



# L'organizzazione della diagnostica nelle malattie infettive del suino

## Iter diagnostico per PRRSV e *Streptococcus suis*

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Nella diagnostica delle malattie infettive del suino, esistono degli "indicatori di rischio", utili nella elaborazione del sospetto





# Aumento del rischio infettivo

## FATTORI PREDISPONENTI

quota di rimonta

introduzione delle rimonte

quarantena

età alla 1<sup>a</sup> fecondazione

composizione scrofaia

gruppi di gestazione

## INDICATORI

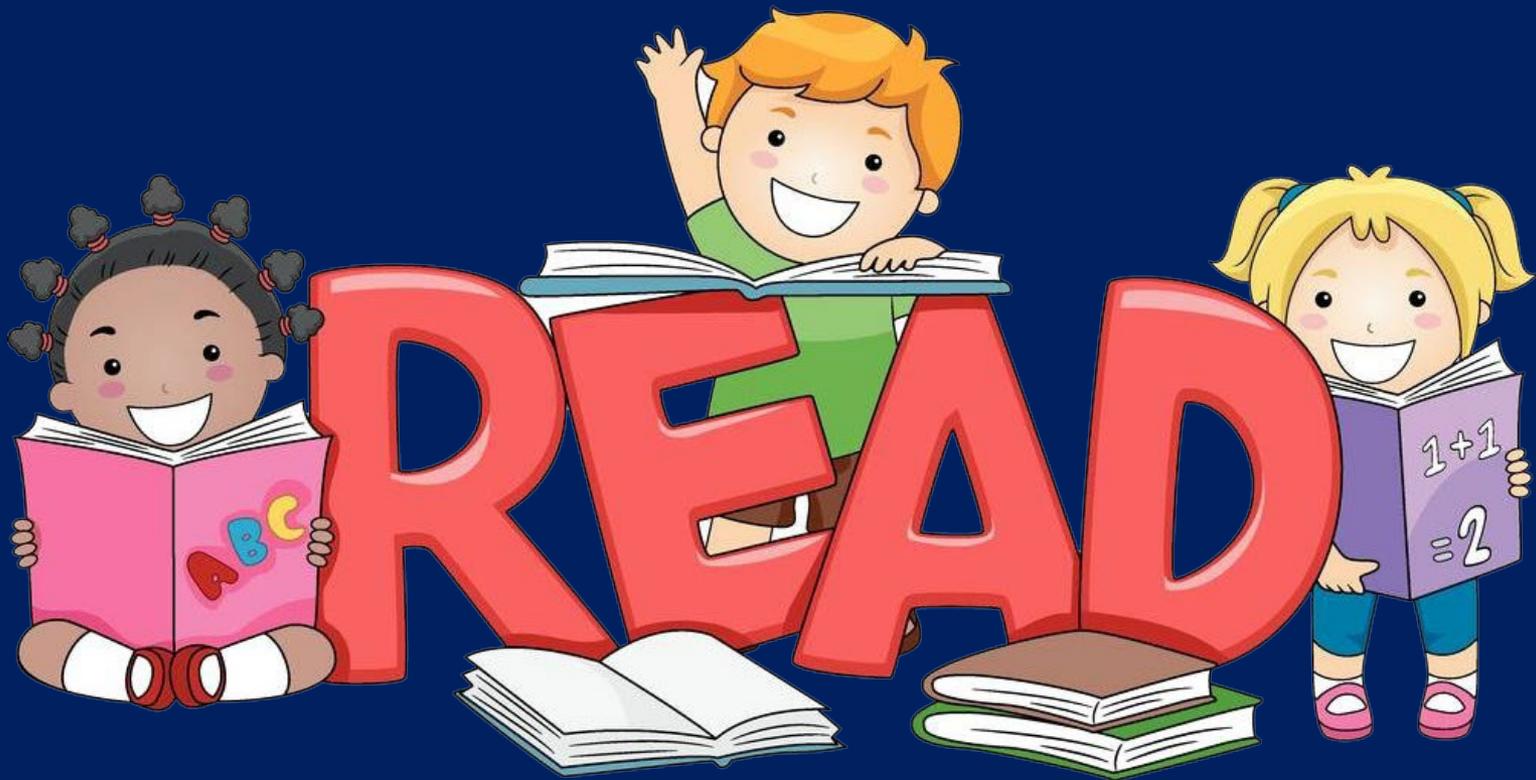
mortalità in gestazione

fertilità

portata al parto

parti/scrofa produttiva/anno

Necessario "leggere" le evidenze...



# SINDROME RIPRODUTTIVA DELLA SCROFA

(Agenti eziologici ed evidenze correlate)

Eziologia	Sintomi nella scrofa	Manifestazioni visibili	Lesioni Fetali
PRRSV	Depressione, anoressia, febbre	Aborto tardivo, mortinatalità, disvitalità	Emorragie cutanee, edema del cordone ombelicale
PCV2	Nessuno	Mummificazione, mortinatalità, disvitalità	Ipertrofia e dilatazione cardiaca, fluidi cavitari, congestione epatica
PPV	Nessuno	Riassorbimento embrionario, mummificazione, mortinatalità	Mummificazione
PRV	Depressione, anoressia, febbre	Morte degli embrioni, aborto lungo tutta la gestazione	Necrosi focale in fegato, milza e polmoni
SIV	Febbre, letargia, tosse, dispnea	Ipfertilità, aborto (ipertermia), mortinatalità, disvitalità	Nessuna
Leptospire	Febbre ad accessi, anoressia, depressione	Infertilità, mummificazione, aborto medio-tardivo, disvitalità	Epatite, nefrite, ittero (occasionale)
Chlamydia spp.	Nessuno	Infertilità, aborto	Nessuna

## Manifestazioni più frequenti (su base infettiva) / conferma diagnostica

manifestazioni	possibile causa	conferma diagnostica
Ipfertilità	PPV, PRV, PRRSV endometriti batteriche	sierologia, PCR Batteriologia
Infertilità	<i>L. Bratislava</i>	sierologia
Riassorbimento embrionario	PPV endometriti batteriche	sierologia batteriologia
Mummificazione	PPV, PRRSV <i>L. Pomona e Tarassovi</i>	IF, PCR sierologia, IICH
Aborto	PRRSV, PRV, PCV-2 <i>L. Pomona e Tarassovi</i>	virologia, PCR sierologia, IICH
Natimortalità	PPV, PRRSV	sierologia, IF, PCR
Disvitalità	PPV	sierologia, IF
Ipertermia acuta	SIV, PRRSV <i>E. Rhusiopathiae</i>	sierologia, PCR batteriologia

# LETTURA EPIDEMIOLOGICA

Resistenza del  
patogeno

Diffusione territoriale

Diffusione aziendale

Diffusione animale

Modalità d'infezione

Apparati bersaglio

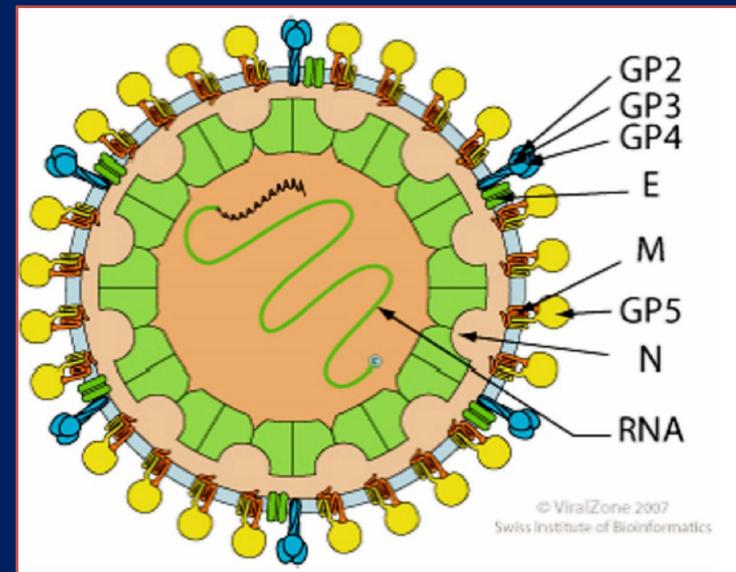
<b>Agente Patogeno</b>	<b>Resistenza Ambientale</b>	<b>Diffusione Territoriale</b>	<b>Diffusione Animale</b>	<b>Apparato Bersaglio</b>	<b>Cellule Bersaglio</b>
PRRSV	Bassa	Suino Altri animali Trasporti	Escreti e secreti Feti e invogli	Respiratorio Riproduttore	Macrofagi
PCV2	Alta	Suino Altri animali Trasporti	Escreti e secreti Feti e invogli Strutture	Respiratorio Digerente Riproduttore	Linea Monocito- Macrofagica
PRV	Bassa	Suino Altri animali Trasporti	Escreti e secreti Feti e invogli	Respiratorio Riproduttore SNC	Neuroni Epiteliali Macrofagi
PPV	Alta	Suino Liquami, acque	Escreti e secreti Feti e invogli Strutture	Riproduttore	Tutte (feti) Enterociti
Leptospire	Bassa	Suino Acque	Urine Feti e invogli	Urinario Riproduttore	N.A.



# PRRSV

ordine *Nidovirales*, famiglia  
*Arteriviridae*, genere  
*Arterivirus* (con EAV, LDV e  
SHFV)

RNA-virus provvisto di  
*envelope*



## PRRSV variante europea (EU) – Tipo 1

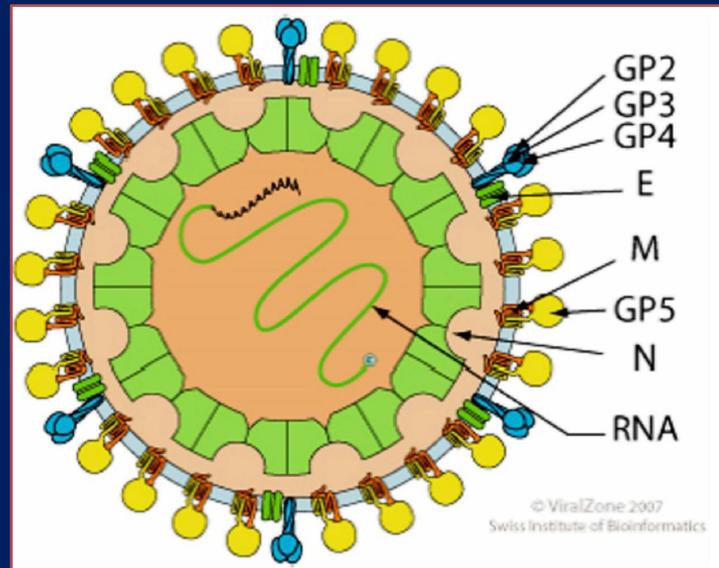
Sequenziamento del genoma completo del Lelystad virus nel 1997

## PRRSV variante americana (NA) – Tipo 2

Sequenziamento del genoma completo di VR-2332 nel 1999

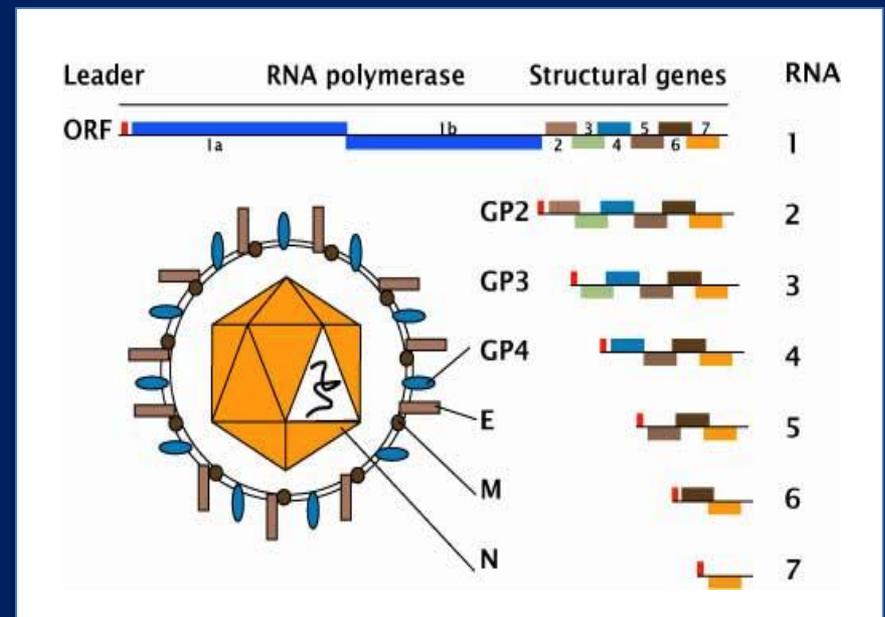
70 % del genoma è identico

La presenza dell'**envelope glicoproteico**  
limita la **sopravvivenza ambientale**



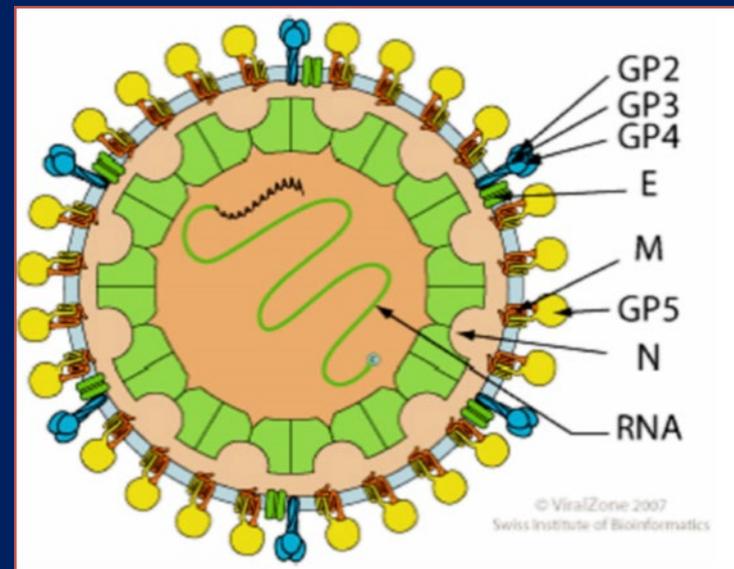
# Organizzazione genomica e proteine virali

- Il genoma di PRRSV consiste di un singolo filamento di RNA
- Contiene 7 segmenti leggibili (**Open Reading Frames, ORF**) che codificano per 20 differenti proteine

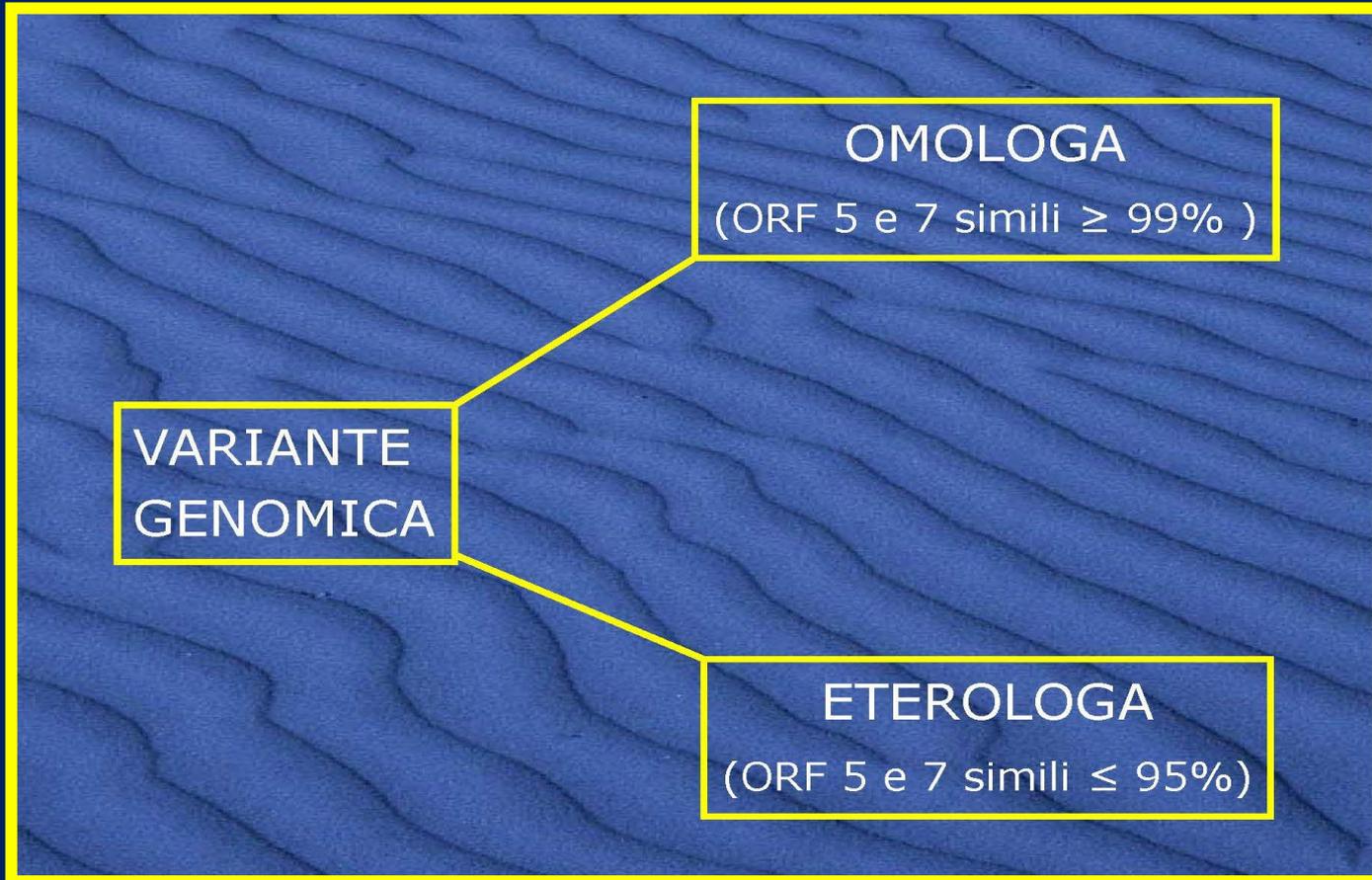


**ORF 5** codifica per **GP 5**, glicoproteina dell'envelope  
(attiva nel processo d'infezione)

**ORF7** codifica la **Proteina N** del nucleocapside



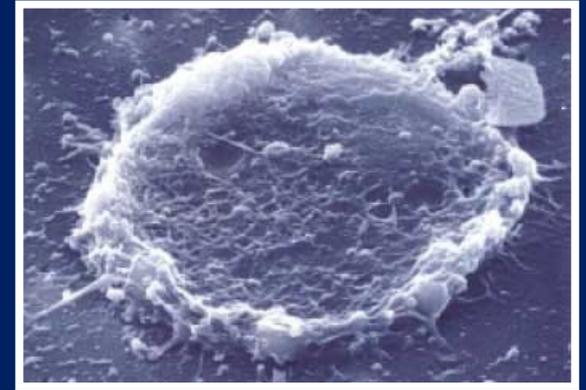
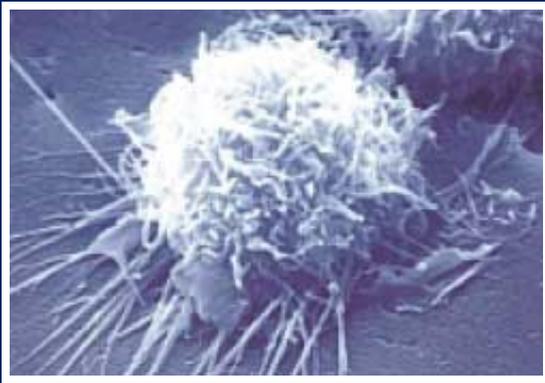
- ORF 5 e 7 mostrano una variabilità genomica molto elevata
- → genoma potenzialmente differente a ogni replicazione
- più VARIANTI da ogni ceppo virale (anche nello stesso allevamento)



VARIANTE  
GENOMICA

OMOLOGA  
(ORF 5 e 7 simili  $\geq$  99% )

ETEROLOGA  
(ORF 5 e 7 simili  $\leq$  95%)



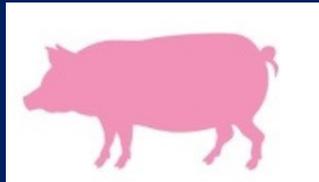
cellule bersaglio

macrofagi/monociti

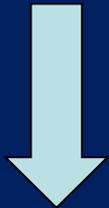
Endoteli vasali

la viremia può durare fino a 6 settimane

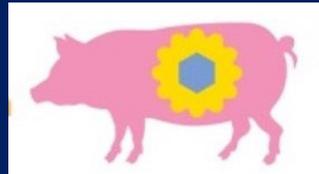
# Fasi evolutive della PRRS



Infezione



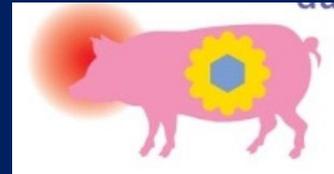
VIRUS



Sintomi  
da 10-14 gg p.i.



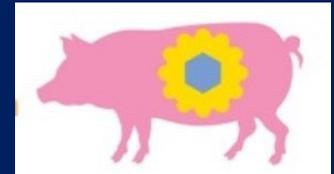
VIRUS  
IgM



*Shedding*  
fino a 100 gg p.i.



VIRUS  
IgG



Persistenza tiss.  
fino a 250 gg p.i.



IgG



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IVD Gesellschaft für innovative Veterinärdiagnostik mbH, Seelze-Letter<sup>3</sup>

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## PDNS-artige Hautläsionen durch PRRSV?

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**Zusammenfassung** In einem Ferkelerzeugerbestand wurde bei drei bis sieben Prozent der Absetzferkel im Alter von fünf bis sieben Wochen aufgrund der klinischen Symptomatik der Verdacht auf das „Porcine Dermatitis Nephropathy Syndrome“ (PDNS) geäußert. Die Erkrankung ging mit hohem Fieber und typischen Hautveränderungen, vornehmlich im Bereich der Hintergliedmaßen, einher. Nach erfolglosen Versuchen, die Verdachtsdiagnose durch den Nachweis des Porzinen Circovirus Typ 2 (PCV2) mittels Polymerase Chain Reaction (PCR) in Serumproben nachzuweisen, wurden zwei Ferkel zur Sektion eingeschickt. Die pathologisch-anatomische Untersuchung sowie die histologische Untersuchung der Haut bestätigten eine nekrotisierende Vaskulitis und Dermatitis wie bei PDNS. In Lunge und Lymphknoten waren PRRSV-verdächtige Läsionen festzustellen. Eines der beiden Ferkel zeigte eine nicht-eitrige interstitielle Nephritis mit fokaler nekrotisierender Vaskulitis, jedoch keine für PCV2-bedingte PDNS-Fälle typische Glomerulonephritis. In der Lunge beider Ferkel war PRRSV mittels PCR nachweisbar. Untersuchungen auf PCV2 und PCV3 an Material aus den inguinalen Lymphknoten blieben bei beiden Ferkeln ohne Nachweis. Mittels Immunhistochemischer Untersuchungen gelang der Nachweis von PRRSV-Antigenen in multiplen perivaskulären Makrophagen der veränderten Haut. Ein kausaler Zusammenhang zwischen der PRRSV-Infektion und der PDNS-artigen Dermatitis wird daher vermutet.

**Schlüsselwörter** Schwein, Vaskulitis, Dermatitis, PRRSV, PCV2

### PDNS-like skin lesions due to PRRSV?

**Summary** In a farrow-to-finish herd 3–7% of weaned piglets at 5–7 weeks of age were suspected to suffer from the “Porcine Dermatitis Nephropathy Syndrome” (PDNS) due to clinical signs. The disease was associated with high fever and typical skin lesions, mainly in the area of the hind limbs. Since porcine circovirus type 2 (PCV2) could not be detected in serum samples using polymerase chain reaction (PCR), two piglets were submitted to necropsy. The gross and microscopic examination of the skin confirmed a PDNS-like dermatitis with necrotizing vasculitis. Lesions compatible with PRRSV infection were found in lungs and lymph nodes. One of the two piglets showed interstitial nephritis with focal necrotizing vasculitis, but no glomerulonephritis like in PCV2-associated PDNS cases. PRRSV was detected in the lungs of both piglets by PCR. Testing for PCV2 and PCV3 on the inguinal lymph nodes remained negative in both piglets. PRRSV antigen was detected by immunohistochemistry in multiple perivascular macrophages of the altered skin. A causal association between PRRSV infection and PDNS-like dermatitis is therefore suspected.

**Keywords** swine, vasculitis, dermatitis, PRRSV, PCV2



## Materiali diagnostici

- Emosiero (scrofa, svezzati, magroni)
- Feti e invogli
- Visceri (carcasse, tutte le età)
- Fluidi sierosanguinei (castrazione, taglio coda)
- Lavaggi tracheobronchiali (tamponi?)

**RICORDARE LA LABILITÀ DEL VIRUS**

# Prove diagnostiche

Test	Impiego
<b>RT-PCR</b> (Reverse transcriptase polymerase chain reaction)	0-65 gg p.i. (siero) 0-250 gg p.i. (tessuti)
<b>IHC</b> (Immunoistochimica)	0-250 gg p.i. (tessuti)
<b>FA / IFAT</b> (Immunofluorescenza)	0-65 gg p.i. (siero)
<b>ELISA</b> (IgM e IgA)	10-250 gg p.i. (siero)

# Sequenziamento

```
SEQ-1 : CAGAGCCAGAAGAAAAATGAAATCAGCTCCATGGGGAATGGCCAGTCAGTCAATCACTGTGCCAGTTGCTGGGTCGATGATGAAATCCCAGCGGCCA :
SEQ-2 : CAGAGCCAGAAGAAAAATGAAATCAGCTCCATGGGGAATGGCCAGTCAGTCAATCACTGTGCCAGTTGCTGGGTCGATGATGAAATCCCAGCGGCCA :
SEQ-3 : CAGAGCCAGAAGAAAAATGAAATCAGCTCCATGGGGAATGGCCAGTCAGTCAATCACTGTGCCAGTTGCTGGGTCGATGATGAAATCCCAGCGGCCA :
LV_PRRS : cagagccagaagaaaaaagaaagtaacagctccatgggggaatggccagtcagtcaatcaactgtgccagttgctgggtcgatgatgaaatcccagcgcca :
CAGAGCCAGAAGAAAAA A aAa aCAGCTCC ATGGGGAATGGCCAGTCAGTCAATCA CTGTGCCAGTTGCTGGG ac ATGATgA aTCCCAGCGCCA

* 320 * 340 * 360 * 380 * 400
SEQ-1 : GCGAATCAGGGGGGGACAGGCCAAAAAGAAAAGCCTGAGAAGCCACATTTCCCCCTGGCTGCTGAAGATGATGTCCGGCACTCACTCACTCAAGCCGGAAC :
SEQ-2 : GCGAATCAGGGGGGGACAGGCCAAAAAGAAAAGCCTGAGAAGCCACATTTCCCCCTGGCTGCTGAAGATGATGTCCGGCACTCACTCACTCAAGCCGGAAC :
SEQ-3 : GCGAATCAGGGGGGGACAGGCCAAAAAGAAAAGCCTGAGAAGCCACATTTCCCCCTGGCTGCTGAAGATGATGTCCGGCACTCACTCACTCAAGCCGGAAC :
LV_PRRS : gcaactcagggggggacagggccaaaaagaaaaagcctgagaagccacattttcccctggctgctgaagatgacatccggcaccactcaccagactgaac :
GcG A C AGGGG GGACAGGCCAAAAAGAAAAGCCTGAGAAGCCACATTTCCCCtGCTGCTGAAGATGAtGTCCGGCA CAcCTCAc CAaaCcGGAc

* 420 * 440 * 460 * 480 * 500
SEQ-1 : GTTCCCTTTGCTGCAATCGATCCAGACAGCCTTCAATCAAGGCGCGGAAGTGCATCGCTTTCATCCAGGGGAAGGTCGGTTTCAGGTTGAGTTTATG :
SEQ-2 : GTTCCCTTTGCTGCAATCGATCCAGACAGCCTTCAATCAAGGCGCGGAAGTGCATCGCTTTCATCCAGGGGAAGGTCGGTTTCAGGTTGAGTTTATG :
SEQ-3 : GTTCCCTTTGCTGCAATCGATCCAGACAGCCTTCAATCAAGGCGCGGAAGTGCATCGCTTTCATCCAGGGGAAGGTCGGTTTCAGGTTGAGTTTATG :
LV_PRRS : gttccctttgcttgcaatcgatccagacagccttcaatcaagggcgggaagtgcactcgctttcatccaggggaaggtcagttttcaggttgagtttatg :
G tCCCTtTGC TGCAATCGATCCAGAC GCtTCAATCAAGGCGC GGAAGTGC TCGTtTTCATCCAGcGGGAAGGTcGtTtTCAGGTTGAGTTtATG

* 520 * 540 * 560 * 580 * 600
SEQ-1 : TTAACCGGTTCCATACAGTGCGCCTGATTCGCGTGACTTCCACATCCGGCAGTCAGGGTGCAAAATTAAT :
SEQ-2 : TTGCCGGTCCCTCATAcAGTGCgcCTGATTCGCGTGACTTCCAcATCCGGcAGTCAGGGTGcAAATTAAT :
SEQ-3 : TTGCCGGTTCGcCATAcAGTGCgcCTGATTCGCGTGACTTCCGcAcCCCTTtAGTCAGGGTGtAAATTAAT :
LV_PRRS : ttaacggttccatacagtgccctgattcgcgtgacttccacatccggcagtcagggtgcaaattaaatttgacagtcagtgaaatggcgcgattggcg :
TgCCGGTt CtATAcAGTGCgcCTGATTCGCGTGACTTCCAcATCCGGcAGTCAGGGTGcAAATTAAT
```

- Metodo di scelta per la caratterizzazione delle varianti
- Si esegue sugli amplificati da PCR
- ORF5 (altamente variabile) è più affidabile
- Disponibile libreria di sequenze per il confronto filogenetico
- Relazioni tra i ceppi → dendogrammi (individuali e aziendali)
- Comparsa di nuove varianti e/o mantenimento nel tempo
- Ricombinazione o selezione genomica possono rendere complessa l'interpretazione

# *Streptococcus suis*



Università di Milano - Istituto di Malattie Infettive,  
Profilassi e Polizia Veterinaria

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con la collaborazione tecnica di C. BERGAMI — R. PICCININI — C. PAGANI

## Sull'isolamento di «*Streptococcus suis* (tipo 2)» in corso di alcune forme patologiche del suino

Isolation of “*Streptococcus suis* type II” from swine infections

**Key words:** *swine pathology, streptococcosis, Streptococcus suis II*

**1984**



*Proceedings of the 14<sup>th</sup> IPVS Congress, Bologna, Italy, 7-10 July 1996*

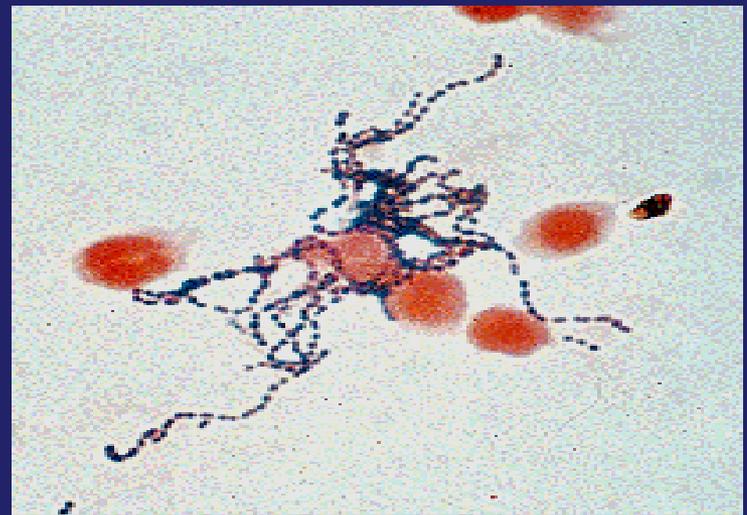
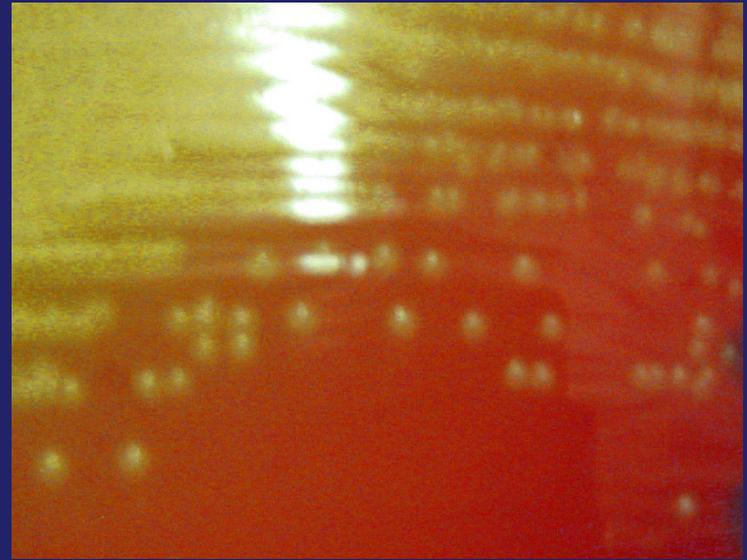
### DISTRIBUTION OF CAPSULAR TYPES AND HEMOLYSIN PRODUCTION OF *STREPTOCOCCUS SUIS* ISOLATES IN NORTHERN ITALY

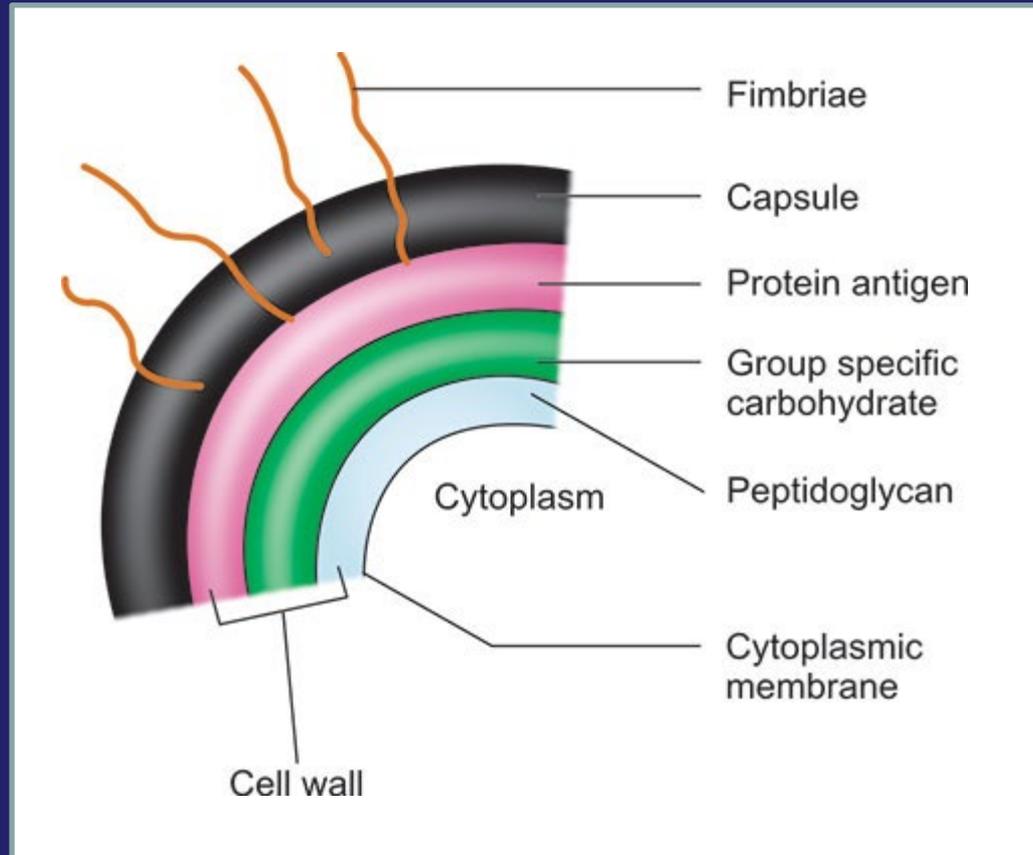
V. Sala<sup>1</sup>, M. Antonini<sup>1</sup>, O. Vischi<sup>1</sup>, A. Ansuini<sup>2</sup>, P.F. Guadagnini<sup>2</sup>, G. Conedera<sup>3</sup>, M. Fabbi<sup>2</sup>, S. Perini<sup>2</sup>

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# *Streptococcus suis*

- ✓ Patogeno opportunista
- ✓ Forme cliniche acute o croniche
- ✓ Sempre condizionate
- ✓ Rapporto forma clinica - capacità patogena





Identificazione sierologica in base ai polisaccaridi capsulari

Review

## Current Taxonomical Situation of *Streptococcus suis*

Masatoshi Okura<sup>1</sup>, Makoto Osaki<sup>1</sup>, Ryohei Nomoto<sup>2</sup>, Sakura Arai<sup>3</sup>, Ro Osawa<sup>4</sup>,  
Tsutomu Sekizaki<sup>3</sup> and Daisuke Takamatsu<sup>1,5,\*</sup>

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  - <sup>5</sup> The United Graduate School of Veterinary Sciences, Gifu University, 1-1 Yanagido, Gifu, Gifu 501-1193, Japan
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Academic Editor: Mariela Segura

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**Abstract:** *Streptococcus suis*, a major porcine pathogen and an important zoonotic agent, is considered to be composed of phenotypically and genetically diverse strains. However, recent studies reported several “*S. suis*-like strains” that were identified as *S. suis* by commonly used methods for the identification of this bacterium, but were regarded as distinct species from *S. suis* according to the standards of several taxonomic analyses. Furthermore, it has been suggested that some *S. suis*-like strains can be assigned to several novel species. In this review, we discuss the current taxonomical situation of *S. suis* with a focus on (1) the classification history of the taxon of *S. suis*; (2) *S. suis*-like strains revealed by taxonomic analyses; (3) methods for detecting and identifying this species, including a novel method that can distinguish *S. suis* isolates from *S. suis*-like strains; and (4) current topics on the reclassification of *S. suis*-like strains.

## *Streptococcus suis*

- ✓ Originariamente 35 tipi capsulari (1-34 + 1/2)
- ✓ Tipi 20, 22, 26, 32, 33 e 34 rimossi dal taxon
- ✓ Oggi: 29 tipi capsulari
- ✓ 1, 1/2, 7, 9 e 14 patogeni prevalenti

## *fattori di patogenicità*

- ✓ capsula: polisaccaridica, anti-fagocitosi
- ✓ acido sialico
- ✓ adesine e fimbrie
- ✓ fenotipo (MRP e EF)
- ✓ proteina 44kDa
- ✓ IgG binding-protein
- ✓ ribotipo (corrispondenza con fenotipo, forma clinica, e livello di patogenicità)
- ✓ suilisina



## Review

# Critical *Streptococcus suis* Virulence Factors: Are They All Really Critical?

Mariela Segura,<sup>1</sup> Nahuel Fittipaldi,<sup>2,3</sup> Cynthia Calzas,<sup>1</sup> and Marcelo Gottschalk<sup>4,\*</sup>

*Streptococcus suis* is an important swine pathogen that can be transmitted to humans by contact with diseased animals or contaminated raw pork products. This pathogen possesses a coat of capsular polysaccharide (CPS) that confers protection against the immune system. Yet, the CPS is not the only virulence factor enabling this bacterium to successfully colonize, invade, and disseminate in its host leading to severe systemic diseases such as meningitis and toxic shock-like syndrome. Indeed, recent research developments, cautiously inventoried in this review, have revealed over 100 ‘putative virulence factors or traits’ (surface-associated or secreted components, regulatory genes or metabolic pathways), of which at least 37 have been claimed as being ‘critical’ for virulence. In this review we discuss the current contradictions and controversies raised by this explosion of virulence factors and the future directions that may be conceived to advance and enlighten research on *S. suis* pathogenesis.

### Trends

*Streptococcus suis* is a major swine pathogen – an emerging zoonotic agent whose pathogenesis of disease is partially characterized.

*S. suis* is an encapsulated microorganism and its capsular polysaccharide (CPS) allows bacterial evasion of the host immune system and bloodstream dissemination. But, the CPS is not the only virulence factor and, under certain circumstances, its absence may also be beneficial to pathogenic strains.

Indeed, the immune-pathogenesis of *S. suis*-induced disease is a complex,

## DOVE STA IN AZIENDA ?

nelle tonsille delle scrofe e sulla  
mucosa vaginale nel pre-parto



nelle tonsille degli svezzati  
(più tipi capsulari nello stesso animale)

nei suinetti con artrite e  
meningite in sala parto e  
nello svezzamento



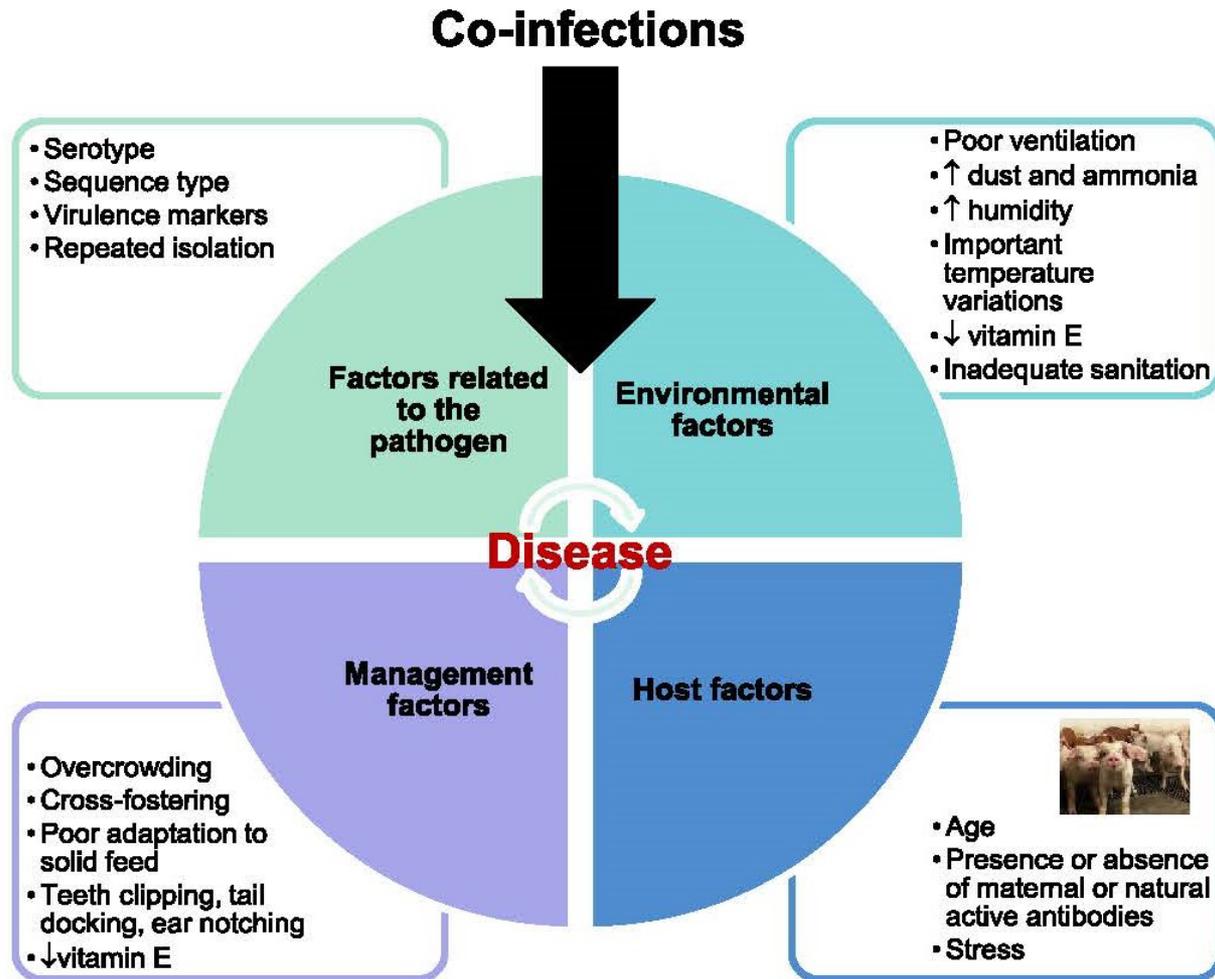


Figure 1 Factors influencing the appearance of clinical signs of *Streptococcus suis* infection.

**Table 2.—** *Streptococcus suis* survivability: Surface study

Surface	4h	8h	12h	16h	20h	24h	48h	72h
Painted plywood	-	-	-	-	-	-	NT	NT
Plywood	-	-	-	-	-	-	NT	NT
Plywood, heat	-	-	-	-	-	-	NT	NT
Plywood, manure	+	+	+	-	-	-	-	NT
Plastic flooring	+	+	+	+	+	-	-	-
Plastic, heat	-	-	-	-	-	-	NT	NT
Plastic, manure	+	+	+	+	+	+	-	-
Plastic, heat, manure	+	-	-	-	-	-	-	NT
Concrete	-	-	-	-	-	-	NT	NT
Concrete, heat	-	-	-	-	-	-	NT	NT
Concrete, manure	+	+	+	+	+	+	-	-
Concrete, heat, manure	+	-	-	-	-	-	-	NT
Metal	-	-	-	-	-	-	NT	NT
Metal, manure	+	+	-	-	-	-	-	NT
Rubber, manure	+	+	+	+	+	+	+	+

**Key:** + Growth detected; - No growth detected; NT not tested

(Dee, 1993)

**Table 3.**— *Streptococcus suis* survivability: Media study

<b>Media (Temp.°C)</b>	<b>1d</b>	<b>2d</b>	<b>3d</b>	<b>4d</b>	<b>5d</b>	<b>6d</b>	<b>7d</b>	<b>8d</b>	<b>9d</b>	<b>10d</b>
Oil (4°)	+	-	-	NT						
Aluminum hydroxide (4°)	+	+	+	+	-	-	-	NT	NT	NT
Amies culturette (20°)	+	+	+	+	+	+	+	-	NT	NT
Urine (20°)	+	+	+	+	+	+	+	+	+	+
Semen (20°)	+	+	+	+	+	+	+	+	+	+
Whole blood (20°)	+	+	+	+	+	+	+	+	+	+
Brain (20°)	+	+	+	+	+	+	+	+	+	+

**Key:** + Growth detected; - No growth detected; NT not tested

(Dee, 1993)



la scrofaia è il serbatoio dell'infezione



i suinetti si contaminano durante e dopo il parto



lo svezzamento favorisce la diffusione



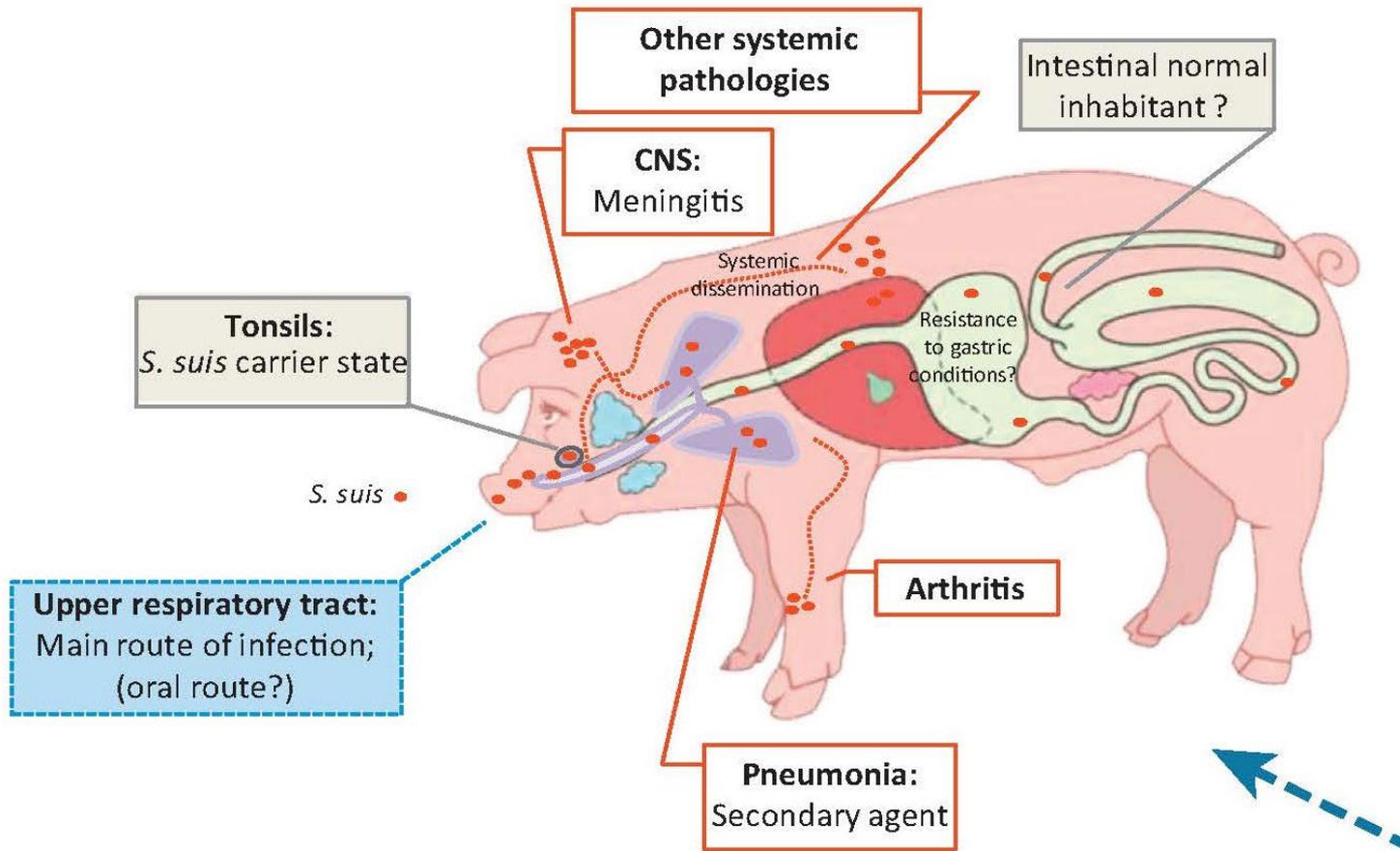
una scrofetta infetta sarà portatrice /eliminatrice per tutta la vita

**la scrofa trasmette**  
(nel peri-parto)

con la saliva  
con le urine  
con l'aria espirata



**lo svezzato trasmette:**  
con la saliva  
con i morsi  
con l'aria espirata

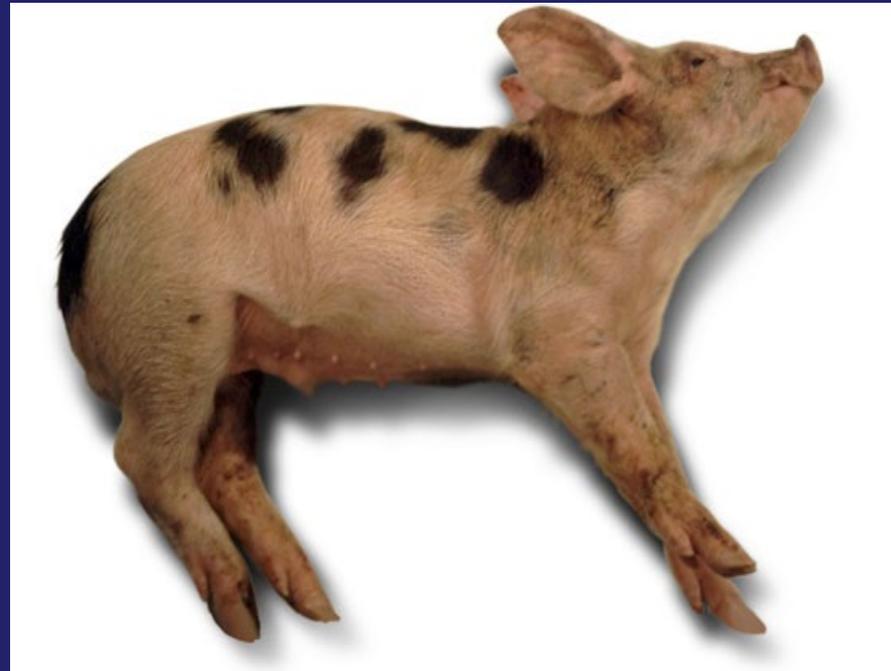
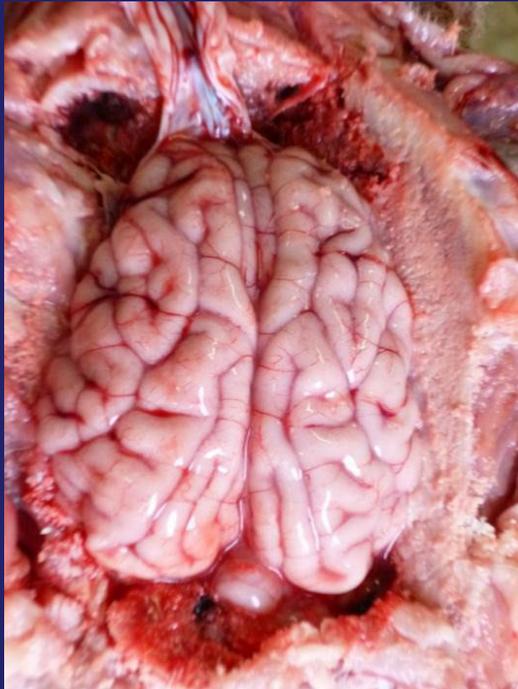
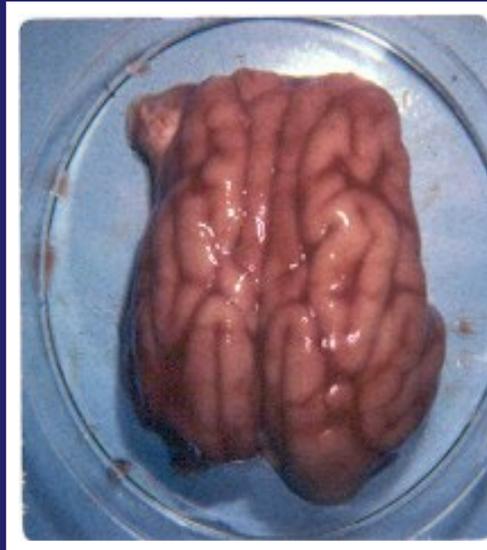


(Segura *et al.*, 2017)

# ARTRITE



# MENINGITE



# ENDOCARDITE



# Diagnostica



# Materiali diagnostici

-  Carcasse (lattonzoli e svezziati)
-  LCR (puntato occipitale o tampone; età crescente)
-  Tonsille o tamponi tonsillari
-  Polmoni (complicanze)

**Dall'endocardite non si isola**  
(patologia da immunocomplessi)

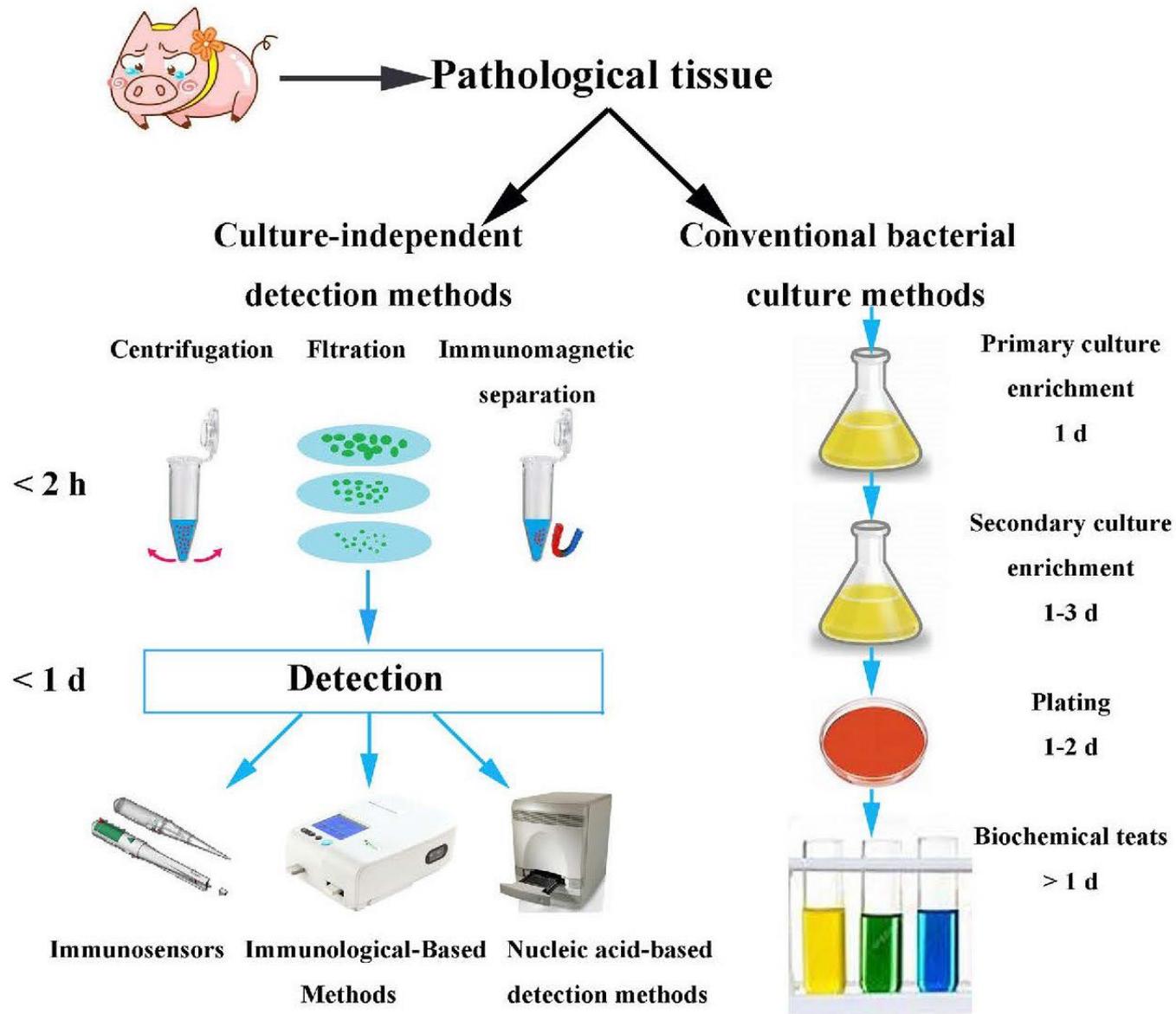


Fig. 1 Comparison of dection methods



Review

# Update on the Mechanisms of Antibiotic Resistance and the Mobile Resistome in the Emerging Zoonotic Pathogen *Streptococcus suis*

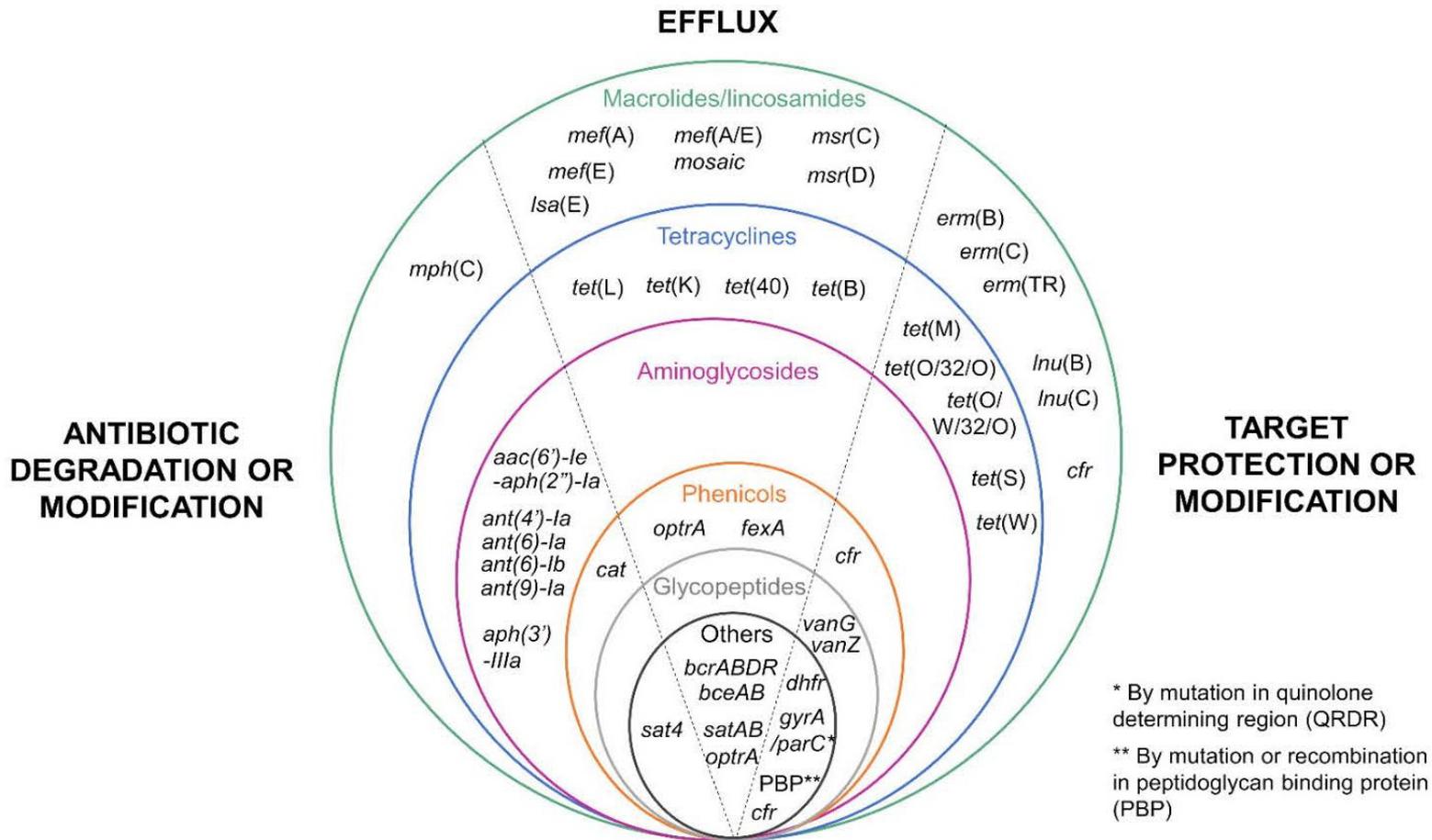
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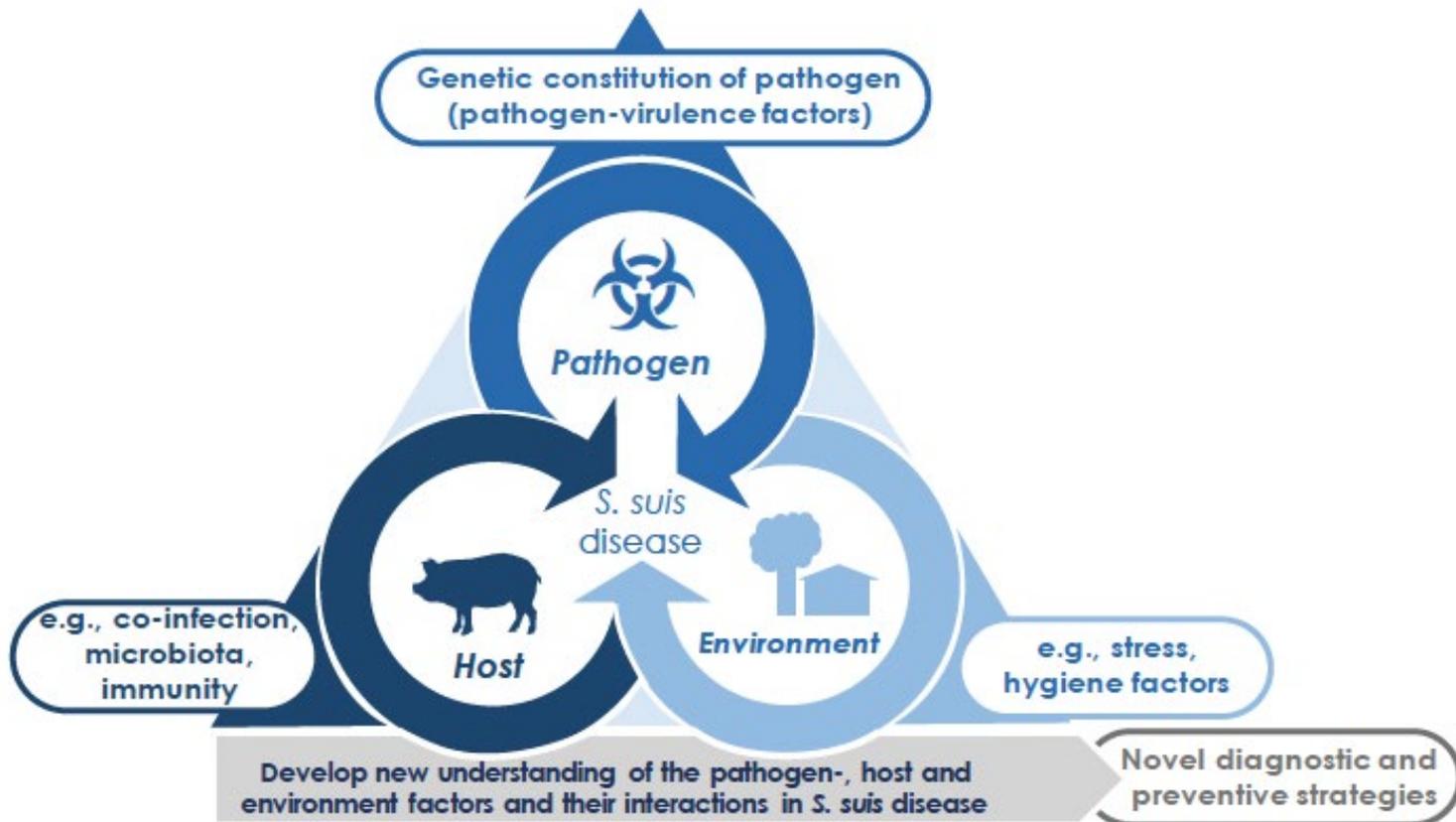
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- Resistenza a tetracicline, beta-lattamici e macrolidi in tutto il mondo
- Resistenza ad amminoglicosidi, fluorochinoloni, anfenicoli e glicopeptidi in aumento
- Elementi genetici mobili (MGE) che possono essere trasferiti per via orizzontale
- Ruolo di *S. suis* come serbatoio di geni dell'AMR per altre specie



**Figure 1.** Resistance genes described in *Streptococcus suis*. The different genes conferring antibiotic resistance are classified in two ways: (i) according to their mechanism of resistance (on the left: degradation or modification of the target antibiotic; in the middle: efflux mechanisms; and on the right: target protection or modification, separated by a dotted line) and (ii) according to the family of antibiotics they target (circles of different colors: green for macrolides/lincosamides, blue for tetracyclines, pink for aminoglycosides, orange for amphenicol, gray for glycopeptides, black for other families).

# Program for Innovative Global prevention of *Streptococcus suis*



**VALUTAZIONE DEI FATTORI CONDIZIONANTI LA  
STREPTOCOCCOSI NELL'ALLEVAMENTO SUINICOLO**

***EVALUATION OF STREPTOCOCCOSIS CONDITINING FACTORS  
IN SWINE FARMING***

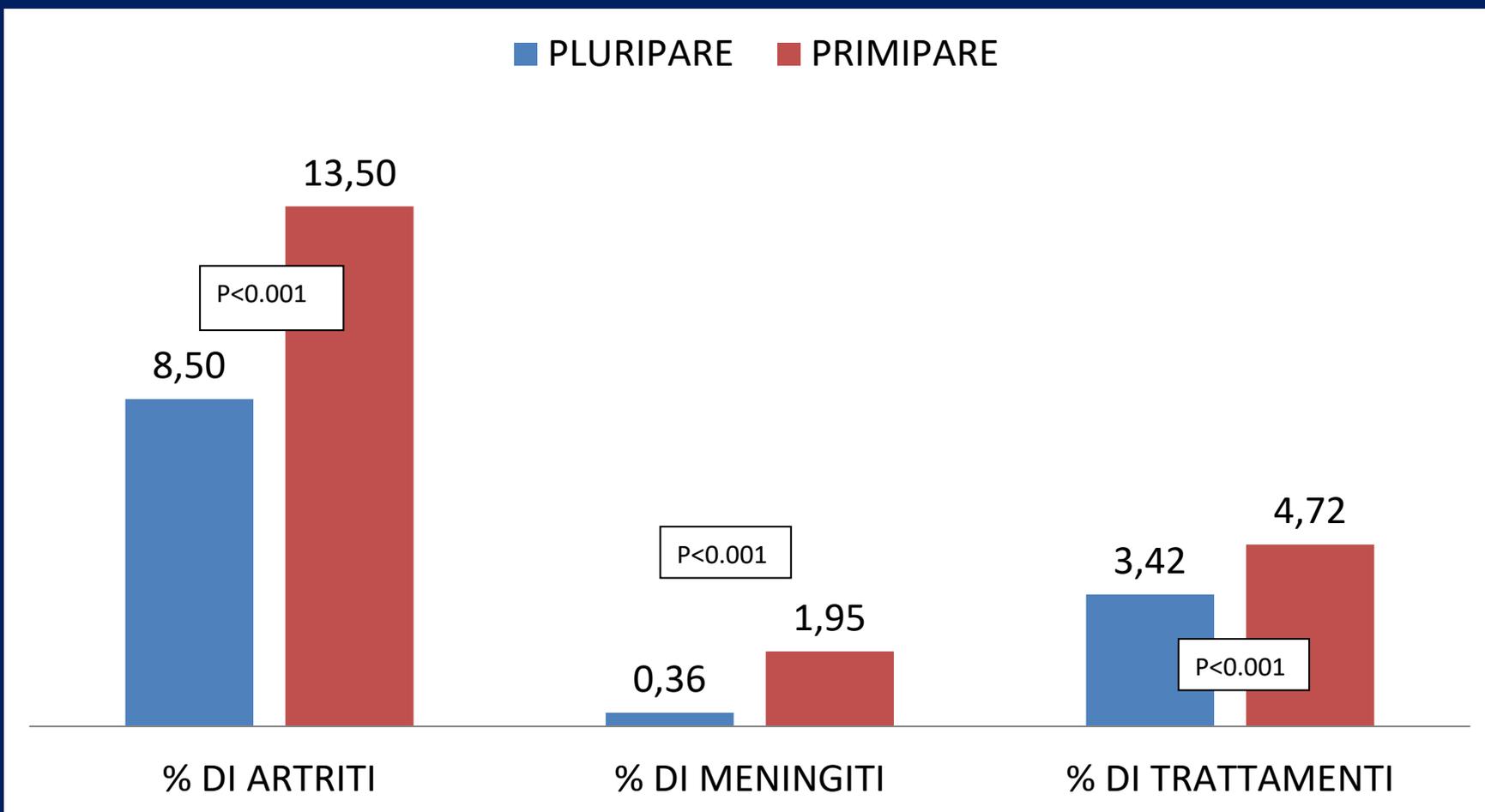
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**Parole chiave:** streptococcosi, artrite, meningite, ordine di parto

**Key words:** streptococcosis, arthritis, meningitis, parity

(Sipas, 2015)



**Figura 3.** Medie riferite alla percentuale di lesioni tarsiche e meningiti nei suinetti, di trattamenti in dipendenza dell'ordine di parto (primipara- multipara)





# L'organizzazione della diagnostica nelle malattie infettive del suino

Grazie e ... Alla prossima!

*Vittorio Sala*

*Ordinario di Malattie Infettive degli Animali Domestici*