Factors associated with within-herd transmission in cattle of serotype A foot and mouth disease virus in Argentina, 2001

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Conclusion

- Factors associated with transmission: herd size, days to detection and vaccination
- Improved understanding of disease spread
- Field study serotype A
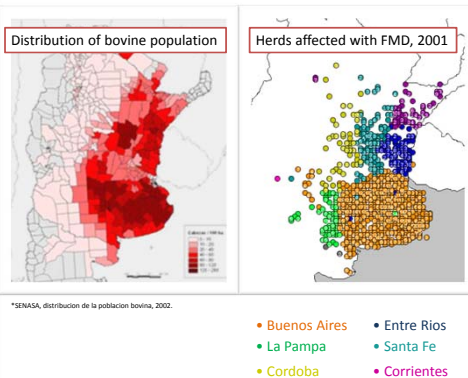- Epidemiologic factors- targeted resources


Introduction

FMD in Argentina

- 1870 - Introduced
- 1996 - FMD free-with vaccination
- 2000 - FMD free-without vaccination
- 2000 - FMDV serotype A and O epidemic
- 2001- new serotype A extensive epidemic

Argentina 2001 Epidemic

Distribution of bovine population

Herds affected with FMD, 2001

*SENASA, distribucion de la poblacion bovina, 2002.

- Buenos Aires
- Entre Rios
- La Pampa
- Santa Fe
- Cordoba
- Corrientes

Within herd transmission

- Experimental studies: controlled variables (in serotype O)
- Simulation models: using information from experimental studies when available.
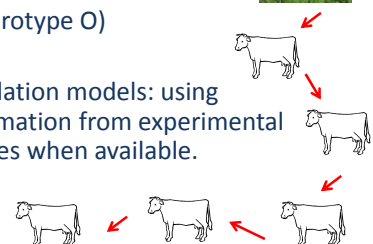
Objectives

- To estimate the intra-herd transmission coefficient (β)

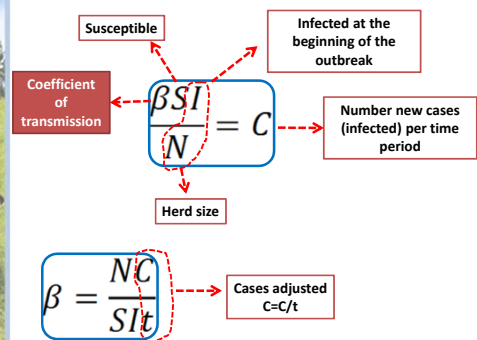- To estimate the association with potential epidemiological factors for the disease.

Materials & Methods

Database

- Outbreak (case): herd officially recognized by SENASA as infected.

- Records : demographic variables and disease/dates records.

Coefficient of Transmission
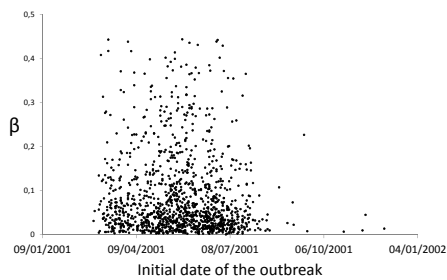
Estimating β- "Mass action" frequency-dependent

Susceptible — Infected at the beginning of the outbreak

Coefficient of transmission

$$\frac{\beta S I}{N} = C$$

Number new cases (infected) per time period

Herd size

$$\beta = \frac{N C}{S I t}$$

Cases adjusted C=C/t

Multivariate logistic regression

- Dependent variable: β categorized

  1 = > β median
  0 = ≤ β median

- Independent variables

  o Latitude and longitude
  o Duration of the outbreak
  o Herd size
  o Days initial infection-detection
  o Predominant age group
  o Days initial infection-vaccination

Results

Distribution of β Over Time

β

| 0,5 | 0,4 | 0,3 | 0,2 | 0,1 | 0 |

09/01/2001   09/04/2001   08/07/2001   06/10/2001   04/01/2002

Initial date of the outbreak

Multivariate Logistic Regression

Variable	Category	n	OR	95% CI	P-value
Herd size (100 animals)		1134	1.01	(1.00, 1.02)	0.04
Days to detection[a]		1134	0.95	(0.92, 0.98)	0.001
Vaccination					
	Non vaccinated	747	1	*	Reference
	0-4 days after[a]	25	0.59	(0.26, 1.34)	0.211
	1-3 days before[a]	35	0.43	(0.21, 0.88)	0.021
	4-7 days before[a]	65	0.52	(0.31, 0.88)	0.015
	8-14 days before[a]	55	0.58	(0.33, 1.01)	0.054
	15-28 days before[a]	56	0.7	(0.40, 1.21)	0.205
	>28 days before[a]	151	0.51	(0.36, 0.74)	<0.001

[a] days in relation to the estimated day of first infection in the herd.

Discussion

Within Herd Transmission Associations

- Herd size
  - ↑ Susceptible
  - ↑ Density?

- Time to detection
  - ↑Time→ Low Density Herds → Lβ
  - ↓time→ High Density Herds → Hβ

Within Herd Transmission Associations

- VACCINATION- DAYS TO VACCINATION

  o Decreased spread in vaccinated herds
  o Vaccination >28 days before outbreak
  o Decreased transmission in short vaccination-challenge time
  o Vaccine A/Arg/00 vs A/Arg/01
  o Parallel dynamics of spread-immunity development

- Variables not associated with β

  o Duration of the outbreak

  o Predominant age group in the herd

  o Latitude and longitude

Conclusion

- Improved understanding of mechanisms for disease spread

- SEROTYPE A

- Epidemiologic factors- targeted resources

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Questions?