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DanBred Knowledge Hub

Attain the full potential of DanBred

DanBred Knowledge Hub

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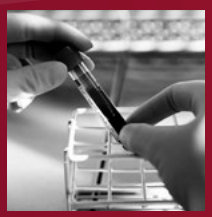

- Cleaning practice – secure semen quality
- Piglet growth – support colostrum supply
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- Large litters – correct handling
- Heat management observations – increase productivity
- Quality assurance of high value breeding stock
- Pregnancy testing – worth the effort

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Boar training 2 – Evaluation of the boar

Evaluation of boar training

Proper boar training as well as correct semen assessment and analysis in due time, will ensure an efficient on-farm transfer of high genetic potential of DanBred.

What to look for in achieving ideal training results

The rapid genetic development within the DanBred breeding programme, entail that a young DanBred boar is delivered with the a superior genetic potential compared to older DanBred boars. On this basis it is imperative that young boars are trained and set in production as soon they have reached sexual maturity. Training the boars and having their semen go through a proper quality analysis in due time will ensure an efficient transfer of the high genetic potential from the boars into the herd.

Optimum evaluation upon training

The purebred DanBred boar reaches sexual maturity by the age of 6-7 months, and when the DanBred boar is 8 months it is able to deliver a semen quality and sperm count which is adequate for use within a breeding program.

The semen collected should always go through a proper quality evaluation.
Basic parameters can be used for evaluating boar semen quality:

- Colour and Odour
- Concentration
- Motility
- Morphology

Colour and odour as well as semen concentration is not a direct a component of semen quality evaluation, but is valuable indicator of the boars health and productive output. Collected semen should have a milky white colour and must not have a noticeable odour (Rozeboom, 2000). The concentration of sperm cells should be above 150 mill./ml (DPRC, 2018).

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Motility describes the ability of sperm to move properly forward, and is important in order for the sperm ability to move through the reproductive tract. Because semen motility decreases during storage, semen should be tested shortly after collection and subsequently the diluted semen dose should be tested after 2-3 days of proper storage. The minimum motility rates during initial evaluation should be 90-80 % – with a motility cut off level at 70-60 % (DPRC, 2018).

Motile Sperm Cells	Semen Quality	Expected productivity
90 %	Very Good	Excellent
80 %	Good	
70 – 60 %	Sub-standard	Reduced
40 – 20 %	Poor	Very reduced
< 20 %	Unusable	Non-productive

Table 1: Semen motility evaluation.

Morphology is the study of the form or shape. The morphology assessment determents the percentage of abnormal sperm cells. Semen with less than 70 % morphological normal sperm can be identified as poor quality why the ejaculate should be discarded if the assessment is below this level (Rozeboom, 2000).

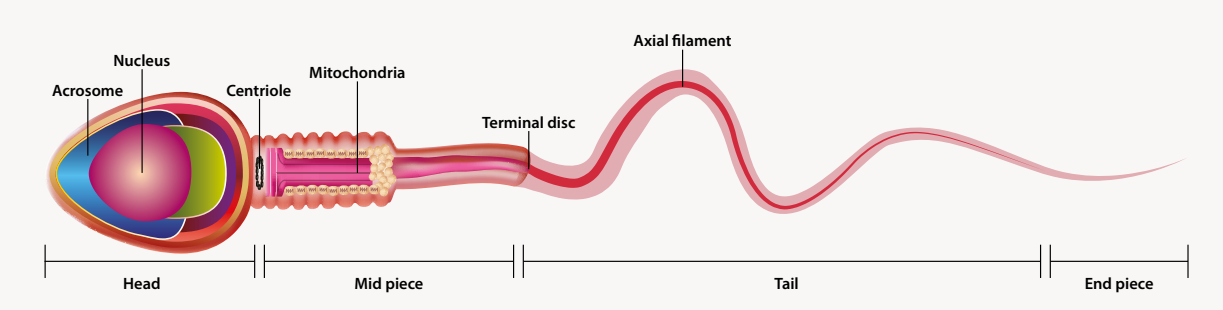

Figure 1: Sperm cell anatomy.

Sub-standard motility levels as well as an odd number of abnormal cells found with young boar can be a sign that the boar not mature for production or a sign of disease. Continue evaluating the semen until the results are acceptable and make sure to have the boar examined by the herd veterinarian.

Test the boar in the sow herd

Before the boar is finally approved for production an on-farm test of the fertility can be made by initiating a series of purebred matings in the sow herd and evaluating the percentage of non-pregnant sows an among the mated sows. The suggestion is to inseminate 10 productive sows with proper diluted doses from the new boar. If 9 or more sows are pregnant and the semen analysis for the boar are within the quality standards the new boar is ready for use. If less than 7 sows are found pregnant can be a sign of the boars age and maturity or a sign of disease. Give the boar a few weeks to recover and make sure to have the boar examined by the herd veterinarian.

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Easy steps for boar evaluation

Semen evaluation

Make a a proper quality evaluation.

- Semen should have a milky white colour and no noticeable odour.
- Concentration of sperm cells >150 mill./ml.
- Semen morphology >70 % morphologically normal sperm cells
- Semen motility level: 90-80 %
  - Motility cut off level: 70-60%

Semen Motility should be evaluated both in the ejaculate as well as in a diluted semen analysed after 2-3 days storage at 16-18 degree Celsius

Boar test on-farm

Inseminate 10 productive purebred sows:

- If 9 or more sows are pregnant
  - The boar is ready for production.
- If less than 7 sows are pregnant
  - Give the boar a few weeks to mature further
  - Have the boar examined for disease by the herd veterinarian

Sub-standard results in young boars can be a sign that the boar is not mature for production or can be a sign of disease. Continue evaluating the semen for some weeks until the results are acceptable and make sure to have the boar examined by the herd veterinarian.

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Boar training 1 – efficient management and handling

How to efficiently manage DanBred boar training

Correct training of DanBred boars form the basis for many successful collections in the future and represent the onset of obtaining the maximum productivity.

Maximise productivity with correct handling

A new DanBred boar is not just an animal, but rather it represents an extraordinary genetic potential for reproductive performance within the sow herd. Furthermore, on-farm AI boars reduce the risk of disease transmission when introducing superior DanBred genes into the sow herd. The correct training of DanBred boars form the basis for many successful collections in the future and represent the onset of obtaining the maximum productivity.

Achieve lifetime production & maximum productivity

The purebred DanBred boar reaches sexual maturity by the age of 6-7 months- at that time it will be eager to mount the dummy and be able to produce semen. By 8 months of age, the boars are able to deliver sperm counts adequate for use in a breeding program.

If the boars have been group housed they should be separated and placed in individual pens at least 14 days prior to beginning training. This is done to protect the boars, as their strong sexual instincts can lead to damaging fights. When training boars for semen collection the key word is patience.

Devote the time it takes to train a young boar and be calm and consistent, as this will be beneficial and rewarded in productivity. Training will be more efficient if boars are trained in keeping with their natural sexual instincts- this will also lay the foundation for a long-term positive association, increasing lifetime production (DPRC, 2018)

Begin boar training by introducing the dummy sow into the pen. To induce interest to the dummy place some feed on it. Give the boar some minutes alone to explore the dummy.

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To encourage the boar to mount the dummy, put some previously collected semen directly onto the dummy - the smell from another mature boar can trigger the boar in training into mounting the dummy.

Most boars will mount the dummy during one of the first few training sessions. Once the boar mounts the dummy, slowly enter the pen. Talk calmly to the boar and stroke his sides, testes and prepuce and try to collect from the boar, while giving encouragement all the time. When collecting lock the penis in a firm grip and collect the ejaculate. During the collection examine the penis for abnormalities or anatomical issues (i.e., limp penis, persistent frenulum).

Always praise the boar after a successful training session. Train the boars for 10-15 minutes a day, to uphold their interest.

Successful training of a new boar should take no more than 4 weeks (DPRC, 2018).

Easy steps for training of DanBred boars

Keep the boars interested and easier to work with by feeding them in the morning or after training.

- Train the boars for 10-15 minutes a day.
  - Keep track of the training sessions and the progress in a scheme for each boar.
- Ensure the boar is comfortable with human contact.
- Provide calm surroundings and keep the pen clean, dry and well-lit.
- Adjust the height of the dummy to match the size of the boar (wherever possible).

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Help the boars stay focused on the training, by:

- Using the boars own pen.
- Keeping other boars out of sight.

Placing the dummy in the middle of the pen.

Stimulate the boars interest in the dummy by:

- Placing some feed on the dummy.
- Letting an older, mature boar mount the dummy beforehand.
- Lightly gripping the preputial diverticulum.
- Gently pushing the boar away from the dummy, without scaring the boar.

If the boar actively mounts the dummy:

- Slowly enter the pen.
- Stimulate sides, testes and prepuce.
- Gently attempt a collection.
- Keep talking and give encouragement to the boar.

If the boar does not show any interest:

- Remove the dummy and leave the boar.
- Repeat the procedure after a couple of days
- Reward the boar with a treat after a successful training session

Once the boar starts to mount the dummy without hesitation, do the first real collection.

- Let the boar mount the dummy.
- Lock the penis in a firm grip.
- Collect the ejaculate.
- Examine the penis for abnormalities or anatomical issues.
- Keep talking and give encouragement to the boar.
- Reward the boar with a treat

Once the boar starts to mount the dummy without hesitation, repeat the collection for 3 days in a row (for experience), then let the boar rest for a few days before collecting again.

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Training is complete when the boar mounts the dummy confidently each time and the laboratory analysis confirms that the quality of semen meet your expectations.

Semen collected during training should be examined for quality analysis.

Do not use semen collected during training for insemination, unless the result of the analysis is approved within your quality standards.

When training is complete the boar should be collected no more than twice a week, until the age of 12 months where the collection interval can be increased to a maximum of 5 times a week.

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Transport – Effect on boar performance

Why do age and transport affect boar performance?

The correct transport and handling of on-farm boars is of the utmost importance to release their full genetic potential, whilst also preserving the high quality of the boars- especially their semen.

Maximise productivity with correct handling

High health DanBred genetics are well known for world class performance- delivering large robust litters with an extraordinary genetic potential for growth. Correct transport and handling of on-farm boars is of the utmost importance to release the full genetic potential and to preserve the high quality of the boars- especially their semen, Careful attention to detail and knowledge on how/ when to transport the boars is vital to achieve the full value of extraordinary potential for reproductive performance that DanBred breeding animals deliver.

Ensure correct transfer of new boars

The correct handling of boars is imperative for their ability to produce quality semen- in particular, changes in the surrounding environment are of great concern when it comes to maintaining and enhancing the quality of on-farm boars. The approach to transport is important as transport can lead to the risk of injuries and stress, both of which negatively affects semen production. This is why the transport of sexually mature boars is never recommended. In cases where it is absolutely necessary to move the boars, the following considerations should be taken into account.

Age of the boar is one of the first factors to consider when considering transport. Sexually mature boars should always be transported separately, so as to reduce the risk of aggressive behaviour and fighting during transportation. Younger boars can be transported together, but only with well known pen mates. Mixing of boars prior to transport will lead to fighting, which with a considerable risk of devastating injuries (Lambooij, 2014).

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Size and fitness is also a key factor when determining if transportation is an option, as the the heavier or larger the boar is, the greater the risk of injuries- in particular leg injuries. Transport can be a rough affair and it has been shown that pigs, especially in shorter distances, will stand whilst being transported due to their alertness towards the new surroundings- this in turn increases the risk of leg injuries essentially because their base is moving (Faucitano et al., 2019). Fever is another factor which has a negative effect on semen production- boars which experience body temperatures above 39°C for 2 days or more can have an increase in abnormal sperms- this can take up to 8 weeks before semen quality is back to normal (Vestager, 1993).

Temperature and humidity both have profound effects on pig welfare, as pigs are unable lose heat by sweat. Therefore it is essential to have good climate control when transporting boars. In particular, the exposure to high ambient temperature has shown to have a long term negative effect on semen production. Ambient temperatures above 30°C can affect semen production for as long as 8 weeks (DPRC, 2013).

Basic recommendations for the transport of boars

- Wherever possible, prevent transporting sexually mature boars (> 6 months).
- Ensure the transportation of boars in separate compartments within the vehicle.
- Younger boars (< 6 months) can be transported in smaller, static, socially known groups.
  - No new entries to the group within 14 days of the transport.
- Do a thorough health and fitness evaluation of each boar before transportation and again upon loading.
- Ambient temperature should not exceed 30°C for long periods of the journey.
  - Transportation at night is recommended in hot climates.
- Floors in the transport vehicle should be skid proof and prevent the boars from slipping.
- Sufficient bedding materials should be supplied in the transport vehicle.

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Quarantine for high value breeding stock

Why quarantine compliance is essential

Proper acclimatisation, with a well-managed quarantine period allows the breeding stock to adjust to the climate, feed, housing and management, is essential when receiving high health DanBred animals.

Integrating high value breeding stock

High health DanBred genetics are well known for world class performance- delivering large robust litters with an extraordinary genetic potential for growth. When entering new breeding stock into the herd, proper acclimatisation with a well-managed quarantine period will allow the animals to adjust to their new climate, the new feed, the housing and management systems. One of the most critical factors and goals of the acclimitisation is to slowly expose the incoming animals to the organisms and pathogens existing in the recipient herd, whilst also allowing them time to recover and establish immunity.

Ensuring the best possible introduction of new breeding stock

A high level of management and systematic recording are essential tools when introducing new breeding stock into any existing production enterprise. New breeding animals should always be placed in an isolated quarantine facility where the animals (aside from undergoing a heath evaluation) can recover from transport and adapt to the new climate, feeding and housing systems (DPRC, 2007).

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The main objective is to make the breeding animals comfortable in their new environment as quickly as possible.

Key areas to focus on are:

Water & feeding: A change in the type of feed or climate can cause the animals to temporarily stop eating. Observation around feeding time is therefore really important to see if all breeding animals are adequately drinking and eating.

Housing & environment: The transport and new housing systems, especially floor types, can cause sore legs among the incoming breeding stock. Ensure there is enough space and a smooth transition by providing bedding materials in a part of the quarantine where possible (keeping in mind the manure system and biosecurity maintenance).

Medication & Vaccinations: Ideally, the farm veterinarian should check all animals upon arrival. At the first sign of injuries or disease ensure the proper measures are taken. Before integrating new breeding stock into the main herd, ensure the on-farm veterinary health plan is followed.

Quarantine facilities should be placed separately from the main herd, including the ventilation and feeding systems. Manure should also be handled independently from the receiving main herd.

Set up a separate entrance for the quarantine area, with the minimum biosecurity action a change of clothes and footwear as well as a proper hand wash. It is highly recommended to have a shower-in shower-out set up (DPRC, 2013).

The quarantine staff should ideally be allocated specially to the quarantine unit to ensure the best possible care and (possible) disease segregation. Alternatively, work with the isolated quarantine area should be completed at the end of the day, ensuring that staff can shower and be pig free overnight before entering the main herd again.

The quarantine should be run as all-in/all-out production system and must have a capacity for an 8 week cycle. Depending on health status and the vaccination procedures, the isolation period can be extended to 12 weeks (DPRC, 2007).

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Easy steps for setting up and managing quarantine facilities

Managing proper isolation and acclimatisation will increase the success rate at entry to the main herd.

Space

DanBred recommended pen area per animal in isolation:

Weight	Recommended Area per Animal
50–85 kg	0.75 – 1.00 m2
85–110 kg	0.75 – 1.00 m2
110+ kg	1.50 – 1.90 m2

Preparation

Before arrival make sure that all surfaces in the quarantine unit have been:

- Emptied for slurry and/or manure.
- High-pressure washed with soap, rinsed and disinfected.
- Completely dried without water present on both the floor and equipment.

Temperatur

Recommended ambient temperature 15-20°C

Two-climate pens with partial covers can help meet the demands of different ages.

In hot climates, increase the air speed to help regulate temperature and reduce humidity, but avoid direct drafts in the pens. Water sprinklers or foggers can be used to help the animals stay cool and comfortable, although be careful to select the correct particle size to avoid creating a constantly wet and/or humid environment.

Health status

Monitor the animals' health status daily and seek veterinary advice if any concerns arise.

Watch for signs and symptoms of diseases:

- Reduced appetite or lack of interest in water
- Lameness
- Cough
- Wobbly walk
- Abnormal head position
- Changed consistency of faeces

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Pregnancy testing – Worth the effort

Why pregnancy testing is worth the effort

Attain the full potential of DanBred with systematic management of on-farm pregnancy tests combined with a consequent culling strategy to optimise overall efficiency and reduce Non-Productive Days.

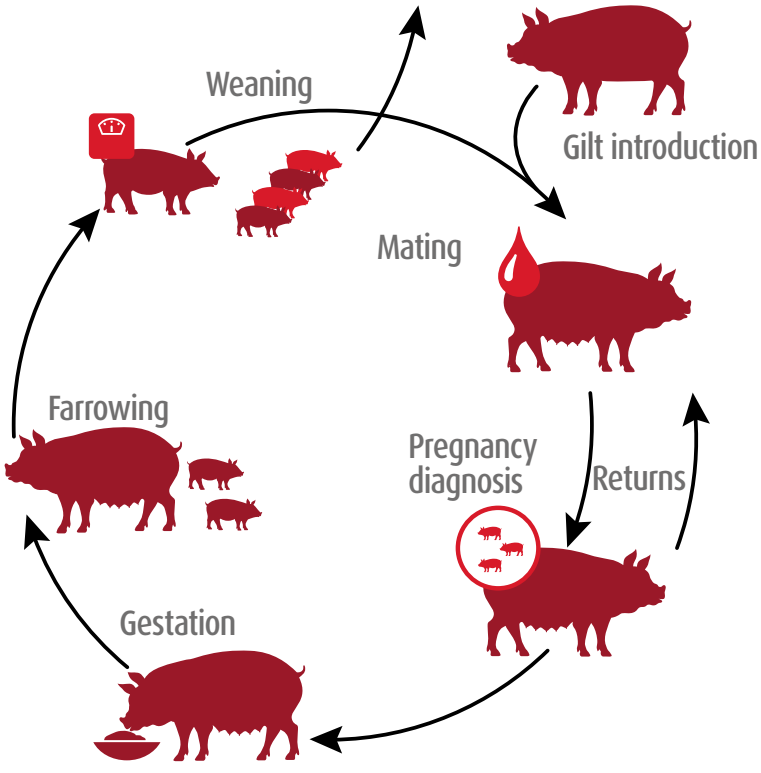
Increase productivity by systematic on-farm pregnancy testing

DanBred breeding animals deliver extraordinary reproduction results and attentive systematic performance of on-farm pregnancy tests combined with a consequent culling strategy will optimise the overall production efficiency and reduce Non-Productive Days (NPD). A high number of pregnant or lactating sows and gilts increases reproductive efficiency, whilst maximising both productivity and the use of space. Increasing the number of possible productive days by eliminating NPDs will enlarge the number of litters per year as well as increase the number of number of pigs weaned.

Efficient pregnancy diagnostics increase productivity

On farm pregnancy diagnostics must be efficient, secure, inexpensive and easy to perform. The time spent on pregnancy testing as well as the training of staff to do so is money well spent. It is important that all members of staff know the culling strategy set for sows returning to service, as well managed protocols and successful implantation of culling strategies will ultimately minimise NPDs.

Many diagnostic methods have been tested over the years. Using a boar for detection of heat is one of the most common methods and has shown to be very efficient as it is almost 100 % certain that a sow which shows signs of being in heat after mating failed to conceive when mated (DPRC, 2017).



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Non pregnant sows will normally return to oestrus within 17 to 24 days after mating, therefore daily nose-to-nose contact between sows and a boar from day 19 to day 28 is recommended (Almond, 1994).

Ultrasound scanning the sows between day 28 to 42 has shown significant accuracy in finding non-pregnant sows, but is dependent on both the equipment used as well as the technicians' skills- training is therefore essential (DPRC, 2017). When finding returning sows it is imperative that these are moved to the mating unit straight away- optimised feeding and daily boar exposure can provoke a new heat, and thereby return the sow into production – alternatively the sow must be culled (DPRC, 2017).

Week of Gestation	Days of Gestation	Method	Percentage of non-pregnant sows/gilts
3+	17-24	Boars and heat check	80%
5+	24-35	Ultrasound	15%
8-10	56-70	Visual	5%

Table 1: Methods for pregnancy diagnosis according to time of gestation

Easy steps to maximise production with accurate pregnancy diagnostics

Heat detection

- Use a boar in front of the sows every day from day 19 to day 28 after mating.
- During a quiet time of the day check for the 8 signs of heat;
  - Swelling and redness of the vulva
  - Clear fluid discharge from vulva
  - Lack of appetite
  - Increased activity/restlessness
  - Perked or twitching ears
  - Tail flicking up and down
  - Vocalization or grunting
  - Standing reflex.
- Use an older, odorous and high libido boar.
- For loose house systems, keep the boar in a pen with an opening into the sows and use the electronic registration to track which sows show interest in the boar.

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Ultrasound scanning

- The ultimate goal of pregnancy detection is to identify non-pregnant females before 35 days of gestation
- Scan all sows once between day 24 and day 28 after mating
- If in doubt of the diagnosis mark the sow and scan again within a week
- For optimised results, a second scan of all sows can be done around day 42
- Timing ultrasound scanning with a feeding can help efficiency
- Following the scanning evaluate the body condition in order to optimise feeding during gestation.

Strategy for returns

- Clearly mark sows in heat or scanned non-pregnant
- Move sows in heat or scanned non-pregnant to the mating unit or cull depending upon protocol
- Check for heat every day
- Inseminate when standing heat is detected
- Let the sow continue in the new week batch
- Set a culling strategy for returning sows and make sure that all employees know the strategy (for example cull after 2nd unsuccessful mating).

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Health assurance of high value breeding stock

How to secure on-farm health status integration

High health DanBred animals are well known for world class performance- implementing the correct health integration strategy for the new breeding stock will ensure world class performance on farm.

Health assurance of high value breeding stock

High health DanBred genetics are well known for world class performance- delivering large robust litters with an extraordinary genetic potential for growth. To maximise the full potential of their genes, it is imperative to implement a proper acclimatisation program which includes a well-managed quarantine period. This will slowly expose the breeding stock to the pathogens in the recipient herd whilst allowing the animals time to recover and establish proper immunity. At the same time, the animals will be able to adjust to their new climate, feed, housing and management systems.

Ensuring the best possible introduction of DanBred animals to your herd

DanBred breeding stock is delivered with a declared health status and transparent vaccination and treatment history. Disciplined management and systematic recording are essential tools when introducing new animals into any herd. Maintaining the health status of the existing herd is critical to sustaining productivity, which is why knowing the health history and subsequent status of both incoming stock and the receiving herd is important. If breeding animals from high health status herds are entered directly into an existing herd in which certain infections are present and active, the immediate productivity of the new animals is compromised (DPRC, 2013).

Implementing a correct acclimatisation strategy of the new breeding stock will ensure immunity to the diseases in the existing herd before entry.

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The main objectives for the acclimatisation period is to:

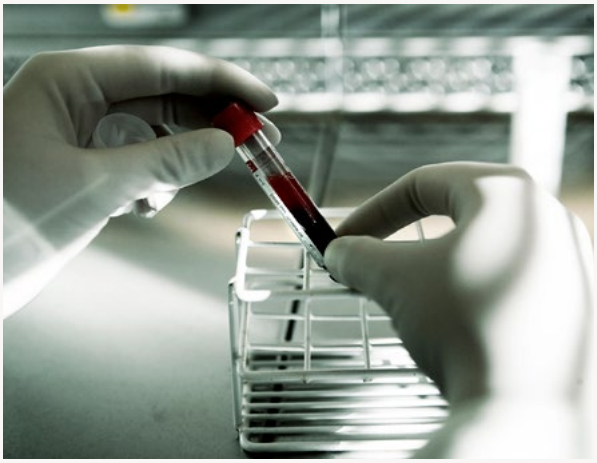
- Prevent new diseases entering into the existing herd.
- Establish a common immune status between the incoming animals and the existing herd without disturbing the general health in both the new animals and the existing herd.

To ensure the above goals, new breeding stock should always be placed in an isolated quarantine facility.

It is there that the incoming animals can be blood tested to ensure they are not incubating diseases that do no already exist in the production herd.

Furthermore, a vaccination plan in accordance with the on farm health status should be initiated to ensure a health match between the existing herd and the incoming breeding stock (DPRC, 2013).

The vaccination programme should be initiated in the quarantine facility where the new animals are isolated for at least 8 weeks, Depending on health status and vaccination procedures, the isolation period could be extended to 12 weeks (DPRC, 2007).



Develop and implement a diagnostic plan specific to your herd with your herd veterinarian or health services department - DanBred is happy to assist if needed.

Easy steps for on farm health assurance

Proper health management will minimise potential challenges which could disrupt either the new breeding stock or the existing herd.

The quarantine facilities

New breeding stock should always be placed in a quarantine facility upon arrival:

- Quarantine facilities should be located separately from the existing herd.
- Both the ventilation and feeding systems should be separate from the main herd, as well as the manure management system.
- The quarantine unit absolutely must have its own separate entrance
- Change of clothes and footwear as well as a proper hand wash is essential (these should be considered the minimum requirement)
- A shower-in/shower-out facility is highly recommended.

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If it is not possible to allocate independent labour for the quarantine unit, ensure that the work in the quarantined section is done at the end of the day. Enforce proper downtime for all staff before entering back into the existing herd, and consult the herd veterinarian for further guidance.

Health monitoring

Check the animals' immediate health on a daily basis. Seek veterinary advice if concerns arise and watch for signs and symptoms of diseases, including:

- Reduced appetite or lack of interest in water
- Lameness
- Cough
- Wobbly walk
- Abnormal head position
- Changed consistency of faeces

Diagnostic testing & Vaccination program

Vaccinations should be administered in accordance with the on farm veterinary health plan, and should support the following ideals:

- Ensure diagnostic tests and vaccinations for all relevant diseases
- Reduce production losses in the new animals due to health differences with the existing herd
- Avoid disturbing the health of the existing herd.

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New arrivals – Inspect and assess breeding stock

Proper selection

High health DanBred breeding stock represent the future of the herd- proper selection and management upon arrival will help form the basis for best possible production and lifetime performance.

Inspection and assessment of breeding stock upon arrival

High health DanBred breeding stock are well known for world class performance- delivering large and robust litters with an extraordinary genetic potential for growth. New breeding animals represent the future of the herd which is why proper selection and management upon arrival is the initial step for achieving the best possible production and lifetime performance.

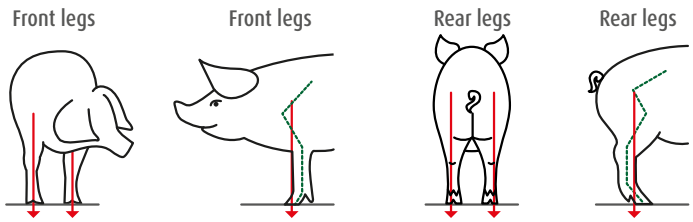
Laying the foundation for successful introduction

DanBred breeding stock bought for as replacement animals will be genetically superior, structurally robust and have a declared health status. At selection, the DanBred animals are genetically assessed on the basis of their breeding index. The DanBred breeding program is officially registered, which means that all DanBred breeding animals- no matter the breed- have an official pedigree, providing full transparency. This ensures that all DanBred partners can follow the breeding value for their animals and in this way, ensure continued genetic progress by choosing only the best animals for next generation.

Aside from ensuring that the breeding animals have the best genetic basis, all DanBred breeding stock undergo a thorough visual examination and quality assurance where conformation, feet, legs, weight and age are evaluated in regards to optimum longevity and increased productivity.

Visual evaluation starts with the feet and legs. An ideal foot is visibly healthy and is of equal length and size. All toes point forward and the legs are straight. Front and back legs are aligned and the rear hocks and front knee should be angled so as to not put extreme pressure on the leg joints when the animal is walking. The pastern should be relatively soft and the foot should be flat against the floor with dew claws only just touching the ground. The foot must not rotate or turn when the pig walks (DPRC, 2007).

Transport can temporarily weaken the legs of the animals, which is why the receiving quarantine should always have soft bedding available where possible (taking into consideration the manure system and biosecurity) (DPRC, 2007).



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DanBred animals are delivered with a declared health status- ideally the health status of the incoming animals are matched with the receiving herd status to ensure a smooth transition. At delivery, a vaccination strategy has been initiated for all animals, so it is important to make sure to inform the herd veterinarian of the vaccinations already administered in order for this to be registered correctly in the on farm veterinary health plan (DPRC, 2007).

Easy steps for receiving DanBred breeding stock

Correct management on arrival will form the basis for best possible production and lifetime performance

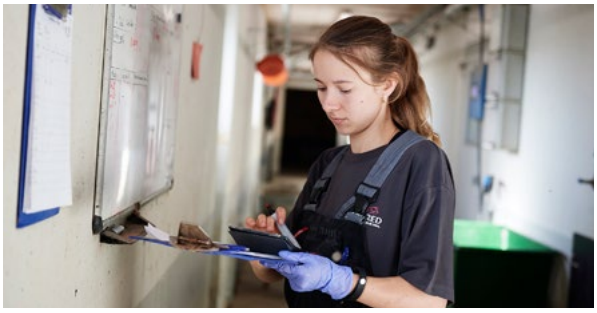
- Make sure all the animals get fresh water and feed as soon as they arrive.
- Check all animals for signs of disease or defects– repeat this every day of quarantine.
- Check the animals are correctly registered in the delivery notes.
- Check that weight and age match the requested.
- Note the vaccinations administered by the supplier and inform the herd veterinarian of this.
- Report any questions within 48 hours of receiving the animals for quick resolution or follow up.

Sort breeding stock upon arrival

Sort all animals by sex, age, weight and if possible by genetic line when entering them into quarantine.

Provide management with a daily updated spreadsheet containing:

- Pen ID.
- Animal ID per pen.
- Age and approximate weigh of each animal.
- Vaccination(s) dates.
- Dates for blood test(s).
- For gilts:
  - Expected date of first heat.
  - Date for starting heat induction for each pen.
  - Date of first heat for each gilt.
- For boars:
  - Development in daily gain.
  - Date for training start up.
  - Date of first collection.



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Semen Doses – Maximise productivity with correct handling

How to store and handle semen doses

Artificial insemination has become a standard, especially among modern farms working with DanBred high quality genetics. Correct handling of the semen is vital to achieve the extraordinary potential.

Maximise productivity with correct handling

Artificial insemination (AI) has become an industry standard, in particular on modern farms that are working with high quality genetics such as DanBred. It has been estimated that more than 95% of inseminations worldwide are now done with semen extended in liquid state (Yeste, 2017). DanBred breeding animals come with an extraordinary potential for reproductive performance and careful attention to and knowledge of correct semen handling and storage is vital to preserve the high quality of the semen, and subsequent release of full genetic potential on farm.

Preserve genetic quality and uncompromised fertility

As the call for high quality pig genetics such as DanBred rises worldwide, the need for knowledge on AI semen increases. Two main factors influence productivity when it comes to the handling and storage of semen doses: temperature and age (Johnson et. al. 2000).

A range of sub factors including the correct preparation of doses and the boars' condition also matter, as described in the DanBred boar management manual.

It is an established fact that boar sperm is susceptible to fluctuations in temperature. Semen temperatures below 15°C can result in a loss of viability and efficiency (Johnson et. al. 2000). Because of this factor, ready-to-use semen doses should be kept in a semen cabinet at a very consistently controlled temperature between 15-18°C to preserve semen quality and uphold maximised productivity results (DPRC, 2018).

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Shelf life and durability of prepared semen doses depend on the commercial extender used when diluting the raw semen ejaculate. It is possible to make a general segregation of commercial extenders into both short and long term extenders. Semen diluted with short term extender should be used within 2-4 days of production and long term extender should be used within 7 days of production (DPRC, 2018). The use of semen beyond the expiry date will adversely impact farrowing rate and litter size, which is why it is important to be familiar with the properties of the extender used in order to maintain quality and optimised fertility of the semen.

Keep a record of the number of doses in the cabinet, including the race or boar name and ID of each dose, as well as the production and use-by dates of each dose. Minimise the number of times the cabinet door is opened (reducing potential temperature changes) by keeping the record close to the cabinet.

To verify that the semen is not being exposed to significant temperature changes, a temperature logger should be introduced. Sedimentation within the semen doses can be prevented by gently rotating the semen doses twice a day (Belstra, 2007).

Easy steps for correct semen storage and handling

Storage

- Place the semen doses in a temperature controlled semen cabinet.
- Position the semen doses in one layer in the semen cabinet.
- Do not return doses which have been removed from semen cabinet.
- Rotate semen twice daily to re suspend the semen cells in extender.

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Temperature

- Keep maximum/minimum thermometers or a temperature logger in the semen cabinet.
- Record cabinet storage temperatures twice daily (when rotating doses). Ideally use a thermometer placed inside a liquid sample stored in the refrigerator.
- Storage temperature must be kept steady between 15-18°C at all times.
- Do not heat or chill the semen doses.
- Ensure sufficient space between the wall and the semen storage cabinet to allow movement of air for better circulation.

Shelf life

- Shelf life depends on the commercial extender used in the semen doses:
  - Short-term extender at correct storage and temperature: 2 – 4 days.
  - Long-term extender at correct storage and temperature: 7 days.
- Always check with the manufacturer of the extender and follow their exact instructions.

For fresh semen: delivery frequency is strongly correlated to reproductive performance.

Handling

- Do not shake or drop the semen doses.
- Use an insulated box including a thermometer when transporting semen to the mating unit.
- A temperature gel pack beneath the semen in the portable semen box can help stabilise the temperature. The gel pack must be stored in the semen cabinet when not in use.
- Do not bring more doses than can be used within an hour. Never return doses that have been removed from the semen cabinet.

Factors which can lead to decreased semen life

- Keep the semen doses out of direct sunlight.
- Avoid any contamination of the semen, for example with:
  - disinfectants.
  - detergents.
  - lubricants not approved for AI use.

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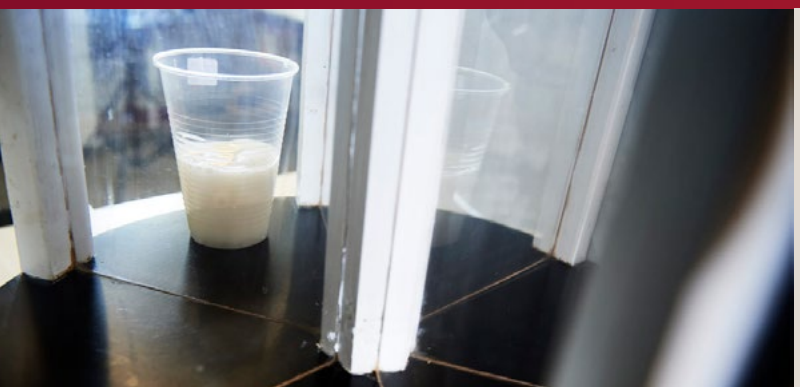
DanBred Knowledge Hub

2. Release potential

- Prepare semen doses – correct procedures
- Laboratory practices – setup good routines
- Semen hygiene – increase semen quality
- Collection – achieve full potential of semen
- Piglet growth – support colostrum supply
- Farrowing – procedures for success
- Weaning – the foundation for success
- Large litters – correct handling
- Lactation – supporting a high number of nursing piglets

Prepare semen doses – correct procedures



Preparation of semen doses

The correct procedures in transforming the raw ejaculate into ready-to-use semen doses will maintain the uncompromised value and help unlock the full reproductive potential of DanBred genetics on farm.

How to prepare raw semen for AI application

To obtain the outstanding reproductive results DanBred genetics can deliver, good quality boar semen I essential. When following the correct procedures in transforming the raw ejaculate into ready-to-use semen doses will maintain the uncompromised value and help unlock the full reproductive potential of DanBred genetics on-farm.

Transformation into ready-to-use semen doses

The first step in semen production is a quality assurance of the raw ejaculate. The semen should reach the laboratory within 15-20 minutes after collection. In the laboratory the quality evaluation protocol initiated.

Colour and odour is not a direct component of semen quality evaluation but is a valuable indicator of the boars' health and productive output. The ejaculate should have a milky white colour and must not have a noticeable odour. If abnormal appearances happen, it should be discarded and not used. Furthermore, the boar should be seen by the herd veterinarian (Rozeboom, 2000).

Motility describes the ability of sperm to move properly forward and is important for the sperm ability to move through the reproductive tract. Because semen motility decreases during storage, semen should be tested shortly after collection and subsequently, the diluted semen dose should be re-tested after 2-3 days of proper storage. The minimum motility rates during initial evaluation should be 90-80 % – with motility cut off level at 70-60 % (DPRCa, 2018).

Motile Sperm Cells	Semen Quality	Expected productivity
90 %	Very Good	Excellent
80 %	Good	
70 – 60 %	Sub-standard	Reduced
40 – 20 %	Poor	Very reduced
< 20 %	Unusable	Non-productive

Table 1: Semen motility evaluation.

Morphology is the study of the form or shape. The morphology assessment determents the percentage of abnormal sperm cells. Semen with less than 70 % morphologically normal sperm can be identified as poor quality why the ejaculate should be discarded if the assessment is below this level (Rozeboom, 2000).

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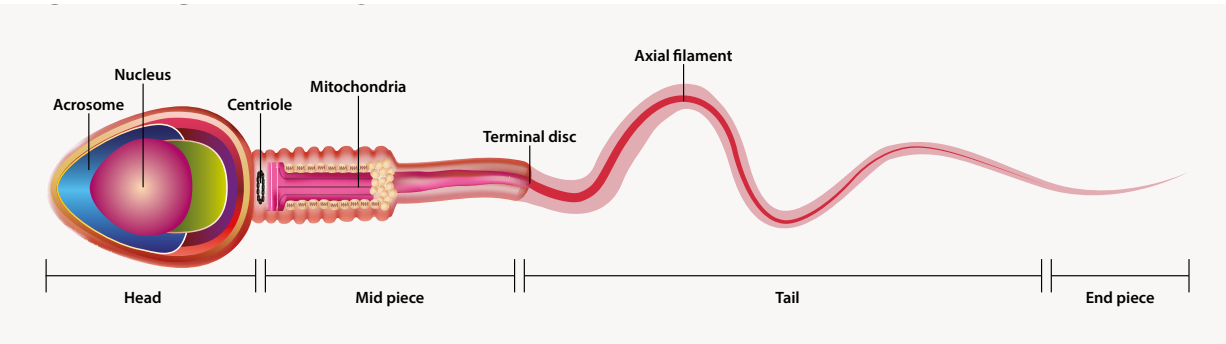

Figure 1: Sperm cell anatomy.

Sub-standard motility levels, as well as an odd number of abnormal cells found with young boar, can be a sign that the boar not mature for production or a sign of disease. Continue evaluating the semen of the young boar until the results are acceptable and make sure to have the boar examined by the herd veterinarian.

Sperm concentration in the ejaculate describes the number of sperm cells in the collected amount and is an important value, as this together with a total volume of the ejaculate, it will determine the number of doses which can be prepared. The concentration of the semen can be determined by using a haemocytometer under a microscope, by using a calorimeter or a photometer or by using Computer Assisted Semen Analysis (CASA) (Althouse et al., 2015). The concentration of sperm cells should be above 150 bill./ml (DPRCb, 2018).

Investing in equipment will maximise the use of sperm by optimising the number of doses produced and consequently increase the economic and genetic gain on-farm. The DanBred recommendation is to dilute the semen to 2-2.1 billion (109) sperms per dose containing 80-85 ml diluted semen (DPRCa, 2018). Under-diluting semen, will give a higher concentration but can, besides reducing the optimum number of doses produced, result in a shorter shelf life because the amount of available energy substrates in the extender will exhaust sooner than expected. On the other hand over-diluted semen, with a low sperm count, will potentially cause reduced semen viability and thereby decrease the farrowing rate and potentially increase the number of non-productive days on-farm (Althouse et al., 2015).

The choice of extender depends on availability as well as production setup. Depending on the active ingredients in the extender, semen doses can be stored between 3 to 8 days without significant loss of fertility potential (Althouse et al., 2015).

Water for semen dilution must be purified either by distillation or demineralisation. Tap water cannot be used at the content of minerals as well as variable levels of chemicals, organic compounds, microorganisms and endotoxins can harm the semen. Ensure water hygiene by never using tools or thermometers in the container, as well as ensuring that water is only taken out and never returned into the hygienic container (DPRCa, 2018).

It is a fact that boar sperm is very susceptible to fluctuations in temperature and semen temperatures below 15°C will result in a loss of viability and efficiency why semen doses should be kept at a very steady temperature (DPRCa, 2018). At collection the semen has a temperature of 37°C while doing quality assessment as well as dilution of the semen it is very important to keep the temperature around 35°C until the semen has been filled into tubes, flatbacks or bottles, now the doses can be transferred to a temperature-controlled storage facility at 16-18°C.

Easy work flow on preparing semen doses for AI

Before collecting the semen make sure the extender is prepared.

Prepare the extender

- Prepare the liquid extender in a single-use, disposable plastic bag.
- Use demineralised or distilled water.
- Carefully follow the instructions provided by the extender manufacturer.
- Dissolve the extender in the amount of water described by the manufacturer.
- Place the dissolved extender in a water bath at 35-37°C for a minimum of 1 hour to allow for temperature and pH equilibration.

Boar test on-farm

- Register the boar ID number.
- Register the boar race.
- Register the date of collection.

Semen evaluation

- Measure the volume of raw semen collected (by weight: 1 Gram = 1 Millilitre).
- Check the colour and odour (must be milky white with no odour).
- Calculate the concentration (using a haemocytometer, a calorimeter, a photometer or CASA.
- Check Semen morphology (>70 % morphologically normal sperm cells).
- Check Semen motility level: 90-80 % (Motility cut off level: 70-60%).

Semen Motility should be evaluated in the ejaculate as well as in the ready-to-use semen dose after 2-3 days of storage.

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Calculations

The number of doses must be calculated to know the amount of extender needed:

The number of doses:

$$\#\ \text{Doses} = \frac{\text{Concentration of raw semen (sperms/ml)} \times \text{Total volume of raw semen (ml)} \times \text{motility rate}}{\text{Number of sperms per dose (sperms/dose)}}$$

The mixing ratio:

The total volume of diluted semen (ml) = # Doses – Size of the dose (ml)

Volume of diluted extender (ml) = Total volume of diluted semen (ml) – volume of raw semen (ml)

Prepare the semen doses

- Measure out the amount the needed volume of the diluted extender.
- Maintain the temperature at 30-35°C
- Add the raw semen into the extender.
- Test a sample of the diluted semen to see that the semen is still viable.
- Fill the diluted semen into tubes, flatbacks or bottles.

Place the ready-to-use doses in a temperature-controlled storage facility at 16-18°C.

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Laboratory Practices – Setup good routines

Focus on lab practices and uncompromised hygiene

A well-designed laboratory layout combined with thorough lab practices focusing on uncompromised hygiene is the backbone in producing high quality DanBred semen doses.

How to comply with good laboratory practices

The main aim when working with on-farm AI is to produce a consistent amount of high quality semen doses in order to reach the reproductivity targets set for the herd. Introducing a well-designed laboratory layout combined with thorough lab practices focusing on uncompromised hygiene is the backbone in producing excellent semen which will initiate the process of unlocking the reproductive potential of DanBred.

Maintain quality and increase success

One of the central points within a successful on-farm AI is the laboratory. The basics of a successful AI production to keep hygiene and biosecurity in focus, this includes a proper design of the laboratory facilities as well as clear working procedures.

The laboratory is a clean zone and should be clearly separated from the boar unit. The laboratory layout be focused around hygiene and a natural working flow that optimises production and minimise the risk of semen contamination. To maintain the uncompromised quality of Danbred semen the laboratory is only used for analysis and production of semen.

Storage, office tasks as well as lunch break facilities should always be kept outside the laboratory.

Semen quality in increased if no direct crossing between the boar unit and the laboratory for personnel or tools is possible. Anyone entering the clean zone should at least change clothes and footwear and do a proper hand wash and

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disinfection, before entry. The ejaculate should always be decanted into a clean hygienic disposable cup outside the laboratory before entering the lab through a small window or sluice.

End of day procedures should include proper cleaning and disinfection of all surfaces and materials used in production. Furthermore, clothes worn inside the laboratory must be washed on a regular basis.

Easy steps to Comply with Good Laboratory Practice

Below a general list of recommendation for maintaining the semen quality and hygiene during semen processing:

1. Before any staff enters the laboratory:
   - Change clothes and footwear.
   - Properly wash and disinfect hands.

2. Only the clean decanted ejaculate can enter from the boar unit into the laboratory:
   - Ejaculate is decanted into a clean hygienic disposable cup.
   - Ejaculate enters the laboratory through a small sluice or window.

3. The laboratory is only used for analysis and production of semen:
   - No office tasks in the laboratory.
   - No storage room in the laboratory.
   - No food or beverages in the lab area.
   - No smoking permitted in the laboratory.
   - Avoid touching devices which are in direct contact with semen or extender.
   - Avoid bringing tools or materials from the collection area into the lab (except the decanted ejaculate).

4. Maintain proper hygiene and cleaning procedures:
   - Wash and disinfect hands between different semen processes.
   - Clean spills on equipment or countertops with 70% isopropyl alcohol mix.
   - At the end of day clean and disinfect the lab and materials used in production.
   - Ensure that all clothes worn inside the laboratory are washed on a regular basis.

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Semen hygiene – Increase semen quality

Focusing on hygiene will increase semen quality

Hygiene is fundamental to ensuring semen quality. The introduction of clearly defined hygiene protocols that maintain a focus on hygiene during collection will increase quality as well as shelf-life.

How to avoid contamination when collecting semen

As artificial insemination (AI) has become more of a standard practice, especially amongst modern farms working with as higher quality genetics as DanBred, the quality of the semen is of the highest importance to unlock of full genetic potential of the DanBred boars and meet production targets. Hygiene in particular is fundamental when reviewing semen quality- the introduction of a clearly defined hygiene protocol when working with on-farm boar collection will not only decrease the risk of contamination but will also increase shelf-life. This is vital to achieve the full value of the extraordinary potential for reproductive performance within the DanBred breeding animals.

The importance of hygiene during semen collection

When collecting semen, hygiene should be a focal point as bacterial contamination of semen doses can have a major influence on semen quality in relation to both shelf-life and semen fertility, consequently affecting farrowing rate (Romero, 2010).

Bacterial contamination of a semen dose can kill the sperm cells, but a high number of patho-genetic bacteria in a semen dose can also lead to a genital infection within the sows, causing reduced farrowing rate and subsequently increas-ing the herd sow replacement rate. Therefore, it is imperative to maintain a maximum level of sterile hygiene during collection to prevent con-tamination of the ejaculate. Review the on-farm protocols periodically to continuously improve and sustain semen quality (Weitze, 2008).

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Several important aspects should be considered when collecting semen.
Firstly, boar health: Ensure only semen from healthy boars is collected. Diseased boars may lead to a rapid transmission of pathogens and disease outbreaks, which is why the herd veterinarian should introduce a protocol health surveillance in the boar unit (Weitze, 2008).

Secondly, ensure the tasks of cleaning the pens, brushing the boars down and trimming the preputial hairs are carried out on a regular basis. Clean and dry the boars underside with a towel if needed. The preputial area should be always cleaned and the preputial sac should be emptied by carefully squeezing the preputial fluids from the prepuce before collection- this will reduce the risk of dirt and bacteria from the preputial area entering into the collection cup (Weitze, 2008).

Thirdly, use the double gloved method when collecting. Two commercially available gloves for semen collection are worn on top of each other, on the hand which is to be used when collecting. Be aware that using a non-approved glove for collection can impair semen quality.

Gently reach to the prepuce and help evacuate preputial fluids with the double gloved hand. The boar will start to thrust and extend the penis from the sheath. This is when the external vinyl glove can be removed. Once the penis is extended from the prepuce, the corkscrew-shaped penile tip can be held with the fingers applying uniform pressure. Ensure that the internal glove only touches the penis, any contact with the prepuce or anything else should be avoided (Weitze, 2008).

The penis should be held in a horizontal position, if extending the little finger, preputial liquids can be diverted away from the collection cup.

The ejaculate consists of 4 fractions:

- Pre-sperm,
- sperm,
- Post-sperm
- gelatinous (boar plug).

Do not collect the pre-sperm, a clear liquid which contain urine as well as many bacteria, but start collection when the sperm fraction comes, continuing until the ejaculation is complete, within typically 8-10 minutes (Weitze, 2008).

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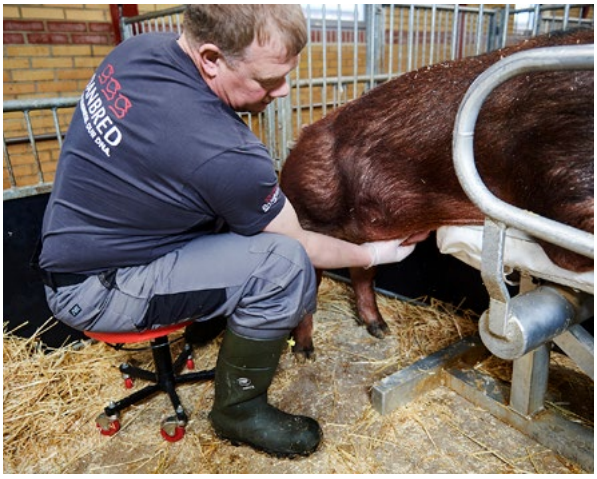

12 easy steps for improving hygiene during collection

1. Clean the pens and brush down the boars regularly.
2. Clean and dry the boars underside and trim the preputial hair.
3. Prepare the collection cup with a double layer of gauze as filter
4. Use the double gloved method – use commercial available gloves for semen collection.
5. Clean the preputial area and empty the preputial sac prior to collection.
6. Remove the external glove and ensure the internal glove only touches the penis.
7. Discard the first, clear ejaculate fraction.
8. Be patient and collect the until the boar plug is ejaculated (8-10 minutes).
9. Ensure the collection cup does not touch the floor or interior after collection.
10. Ensure efficient delivery of the ejaculate from boar unit to the laboratory entrance zone.
11. Dispose of rubber band and filter before decanting the semen to a sterile cup.
12. Never squeeze the filter gauze when decanting the semen dose.

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Collection – Achieve full potential of semen

How to achieve full potential when collecting semen

Proper preparation and sanitation are of the utmost importance when it comes to in the process of semen collection and an important for achieving the full value of DanBreds reproductive performance.

Achieve full potential when collecting semen

As artificial insemination (AI) has become more of a standard especially among modern farms working with high-quality genetics as DanBred. The quality of the semen is of the highest importance to unlock of the full genetic potential of DanBred boars while assuring the unprecedented reproductive results correlated with not only meeting production targets but greatly exceeding them. Proper preparation and sanitation is of the utmost importance and is one step in the process of improving overall on-farm boar production and performance and achieving the full value of the extraordinary reproductive performance within the DanBred breeding animals.

Preparation to assure quality and attain full potential

Organisation, planning and sanitation are key elements in the proper semen collection process and will help realise the full efficiency of a proper workflow by making all task quicker, safer and more hygienic as well as improving the production productivity.

Success can easily be obtained by following some simple but effective procedures before on-farm boar collection.

Reduce the risk of semen contamination, by ensuring only semen from healthy boars is collected. Diseased boars may lead to rapid transmission of pathogens and disease outbreaks, why the herd veterinarian should introduce a protocol health surveillance in the boar unit (Weitze, 2008).

Have the boars brushed down routinely and maybe even washed once in a while. The preputial

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area should be cleaned before collection and the hair preputial should be trimmed regularly. This will reduce the risk of dirt and bacteria from the preputial area entering into the collection cup (Weitze, 2008).

Ensure the pens are cleaned and the floors are dry, have good traction and proper drainage. This both ensures the safety of the boar when it jumps the dummy and the safety of the staff performing the collection, should an expected situation occur (DPRC, 2018).

An easy to adjust dummy which to regulated to fit the boar is vital. A washable cover in a soft washable material should be used. This is to protect the boars' sternum during collection, as this will be the main point of contact while the boar mount the dummy and almost the full weight of the boar is resting during collection (DPRC, 2018).

Use appropriate professional materials when collecting semen. Use disposable vinyl gloves as these have shown to have no effect on semen quality, use the double glove method with 2 gloves on top of each other to increase hygiene (Weitze, 2008).

On the day before collection all materials that are to be utilized should be prepared and stored in a sealed, clean area.

Prepare an insulated collection cup with a clean disposable plastic liner for collecting the ejaculate. It is an advantage to pre-warm the collection cup to around 38ºC before collection. This will ensure the sperm cells are not exposed to a damaging cold shock when the boar ejaculates. The collection cup should be insulated and if reused it should be possible to wash and sterilise it, between each collection.

Fit the collection cup with an airtight plastic bag and place a double layer filter over the container and plastic bag and secure with a rubber band. (Weitze, 2008).

Besides the essential equipment for collection, you might also need, an extra clean pair of vinyl gloves, a thermometer, a notepad and pen, wipes for cleaning and a trash bag for garbage. It can be convenient to make a collection "tool-box" which can follow you in the collecting area but always beware of hygiene and clean the tools between collections (DPRC, 2018).

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12 easy steps for preserving semen quality

1. Follow health surveillance protocol, ensure the boars are fit for the collection.
2. Clean the pens on a daily basis.
3. Ensure floors are dry, have good traction and proper drainage.
4. Brush down the boars regularly.
5. Trim the excess hair from the preputial opening.
6. Adjust the dummy to a proper height to fit the boars scheduled for collection.
7. Cover the dummy with a soft and washable material.
8. Fit the collection cup with a clean airtight disposable plastic liner.
9. Cover the collection cup with a double layer filter – secure with a rubber band.
10. Ensure the collection cup is pre-heated to around 38ºC before collection.
11. Wear 2 vinyl gloves on top of each other.
12. Prepare a clean tool-box with, extra clean vinyl gloves, a thermometer, a notepad and pen, wipes for cleaning and a trash bag for garbage.

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Piglet growth – Support colostrum supply

Why all piglets must have colostrum within the first 12 hours

Colostrum is essential for piglet health and growth. Ensuring sufficient colostrum intake during the first 12 hours after farrowing is achieved by a disciplined approach to day 1 care of the piglets.

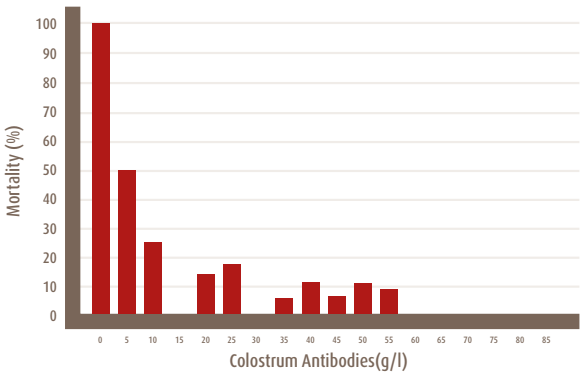
Adequate supply of colostrum will support health and growth

Success in managing hyper prolific DanBred sows is especially centred around the careful management of the new born piglets. Newborns are not protected by an active immune system, which means that their health relies on the passive immunity gained from colostrum, making colostrum essential for piglet health and growth. Ensuring sufficient colostrum intake during the first 12 hours after farrowing is achieved by optimising the DanBred sows' feed intake in late gestation for maximised milk production, as well as a disciplined approach to day 1 pig care in farrowing.

The importance of colostrum intake

Colostrum production starts when the first piglet is born and continues for 24 to 48 hours. Analysis of colostrum has shown that the amount and composition of antibodies in the colostrum slowly starts changing from around 12 hours after farrowing. Within the same time period, the piglet's ability to absorb the antibodies from the colostrum will start to decrease (Quesnel, 2012). This means that all piglets must have a sufficient amount colostrum within the first 12 hours after birth in order to get the full benefit in terms of health and growth. Additionally, the energy supply for activity and thermoregulation is also very limited in new born piglets, hence why colostrum intake is not only crucial for health it is also essential for the piglets to keep warm and be mobile right after birth (Thorup, 2013).

When managing hyper prolific sows, it is imperative to master skills such as split suckling and the correct management of foster sows in order to wean as many high-quality piglets as possible. Split suckling, where the smallest 8-10 piglets are allowed to suckle for 30 to 90 minutes, while the bigger piglets are kept in the creep or constrained in another way, has shown to increase survival with 0,4 piglet per litter (Thorup, 2013) Furthermore, the use of foster sows increases both daily gain among all the piglets as well as increasing survival rate among the smaller piglets (Thorup & Nielsen, 2017). In either case it is important to optimise the sows milk production throughout the lactation to maximise the number of piglets nursed by each sow.



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Easy steps for managing colostrum intake for optimal piglet health and growth

- Ensure all piglets get access to the udder quickly. Reducing the birth to nursing interval (BNI) is critical to survival.
- Ensure piglets are dried and warmed manually. Drying and warming pigs via towels or drying powder helps the pigs thermoregulation as well as and achieving optimal core body temperature levels.
- Ensure all piglets get at least 12 hours for colostrum intake preferably with their mother.
- Ensure the sow is healthy and in good body condition.

Split suckling

Enclose all the piglets within the creep area, behind a board or in a disinfected box, and make sure to provide them with heat (at least 34°C but not above 40°C).

Let the sow get up to eat and drink while all the piglets are enclosed.

- Split the litter into two groups – smaller piglets and bigger piglets.
- Keep the group of bigger, more viable piglets enclosed in a heated zone
- Allow the smaller piglets to suckle for 60-90 minutes
- Mark the start time at the litter card to keep track of time and ensure sufficient suckling time, and mark the pigs which has received colostrum
- Swap the groups over and let the bigger piglets get at least 30-45 minutes of suckling
- Mark the start time at the litter card to keep track of time and ensure sufficient suckling time
- Wash and disinfect the heat box before using it for another litter.

Hand feeding colostrum to piglets

If staff are able, cold or low vitality piglets can be provided with colostrum directly in the mouth from a cup or a disposable syringe. Milk the colostrum from a newly farrowed (within 4 hours) sow in the herd. This should preferably be the mother, but another newly farrowed sow from the herd can be used.

Heat colostrum to 30-35°C (not above 35°C) in a water bath or at low frequency in a microwave oven. Supply a 500 g piglet with 15 mL of colostrum 3 times, with an interval of at least one hour. Supply a 1 kg piglet 30 mL of colostrum 3 times, with an interval of at least one hour.

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- Colostrum milked from a sow, has a refrigerated shelf life of 3 days.
- Pack the milked colostrum in portion sizes.
- The colostrum is safe to freeze.
- Be aware of the temperature when thawing.

Foster sows

Foster sows or cross fostering should be used for surplus piglets from big litters.

Ensure all piglets have had colostrum for at least 12 hours before moving them to a foster sow. Remember, split suckling is a tool to effectively get all pigs on a teat and access to adequate colostrum during this initial 12 hours. If a foster sow is needed, choose a sow that is calm, in good health and body condition. 1st or 2nd parity sows are preferred as foster sows, as their teat size will likely match the small mouths of smaller piglets.

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Farrowing – Procedures for success

How to ensure a successful farrowing

Capturing the immense production potential of the DanBred sow relies on fundamentally sound and proven management practices.

Correct procedures ensure success at farrowing

The successful management of large litters from hyper prolific DanBred females is reliant on the careful day 1 management of piglets. Capturing the immense production potential of the DanBred sow depends on the implementation of fundamentally sound and proven management practices to ultimately wean and market high value animals.

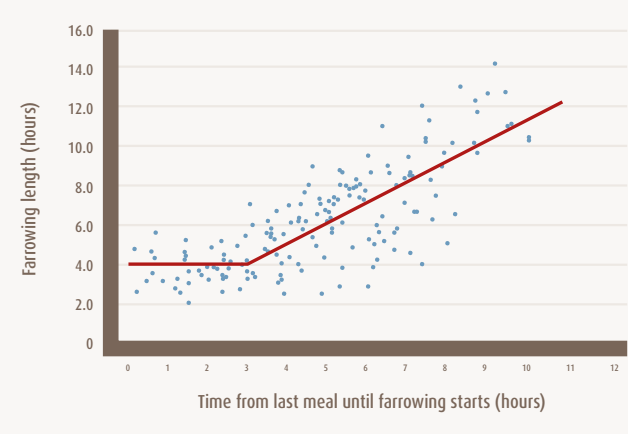
Successful management at the time of farrowing

Studies have established that several factors affect the success rate within the farrowing unit. The average farrowing time is 4-7 hours- this time span is not affected by litter size as big litters will be born with shorter intervals than small litters. The energy demand for producing a large litter is higher, therefore feeding in late gestation is critical with hyper prolific sows (DPRC, 2017).

The duration of farrowing has been shown to be closely linked to the sow's energy status. Low-energy status at the onset farrowing negatively affects the farrowing process (Theil et al., 2017). Furthermore, the duration of the farrowing is negatively correlated with the risk of piglet losses, as the sow does not eat during farrowing. Feeding 3 to 4 times a day when the sows enter the farrowing unit will help to improve energy status and increase the success rate of farrowing (Feyera, 2018). Because of these factors, being able to recognise the onset of farrowing and acting accordingly is of great importance.

The observation and recording of sows that are farrowing is important- in particular you should take note of the birth interval between each piglet, as this is a big indicator of how the process is going.

The birth interval between the first 4 piglets is 40 minutes (on average), and the first 4 piglets should be born within 2 hours. After the 4th piglet, the average birth interval decreases to around 20 minutes- the 5th piglet should then be born within the hour. (DPRC, 2017). If this is not the case, intervention should be considered.



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Monitored or attended farrowings has a tremendously positive effect on piglet survivability. DanBred highly recommends the observation of farrowing sows every 20 – 30 minutes. Farrowing assistance should begin if the birth interval exceeds 1 hour (Thorup et al., 2009).

Red eyes and underline and an increased breathing rate are all possible signs of a sow needing assistance.

As performing farrowing assistance (i.e. a manual examination) is an invasive procedure for the sow, hygiene and technique is of great importance.

The period following farrowing assistance is when the sow should be left to rest but kept under observation - it might necessary to repeat assistance (DPRC, 2017).

Important steps for the management of a successful farrowing

Prepare for farrowings when the sows has entered the farrowing unit. Be aware of hygiene in the pens and clean behind the sows regularly. Prepare the piglet area – include heat lamp/floor heating.

Early signs of farrowing

- Swelling of the vulva
- Restless sows
- Nest-building behaviour
- Milk expressed from teats

Once milk let-down in seen, expect farrowing to start within 12 hours

Check the farrowing sows

- At the onset of farrowing, sows should be checked every 20 – 30 minutes, or at least once an hour (at minimum) during a 24-hour period.
- Make note of the time of birth for each piglet
- The first 4 piglets should be delivered within 2 hours
- Following piglets should be delivered with an interval not exceeding 60 minutes

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Farrowing assistance

Signs of sows needing farrowing assistance include:

- Farrowing seems to have stopped
- Not passing a piglet within the above mentioned time span
- Red eyes and underline, and/or an increased breathing rate

Initiate farrowing assistance by following this procedure:

- Remove any equipment behind the sow to decrease the risk of work-related injuries
- Wash the sow with mild soap and rinse with plenty of clean water
- Put on a sterile glove, apply lubricant and pull up the glove sleeve
- Carefully introduce the arm by keeping the thumb and fingers together in a cone shape (note, fingernails should be short so as not to tear the sow):
  - If sow is lying on her right side use the right arm.
  - If on her left use the left arm.
- Grip the piglet around the hind legs or around neck or chin
- Pull the pig out in one even motion
- Make sure the pig's airway is clear – rub the piglet gently but with firm pressure
- Dry the piglet and place it next to the udder
- Help out all piglets that are within reach

After assistance

- Leave the sow and piglets to rest but continue observation until farrowing has finished (watch for the placenta to pass)
- If the farrowing has not re-initiated within an hour repeat farrowing assistance

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Weaning – The foundation for success

Rearing many high quality piglets

Successful rearing of many high quality piglets is highly related to the transition from a milk-based diet to a solid feed diet. Correct handling will maximise daily gain and piglet growth rates.

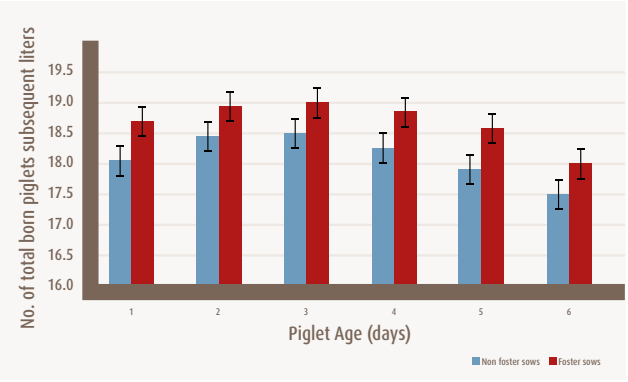
How to lay the foundation for successful weaning

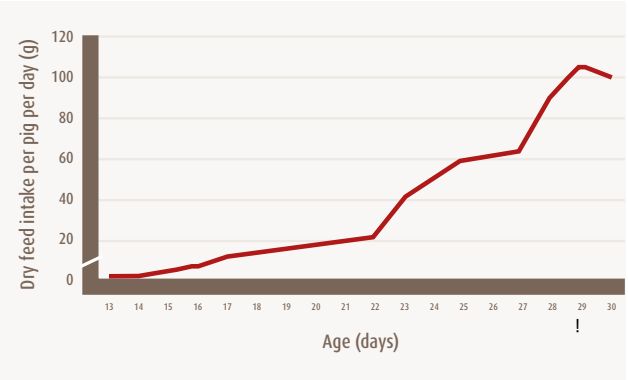
The successful rearing of many high quality piglets is highly related to the transition from a milk-based diet to a solid feed diet. Starting this transition in the farrowing unit will reduce the risk of post weaning growth lag as well as post-weaning diarrhoea while continuing to maximise daily gain and growth rates.

Increase success rate in the weaning section

Regardless of production type, weaning is a stressful event for pigs. Successfully managing the change from a liquid based diet to feeding solid food can significantly help to reduce this stress. Many pigs will undergo a post weaning growth lag (PWGL) in the 3-7 days after weaning. The use of creep feeding to start the change from milk to solid feed initiates a transformation in the digestive system of the pigs in order for them produce enzymes that digest the nutrients in solid feed (DPRC, 2010). Furthermore, creep feeding has been shown to increase weaning weight, average daily gain post weaning as well as reduce PWGL (Eastwood, 2018).

Offering creep feed to piglets from of 7-10 days will train the piglets to not only eat solid food but will also help stimulate their digestive enzymes. Feed intake will vary between the piglets but slowly increasing the feed allowance reaching ad lib feeding around the age of 3 weeks is the currently recommended strategy (DPRC, 2018).





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To ensure hygiene and to keep the piglets interested in the feed, always feed small amounts many times a day and ensure the troughs are clean and dry before feeding.

It is also good practice to have the pigs consume all the creep feed before the next feeding to assure hygiene and reduce the risk of diarrhoea (DPRC , 2018). To increase piglet feed intake, increase the number of feedings instead of increasing feed amount per feeding. Start by feeding twice a day and build up to feeding the piglets 4 to 5 times a day (DPRC, 2010).

Due to rapid growth rate, new born piglets require a higher amount of iron than the deposit they are born with or the amount which can be supplied from sow milk. Ideally piglets should receive a minimum of 200 mg iron within the first week to support daily gain as well as their immune system (DPRC, 2017).

Easy steps for increasing weaning transition success

Maximise creep feed intake in the farrowing unit

- Start creep feeding at the age of 7-10 days.
- Offer feed of high-quality and highly-digestible ingredients. Ideally the feed used in the farrowing unit is the same as the 1st stage feed after weaning.
- Feed small amounts frequently.
- Ensure good hygiene and keep feeders clean.
- Offer the feed when the sow is eating and the piglets are awake.
- Consider providing a liquid creep feed mix to promote early feed intake.

Feedings

When feeding, it is important that the pigs empty the trough within 20 to 30 minutes

- Age of 7-10 days = feeding 2 x / day
- Age 11 -20 = feeding 3 x / day
- Age 21 days+ = feeding 4-5 x / day

Water and hygiene

Reduce the risk of bacterial growth by rinsing the troughs after each feeding

- Water in the trough after each feeding can serve as extra drinking water

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Liquid creep feed mix

Starting the piglets on a liquid mix can help the transition from milk to starter feed as the liquid texture is similar to that of milk.

- Mix together 5 parts water, 1 part milk-replacer and 2 parts starter feed.
- Provide 1 litre of liquid mix per 10 pigs.
- The piglets must empty the trough in 20 to 30 minutes.

The liquid mix can be used in both the farrowing unit as well as after weaning.

Iron

Ensure optimum growth and health by the administration of a minimum 200 mg iron to each piglets.

- Administer iron within the first week of life.
- Administer iron orally or by injecting it into the neck or groin.
- If using drinking iron: check regularly for blockage or dripping valves.
- Administer extra iron by injection to pale, slow growing piglets.

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Large litters – Correct handling

How to set-up and manage foster sows for large litters

Success in managing hyper prolific DanBred sows is centered around piglet management. Knowing how to rear the extra piglets is essential to capture the full production potential of the DanBred female.

Correct handling of large litters for maximum performance

Success in managing hyper prolific DanBred genetics is reliant on the correct management of piglets and large litters. As a result of the successful development in litter size, knowing how to rear the additional pigs is necessary to capture the full production potential of the DanBred female.

Successful management of litter equalisation, where excess piglets from large litters are distributed among sows with smaller litters, is a critical management step. Nurse sows, where excess piglets from large litters are placed with a foster mother is essential to improve the number of full value weaned pigs.

Success when cross-fostering piglets

The correct management of litter equalisation and setup of nurse sows to raise additional piglets from hyper prolific sows will increase the number of weaned pigs per sow per year, increase growth rates and reduce weight variations among piglets.

Results have shown that the use of nurse sows will give a significant increase in average daily gain as well as weight at weaning (Thorup & Nielsen, 2017).

The fact that a sow has been fostering excess piglets from large litters does not affect the subsequent litter performance, on the contrary, results from nearly 80,000 farrowings where sows raising their piglets were compared to nurse sows

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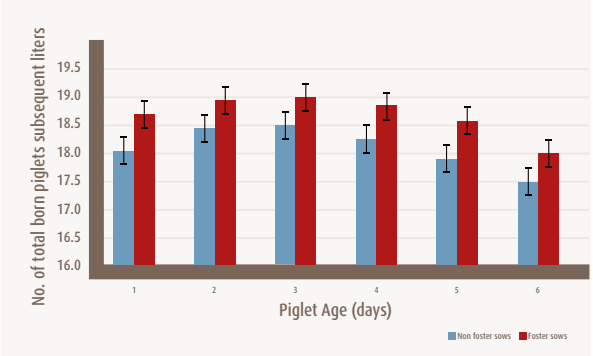
raising excess piglets from large litters, showed an increase of 0.57 total born piglets in subsequent litters of the nurse sows (Bruun et. al., 2015).

Furthermore, it has shown that nurse sows do not suffer from stress any more than other sows during lactation (Amdi et. al., 2017).

It is imperative for success with nurse sows to focus on the correct nurse sow selection- this important management strategy will help to ensure the maximization of quality weaned piglets.

A successful system is the 2-step-foster sow where the piglets from a sow 21 days into lactation are weaned (intermediate sow). This sow receives the full litter from a sow which farrowed 4-7 days ago (foster sow).

Newborn piglets from large litters are then placed with the foster sow. Piglet mortality with the 2-step sow was significantly lower and weight at weaning was significantly higher when comparing nurse sow systems in a Danish setup (Thorup & Sørensen, 2017).



When working with nurse sow systems it is important to focus on health and never move piglets if it can compromise the health- if in doubt consult the herd veterinarian.

Always choose sows in good body condition that is eating well, with healthy large piglets, as she must be able to tolerate the extended lactation period.

Easy steps for setting up successful cross-fostering

Successful management of litter equalisation and the correct nurse sow identification is essential to increase the number of weaned pigs from large litters in professional pig production systems. At entry into the farrowing unit, note the number of available and functional teats and make an overall evaluation of how many piglets each sow is expected to raise.

Colostrum

New-born piglets are not protected by an active immune system, which is why their health relies on the passive immunisation gained from colostrum. Before moving any piglet sufficient colostrum intake should be ensured.

- Ensure all new born piglets get to the udder
- Ensure all piglets get at least 12 hours for colostrum intake with their mother

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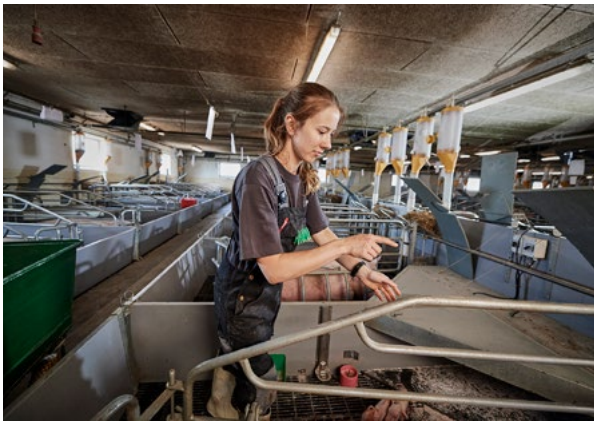
Split suckling

- Split the litter into two groups – smaller piglets and bigger piglets.
- Keep the group of bigger, viable piglets enclosed
- Allow the smaller piglets to suckle for 60-90 minutes
- Swap the groups over and let the bigger piglets get 30-45 minutes of suckling

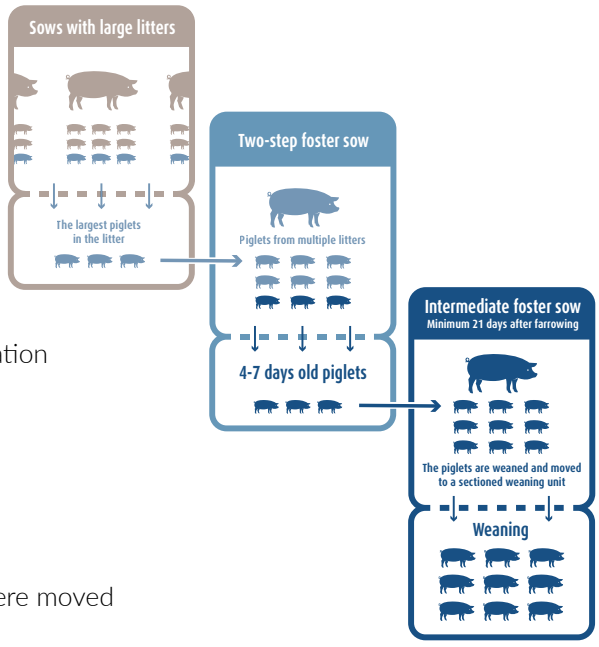


Litter equalisation

- Equalise the litters to the number of piglets the sow has been assessed to nurse
- Young sows must nurse at least the same number of piglets as the number of good active teats available (if capable, an additional piglet should be given)
- Move the bigger excess piglets and leave the smaller piglets with their mother
- Equalise the litters until 48 hours after farrowing, after which time piglets should not be moved unless absolutely necessary

Choosing the right nurse sow

- 1st or 2nd parity sow.
- Ideal body condition and optimum back fat thickness is 16-19 mm.
- Calm temperament
- Small active well placed teats and good onset of lactation
- Good strong piglets from her own litter
- Good appetite and feed intake



The 2-step-nurse sow

- Give the nurse sow the same number of piglets as were moved
- Separate the piglets from their new sow
- Give the sow a feed ration
- Release the piglets when the sow lays down
- Make sure all piglets get to the udder
- Reduce feed allowance of the nurse sow to 2 kg per day (this can be increased as the piglets grow)

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Nurse sow for smaller piglets

Using a sow for the smaller piglets can increase the average weight gain.

Setup in 3 steps:

1. A newly farrowed nurse sow receives smaller excess nurse-piglets from large litters.
2. The largest piglets from the newly farrowed nurse sows are moved to a sow 4-7 days into lactation.
3. The 4-7 days old piglets are moved to a sow which has just weaned piglets after 21 days of lactation.

Important factors to remember:

- The newly farrowed nurse sow should be a 1st, 2nd or 3rd parity sow.
- The nurse-piglets must have had colostrum for at least 12 hours before they are moved.
- The nurse sow must have small accessible teats and have show good milking abilities.

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Lactation – Supporting a high number of nursing piglets

How to correctly manage lactation feeding

DanBred breeding animals come with an extraordinary genetic potential for reproductive performance. Focused attention on management and feeding during lactation has been proven to support piglets.

Feeding for high milk yield to maximise the number of nursing piglets

DanBred breeding animals comes with an extraordinary genetic potential for reproductive performance. Focussed attention on management and feeding during lactation has proven been to support immediate piglet growth as well as improve lifetime productivity.

Correct feeding and water supply will increase productivity

Among one of the most important maternal breeding goals for the DanBred female is live piglets on day 5 or LP5. This breeding goal not only supports piglet liveability and viability but also the development of sow milking and rearing capacity.

Careful attention to water and feeding during lactation is vital to reach the full potential for maximising piglet growth.The greatest component in sow milk is water, and it is estimated a sow needs a water intake of approximately 25-35 litres per day when milk production peaks (generally 3 weeks into lactation) (DPRC, 2010; DPRC, 2013).

Increasing water intake by optimising water flow, quality, placement and type of drinkers will have a positive effect on piglet growth and total litter gain (Fraser & Phillips, 1989). To ensure the targeted water intake is reached by the sows, it is recommended to have a minimum flow rate of at least 2 litres per minute (which should be checked regularly).

Size	Amount of feed
< 1 mm	50%
1-2 mm	35%
2-3 mm	12%
> 3 mm	3%

Table 1: Recemented micron sizes for lactation feed

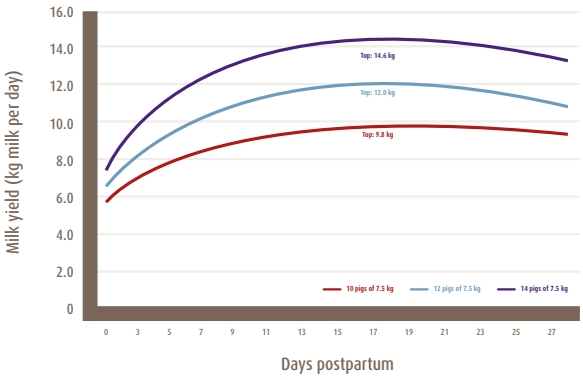

Figure 1. Estimated daily gain at litter sizes of 10, 12 and 14 piglets weaned at 28 days.

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Feeding throughout lactation must ensure that weight loss does not exceed 5 % of the total sow body weight in order to reach optimum wean-to-service interval in subsequent litters (Thaker & Bilkei, 2005). Maintaining average body condition throughout lactation will furthermore impact the number of eggs developed, maximising the size of the following litter (DPRC, 2013).

To increase lactation consumption, it is recommended to feed at least 3-4 times per day throughout the entire lactation period. Additionally, a coarse grinding of feed will help optimise stomach health (DPRC, 2013).

Milk yield is naturally increasing during early lactation, which why feed allowance should increase gradually with daily adjustments. The aim is to reach the maximum feed allowance by around day 16 when milk yield is starting to peak (DPRC, 2013).

Trials have shown a linear relationship between the number of piglets with the sow and milk yield. Larger number of piglets with the sow will give a stronger stimulation of the udder resulting in a greater milk yield and result in subsequent litter weight gain. This highlights the importance of letting as many piglets as possible nurse with each sow (Hansen et. al, 2016). Optimising the equipment to match both sow and litter size is highly recommended, as piglet gain is closely linked to the accessibility of the udder when the sow lays down (DPRC, 2013).

The optimal ambient temperature for sows in lactation is 15-20°C whereas the piglets need a temperature around 32-36°C. A compromise between the recommendations is therefore needed to optimise both the sow and piglets' needs.

Easy steps to feed lactating sows

The following recommendations will help achieve maximised litter gain and subsequent litter size.

- Adjust the feed ration individually on a daily basis.
- It is advisable that trained personnel assume the task of daily feed observation and adjustment.
- Empty any leftovers from the troughs before each feeding.
- Feed the sows at least 3 to 4 times a day.

When using 3 to 4 feedings per day, the following example could be used for feeding times:

- 00-08.00
- 00-12.00
- 00-16.00
- and/or 19.00-21.00

Feedings should be done with adequate time spacing in between, depending upon staffing availability and temperature.

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Daily feed adjustments for sows eating the full ration:
The feeding curve below is based on an energy concentration on 9.8 MJ NE/13.0 MJ ME /1,06 EW per kg feed, containing 8.3 g SID lysine per kg equivalent to 9.4 g total lysine per kg feed.

Gradually increase the feed allowance by 8-10 % per day for sows with good appetite.

Feed curve for sows with an average body condition score		
Days post farrowing	**Minimum feed allowance (kg per day)**	**Aim for feed allowance (kg per day)**
0	2.9	2.9
2	3.3	3.7
7	4.7	6.0
14	7.0	8.5
16	7.5	9.0
18	8.0	9.0
21	8.0	9.0
28	8.0	9.0
35	8.0	9.0

Table 2: Recommended feed curve for lactating sows with an average body condition.

Maximum feed allowance

- Maximum feed allowance should be reached by day 16 of lactation.
- Feed 2.4 – 2.9 kg for maintenance and add 0.47 kg per piglet (maximum).
- Sows feeding 14 piglets should be fed around 9.3 kg per day at their maximum milk yield. Gilts should be fed 8 kg a day but increase feed allowance if nursing above 12 piglets.

Body condition	Thin/Skinny	Average	Fat	Gilts
feed allowance (Kg per day)	up to 10.5	9.0	8.0	8.0

Table 3: Recommended feed based on body condition.

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Water for lactating sows:

- Check the water nipples or drinkers regularly, making make sure the water flow is meeting the recommendations.
- Recommended water flow is at least https://danbred-knowledge.com/wp-content/uploads/2019/08/DSC_7417.jpg 4 litres a minute when 20% of the sows are using the nipples/drinkers.
- Lactating sows need 25-35 litres a day, but this is dependant on the number of piglets she is nursing.

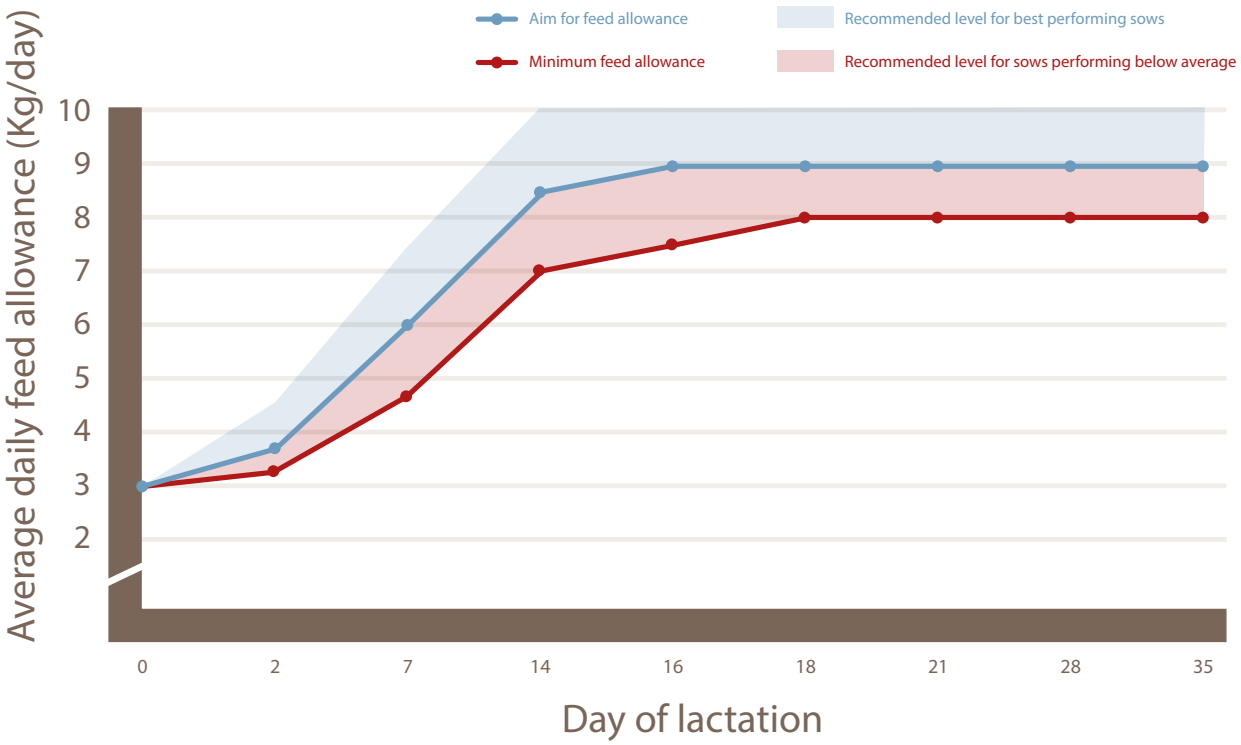

Figure 2: minimum feed allowance as well as the aim regarding feed allowance. Sows in good condition with many piglets should be fed levels of feed beyond the level of the blue line. Remaining sows should be fed a level in between the blue and grey line.

References

Danish Pig Research Centre (DPRC) (2010): Grisenes vandbehov. SEGES Videncenter for Svineproduktion. Retrieved 16/02/19 https://svineproduktion.dk/Viden/I-stalden/Foder/Vand/Vandbehov

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DanBred Knowledge Hub

3. Feeding

- Weaning – the foundation for success
- Lactation – supporting a high number of nursing piglets
- Gestation – keeping body condition in focus
- Gilt feeding – restricted phase feeding
- Gilt feeding – ad libitum feeding

Weaning – The foundation for success

Rearing many high quality piglets

Successful rearing of many high quality piglets is highly related to the transition from a milk-based diet to a solid feed diet. Correct handling will maximise daily gain and piglet growth rates.

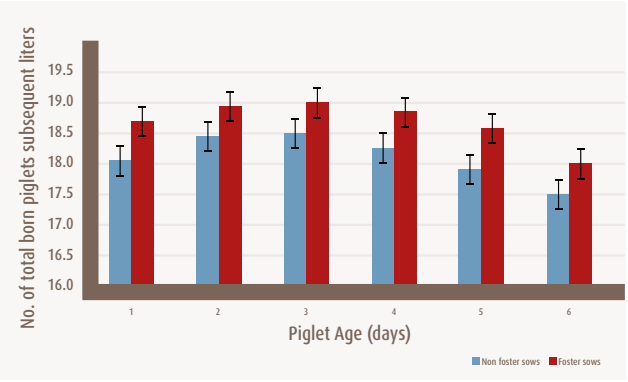
How to lay the foundation for successful weaning

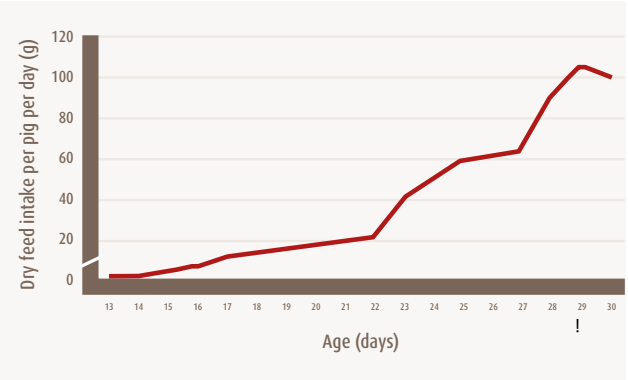
The successful rearing of many high quality piglets is highly related to the transition from a milk-based diet to a solid feed diet. Starting this transition in the farrowing unit will reduce the risk of post weaning growth lag as well as post-weaning diarrhoea while continuing to maximise daily gain and growth rates.

Increase success rate in the weaning section

Regardless of production type, weaning is a stressful event for pigs. Successfully managing the change from a liquid based diet to feeding solid food can significantly help to reduce this stress. Many pigs will undergo a post weaning growth lag (PWGL) in the 3-7 days after weaning. The use of creep feeding to start the change from milk to solid feed initiates a transformation in the digestive system of the pigs in order for them produce enzymes that digest the nutrients in solid feed (DPRC, 2010). Furthermore, creep feeding has been shown to increase weaning weight, average daily gain post weaning as well as reduce PWGL (Eastwood, 2018).

Offering creep feed to piglets from of 7-10 days will train the piglets to not only eat solid food but will also help stimulate their digestive enzymes. Feed intake will vary between the piglets but slowly increasing the feed allowance reaching ad lib feeding around the age of 3 weeks is the currently recommended strategy (DPRC, 2018).





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To ensure hygiene and to keep the piglets interested in the feed, always feed small amounts many times a day and ensure the troughs are clean and dry before feeding.

It is also good practice to have the pigs consume all the creep feed before the next feeding to assure hygiene and reduce the risk of diarrhoea (DPRC , 2018). To increase piglet feed intake, increase the number of feedings instead of increasing feed amount per feeding. Start by feeding twice a day and build up to feeding the piglets 4 to 5 times a day (DPRC, 2010).

Due to rapid growth rate, new born piglets require a higher amount of iron than the deposit they are born with or the amount which can be supplied from sow milk. Ideally piglets should receive a minimum of 200 mg iron within the first week to support daily gain as well as their immune system (DPRC, 2017).

Easy steps for increasing weaning transition success

Maximise creep feed intake in the farrowing unit

- Start creep feeding at the age of 7-10 days.
- Offer feed of high-quality and highly-digestible ingredients. Ideally the feed used in the farrowing unit is the same as the 1st stage feed after weaning.
- Feed small amounts frequently.
- Ensure good hygiene and keep feeders clean.
- Offer the feed when the sow is eating and the piglets are awake.
- Consider providing a liquid creep feed mix to promote early feed intake.

Feedings

When feeding, it is important that the pigs empty the trough within 20 to 30 minutes

- Age of 7-10 days = feeding 2 x / day
- Age 11 -20 = feeding 3 x / day
- Age 21 days+ = feeding 4-5 x / day

Water and hygiene

Reduce the risk of bacterial growth by rinsing the troughs after each feeding

- Water in the trough after each feeding can serve as extra drinking water

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Liquid creep feed mix

Starting the piglets on a liquid mix can help the transition from milk to starter feed as the liquid texture is similar to that of milk.

- Mix together 5 parts water, 1 part milk-replacer and 2 parts starter feed.
- Provide 1 litre of liquid mix per 10 pigs.
- The piglets must empty the trough in 20 to 30 minutes.

The liquid mix can be used in both the farrowing unit as well as after weaning.

Iron

Ensure optimum growth and health by the administration of a minimum 200 mg iron to each piglets.

- Administer iron within the first week of life.
- Administer iron orally or by injecting it into the neck or groin.
- If using drinking iron: check regularly for blockage or dripping valves.
- Administer extra iron by injection to pale, slow growing piglets.

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Lactation – Supporting a high number of nursing piglets

How to correctly manage lactation feeding

DanBred breeding animals come with an extraordinary genetic potential for reproductive performance. Focused attention on management and feeding during lactation has been proven to support piglets.

Feeding for high milk yield to maximise the number of nursing piglets

DanBred breeding animals comes with an extraordinary genetic potential for reproductive performance. Focussed attention on management and feeding during lactation has proven been to support immediate piglet growth as well as improve lifetime productivity.

Correct feeding and water supply will increase productivity

Among one of the most important maternal breeding goals for the DanBred female is live piglets on day 5 or LP5. This breeding goal not only supports piglet liveability and viability but also the development of sow milking and rearing capacity.

Careful attention to water and feeding during lactation is vital to reach the full potential for maximising piglet growth.The greatest component in sow milk is water, and it is estimated a sow needs a water intake of approximately 25-35 litres per day when milk production peaks (generally 3 weeks into lactation) (DPRC, 2010; DPRC, 2013).

Increasing water intake by optimising water flow, quality, placement and type of drinkers will have a positive effect on piglet growth and total litter gain (Fraser & Phillips, 1989). To ensure the targeted water intake is reached by the sows, it is recommended to have a minimum flow rate of at least 2 litres per minute (which should be checked regularly).

Size	Amount of feed
< 1 mm	50%
1-2 mm	35%
2-3 mm	12%
> 3 mm	3%

Table 1: Recemented micron sizes for lactation feed

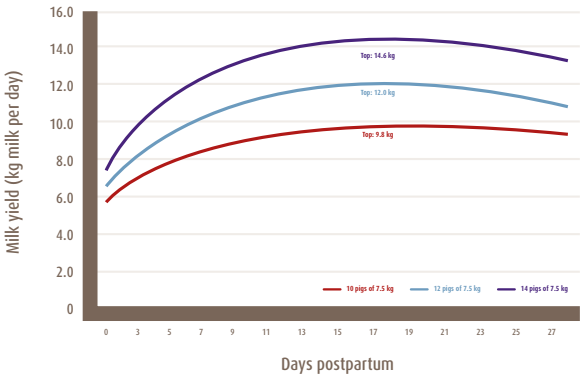

Figure 1. Estimated daily gain at litter sizes of 10, 12 and 14 piglets weaned at 28 days.

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Feeding throughout lactation must ensure that weight loss does not exceed 5 % of the total sow body weight in order to reach optimum wean-to-service interval in subsequent litters (Thaker & Bilkei, 2005). Maintaining average body condition throughout lactation will furthermore impact the number of eggs developed, maximising the size of the following litter (DPRC, 2013).

To increase lactation consumption, it is recommended to feed at least 3-4 times per day throughout the entire lactation period. Additionally, a coarse grinding of feed will help optimise stomach health (DPRC, 2013).

Milk yield is naturally increasing during early lactation, which why feed allowance should increase gradually with daily adjustments. The aim is to reach the maximum feed allowance by around day 16 when milk yield is starting to peak (DPRC, 2013).

Trials have shown a linear relationship between the number of piglets with the sow and milk yield. Larger number of piglets with the sow will give a stronger stimulation of the udder resulting in a greater milk yield and result in subsequent litter weight gain. This highlights the importance of letting as many piglets as possible nurse with each sow (Hansen et. al, 2016). Optimising the equipment to match both sow and litter size is highly recommended, as piglet gain is closely linked to the accessibility of the udder when the sow lays down (DPRC, 2013).

The optimal ambient temperature for sows in lactation is 15-20°C whereas the piglets need a temperature around 32-36°C. A compromise between the recommendations is therefore needed to optimise both the sow and piglets' needs.

Easy steps to feed lactating sows

The following recommendations will help achieve maximised litter gain and subsequent litter size.

- Adjust the feed ration individually on a daily basis.
- It is advisable that trained personnel assume the task of daily feed observation and adjustment.
- Empty any leftovers from the troughs before each feeding.
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When using 3 to 4 feedings per day, the following example could be used for feeding times:

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Feedings should be done with adequate time spacing in between, depending upon staffing availability and temperature.

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Daily feed adjustments for sows eating the full ration:
The feeding curve below is based on an energy concentration on 9.8 MJ NE/13.0 MJ ME /1,06 EW per kg feed, containing 8.3 g SID lysine per kg equivalent to 9.4 g total lysine per kg feed.

Gradually increase the feed allowance by 8-10 % per day for sows with good appetite.

Feed curve for sows with an average body condition score		
Days post farrowing	**Minimum feed allowance (kg per day)**	**Aim for feed allowance (kg per day)**
0	2.9	2.9
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18	8.0	9.0
21	8.0	9.0
28	8.0	9.0
35	8.0	9.0

Table 2: Recommended feed curve for lactating sows with an average body condition.

Maximum feed allowance

- Maximum feed allowance should be reached by day 16 of lactation.
- Feed 2.4 – 2.9 kg for maintenance and add 0.47 kg per piglet (maximum).
- Sows feeding 14 piglets should be fed around 9.3 kg per day at their maximum milk yield. Gilts should be fed 8 kg a day but increase feed allowance if nursing above 12 piglets.

Body condition	Thin/Skinny	Average	Fat	Gilts
feed allowance (Kg per day)	up to 10.5	9.0	8.0	8.0

Table 3: Recommended feed based on body condition.

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Water for lactating sows:

- Check the water nipples or drinkers regularly, making make sure the water flow is meeting the recommendations.
- Recommended water flow is at least https://danbred-knowledge.com/wp-content/uploads/2019/08/DSC_7417.jpg 4 litres a minute when 20% of the sows are using the nipples/drinkers.
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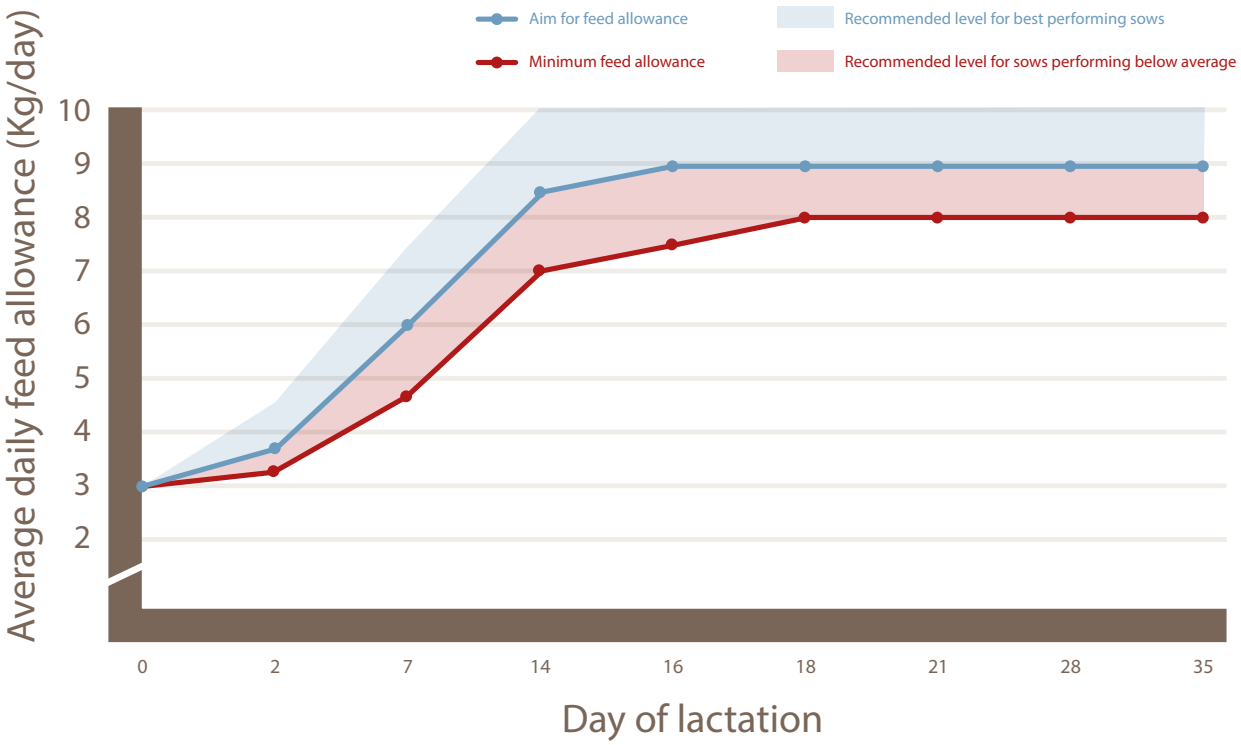

Figure 2: minimum feed allowance as well as the aim regarding feed allowance. Sows in good condition with many piglets should be fed levels of feed beyond the level of the blue line. Remaining sows should be fed a level in between the blue and grey line.

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Gestation – Keeping body condition in focus

How to ensure balanced gestation feeding

Focusing on body condition throughout the gestation period has shown to be highly correlated to success in the farrowing unit and subsequent lifetime reproductive productivity.

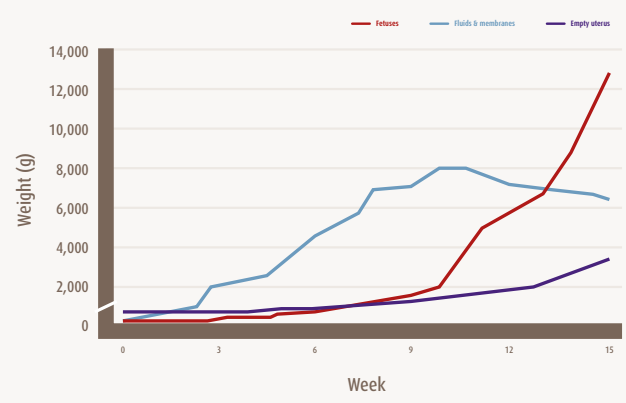
Optimise production by focusing on body condition throughout gestation

DanBred breeding animals come with an extraordinary genetic potential for reproductive performance. Focusing on body condition throughout the gestation period has shown to be highly correlated to success in the farrowing unit and subsequent lifetime reproductive productivity.

Enhance performance at farrowing

Feeding during gestation serve 3 purposes:

- Successful conception and embryo implantation
- Ideal body condition for the lactation period
- Optimum uterine and maternal growth



The vast part of gestation feeding should be focused on restoring body condition from the previous lactation to ensure optimum lifetime productivity. The last 4 weeks of gestation feeding should be changed for optimised piglet birth weight as well as building and maintaining optimal body condition towards gestation (Van Heugten). Feeding sows according to body condition either individually or in groups by body condition will enhance performance at farrowing and optimise overall feed consumption (DPRC, 2013). It has been shown that feeding according to body condition and optimum back fat thickness (BFT) will significantly increase the number of live born piglets, optimise milk production and also reduces the risk of developing shoulder ulcers during lactation (Sørensen, 2010).

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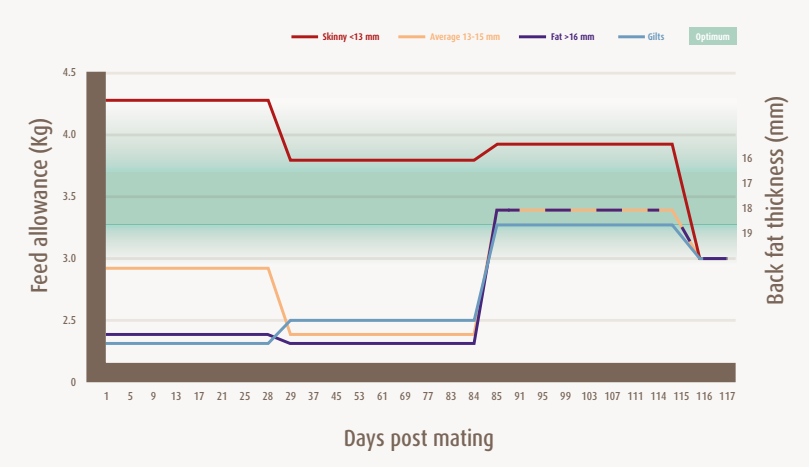
The recommended approach for feeding of DanBred breeding animals during gestation is to set 4 different feeding curves:

- Thin sows (BFT < 16 mm)
- Average sows (BFT 16-19 mm)
- Fat sows (BFT >19 mm)
- Gilts



Each feed curve will ensure optimised nutritional balance in relation to the BFT as well as the time in gestation. By following DanBred's ideal standards, the diet should keep an energy density of 9.5 MJ NE/12.5 MJ ME/1.05 EW and around 4.12 g Standardized Ileal Digestible (SID) per kg feed. The standards are based on the conditions in a temperate climate, however. temperature and humidity can have a big influence on feed consumption and should always be taken into consideration when formulating gestation feed. Feeding the full ration once per day will keep the sows full for longer and help to ensure a balanced behaviour among the sows (DPRC, 2013). Body condition and optimum BFT should remain in focus throughout gestation as this has a significant impact on the number of live born piglets as well as the base for optimised milk production.

Easy steps to reach the optimum weight at farrowing

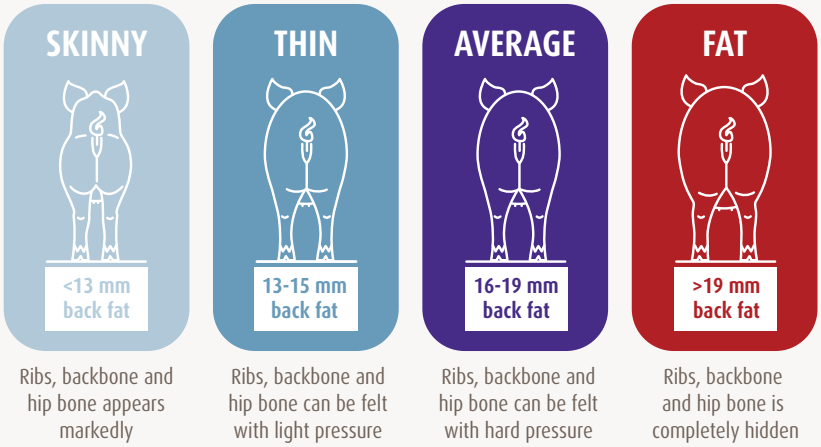
Group the sows according to their body condition and follow their development throughout gestation.

At the time of farrowing the sows should have an average body condition with a BFT of 16-19 mm.

Follow and evaluate each sow to ensure correct adjustment of the feeding curve during gestation.

Evaluate at:

- Mating
- Post Pregnancy Detection
- 70 Days of Gestation
- 112 Days of Gestation



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Recommended principles for feeding in gestation unit

The ideal diet should keep an energy density of 9.5 MJ NE/12.5 MJ ME/1.05 EW and around 4.12 g Standardized Ileal Digestible (SID) per kg feed.

After mating, it is recommended to keep a focus on the body condition of the sows, in particular the gilts in the first 4 weeks after mating where smaller gilts should be fed 2.2 kg/day, and bigger gilts should be fed 2.4 kg/day.

Guideline feed allowance based on body condition score and BFT at mating (kg/day)				
Days post mating	**Fat > 19 mm**	**Average 16-19 mm**	**Skinny < 13 mm**	**Gilts**
1-28	2.4	2.9	3.9	2.2 – 2.4
29-84	2.3	2.5	3.7	2.4 – 2.6
85-114	3.4	3.4	3.9	3.3
115-116	2.9	2.9	2.9	2.9

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Gilt feeding – Restricted phase feeding

How to maximize lifetime productivity

Gilts represent the future production of sow herds and DanBred gilts come with an extraordinary genetic potential for reproductive performance.

Optimum feeding of gilts using restricted phase feeding

Gilts represent the future production of sow herds and DanBred gilts come with an extraordinary genetic potential for reproductive performance. Careful attention when feeding the DanBred gilt will be rewarded in the farrowing unit and set a prime starting point on the road to release the genetic potential for consistently high lifetime productivity.

The ideal feed curve for DanBred gilts will ensure a balance of the feed amount in relation to the age and weight of the gilts as shown in figure 1 (to the left).

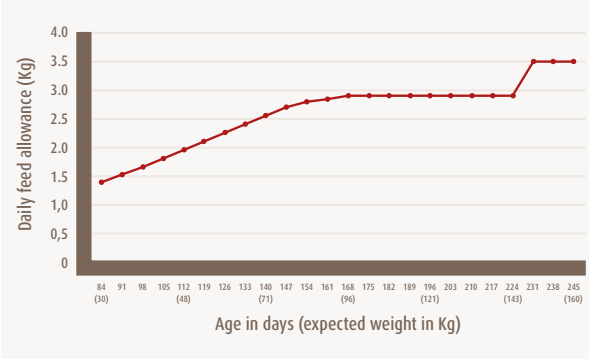
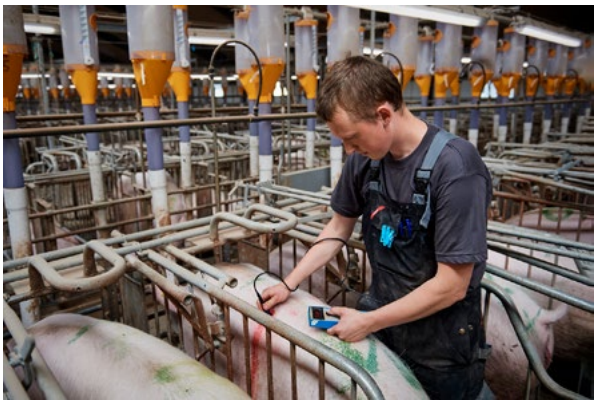


Figure 1 Following the above feed curve will ensure an ideal balance of the feed amount in relation to age and weight.

The huge potential for growth in the DanBred animals means that there must be a focus to limit growth rate in the DanBred gilts, which is why the feed energy level is a very important factor when working with DanBred gilts.

The optimum lifetime production for DanBred gilts is reached when the gilt is mated for the first time in the second heat, at the age of 230-250 days weighing between 130-155 kg with a backfat thickness of 12-15mm at the P2 measuring point (2).



Find P2 about 7 cm from the backbone. When measured in a straight line from the tip of the last up towards the backbone.

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Moderation of gilt growth

The feeding strategy for DanBred gilts is set to meet their nutrient requirements as well as maximise their long-term productivity.

A daily gain of 750-800 g/day from 30 kg to 140 kg will lead to the best possible basis for long-term reproduction productivity in DanBred gilts [2].

Feeding of DanBred gilts should ensure a steady, continuous but controlled weight gain throughout the period of growth. Expected weight development from following the DanBred recommendations is shown in figure 2.

The target is to initiate puberty and the onset of the oestrus cycle, support the pre-pubertal mammary development and maximise the productivity on litter size and longevity.

Studies indicate that the age of the gilt, as well as the correct introduction of boar contact, are the main factors when it comes to the onset of puberty [2][3].

The amount of body fat in the gilts might help the onset of puberty in gilts [1]. In a 2004 trial Vestergaard et. al. found that 50 to 60 % of sows were culled due to leg problems.

Age, Days (weeks)	Weight, Kg	ADG, (g/day)
28 (4)	7	250
56 (8)	17	430
70 (10)	25	430
84 (12)	30	500
112 (16)	48	500
140 (20)	71	500
168 (24)	96	570
196 (28)	121	615
224 (32)	143	640
245 (35)	160	650
From 84 to 245 days	135	770

Table 1: Optimum ADG from weaning to first mating.

The moderated growth rate for replacement gilts has shown to positively correlate with sow longevity, as the managed growth rate has a positive effect on bone growth - giving the gilts stronger legs and thereby increasing longevity in breeding animals [5].

Moderating growth and increasing fat deposits through feeding will give lighter but slightly fatter gilts at the age of first mating. As the body fat content can play a role in the onset of puberty, it is important to ensure a back fat target of 15 mm (at least 12 mm) at the first mating [4].

Mammary development in the replacement gilts is not affected by the more linear growth curve, as the vast part udder growth happens in the last third of gestation [2].

The size of first litter might be marginally decreased with a steady growth rate, but flushing the gilts before mating has proven to be a very efficient way of increasing the ovulation rate at mating in the second oestrus and thereby enlarge the litter size [1].

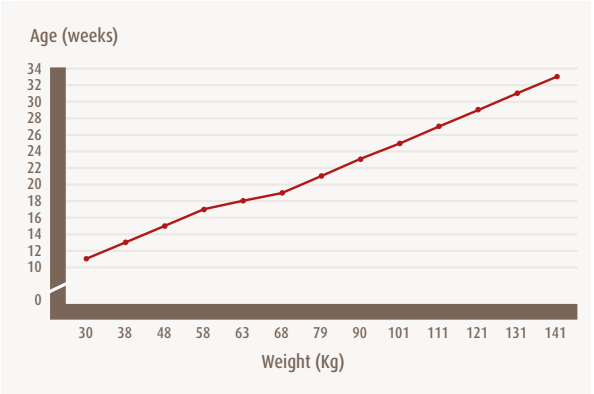

Figure 2 Feed to ensure balanced steady growth

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Easy gilt feeding strategies to reach optimum DanBred reproductivity targets

To reach the full potential of DanBred gilts, the following targets should be met at first mating:

- Age: 230-250 days (32-35 weeks)
- Weight: 130-155 kg
- 12-15 mm back fat at the P2 measuring point.
- First mating on the 2nd heat
- Start boar exposure daily at the age of 200 days (28 weeks)

To efficiently control daily gain, the DanBred gilts must be fed diets containing less crude protein and lysine than finisher pigs. Restricted phase feeding with three different diets from 30 to 140 kg is recommended.

The feeding curve (figure 1) shows phase feeding based on feed with a content of 9.5 MJ NE/12.5 MJ ME/1.05 EW per kg of feed.

At a weight of 110 kg, the diet should be changed to promote the deposit of back fat. Energy density should be kept but Standardized Ileal Digestible (SID) lysine should be reduced, and the gilts should be fed based on body condition.

The table below shows the recommended content of selected nutrients per kg feed, when using restricted phase feeding or using a single diet from 30 to 110 kg followed by a diet formulated to weaned/dry sows.

Restricted feeding	Diet phase 1	Diet phase 2	Diet phase 3	Single diet
Weight	30-65 kg	65-110 kg	Gilts >110 kg[1]	Gilts 30-110 kg
Energy density per kg feed	9.7 MJ NE/ 12.6 MJ ME/ 1.06 EW	9.5 MJ NE/ 12.5 MJ ME/ 1.05 EW	9.5 MJ NE/ 12.5 MJ ME/ 1.05 EW	9.5 MJ NE/ 12.5 MJ ME/ 1.05 EW
SID Lysine per kg feed (g)	8.2	5.3	4.2	6.3
Total lysin per kg feed (g)	9.4	6.5	5.2	7.4
Minimum SID crude protein per kg (g)	125	100	95	105
Phosphorous per kg (g)	5.8	4.6	4.2	4.9
Digestible phosphorus per kg (g)	3.2	2.4	2.1	2.6
Calcium per kg (g)	7.8	6.8	6.8	7.2

[1]*This is also recommended for the mating unit.*

**NE = Net energy,; ME = Metabolic Energy; EW= Net Energy in Dutch evaluation system*

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[1] Beltranena, E., Aherne, F. X., Foxcroft, G. R. og Kirkwood, R. N. (1991): Effects of pre- and postpubertal feeding on production traits at first and second estrus in gilts. Journal of Animal Science. 69: 886-893.

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Gilt feeding – Ad libitum feeding

How to maximize lifetime productivity

Careful attention to the feeding of the DanBred gilt will be rewarded in the farrowing unit- setting a prime starting point on the road to release their genetic capability.

Optimum feeding of gilts by ad libitum feeding

Gilts represent the future production of the sow herd, and DanBred gilts come with an extraordinary genetic potential for reproductive performance.

Careful attention to the feeding of the DanBred gilt will be rewarded in the farrowing unit- setting a prime starting point on the road to release the genetic capability for optimum lifetime performance.

The recommended feed curve will ensure a balance of the feed amount in relation to the age and weight of the gilts as shown in figure 1 (on the left).

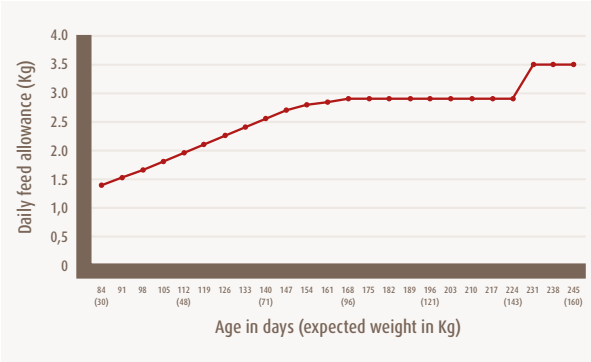

Figure 1 Feed curve ensuring ensure a balance of the feed amount in relation to age and weight.

The huge potential for growth in the DanBred animals means that there must be a focus to limit growth rate in the DanBred gilts, which is why the feed energy level is a very important factor when working with DanBred gilts.

Find P2 about 7 cm from the backbone. When measured in a straight line from the tip of the last up towards the backbone

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Moderation of gilt growth

The feeding strategy for DanBred gilts is set to meet nutrient requirements as well as maximisation of long-term productivity.

A daily gain of 750-800 g/day from 30 kg to 140 kg will lead to the best possible basis for long-term reproduction productivity in DanBred gilts [2].

Feeding of DanBred gilts should ensure a steady continuous but controlled weight gain throughout the period of growth. Expected weight development from following the DanBred recommendations is shown in figure 2.

The target is to initiate puberty and the onset of the oestrus cycle, support the pre-pubertal mammary development and maximise the productivity on litter size and longevity.

Studies indicate that the age of the gilt, as well as the correct introduction of boar contact, is the main factors when it comes to the onset of puberty [2][3].

The amount of body fat in the gilts might help the onset of puberty in gilts [1].

The managed growth rate for replacement gilts has shown to positively correlate with sow longevity because the moderated growth rate has a positive effect on bone growth giving the gilts stronger legs and thereby increase longevity in breeding animals [5].

In a 2004 trial Vestergaard et. al. found that 50 to 60 % of sows were culled due to leg problems and this can be related to unmanaged growth rates during gilt development. Managing growth and increasing fat deposit through feeding will give lighter but slightly fatter gilts at the age of first mating.

Age, Days (weeks)	Weight, Kg	ADG, (g/day)
28 (4)	7	250
56 (8)	17	430
70 (10)	25	430
84 (12)	30	500
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Table 1: Optimum ADG from weaning to first mating.

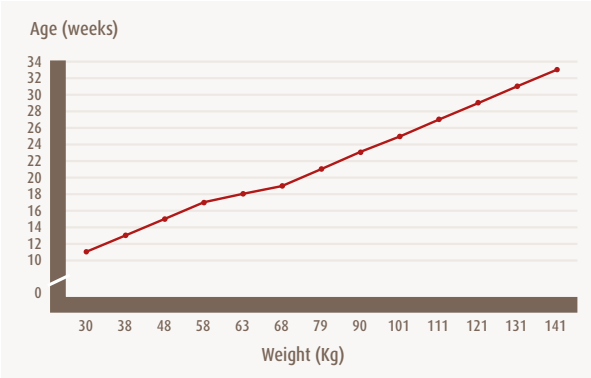

Figure 2 Feed to ensure balanced steady growth

Gilt body fat content can play a role in the onset of puberty, therefore, it is important to ensure a back fat target of 15 mm and of at least 12 mm at first mating [4].

Mammary development in the replacement gilts is not affected by the more linear growth curve, as the vast part udder growth happens in the last third of gestation [2].

Size of first litter might be marginally decreased at steady growth rate, but flushing the gilts before mating has proven to be a very efficient way of increasing the ovulation rate at mating in the second oestrus and thereby enlarge the litter size [1].

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Easy gilt feeding to reach optimum DanBred reproductivity targets

To exploit the full potential of DanBred gilts the following targets should be met at first mating:

- Age: 230-250 days (32-35 weeks)
- Weight: 130-155 kg
- 12-15 mm back fat at the P2 measuring point.
- First mating on the 2nd heat

Start boar exposure daily at the age of 200 days (28 weeks).

To efficiently control daily gain, the DanBred gilts must be fed diets containing less crude protein and lysine than finisher pigs. Restricted phase feeding with three different diets from 30 to 140 kg is recommended as shown in figure 1.

If ad libitum feeding is the only possibility, the daily gain should be controlled as ad libitum increase the risk of daily gain exceeding the recommendation.

From 30-110 kg keep the energy density between 9.2-9.5 MJ NE/12.0-12.5 MJ ME/0.97-1.00 EW per kg feed and feed increased amounts of fibre. Additionally, follow the lysine and protein recommendations shown below.

At a weight of 110 kg, the diet should be changed to promote the deposit of back fat. Energy density should be kept but Standardized Ileal Digestible (SID) lysine should be reduced and the gilts should be fed based on body condition to ensure a growth rate within the desired level.

The table to the right shows the recommended content of selected nutrients per kg feed when using ad libitum feeding for gilts from 30-110 kg and for gilts above 110 kg, respectively.

Ad libitum feeding	Diet 1	Diet 2
Weight	30-110 kg	>110 kg
Energy density per kg feed	9.2-9.5 MJ NE/ 12.0-12.5 MJ ME/ 0.97-1.00 EW	8.7-9.2 MJ NE/ 11.5-12.0 MJ ME/ 0.90-1.00 EW
SID Lysine per kg feed (g)	5.8	4.0
Total lysin per kg feed (g)	6.8	4.9
Minimum SID crude protein per kg (g)	102	90
Phosphorous per kg (g)	4.7	4.0
Digestible phosphorus per kg (g)	2.5	2.0
Calcium per kg (g)	6.9	6.5

**NE = Net energy,; ME = Metabolic Energy; EW= Net Energy in Dutch evaluation system*

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[1] Beltranena, E., Aherne, F. X., Foxcroft, G. R. og Kirkwood, R. N. (1991): Effects of pre- and postpubertal feeding on production traits at first and second estrus in gilts. Journal of Animal Science. 69: 886-893.

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DanBred Knowledge Hub

4. Management

- Cleaning practice – secure semen quality
- Piglet growth – support colostrum supply
- Mating – reach reproductive success
- Large litters – correct handling
- Heat management observations – increase productivity
- Quality assurance of high value breeding stock
- Pregnancy testing – worth the effort

Cleaning practice – secure semen quality

Correct cleaning practice will preserve semen quality

Cleaning and disinfection are a corner stone in semen quality - focusing on correct cleaning practice is imperative to preserving the high quality and shelf life of DanBred semen.

How to finish a successful day of collection

Quality of semen is of the highest importance to unlock of full genetic potential that DanBred offers. Hygiene in particular is fundamental, and the introduction of a clearly defined hygiene protocol focusing on cleaning procedures at the end of the working day will greatly influence how the next day will start, work flow, efficiency and ultimately the quality of the semen. This is vital to achieve the full value of the extraordinary potential for reproductive performance within the DanBred breeding animals.

To assure the genetic potential of the DanBred boar is achieved on a daily basis, it it imperative to focus on key areas associated with the end of day tasks, so that the targets of increased quality and reduced risk of semen contamination are met.

Maintain quality by cleaning the laboratory and collection area daily

It is a must for a well run on farm boar stud producing high quality semen that all equipment and tools that might come into direct or indirect contact with semen is cleaned, disinfected and/or sterilised at the end of the day of collection. Reducing the risk of bacterial contamination within the semen is desirable in order to maintain the superior fertility.

Cleaning and disinfection are integral to maintaining semen quality, and focusing on correct cleaning practice is imperative to preserve the high quality and shelf life of the DanBred semen.

It is important to properly clean and disinfect all collection equipment, as well as tools, processing equipment, the laboratory room(s) and collection area itself at the end of the day or after use. When purchasing equipment, assess the ability to disassemble and the overall ease of cleaning- this plays a major role when it comes to the time and effort needed for cleaning on a daily basis.

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It is highly recommended to have protocols and schedules in place not only for daily cleaning, but also weekly and monthly along with general maintenance. Furthermore, keep a protocol on calibration schedules for the semen evaluation equipment used. Please refer to equipment manuals for specific internal and external maintenance schedules.

When purchasing disinfectants for commercial use, it is extremely important to choose a product appropriate for the bacteria that may be present in the area to be treated, particularly in the laboratory as the choice of disinfectant for laboratory equipment can affect the quality of the semen. Moreover, attention needs to be paid to the quality of water used for cleaning, the ambient temperature, concentration and exposure times in order for the cleaning agent to be effective. Please pay close attention to the manufacturers recommendations for these items.

Easy steps for the successful cleaning of collection and laboratory areas

After each day of use, the collection and laboratory areas (and equipment) should be cleaned and disinfected.

We recommended making a schedule for the daily, weekly and monthly cleaning routines and develop a positive “culture of cleaning” within your facilities.

Cleaning the laboratory and collection areas (and the equipment and tools used) should follow these key steps:

1. Remove any organic material from the surfaces.
2. Pre-soak with a degreaser or foaming detergent.
3. High pressure wash or manually by hand to remove organic matter and biofilm.
4. Rinse thoroughly with clean water at low pressure.
5. Dry – being careful to avoid contamination when drying.
6. Disinfect appropriate products or sterilize where applicable using proper heat and time.

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Piglet growth – Support colostrum supply

Why all piglets must have colostrum within the first 12 hours

Colostrum is essential for piglet health and growth. Ensuring sufficient colostrum intake during the first 12 hours after farrowing is achieved by a disciplined approach to day 1 care of the piglets.

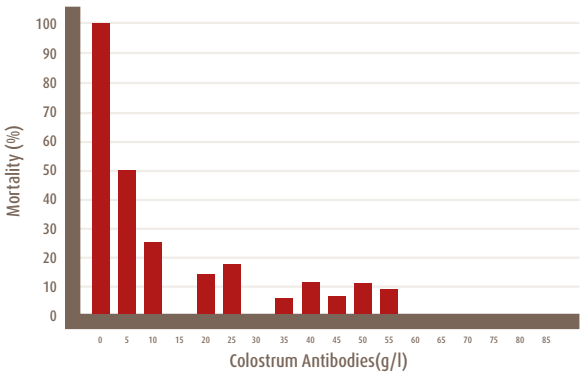
Adequate supply of colostrum will support health and growth

Success in managing hyper prolific DanBred sows is especially centred around the careful management of the new born piglets. Newborns are not protected by an active immune system, which means that their health relies on the passive immunity gained from colostrum, making colostrum essential for piglet health and growth. Ensuring sufficient colostrum intake during the first 12 hours after farrowing is achieved by optimising the DanBred sows' feed intake in late gestation for maximised milk production, as well as a disciplined approach to day 1 pig care in farrowing.

The importance of colostrum intake

Colostrum production starts when the first piglet is born and continues for 24 to 48 hours. Analysis of colostrum has shown that the amount and composition of antibodies in the colostrum slowly starts changing from around 12 hours after farrowing. Within the same time period, the piglet's ability to absorb the antibodies from the colostrum will start to decrease (Quesnel, 2012). This means that all piglets must have a sufficient amount colostrum within the first 12 hours after birth in order to get the full benefit in terms of health and growth. Additionally, the energy supply for activity and thermoregulation is also very limited in new born piglets, hence why colostrum intake is not only crucial for health it is also essential for the piglets to keep warm and be mobile right after birth (Thorup, 2013).

When managing hyper prolific sows, it is imperative to master skills such as split suckling and the correct management of foster sows in order to wean as many high-quality piglets as possible. Split suckling, where the smallest 8-10 piglets are allowed to suckle for 30 to 90 minutes, while the bigger piglets are kept in the creep or constrained in another way, has shown to increase survival with 0,4 piglet per litter (Thorup, 2013) Furthermore, the use of foster sows increases both daily gain among all the piglets as well as increasing survival rate among the smaller piglets (Thorup & Nielsen, 2017). In either case it is important to optimise the sows milk production throughout the lactation to maximise the number of piglets nursed by each sow.



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Easy steps for managing colostrum intake for optimal piglet health and growth

- Ensure all piglets get access to the udder quickly. Reducing the birth to nursing interval (BNI) is critical to survival.
- Ensure piglets are dried and warmed manually. Drying and warming pigs via towels or drying powder helps the pigs thermoregulation as well as and achieving optimal core body temperature levels.
- Ensure all piglets get at least 12 hours for colostrum intake preferably with their mother.
- Ensure the sow is healthy and in good body condition.

Split suckling

Enclose all the piglets within the creep area, behind a board or in a disinfected box, and make sure to provide them with heat (at least 34°C but not above 40°C).

Let the sow get up to eat and drink while all the piglets are enclosed.

- Split the litter into two groups – smaller piglets and bigger piglets.
- Keep the group of bigger, more viable piglets enclosed in a heated zone
- Allow the smaller piglets to suckle for 60-90 minutes
- Mark the start time at the litter card to keep track of time and ensure sufficient suckling time, and mark the pigs which has received colostrum
- Swap the groups over and let the bigger piglets get at least 30-45 minutes of suckling
- Mark the start time at the litter card to keep track of time and ensure sufficient suckling time
- Wash and disinfect the heat box before using it for another litter.

Hand feeding colostrum to piglets

If staff are able, cold or low vitality piglets can be provided with colostrum directly in the mouth from a cup or a disposable syringe. Milk the colostrum from a newly farrowed (within 4 hours) sow in the herd. This should preferably be the mother, but another newly farrowed sow from the herd can be used.

Heat colostrum to 30-35°C (not above 35°C) in a water bath or at low frequency in a microwave oven. Supply a 500 g piglet with 15 mL of colostrum 3 times, with an interval of at least one hour. Supply a 1 kg piglet 30 mL of colostrum 3 times, with an interval of at least one hour.

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- Colostrum milked from a sow, has a refrigerated shelf life of 3 days.
- Pack the milked colostrum in portion sizes.
- The colostrum is safe to freeze.
- Be aware of the temperature when thawing.

Foster sows

Foster sows or cross fostering should be used for surplus piglets from big litters.

Ensure all piglets have had colostrum for at least 12 hours before moving them to a foster sow. Remember, split suckling is a tool to effectively get all pigs on a teat and access to adequate colostrum during this initial 12 hours. If a foster sow is needed, choose a sow that is calm, in good health and body condition. 1st or 2nd parity sows are preferred as foster sows, as their teat size will likely match the small mouths of smaller piglets.

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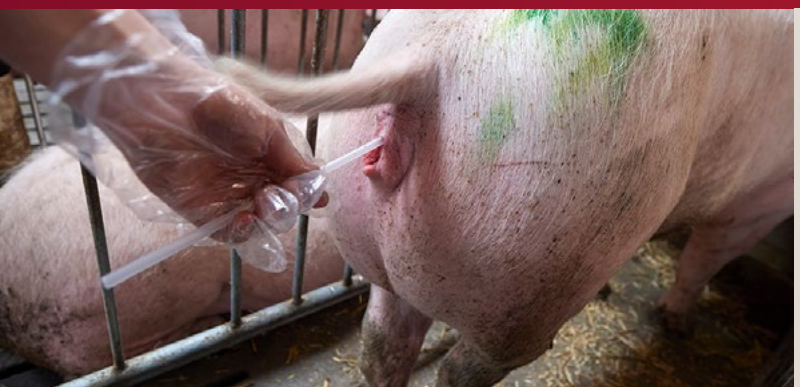
Mating – Reach reproductive success



Why proper insemination technique is important for success

Careful attention to heat stimulation, timing of insemination and the insemination technique can help you attain the full reproductive potential of DanBred.

Mating for reproductive success

DanBred breeding animals are exceptional when it comes to reproductive performance. Strict compliance to best practice insemination on-farm will release the DanBred potential for reaching uncompromised lifetime production and world class productivity along the entire production chain. Trials show that careful attention to heat detection, heat stimulation, timing of insemination and the insemination technique have a significant impact on reproductive success (Sørensen, 2009).

Insemination for improved fertility

At the point of insemination, the achievement of improved fertility and maximised farrowing rates rely on some key success factors: timing, stimulation and frequency of insemination. The first day the sow shows standing heat is the first day of oestrus. Oestrus is defined as the period during which the gilts and sows are receptive to the boar, ovulating and capable of conceiving. Reproductive performance can be increased if standing heat is used as guideline for timing of mating (Flowers 1996). In practice, this means that a sow which shows standing heat shortly after weaning will generally ovulate relatively late. Conversely, sows that show heat 6 days or more after weaning can ovulate shortly after standing heat (Nissen et.al., 1997). Trials have shown that structured human stimulation before insemination resulted in an increased farrowing rate of 6%, compared to sows where none or only a limited amount of stimulation was performed. The stimulation impacts the release of oxytocin, which helps contractions in the muscle cells of the uterus, creating an efficient boost of semen transport into the uterine horns (Madsen et. al. 2001). Frequency has showed important as inseminating twice per heat will give an extra 0.5 total born per litter (Hedeboe, 2006). Furthermore, significantly more gilts will conceive if the surroundings are calm upon mating (Fisker, 2003).

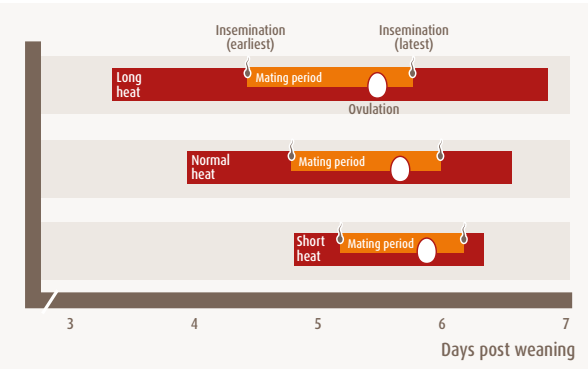


Figure 1: Adjust timing of insemination according to expected length of heat

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Easy steps to on-farm best practice for reproductive success

Reduce stress

- Keep at least one hour between feeding and the start of insemination
- Be calm around the animals

Optimise timing

- Let gilts and sows have nose-to-nose contact with a boar through equipment or use a boar wagon.
  - When using a boar wagon, utilise the oldest most odorous boar available.
- For greatest results, let the boar have contact with only the 5-6 sows currently being inseminated.
  - Using 2 different boars can enhance the effect
- Inseminate gilts no later than 12 hours after standing heat has been detected. Repeat after 12 hours.
- Sows should be inseminated no later than 12 hours after standing heat has been detected. Repeat insemination 24 hours later.

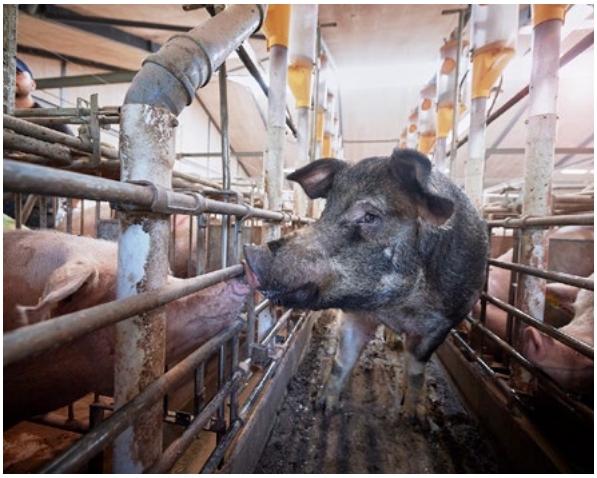
Follow the five point plan when stimulating sow and gilts

Stimulate the sow for 3-5 minutes.

Start with sows that show the strongest signs of heat.

The five point plan:

- Apply pressure to the flank area by gently lifting or pushing the flank.
- Lift the groin and gently rub the underline.
- Push with a fist below the genital opening when doing so check the vulva for clear discharge
- Grip and massage the corners of the sows' hips
- Performed a back pressure test (riding test) the sow must be willing to let you sit



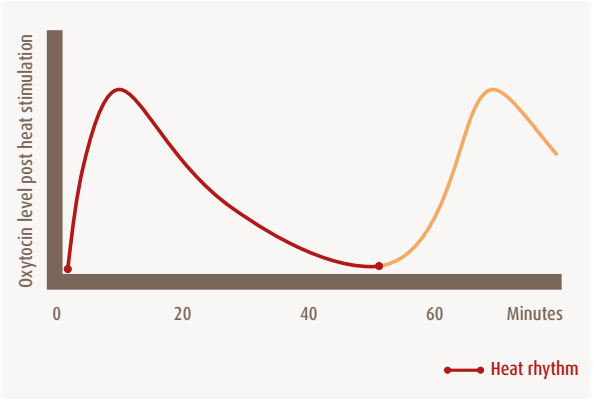


Figure 2: Sow heat cycle. The heat cycle for a sow is 40 to 60 minutes. In the first 20 minutes the sow will show a strong heat and the following 20 to 30 minutes it will be difficult to stimulate the sow to a standing heat. For this reason, it is important not to stimulate more sows than can be mated within 15 to 20 minutes.

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Master conventional insemination technique

- Have all supplies ready for insemination.
- Introduce the boars to the females that are to be bred.
  - Do not allow boar exposure if matings will not happen immediately.
- Ensure hygiene by cleaning the vulva with a disposable tissue. Do not reuse tissue paper.
- Apply obstetric, non-spermicidal gel to the catheter. Do not cover the opening with the gel.
- Gently separate the lips of the vulva and insert the clean sterile head of the catheter.
- Push the catheter gently forward and upwards into the reproductive tract at a 45 degree angle through the vagina into the cervix.
- When a firm resistance is felt, pull slightly back while twisting the catheter to achieve a firm lock.
- Remove the semen dose from the semen box and resuspend semen gently by rotating the dose.
- Mount the semen tube/pack and raise it above the level of the vulva.
- Ensure there is nose to nose contact with the boar and continue the stimulation of the sow through the breeding process (this mimics the boar to enhance uterine contractions .
- Uterine contractions will pull the semen into the uterine tract over a period of 2-5 minutes.
- Do not squeeze the semen dose or perforaten the dose to increase the speed of insemination.
- In the event of backflow of semen:
  - Reposition the catheter, ensure boar exposure and adequate stimulation.
  - If more than 1/3 of the dose is lost due to backflow, start over with a new dose of semen.
- After the insemination is complete, bend the catheter to prevent backflow and leave in the sow or gilt for another 5-7 minutes to help continue cervical contractions and better semen transport.
- Gently remove the catheter with a firm but gentle downward pull.
- It is recommended for further stimulation after breeding to leave a boar or 2 in front of the bred females for 2 hours.

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Ensure conception

- Leave sows and gilts in stress-free surroundings, do not moved or re-group for 5 to 7 hours.
- Feed according to on farm protocols

Learn from experience

- Record quality of insemination by making a technician scoreboard where each insemination is given a rating by the technician who did the insemination.
- Include ratings when analysing productivity, this could show if a technician is in need of extra training.

Record unexpected events like bleeding or back flow.

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Large litters – Correct handling

How to set-up and manage foster sows for large litters

Success in managing hyper prolific DanBred sows is centered around piglet management. Knowing how to rear the extra piglets is essential to capture the full production potential of the DanBred female.

Correct handling of large litters for maximum performance

Success in managing hyper prolific DanBred genetics is reliant on the correct management of piglets and large litters. As a result of the successful development in litter size, knowing how to rear the additional pigs is necessary to capture the full production potential of the DanBred female.

Successful management of litter equalisation, where excess piglets from large litters are distributed among sows with smaller litters, is a critical management step. Nurse sows, where excess piglets from large litters are placed with a foster mother is essential to improve the number of full value weaned pigs.

Success when cross-fostering piglets

The correct management of litter equalisation and setup of nurse sows to raise additional piglets from hyper prolific sows will increase the number of weaned pigs per sow per year, increase growth rates and reduce weight variations among piglets.

Results have shown that the use of nurse sows will give a significant increase in average daily gain as well as weight at weaning (Thorup & Nielsen, 2017).

The fact that a sow has been fostering excess piglets from large litters does not affect the subsequent litter performance, on the contrary, results from nearly 80,000 farrowings where sows raising their piglets were compared to nurse sows

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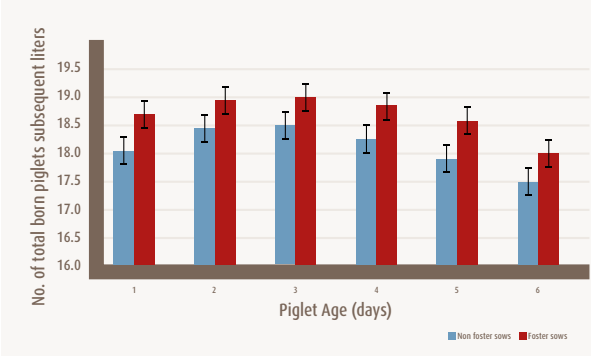
raising excess piglets from large litters, showed an increase of 0.57 total born piglets in subsequent litters of the nurse sows (Bruun et. al., 2015).

Furthermore, it has shown that nurse sows do not suffer from stress any more than other sows during lactation (Amdi et. al., 2017).

It is imperative for success with nurse sows to focus on the correct nurse sow selection- this important management strategy will help to ensure the maximization of quality weaned piglets.

A successful system is the 2-step-foster sow where the piglets from a sow 21 days into lactation are weaned (intermediate sow). This sow receives the full litter from a sow which farrowed 4-7 days ago (foster sow).

Newborn piglets from large litters are then placed with the foster sow. Piglet mortality with the 2-step sow was significantly lower and weight at weaning was significantly higher when comparing nurse sow systems in a Danish setup (Thorup & Sørensen, 2017).



When working with nurse sow systems it is important to focus on health and never move piglets if it can compromise the health- if in doubt consult the herd veterinarian.

Always choose sows in good body condition that is eating well, with healthy large piglets, as she must be able to tolerate the extended lactation period.

Easy steps for setting up successful cross-fostering

Successful management of litter equalisation and the correct nurse sow identification is essential to increase the number of weaned pigs from large litters in professional pig production systems. At entry into the farrowing unit, note the number of available and functional teats and make an overall evaluation of how many piglets each sow is expected to raise.

Colostrum

New-born piglets are not protected by an active immune system, which is why their health relies on the passive immunisation gained from colostrum. Before moving any piglet sufficient colostrum intake should be ensured.

- Ensure all new born piglets get to the udder
- Ensure all piglets get at least 12 hours for colostrum intake with their mother

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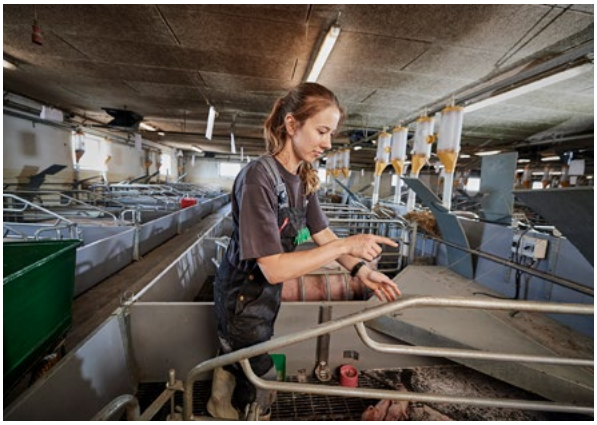
Split suckling

- Split the litter into two groups – smaller piglets and bigger piglets.
- Keep the group of bigger, viable piglets enclosed
- Allow the smaller piglets to suckle for 60-90 minutes
- Swap the groups over and let the bigger piglets get 30-45 minutes of suckling

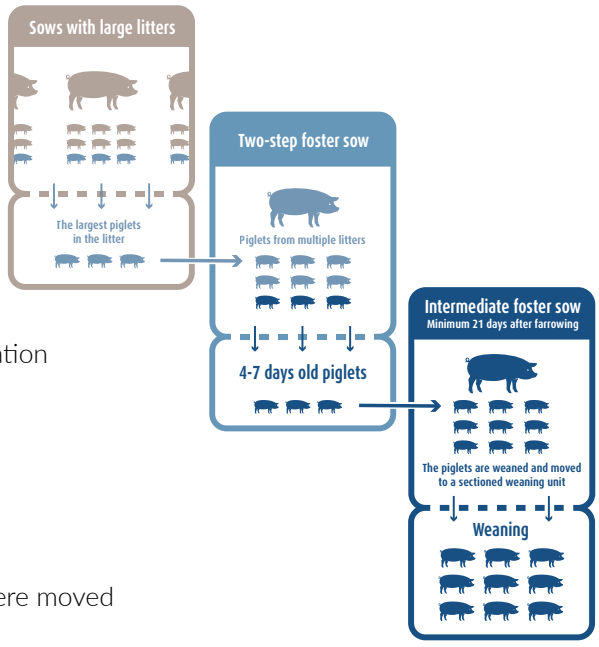


Litter equalisation

- Equalise the litters to the number of piglets the sow has been assessed to nurse
- Young sows must nurse at least the same number of piglets as the number of good active teats available (if capable, an additional piglet should be given)
- Move the bigger excess piglets and leave the smaller piglets with their mother
- Equalise the litters until 48 hours after farrowing, after which time piglets should not be moved unless absolutely necessary

Choosing the right nurse sow

- 1st or 2nd parity sow.
- Ideal body condition and optimum back fat thickness is 16-19 mm.
- Calm temperament
- Small active well placed teats and good onset of lactation
- Good strong piglets from her own litter
- Good appetite and feed intake



The 2-step-nurse sow

- Give the nurse sow the same number of piglets as were moved
- Separate the piglets from their new sow
- Give the sow a feed ration
- Release the piglets when the sow lays down
- Make sure all piglets get to the udder
- Reduce feed allowance of the nurse sow to 2 kg per day (this can be increased as the piglets grow)

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Nurse sow for smaller piglets

Using a sow for the smaller piglets can increase the average weight gain.

Setup in 3 steps:

1. A newly farrowed nurse sow receives smaller excess nurse-piglets from large litters.
2. The largest piglets from the newly farrowed nurse sows are moved to a sow 4-7 days into lactation.
3. The 4-7 days old piglets are moved to a sow which has just weaned piglets after 21 days of lactation.

Important factors to remember:

- The newly farrowed nurse sow should be a 1st, 2nd or 3rd parity sow.
- The nurse-piglets must have had colostrum for at least 12 hours before they are moved.
- The nurse sow must have small accessible teats and have show good milking abilities.

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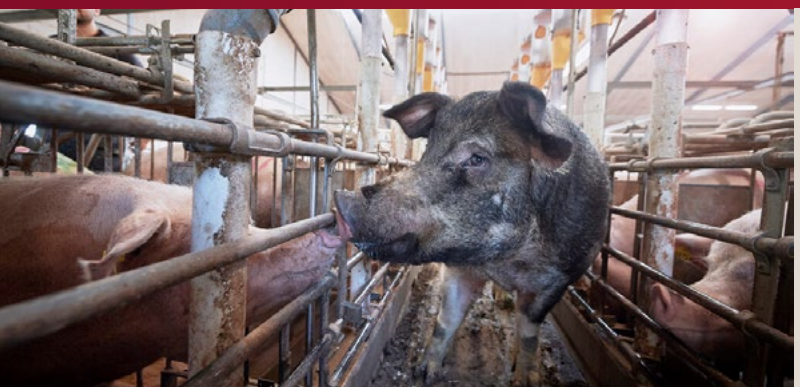
Heat management observations – Increase productivity



How to carry out correct heat management observations

DanBred breeding animals deliver extraordinary reproduction results and careful heat observation will increase insemination success and greatly contribute to optimising production flows.

Increase productivity with correct heat check management

Successful insemination revolves around one core principle: locating sows showing the standing reflex or standing heat. The standing reflex is a natural behaviour that ensures the sow can withstand a boar's weight during breeding. It indicates that the gilts and sows are receptive to the boar, ovulating and capable of conceiving. Accurate identification of sows in heat ensures the correct timing of insemination which has shown not only to reduce the number of sows not conceiving, but both farrowing rate and litter size increase (Nissen, 1995). DanBred breeding animals deliver extraordinary reproduction results and careful heat observation will greatly contribute to optimising production flows.

Achieve full potential from DanBred by introducing systematic routines on heat observation

Inseminations should be timed using standing heat as a reference point. (Flowers 1996). The approach to accurate heat detection and timing of insemination has significant impact on reproductive success (Sørensen, 2009). If not pregnant or lactating, mature sows will naturally come into heat every 18 – 23 days or 4-5 days after weaning. During heat observations, stimulation of the sows impacts the release of hormone oxytocin, which causes a strong muscle rigidity that is expressed as the standing heat. Structured human stimulation has shown to increase the expression of heat (Madsen, 2003) and introducing mature, healthy and high libido teaser boars will enhance the signs as boar pheromones evoke heat (Flowers 1996). Heat observation is a technique which has to be learned and trained before it is mastered. Consistent, planned and focused heat observations will result in increased reproductive success. Onset is triggered by physiological mechanisms primarily caused by the lack of udder stimulation from piglets. Foster sows or re-turning sows might deviate from a normal heat cycle, which is why these should have extra attention. Sows which show standing heat soon after weaning generally have a relatively long heat whereas sows which show standing heat relatively long after weaning have a short heat (Nissen, 1995). As ovulation happens about 2/3 into the heat, the optimised conception rate is achieved if the sows are inseminated from 24 hours before until 4 hours after ovulation (DPRC, 2018). Heat detection for repeat breeds should identify all females in heat (wean sows, gilts and repeats) early in their oestrus cycle. The goal should be to identify 80%+ of non-pregnant animals by 4 weeks of gestation and more than 95%+ by 8 weeks of gestation as this will minimize the impact of non-productive days as well as the associated negative production and financial impact.

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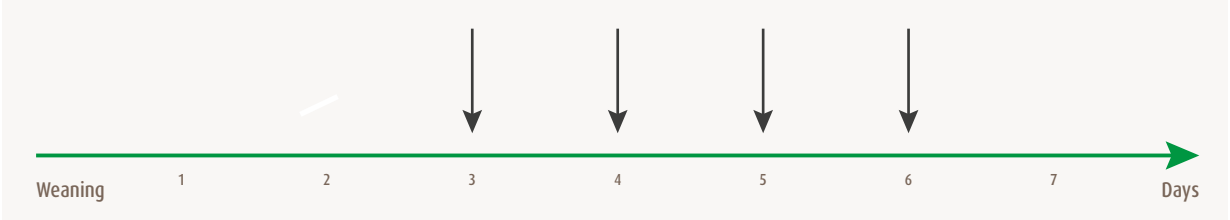
Easy steps for accurate heat observation

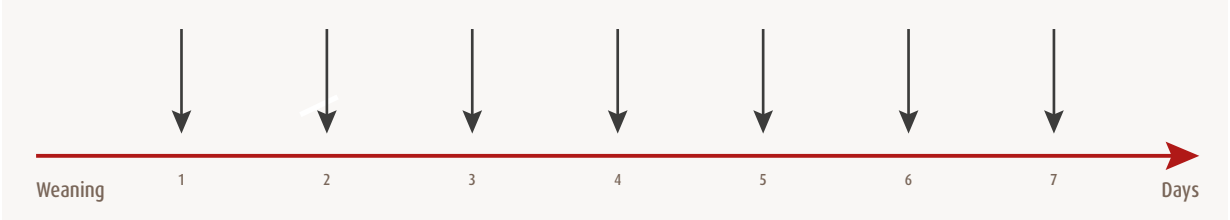
Follow the plan below to improve productivity

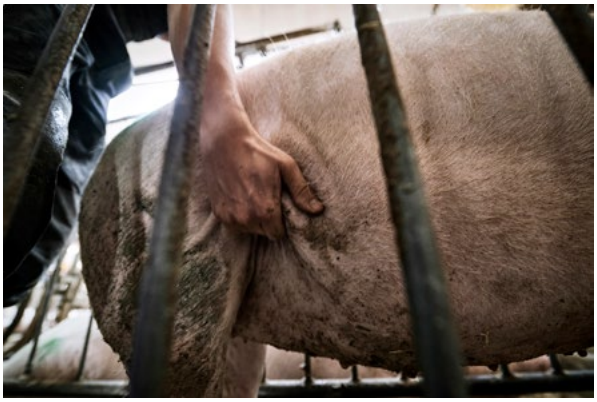
Take care in finding the correct sows

Sows weaned after 3-4 weeks of lactation should be heat checked at least once per day from 3 days after weaning until insemination



Sows deviating from a normal cycle, such as foster sows and returns should be heat checked at least once per day from day 1 until insemination





1) Observe the 8 signs of heat

The sows can display the onset or presence of heat with several conditions.

- Swelling and redness of the vulva
- Clear fluid discharge from vulva
- Lack of appetite
- Increased activity/restlessness
- Perked or twitching ears
- Tail flicking up and down
- Vocalization or grunting
- Standing reflex

2) Use a teaser boar

- Place the boar in front of a limited amount of sows- 5-6 at one time is enough
- Ensure that nose-to-nose contact between boar and sows is possible.
- If boars are housed together, use multiple boars to enhance nose to nose contact.
- Ideal boar to sow ration is 1 boar per 250 sows and gilts in inventory or heat induction age
- Set up a protocol for the replacement of teaser boars, changing them every 6-18 months.

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3) Stimulate the sows

Stimulate the sow and gilts by following these five points:

- Apply pressure to the flank area by gently lifting or pushing the flank.
- Lift the groin and gently rub the underline.
- Push with a fist below the genital opening when doing so check the vulva for clear discharge.
- Grip and massage the corners of the sows' hips.
- Performed a back pressure test (riding test) the sow must be willing to let you sit on her without agitation

Standing heat is confirmed when the sow stands still on strong rigidity legs. Heat detection should be performed by only well trained employees.

4) Plan insemination

When standing heat is confirmed insemination should be according to the weaning day:

- Standing heat on day 3 after weaning: Inseminate in the afternoon on day 4, repeat after 24 hours.
- Standing heat on day 4 after weaning: Inseminate in the morning on day 5, repeat after 24 hours.
- Standing heat on day 5 after weaning: Inseminate in the afternoon on day 5, repeat after 24 hours.
- Standing heat after day 5 after weaning: Inseminate as soon standing heat is seen and repeat after 12 hours.
- Sows deviating from a normal cycle, such as foster sows and returns: inseminate as soon standing heat is seen and repeat after 12 hours.

Note that foster sows can come into heat in the farrowing unit, as the change from bigger pigs to smaller pigs can induce heat due to the reduced stimuli of the udder. Look for signs of heat with the foster sows- inseminate if standing heat is seen and repeat after 12 hours.

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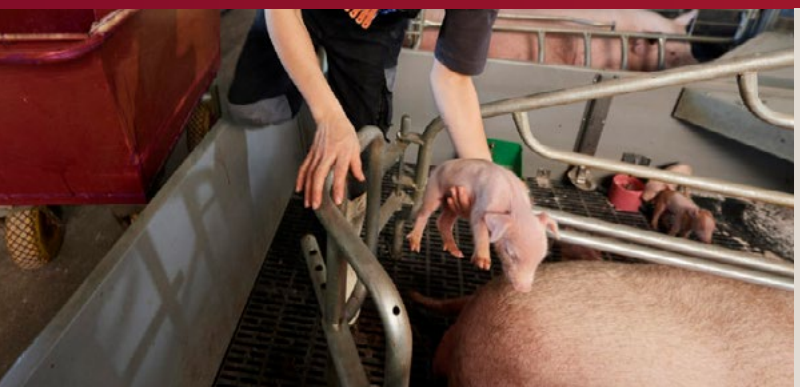
Quality assurance of high value breeding stock



How hygiene reduces the risk of umbilical hernia

On farm issues with umbilical hernia might indicate that it is time to focus on best management practice within the farrowing and piglet units.

Quality assurance of high value breeding stock

On farm issues with umbilical hernia (UH) might indicate that it is time to focus on best management practice within the farrowing and piglet units. In 2002 Vestergaard & Wachmann showed that it is possible to reduce the development of UH in pigs significantly.

Across the world UH can be a problem regardless of genetics, which clearly indicates that UH is primarily caused by external factors – such as poor pen hygiene and incorrect pig handling. That said, DanBred breeding animals are all systematically elected to eliminate UH as well as any other malformations.

A breeding animal which does not meet the DanBred selection standards is immediately removed, to continuously ensure the high value of DanBred breeding animals. The strategy of this approach is to reduce and or eliminate the prevalence of defects in all DanBred genetics.

What is umbilical hernia

A bulge near the belly button can have many causes. It can be UH, abscesses, scar tissue or cysts. All of which, will look alike when visually examining the pig. A bulge caused by UH will occur if the abdominal connective tissue fails to close around the umbilical ring (navel), thus allowing the intestines to protrude through the abdominal wall. The majority of UH are related to inflammation due to infection of the umbilical cord, caused by poor environmental and hygiene conditions. Furthermore, the handling of the piglets, as well as the practice around treatments administered, seems to be of some importance. For these reasons there is variance in the occurrence of UH between herds. Even though UH worldwide leads to losses by reduction of the potential profit, surprisingly few randomised trials has evaluated the effect of management on the occurrences of UH in a professional pig production set up. A Danish trial by Vestergaard & Wachmann (2002) showed that by spraying the umbilical cord with a 5% iodine-alcohol solution within 24 hours after birth, the occurrence of UH was reduced around 25%. Furthermore, this trial showed that preventive treatment with antibiotic within 24 hours after birth reduced the occurrence by 33%. This indicates that it is possible to maintain a continuously low prevalence of UH among high value piglets by focusing on the management of the piglets.

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Simple everyday initiatives to assure umbilical health

1. Keep focus on management of umbilical cord with the newly born piglets:

- Do not pull the umbilical cord when performing farrowing assistance
- Ensure the umbilical cord is cut as soon as possible- preferably before piglets are moved to the udder
- Cut the cord with disinfected cutters, to measure no more than 3-4 cm (1.5 inch.)
- Cauterizing cutters can be used for managing the umbilical cords to limit blood loss and effectively close a possible entry point to bacteria
- An alternative to cutting the cord is pinching or shredding it. Wrap the cord around a finger to cut off blood flow and pinch of the the cord.
- A drying powder can help to dry out the cord and reduce the presence of bacteria

2. Sanitation, hygiene and correct handling of piglets:

- Dry out pen floors with an antiseptic desiccant drying powder, avoid wood shavings
- Ensure the floor surfaces are smooth to protect the piglets
- Scraping behind the sows twice daily to ensure pen hygiene
- Pick up piglets by placing the dominant hand palm beneath the stomach without squeezing. Do not pick up piglets by the legs without supporting the chest area.

3. Prevent omphalitis:

- Use a disinfectant iodine based product after the umbilical cord is cut
- Place a patch over the navel to keep bacteria out, and protect the teats in future breeding stock.
- Trials have shown that the preventive use of antibiotics has some beneficial effects but the cost / reward should be reviewed with your Veterinary Services Team.

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Pregnancy testing – Worth the effort

Why pregnancy testing is worth the effort

Attain the full potential of DanBred with systematic management of on-farm pregnancy tests combined with a consequent culling strategy to optimise overall efficiency and reduce Non-Productive Days.

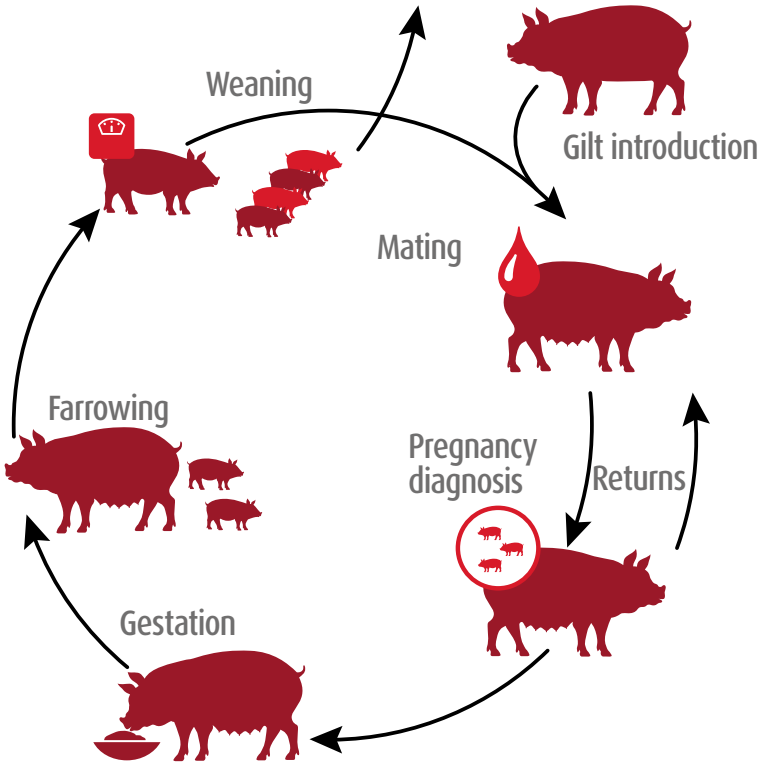
Increase productivity by systematic on-farm pregnancy testing

DanBred breeding animals deliver extraordinary reproduction results and attentive systematic performance of on-farm pregnancy tests combined with a consequent culling strategy will optimise the overall production efficiency and reduce Non-Productive Days (NPD). A high number of pregnant or lactating sows and gilts increases reproductive efficiency, whilst maximising both productivity and the use of space. Increasing the number of possible productive days by eliminating NPDs will enlarge the number of litters per year as well as increase the number of number of pigs weaned.

Efficient pregnancy diagnostics increase productivity

On farm pregnancy diagnostics must be efficient, secure, inexpensive and easy to perform. The time spent on pregnancy testing as well as the training of staff to do so is money well spent. It is important that all members of staff know the culling strategy set for sows returning to service, as well managed protocols and successful implantation of culling strategies will ultimately minimise NPDs.

Many diagnostic methods have been tested over the years. Using a boar for detection of heat is one of the most common methods and has shown to be very efficient as it is almost 100 % certain that a sow which shows signs of being in heat after mating failed to conceive when mated (DPRC, 2017).



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Non pregnant sows will normally return to oestrus within 17 to 24 days after mating, therefore daily nose-to-nose contact between sows and a boar from day 19 to day 28 is recommended (Almond, 1994).

Ultrasound scanning the sows between day 28 to 42 has shown significant accuracy in finding non-pregnant sows, but is dependent on both the equipment used as well as the technicians' skills- training is therefore essential (DPRC, 2017). When finding returning sows it is imperative that these are moved to the mating unit straight away- optimised feeding and daily boar exposure can provoke a new heat, and thereby return the sow into production – alternatively the sow must be culled (DPRC, 2017).

Week of Gestation	Days of Gestation	Method	Percentage of non-pregnant sows/gilts
3+	17-24	Boars and heat check	80%
5+	24-35	Ultrasound	15%
8-10	56-70	Visual	5%

Table 1: Methods for pregnancy diagnosis according to time of gestation

Easy steps to maximise production with accurate pregnancy diagnostics

Heat detection

- Use a boar in front of the sows every day from day 19 to day 28 after mating.
- During a quiet time of the day check for the 8 signs of heat;
  - Swelling and redness of the vulva
  - Clear fluid discharge from vulva
  - Lack of appetite
  - Increased activity/restlessness
  - Perked or twitching ears
  - Tail flicking up and down
  - Vocalization or grunting
  - Standing reflex.
- Use an older, odorous and high libido boar.
- For loose house systems, keep the boar in a pen with an opening into the sows and use the electronic registration to track which sows show interest in the boar.

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Ultrasound scanning

- The ultimate goal of pregnancy detection is to identify non-pregnant females before 35 days of gestation
- Scan all sows once between day 24 and day 28 after mating
- If in doubt of the diagnosis mark the sow and scan again within a week
- For optimised results, a second scan of all sows can be done around day 42
- Timing ultrasound scanning with a feeding can help efficiency
- Following the scanning evaluate the body condition in order to optimise feeding during gestation.

Strategy for returns

- Clearly mark sows in heat or scanned non-pregnant
- Move sows in heat or scanned non-pregnant to the mating unit or cull depending upon protocol
- Check for heat every day
- Inseminate when standing heat is detected
- Let the sow continue in the new week batch
- Set a culling strategy for returning sows and make sure that all employees know the strategy (for example cull after 2nd unsuccessful mating).

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