Effects of a bovine non-specific immune stimulant on health of Jersey and Jersey-cross heifer calves in the first month of life

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Health and performance of calves influence adult life production

↑ ADG + ↓ Diseases = More milk

Photo credit: Eat Farm Love

To have healthier calves we need:

- To have proper colostrum management
- To provide adequate nutrition
- To provide clean, dry and comfortable housing
- To have adequate ventilation and air quality

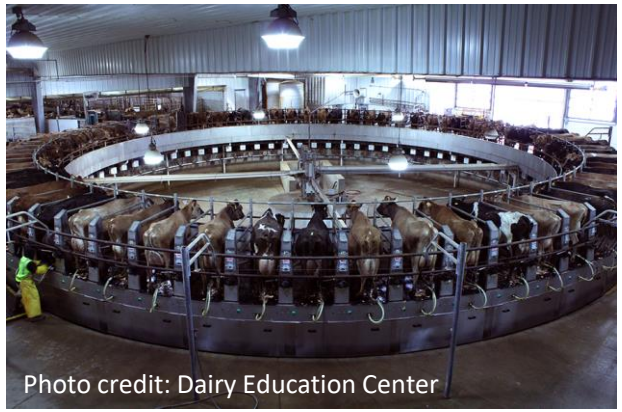
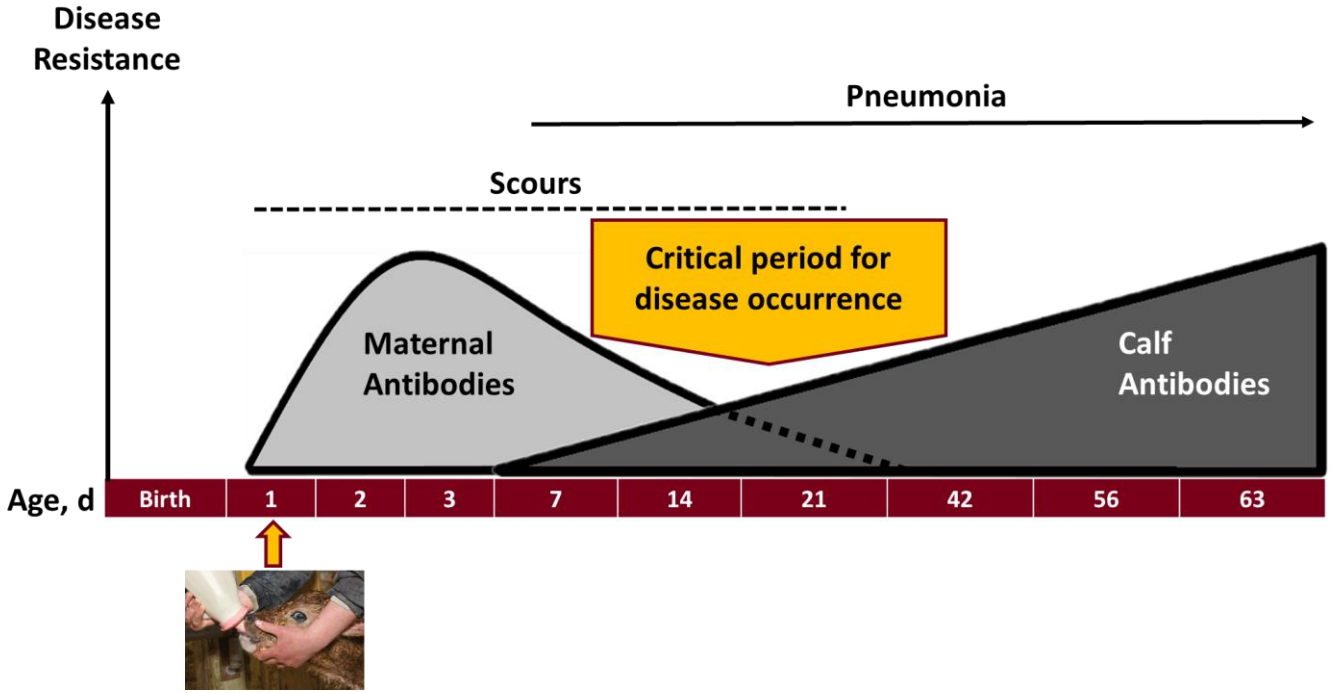


Photo credit: Dairy Education Center

Good colostrum management and hygiene are key for calf health

- Dairy calves depend on the immune protection acquired from ingestion of colostrum immediately after birth to fight infections
- Proper hygiene decreases chances of pneumonia and scours during the pre-weaning period



Pneumonia and scours are the two most important diseases that affect preweaned calves

Pneumonia up to 20 to 30%

Scours up to 50 to 60%

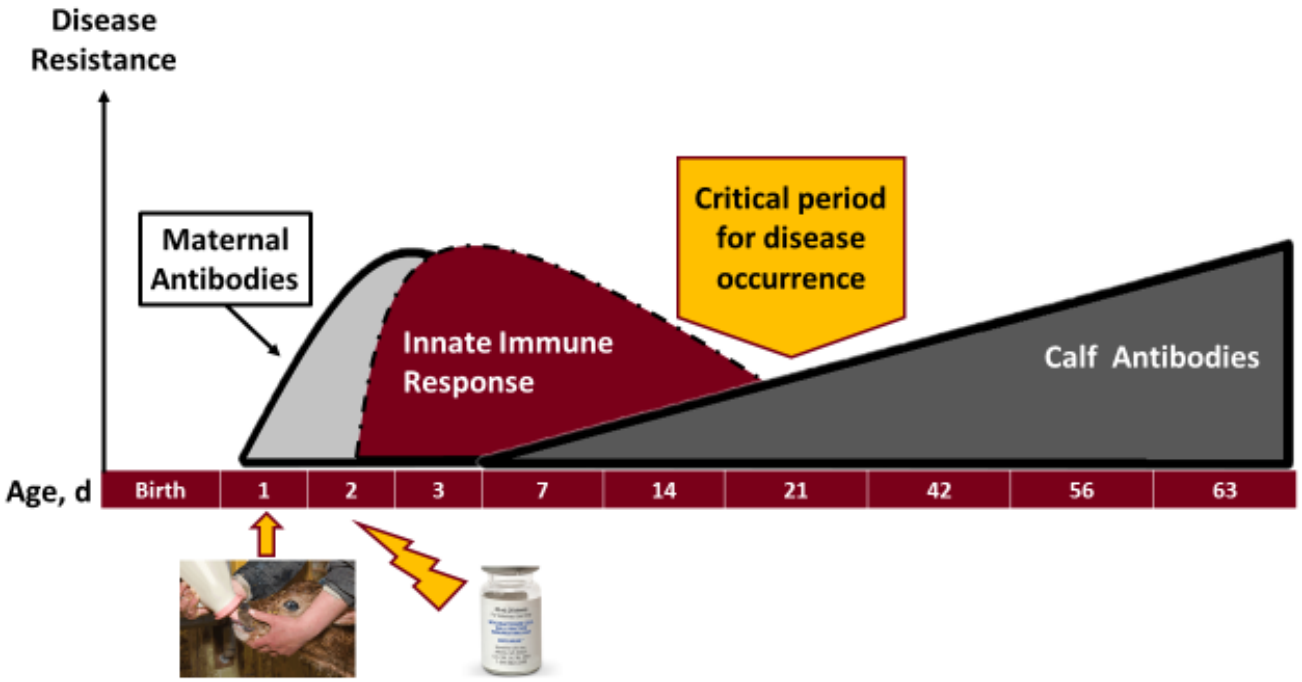
- Both diseases can have lifelong effect on animal performance
- Preventing diseases is much better and cheaper than treating diseases

"There is no magic bullet to overcome a poor colostrum program and/or bad housing/hygiene. Our overall focus should be on management."

Dr. Geof Smith

Improving calf health and performance without the use of antibiotics

Our hypothesis: Non-specific immune stimulants can induce an early activation of the immune system of newborn dairy calves, decreasing the period of high susceptibility to infectious diseases (i.e. pneumonia and scours).



Our goal: decrease the length of critical period for disease occurrence

Immune stimulant that was tested

Amplimune®

- Active ingredient is mycobacterium cell wall fraction (MCWF) of *Mycobacterium phlei*, a non-pathogenic, soil-borne bacterium
- Non-specific immune response modifier that initiates and modulates an appropriate immune response
- Amplimune® is licensed in US and Canada as an immunotherapeutic for the treatment of *Escherichia coli*K99+ scours in newborn calves

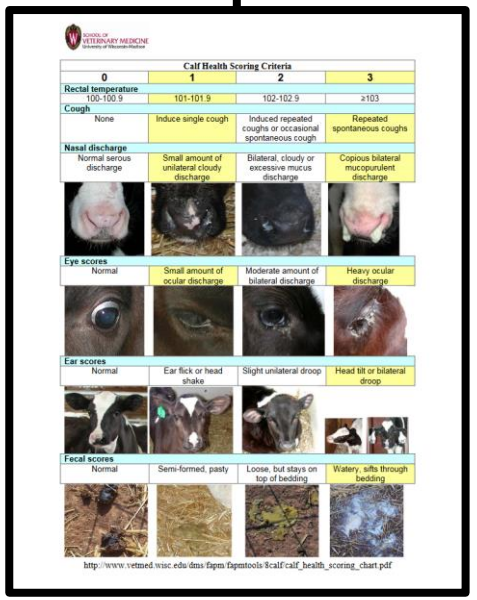
Study design

- Commercial dairy farm in Minnesota (well managed)
  - Calves were transported for 17h to grower facility
- Jersey and Jersey-cross heifer calves (2- 3 days old)
- Randomized clinical trial (n = 1,360)
- **Treatment groups**
  - Control (**CON**): 1 mL of sterile saline subcutaneous (n = 458)
  - Before Transport (**BTIS**): 1 mL of immune stimulant subcutaneous (n = 449)
  - After Transport (**ATIS**): 1 mL of immune stimulant subcutaneous (n = 453)

Study design

BIRTH **2d** **3d** **7d** **10d** **Weeks 2 & 3**

Treatment & Total Solids



At…

BIRTH

- Calves received 4L of good quality pasteurized colostrum within 6 hours of birth.

- Birth weight was measured using a digital scale.

At…

BIRTH

d 2 or 3

- Calves were randomly allocated to the **CON** or **treatment** (groups **BTIS** and **ATIS**).

- Blood samples were collected for measurement of serum total solids to assess passive transfer.

At…

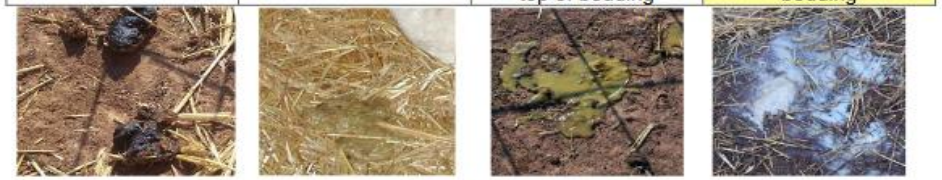
SCHOOL OF VETERINARY MEDICINE
University of Wisconsin-Madison

Calf Health Scoring Criteria			
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
Nasal discharge			
Normal serous discharge	Small amount of unilateral cloudy discharge	Bilateral, cloudy or excessive mucus discharge	Copious bilateral mucopurulent discharge

Eye scores			
Normal	Small amount of ocular discharge	Moderate amount of bilateral discharge	Heavy ocular discharge

Ear scores			
Normal	Ear flick or head shake	Slight unilateral droop	Head tilt or bilateral droop

Fecal scores			
Normal	Semi-formed, pasty	Loose, but stays on top of bedding	Watery, sifts through bedding



http://www.vetmed.wisc.edu/dms/fapm/fapmtools/8calf/calf_health_scoring_chart.pdf

10d Weeks 2 & 3

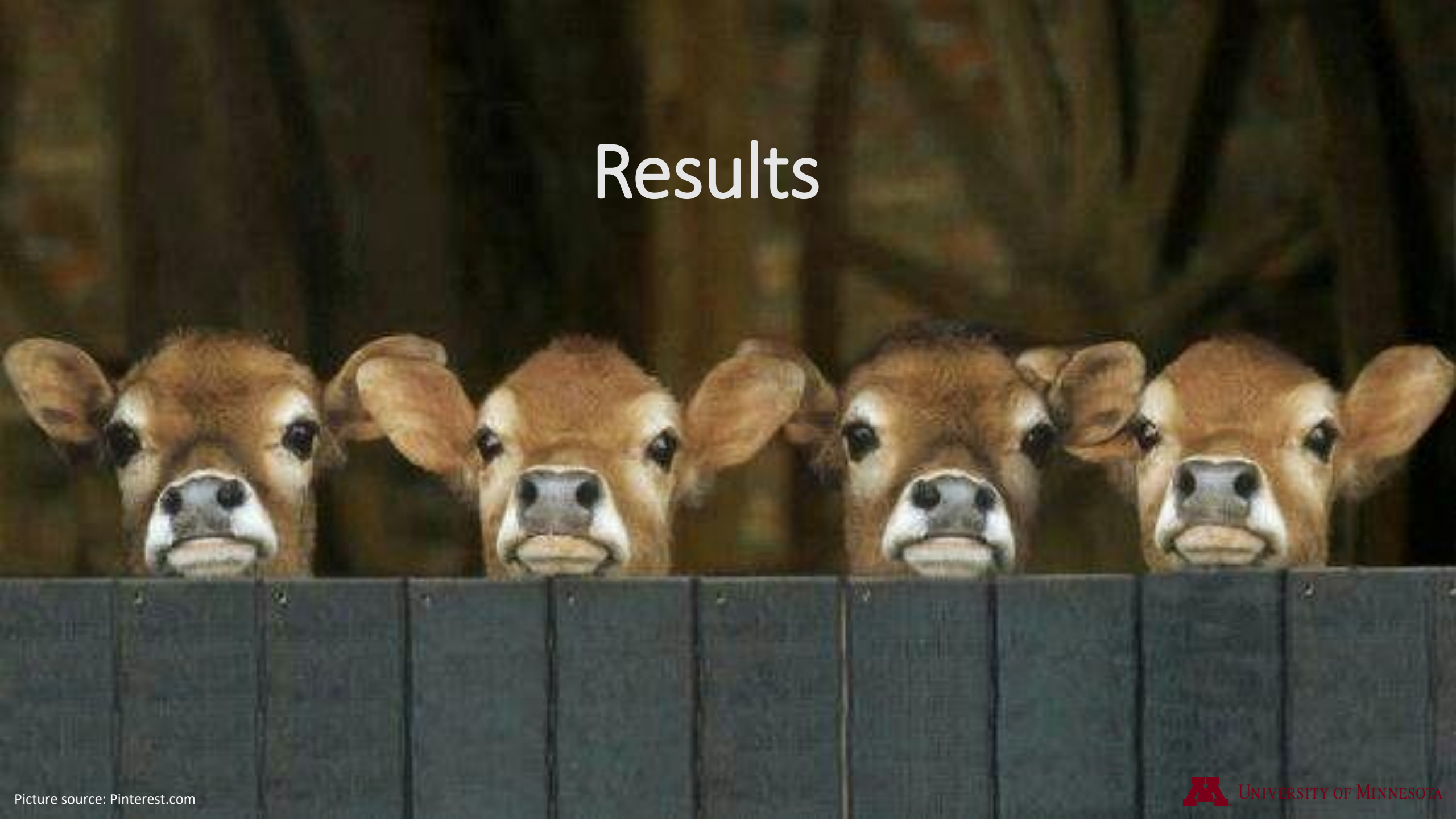
- Calf health was evaluated for the first three weeks using the calf health scoring criteria from University of Wisconsin.

- Factors: Body temperature, nasal discharge, eye score, and fecal scores.

Data Analyses

- Incidence of treated and dead calves – Percentage.
- Hazard of disease treatment - Cox's proportional hazard regression.
- Weekly health score analyzed - Logistic regression.
- Initial models included treatment group, total serum protein score, breed, calving ease and birth weight.
- Variables with $P > 0.10$ were removed from the model using backward stepwise elimination.

Results



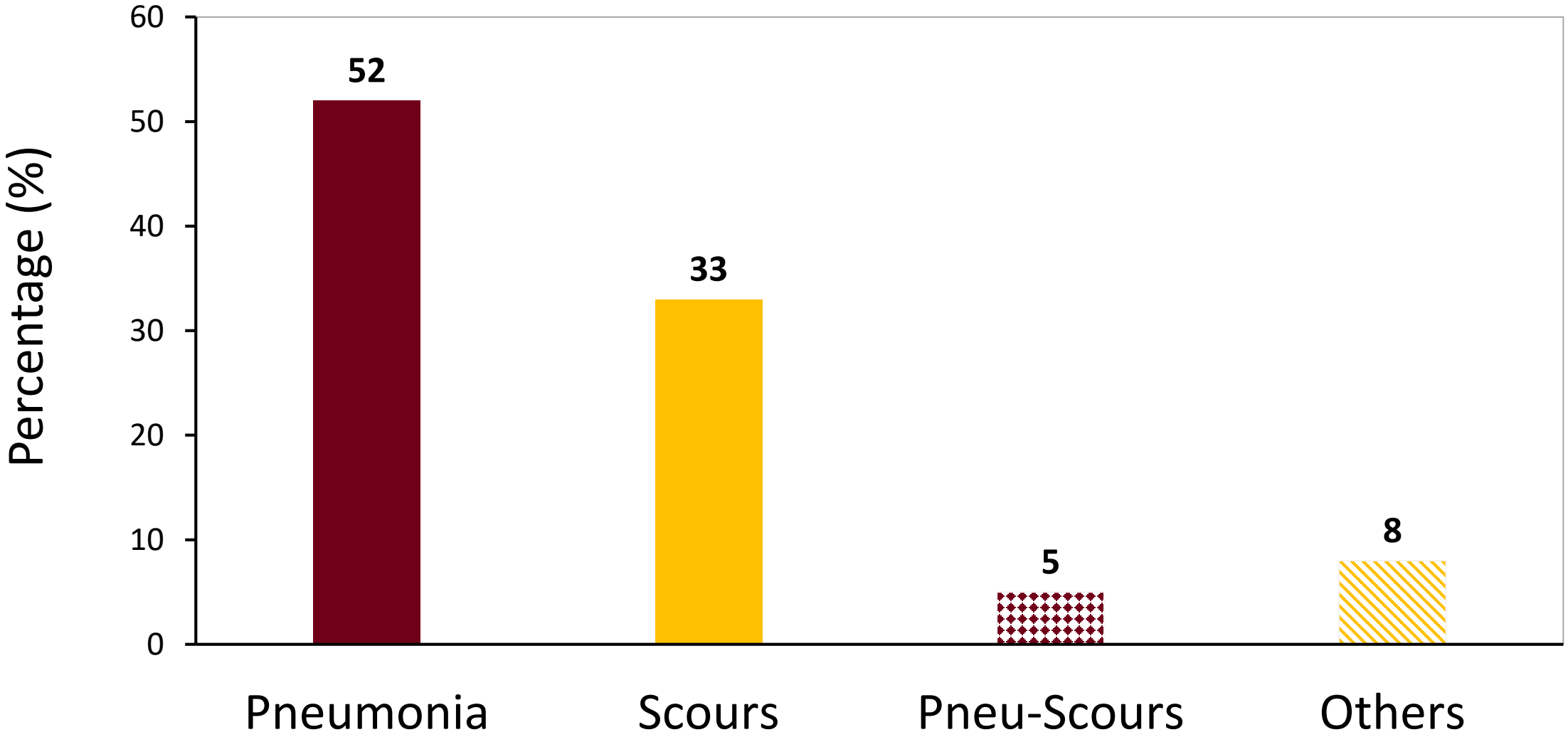
Picture source: Pinterest.com

Disease treatment events were lower than the national average

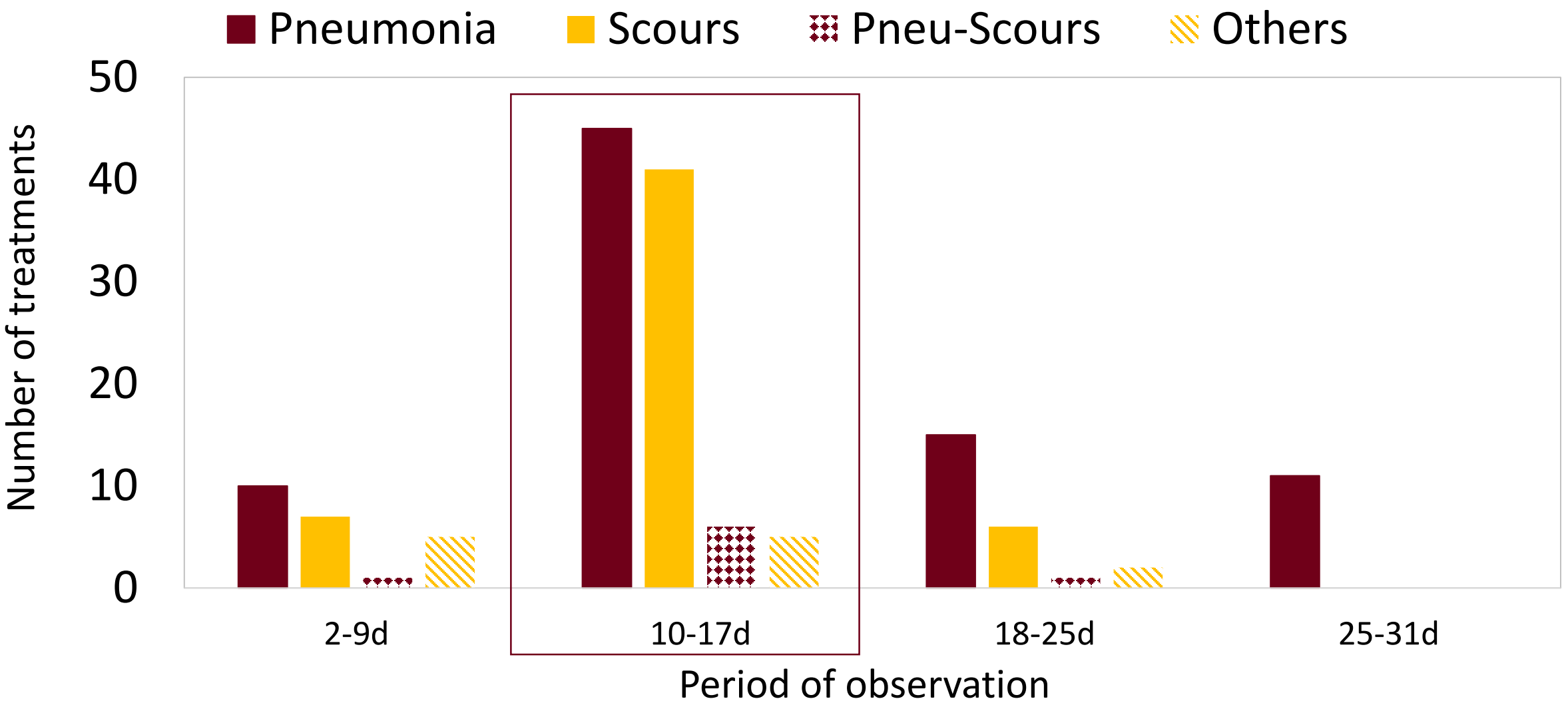
Item	Enrolled (%)	Treated (%)	Dead (%)
Calves	1,360	155 (11.3)	16 (1.2)
CON	458	60 (13.1)	6 (1.3)
BTIS	449	44 (9.8)	5 (1.1)
ATIS	453	51 (11.4)	5 (1.1)

CON: control; BTIS: before transport; ATIS: after transport

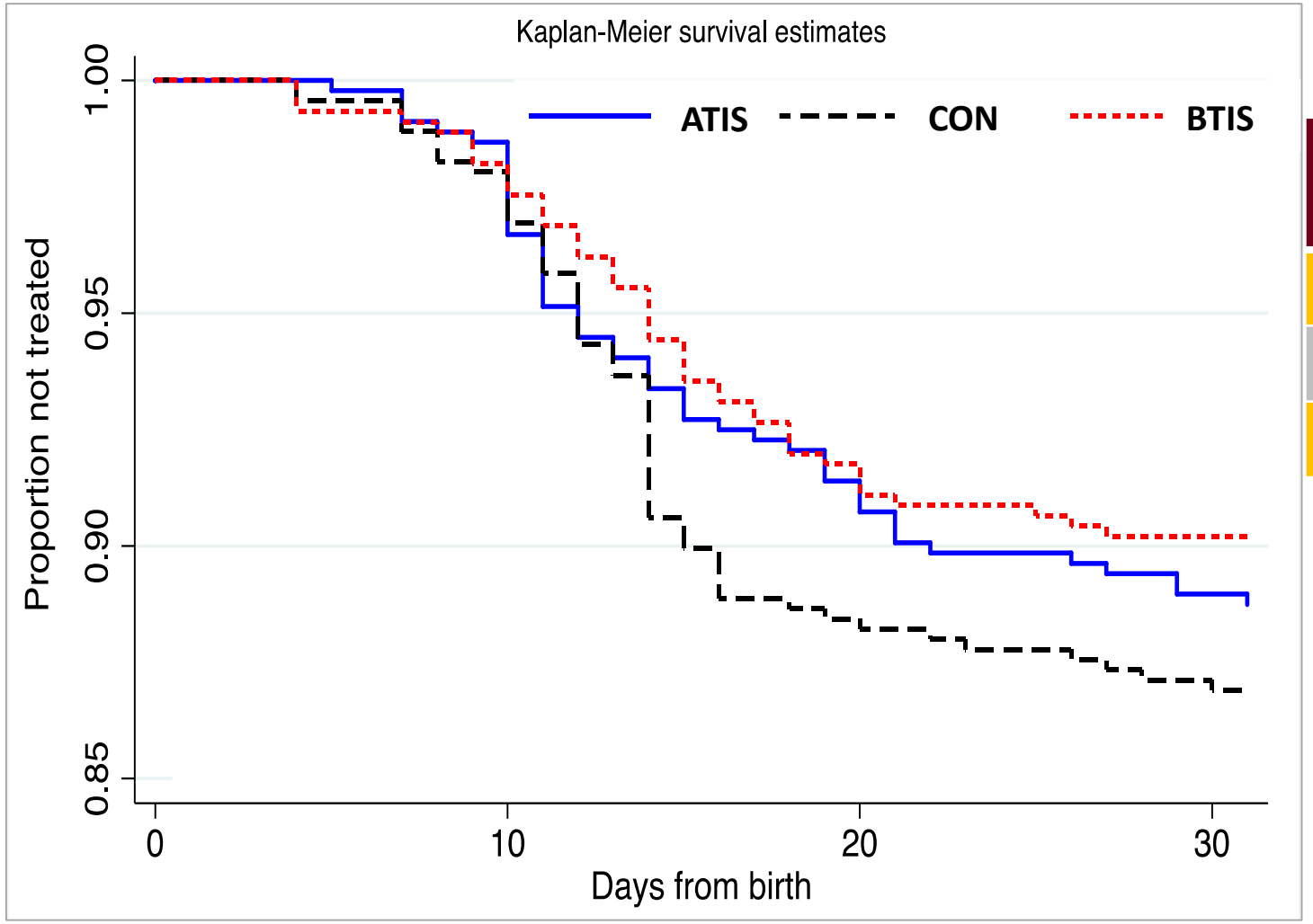
Pneumonia treatment accounted for over 50% of treatments within first month of life



Most of the disease treatments happened in the second week of life



No difference in hazard of treatment within first month of life



Group	Adjusted Hazard ratio	95% CI	*P* - value
CON	*Ref.*	-	-
BTIS	0.74	0.50 – 1.09	0.14
ATIS	0.84	0.57 – 1.2	0.35

CON: control;
BTIS: before transport;
ATIS: after transport

BTIS reduced hazard of treatment for pneumonia but not for scours within first month of life

Group	Pneumonia			Scours		
	HR	95% CI	*P*-value	HR	95% CI	*P*-value
CON	*Ref.*	-	-	*Ref.*	-	-
BTIS	0.54	0.31 – 0.94	0.02	1.04	0.58 – 1.88	0.87
ATIS	0.88	0.55 – 1.42	0.60	0.75	0.40 – 1.42	0.38

CON: control;

BTIS: before transport;

ATIS: after transport

Health scores did not differ between treatment groups within the first week of life

Item	Health Scores Week 1		
	OR	95% CI	*P*-value
CON	*Ref.*	-	-
BTIS	1.00	0.75 - 1.34	0.98
ATIS	1.19	0.89 - 1.58	0.23

CON: control; BTIS: before transport; ATIS: after transport

Health scores did not differ between treatment groups within the second week of life

Item	Health Scores Week 2		
	OR	95% CI	*P*-value
CON	*Ref.*	-	-
BTIS	1.22	0.87 - 1.70	0.25
ATIS	0.82	0.57 - 1.17	0.27

CON: control; BTIS: before transport; ATIS: after transport

Health scores did not differ between treatment groups within the third week of life

Item	Health Scores Week 3		
	OR	95% CI	*P*-value
CON	*Ref.*	-	-
BTIS	0.99	0.67 - 1.47	0.97
ATIS	0.86	0.58 - 1.29	0.48

CON: control; BTIS: before transport; ATIS: after transport

Conclusions

- Administration of Amplimune before transportation reduced the number of calves treated for pneumonia within the first 30 days of life.

- Administration of Amplimune did not affect weekly health scores.

Study limitations

- Smaller calf disease incidence compared with national average
  - *We are currently developing economic analysis to assess effects of using Amplimune treatment under **different disease incidence** rates. – ongoing*

- Health score was only given once a week for 3 weeks
  - *Health scoring more often would be ideal, but the number of animals in this study made it hard to accomplish.*

- Disease treatment instead of disease diagnosed
  - *Our outcome was based on farm diagnosis of diseases and treatment. Ideally, diseases would be diagnosed by research personnel.*

Thank you for listening!

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