

# In vitro evaluation of antimicrobial activity of short- and medium-chain fatty acid salts and their combinations against

## Streptococcus suis

C. Sol\*<sup>1</sup>, M. Puyalto<sup>1</sup>, B. Canal<sup>1</sup>, A. Carvajal<sup>2</sup>, M. Gómez<sup>2</sup>, and J. J. Mallo<sup>1</sup>

<sup>1</sup>NOREL SA, Spain <sup>2</sup>Department of Animal Health, Faculty of Veterinary Medicine, Universidad de León, Spain

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### INTRODUCTION

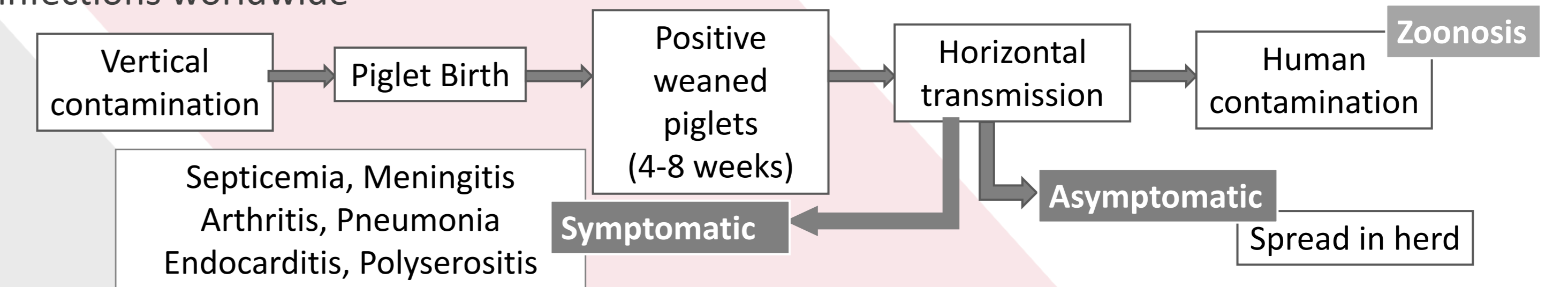
Among the alternatives to antimicrobials as growth promoters, feed additives such as organic acids and their salts, have been widely used in recent years. It is well known that butyric acid, a short chain fatty acid, has strong antimicrobial activity against Gram-negative bacteria. In contrast, coconut and palm kernel fatty acids distillates are medium-chain fatty acid (MCFA) sources rich in lauric acid, which have strong antimicrobial activity against Gram-positive bacteria. Both products are generally available as salts to facilitate the application in feed

#### OBJECTIVE:

The aim of this study was to investigate the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of organic acid salts against six field isolates of *Streptococcus suis*

*Streptococcus suis* is a Gram + bacterial pathogen which is a major cause of mortality and economic losses in the pig farming industry. Almost 100% of pig farms worldwide have carrier animals

*S. Suis* is naturally present in upper respiratory tract, GIT and reproductive system. *S. Suis* is also a zoonotic pathogen causing human infections worldwide



### MATERIAL AND METHODS



1. Preparation of BHI broth, adjusted to pH6 with phosphate buffer



2. Broth microdilution method using 96-well microplates



3. MIC was determined by the first well without turbidity (no bacterial growth)



4. MBC was determined by subculturing from wells without evident bacterial growth onto BHI agar

#### Products tested:

- **DICOSAN (DIC):** sodium salt of medium fatty acids distillate
- **DICOSAN+ (DIC+ 70/30):** 70% of sodium butyrate protected with sodium salt of medium chain fatty acids distillate (70:30 ratio)
- **DICOSAN+ (DIC+ 50/50):** 50% of sodium butyrate protected with sodium salt of medium chain fatty acids distillate (50:50 ratio)

### RESULTS

#### Parameters measured:

- **MIC 50/90:** Minimum concentration that will inhibit 50%/90% of bacterial growth

|               | MINIMUM INHIBITORY CONCENTRATION (ppm) |                   |                   |
|---------------|--|-------------------|-------------------|
|               | DICOSAN                                | DICOSAN + (70/30) | DICOSAN + (50/50) |
| MIC (min/max) | 4/16                                   | 64/128            | 16 /64            |
| MIC (50/90)   | 8/16                                   | 64/128            | 32 / 64           |

- **MBC 50/90:** Minimum concentration that will kill 50%/90% of initial bacterial population

|               | MINIMUM BACTERICIDE CONCENTRATION (ppm) |                   |                   |
|---------------|---|-------------------|-------------------|
|               | DICOSAN                                 | DICOSAN + (70/30) | DICOSAN + (50/50) |
| MBC (min/max) | 16 /32                                  | 64 /128           | 64 /128           |
| MBC (50/90)   | 16/32                                   | 64 /128           | 64 /128           |

- > It is well known that butyric acid is a short chain fatty acid which has strong antimicrobial activity against Gram-negative bacteria
- > In contrast, medium-chain fatty acids (MCFA) rich in lauric acid have strong antimicrobial activity against Gram-positive bacteria
- > Combination of both additives could be active against Gram+ and Gram- bacteria. Depending on the concentration of those additives their combination will be more active against Gram+ or Gram- bacteria

### CONCLUSIONS

Results showed that DIC was the most effective against the Gram-positive bacteria tested, followed by DIC+ 50:50 and DIC+ 70:30, the sodium butyrate based products. As expected, a higher concentration of MCFA in the tested product was associated with a higher inhibitory and bactericidal activity