'Problems' with nulliparas going into heat

When we talk about reproductive problems, sometimes the cause is external to the animals. In this article we will present an example of this.

Julia Cantín and Carlos Cantín

The objective for breeding females is to maximise the number of healthy weaned piglets produced per sow over their lifetimes. A series of factors are involved in this objective, as detailed in *figure 1*. But, to a greater or lesser extent, these factors will always be influenced by the way the future breeder started her life in production (*figures 2–4*; *table 1*).

Anestrus is not a specific disorder; it is simply a sign.

Our objective is for 80% of nulliparas to show signs of heat three weeks after exposure to the boar, with more than 95% of them showing these signs in the following six weeks.

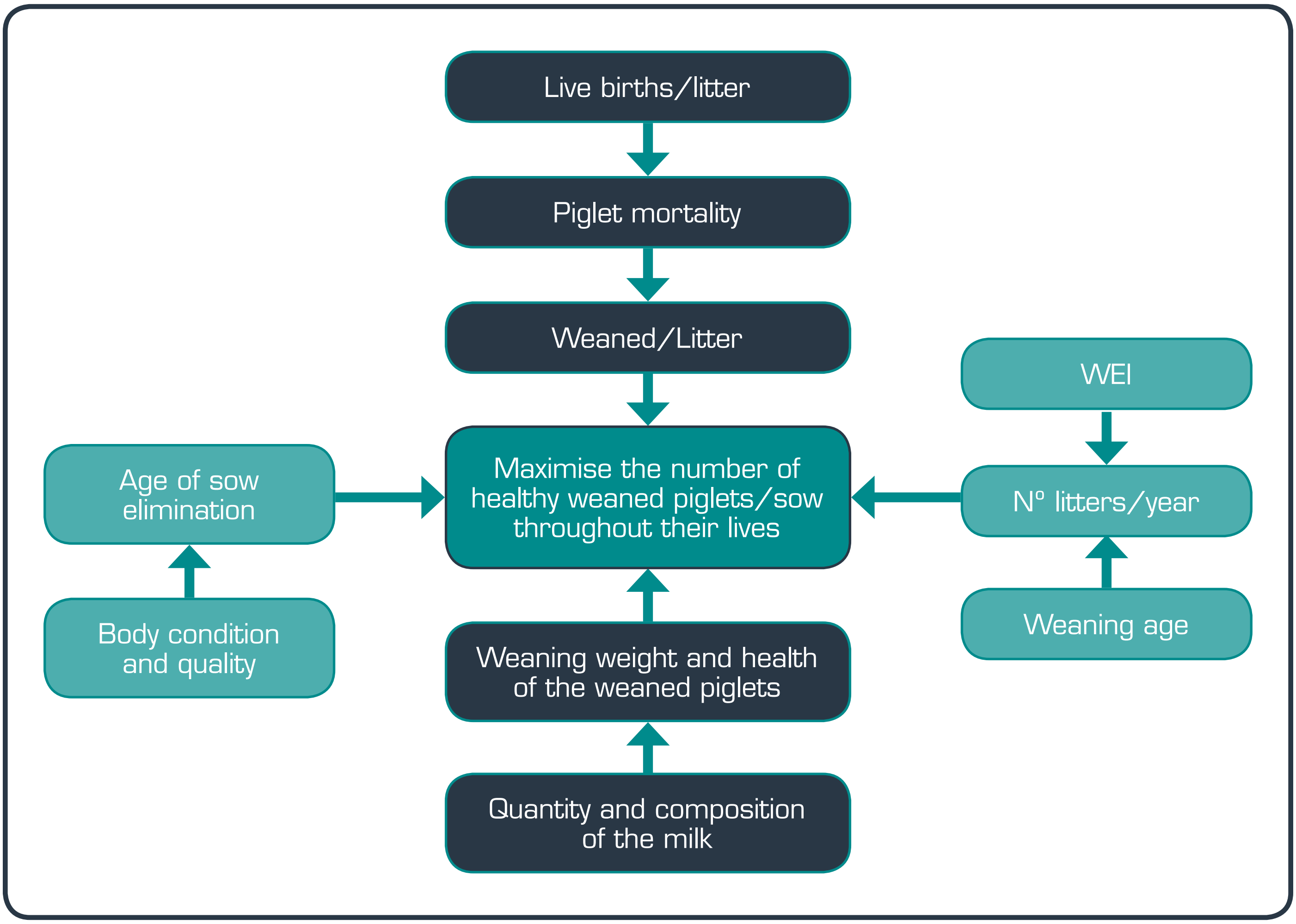


Figure 1. Target for the reproductive female.

Exposure of gilts to boars

To achieve this objective, exposure must occur:

- When the sows are aged over six months.
- With an adult boar (older than seven months).
- With the boar in direct contact with the gilts.

Clinical case

A farm with 700 Landrace × Large White breed sows located in the province of Lleida, Spain.

These animals were managed in 3-week groups with weaning at 28 days.

In 2017, the farm decided to move from buying external replacement gilts to self-replenishment.

External replacement

Replacement gilts are received every 4 weeks aged 150–160 days and at a weight of 110–120 kg. Since 2007, they have always been supplied from the same origin. The arrive already vaccinated for porcine reproductive and respiratory syndrome virus (PRRSv), circovirus, and mycoplasma.

In the adaptation barns:

- Upon their arrival, they are dewormed with ivermectin and their health program continues with revaccination for PRRSv and mycoplasma as well as vaccination and re-vaccination for Aujeszky disease, atrophic rhinitis, parvovirus-swine erysipelas, and influenza.
- These gilts will be 50–80 days old and are visited daily by an adult boar for about 15 minutes.
- Those that show signs of heat are marked so that they can enter production according to their age, weight, and the date of their first heat.
- All of the gilts are given feed for lactating sows *ad libitum*, except the last ones to go into heat, which are given gestation feed to prevent them from becoming overweight.

From the adaptation barns they are transferred to cages, where they begin treatment with altrenogest (for 18 days) one week later, while also receiving a *flushing* diet.

The productive results from 2007 to 2016 were:

- Sows entering the farm: 2,350.
- Sows being treated with altrenogest: 2,326.

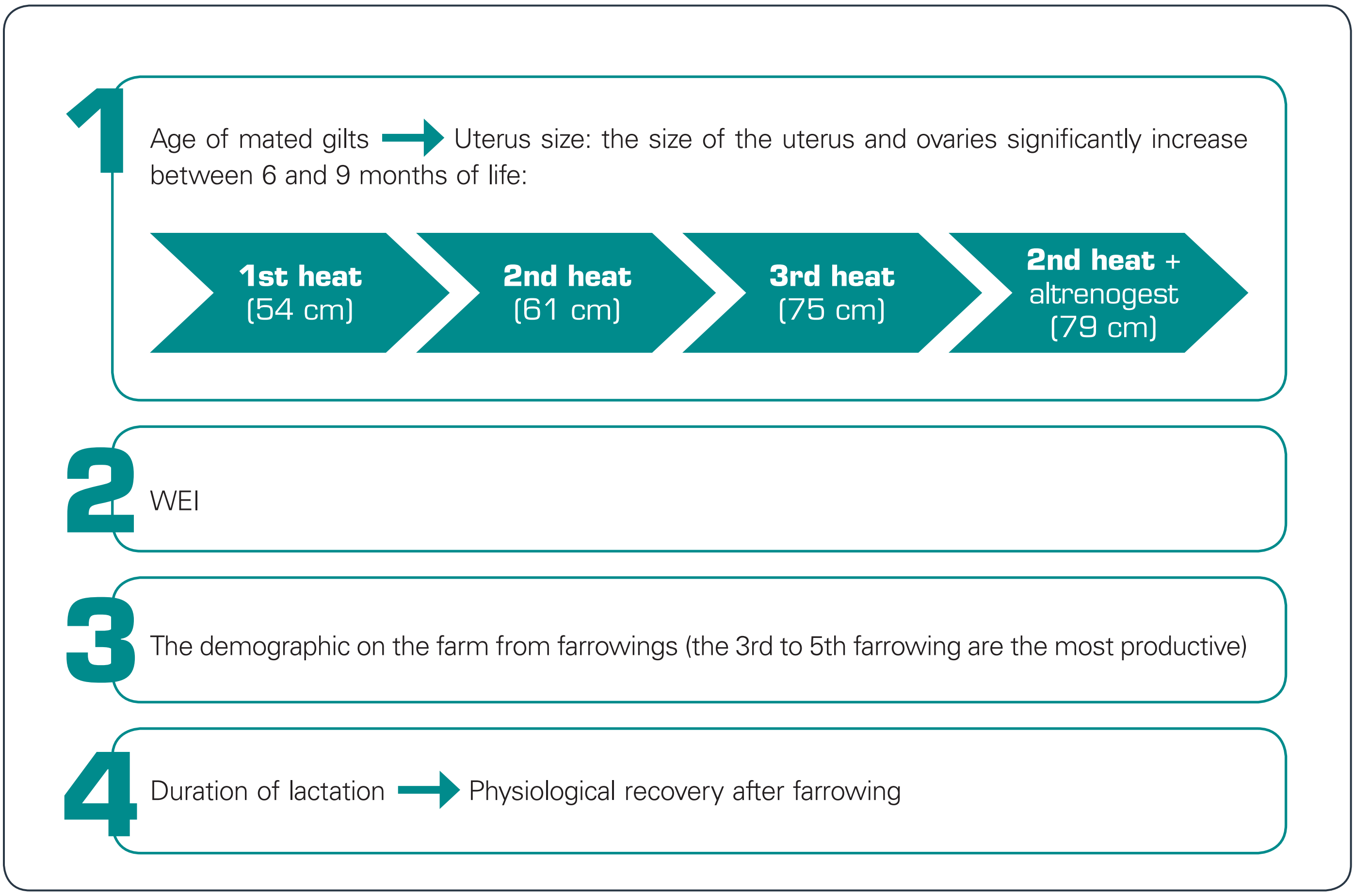


Figure 2. Operation control and management parameters that generate low prolificacy.

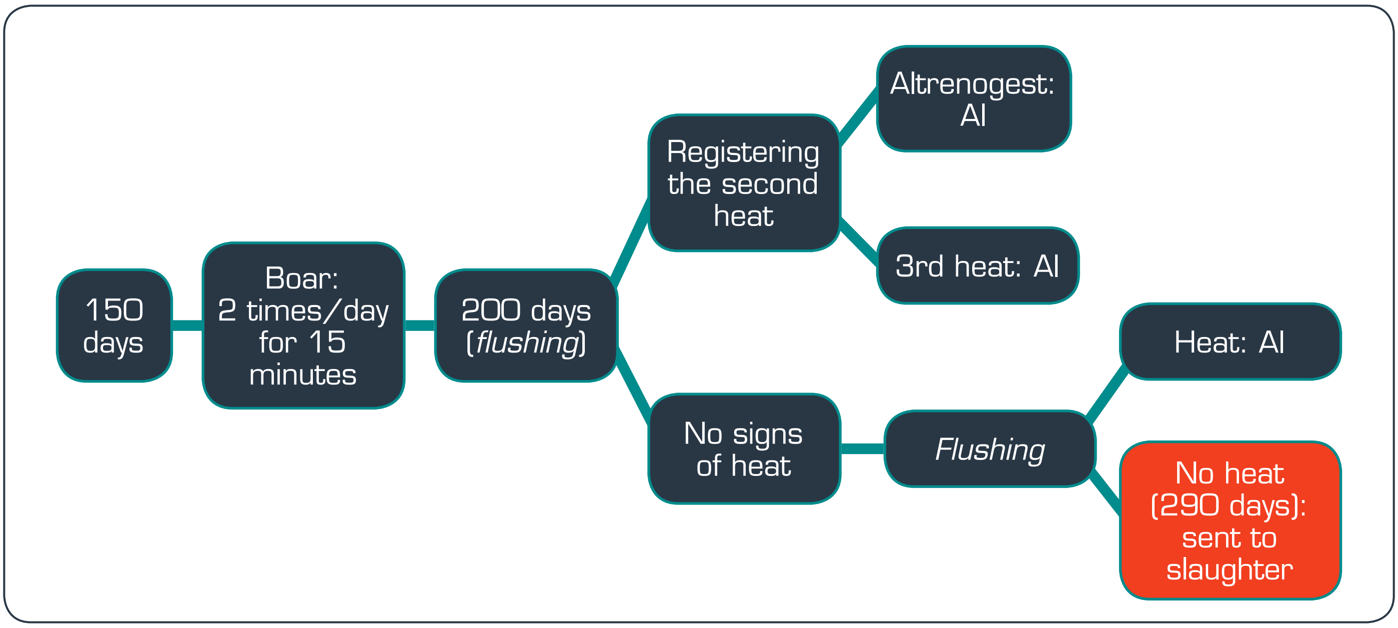


Figure 3. Decision tree for nulliparas.

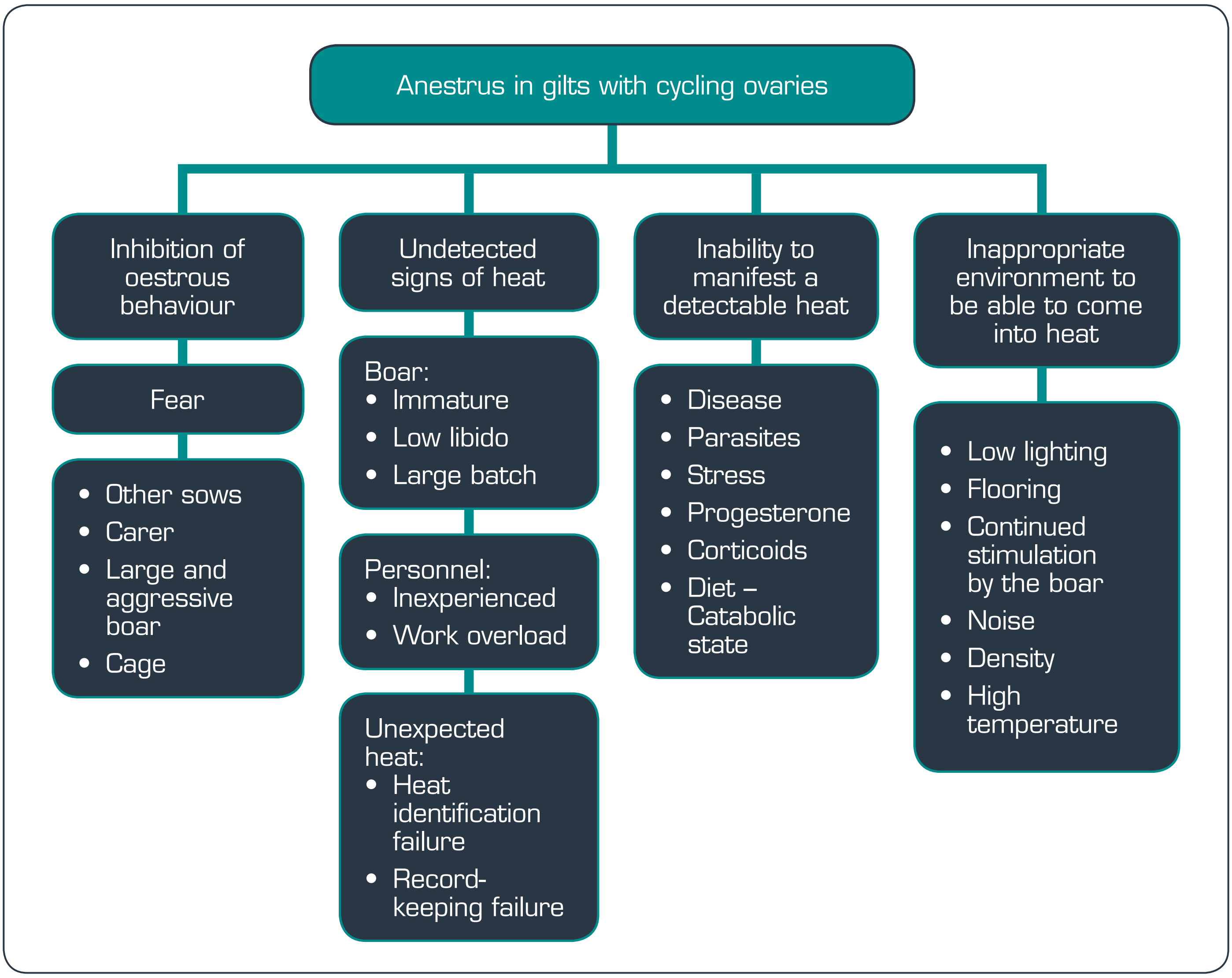


Figure 4. Anestrus in gilts with cycling ovaries.

- Sows inseminated at the end of the treatment: 2,298.
- Number of first-time farrowings: 2,068.
- Loss percentage from the time sows come onto the farm to the time of altrenogest treatment: 1%.
- Percentage of losses from the time of treatment until a fertile insemination is achieved: 1.2%.
- Fertility in nulliparas: 92%.

Self-replenishment system

The great-grandparent (GGP) sows from the same reproduction farm were introduced while an external replacement program (as described above) continued until self-produced animals were available.

The first grandparent (GP) sows were inseminated in July 2017 and the first batches of their own hybrids (F1) entered the fattening period in January 2018. A feedlot was set aside to rear these F1 batches of animals, which were introduced at a live weight of 20 kg.

They were fed with a growth feed until they reached 40 kg and were then transferred to a diet for future breeders.

From the age of 5.5 months they began to receive visits from an adult boar to induce puberty so that heat detection could begin.

Description of the problem

Some of the gilts were observed to have a normal heat, some did not come back into heat a second time, while others:

- did not show any signs of heat before seven months.
- The signs they presented were very weak, such as slight oedema and reddening of the vulva, and diminished after a few days. However, they did not accept a boar or show the standing reflex when presented with a boar.

In May 2018, the farm started to introduce the boar to the first batch of gilts to stimulate puberty and start registering their heats.

Therefore, these gilts went into the caged phase for the start of treatment with altrenogest with identified and recorded heats in only a few cases. When these batches of gilts finished their hormonal treatment, only 40–70% of them showed signs of heat.

Their fertility at first mating was also highly variable and ranged from 60% to 75%. In addition, a large number of piglets that had not become pregnant did not return to heat and remained empty when scanned with an ultrasound scanner.

Proven or suspected factors	Production status affected		
	Puberty	Post-weaning	Post-mating
Defective stimulation with the boar	+	+	-
Accommodation/social environment	+	+	-
High temperature	+	+	+
Seasonality	+	+	+
Photoperiod	+	?	-
Genotype	+	+	-
Nutrition	+	+	-
Short lactation	-	+	-
Big litter	-	+	-

Table 1. Aetiological factors causing ovarian inactivity.

As the batches accumulated, this started to become a very serious problem:

- The mating objectives for the groups were not achieved and so the nullipara failures started to make these groups very unbalanced.
- A remarkably high number of unproductive gilts were generated, which the farm ended up sending to the slaughterhouse at a consequent economic loss.

First steps taken

Given this situation, changes were made both to the genetics of the farm as well as to its management.

Despite this, no response was obtained in terms of achieving puberty and heats in these gilts and so the farm's results during this period were poor.

Despite these changes, the farm still did not achieve the results it required to reach its intended objectives. Therefore, they decided to change their approach in order to find an appropriate solution.

New monitoring guidance

A more complete anamnesis of the entire base rearing population was carried out and the farmer responsible for production completed a detailed questionnaire. The sow groups were weighed to check their average daily weight gain (ADG) and a small batch of animals were scarified at the slaughterhouse to allow us to perform a *post mortem* inspection.

Genetics

Because there was a suspicion of a possible error in the crossings that had been carried out, the genetic lineage of the animals was reviewed.

We verified that the GGP and GP used were the same (sisters) as those used by the replacement reproducer and that the GGP and GP semen used in the crossings was the same as that of the reproducer.

Because the replacements came from the reproducer and one sent to another farm had not presented a problem, this possibility was ruled out as a possible cause.

Management

All the windows in the fattening batch were changed and the size of the barn was increased to favour better lighting.

Two more heat-detection boars were introduced for variety and the gilts started to be checked twice a day.

Four gilts were housed per 9 m^2 pen in order to facilitate their contact with the boar.

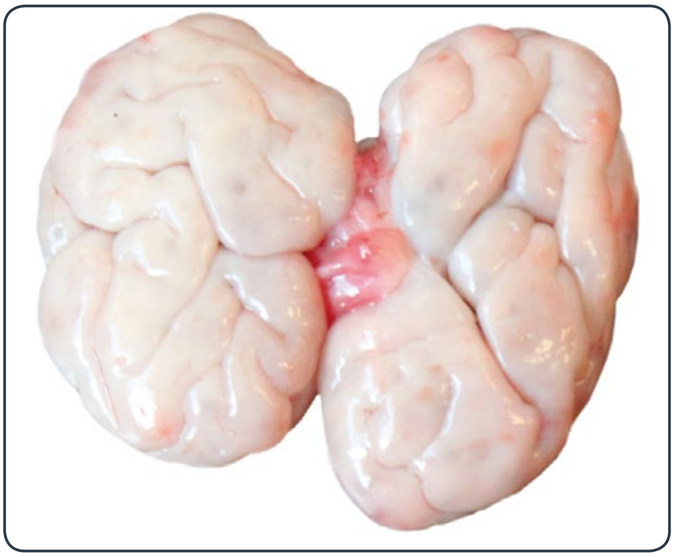
Gilts that had not shown signs of heat or that remained negative by ultrasound and had not returned to heat were injected with human chorionic gonadotropin (HCG) 200 IU and pregnant mare serum gonadotropin (PMSG) 400 IU, and were grouped into barns and given a *flushing* diet.

Results

- Percentage of gilts in heat after treatment with altrenogest: 68%.
- Percentage of fertility after treatment with altrenogest: 76%.
- Percentage of gilts in heat after treatment with gonadotropins, *flushing*, and regrouping in barns: 70%.
- Percentage of heat fertility after treatment with gonadotropins: 58%.
- Percentage of sows eliminated at the slaughterhouse because of infertility, repetitions, and/or anestrus: 36%.

We obtained the following information from the questionnaire completed by the breeder and from our visits:

- The general appearance of the animals weighing 50–70 kg was quite bad. Some animals had a cough, dyspnoea, and nasal discharge.
- Some 6% of the sows weighing 50–70 kg were being eliminated because they were not recovering an adequate body condition. The animals were being treated with injectable antibiotics with an acceptable response.
- A seroprofile was carried out in the animals weighing approximately 50 kg, which detected seroconversion and was PCR positive for PRRSv. Therefore, we decided to vaccinate the 20 kg piglets against PRRSv.
- Some gilts aged less than 5 months were observed with symptoms that could have been related to heat (vulval oedema and redness), and so we suspected that some gilts were entering puberty early. During our visits we only detected two cases, but the farmer said they had seen more.
- We observed one case of rectal prolapse and the farmer said they had seen more cases which they had attributed to cold conditions or swine genetics.
- It is not possible to calculate the exact daily feed consumption because there were animals of different weights and ages.
- Two batches of sows were weighed and their ADG was 580 g/day, when the reference figure for their genetic line is 680–750 g/day.
- No improvement in the ADG was seen in the groups that were vaccinated against PRRSv.
- The *post mortem* inspection could only be performed on five animals.



Source: [Ovarian pathophysiology of the sow], Falceto MV (2006).

Figure 5. Smooth ovaries with lack of activity.

Post mortem inspection

Based on the inspection, we noted that:

- The ovaries and uterus in one of the animals were normal, which may indicate a heat-detection failure.
- In another, the uterus was small, and the ovary was practically smooth (*figure 5*), with some small follicles, possibly indicating hat the animal had not yet reached puberty.
- The presence of ovarian cysts (*figure 6*) and an increased uterine size with a thickening of the wall and increased uterine mass was observed in the other three sows.
- We sent samples of the feed the animals were consuming at that time for a mycotoxin profiling analysis, the results of which are shown in *table 2*.

Mycotoxins

Mycotoxins are biologically active secondary fungal metabolites which are often found as raw material contaminants. The toxins produced by *Fusarium* spp., such as fumonisins (FUMs), deoxynivalenol (DON), and zearalenone (ZEA), contaminate wheat, corn, and barley worldwide (Abouzied *et al.*, 1991; Chelkowski, 1998; EFSA, 2004a and 2004b; Palomo A, 2014). Moreover, the action of mycotoxins is summative, that is, they potentiate each other.

- Before their first heat, gilts are the more susceptible to poisoning with higher doses of ZEA. This is an oestrogenic toxin that leads to the formation of ovarian cysts and ovarian atrophy, increased uterine mass, alteration of the vaginal mucosa, and induction of early puberty without ovulation (Falceto MV, 2006; Palomo A, 2014). All this produces reproductive alterations such as an increase in repetitions, anestrus, reduced fertility, and abortions.
- The DON toxin is a powerful immunosuppressant that increases the susceptibility of animals to other infections such as *Candida*, *Listeria*, *Mycobacterium*, and *Salmonella*; it also produces hypoestrogenism and a reduction in fertility (Palomo A, 2014).
- FUMs notably reduce the ADG and daily consumption of feed in swine (Palomo A, 2014).

Final measures put in place

Upon confirmation of the mycotoxicosis problem, we decided to take the following measures:

- We cleaned and disinfected the silos, ducts, and feeders with antifungals.
- Reformulation of the feed used for future breeders. A drastic reduction in the use of high-risk raw materials such as corn and 'pastone' (i.e. wet fermented corn) and incorporation of mycotoxin sequestrants (aluminosilicates) at the maximum recommended dose. The feed was also fortified with a liver protector.
- Sows presenting any type of problem were eliminated and were replaced with external breeders until the process was completed.

Source: [Ovarian pathophysiology of the sow], Falceto MV (2006).

Figure 6. Polycystic ovaries.

Results

Self-replenishment results on the farm from November 2018 to May 2019:

- Percentage of sows in heat from the age of six months to the start of treatment with altrenogest: 97%.
- Percentage of gilts in heat after treatment with altrenogest: 98.5%.
- Percentage fertility according to ultrasound examinations: 92%.

Conclusion

The rearing of future breeders is a critical period that, to a large extent, will affect the production of farms.

During this period, many factors can intervene and will affect the reproductive future of the gilts in one way or another. One of the most important factors is health, although this is just as important as providing an adequate and guaranteed diet that covers the needs of future breeders to ensure their health throughout their growth.

	Full profile	Recommended limit	Porcine toxicity threshold
DON	948	300	0.5 ppm
ZEA	85	< 100	50 ppb
FUM	360	200	2 ppm

ppm: parts per million; ppb: parts per billion.

Table 2. Results of the mycotoxin profiling analysis of the animal feed.

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