Clinical case: **'dirty sow syndrome'** in nulliparous females

Without a doubt, altrenogest is a very useful tool for farms who want to synchronise heat, rationalise the incorporation of nulliparas into production, and maintain a compensated and stable population, all of which directly affects production costs.

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Special thanks to Ruth Menjón (MSD Animal Health) and María Victoria Falceto (doctor at the Veterinary Faculty of the University of Zaragoza).

Characteristics of the farm

This farm, located in the province of Soria (Spain), has 2,650 Landrace × Large White breeders (a hyperprolific line) and carries out self-replacement.

These facilities were recently constructed (in 2015) and have significantly invested in new technologies. In addition, the staff who work there have a high degree of professionalisation.

The farm can be classified as 'high health' because it is free of PRRSv, *Mycoplasma hyopneumoniae*, *Actinobacillus pleuropneumoniae*, and *Brachyspira hyodysenteriae*, among other pathogens.

Adaptation and health program

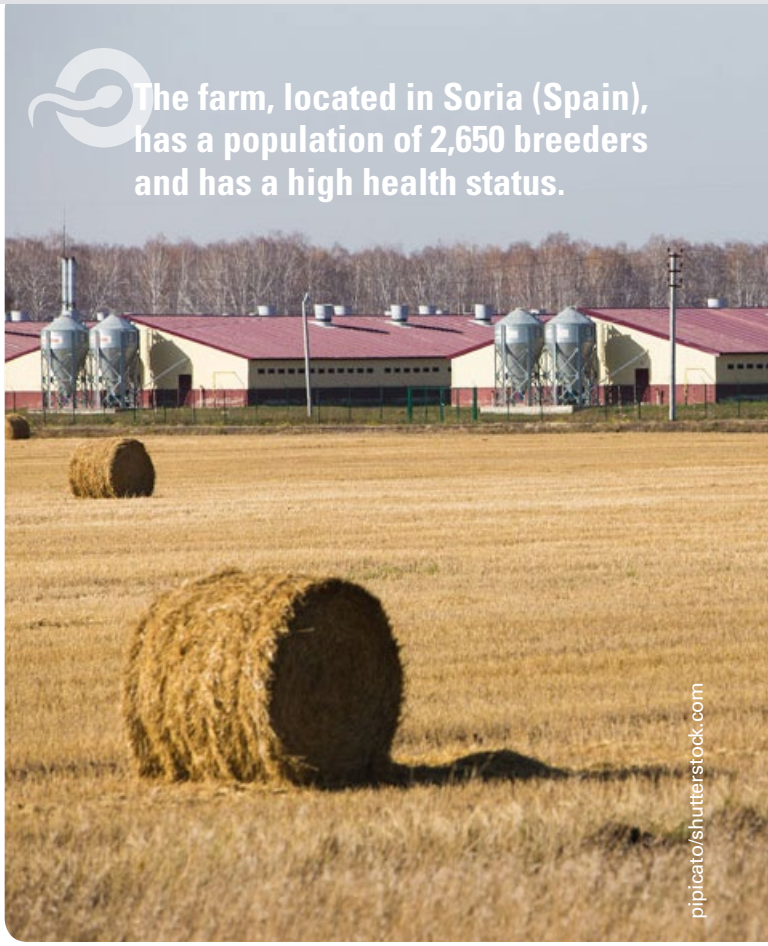
Replacement gilts are reared on the farm itself.

1st stage: health adaptation

The piglets are moved from the transition area to the fattening facilities when they weigh 22–25 kg (10/11 weeks old), and are kept there until they are 6.5–7.0 months old.
Health adaptation occurs during this period.

2nd stage: heat detection

The gilts are transferred to the training barns which is fully grated and contains the feeding machines. Fattening feed is provided throughout the whole of this stage.



Fattening of reared gilts

This installation is representative of a conventional feedlot:

- Central hallway.
- Not modulated.
- 28 of 3.8 × 4.4 metre pens, with 1.9 meters of solid flooring (at the front) and 2.5 meters of gridded flooring.

The gilts are also stimulated daily (and simultaneously) with several boars during this phase, and if they show signs of heat, this is recorded.

3rd stage: treatment with altrenogest

Once this learning stage is completed, the gilts are transferred to the mating area so that they can adapt to the boxes, and a treatment with altrenogest for 18 days is started.

The objective is to inseminate these gilts for the first time when they are 32–33 weeks old and their live weight is 135–145 kg.

They are provided feed *ad libitum* during this phase of adaptation to the box in order to obtain a good ovulation rate.

4th stage: mating

At the end of the treatment, after the gilts go into heat, they are inseminated with a foam catheter with a conventional dose in the presence of boars.

The farm was self-replenishing: the piglets were taken from the transition to the reared-gilt fattening area when they were 10–11 weeks old and stayed there until they were 6.5–7.0 months old.

Treatment with altrenogest

This treatment is individually administered to each sow by mouth.

Ideally, the same person should always administer it at the same time of day.

Mountains Hunter/shutterstock.com

Health adaptation

The gilts:

- Are immunised by vaccination against PCV2, influenza, *E. coli* - *Clostridium*, parvovirus, and swine erysipelas.
- They are dewormed with ivermectin before being sent to the mating barn. In addition, throughout their rearing, an antiparasitic is administered in the feed once a month (for example, flubendazole).

Reproductive and productive data for 2019

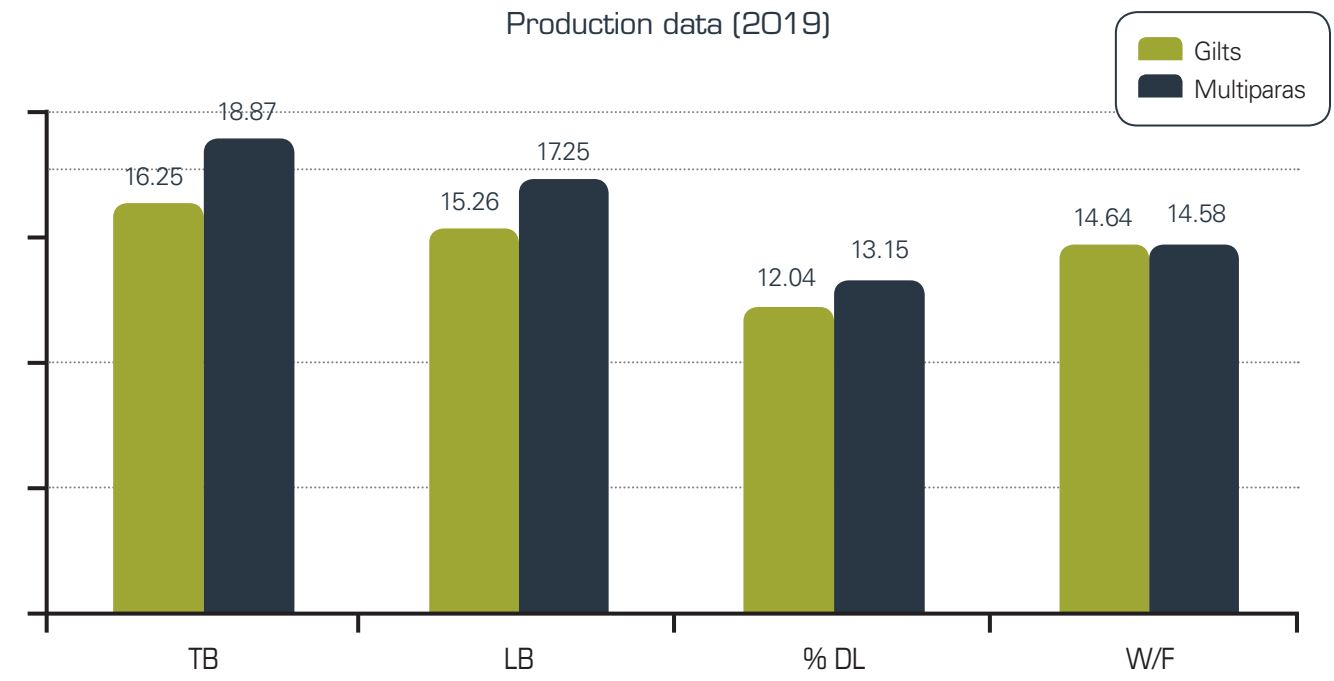
- Average fertility measured by ultrasound in nulliparas (up to clinical presentation): 92.33%
- Average fertility in multiparas: 94.75%
- Average birth rate at the holding: 89.75%
- *Table 1*, *table 2*, and *figure 1* summarise the evolution of the population and of the productive parameters in 2019.

Cycle N°	1	2	3	4	5	6	7	8	9	10	11
% of the total	23.0	21.9	17.0	13.0	9.6	5.7	5.2	1.9	0.6	1.1	1.0
Objective	21.0	17.0	15.0	12.0	11.0	9.0	8.0	7.0	0.0	0.0	0.0

Table 1. Farm population in 2019.

	Total births	Live births	% Stillbirths	Mummified	% deaths during lactation	Piglets weaned per farrowing	Lactation duration	Gestation duration	Cycle duration
Gilts	16.25	15.26	6.11 %	1.34	11.89 %	14.64	27.3	116.2	149
Multiparas	18.87	17.25	8.60 %	0.62	10.55 %	14.58	27.6	115.8	150

Table 2. Summary of the 2019 production data.



TB: total births; LB: live births; % DL: deaths during lactation; W/F: weaned/farrowing.

Figure 1. The main productive parameters in gilts and multiparas.

Description of the problem

For biosafety reasons, veterinary visits to this farm were made every two weeks, always on a Monday. In addition to reviewing each section, the veterinarian looked over a series of productive data.

During the routine visit in week 35 the manager reported the appearance of some cases of gilts that were 'dirty' halfway through or, more frequently, at the end of treatment with altrenogest. They had noted that, in some cases, the gilts presented larger quantities of discharge and had a worse appearance than others. Even so, based on the belief that endometritis was impossible because thse animals had never been inseminated before, these gilts were still inseminated.

Production data list

- Population and structure by cycles.
- Number of matings (nulliparas/multiparas).
- Percentage and type of repetitions.
- Number and farrowing rate.
- Live, dead, and mummified births per farrowing.
- Number of sows weaned.
- Body condition of weaned sows.
- Total weaned piglets.
- Weaned piglets per sow per year.
- Percentage of deaths during lactation.
- Feed and water consumption by sows during farrowing.
- Percentage of deaths during transition.

During the routine visit in week 35 the manager had reported the appearance of some cases of 'dirty sows' at the end of treatment with altrenogest.

At the time of the visit, two cases were observed in which the gilts were not producing too much discharge, but it did look infectious. At that point, several measures were implemented until more data were available.

Measures implemented

1 Not inseminating any sows producing discharge. Gilts producing a lot of discharge were sent to the slaughterhouse; those producing only some discharge were treated with a broad-spectrum antibiotic (such as long-acting [L.A.] amoxicillin, L.A. oxytetracycline, or marbofloxacin) and the heat was skipped.

2 Some of the affected and untreated gilts were also sent to slaughter. The case was consulted with Ruth Menjón, at the MSD A. H. technical service, who asked the Chair of Reproduction at the Faculty of Veterinary Medicine of Zaragoza University (Mª Victoria Falceto) to study the reproductive systems of these eliminated animals.

3 All the gilts were preventively treated with the chosen antibiotic in a single dose on the day that treatment with altrenogest was initiated.

4 General cleanliness and hygienic measures were implemented to avoid cross-contamination between the pens and buildings.

Noted cases

According to the annotations on the cover sheet:

- Some scattered cases (three sows) appeared from week 32.
- Most of the cases concentrated between weeks 34 and 36, specifically in a group of 12 sows from among a total of 112.
- Subsequent visits found that there had been a significant decrease in the fertility of the nuliparas, especially during those three weeks.
- In all cases where 'dirty' had been noted on the insemination cover sheet, the result had been the absence of gestation, which caused an average 10% decrease in fertility in that group of sows with respect to normal.

Recommended cleanliness and hygienic measures

- Trying to keep the gilts' resting area in the rearing house clean. This installation was still a conventional feedlot in which the rest area in some pens was sometimes very dirty.
- The use of exclusive footwear for these barns, or at least, the disinfection of footwear worn when entering the mating area (especially if cases of endometritis appear).

Chronological evolution of the process

Week 36: veterinary visit to the farm

A group of 7 representative gilts from the production flow were sent to the slaughterhouse on 06/09/19 in order to carry out a complete clinical study of the genitourinary system at the University Faculty Reproductive Advisory Service.

Rearing and gestation feed samples were collected for mycotoxin analysis.

Week 37

The last two cases of pre-insemination 'dirty sows' were recorded after the implementation of the described measures.

The mycotoxin analysis results came back negative.

Week 38: visit to the farm

Compared to the previous week, the gilt heats had completely returned to normal.

The University sent us images of the genitourinary apparatus they had analysed: the most striking thing was that several uteri presented evident endometritis with purulent-looking content (*figures 2–5*).

While we were still waiting for the final results (including histology and microbiology results), we classified the case as one of 'ascending infections', and so we prioritised cleanliness and hygienic measures.

Because these animals formed part of a conventional continuous fattening flow on the farm, thorough cleaning and disinfection was not feasible, so we directed our efforts towards reducing the infection pressure in the installation as far as possible (*table 1*).

Week 42: visit to the farm

Improvement in the fertility data noted by ultrasound compared to week 37.

Mª Victoria Falceto sent us the full report (*figures 2–5* and *figures 7–9*).

Figure 2. Increased uterine volume.

Figure 3. Purulent content in the vagina and cervix.

Figure 4. Purulent content in vaginal vestibule and vagina.

Figure 5. A bulky uterus that, when opened, contained purulent content.

Sow N°	Date of birth	Age (weeks)	Birth canal weight	Ovarian state	Genitourinary system study	Infertility expected
91104	01/09/19	34	116.3	Cyclical (metoestrus)	Mild subacute endometritis No uterus content Vagina: intraepithelial neutrophils	Uterine implantation failure
91106	01/09/19	34	109.7	Cyclical (oestrus)	Mild subacute endometritis No uterus content Mild vaginitis	Uterine implantation failure
91122	01/09/19	34	127.5	Postpubertal anestrus	Severe subacute endometritis Pyometra Mild vaginitis	Heat, ovulation, and uterine implantation failure
91124	01/09/19	34	100.5	Cyclical (metoestrus)	Severe subacute endometritis No uterus content Mild vaginitis	Uterine implantation failure
91134	01/09/19	34	102.9	Cyclical (regressive anestrus)	Severe subacute endometritis Pyometra Mild vaginitis	Uterine implantation failure
91141	01/09/19	34	116.1	Postpubertal anestrus	Moderate subacute endometritis Pyometra Mild vaginitis	Heat, ovulation, and uterine implantation failure
91184	01/16/19	33.0	106.7	Prepubertal anestrus	Mild subacute endometritis Serous content Cystitis (*figure 6*) Mild vaginitis	Heat, ovulation, and uterine implantation failure

Table 3. Summary of the genitourinary system findings from the samples obtained in the slaughterhouse.

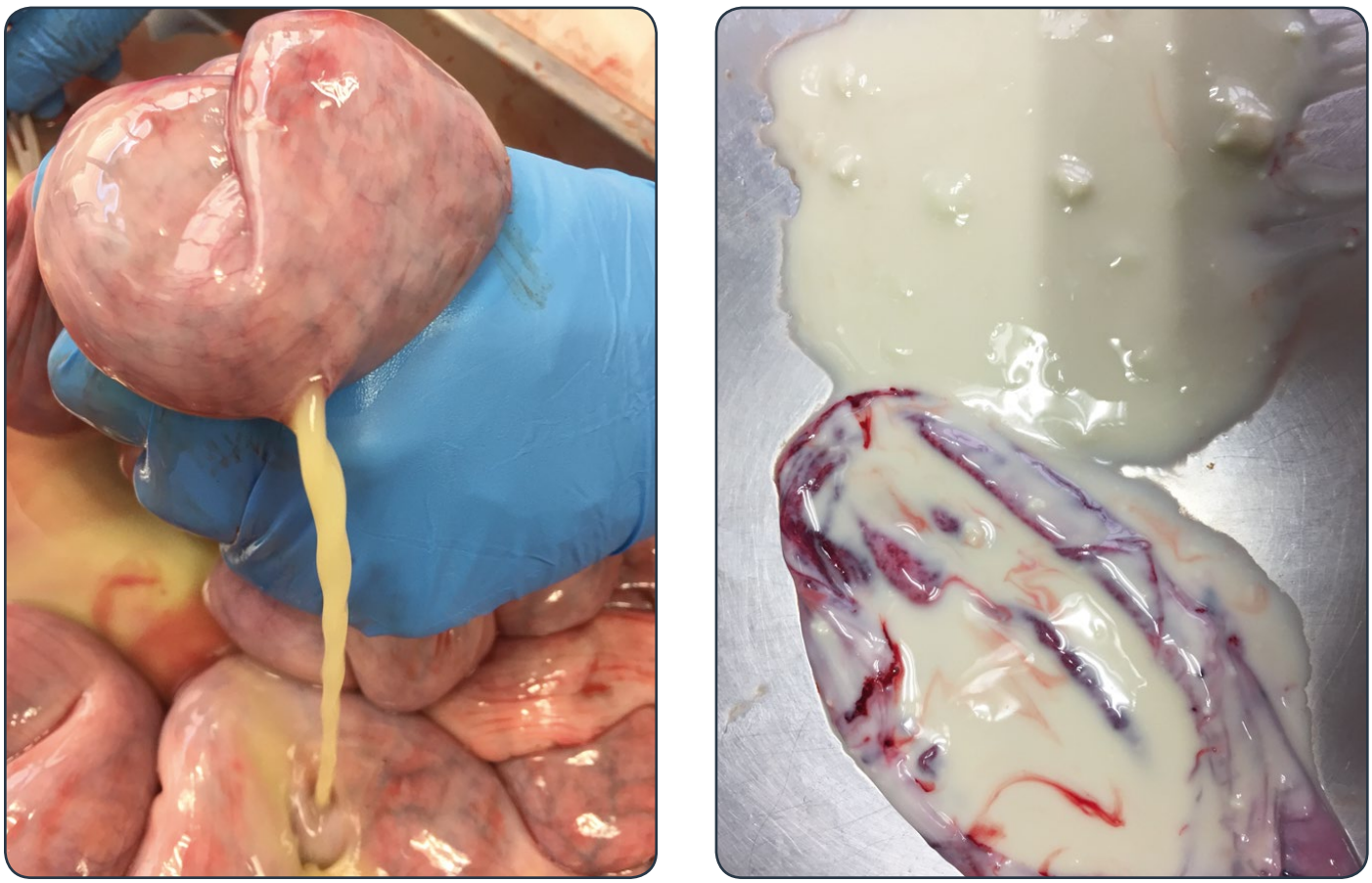


Figure 6. Purulent content in the uterine horn.

Every time a pen is emptied	• We recommended removing the faeces from the entire pen (especially the solid part) with a scraper. Emptying these remains into the pit. • Disinfecting the area (with a disinfectant backpack) before introducing new gilts. Using a disinfectant with activity against bacteria, viruses, and algae. Allowing the area to dry. The farm staff were made aware that this was not the ideal situation, but that these 'unorthodox' measures were preferable to inaction. • Once dry, a sanitiser (the one used in the farrowing house for piglets) should be sprinkled onto the bedding. • Using clothing and boots that are exclusively for use in this barn and to carry out these tasks.
Barns in use	• Trying to get the gilts used to keeping the solid area of the pen clean by adding some food to it every day. • Periodically (weekly or as necessary) remove the faeces in the pen into the mesh area and re-apply the sanitiser.
Group of gilts for insemination	• We recommended continuing the administration of the L.A. antibiotic for a few weeks (until batches arrive in which all the measures had been implemented from the beginning), administering it when treatment with altrenogest began. • No insemination of new cases of dirty sows and assessment of whether it is worth recovering these animals or not.

Clinical presentation 1. Measures to reduce the infection pressure in the installation.

Figure 7. Congestion and edema of the endometrium. Histology indicated endometritis.

Figure 8. Uterus without content but with endometritis in the histological study.

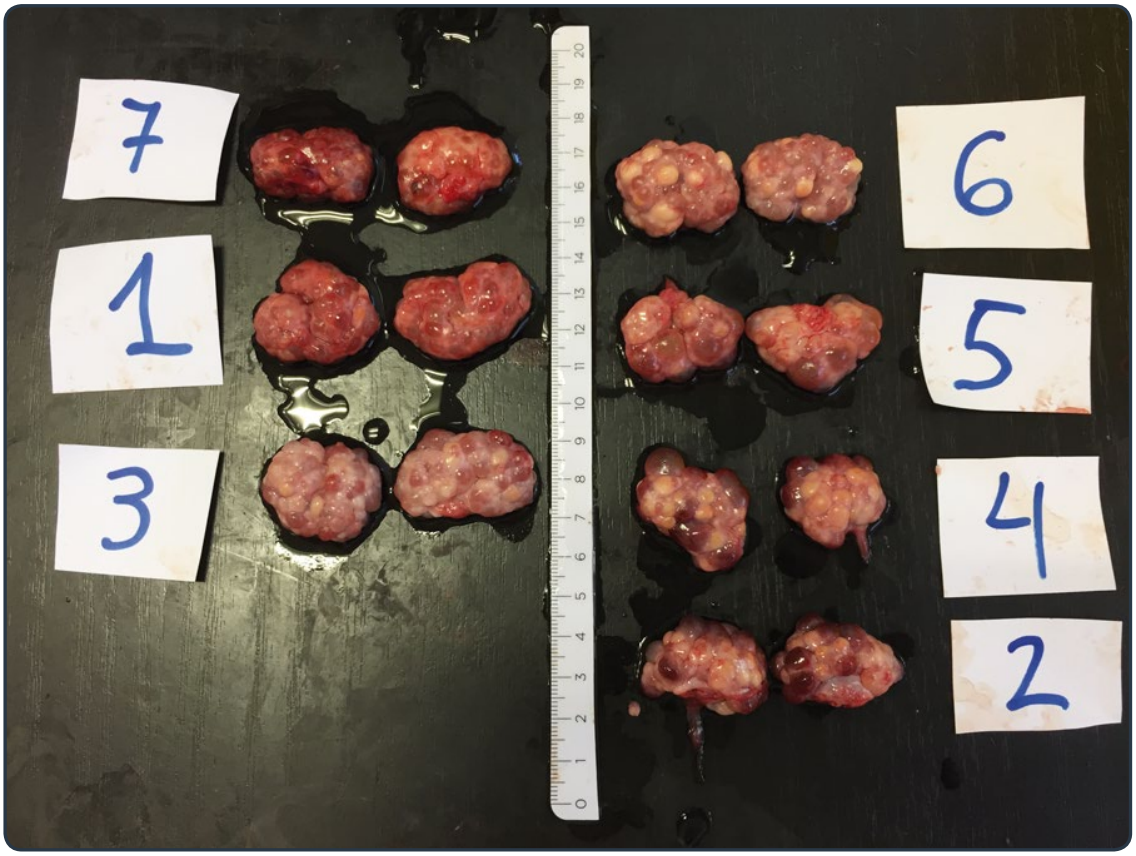


Figure 9. Ovaries in anestrus (left) and cyclical (right).

Results

Analysis of mycotoxins in feed samples: negative results (below acceptable levels in feed) for the battery of mycotoxins analysed.

Genitourinary system findings from the samples obtained in the slaughterhouse (*table 3*):

- Sows Nºs 104, 106, and 124: had gone into heat after treatment with Regumate®. They had probably emptied the uterine contents before the heat.
- Sow Nº 134: had not gone into heat after withdrawal of progestin and luteal bodies were still present in the ovary. Suspected synchronisation for less than 18 days (incomplete treatment with altrenogest).
- Sows Nºs 122 and 141: had a postpubertal anestrus status and had come into heat but later had stopped their ovarian activity.
- Sow Nº 184: prepubertal anestrus (had never come into heat and should not have been given Regumate®). Presented cystitis.

Results from the bacterial isolates (*table 2*) and the antibiogram (*table 4*). PCR was performed using the collected swabs to detect Leptospira and all the results were negative.

Mycotoxins analysed

- Vomitoxin: < 200 ppb.
- Aflatoxin: < 20 ppb.
- Zearalenone: < 250 ppb.

The sexual cycle of sows

Phases of the sexual cycle (*figure 10*):

- Proestrus: period of follicular growth.
- Oestrus: period of final maturation of the follicle and ovulation. Sows accept mounting/AI.
- Metaoestrous: period immediately after ovulation with the presence of *corpora hemorrhagicum*.
- Anestrus: comprising a progressive phase with functional corpora lutea and maximal production of P4, and a regressive phase with regressive corpora lutea after luteolysis and decreased P4 production.

Swab 1 (uterus)	*Staphylococcus hyicus***/Streptococcus porcinus*/ Trueperella pyogenes***/Escherichia coli**
Swab 2 (uterus)	*Serratia liquefaciens***/Acinetobacter johnsonii***/Escherichia coli**
Swab 3 (uterus)	*Pasteurella multocida***/Escherichia coli**
Swab 4 (uterus)	*Escherichia coli***
Swab 5 (uterus)	*Acinetobacter lwoffii***/Enterococcus faecium*/Escherichia coli**
Swab 6 (uterus)	*Pasteurella multocida****
Swab 7 (uterus)	*Acinetobacter* spp***/Escherichia coli****
Swab 7 (uterus)	*Escherichia coli****

Salmonella spp. were not isolated
Meaning: ***Massive colonisation. **Observation of a high number of colonies.
*Observation of only a few colonies.

Clinical presentation 2. Results from the isolates (Exopol).

Bacteria	Antibiotic	Diameter (mm)	Result
Pasteurella multocida. **Uterine swab 3**	Amoxicillin Tetracycline Marbofloxacin	30.8 36.5 38.7	Sensitive Sensitive Sensitive
Staphylococcus hyicus. **Uterine swab 1**	Amoxicillin Tetracycline Marbofloxacin	19.8 27.7 23.6	Intermediate Sensitive Sensitive
Serratia liquefaciens. **Uterine swab 2**	Amoxicillin Tetracycline Marbofloxacin	19.8 27.7 23.6	Intermediate Sensitive Sensitive
E. coli. **Uterine swab 7**	Amoxicillin Tetracycline Marbofloxacin	0 0 30.6	Resistant Resistant Sensitive

Table 4. Antibiogram (Exopol).

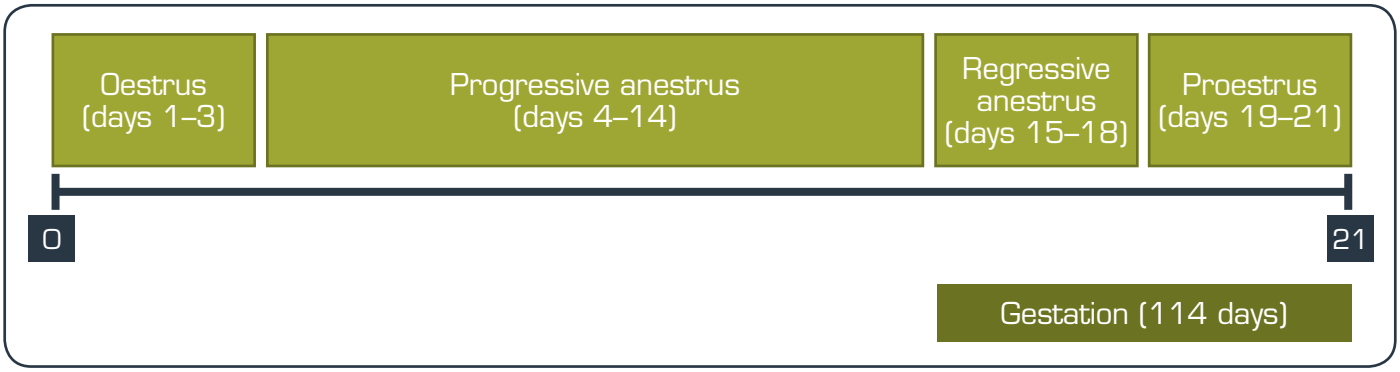


Figure 10. Phases of the sexual cycle.

Current situation (November 2019)

- To date, no cases of pre-insemination endometritis had appeared in nulliparous gilts.
- The antibiotic treatment we had started at the beginning of heat synchronisation had been withdrawn.
- The cleanliness and hygienic measures described in the clinical case had been maintained.
- The fertility percentage measured by ultrasound had recovered to levels from prior to the problem (*figure 11*).

Conclusions

- The pathology was homogeneous across the batch that had been sent to the slaughterhouse. All the sows had had endometritis and vaginitis but no salpingitis had presented.
- The urinary system did not seem to have been the focus of infection because only one sow had presented cystitis.
- An ascending infection pathway was highly likely given that all but one sow had had vaginitis.
- One of the sows had never been in heat and had presented mild endometritis. This had originated as cystitis, which itself had originated as vaginitis. This infection may have started lymphogenically or haematogenically, although the sow had never opened its cervix due to heat.
- The results from the analysis of mycotoxins in the feed did not make us suspect any problems related to mycoplasma.
- In principle, the antibiotic of choice for when new cases appear will be marbofloxacin, because the bacteria we isolated in the antibiogram were sensitive to this antibiotic.

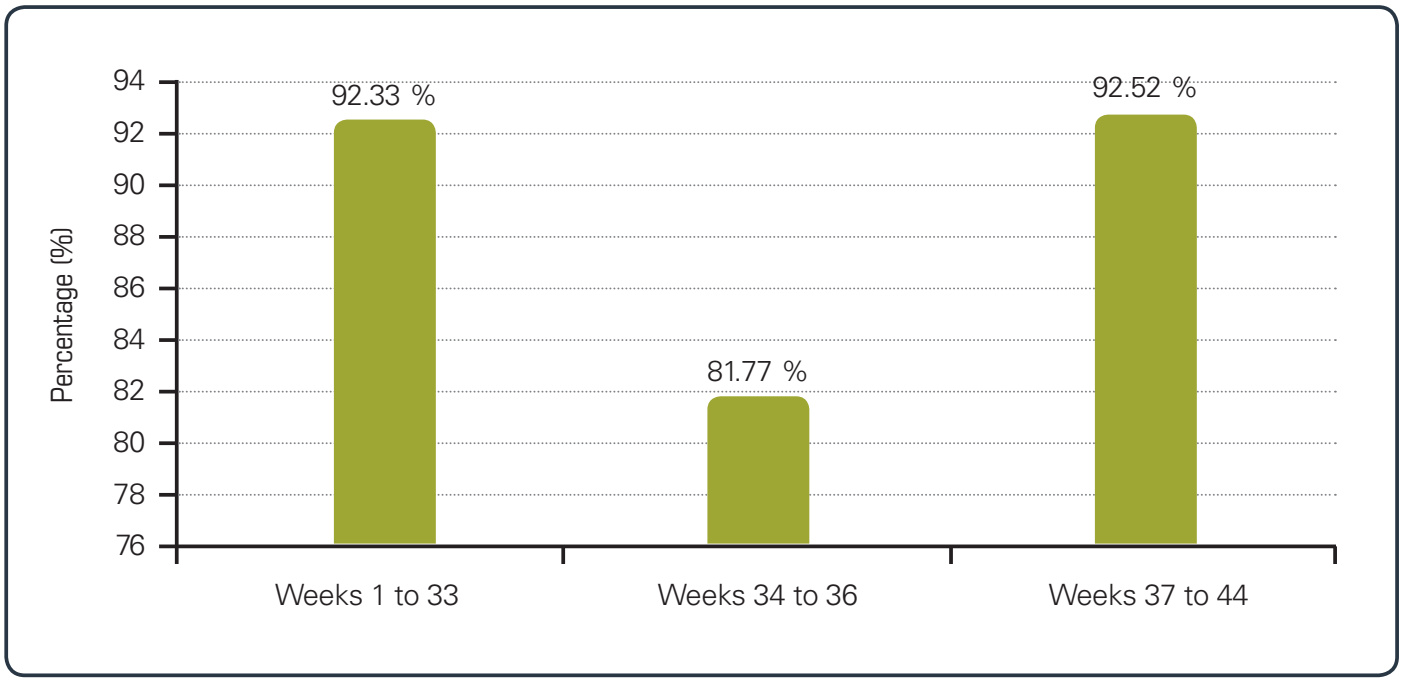


Figure 11. Evolution of fertility measured by ultrasound in nulliparas during the year 2019.

Final thoughts...

There are some questions about this case for which we have not yet found a clear explanation (or even a good theory) at the farm…

- Why had these cases appeared in a concentrated way in only a few weeks? Could the environmental temperature have been involved in making the animals more susceptible? (These clinical cases had occurred during the months of August and September).
- Had there been more possible causative mechanisms than we had previously thought (including on other farms), but these had gone unnoticed because the collective presentation had been less frequent?

Should we think about changing the design of the rearing barns present on farms? (Even more so when installations want gilts to grow within a certain average daily profit range without exceeding it).

- Is it worth having modular buildings in self-replenishment farms so that we can use an all-in/all-out cleaning and disinfection system?
- The same farm building had housed animals weighing from 20 to 110 kg, each with different environmental, space, and nutritional requirements. Nonetheless, they had all had to be treated the same as if they had been a homogeneous batch.
- If treatment (e.g. an antibiotic) is required, it is easiest to treat all the animals simultaneously, rather than specifically targeting a group.
- We should be implementing different feeding strategies for raising replacement pigs (such as rationing from a certain age or weight) that are difficult to carry out in conventional facilities.