Selecting quality gilts: Key considerations for improved sow lifetime productivity

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Outline

1. Introduction and background
2. Key considerations for improved sow lifetime productivity
    - A gilt becomes a replacement female at birth
    - Early responses to effective boar stimuli in the GDU is the critical selection tool
    - Appropriate management for body state at breeding
3. Conclusions

Sow Lifetime Productivity

- Sow lifetime productivity (SLP)
  - Gilts are the foundation of good production (Tubbs, 2015)
  - Gilts drive farm success now and in the future (Ketchem and Rix, 2015)
- Good gilt management is often overlooked.
- Farms still lacking gilt development programs.
- There are challenges in implementing gilt management programs.
- There are several key aspects to gilt development – not just a single factor contributing to the success of a GDU.

STAGES OF A GILT REPLACEMENT PROGRAM

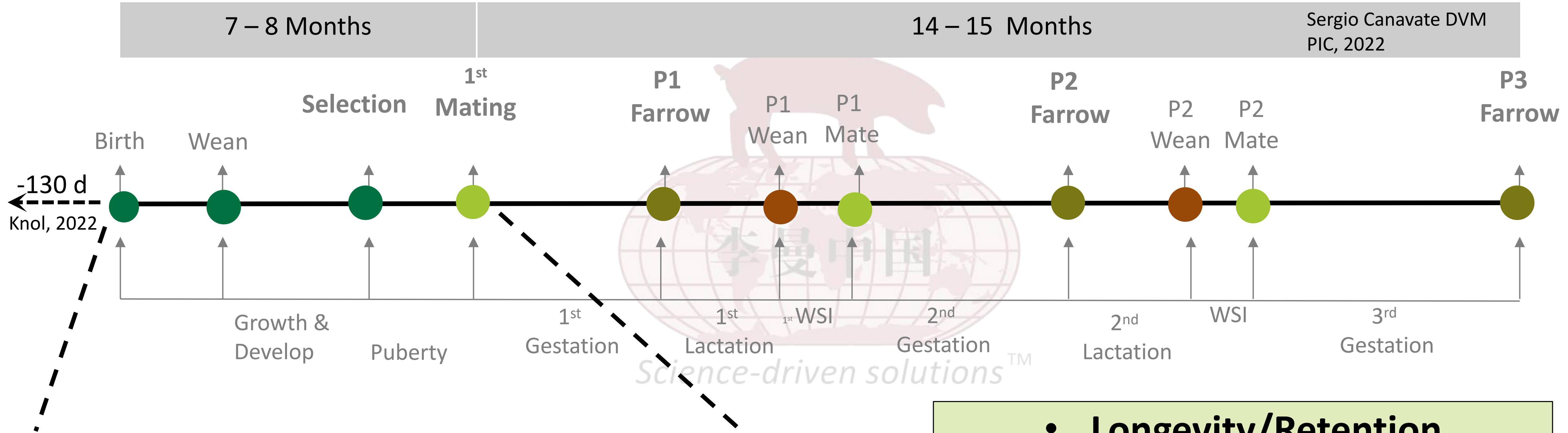
A gilt becomes a potential replacement female at birth!

Pre-Select 1	Pre-Select 2	Final Select	Breed Group Mmgt
Birth -Weaning	~ 140 d	~ 170 - 200 d	100% breed targets met 100% Select Gilts 100% bred at target weight 100% bred at 2nd–3rd estrus Feed mgt before breeding
✓Conformation ✓ 14 + teats ✓ Health ✓ Growth ✓ **Birthweight** ✓ **Birthweight Pheno**	✓Conformation ✓ 14+ teats ✓ Health ✓ 0.6 kg/day ✓ Litter of origin	-Direct boar contact **85% estrus in 35 d** **+~5% Non-Selects**	

Genetics, health programs, nutrition, quality of floor and slats, air flow and temperature, stocking density, PEOPLE and biosecurity ~ Dr. Gonzalo Castro (2018)

SOW LIFETIME PRODUCTIVITY

*The total number of <u>quality</u> pigs weaned during the productive lifetime of a female; from the time she **becomes breeding eligible** until she leaves the herd"*



Pre-Select 1	Pre-Select 2	Final Select	Breed Group Mgmt
Birth to Weaning	~ 160 -170 d	~ 170-200d	100% breed targets met Target weight – 135-160 kg Target estrus - 2nd – 3rd Service age - <225 days Feed mgmt before breeding
✓Conformation ✓ Adequate # teats ✓ Health ✓ Birth weight ✓ Litter of origin ✓ Lactation mgmt.	✓Conformation ✓ Adequate # teats ✓ Health ✓ Litter of origin ✓ GR >0.55kg/d	Implementation of a GDU program >80% estrus in 28-35d -- "Select" gilts **Age at puberty <200 d**	

- **Longevity/Retention**
- **Prolificacy**
- **Fertility**
- **Reproductive Efficiency**

Koketsu et al. 2020

Low birth weight is an important factor in the overall efficiency of replacement gilt management.

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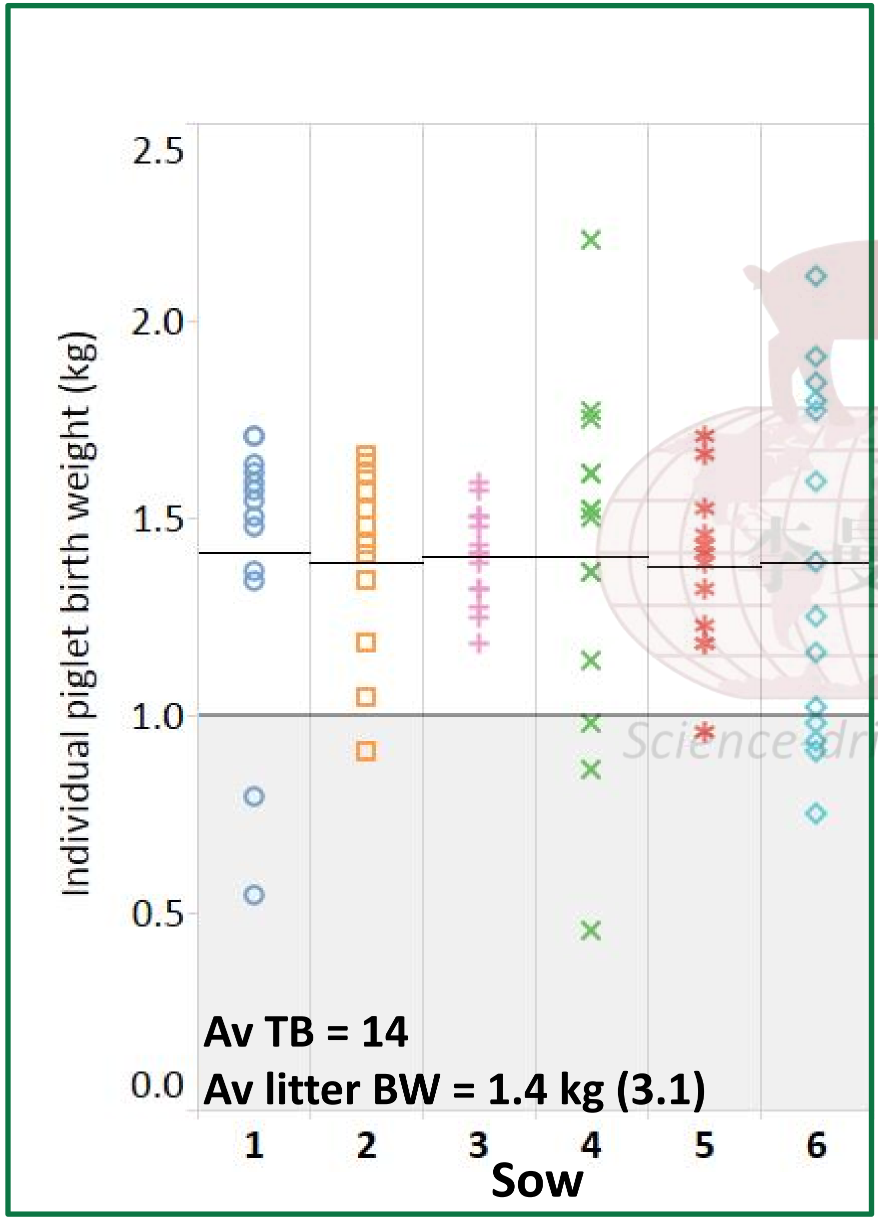
Low Birth Weight

- Genetic selection for litter size has increased the number of low birth weight pigs
- **Low birth weight** offspring are a major concern for the swine industry, detrimental consequences on:

- These detrimental effects of low birth weight are not only restricted to small pigs within in a litter, but extend to entire litters (**litter phenotype**).

Low Birth Weight Gilts

Individual birthweight

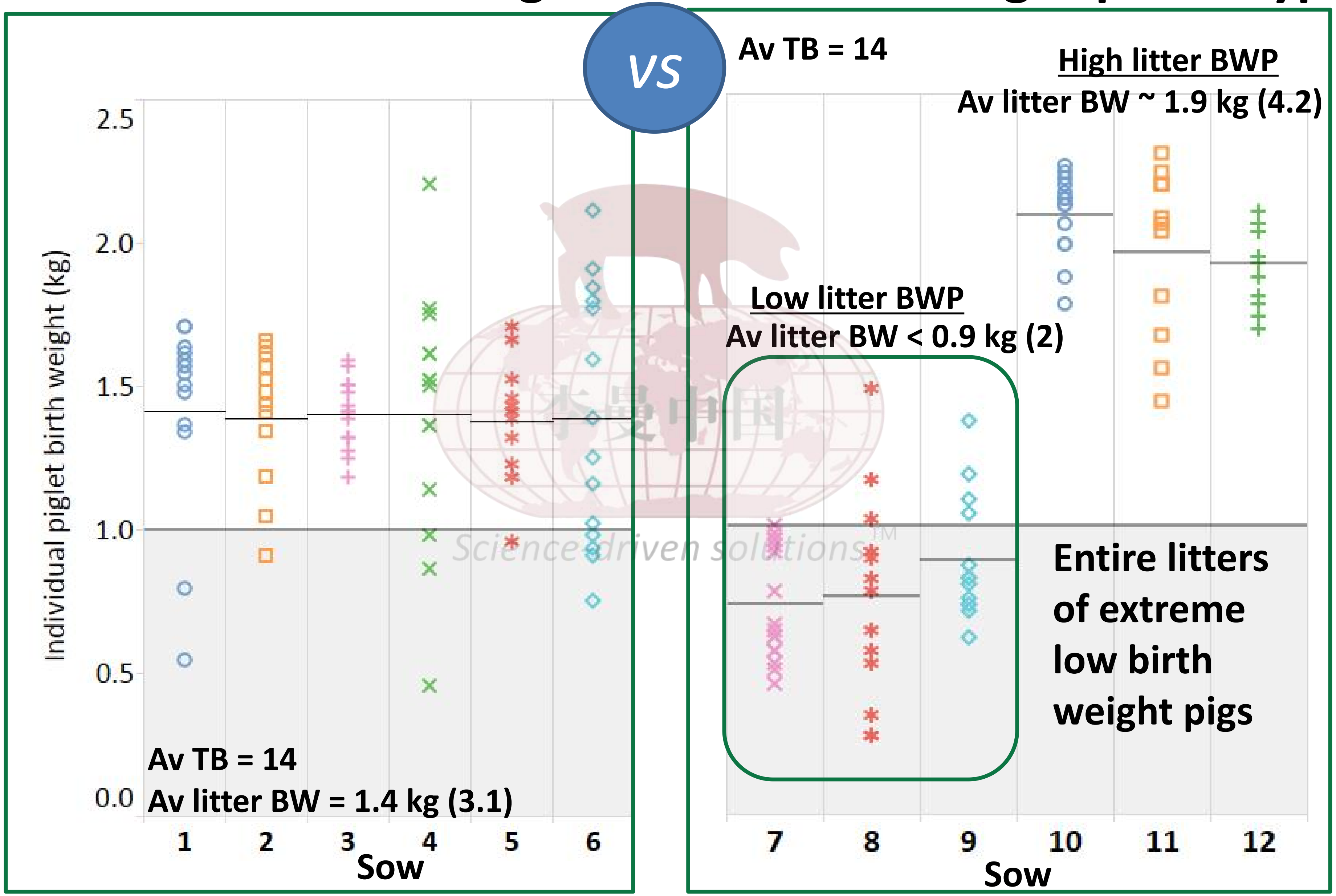


Low individual birth weight

- Gilts with a birth weight of <1.0 kg will have **compromised survival and growth** (Magnabosco et al., 2015).
- The greater risk of mortality until weaning and non-selection **contributes to economic losses in replacement gilt units** (Almedia et al., 2014).
- **Puberty may be delayed in lower birth weight** and slower growing gilts (Patterson et al., 2020).
- Birth weight <1.0 kg **negatively influences piglet production and longevity** (Magnabosco et al., 2016).
- Birth weight ≤1.0 kg negatively influences the **proportion of sows rebred after their sixth parity** (Flowers, 2022).

Low Birth Weight Gilts

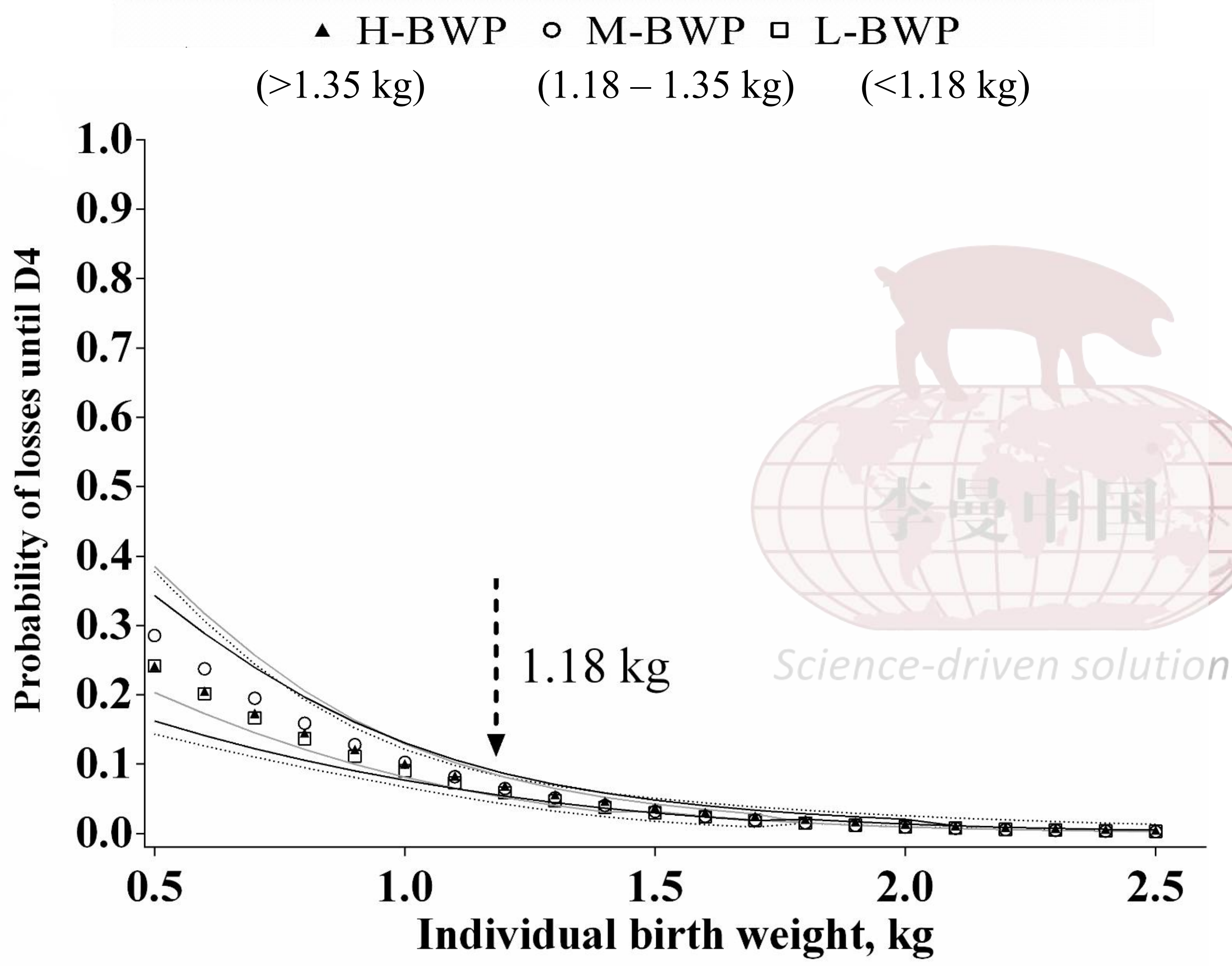
Individual birthweight　Litter birth weight phenotype



Low birth weight phenotype (BWP)

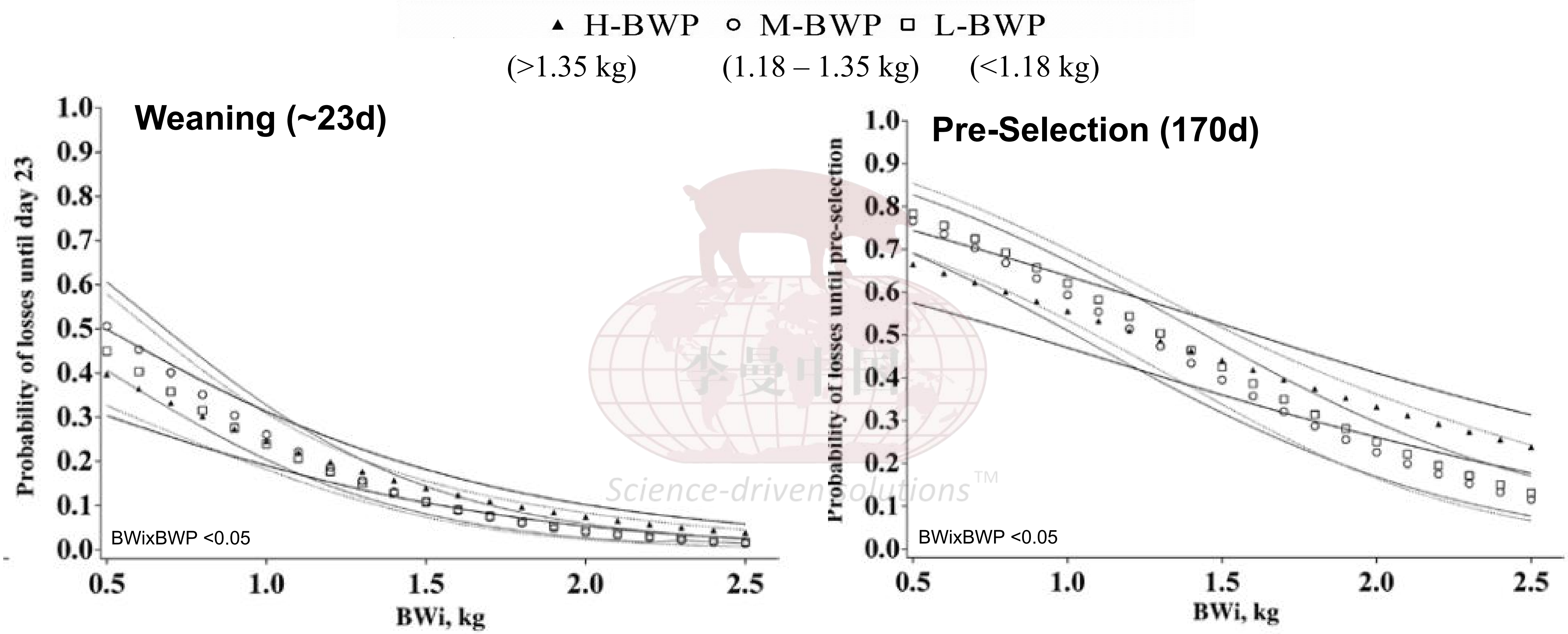
- This **trait is repeatable over consecutive parities and a transgenerational trait** (Foxcroft et al., 2009; Smit et al., 2013; Da Silva et al., 2018).
- Gilts born to low BWP sows **carry all the same risks for individual low birth weight gilts but as a "litter" trait** (Foxcroft, 2012)
- Many <1 kg progeny come from the 15% of the sow population with a repeatable low birth weight phenotype
- Sows with the low BWP **negatively affects birth weight, body composition, post-natal survival and growth performance of terminal-line offspring, independent of the size of the litter born** (Smit et al., 2013).
- Sows with the low BWT phenotype **produce very few "select" gilts.**

Selection Efficiency



- Gilts with an individual birth weight <1.18 kg were at risk for **increased mortality and loss until 4 d of age**
- Likely due to early crushing and poorer preweaning survival.
- Post-farrowing (Day 1) care is essential.

Selection Efficiency



Low individual BW is a primary concern for non-selection of replacement gilts.

Sows with the L-BWP are largely composed of low individual birth weight gilts.

Management Strategies (low birth weight gilts):

- ☑ **Post-farrowing (Day 1) care:**
  - Reduce chilling/hypothermia (Stewart, 2022)
  - Ensure adequate colostrum ingestion (>300 g/d) (Stewart, 2022)
  - Strategic cross fostering of replacement females – reduce size of lactation litter (Flowers, 2022)
- ☑ **Replacement gilts should be at least 24 d old at weaning** (Faccin, 2022)
- ☑ **Non-Selection of low birth weight gilts at weaning**

Management Strategies (low birth weight phenotype sows):

- ☑ Determine sow phenotype early on maternal sows (weigh litters or individual pigs).
- ☑ Cull sows with a repeatable low LBW phenotype at the level of the production nucleus.
- ☑ Efficiency of gilt replacement programs will be improved by early culling of 10-15% of low birth weight phenotype sows.
  - Increased efficiency of genetic transfer program.
  - Improved retention rate of gilts through the GDU.
  - More select gilts (higher SLP) produced per sow bred.

Early responses to effective boar stimuli is <u>the</u> critical selection tool

Pre-Select 1	Pre-Select 2	Final Select	Breed Group Mmgt
Birth -Weaning	~ 140 d	~ 170 - 200 d	
✓Conformation ✓ 14 + teats ✓ Health ✓ Growth ✓ **Birthweight** ✓ **Birthweight Pheno**	✓Conformation ✓ 14+ teats ✓ Health ✓ 0.6 kg/day ✓ Litter of origin	-Direct boar contact **85% estrus in 35 d** **+~5% Non-Selects**	**100% breed targets met** **100% Select Gilts** **100% bred at target weight** **100% bred at 2nd–3rd estrus** **Feed mgt before breeding**

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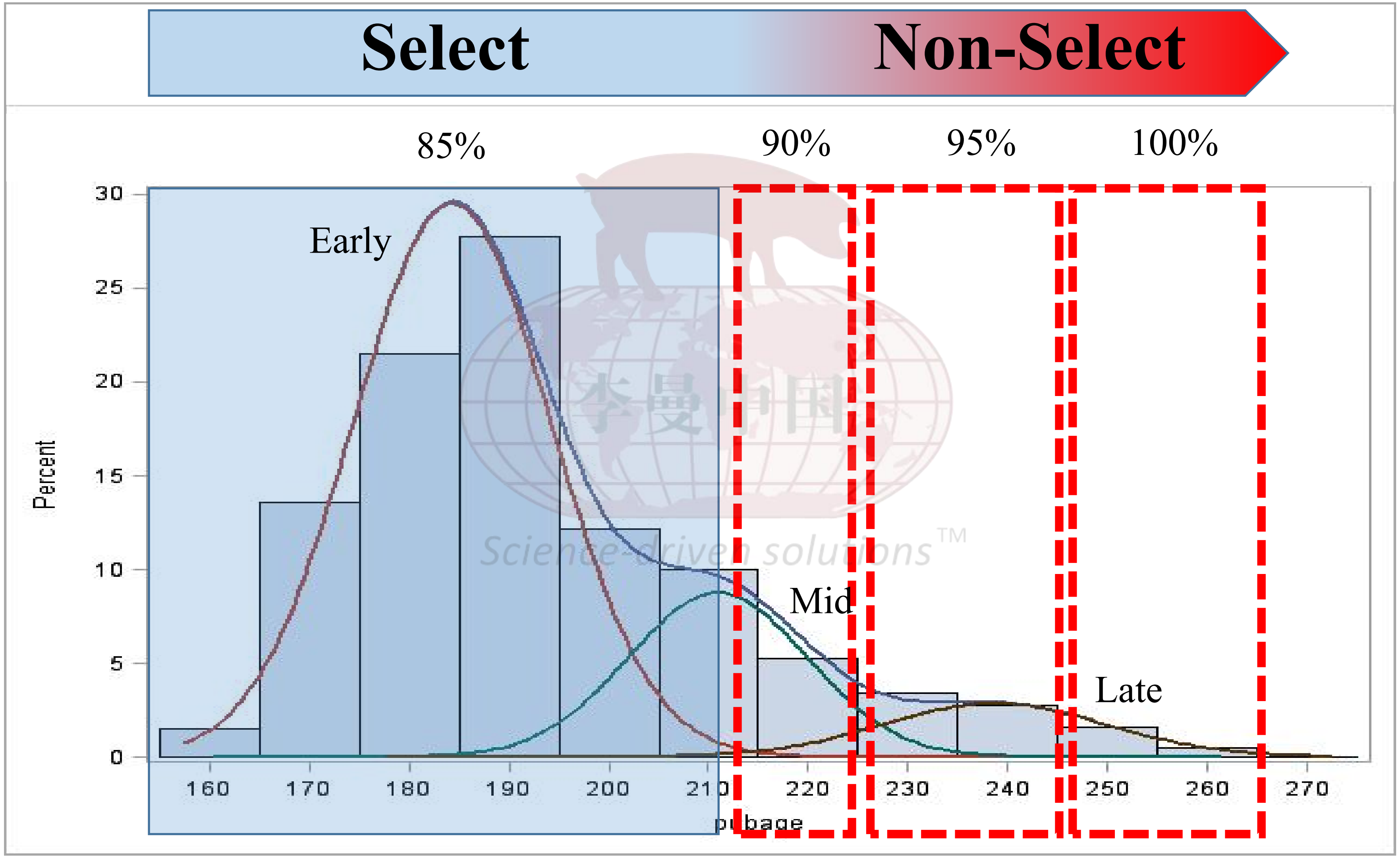
Early responses to effective boar stimuli is the critical selection tool

~95% of gilts will cycle in 100 days…. BUT….



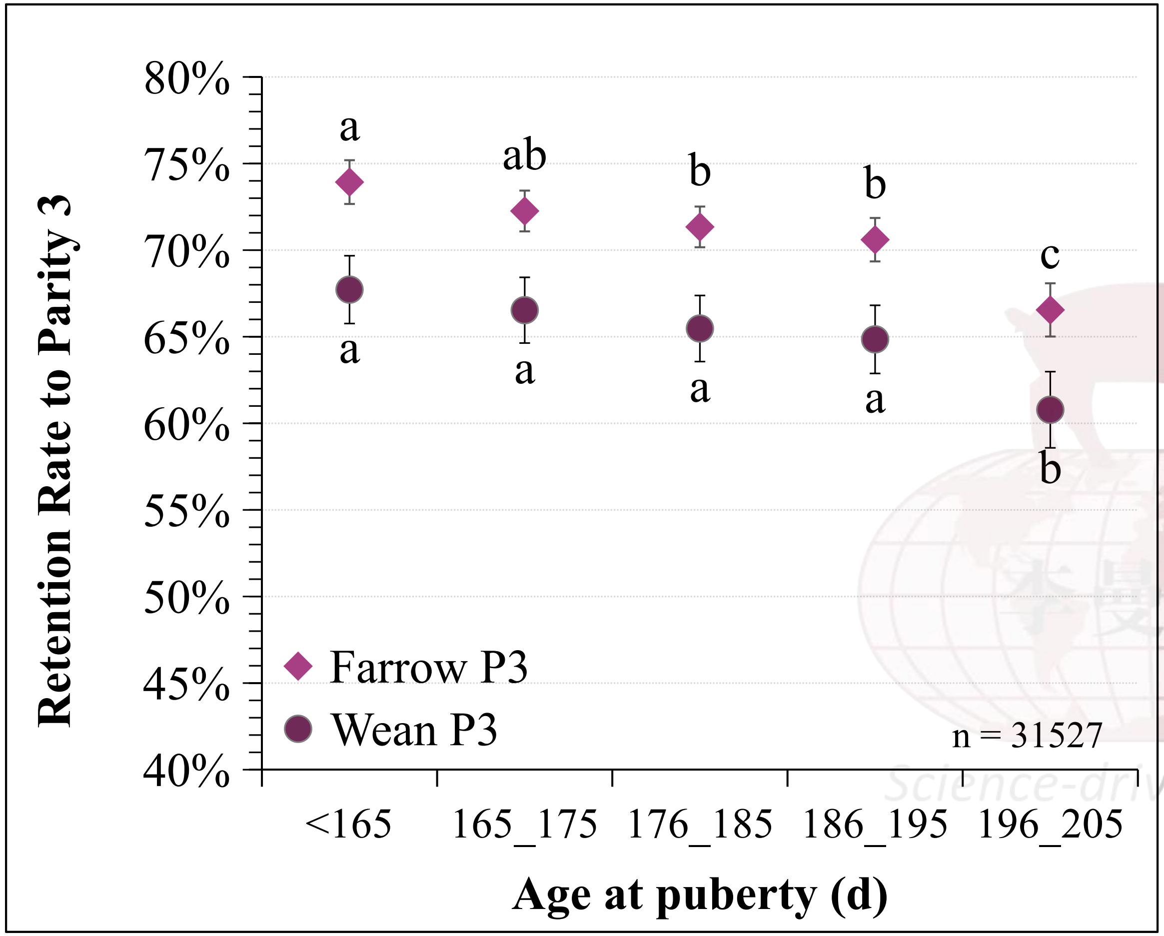
Vallet, 2015

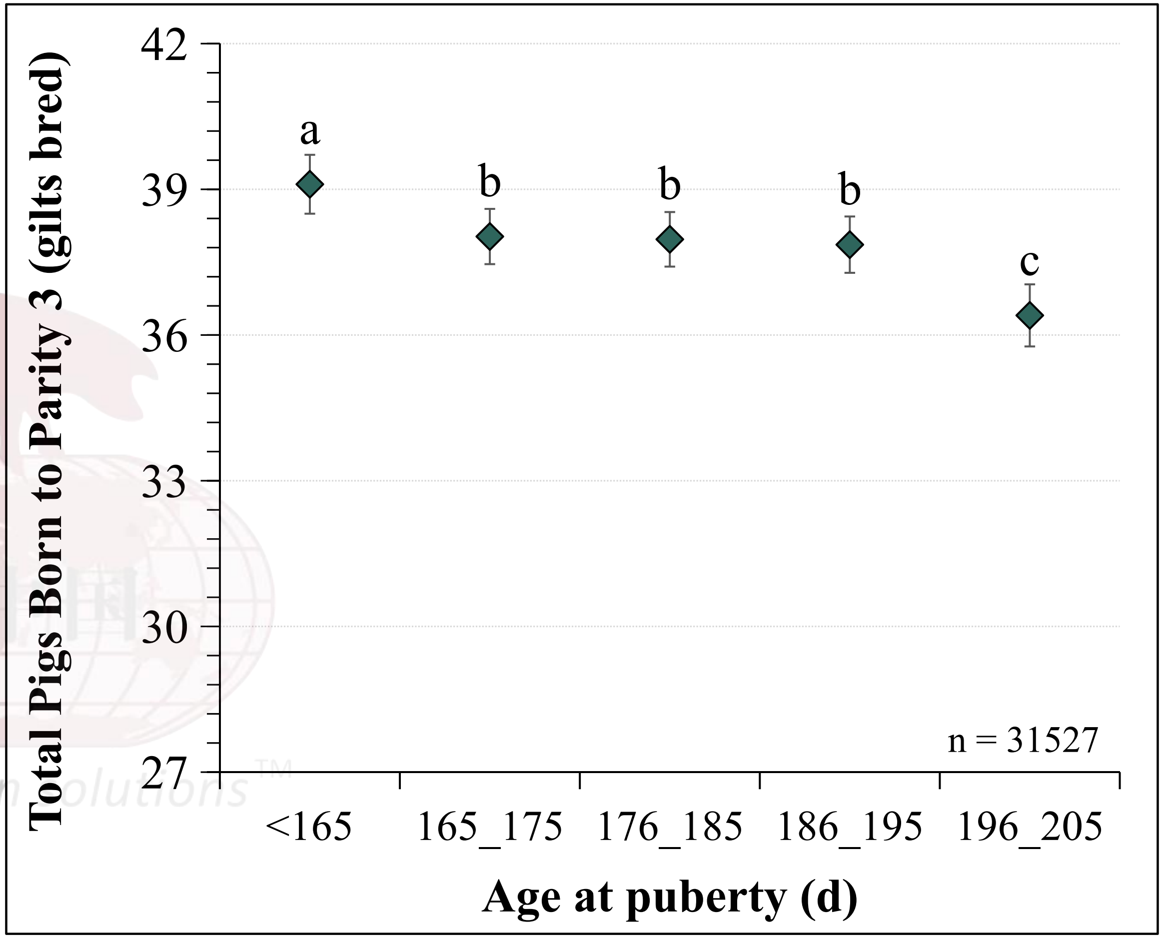
Age at puberty

Estrus characteristics at puberty are predictive of future performance:

- Stronger estrus symptoms (length and strength of the standing reflex)
  - **are more likely to farrow** (Knauer et al., 2011).
- Stronger vulvar signs at puberty
  - **are related to strong vulvar signs after first weaning** (Sterning et al., 1998).

Age at puberty



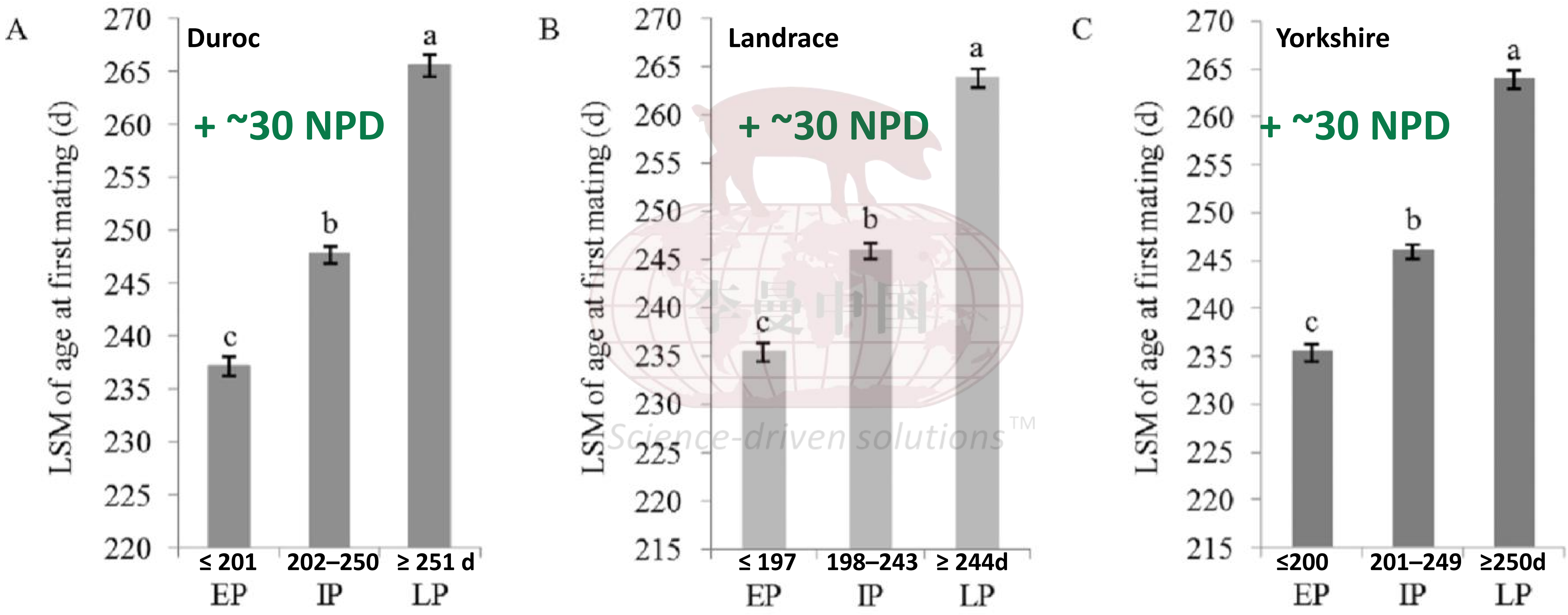


JC Pinilla and J Patterson, 2020

Earlier age at puberty is associated with greater retention and pigs born to third parity

Start boar stimulation early enough (~170 days). Gilts should have recorded heat by 200 days.

Gilts with early puberty are inseminated earlier & therefore have fewer NPD compared to gilts older at puberty

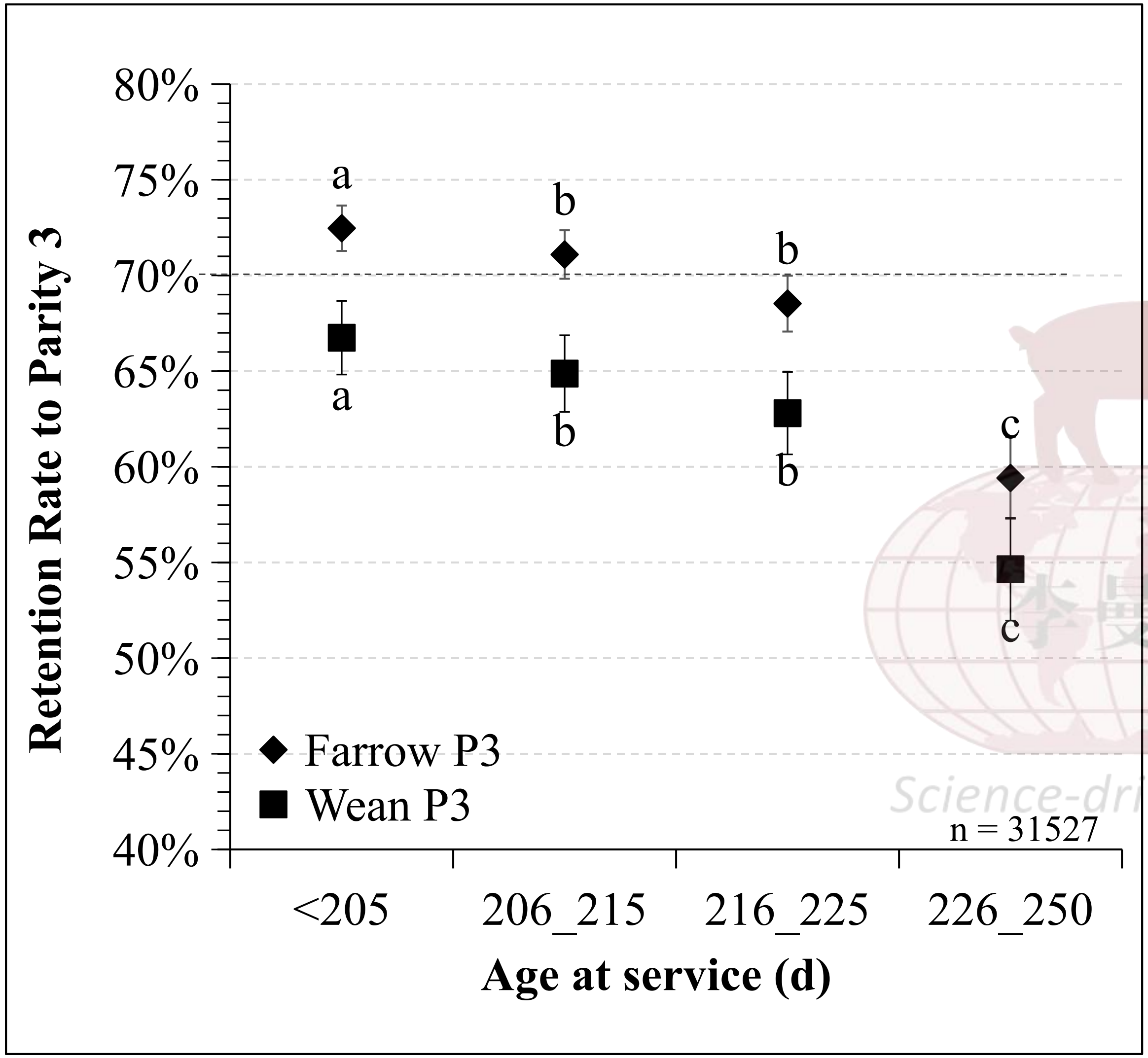


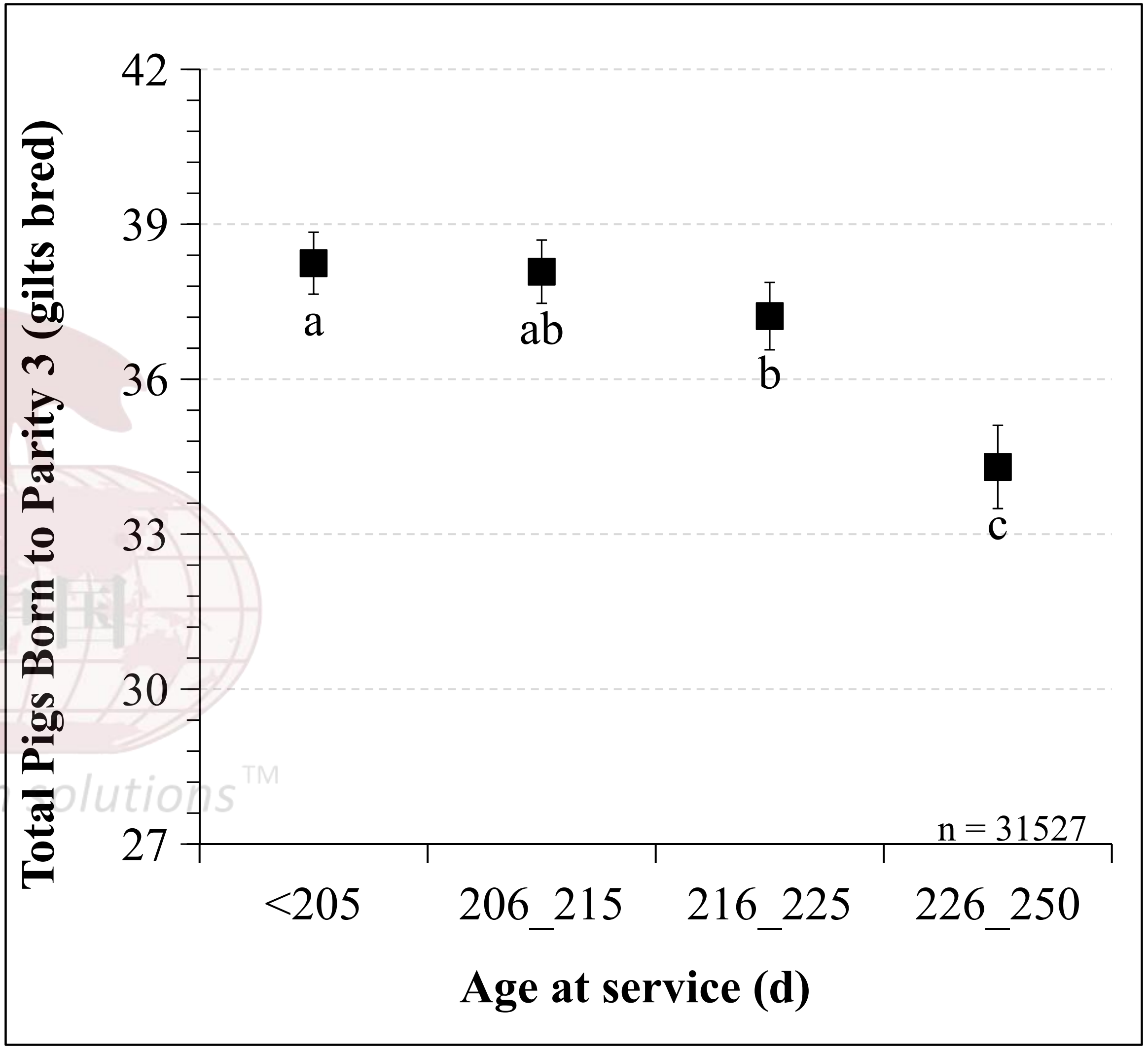
Age at first mating is intrinsically related to the biological variation in age at puberty

Li et

80 d

Age at service



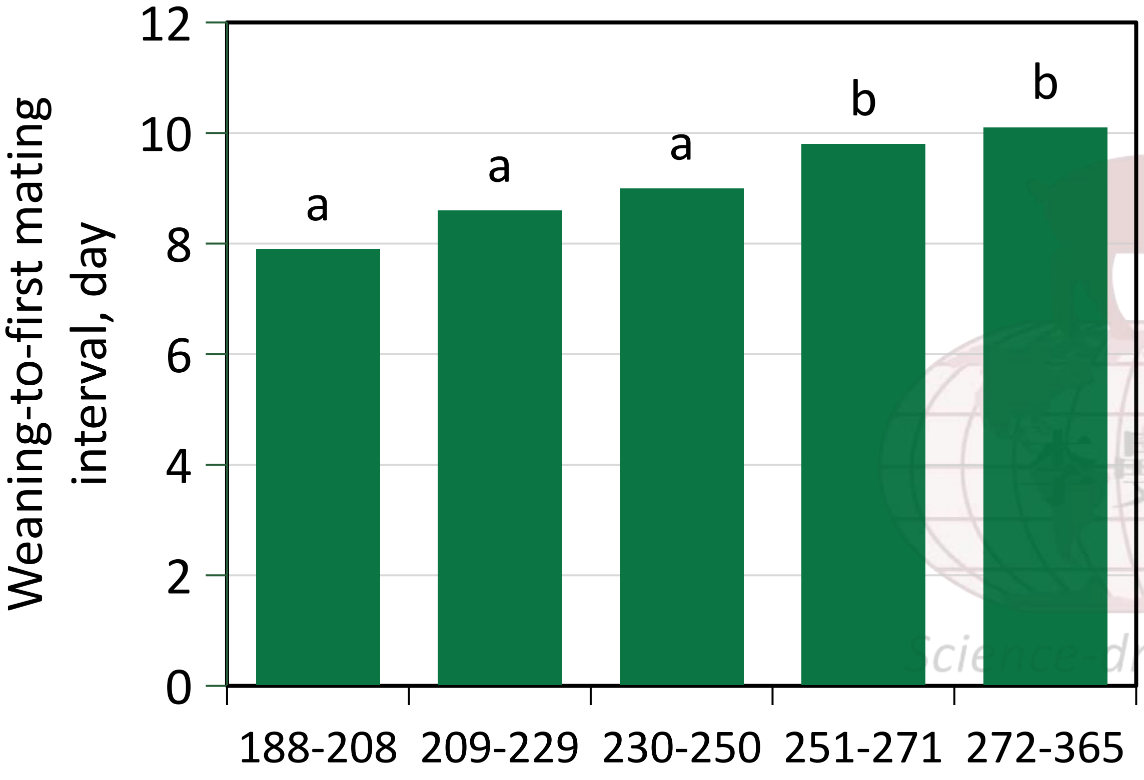


JC Pinilla and J Patterson, 2020

Gilts bred at < 225 days produce more total pigs, linked to better retention in the breeding herd

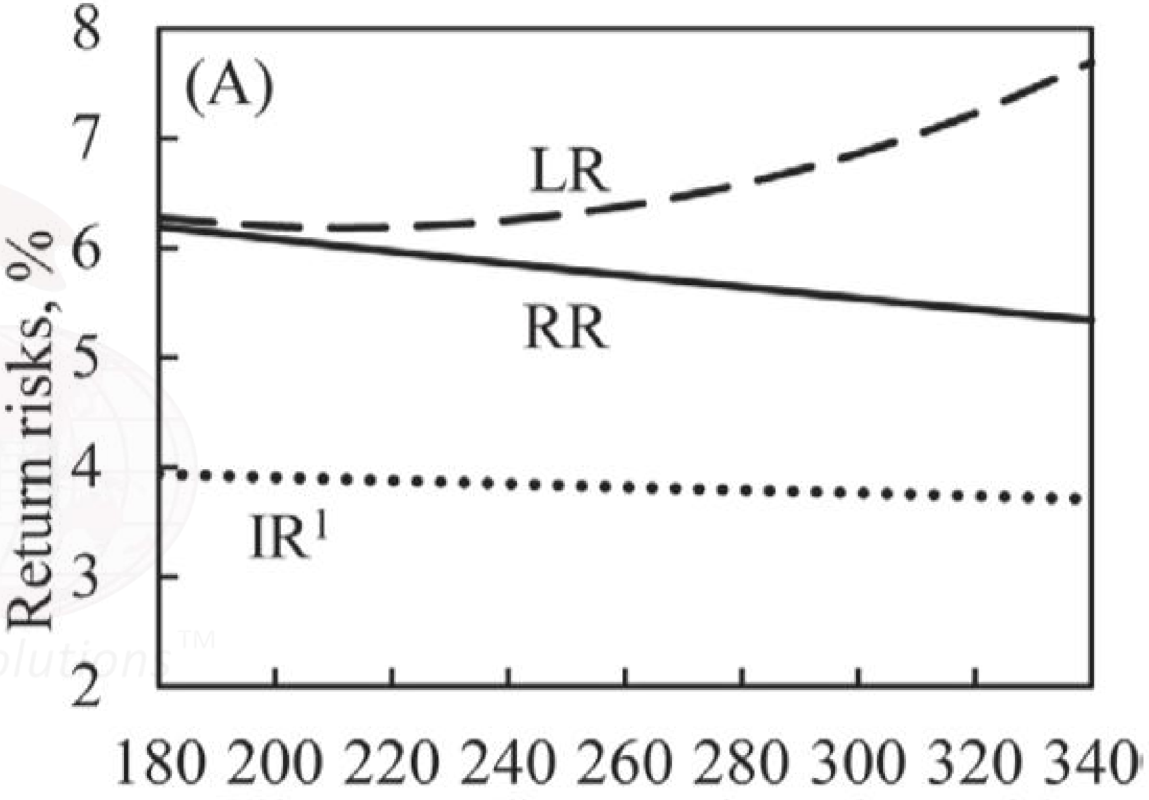
Age at service

Increased weaning to service intervals



Age at first mating

Increased risk for late returns



Age at first mating

Gilts with increased age at first mating are more likely to become low efficiency sows (*Koketsu* et al., 2020)

Estrus at breeding, weight at breeding and feed management before breeding are key components for improved sow lifetime productivity

Pre-Select 1	Pre-Select 2	Final Select	Breed Group Mmgt
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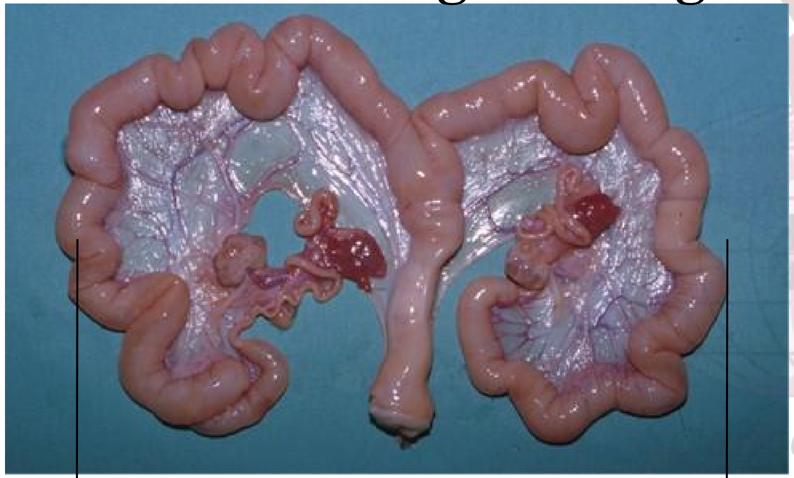
Estrus at breeding

Prepubertal

Uterine weight: 134 g



app. 25 cm

Pubertal

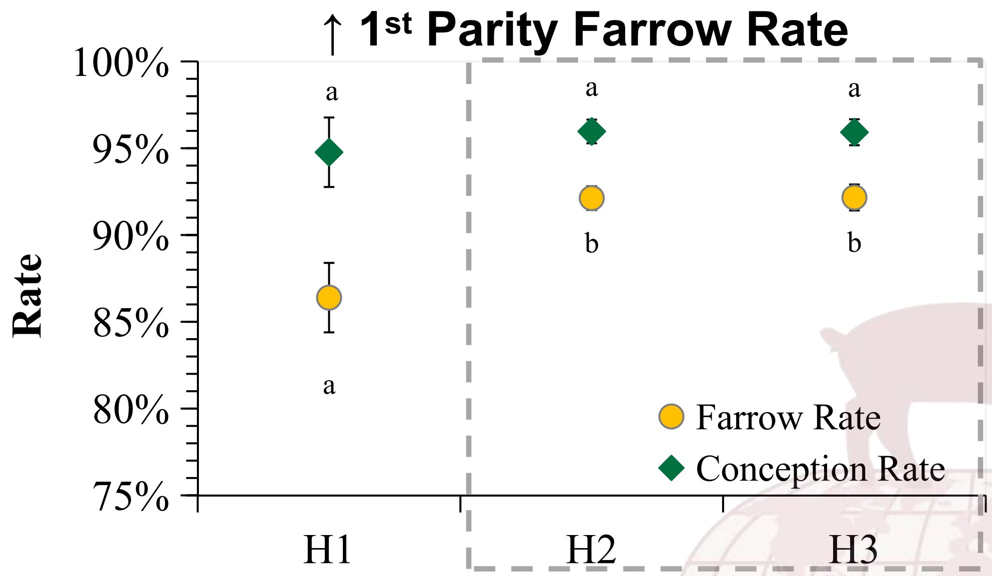
Uterine weight: 588 g

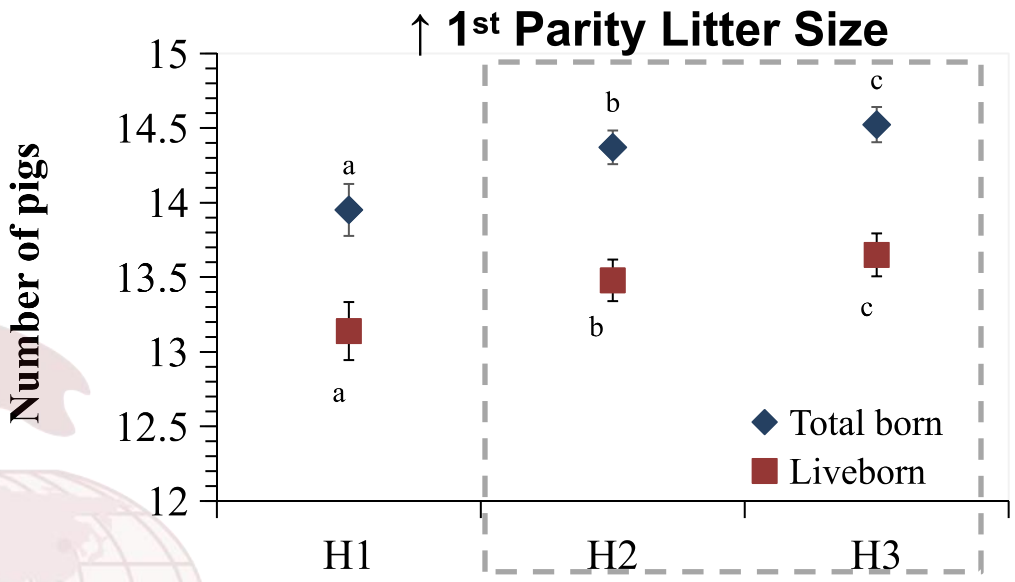
app. 32 cm

Johannes Kauffold (2022)

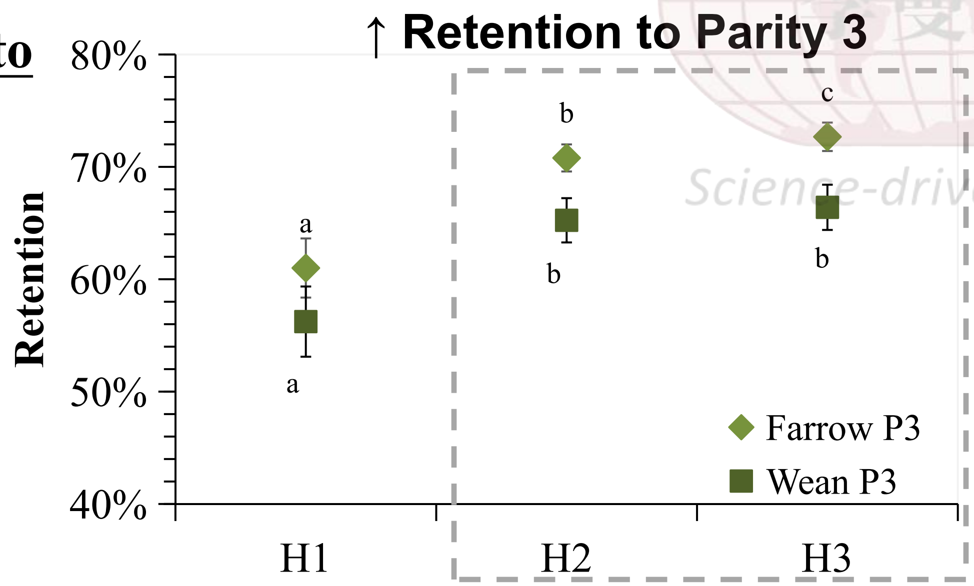
Estrus at breeding

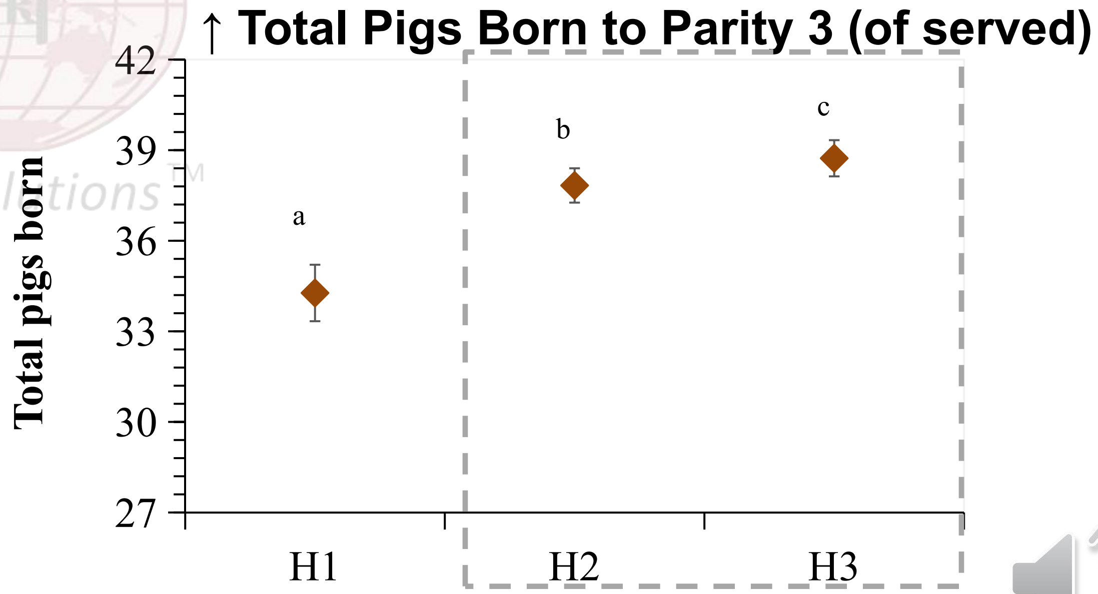
Parity 1





Retention to Parity 3

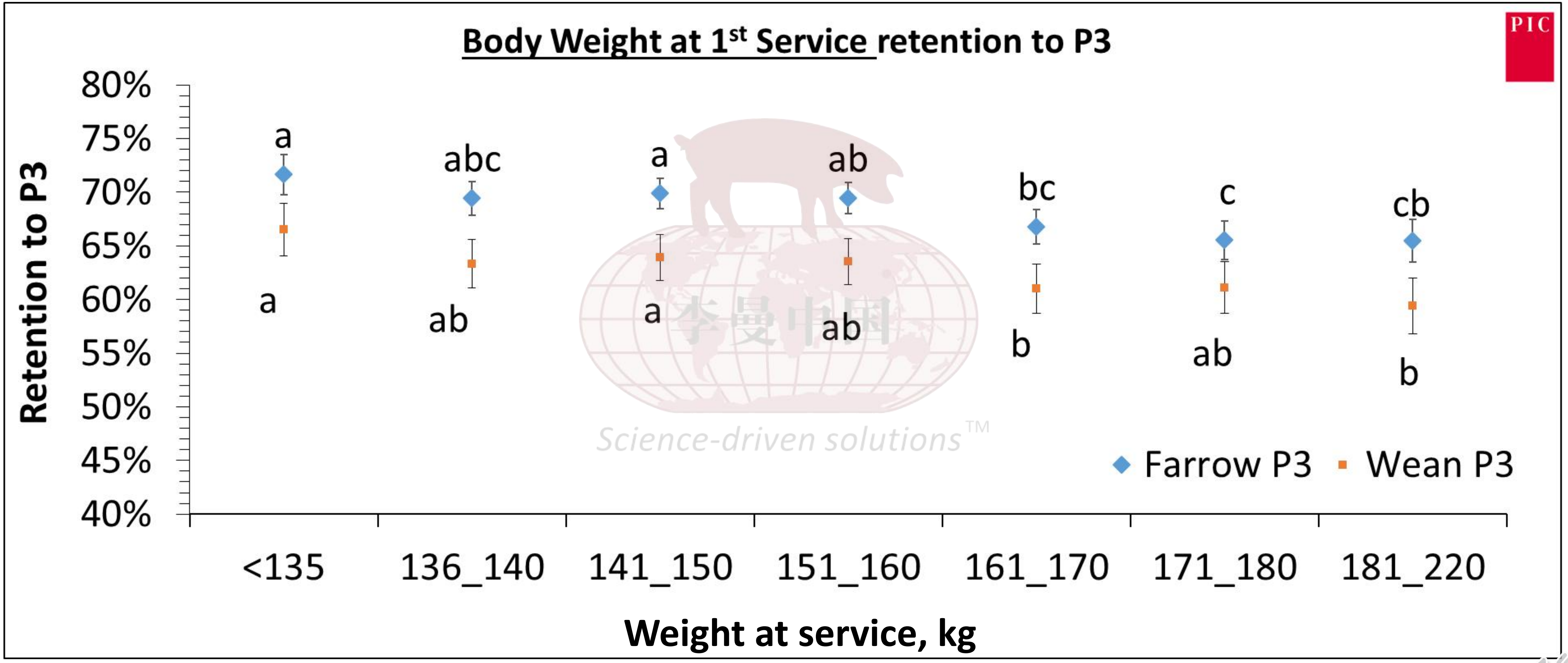




Breed gilts at 2nd detected estrus

Weight at service

A heavier weight at service is associated with lower retention to 3rd parity



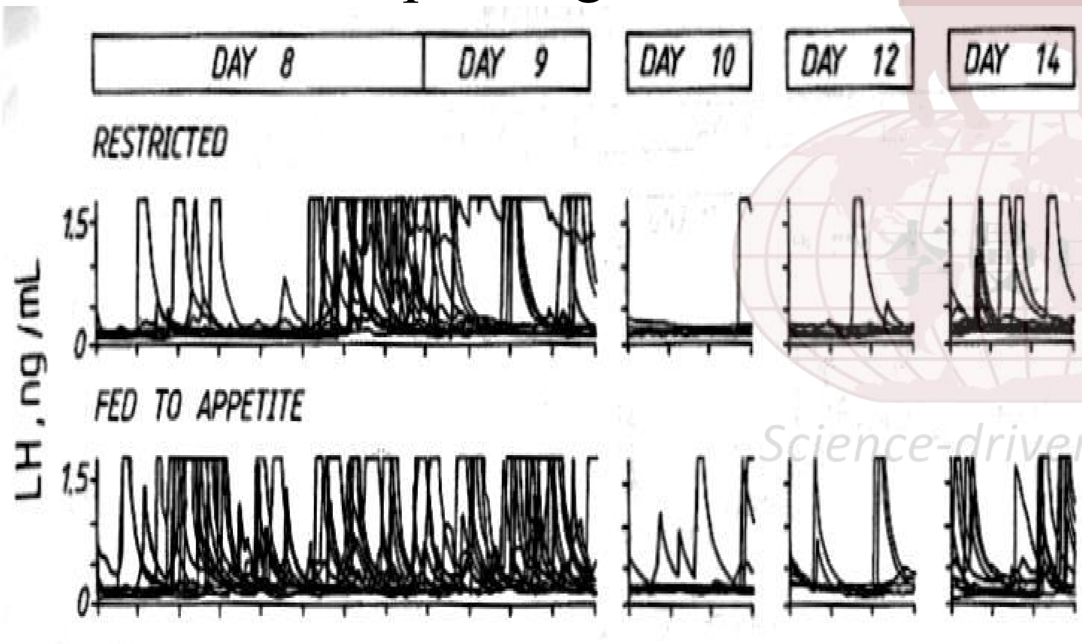
Breed gilts between 140-160 kg body weight: Avoid going beyond that.

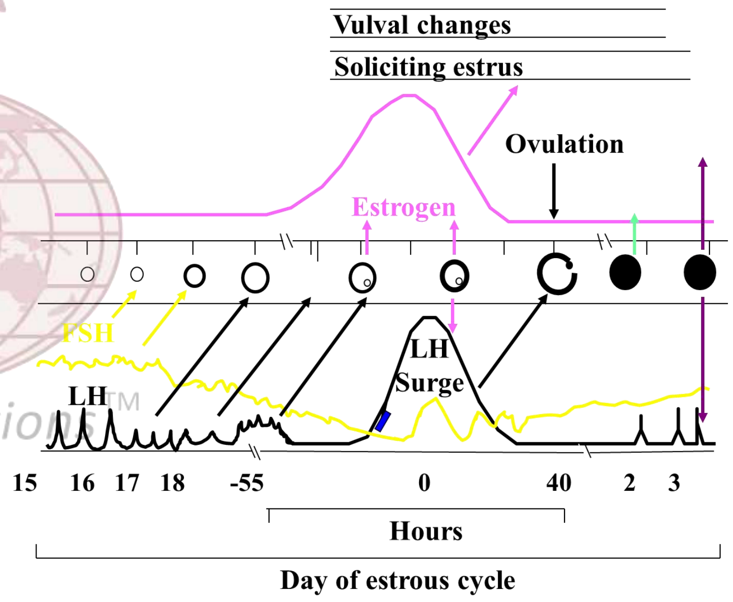
Avoid breeding gilts too heavy:

- Gilts bred >170 kg:
  - **risk of low retention over 3 parities**.
  - **risk for locomotion problems over 3 parities** (Amaral Filha, et al,. 2008).
- Heavy gilts at 1st service:
  - Tend to be **heavy at a farrowing**
  - Have **more demands for maintenance** (Bortolozzo et al., 2009).
  - **Increased risk of stillborns** (Amaral Filha et al., 2008; Bortolozzo et al., 2009; Faccin et al., 2017)
- Heavy gilts during gestation and lactation:
  - **Achieve less than optimal productivity and feed utilization** (Kim et al., 2016).

Management of feed intake

- Any event that disrupts normal feed intake in the gilt will immediately impact LH secretion and remove the critical priming effect of LH secretion on follicular development (Booth et al. 1996).
- This lack of LH "priming" affects follicle and oocyte quality, and gilt fertility if bred.





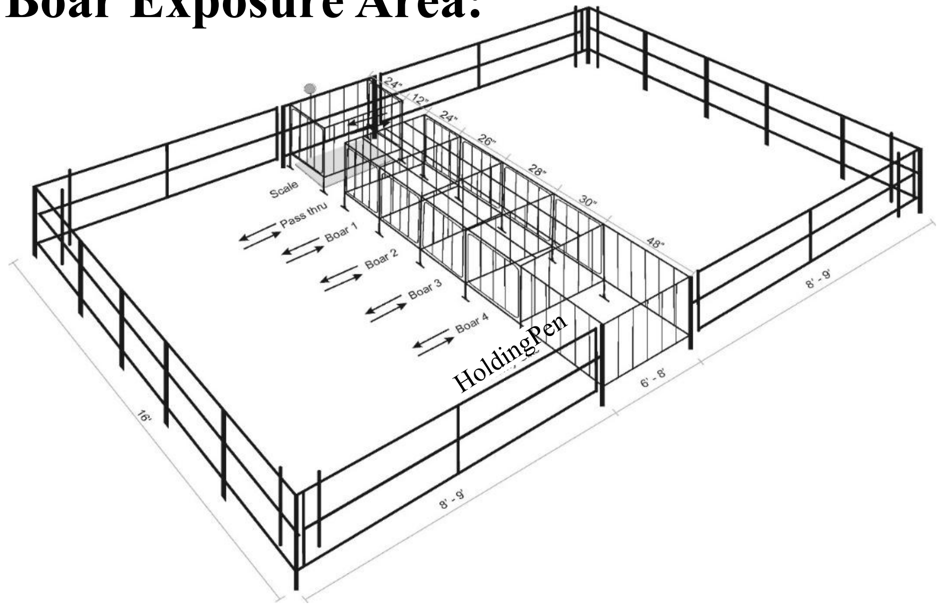
- The feed level provided during the first cycle after pubertal estrus is essential to establish the ovulation rate and the potential litter size (Faccin et al., 2022).

Risk situations for reduced feed intake at critical stages of gilts development would include:

1. Remixing of gilts immediately before boar stimulation
2. Crowding that limits feed intake in timid gilts
3. Health-type incidents at any of these times
4. Relocating gilts within 15 days prior to breeding
5. Water not flowing well in the troughs
6. Fighting, regroupings, fear.

Key components of a GDU program

Boar Exposure Area:



Established Puberty Stimulation Protocols:

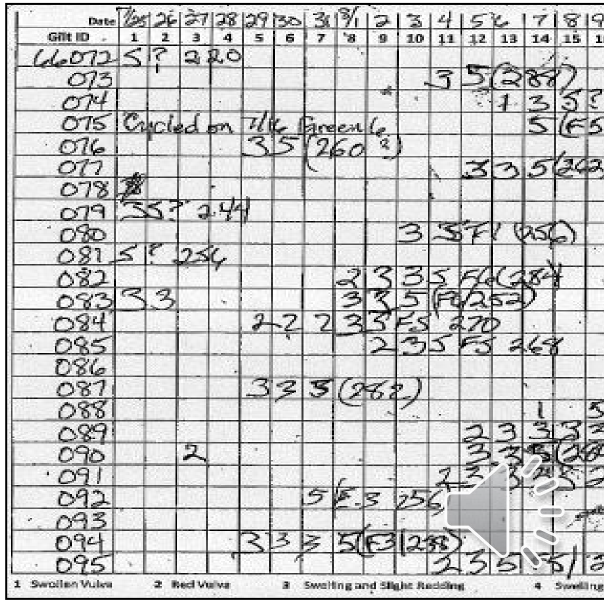
Time Point	Action: group by group
D1-13	▪ Direct (and fenceline) contact with boars
D14	▪ Remix all non-cyclic gilts
D23	▪ "Opportunity" (**known non-cyclic**) gilts without HNS receive PG600
D28-35	▪ All eligible gilts are identified ▪ Gilts without HNS are culled

High libido boars:

Direct Boar Contact:

Fenceline Contact:

Record Keeping:



Take Home Messages: Start With The End in Mind!

1. **Low birth weight (<1 kg) is predictive of non-selection and low retention**
2. **A low birth weight phenotype reduces the efficiency of a gilt replacement program**
3. **Early puberty**: Start boar stimulation early enough (~170 days). Gilts should have a recorded heat by 195 days.
4. **Breed gilts on at least 2nd detected estrus:** Delay to 3rd estrus only to meet minimum weight targets.

Take Home Messages: Start With The End in Mind!

5. **Breed gilts between 140-160 kg** body weight: Avoid going beyond that.
6. **Breed gilts prior to 225 d of age:** Older than that they are likely overweight!
7. **Avoid risk situations** for reduced feed intake at critical stages of gilts development.
8. **Implement a good gilt puberty stimulation and detection program** based on proven principals.

Thank-you for your attention.

Acknowledgments

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