Can BVD (and bovine neosporosis) be controlled in Peru

-results from studies in Arequipa

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Outline

General backround of BVD

Strategies for control

The Scandinavian model

Results from studies in Peru

Conclusions

Pestivirus

Flaviviridae

- **Pestivirus**
  - Classical swine fever virus
  - Bovine Viral Diarrhoea Virus BVDV-1
  - Bovine Viral Diarrhoea Virus BVDV-2
  - Border Disease Virus

Background

- Worldwide distribution, seroprevalence 50-90%, 1-2% persistently infected (PI)
- Considered as one of the most important virus infections in bovines
- Causes reproductive problems and impaired health in infected herds
- Control based on vaccination and/or herd biosecurity schemes
- Experiences from the nordic countries shows that it can be controlled without the use of vaccination
- BVDV can be cleared from a herd without intevention- self clearance

Background

BVDV infection

Subclinical/mild disease

Immunosuppression- secondary infections in calves

Lifelong immunity

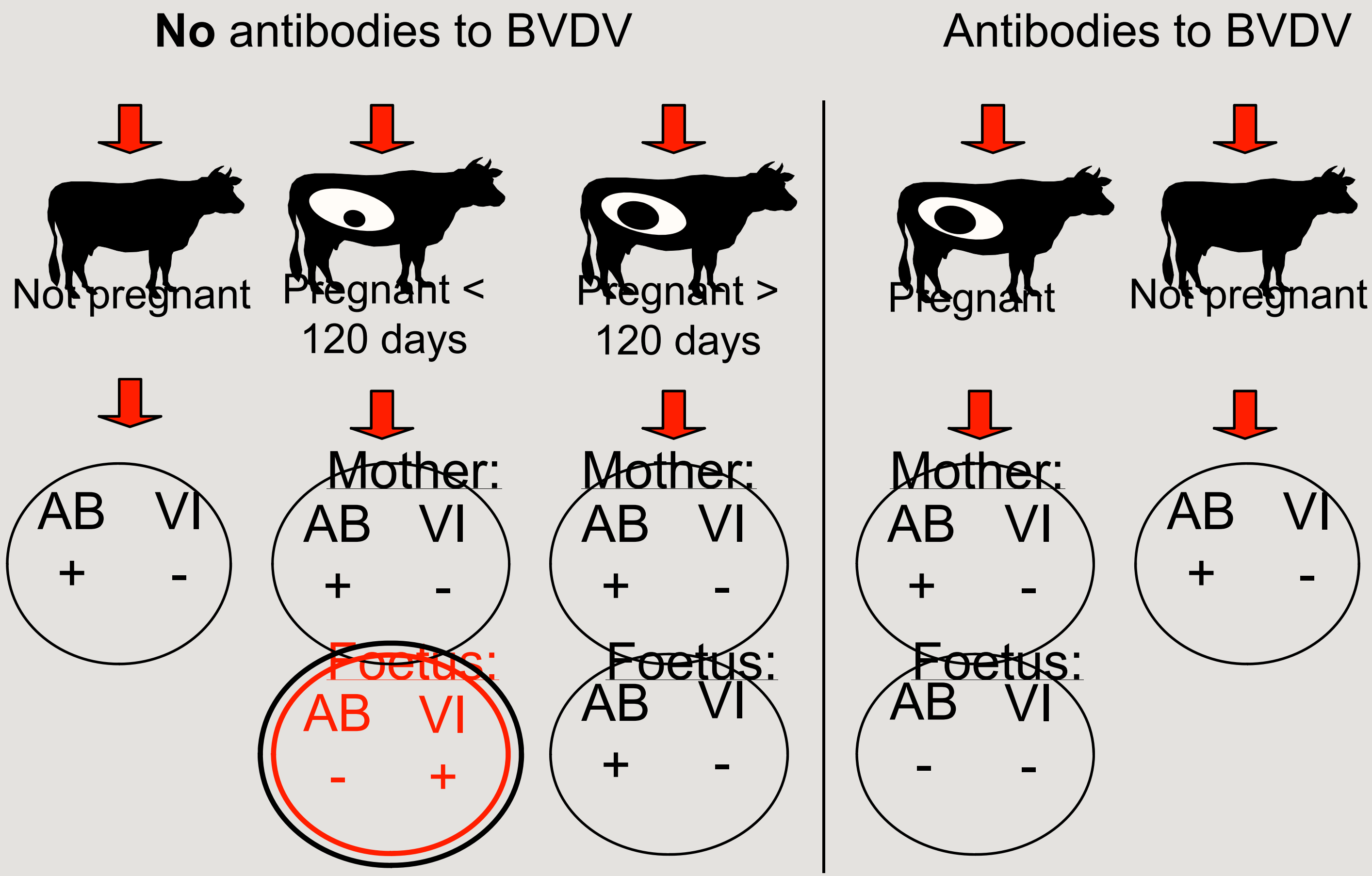
Embryonic/ foetal death

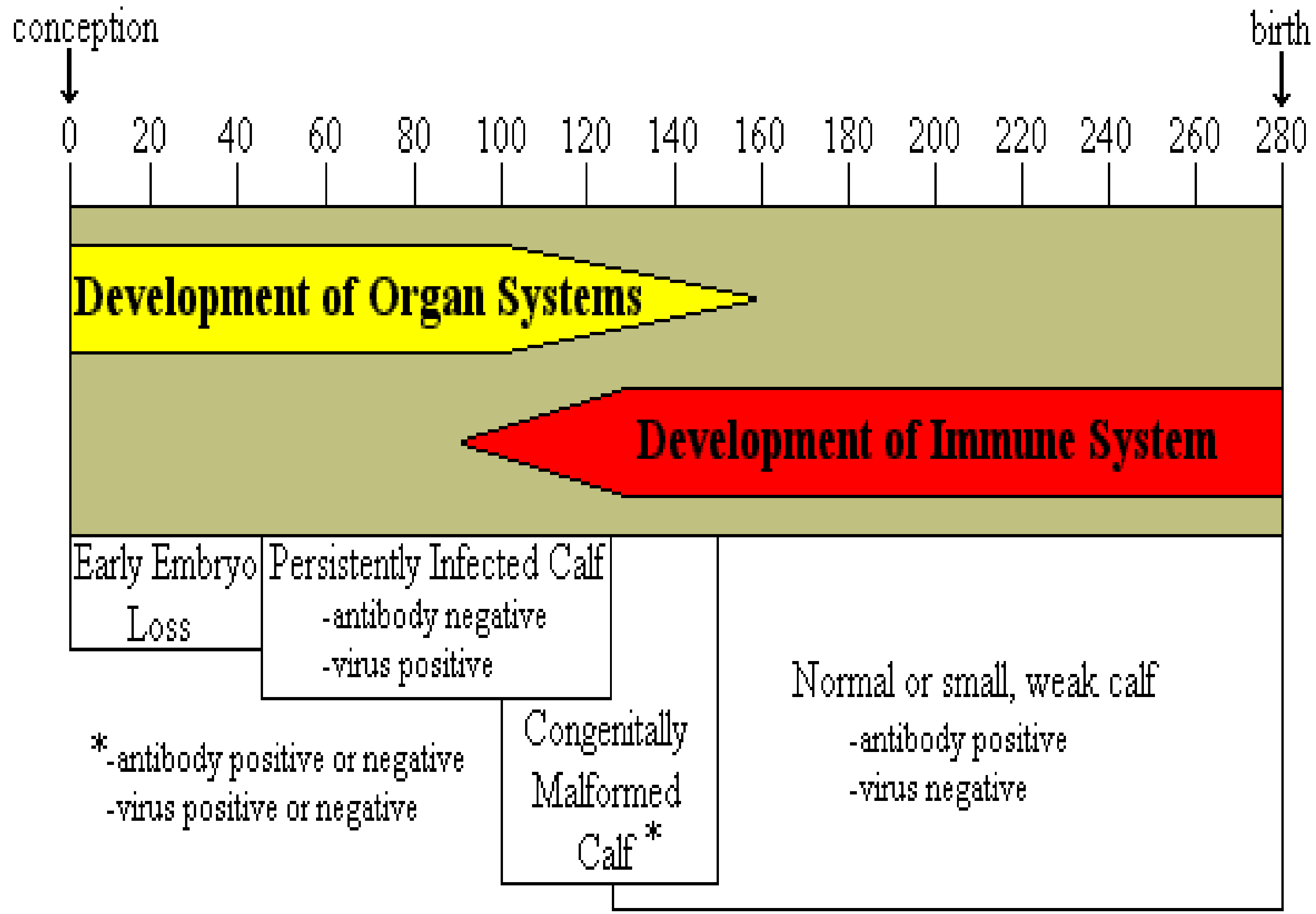
Abortion, malformation

Weak born calves

Birth of PI calves

BVDV


No antibodies to BVDV
Antibodies to BVDV
Not pregnant
Pregnant < 120 days
Pregnant > 120 days
Pregnant
Not pregnant
AB VI
+ -
Mother:
AB VI
+ -
Foetus:
AB VI
- +
Mother:
AB VI
+ -
Foetus:
AB VI
+ -
Mother:
AB VI
+ -
Foetus:
AB VI
- -
AB VI
+ -


conception
birth
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
Development of Organ Systems
Development of Immune System
Early Embryo Loss
Persistently Infected Calf
-antibody negative
-virus positive
*-antibody positive or negative
-virus positive or negative
Congenitally Malformed Calf *
Normal or small, weak calf
-antibody positive
-virus negative

Background

BVDV transmission

Livestock trade

PI animals

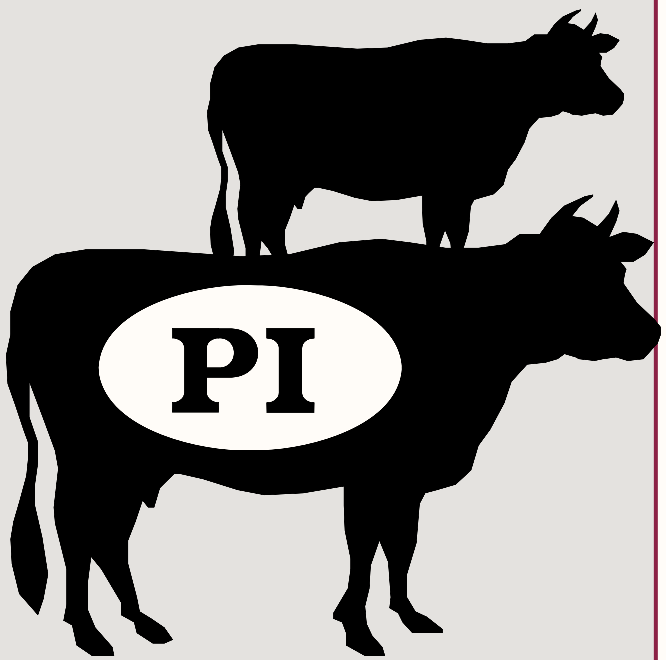
Animals carrying PI foetuses

(Transiently infected animals)

Contact with cattle from other farms (pasture)

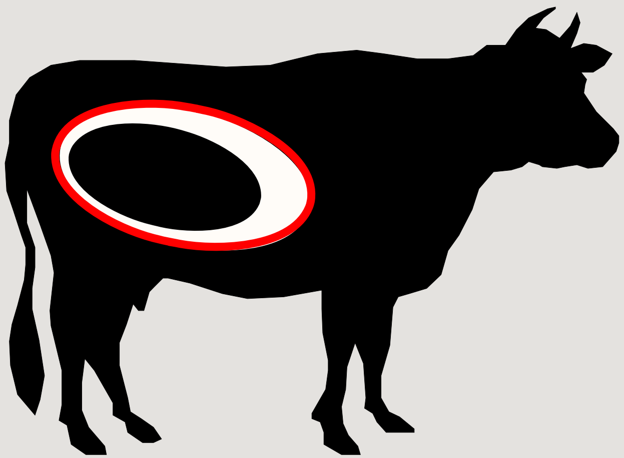
Indirect transmission

Equipment, personnel etc..

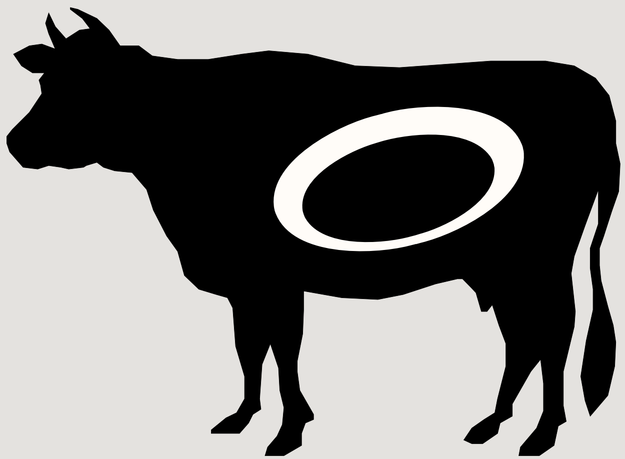


Strategies for BVD control

Immunisation



Biosafety



Systematic control

Goal-oriented, systematic reduction in the incidence and prevalence of BVDV infection

Implies that progress is being monitored

Scale – sectoral/regional/national

Typically based on the ”avoiding exposure” approach

Non-systematic control

Measures implemented on a herd-to-herd decision basis

Typically immunisation strategies using live or killed vaccines

The role of vaccination

Vaccination strategies have been used for > 40 years without reducing the BVD prevalence

Vaccines (live and inactivated) will reduce clinical signs

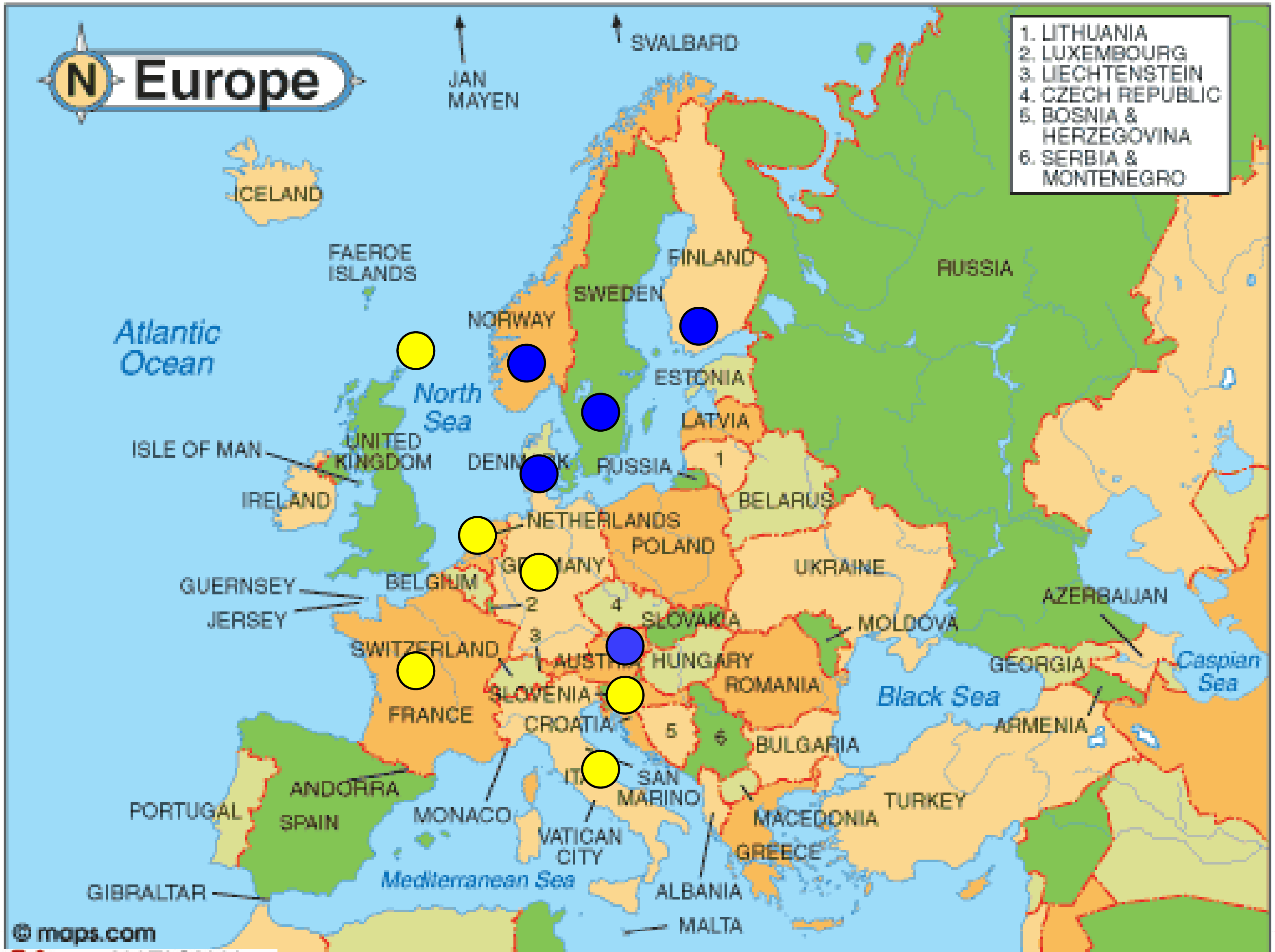
Vaccines will offer protection to the foetus and prevent the birth of PIs

 this protection however is <100% (for inactivated vaccines significantly lower and of short duration)

The use of vaccines has been responsible for transmission of BVD

The use of vaccines interferes with herd level monitoring

The use of vaccines may give a false sense of security and it might be hard to motivate farmers to continue with necessary biosecurity measures


Europe
N
JAN MAYEN
SVALBARD
1. LITHUANIA
2. LUXEMBOURG
3. LIECHTENSTEIN
4. CZECH REPUBLIC
5. BOSNIA & HERZEGOVINA
6. SERBIA & MONTENEGRO
ICELAND
FAEROE ISLANDS
Atlantic Ocean
NORWAY
SWEDEN
FINLAND
RUSSIA
ESTONIA
LATVIA
North Sea
ISLE OF MAN
UNITED KINGDOM
DENMARK
RUSSIA
IRELAND
BELARUS
NETHERLANDS
POLAND
GERMANY
UKRAINE
GUERNSEY
JERSEY
BELGIUM
SLOVAKIA
MOLDOVA
AZERBAIJAN
SWITZERLAND
AUSTRIA
HUNGARY
GEORGIA
Caspian Sea
SLOVENIA
ROMANIA
Black Sea
FRANCE
CROATIA
ARMENIA
BULGARIA
SAN MARINO
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GIBRALTAR
Mediterranean Sea
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General outline of the Scandinavian schemes

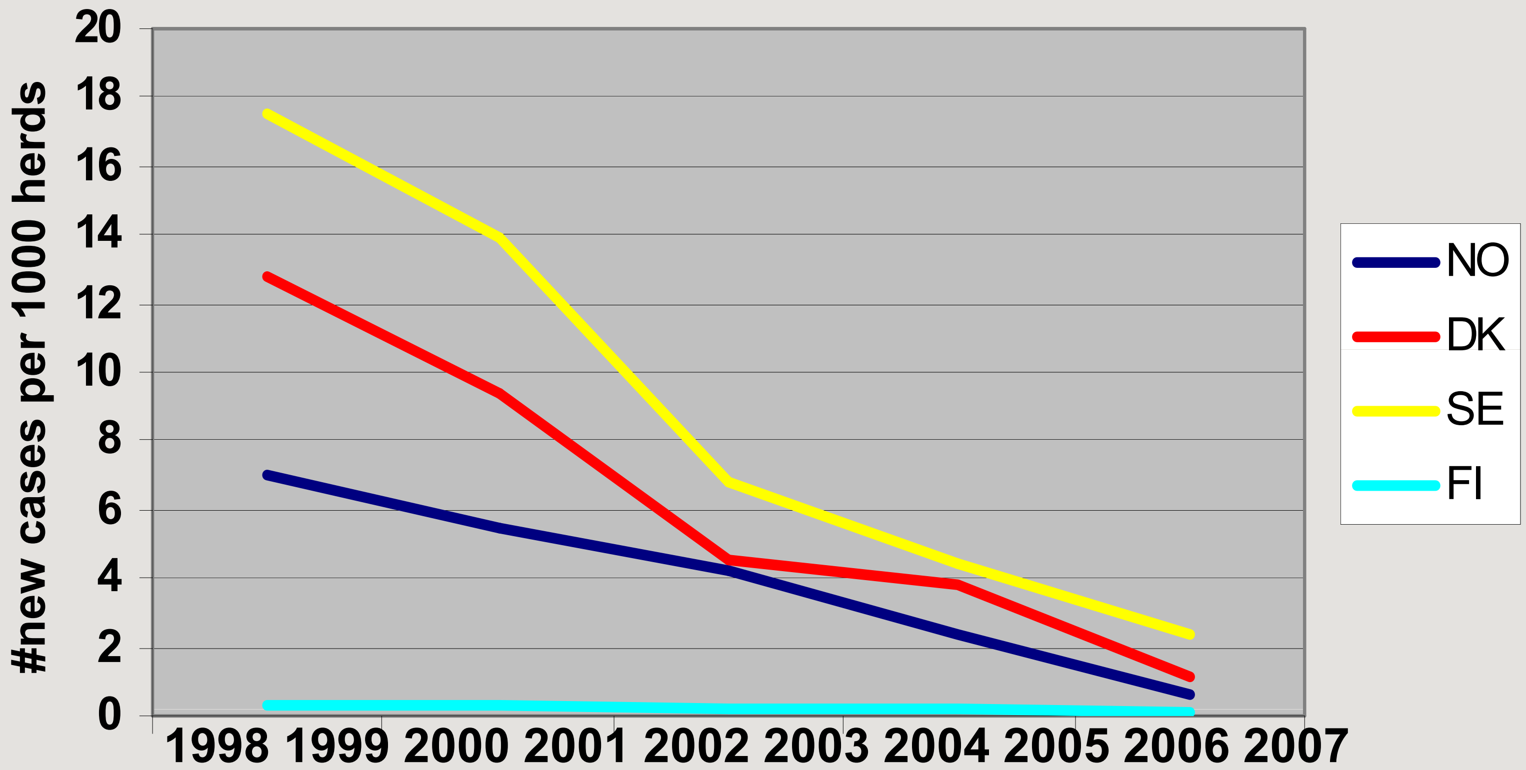
Use herd level tests (test strategies) for screening of herds with unkown status and for monitoring of free herds

General strategy

- Establish probable herd status
- Monitor and protect non-infected herds
- Biosecurity framework controlling contacts / movements of animals between herds
- Clear infected herds from the infection

BVDV

Incidence



Effects of BVDV control

Immediate effect on calf health/mortality

Improvement in animal health

Increased milk production

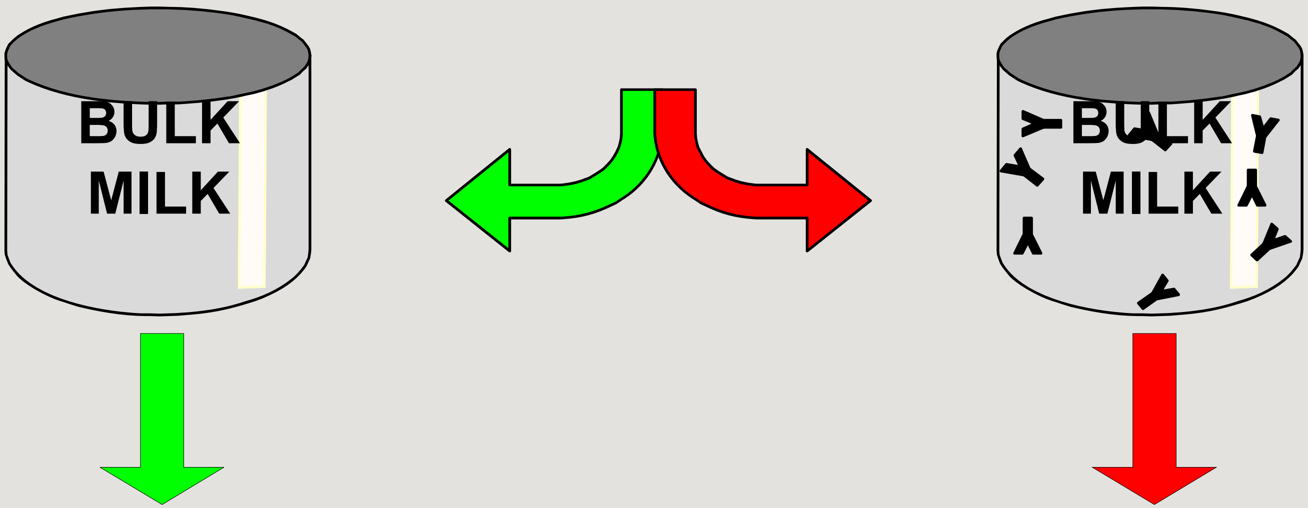
Reduced replacement rate

Improved fertility

Programme cost efficient after 2 years *(H. Houe, Biologicals 31 (2003))*

Herd level tests

Separation between non-infected and infected herds using herd level diagnostics



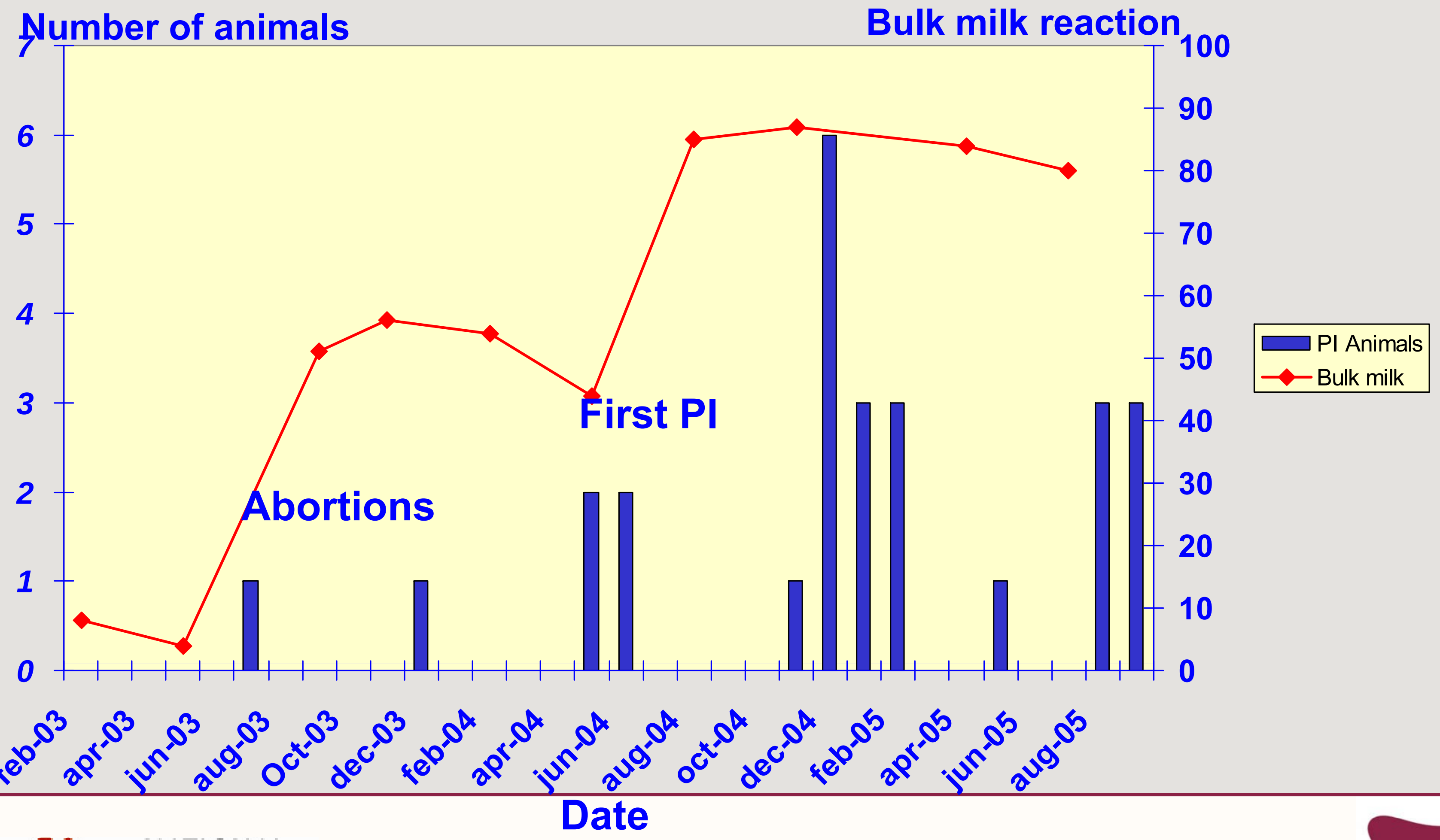
Muestreo

Obtener la primera información en una sola muestra

En hatos donde hay animales PI, la mayoria de las vacas son seropositivas

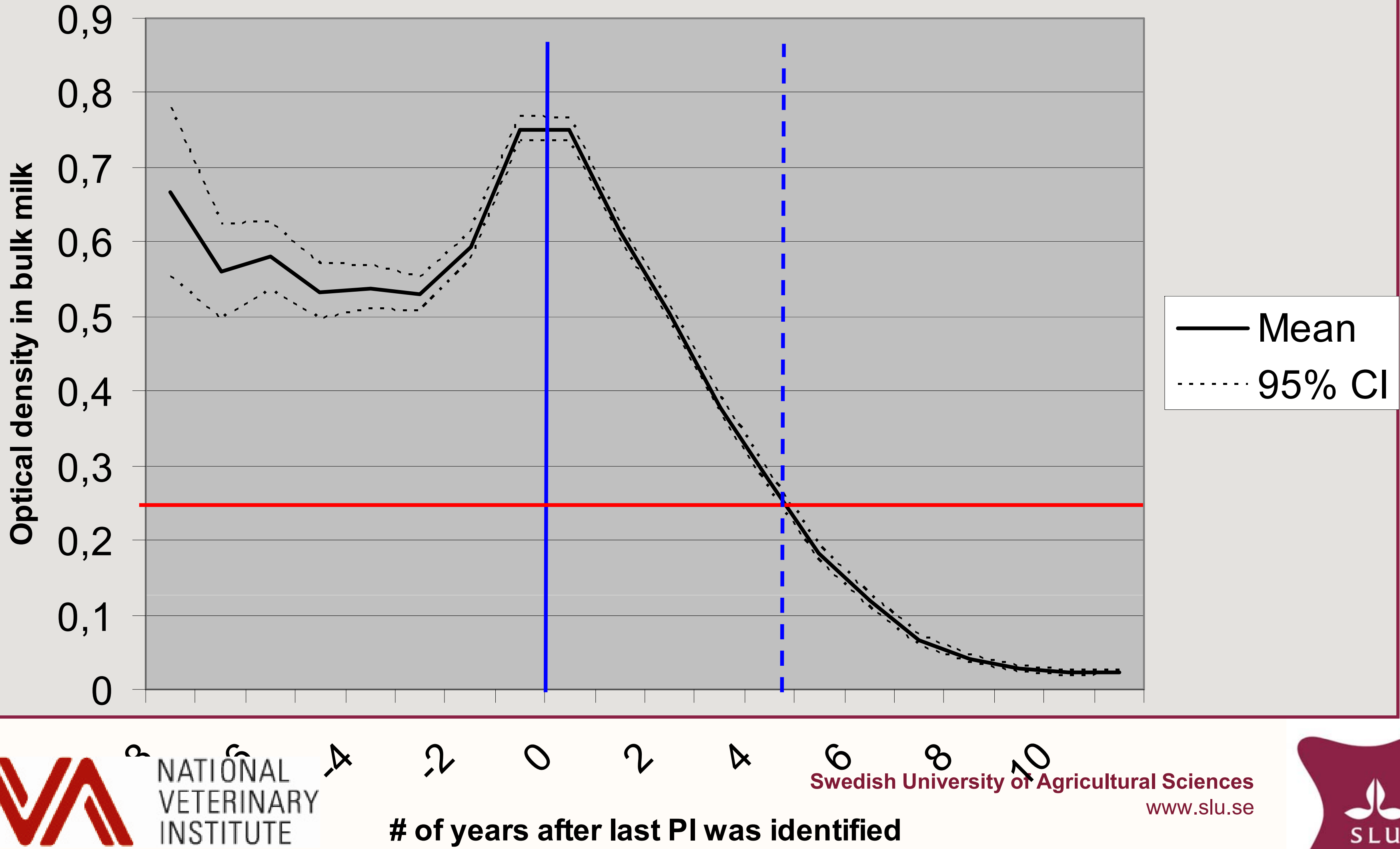
Simple y económica

Antibody reaction in bulk milk compared to occurrence of PI animals

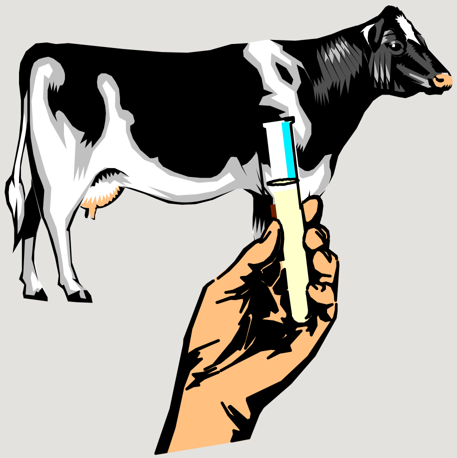


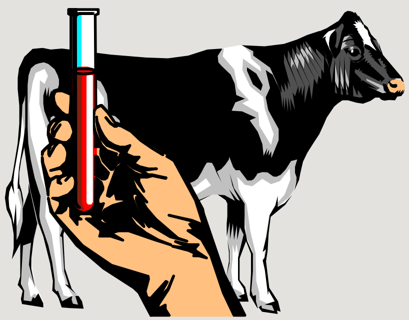
Clases de DVB	Densidad Optica
Clase 0	**0-0,049**
Clase 1	**0,05-0,249**
Clase 2	**0,25-0,549**
Clase 3	**≥0,55**

Decline of bulk milk antibody after virus elimination in 1805 Swedish dairy herds based on results from annual bulk milk screenings 1993 - 2004



Prueba ”spot”





Animales de determinada edad

Refleja la situación en el hato durante la vida de los animales seleccionados

Bovine Viral Diarrhoea Virus & Other Reproductive Pathogens

Epidemiological Studies in Peruvian Cattle

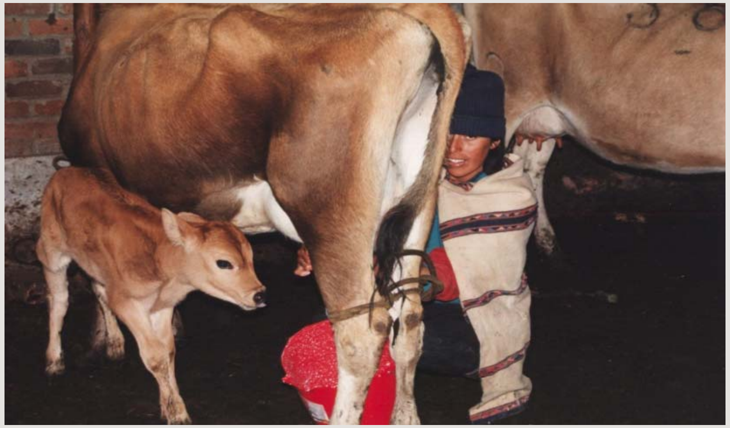
Campesina with dairy cows in Arequipa, Peru, 2003.

NATIONAL VETERINARY INSTITUTE

Swedish University of Agricultural Sciences
www.slu.se

Background

Dairy production in Peru



296 000 producers
635 000 cows in production
1.2 million tons milk/year

Background

Dairy production in Peru

“A major obstacle for these farmers, and for the national dairy production in general, consists of reproductive failures.

BVDV is considered one of the major causative agents for these failures”

Aims

to address questions regarding the epidemiology of BVDV of relevance to control, with particular focus on the situation in Peruvian dairy farms.

in addition, to adress the importance of *Neospora caninum*, as a likely differential diagnosis to BVDV in herds with reproductive disorders.

Aims

- To introduce methods for herd-level testing, and to use them to estimate the current status of BVDV and *Neospora caninum* in dairy herds (I-II).
- To estimate the probability of self-clearance of BVDV infections, and to investigate possible herd and management factors associated with it (II).
- To investigate the association between BVDV and *Neospora caninum*, and endemic abortions in a dairy herd with reproductive disorders (III).

Study populations

The Mantaro Valley (I)

Arequipa (II-III)

BVDV in dairy herds (I & II)

BVDV in smallholder dairy herds (I & II)

Material & methods

The Mantaro Valley (1998)

- Selection of 60 herds for Bulk Tank Milk (BTM) testing

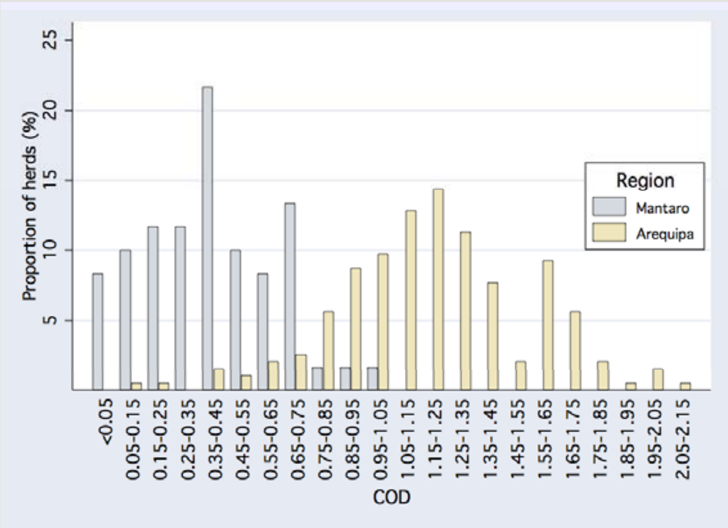
Arequipa (2003-04)

- Selection of 221 herds for BTM testing and a subset of 55 herds for individual sampling (spot tests) and data collection. Prevalence of herds with strongly positive BTM but negative spot test was used as estimate of probability of self-clearance.

- Logistic regression- was used to investigate possible associations between herd and management factors, and the probability of self-clearance.

BVDV in smallholder dairy herds (I & II)

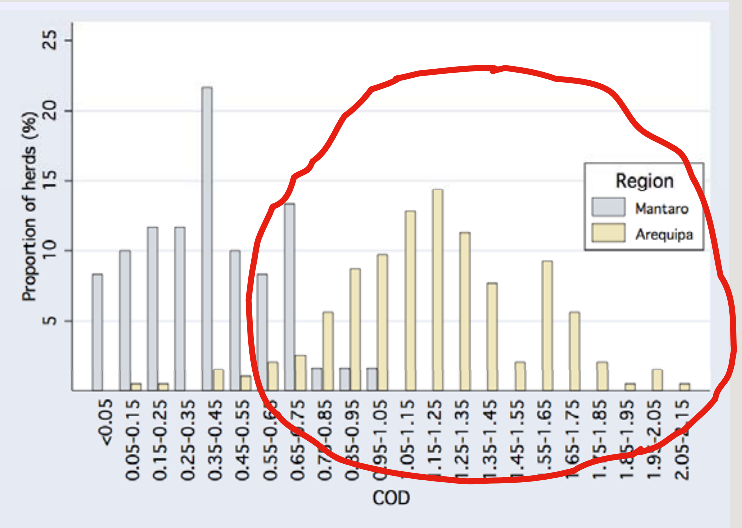
BTM



BVD-classes	COD	Interpretation
Class 0	0-0,04	negative
Class 1	0,05-0,24	low-pos.
Class 2	0,25-0,54	mid-pos.
Class 3	≥0,55	strongly pos.

BVDV in smallholder dairy herds (I & II)

BTM



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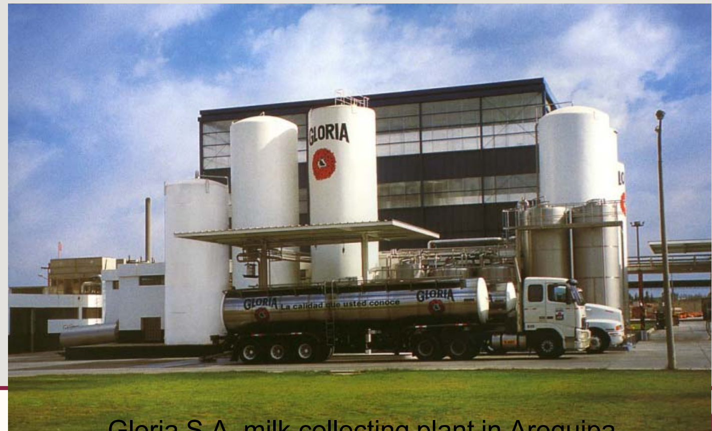
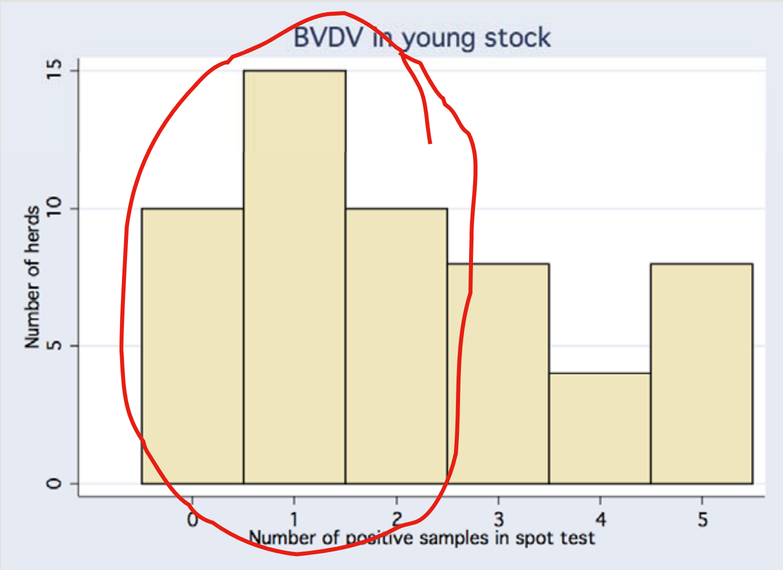
Milk collecting centre in the Mantaro Valley



Gloria S.A. milk collecting plant in Arequipa

BVDV in smallholder dairy herds (I & II)

spot tests



Regardless of herd size & vaccination practices

Ståhl K.et al, Bulk milk testing for antibody seroprevalences to BVDV and BHV-1 in a rural region of Peru. Prev Vet Med 2002
Ståhl K.et al, Self clearance from BVDV infections - a frequent finding in dairy herds in an endemically infected region in Peru Prev Vet Med 2008

N. caninum and BVDV associated abortions (III)

N. caninum and BVDV associated abortions (III)

Material & methods

- Assessment of individual serological status to BVDV and *N. caninum* of all animals > 6 months

- Calvings and abortions recorded

- Assessment of herd level BVDV infection status through testing of young stock. PI animals eliminated

- Survival analysis

N. caninum and BVDV associated abortions (III)

results & discussion

N. caninum	n	Prevalence %	Abortions n
Heifers	213	45	31
1st parity cows	158	56	34
Older cows	167	44	72
Total	538	48	137

BVDV	*n*	Prevalence (%) March 02	Jan 03	June 03	Oct 03	Jan 04	March 04
Animals > 6 mo	538	97	-	-	-	-	-
Calves 6-9 mo	22-73	-	81	56	50	23	0

N. caninum and BVDV associated abortions (III)

Survival analysis

Variable	level	β	S.E.	P	HR	95% CI
Abortion after day 100 in gestation						
N. caninum[a]	negative	0.00	-	-	1.00	-
	positive	1.86	0.54	0.00	6.40	2.20, 18.57
BVDV[b]	negative	0.00	-	-	1.00	-
	positive	-0.33	0.21	0.11	0.72	0.47, 1.08
Heifer		0.00	-	-	1.00	-
1st parity cow		0.21	0.65	0.74	1.24	0.35, 4.38
Older cows		0.59	0.56	0.30	1.80	0.60, 5.44
N. caninum x heifer		0.00	-	-	1.00	-
N. caninum x 1st parity cow		-0.54	0.71	0.45	0.59	0.14, 2.37
N. caninum x older cow		-1.23	0.63	0.05	0.29	0.08, 1.01

N. caninum and BVDV associated abortions (III)

Survival analysis

N. caninum by parity	HR	P	95% CI, HR
N. caninum positive heifer	6.40	0.00	2.20, 18.57
N. caninum positive 1st parity cow	3.74	0.00	1.51, 9.30
N. caninum positive older cow	1.87	0.05	0.99, 3.53

Ståhl K.et al. A prospective study of the effect of Neospora caninum and BVDV infections on bovine abortions in a dairy herd in Arequipa, Peru. Prev Vet Med, 2006

Concluding remarks

- The level of BVDV exposure in the studied population is very high, partly explained by high cattle density and livestock trade.
- The probability of self-clearance is high, regardless of vaccination practices and herd size. Consequently, self-clearance is a process that should be taken into account when a control programme is under consideration.
- The level of exposure to *Neospora caninum* is high, and infection with the parasite is associated with late abortions. The magnitude of the effect of infection is most prominent in heifers and decreases with parity, suggesting that maternal immunity to the parasite may increase with age.

Can BVD be controlled in Peru?

At a National/Regional/Local level

I would say YES, at a regional or local level!

But there need to be….

Motivation among producers, farmer organisations and industry

- Awareness of the problem
- Willingness to be involved
- someone must take the lead

Good laboratory infrastructure

Financial solution

Good understanding of epidemiology

Predictors for progress

Ability to..

..prevent new infections

..intervene in infected herds

..rapidly detect new cases of infection

..get acceptance of / compliance with the scheme

acknowledgements

Dr Hermelinda Rivera, friends & colleagues at UNMSM

Cesar Ortiz & the people at the Gloria dairy plant in Arequipa

Daniel Lozada & the people at the farm Santa Gabriela

Farmers & cattle in Peru

Prof. Stefan Alenius, Ann Lindberg & other co-authors

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MUCHAS GRACIAS