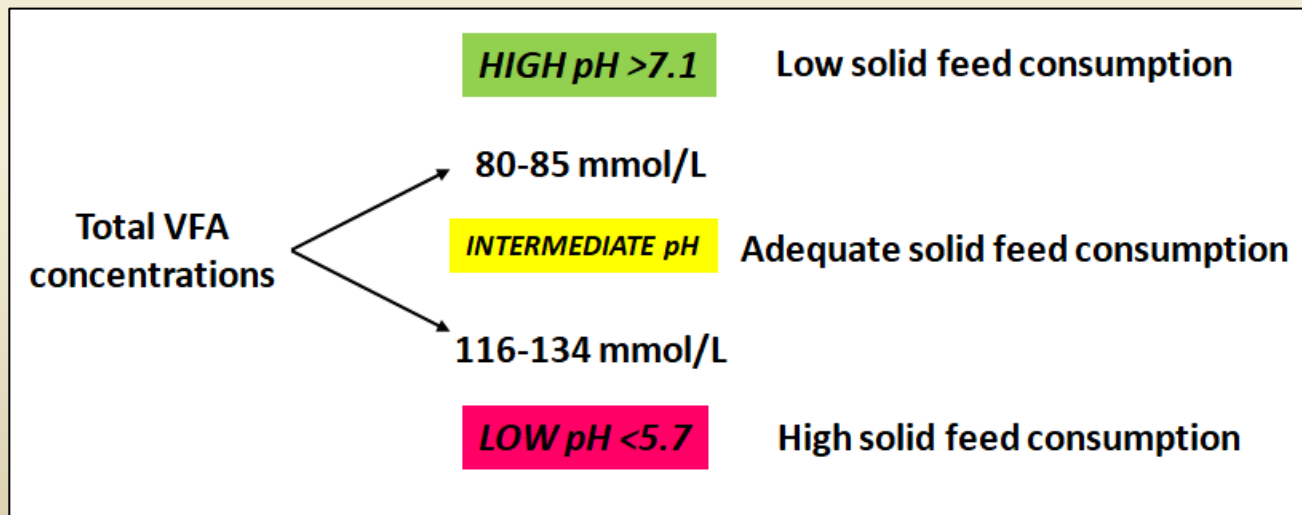
STATISTICAL ANALYSIS

- At each time-point, critical thresholds of total VFA concentrations were identified below or over which there is increased probability of low or high pH values (*multiple ROC curves, VFA as quantitative variables and pH test variable*)

MATERIALS & METHODS

STATISTICAL ANALYSIS

- At each time-point, critical thresholds of total VFA concentrations were identified below or over which there is increased probability of low or high pH values (*multiple ROC curves, VFA as quantitative variables and pH test variable*)



In 0.1 subdivisions,
within the range of 5.0-6.5 and 6.5-7.5
for the “low” and “high” thresholds.

BEST PREDICTIVE VALUES BASED ON THE AUC
Se & Sp : 80-85%

MATERIALS & METHODS

STATISTICAL ANALYSIS

- Multinomial linear logistic regression models were used to assess the classification of calves regarding the concentration of BHBA and NEFA, accounting for the effect of farm and age at weaning.
- When statistically significant effects of either BHB and/or NEFA were detected, ROC curves provided thresholds with an increased probability of categorizing calves in any of the two categories (adequate-high or low).

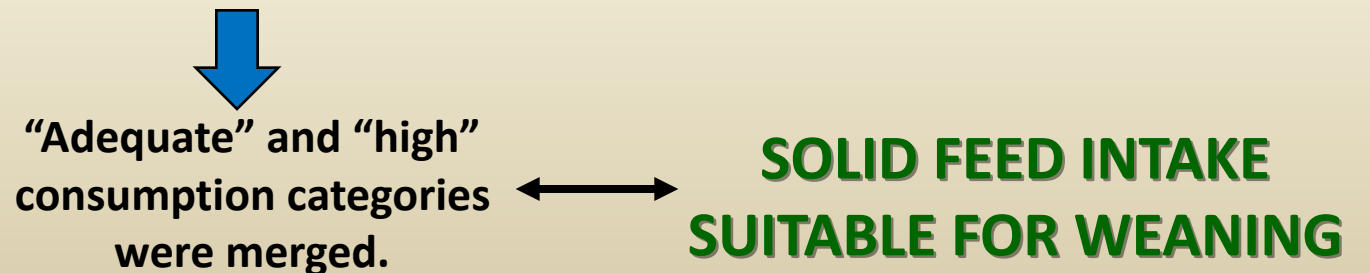


“Adequate” and “high”
consumption categories
were merged.

MATERIALS & METHODS

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RESULTS

Seven days **BEFORE** weaning, when most people start the step-down milk feeding program, calves with:

BHBA > 260.3 $\mu\text{mol/L}$ Se:0.941
or
NEFA > 175.0 $\mu\text{mol/L}$ Se:0.835

*Calves categorized
into the “adequate-high” class
of solid feed intake*

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At the day of weaning...!

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At the day of weaning...!

Recommendation to farmers: check calves on -7d; if BHBA (and/or NEFA) above threshold, start weaning process if NOT, wait 1 week and recheck

RESULTS

Seven days AFTER weaning, calves with:

NEFA < 245.0 $\mu\text{mol/L}$ Sp:0.792

*Calves categorized
into the “low” class
of solid feed intake*

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NEFA < 245.0 $\mu\text{mol/L}$ Sp:0.792

*Calves categorized
into the “low” class
of solid feed intake*



*We are not ready to make recommendations, yet!
We are examining other options, combining NEFA with
other biomarkers...and further studying patterns!*

CONCLUSION

- ✓ *Calf-side clinical tests predicting which calves are ready for weaning 7 days earlier appear feasible.*

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- ✓ *BHBA is an excellent biomarker and can be checked calf-side.*
- ✓ *NEFA which **from now on** can be checked calf-side could be useful combined with other biomarkers.*

**THANKS FOR YOUR ATTENTION!
ANY QUESTIONS?**

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**First author
P. Kazana DVM MSc PhD**



**74th Annual Meeting of the European Federation of Animal Science,
Lyon, France, 26th August to 1st September 2023**