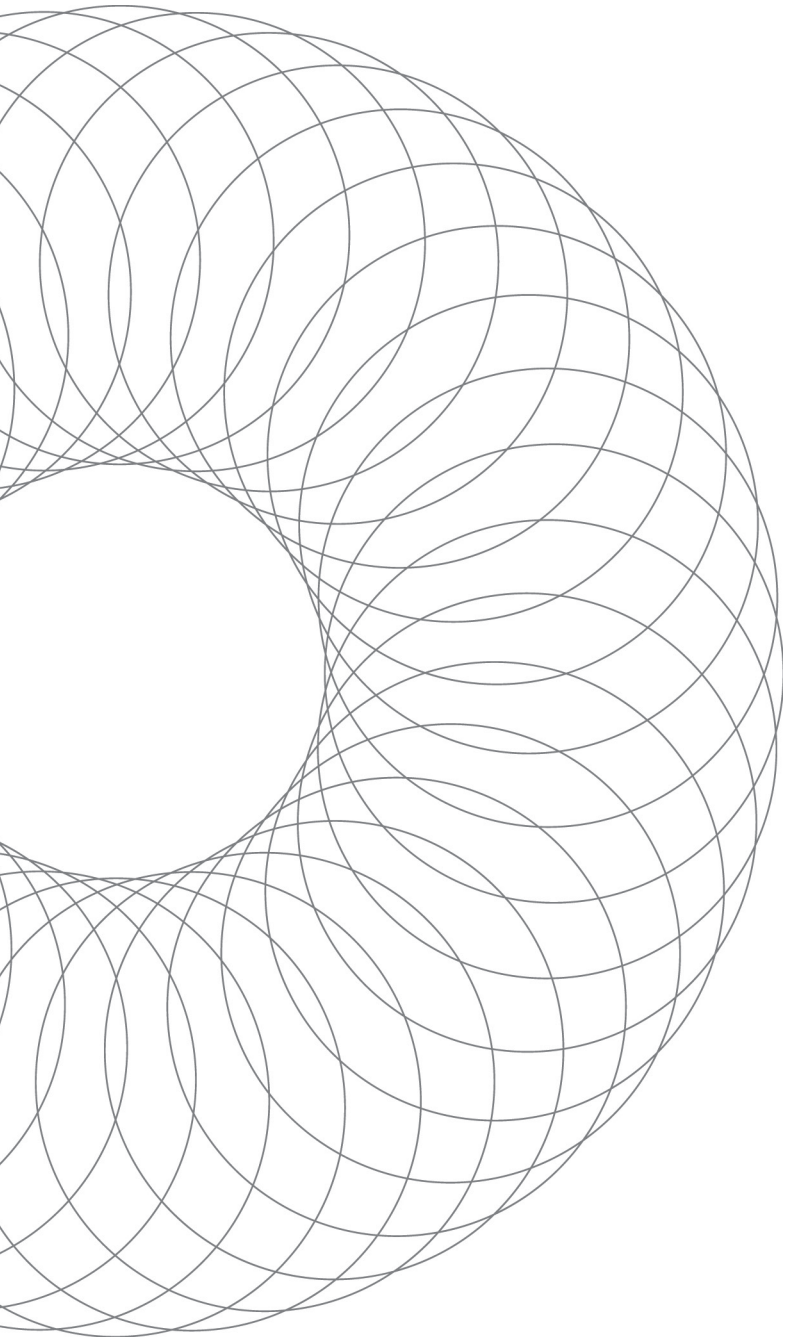
FORMULA

SWINE SEMEN EXTENDERS



TECHNICAL DATA SHEET

medi·nova

CORPORATE CARE, CUSTOMER GAIN

GIVING AN EXTRA VALUE TO YOUR PIG PRODUCTION

MEDI NOVA, A HISTORY OF AN INSPIRATION FOR PIG SUCCESS

After 4 years of development, Medi Nova's team is proud and excited about the new innovative extender line – **FORMULA** – based on considerably lower antibiotic content and a new way to provided energy to the spermatozoa.

FORMULA, a new product developed by Medi Nova's in conjunction with The University of Parma, is designed with a modulated energy concept formula that allows the product to combat bacterial contamination, providing a high degree of protection against bacteria without exclusively relying on antibiotic compounds. Formula has passed specific testing protocol by our customers with great success.

In contrast to traditional boar semen extenders, FORMULA **maintains the release and amount of energy in a more consistent way until the time of the insemination**, this is expressed in a more constant Motility, and an assurance of an "ideal" environment during the insemination process. The concept of the modulated energy source is so innovative that it has been patented by Medi Nova and the University of Parma (Patent number: MI2014A001092).

The Formula Products available are Formula 3, Formula 5, Formula 8 and Formula 12 all named for shelf life (days) for which they have the ability to conserve the viability of each dose of fresh boar semen.

The most important role of an extender is not only to maintain the motility of the sperm it is also to provide the best protection for membrane integrity. Formula extenders are all designed to maintain an enhanced ability to fertilize the oocyte.
FORMULA line of Semen extenders, new extenders and new innovative technology provide extra benefits to the Swine industry.

- Energy modulation
- Low antibiotic content
- High stability, optimal control of pH and Osmolality

WHAT IT IS MODULATED ENERGY SOURCE?

This is a great discovery and a perfect fit for our semen extenders.
FORMULA includes a new component, a modular activator that **regulates the energy liberation time**, permits optimal control and increases the availability of more energy sources enhances storage, timely activity and fertility of the sperm.

FORMULA REGULATES THE SPERMATIC METABOLISM DURING THE PRESERVATION AND PROVIDES ENERGY FOR THE FECUNDATION

The experts at our R&D department and the Parma University have patented a new technology with direct use in different biological applications.

MODULATING ENERGY FOR HIGHER PERFORMANCE

	PROGRESSIVE MOTILITY %			
FORMULA 3	77,54 %	80,05 %	73,04 %	
FORMULA 5	81,46 %	85,55 %	82,33 %	
FORMULA 8	85,45 %	**86,77 %**	85,88 %	65,66 %
FORMULA 12	**85,91 %**	86,63 %	**86,6 %**	**73,38 %**
CONTROL (7 days)	85,47 %	82,81 %	68,14 %	52,04 %
	3 days	**5 days**	**8 days**	**12 days**

Result of Prog. Motility, average of 10 Pietran Boars from Independent Laboratory

FORMULA IS DESIGNED TO MAXIMIZE CELL PERFORMANCE AND FERTILITY

- Preservation media
- Effective protection of spermatozoa's
- Manufacturing and quality control complying with the strictest pharmaceutical standards
- Medi Nova`s R&D team in conjunction with the Scientists at Parma University
- Buffers which guarantee physiological pH and stable osmolality removing any risk of osmotic shock
- Sugars which provide an easily assimilated energy source for preserved spermatozoa
- Specific antibiotic combination to minimize bacterial Growth
- 75% reduction of Antibiotics

THE FORMULA ENVIRONMENT

FORMULA INCLUDES PROTEIN COMPOUNDS THAT WILL PROTECT MEMBRANES AND MAINTAIN STRUCTURES OVER A LONGER PERIOD

- Improving % of progressive spermatozoa motility
- Protection against temperature variations and mechanical stress
- Increased protection against oxidation
- Improved agglutination control

FORMULA PROVIDES PERFECT MEDIA FOR SPERM CELLS PRESERVATION WITH EFFECTIVE PROTECTION OF:

- Environmental variations (osmolality, pH)
- Oxidation
- Temperature variations
- Bacterial and toxin contamination
- Mechanical shocks
- Does not contain substances of animal origin, BSA free
- Does not contain tensoactives
- Does not produce foam

FORMULA ALLOWS AN INCREASED NUMBER OF DOSES PER BOAR BECAUSE IT ALLOWS A REDUCTION IN THE NUMBER OF CELLS PER DOSE

	Preservation time (days)	Modulated Energy	Antibiotics	BSA free	Buffer
FORMULA 3	3	✓	Gentamicin Marbofloxacin	✓	+
FORMULA 5	5	✓	Gentamicin Marbofloxacin	✓	++
FORMULA 8	8	✓	Gentamicin Marbofloxacin	✓	++++
FORMULA 12	12	✓	Gentamicin Marbofloxacin	✓	++++

Formula is available in different format sizes, 1, 5, 10, 60 and 100 litres sizes, with an 18 months shelf life (stored at 5ºC – 30ºC in a dry and dark environment).

FORMULA 3

RELEASES ENERGY TO THE FECUNDATION

FORMULA 5

BREAK-EVEN POINT IN YOUR ARTIFICIAL INSEMINATION PROGRAM

FORMULA 8

SEMEN QUALITY AND LENGTH GUARANTEE BY A NEW AND INNOVATIVE MODULATED ENERGY SOURCE

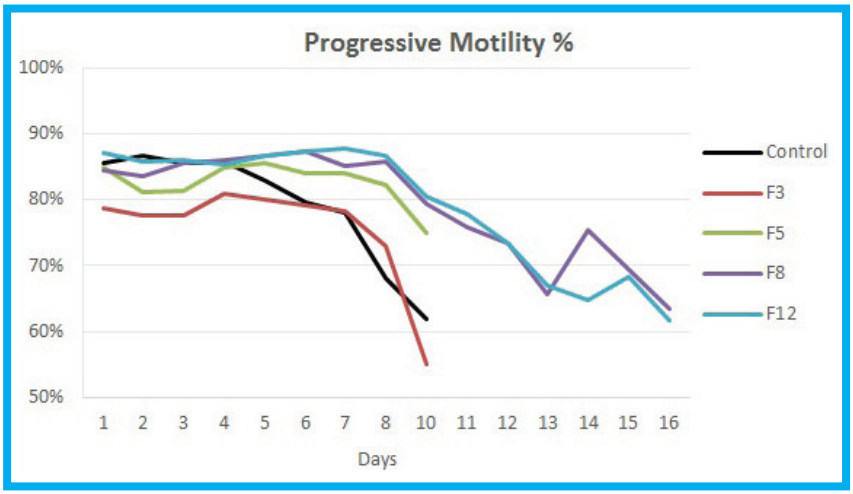
FORMULA 12

THE FUNCTIONAL MODULATOR ACTION SHOWS ITS MAXIMUM POTENTIAL IN A VERY LONG TERM STORAGE

The Modulated energy source included in the formulation will assure that energy remains available until the moment when it is really needed; fecundation.

INDIPENDENT LABORATORY TEST

PROGRESSIVE MOTILITY %



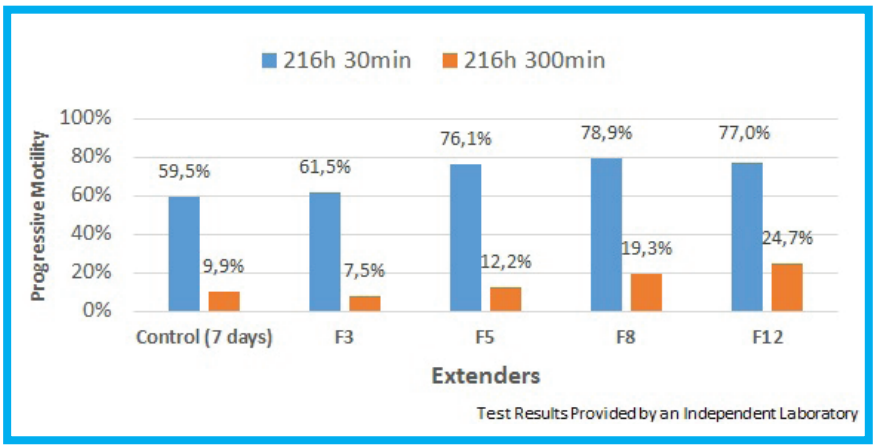
Modulated energy shows a constant release of energy compared with other commercial extenders.

Control is a commercial 7 days extender

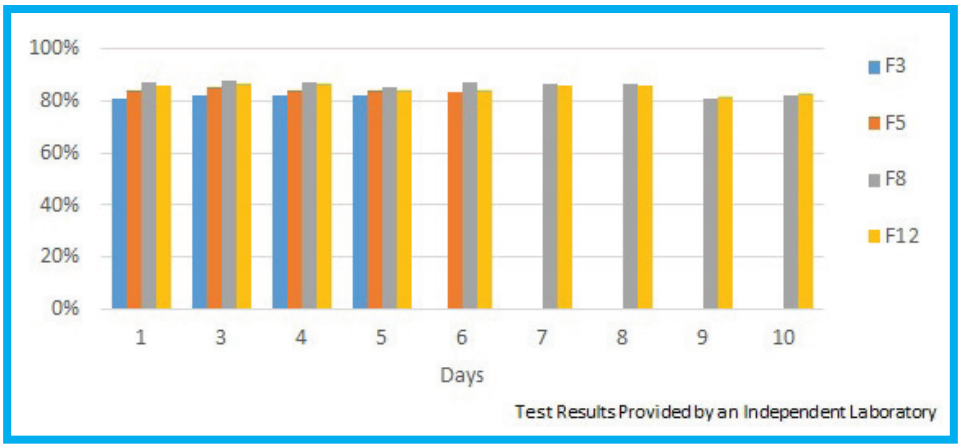
THERMORESISTANCE TEST (TRT) AFTER 216 H

To assess sperm longevity at body temperature, a thermo- resistance test (TRT) was performed 216 h after dose preparation. An aliquot of 10 ml was incubated at 38°C for up to 300 min.

Measurements were performed after 30 min (TRT 1) and 300 min (TRT 2) of incubation using CASA.
The prolonged storage and incubation time allows detecting of differences in motility not earlier observable.



MEMBRANE INTEGRITY - VIABLE CELLS



Eight boars with normosperm ejaculates was chosen for the test. Semen dose preparation was done in a split-sample procedure for all of the extenders. Sperm cell number was adjusted to 20 x 106 sperm cells/ml. Samples were cooled to 17°C during a period of five hours and stored in the dark at 17°C until usage. First analysis was done 24 hours after dose preparation (day 1).

FORMULA IS PROVEN BY RESEARCH AND FIELD TRIALS

- High stability against temperature 5ºC-30ºC
- Latest technology in the market; MODULATED ENERGY SOURCE
- Provides better results than existing commercial extenders

	# Sows inseminated	Herd	% FR	TB	FI	%Δ FI
Previous Semen Extender (X)	30413	1	72,7%	12,68	922	26,7%
Formula 8	28812		84,3%	14,04	1168	
Previous Semen Extender (X)	11223	2	72%	11,99	863	25,8%
Formula 8	12359		84,3	12,87	1085	
Previous Semen Extender (X)	6278	3	75,5%	14,02	1058	11,08%
Formula 8	6141		78,2	15,03	1175	
Total Previous Semen Extender (X)	**47914**	**1+2+3**	**72,9%**	**12,70**	**926**	**24,90%**
Total Formula 8	**47312**		**83,5%**	**13,85**	**1157**	

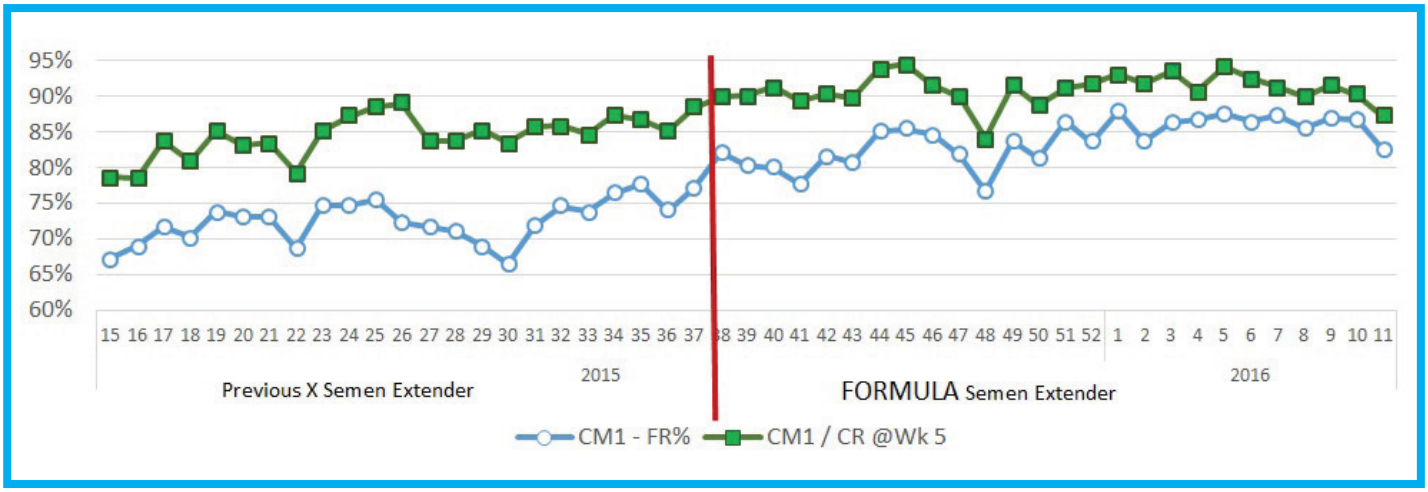
New **FORMULA** extenders will cover 100% of the actual needs in farms and Insemination centres.

Facts:

A Formula customers from the US said it all:
"By using Formula extenders from Medi Nova the number of piglets born alive in our farm is the highest it has been in the last 20 years".

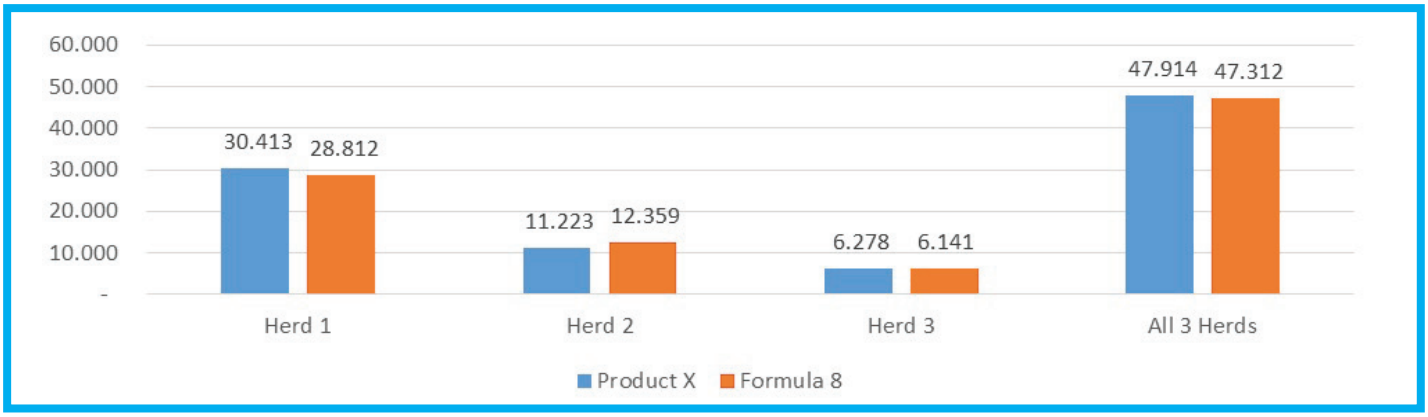
(US customer, Q1 2016)

FARROWING RATE AND CONCEPTION RATE BY BREEDING WEEK IN RELATION TO SEMEN EXTENDER CHANGE

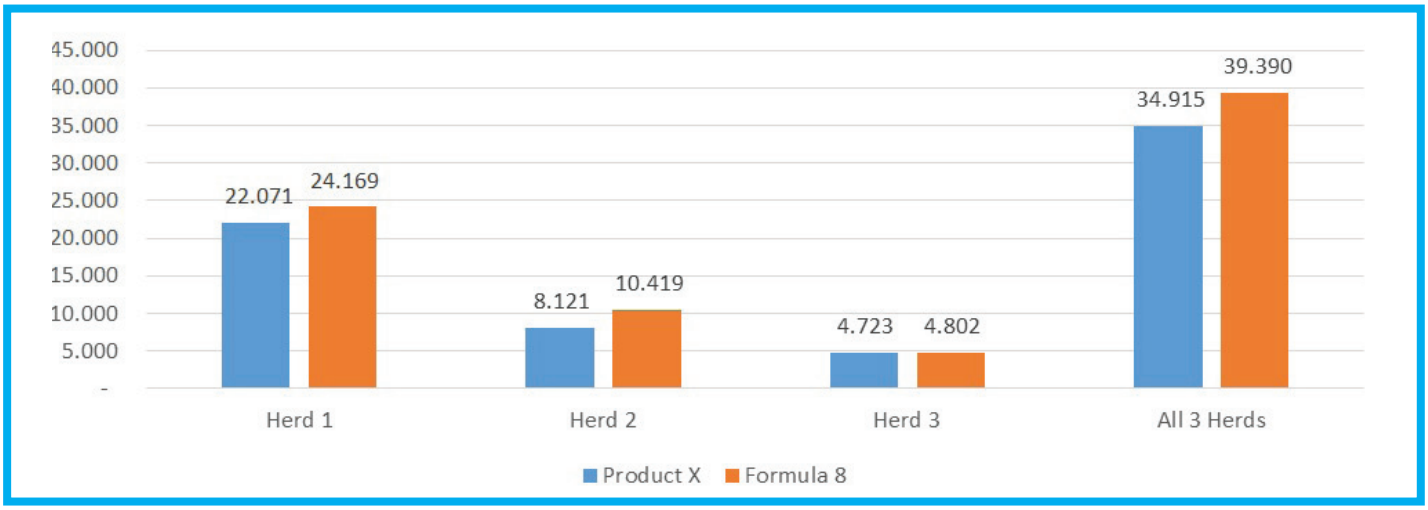


Results from another location achieve values of **98,4% in CR** and **93% in FR** (not shown due to PEDV outbreak).

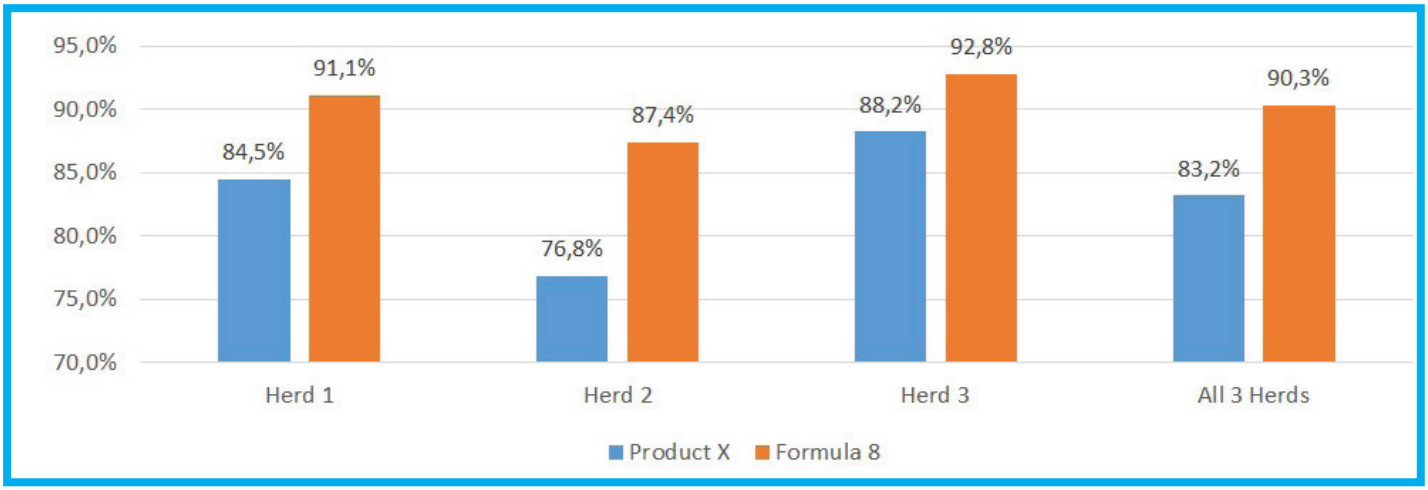
SOWS BRED BY HERD AND EXTENDER



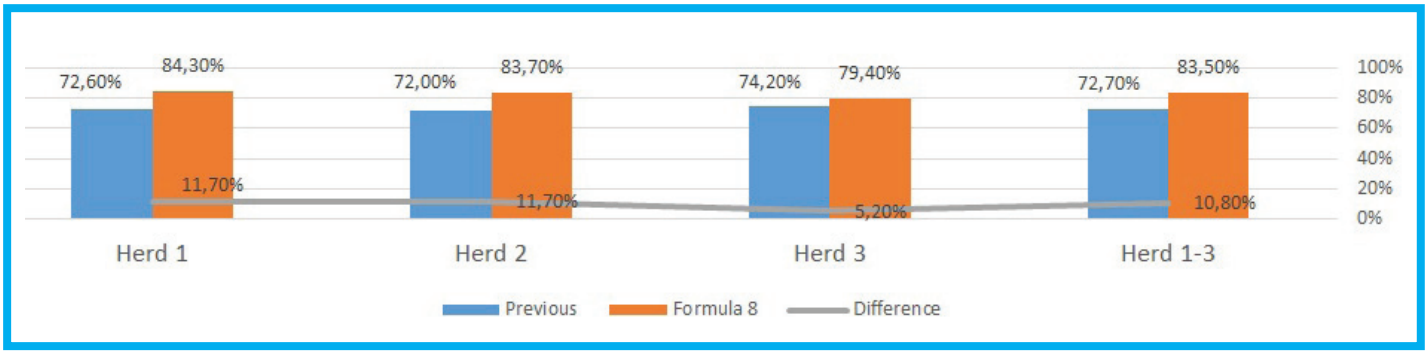
LITTERS FARROWED BY TREATMENT



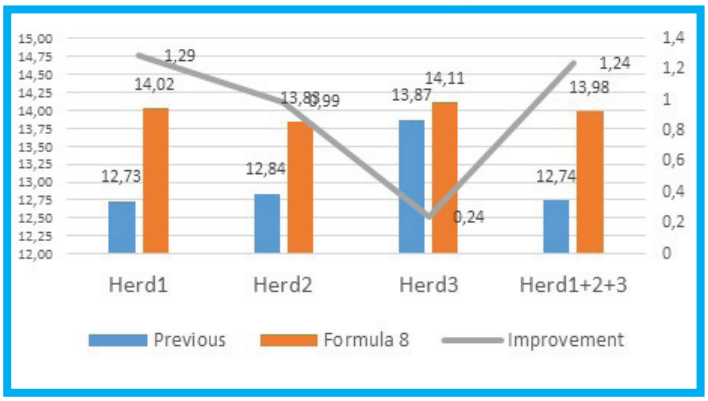
PREVIOUS EXTENDER VS. FORMULA 8
Conception Rate



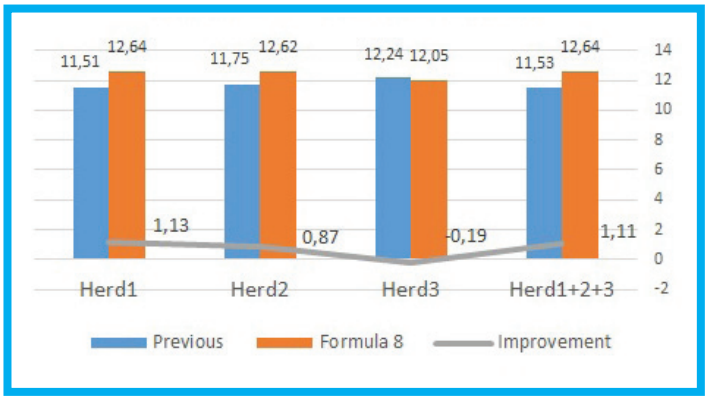
PREVIOUS EXTENDER VS. FORMULA 8
Farrowing Rate



PREVIOUS VS. FORMULA 8
NUMBER OF TOTAL BORN PIGLETS



PREVIOUS VS. FORMULA 8
NUMBER OF BORN ALIVE PIGLETS

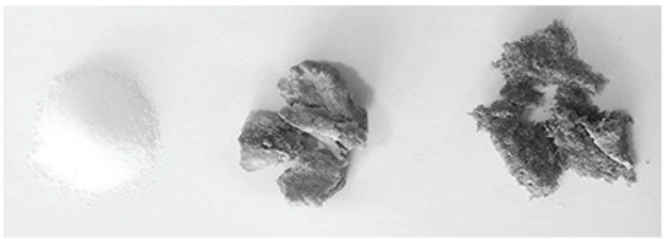


FORMULA HAS STABILITY AGAINST HIGHT TEMPERATURES

The stability of **FORMULA** has been challenged against two commercially available boar semen extenders.

Mixtures at preparation
FORMULA CONTROL 1 CONTROL 2

Mixtures after 7 days at 50 ºc
FORMULA CONTROL 1 CONTROL 2



All Mixtures were placed in airtight packages and stored in a chamber pre-heated to 50 °C. After 7 days, packages were opened and the appearance of formulations checked. The results showed the improved stability of Formula, which can tolerate storage at higher temperatures without suffering deterioration.

FORMULA
at preparation

FORMULA
after 18 months storage at 25°C

FORMULA was introduced into an airtight package and stored at 25 °C. After 18 months the pack has been opened and the appearance of formulation checked. The formulation still looks white, without aggregates, and flows freely. Results show long term stability of FORMULA which does not suffer any alteration after 18 months when stored at room temperature.

RESPONSIBLE USE OF ANTIBIOTICS

CONSUMERS DEMAND WHOLESOME ANIMALS
WE ARE PART OF THE RESPONSIBLE FOOD SUPPLY

"It is well known by the industry that the abusive use of antibiotics will take their toll".
Low antibiotic content using a combination of 2 antibiotics exclusively used for animals, increases the cover and elimination of a wider spectrum of the common bacteria present in raw semen and is indispensable for a good dose preservation.

BACTERIAL CONTAMINANTS AND ANTIBIOTIC RESISTANCE IN RAW SEMEN

Antibiotic	*E. coli* n=20	*Staph. epidermidis* n=8	*Serratia marcescens* n=6	*Proteus mirabilis* n=4	*Streptococcus* spp. n=2	*Staph. aureus* n=2	*Pseudomonas spp.* n=1
Amikacin (30 µg)	10 (50%)	1 (12.5%)	4 (66.6%)	1(25%)	0 (0%)	0 (0%)	0 (0%)
Amox. + Clav. acid (30 µg)	11 (55%)	2 (25%)	4 (66.6%)	2 (50%)	0 (0%)	1 (50%)	1 (100%)
Ampicillin (25 µg)	15 (75%)	3 (37.5%)	5 (83.3%)	3(75%)	0 (0%)	1 (50%)	1 (100%)
Aztreonam (30 µg)	11 (55%)	0 (0%)	3 (50%)	1(25%)	0 (0%)	1 (50%)	1 (100%)
Aminosidine (60 µg)	nd	3 (37.5%)	4 (66.6%)	nd	nd	1 (50%)	nd
Cefapirin (30 µg)	nd	2 (25%)	nd	nd	nd	nd	0(0%)
Cefazolin (30 µg)	11 (55%)	3 (37.5%)	5 (83.3%)	3(75%)	0 (0%)	1 (50%)	1 (100%)
Cefoperazone (30 µg)	13 (65%)	1 (12.5%)	5 (83.3%)	2 (50%)	0 (0%)	1 (50%)	N.D.
Ceftiofur (30 µg)	4 (20%)	1 (12.5%)	4 (66.6%)	0 (0%)	0 (0%)	1 (50%)	1 (100%)
Ceftriaxone (30 µg)	nd	0 (0%)	nd	nd	0 (0%)	nd	nd
Cefquinome (30 µg)	7 (35%)	3 (37.5%)	5 (83.3%)	3(75%)	0 (0%)	0 (0%)	0(0%)
Colistin (10 µg)	19 (95%)	7 (87.5%)	6 (100%)	4(100%)	1 (50%)	2 (100%)	1 (100%)
Doxiciclina (20 µg)	17 (85%)	3 (37.5%)	5 (83.3%)	1(25%)	0 (0%)	1 (50%)	1 (100%)
Danofloxacin (5 µg)	17 (85%)	3 (37.5%)	5 (83.3%)	4(100%)	0 (0%)	1 (50%)	1 (100%)
Enrofloxacin (5 µg)	1 (5%)	0 (0%)	6 (60%)	1(25%)	0 (0%)	0 (0%)	1 (100%)
Florfenicol (30 µg)	13 (65%)	2 (25%)	3 (50%)	3(75%)	0 (0%)	0 (0%)	1 (100%)
Flumequine (30 µg)	12 (60%)	2 (25%)	5 (83.3%)	3(75%)	0 (0%)	1 (50%)	1 (100%)
Gentamicin (10 µg)	14 (70%)	4 (50%)	3 (50%)	2 (50%)	1 (50%)	2 (100%)	0 (0%)
Marbofloxacin (5 µg)	0 (0%)	0 (0%)	0 (0%)	1(25%)	0 (0%)	0 (0%)	0 (0%)
Oxitetracyclin (30 µg)	17 (85%)	3 (37.5%)	5 (83.3%)	4(100%)	0 (0%)	1 (50%)	1 (100%)
Penicillin G (10 µg)	17 (85%)	3 (37.5%)	5 (83.3%)	4(100%)	0 (0%)	1 (50%)	1 (100%)
Rifaximin (40 µg)	14 (70%)	3 (37.5%)	5 (83.3%)	1(25%)	0 (0%)	1 (50%)	1 (100%)
Streptomycin (10 µg)	17 (85%)	3 (37.5%)	5 (83.3%)	3(75%)	0 (0%)	1 (50%)	1 (100%)
Tiamulin (30 µg)	20 (100%)	7 (87.5%)	6 (100%)	4(100%)	1 (50%)	2 (100%)	1 (100%)
Tylosin (30 µg)	20 (100%)	7 (87.5%)	6 (100%)	4(100%)	2 (100%)	2 (100%)	1 (100%)

nd, not detected.

MEDI NOVA QUALITY ASSURANCE:

Internal

Since 2006 Medi Nova has built a quality system certified according to UNI EN ISO 9001:2008 producing products with the best response to temperature, hygrometry and sanitation.
All products are Quality Assured.
Every batch is submitted to controls:

- Visual appearance
- Physicochemical properties
- Packaging
- In vivo test with CASA analysis
- Certificate of analysis is available for every batch
- Complete traceability

QUALITY SYSTEM CERTIFICATION
DNV·GL
ISO 9001

External

All the components used in production fall under the pharmaceutical protocols of raw material quality assurance.

- Suppliers complying ISO standards providing certification of conformity
- Every single ingredient is submitted to physicochemical effectiveness and biocontrol

MEDI NOVA SEMEN EXTENDERS QUALITY CONTROLS - GLOBAL TRACEABILITY

RAW MATERIALS

- Selected suppliers
- Pharmaceutical grade products
- In house specifications control by Medi Novas laboratory, single batch controls of raw materials

PRODUCTION

- Controlled production areas (possitive preasure)
- Dedicated areas by product type
- Analisys by production bath: pH, Conductivity, Osmolality and Microbiological

POST PRODUCTION

- Periodical analisys by external laboratories (phamaceutical grade)
- Historical database of productions with full traceability
- Batch samples to perform long stability test

FOR MORE INFORMATION:

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