Cadena de infección / Cadena de prevención™

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Boehringer Ingelheim

El Concepto

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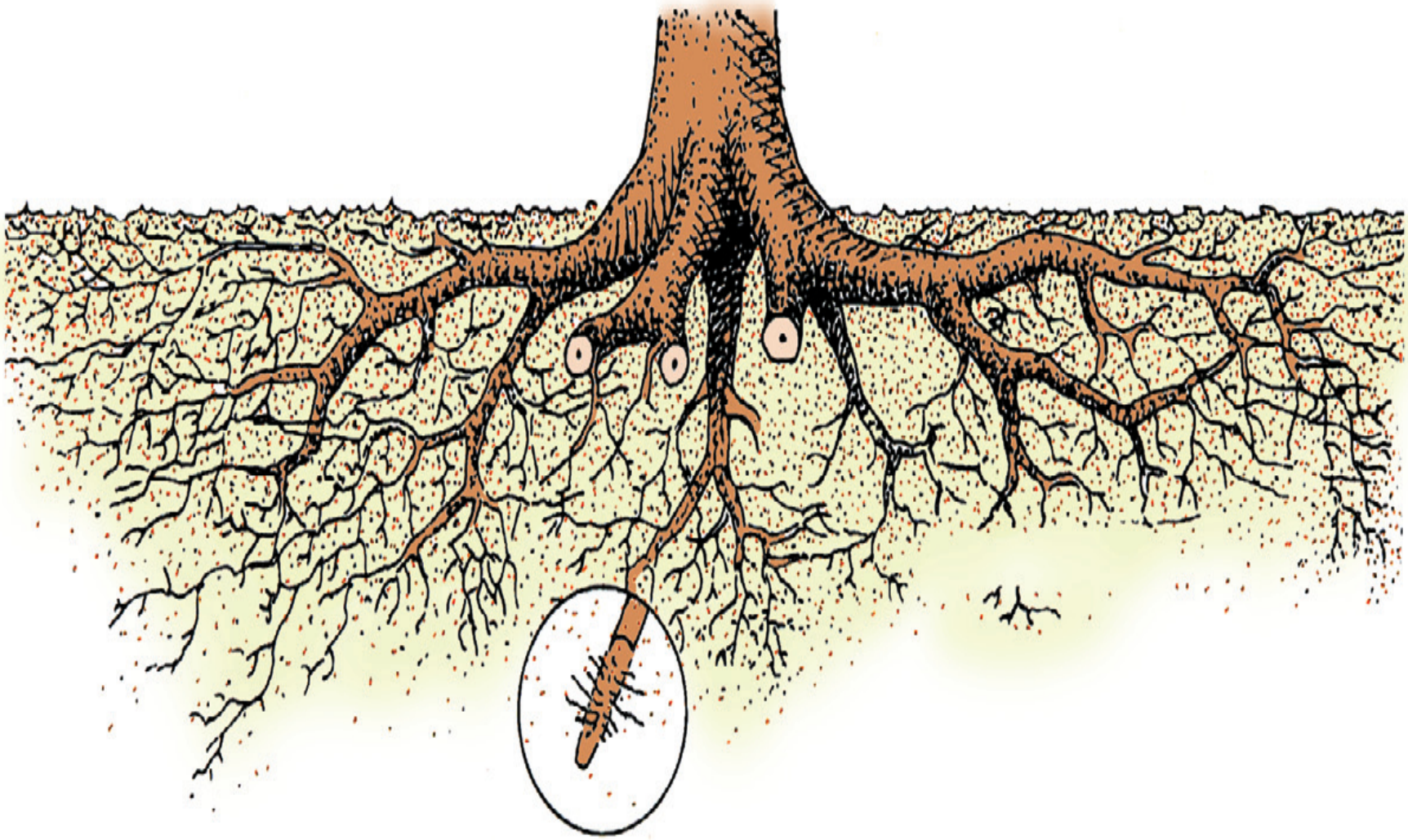

El pensamiento o razonamiento en “cadena”

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Cadena de Infección de los patógenos del cerdo

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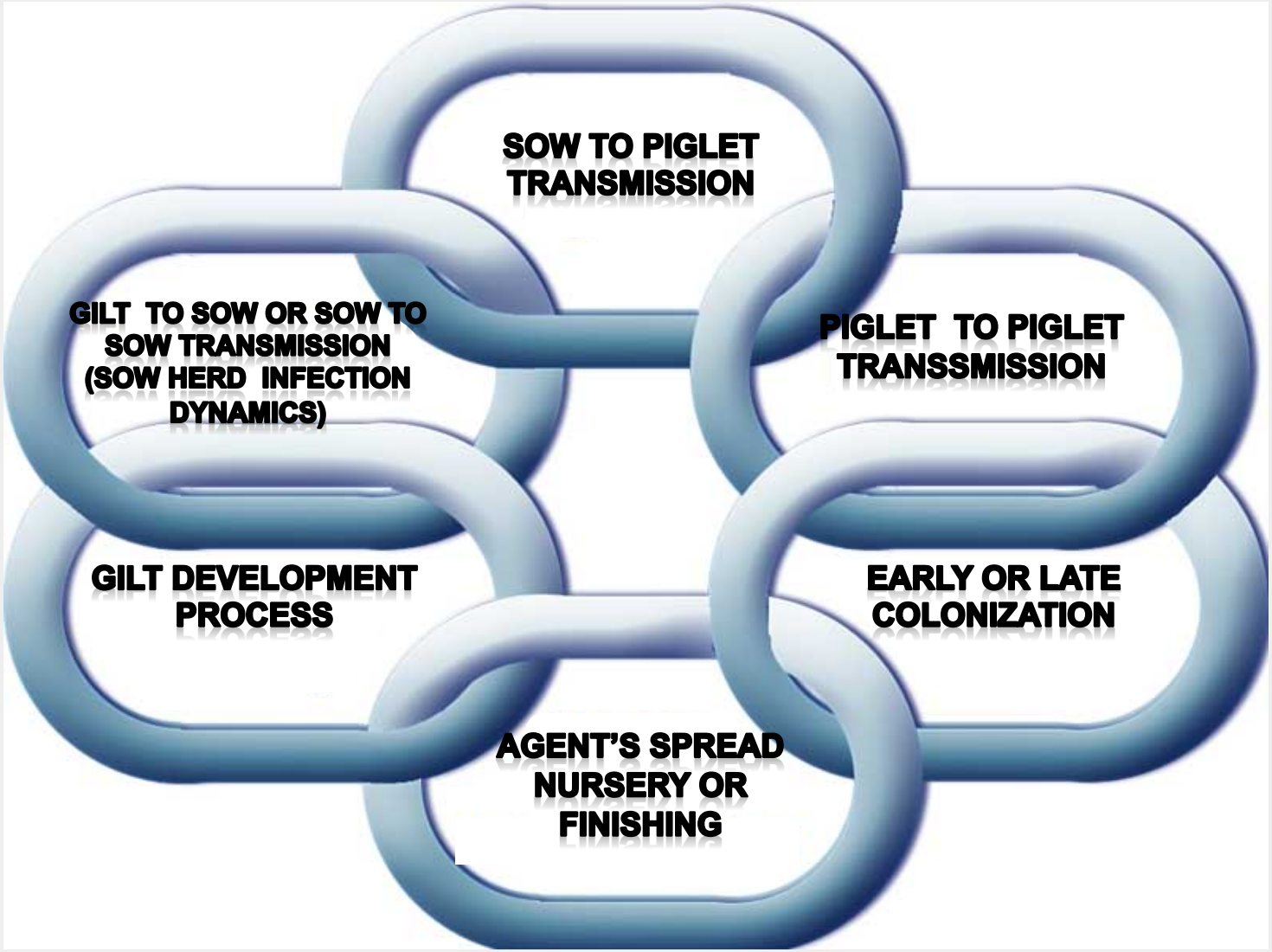

1.- Cadena de producción

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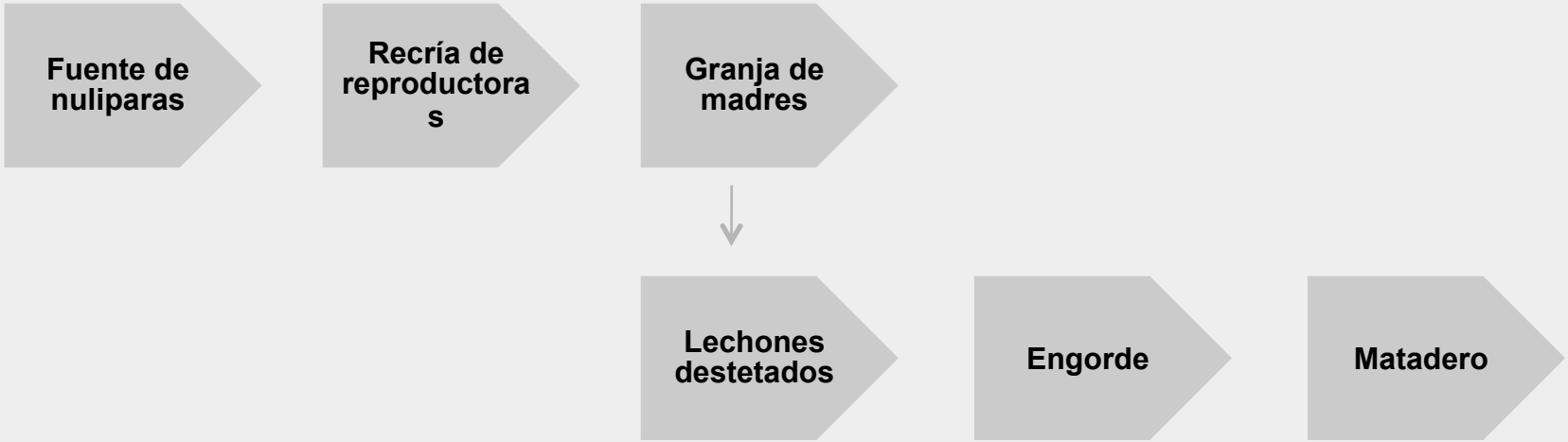
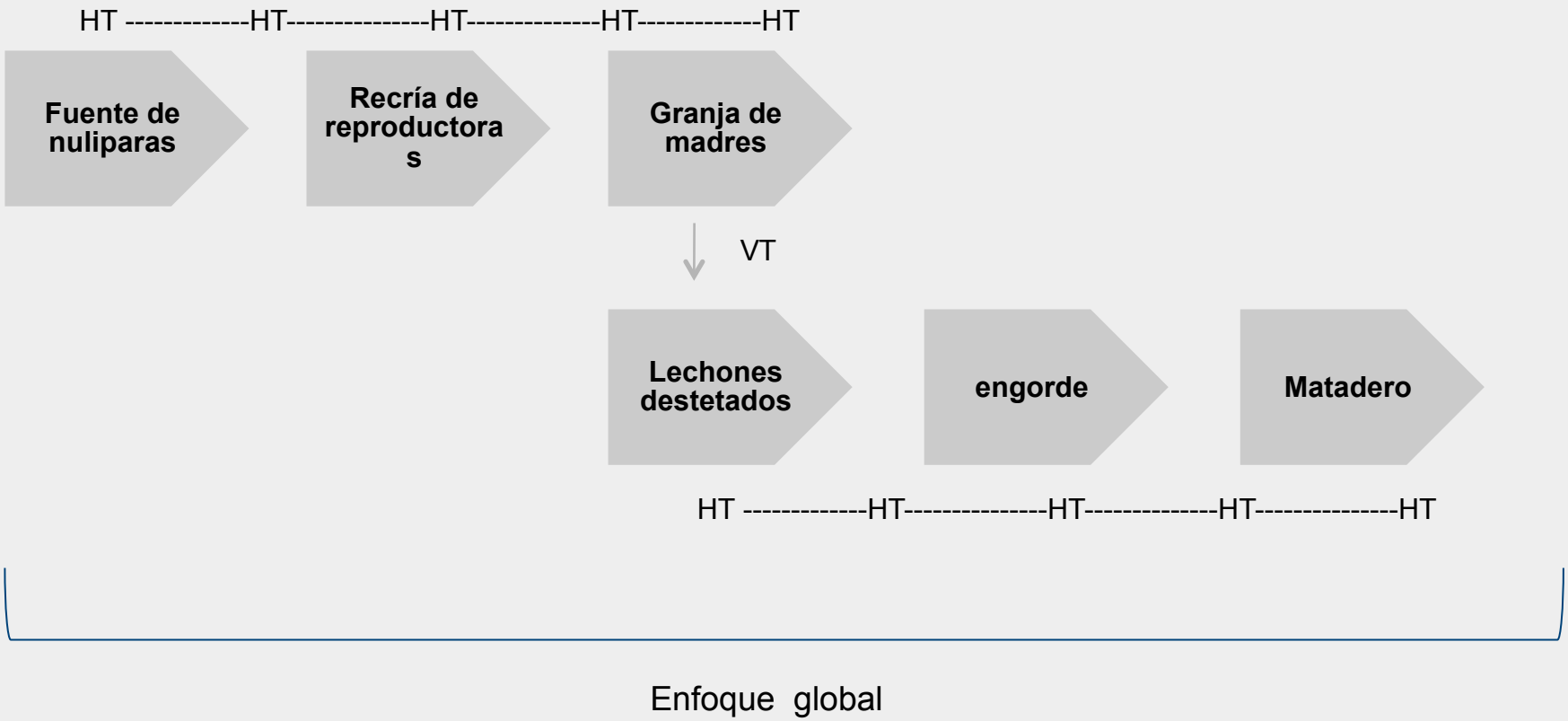
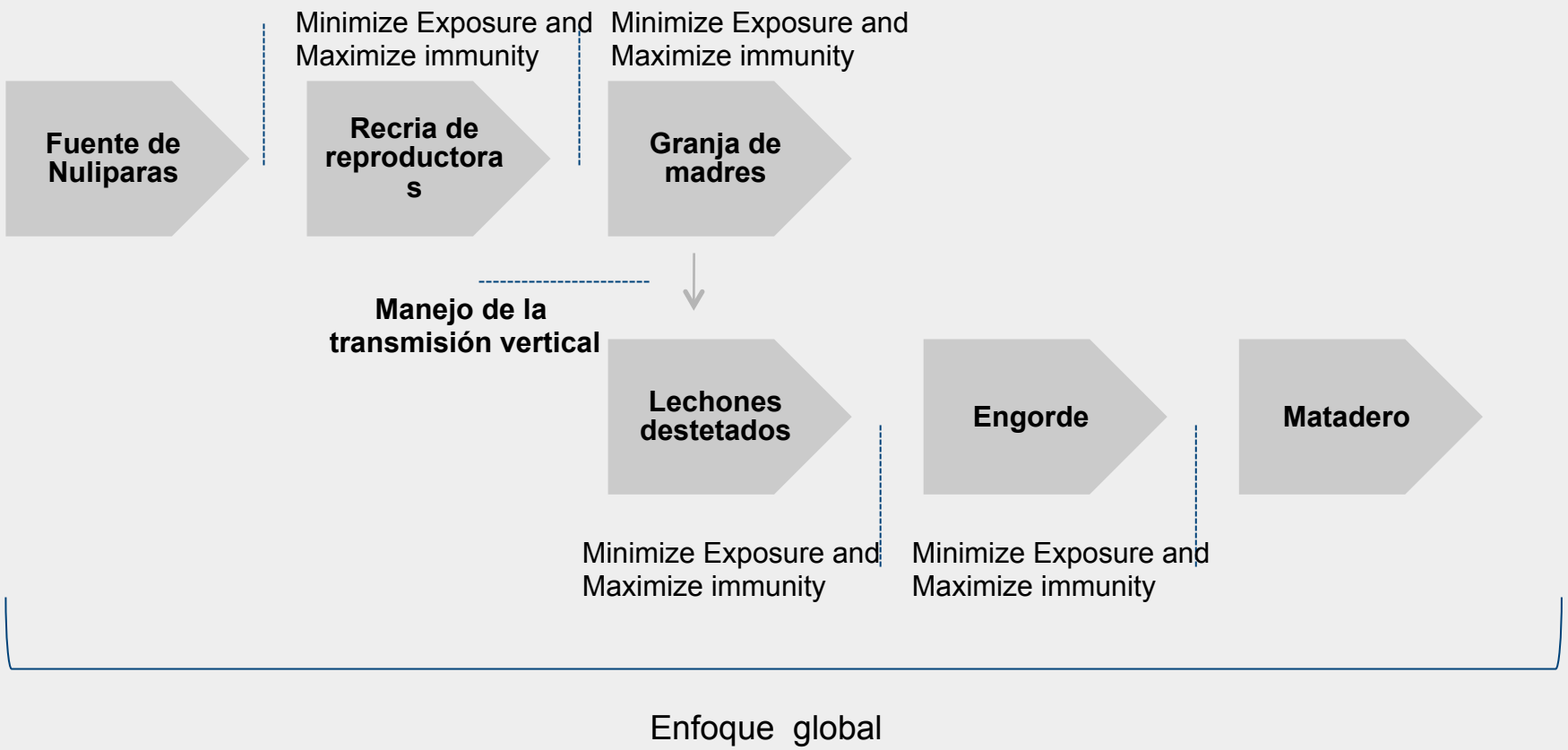


2.- Cadena de Infección

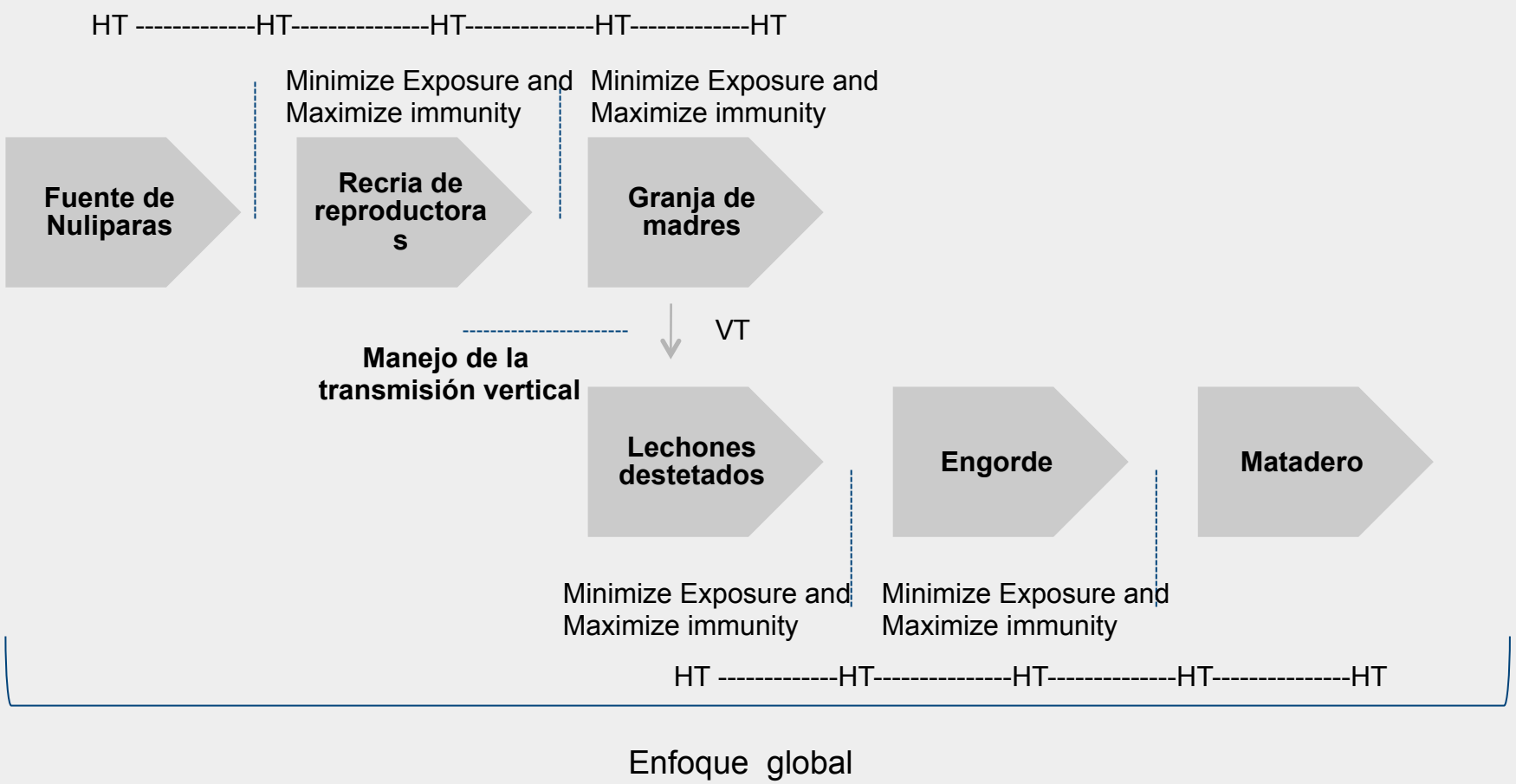


HT: Transmisión Horizontal
VT: Transmisión vertical

3.- Prevención – Enfoque Global (Sistema)



4.- Infeccion/Prevencion Cadena – Enfoque global



HT: Horizontal Transmission
VT: Vertical transmission

Las Herramientas

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Minimizar exposición

- Bioseguridad
- Manejo del flujo de producción
- Antibioticos

Exposición

Maximizar inmunidad

- Vacunación
- Aclimatación
- Manejo en lactación
- Adecuada nutrición

Inmunidad

Artículos previos al concepto “Cadena de infección”

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Goodwin RFW: 1965, The phenomenon of suppressed respiratory disease in the litter of older sows. Vet Rec. 77:383-387.

Alexander TJL, Thornton K, Boon G, Lysons RJ, Gush AF: 1980, Medicated early weanin

Clark L, Scheidt AB, Armstrong CH: 1991, The effect of all-in/all-out management on 106 pigs

Clark LK, Hill MA, Kniffen TS: 1994, An evaluation of the components of MEW. Swine He

Dee S: 1996, The porcine respiratory disease complex: Are subpopulations important? Sw

Harris D: 2000, Multi-site pig production. In Harris D.eds 1st ed. Ams, Iowa: Iowas State Uni

Pijoan, C: 2005, A controversial view of *Mycoplasma hyopneumoniae* epidemiology. A

Fano E, Pijoan C, Dee S: 2007, New information on the epidemiology of *Mycoplasma hyopneumoniae*. Allen D. Leman Swine Conference (Preconference Workshop: Symposium on swine eradication: New approaches to managing old problems) 17-22.

Alexander TJL, Thornton K, Boon G, Lysons RJ, Gush AF: 1980, Medicated early weaning to obtain pigs free from pathogens endemic in the herd of origin. Vet Rec. 106:114-119.

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Objetivo	Intervención	Efecto epidemiológico
Maximizacion inmunidad cerda	Vacunación cerda	
Minimizacion de excrecion cerda	Medica. cerda	Minimizando transmisión Vertical
Minimización colonización	Destete temprano	
Minimización colonización	*Medicacion lechón*	Minimizando transmisión Horizontal

Entiende la afectación del patógeno y su transmisión. Sería una cadena de infección parcial

PRRS Cadena de Infección™

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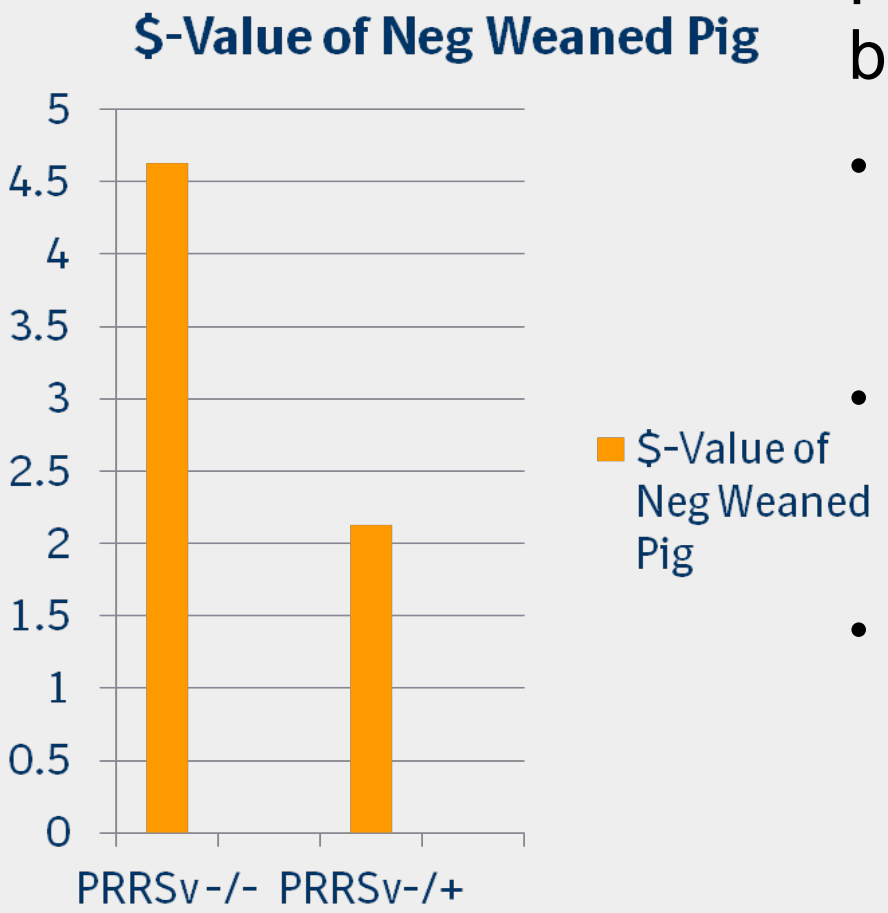
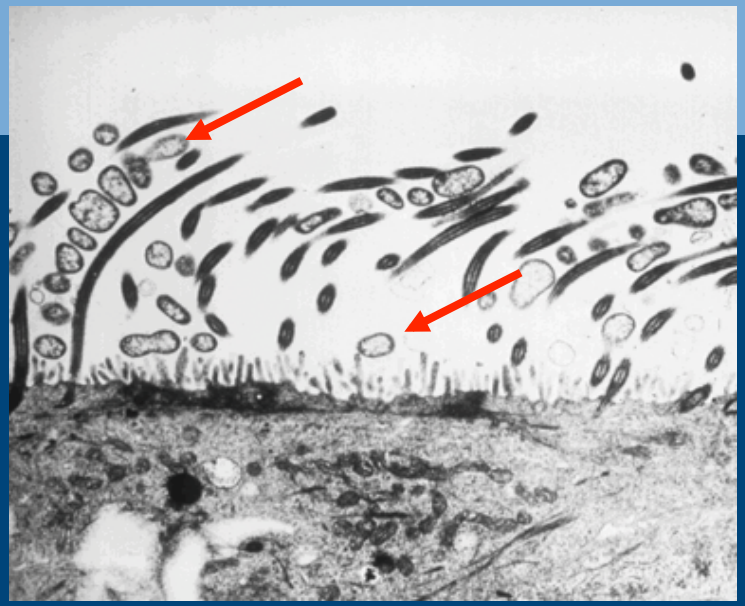


PRRS instability in the breeding herd

- Defined as evidence of PRRSv circulation and transmission vertically and/or horizontally
- Can cause reproductive problems w/ biologic & economic impact
- Can lead to weaning of PRRSv positive piglets w/ biologic & economic impact
  - *PRRSv Control or Elimination; D.Holtkamp, George Young Conf., 2012*
  - *Assessment of economic impact of PRRSv on U.S. pork producers; D. Holtkamp et.al., JSHAP, 2013*

Mycoplasma hyopneumoniae
“Cadena de infección”



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La cadena de infección de *M. hyopneumoniae*

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- Enfermedad respiratoria compatible con Mycoplasma en cebaderos.
- Exposición del patógeno en transiciones
- Prevalencia al destete
- Inestabilidad en granja de madres/Transmisión vertical
- Manejo del Micoplasma en futuras reproductoras

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Level 1

Animales de reemplazo

Nuliparas como factor de riesgo de enfermedad respiratoria

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- Maes et al, 1999. Risk indicators for the seroprevalence of *Mycoplasma hyopneumoniae*, porcine influenza viruses and Aujeszky's disease virus in slaughter pigs from fattening pig herds.

- Maes et al., 2000. Herd factors associated with the seroprevalences of four major respiratory pathogens in slaughter pigs from farrow-to-finish pig herds.

- Meyns T et al., 2011. A cross-sectional study of risk factors associated with pulmonary lesions in pigs at slaughter

- Nathues H, 2012. Herd specific risk factors for *Mycoplasma hyopneumonie* infections in suckling pigs at the age of weaning

¿Por qué es tan importante la hembra de reemplazo?

Persistencia del *M. hyopneumoniae*

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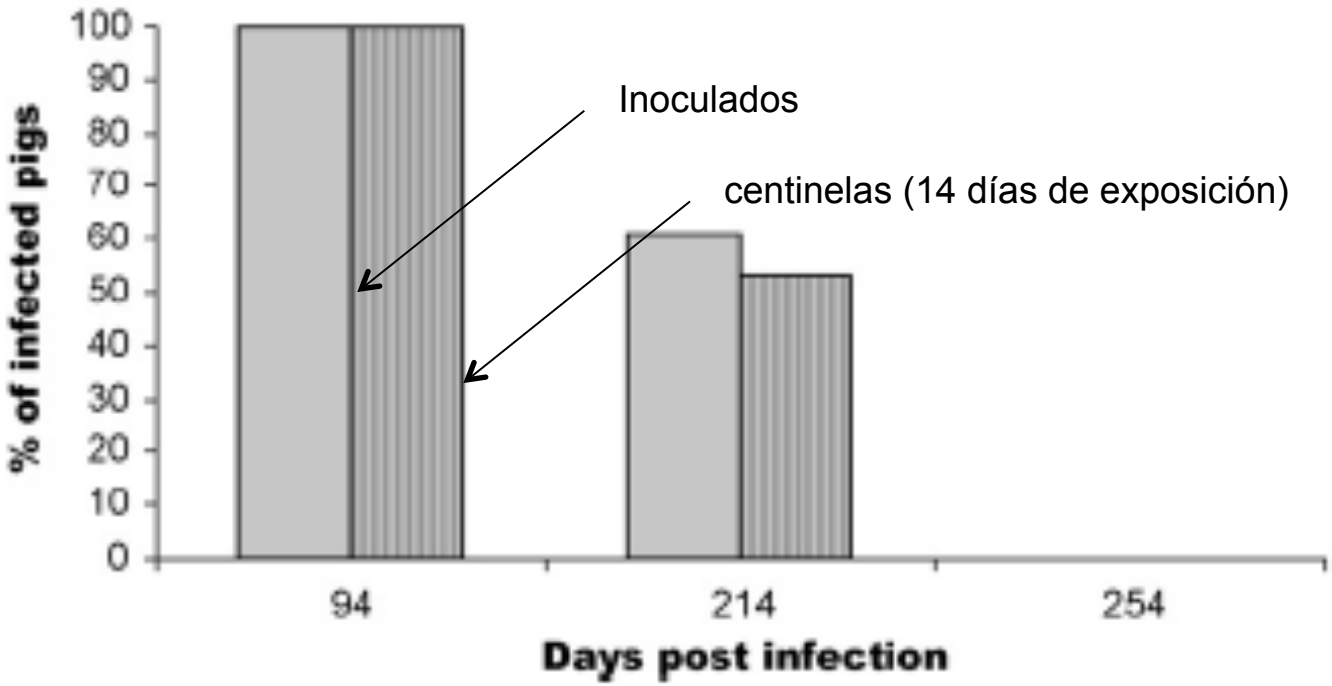

Fig. 2. Percentage of principals and sentinels infected during the chronic phase of *M. hyopneumoniae* infection (nested-PCR from bronchial swabs). Solid column: principal pigs; and patterned column: sentinel pigs. Proportion of infected animals at 94, 214 and 254 dpi were statistically different (p-value < 0.05).

An assessment of the duration of *Mycoplasma hyopneumoniae* infection in an experimentally infected population of pigs

Maria Pieters, Carlos Pijoan[2], Eduardo Fano[1], Scott Dee*

Mycoplasma hyopneumoniae: Gilts, are they the problem?

James F. Lowe, DVM ,MS
Lowe Consulting Ltd. Albers, Illinois
Department of Veterinary Clinical Medicine, College of Veterinary Medicine, University of Illinois at Urbana Champaign

2012 Allen D. Leman Swine Conference

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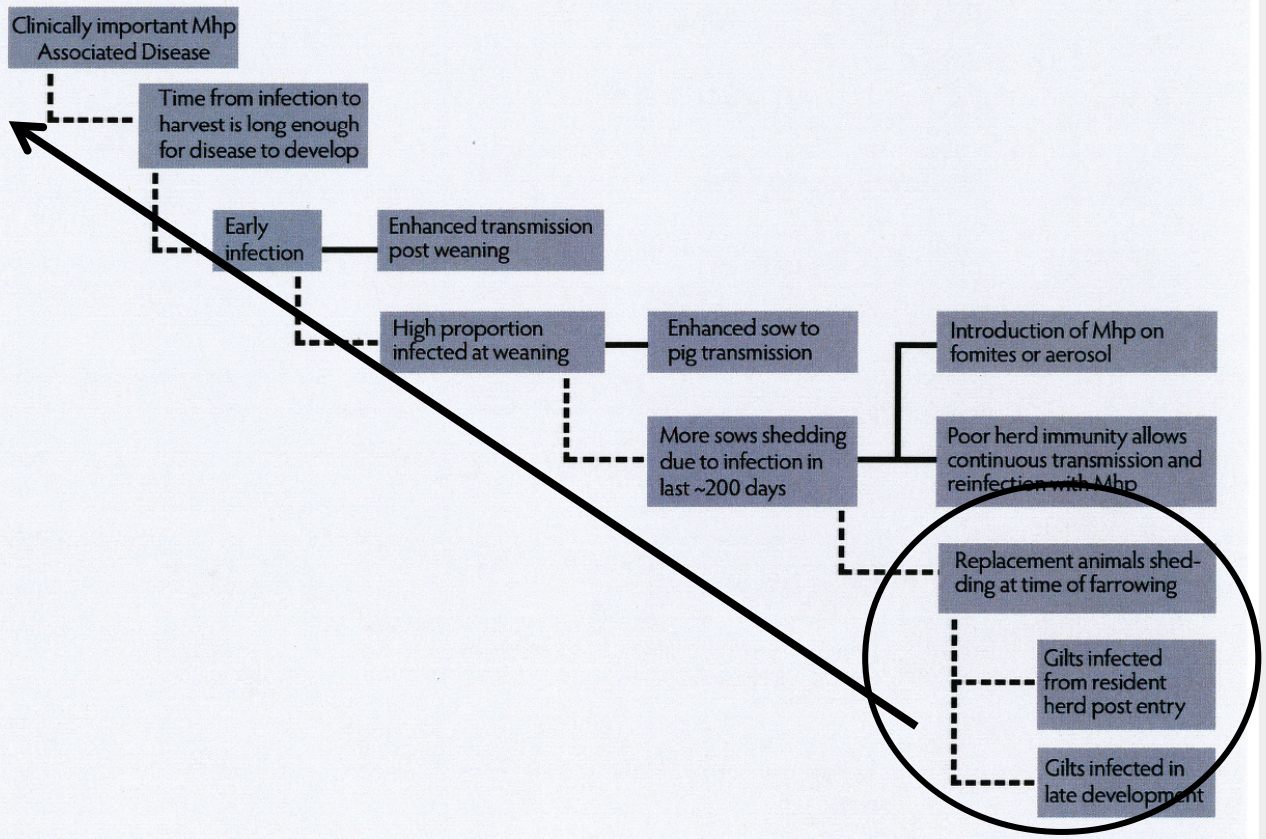
Mycoplasma hyopneumoniae: Gilts, are they the problem?

Figure 1: The status of gilts at entry to the sow farm determine the number of infected pigs at weaning which in turn determines if there is clinically important disease associated with Mhp during the growing period. The there is no other interpretation of the logic path because the alternative paths shown with a solid line are either biologically implausible or there is sound evidence to suggest that they cannot be meaningfully changed with known interventions.



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Level 2

Granja de madres

USING SOW MASS VACCINATION MYCOPLASMA PROTOCOLS FOR THE CONTROL OF MYCOPLASMA HYOPNEUMONIAE.

EF Diaz, JC Chevez, JR Angulo

Proceedings of the 19th IPVS Congress, Copenhagen, Denmark, 2006 · Volume 1

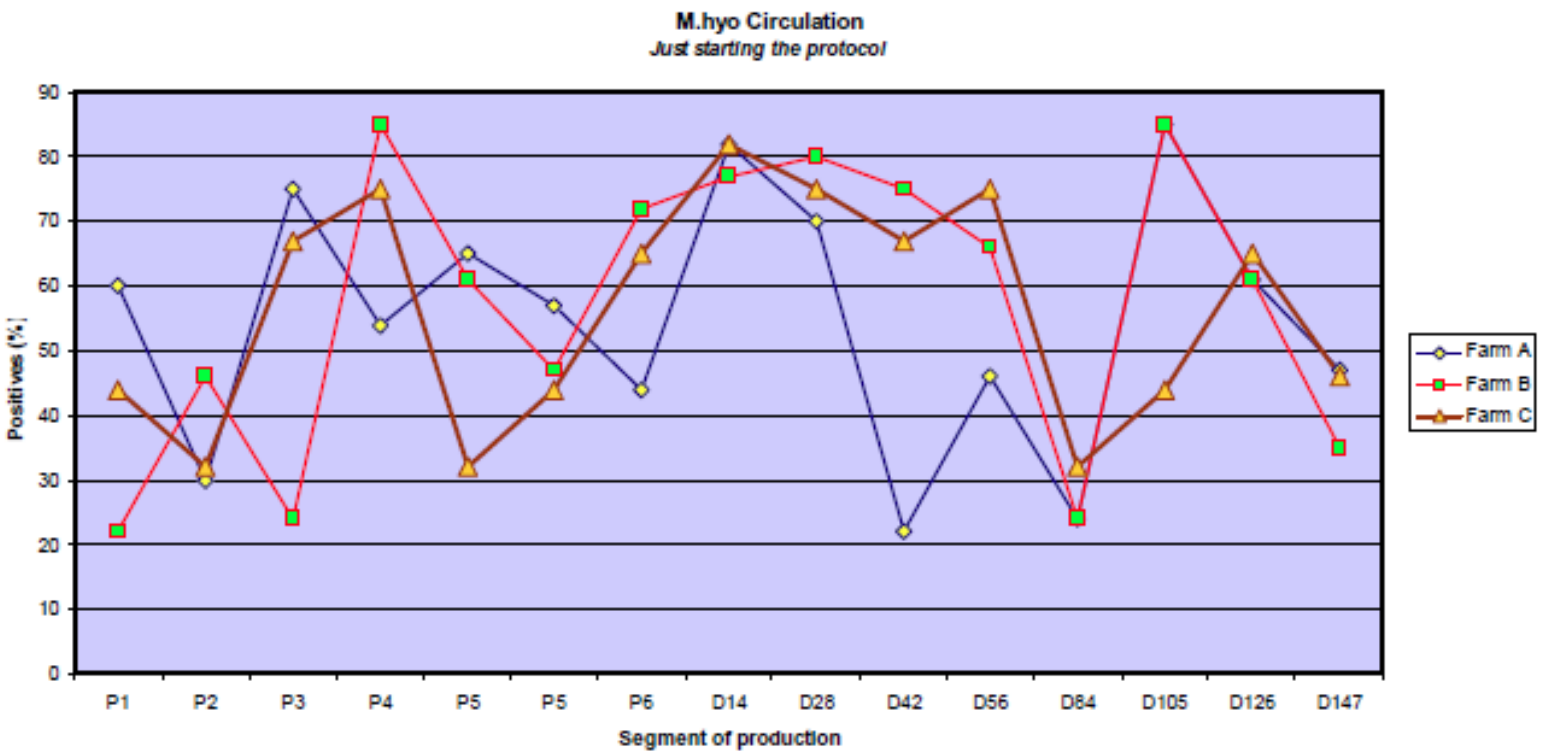

Figure 1 Initial M.hyo serology

Dinamica de inefcción en madres = % de transmisión vertical = Prevalencia de lechones al destete

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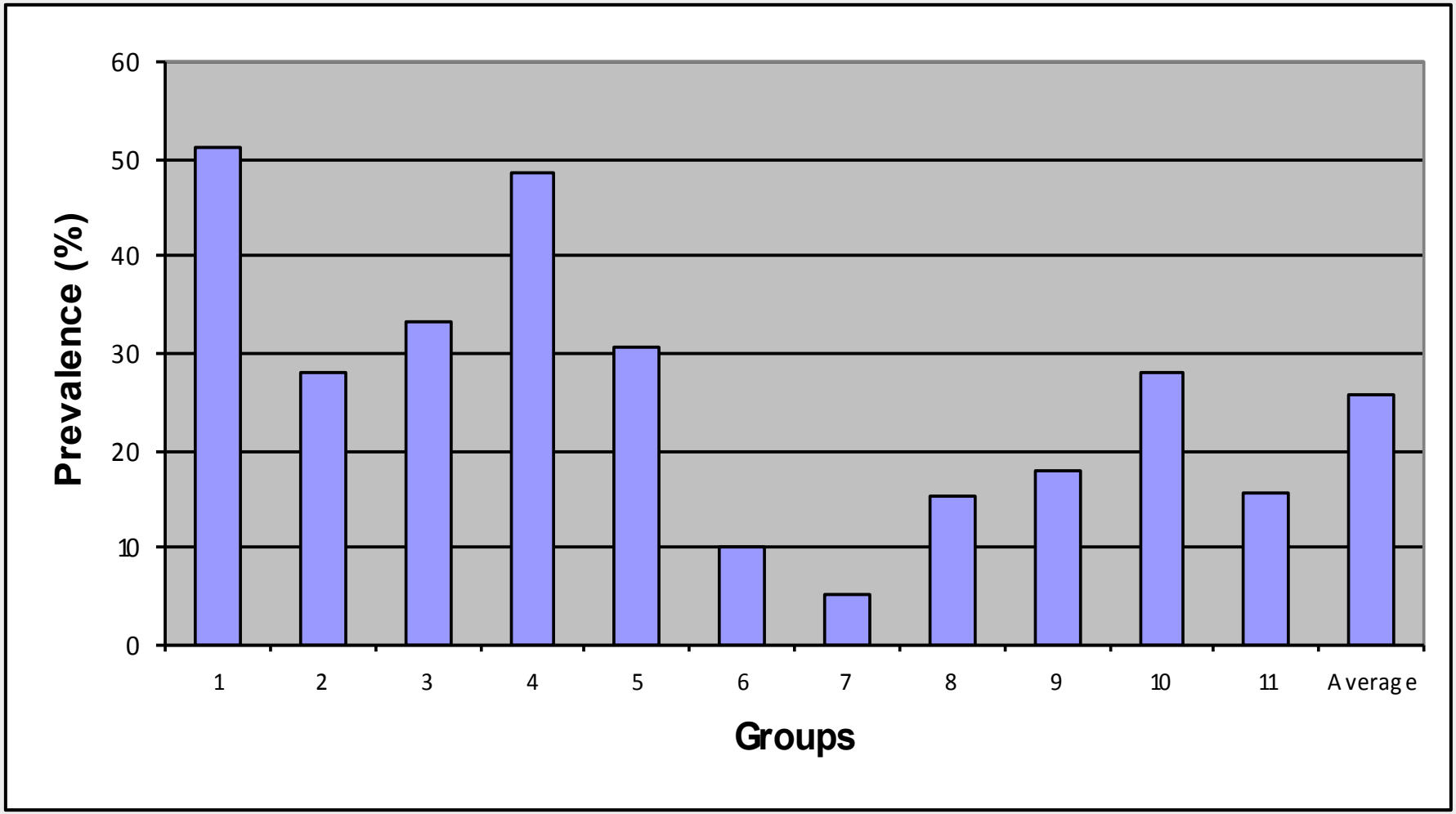

Fano et al., 2007

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Level 2

Granja de madres

Transmisión VERTICAL

Level 3

Fase de cebo

Transmisión Vertical/ Transmisión Horizontal
Es un solo evento: Cadena de Infección

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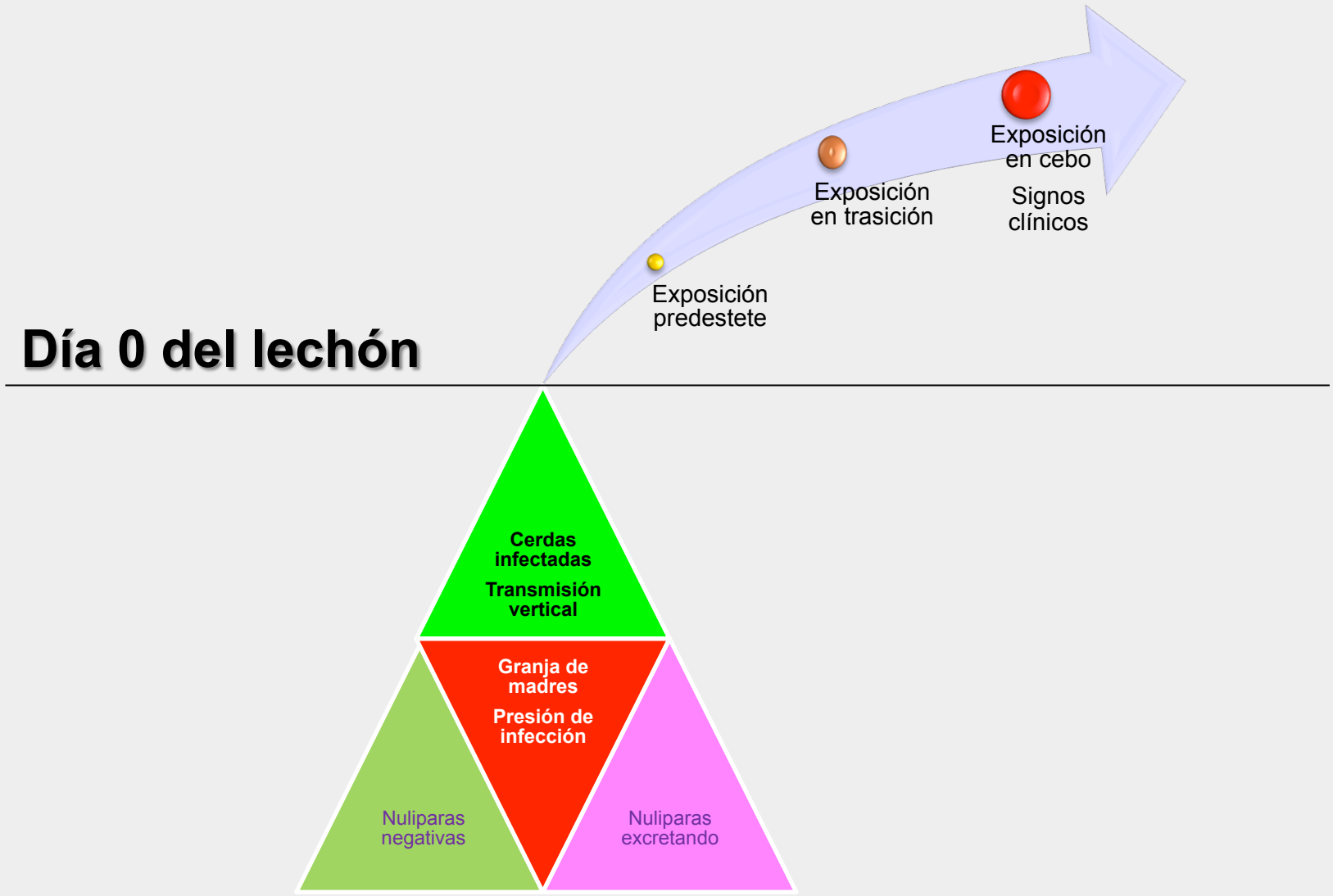

Prevalencia de Myco al destete segun la semana de destete

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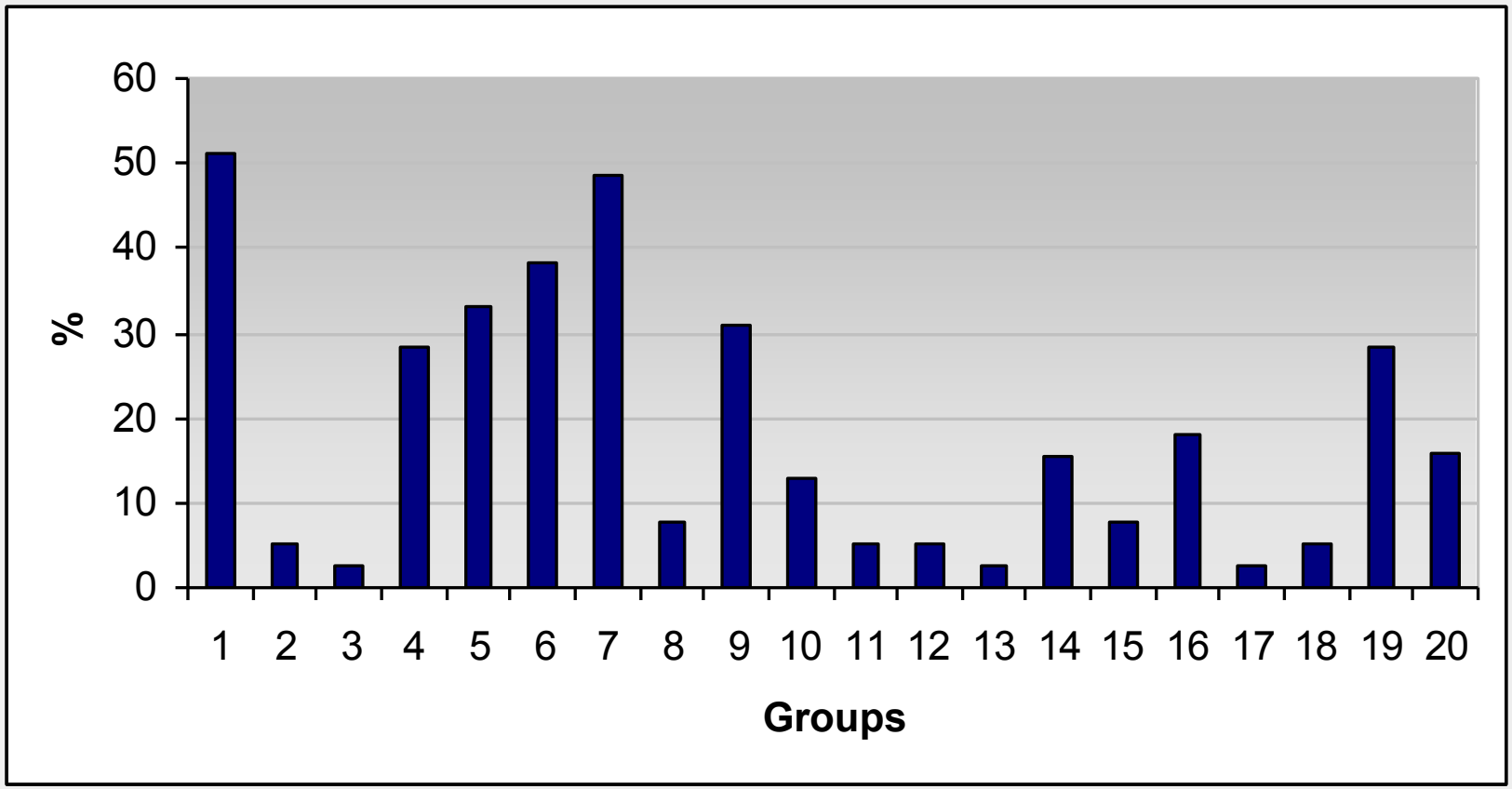

* Fano et al., 2007

Correlation of prevalence at weaning with severity of the disease in finishing populations

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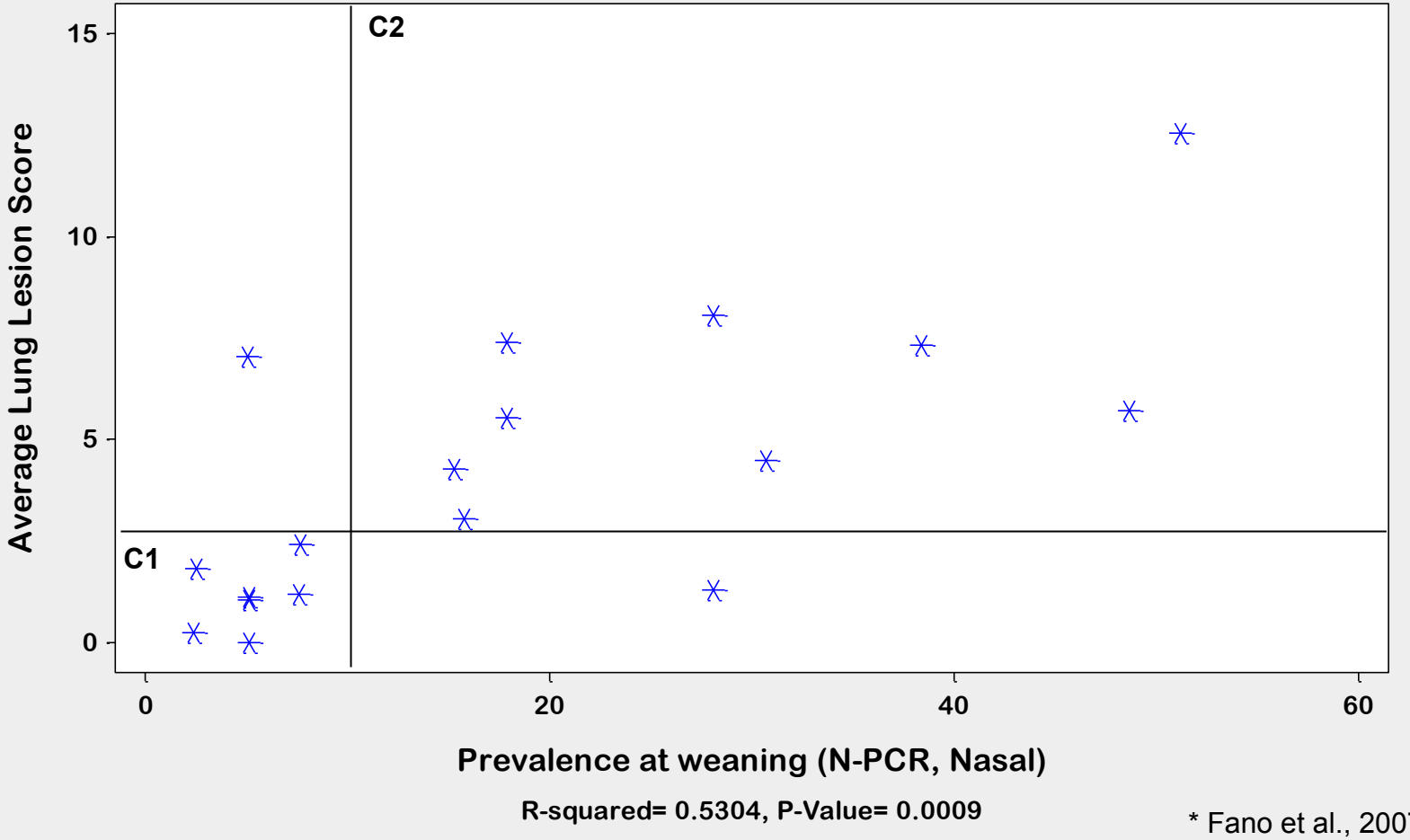

* Fano et al., 2007

How prevalent is M. hyo instability

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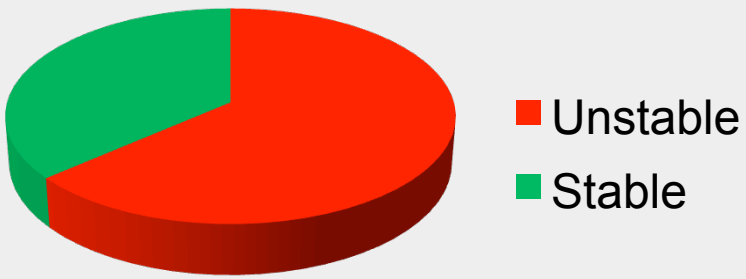
System	Number sow herds tested	Unstable	Stable
A	4	2	2
B	6	5	1
C	3	1	2
D	6	5	1
Total	19	13 68%	6 32%

4 Systems tested in past year
Mhyo diagnosed downstream
1,2,3 dose vax protocols used

Stability



Variation in 6 sow herds over 3 time periods

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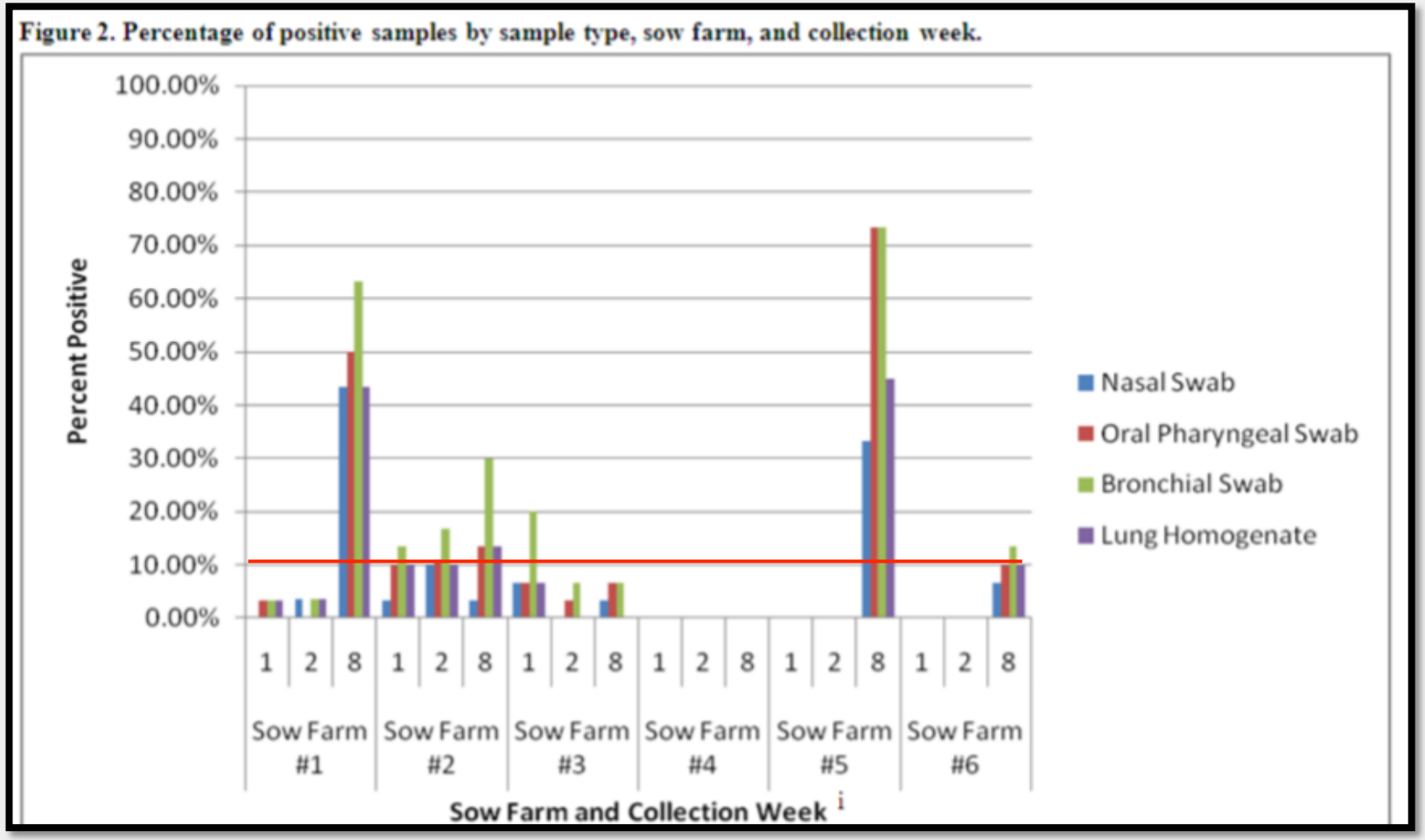

BIVI2013095

Maria Pieters / BIVI Study

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Sampling event	PCR Prevalence Dams (Nasal swabs)	PCR Prevalence Piglets (Nasal swabs)	Serum Prevalence Piglets
1	0	4 %	11 %
2	0	0	28 %
3	11 %	35 %	78 %
4	0	0	56 %
5	22 %	56 %	69 %
6	11 %	22 %	24 %
7	31 %	37 %	11 %

Accepted, AASV 2014

Wean pig M. hyo surveillance tool

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Table 1. Percent positives and mean Ct value by sample type

	Sample Type			
	NS	OP	BS	LH
# pos pigs*	34/539	56/538	75/539	43/538
% of all [i]	6.31[a]	10.41[bc]	13.91[c]	7.99[ab]
Mean Ct[ii]	32.17[a]	30.96[a]	28.27[b]	31.22[a]
% of pos.	43.59	71.79	96.15	55.13
# pos sampling periods	9/18	10/18	11/18	9/18
# herds pos**	5/6	5/6	5/6	5/6

abc Means differ ($p \leq 0.05$); [i]Analyzed using Fisher's Exact Test; [ii]Analyzed using one-way ANOVA. *≥1 sample positive/pig; *≥ 1/3 sampling period positive/farm

Accepted, IPVS 2014

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Level 3

Fase de cebo

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Agent spread: Nursery and Finishing

Prevalence at weaning constitutes the initial microbial load of the piglet batch

This will growth by horizontal (internal) and/or lateral (external: next barn or next farm) transmission.

This is a slow process and would take until finishing to show clinical manifestation on the population

Proper pig flow

Piglet Vaccination

Proper and moderated medication

The order of the epidemiological events

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Sow herd Infection pressure

Vertical transmission

Prevalence at weaning

Nursery piglets exposure

Finishing pigs disease

Vacunación lechón
Desafio: Vertical/Horizontal

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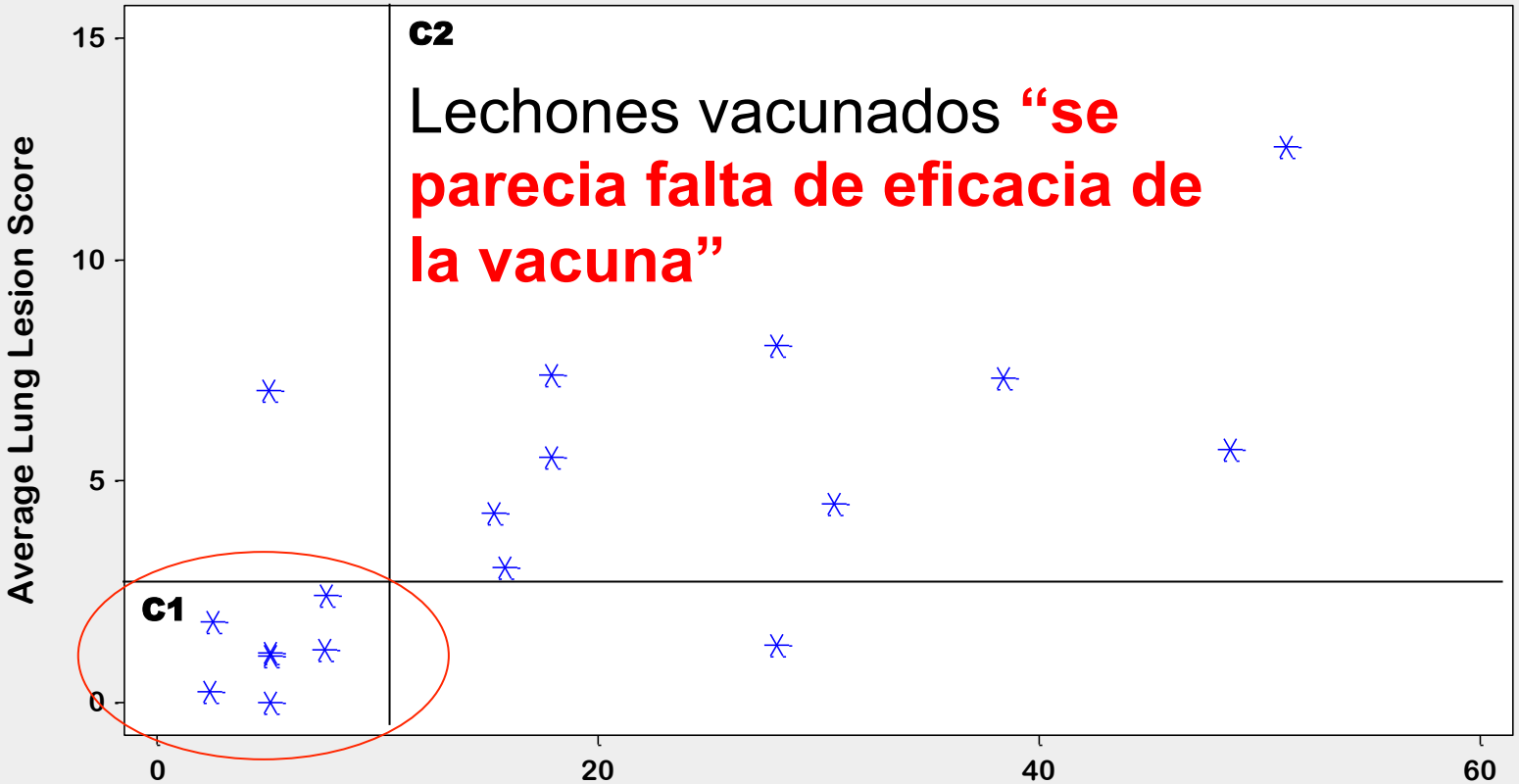
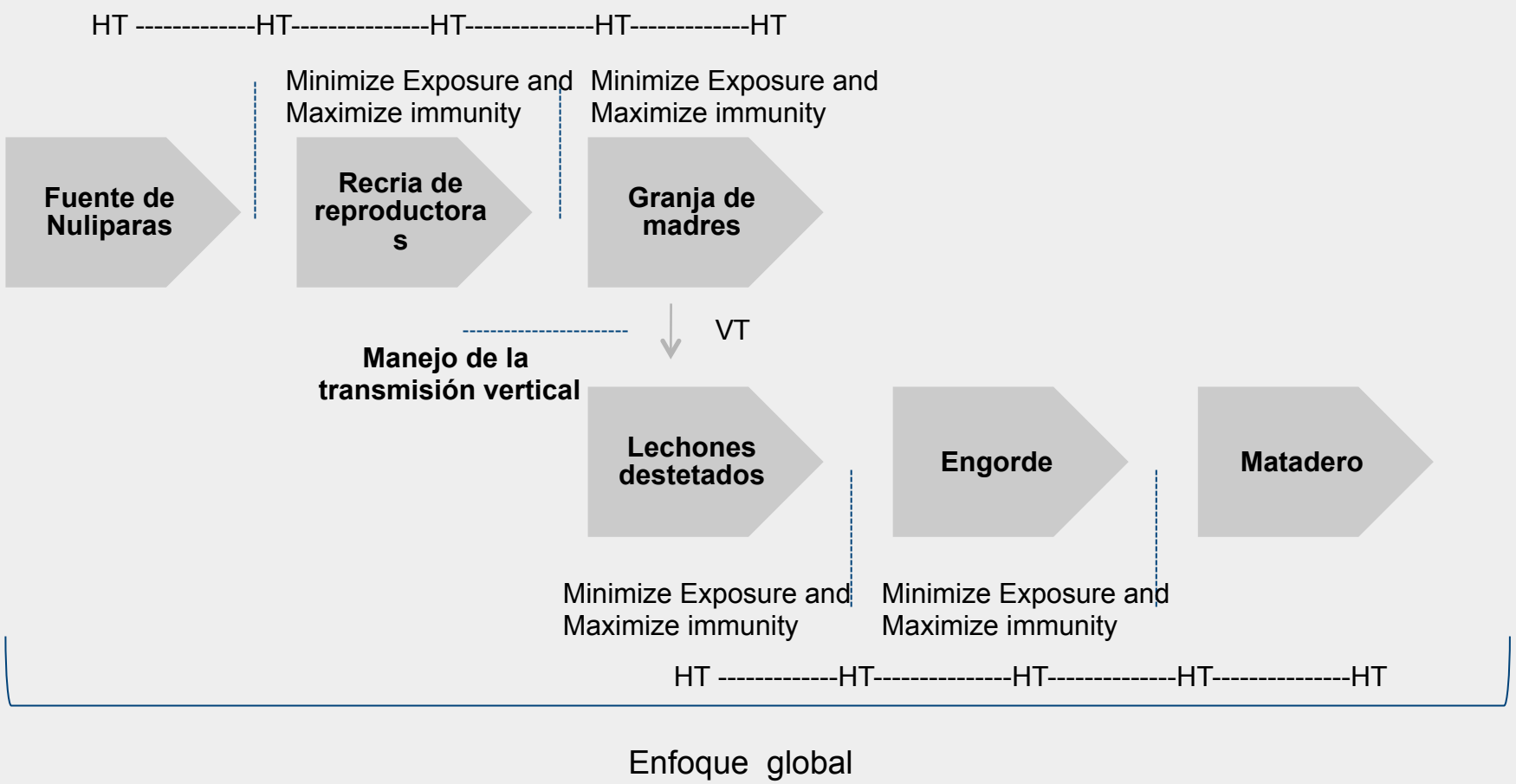


Lechones vacunados y en los que
"No hay reclamación de la eficacia de la vacuna"

* Fano et al., 2007

4.- Infeccion/Prevencion Cadena – Enfoque global



HT: Horizontal Transmission
VT: Vertical transmission

Discussion

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- Minimizing Exposure
  - Gilt Management
  - Sow herd stability
  - Pig flow
  - Immunity
- Maximizing Immunity
  - Vaccination to modulate clinical impact
  - Management of Natural exposure

Conclusiones

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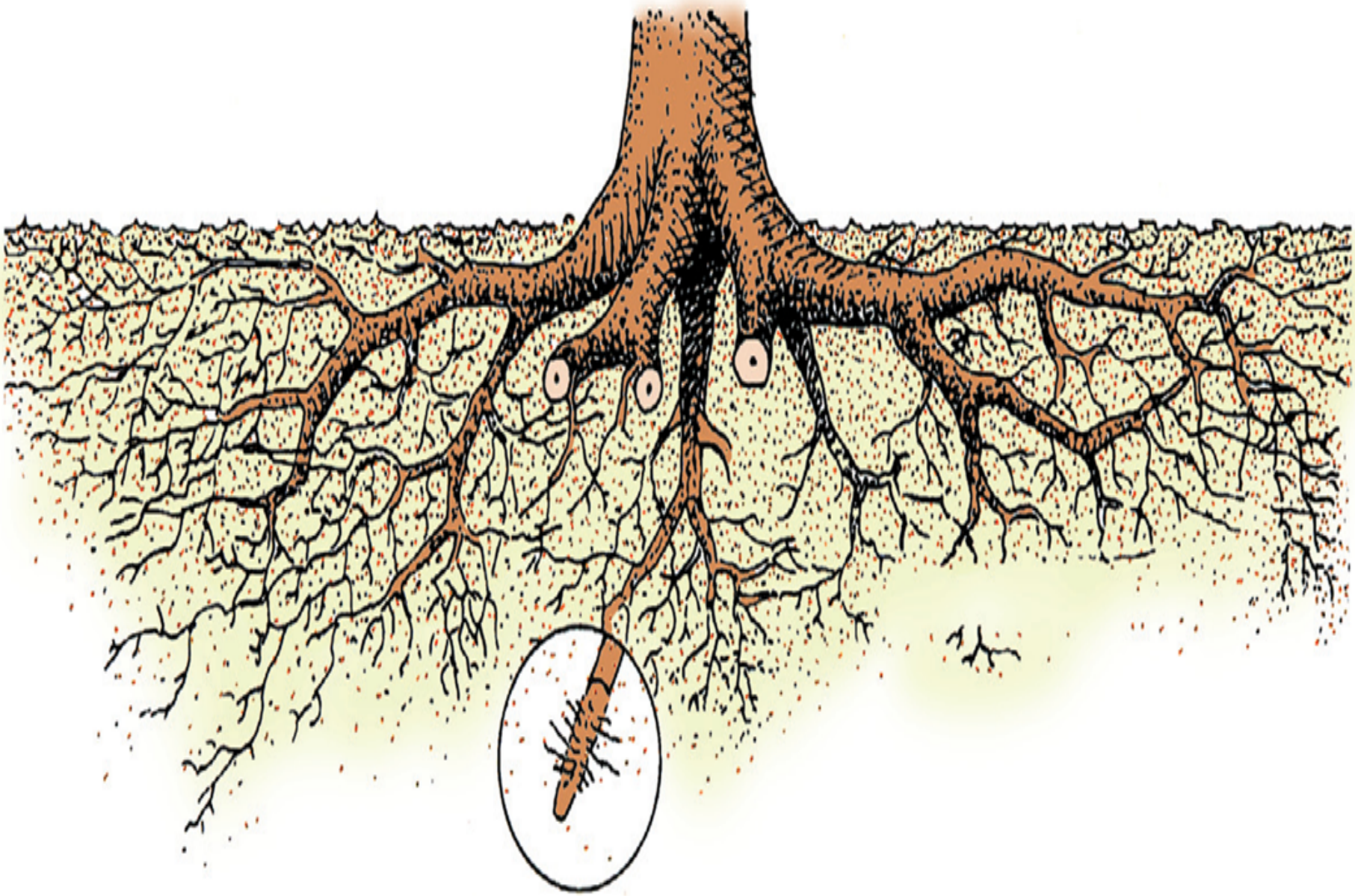
- El concepto **Cadena de Infección- Cadena de Prevención** busca conectar los eventos epidemiológicos con las diferentes fases de producción y sus resultados, para poder crear un programa de prevención Global de salud.



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Shaping the future of swine health

PREVENTION WORKS