# bio medi active

# medinova



# **Research question**

Is the development of an innovative antibiotic free extender for swine artificial insemination possible?



#### MEDI BIO ACTIVE 02



To investigate the suitability of different molecules and and how combining them could develop new antibiotic free formulation for artificial swine insemination

# **MEDI BIO ACTIVE**

is an innovative semen extender formulation for artificial swine insemination free from antibiotics. This product has been formulated using natural and eco-friendly proteins capable of reducing bacterial growth and preserving the capacity to fertilise sperm cells for a period of 4 days.

- Free from antibiotics
- Natural and eco-friendly proteins
- Reduces bacterial growth
- Preserves fertilizing capacity for 4 days
- Temperature stable product

MEDI BIO ACTIVE 03











# Which are the natural and eco-friendly proteins used in medi bio active formulation?





## Protein I

Is a **protein found in bodily secretations** such as seminal plasma, tears, saliva and milk. It **plays a fundamental role** in domestic animals **reproductive processes, either as innate defence** components in seminal plasma or by participating in antioxidative or fertilizing processes.

#### MEDI BIO ACTIVE 05



#### MAIN FEATURES

- Active against Positive Gram Bacteria
- It's an antimicrobial agent which works by cleaving the peptidoglycan component of bacterial cell walls, resulting in cell death
- Able to destroy the bacterial membrane
- Maintains excellent performance when stored at 37°C in pH 7 buffer solution (optimal conditions for semen extender)
- Its activity can be boosted by co-factors (e.g. EDTA-SACCHARIDES that are part of common semen extender formulations)





# Protein II

Is a protein derived from a tropical plant. It has proteolytic and antiinflammatory action and has been adopted in various fields of medicine for its bacteriostatic, anti-inflammatory and inhibitory capacity to eradicate biofilm formation.

#### MEDI BIO ACTIVE 06



#### MAIN FEATURES

- Active against Negative Gram Bacteria
- Able to destroy the peptidic links (peptides) (aminoacids) in the bacterial membrane
- Maintains excellent performance when stored at 37°C in pH 7 buffer solution (optimal conditions for semen extender)

# MINIMUM STANDARDS FOR THE USE OF LIQUID PRESERVED BOAR SPERM

Table 2

Minimum standards for the use of liquid preserved boar semen in 11 pig breeding organization worldwide.

Semen Standards	Α	В	С	D	E	F	G	Н	Ι	• J •	К
Total motility (%)											
	70	80	75	70					70		80
Expire day	60	70		65			60		50	60	70
Progressive motility (%)											
Eroch		80	70			70					
Expire day		70			70	60	50	70		45	
Morphological abnormal sperm (%)	30	20	25	25	25	15	30	25	30	30	
Cytoplasmic droplets (%)		20		15		15	20		30		
Agglutination (%)	20			30		15	30	30			
Sperm/dose (x10 <sup>9</sup> )											
Cervical insemination	1.8	2.0	2.3	1.8	4	3		3	2.2	1.3*	1.5*
Post cervical insemination		1.5	1.4		2.2	1.8		1.5	1.1		
Storage duration (days)	3-7	6	2-5	3	2-3	7		5-6	5	4	4
Extended	s, 1	1	1	S		1	1	1	1	S	S
Bacterial contamination (CFU/mL)	300	0	0		1000		0	0	30		300

A: Agriculture and Horticulture Development Board (GB); B: Netpork (AR); C: Rivalea & Sabor (AU); D: German Livestock Association (DE); E: Agrosuper (CL); F: CP Group (CN); G: Pig Improvement Company (US); H: Pipestone (US); I: AIM Ibérica (ES, PT); J: Topigs Norsvin (NL); K: DanBred (DK); s = short-term extender; m = medium-term extender; l = long-term extender; \* = motile.

#### MEDI BIO ACTIVE 07

Dagmar Waberski, Anja Riesenbeck, Martin Schulze, Karl Fritz Weitze, Lawrence Johnson. Application of preserved boar semen for artificial insemination: Past, present and future challenges. 2019

Colony Forming Unit (CFU)/mL

# **SELECTED RESULTS FROM IN VITRO SPERM CULTURES**



#### MEDI BIO ACTIVE 08



The graph shows the **bacteriological** analysis carried out on sperm cultures of different boar breeds.

The measurement of bacterial growth after 4 days showed that:

- Medi Bio Active mirrored the behavior of the extender formulation containing antibiotics yet with one log more contamination
- Medi Bio Active significantly reduced and controlled the microbial growth when compared to raw sperm (P < 0.0001)

# SELECTED RESULTS FROM IN VITRO SPERM MOTILITY EVALUATION

90





Time (days)

7

The **sperm cell movement** patterns in the ejaculate are characteristic of each boar. The semen samples were diluted with **Medi Bio Active** in comparison with an extender formulation with antibiotics and one base extender formulation.

Medi Bio Active maintained good motility in all tested animals, being even better than the formulation with antibiotics in three out of four cases.

It is also worth noting that, although **Medi Bio Active** is designed to maintain sperm vitality for 4 days, the tested formulation guaranteed progressive motility > 70% in all boars until 6 days.

# Conclusion

## **INDUSTRIAL VIEW POINT**

- Substances contained do not produce environmental contamination
- Biodegradable system
- The low concentration values that can be used are a very important factor in the industry
- Including these substances in the final product composition opens up a big possibility for the ANTIBIOTIC FREE swine production

## **EXPERIMENTAL VIEW POINT**

- The final formulation shows the proteins do not negatively affect the progressive motility of spermatozoa
- The final formulation is able to lower the bacterial load when the initial bacterial load in ejaculate is not higher than 1000 CFU/ml
- The final formulation is highly biocompatible toward sperm cells and is efficacious in reducing bioburden at an affordable price