Pig Reproduction

Practical 2 Intensive Animal Industries 2013
Learning Objectives

• Identify the key parts of the male and female pig reproductive tracts, including the ovaries (covered in the practical).
• Understand the reproductive cycle in the pig, including the signs of oestrus / standing heat
• Understand the key principles of pig artificial insemination
• Be familiar with anaesthesia and surgical techniques used for reproductive conditions in the pig
• Understand how to check pregnancy status in a sow
• Interpret images from real time ultrasound pregnancy testing (covered in the practical)
What are you trying to achieve?

Mating:

• To place as many live sperm as possible from one dose/mating inside the tract of a stimulated oestrus female.
• To achieve fertilisation of the maximum number of eggs.
Spiral shaped penis
Fertilisation

The Physiology of Fertilization

1. Capacitation
2. Binding and recognition
3. Induction of the acrosome reaction
4. Penetration of the zona pellucida
5. Fusion of pronuclei

Source: Minitube
Fertilization ‘rules of thumb’

• Modern sows produce ~23 eggs and gilts ~20 eggs at ovulation
• Eggs will begin to die within 8 hours after ovulation
• Fertilization should occur within 6 hours after ovulation for optimum fertility
• Sperm will survive for ~24 hours but needs to navigate to upper oviduct
• Ovulation occurs ~70% into the time frame of oestrus / standing heat

What is happening with hormones in the oestrus cycle to cause ovulation?
Progesterone

Pregnancy relies on this hormone remaining high.

WSI/WRI = 4-7 days
Abortion/weaning
Detecting Oestrus

Use your senses

• Ears - to detect a calling sow
• Eyes - to detect the restless, nervous sow, which is off her food, has a swollen vulva, which is slightly red. Sow’s ears will be erect.
• Touch - to exhibit back pressure test in the presence of the boar and a tacky change in mucous
The normal courtship sequence in pigs

1. Sniffing
2. Head to head
3. Mounting attempts
4. Standing reaction - mating
5. Nosing
6. Nudging
Ok, you know when they are in standing heat, when should you mate them?

Standing heat only for 15 mins of each hour AFTER boar exposure.
Fertilization rate by AI timing relative to ovulation

<table>
<thead>
<tr>
<th>Wean-estrus</th>
<th>&gt;24</th>
<th>0-24</th>
<th>0-16</th>
</tr>
</thead>
<tbody>
<tr>
<td>before</td>
<td>50</td>
<td>87</td>
<td>69</td>
</tr>
<tr>
<td>3</td>
<td></td>
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<tr>
<td>4</td>
<td>56</td>
<td>92</td>
<td>66</td>
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<tr>
<td>5</td>
<td>49</td>
<td>90</td>
<td>92</td>
</tr>
<tr>
<td>6</td>
<td>71</td>
<td>100</td>
<td>53</td>
</tr>
<tr>
<td>All (%)</td>
<td>55</td>
<td>91</td>
<td>71</td>
</tr>
</tbody>
</table>

So you have to mate ‘before ovulation’, how do you know when that is?
Late standing heat sows have only a short heat cycle. The heat starts on day 6-7 after weaning. It lasts a maximum of 2 days. The optimal insemination timing:

X1: immediately after the onset of heat
X2: 12 hours after X1 if standing for the boar

Normal standing heat sows come into heat on day 5 after weaning. Their heat lasts 2.5 days. The optimal insemination timing:

X1: 12-14 hours after to onset of heat
X2: 12 hours after X1

Early standing heat sows tend to have a longer heat. The heat starts on day 3-4 after weaning and lasts up to 3 more days. The optimal timing:

X1: 24-36 hours after standing heat onset
X2: 12-16 hours after X1
X3: 12-16 hours after X2 (only if heat is so long)

Source: Dr. K. Weitze, Germany, 1994
Testing standing oestrus with boar

VIDEO

• Use a pen familiar to the boar
• Use mature boars over 10 months of age
• Remove non-oestrous sows from the pen to prevent stress or injury
• Handle boars gently and quietly
• Use small groups of sows

• This method does present some risk to the stockperson
• It can be difficult to move sows that are in standing oestrus
• It can be difficult to prevent boar mating the sow
Back pressure test for standing oestrus - video

• Always have a boar present to provide nose to nose contact
• Be quiet and gentle towards sows (sow may not show oestrus if she is wary of the stockperson
• The back pressure test can be performed anywhere so long as there is a boar present
• Check sows for standing heat as soon as they come in contact with a boar.

• Can do in a pen (but have boars in stalls on the other side of the bars) – can put some immature boars in but the majority should be mature boars.
• Can do in stalls (trap the boar in front of 3-4 sows at a time for your testing).
Natural mating - video

• Boar courtship sequence
• Gloves – non spermicidal (vinyl) – not latex and/or powdered.

• Make sure pen is free from obstructions that could injure animals
• Must be at least 2.5m wide - boar should be able to enter the pen and mount the sow easily.
• Handle animals gently and quietly
• Assist the boar if required (supervise all matings)
• Ejaculation (‘winking’) must last for 3 mins or more.
Artificial insemination ‘rules’

• Artificial insemination is used in ~90% of matings

• Extended semen (85ml) needs to have > 2-3 billion sperm and be stored at 16 -18 degrees

• Semen fertility reduces significantly after 2 days storage

• Catheter is inserted in cervix and then semen bag is attached

• Sow needs to have head to head contact with boar to enable uterine contractions – she draws in the semen

• Oestrus detection is the key!!!!
Thermometer

Is this ok?
Why is the range this wide?
Turning the semen 2x daily
AI Best Practice

• Clean vulva to remove dirt etc before inserting catheter with a dry paper towel - HYGIENE
• Do not handle the ends of the catheter that goes into the sow or the end of semen bag - HYGIENE
• Direct catheter upwards to avoid damaging the openings of the urethra
Catheter types

- Clear tip
- Spirette
- Foam tip – sows (left) and gilts (right)
Stimulating the Sow

You now have to pretend to be the boar.

- Scratch back and rub
- Weight on sow rump
- Rubbing the udder
- Pulling on loose folds of skin in front of the hind legs
The AI procedure - video

• Sow must be in standing heat and in nose to nose contact with boar.
• Gloves – non spermicidal (vinyl) – not latex and/or powdered.
• Clean the vulva
• Can use non-spermicidal lubricant (2cm away from the tip of the catheter)
• Inserting catheter: 30 degree upward angle
• Cather type:
  • Lock in: Gently pull back if foam tip catheter
  • Spiral in: counter-clockwise going in (clockwise coming out).
• Attach semen tube.
• Stimulate sow during AI (apply pressure to back, rub flank)
  • If drawing semen in too quickly, slow down flow by lowering tube
• Leave catheter in (crimped) for 5-10 mins post mating
• Leave sow for another 5-10 mins before moving (at least!).
AI in stalls
Surgical Procedures

Females

- Caesarian section
- Hysterectomy
- Ovariohysterectomy
- Embryo transfer

Males

- Epididymectomy
- Vasectomy
- Castration
  - < 21 days of age – anaesthesia not required.
  - > 21 days of age – anaesthesia required.
PIGLET CASTRATION < 21 DAYS
Piglet castration < 21days
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What are the anaesthetic steps for the red highlighted procedures…
Step 1 - Ensure the pig is healthy

• General:
  • Respiratory rate and character
  • Look for obvious problems – colour, alertness...

• Rely on patient history for health status
  • It is difficult to restrain the pig for any other meaningful information.

• Pig must be off feed for 6-8 hours prior to anaesthetising. Do not remove access to water.
Step 2 – Estimate weight

- Weaner: 7-10 kg (4 wks)
- Grower: 30 - 60 kg
- Finisher: 60 - 120 kg
- Gilt: 150 - 170 kg
- Sow: 180 - 250 kg
- Boar: 250 - 350 kg
Step 3 – Anaesthetic protocol
Injectable

• In the field for short duration- *epididymectomy or vasectomy* (surgical) or non-surgical procedures (hoof trimming, tusk trimming for boars).

• Ketamine 20 mg/kg and Xylazine 2 mg/kg by intravenous injection

• Zoletil 5 mg/kg & Xylazine 2 mg/kg intramuscular injection (Zoletil not registered for use in food animals)

This provides quick anaesthesia for at least 15-20 minutes
Step 3 – Anaesthetic protocol

Gaseous

• In a surgery theatre for all other procedures; caesarian section, ovariohysterectomy, embryo transfer and castration > 21 days of age.

• Preferred technique:
  • Acepromazine 2 mg/kg premedication (oral route)
  • Thiopentone 6.6 – 30 mg/kg IV
  • Gaseous anaesthesia – isoflurane

*(don’t use halothane – stress gene problems)*
Intravenous sites - ear
Intravenous sites – jugular vein

BUT…
Difficult to keep your needle in the vein or to be sure that the full dose ended up IV
Intramuscular site

- In the middle of the ‘triangle’ behind the ear.
Oral sedation

- Acepromazine may be given as an oral tablet – sometimes useful in pigs with an attitude
Gaseous anaesthesia
- Face mask
Gaseous anaesthesia
- Endotracheal intubation
Gaseous anaesthesia
- Nasal intubation

- 30 kg, size 5 mm
- 60 kg, size 7 mm
- 90 kg, size 9 mm
Step 4 – anaesthetic monitoring

Depends on your facilities and what you have access to.

- Respiratory rate monitoring
- Pulse rate in ear vein
- Jaw tone and eyes – not great indicators for depth of anaesthesia.
Step 5 – conducting the procedure

NOTE - Preparation of the surgical site is very important but not covered here (it is as per other animals).

### Females
- Caesarian section
- Hysterectomy
- Ovariohysterectomy
- Embryo transfer

### Males
- Epididymectomy
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Why and how do you perform the red highlighted procedures…
Caesarian section

Indications:
• Not performed on farms by staff except as a hysterotomy (see next slide)
• Pet pigs may require assistance during farrowing – as per other animals.
Hysterotomy

- Included for completeness as it is a variation on caesarian section.

- Indications - emergency euthanasia of sow (>112 days of gestation) so anaesthesia not required
Hysterectomy

• Indications – producing specific pathogen free piglets.
• Sow – either anaesthetised (piglets will be anaesthetised as well in this case) or euthanased (>112 days of gestation).
• After removal of uterus, it is dunked into disinfectant before being taken to a clean air space (free from pathogens), opened and piglets removed.
Ovariohysterectomy

- Indications – as per desexing dogs and cats
- A midline incision just below the umbilicus. The uterus is large but very mobile
Embryo transfer

• Indications – want to transfer valuable genetics between farms within Australia without transferring disease.

• Requirements:
  • Donor and recipient sow both need to be synchronised perfectly.
  • Both surgeries need to be done the same day in two separate locations by two separate teams.
  • Someone also needs to transport them between the two sites.
Castration

Indications – same as with dogs/cats
Vasectomy

• Indications
  • Vasectomised boars (V boars) are used for stimulating gilts – still have male characteristics but they won’t impregnate them.

• Caution –
  • Don’t use with gilts until 8 weeks post-surgery.
  • Can sometimes re-join but unlikely if enough is removed – reported failure is usually non-V boar invasion.
Vasectomy
Epididymectomy

Indications – same as for vasectomies
Step 6 - Recovery

• Same as for other animals.
• Pain relief and antibiotic cover - should always be provided.
• Hygiene - Clean pen/area should be provided and sutured skin sprayed with topical disinfectant to prevent infection.
• Feed and water can be provided immediately that the pig enters the recovery area.
Pregnancy Checking
Pregnancy checking

- 1 - 115 days heat detection in the presence of the boar
- 18 - 24 days heat detection with boar (regular return)
- 21 days + ultrasound real time scanner
- 25 - 35 days heat detection with boar (irregular return)
- 28 days doppler machine for uterine pulse
- 35 days doppler machine for uterine pulse
- 8 weeks by eye
Foetal vesicles – 28 days
Foetal Skeleton (>35 days)
Non pregnant

- Metritis
- Bladder
- Loops of gut
- Cyst