Anatomy in simple term, is defined as the study of the structure of the bodies of animals. Pig’s anatomy is the structure of its body.

Physiology is study of the function of animals and their constituents parts.

Brain Storming Session

Can you remember “something” from your AAP module?
Digestive System

- Non-ruminant & Monogastric (One stomach)
- Tube extending from mouth to anus
- Stomach Capacity = 6 litres for 100 kg pig
- Small intestine = 14 times longer than whole body
- Liver Weighs = 1.5 – 2.0 kg
Why understand Swine AAP?

- It will open new areas of application of pig biology to benefit humans
- It helps you have a conversation with other pig people, veterinarians and scientists
- It will help you manage pigs in meaningful ways on farms
  - Recognize disease states more easily
  - Obtain blood or other tissue samples
Figure: Diagrammatic representation of the digestive tracts of different farm animals.

An = Anus; Ab = Abomasum; Ca = Caecum; Cl = Cloaca; Co = Colon; Cr = Crop; D = Duodenum; G = Gizzard; I = Ileum; Oe = Oesophagus; Om = Omasum; P = Proventriculus; Re = Rectum; Rt = Reticulum; Ru = Rumen; S = Stomach.

(Source: McDonald et al., 1995)
Circulatory System

The circulatory system is an organ system that transports oxygen, nutrients, and hormones to body cells and carbon dioxide and other wastes from body cells.

- Heart is the main organ that distributes the blood within the body
- Heart constitute 0.3 – 0.4 % body weight
- Blood volume is relatively small
  - 4 litres for 100 kg pig
  - 4% of the body weight
1. right subclavian  
2. ductus arteriosus  
3. right auricle  
4. renal  
5. dorsal aorta  
6. umbilical  
7. internal iliac  
8. external iliac  
9. anterior mesenteric  
10. coronary  
11. pulmonary  
12. aortic arch  
13. left subclavian  
14. brachiocephalic  
15. common carotid

**Figure:** The major arteries of the fetal pig
1. brachiocephalic
2. ductus venosis
3. umbilical
4. renal
5. common iliac
6. superior (anterior) mesenteric
7. inferior mesenteric
8. gastric
9. hepatic portal
10. hepatic
11. posterior vena cava
12. pulmonary
13. anterior vena cava
14. left subclavian
15. external jugular
16. internal jugular

Figure: The major veins of the fetal pig
1. brachiocephalic artery
2. aorta
3. pulmonary artery
4. right ventricle
5. left ventricle
6. apex
7. right auricle
8. left auricle
9. ductus arteriosus
10. left atrium
11. bicuspid valve
12. chordae tendinae
13. papillary muscle
14. tricuspid valve
15. semilunar valve

Figure: Structure of heart
## Blood Collection from Pigs

1. **Ear veins**
2. **Jugular vein**
3. **Facial vein**
4. **Tail vein**
5. **Orbital Sinus**

### Table: Points to sample from or inject into the venous system of pigs

<table>
<thead>
<tr>
<th>Points to sample from or inject into the venous system of pigs</th>
<th>Piglets</th>
<th>Young pigs</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ventral Neck</td>
<td>![easy]</td>
<td>![easy]</td>
<td>![easy]</td>
</tr>
<tr>
<td>Vena Cava</td>
<td>![easy]</td>
<td>![easy]</td>
<td>![easy]</td>
</tr>
<tr>
<td>External Jugular</td>
<td>![easy]</td>
<td>![easy]</td>
<td>![easy]</td>
</tr>
<tr>
<td>Lingual-facial</td>
<td>difficult</td>
<td>![easy]</td>
<td>![easy]</td>
</tr>
<tr>
<td>Facial</td>
<td>difficult</td>
<td>![easy]</td>
<td>![easy]</td>
</tr>
<tr>
<td>2. Orbital sinus</td>
<td>![easy]</td>
<td>![easy]</td>
<td>not advised</td>
</tr>
<tr>
<td>3. Ear vein</td>
<td>difficult</td>
<td>difficult</td>
<td>![easy]</td>
</tr>
<tr>
<td>4. Tail vein</td>
<td>difficult</td>
<td>difficult</td>
<td>![easy]</td>
</tr>
<tr>
<td>5. Heart (cardiac puncture)</td>
<td>na*</td>
<td>na*</td>
<td>na*</td>
</tr>
</tbody>
</table>

* not advised except as a last resort or in the case of euthanasia

Preferred method of restraint: on back, on back, standing, snared
Auricular (ear) vein

Orbital venous sinus

Facial Vein

External Jugular Vein

Common Bleeding Ports
Respiratory System

- Main respiratory organ: Lungs
- Lungs weigh >600g per 100 kg live weight
- Lungs are narrowly packed between rib cages and the heart – explains why pigs undergo major physiological changes under physical stress.
- 20 breaths per minute
- Breathing can increase up to 200 per minute - to combat heat & physical stress
Excretory System

- Excretion in pigs occurs mainly through urinary tract.
- Each kidney weight = 200 gm per 100 kg live weight
- Urinary bladder = 1 litre; can eliminate up to 4 litres per day

Buzz Group

Q. How does pig perspire?

Q. Why do pigs love shallow ponds, stagnant and muddy water?

Q. Why is wallow or cooling provision for pigs required in hot summer?
Skeleton System

• Pigs have strong Skelton system and rarely suffers from fractures
• Cranium bones are thick
• Spinal column is long and consists of vertebrae
• Pelvis is slightly inclined giving flat hindquarters
• Limb bones are short and thick

Q. How many bones does the pig have?
Vertebral formula for Pig: C7; T14-15; L6-7; S4; cd20-23
Reproductive System

Male Anatomy & Physiology

Figure: Male Reproductive Parts of Pig
• Puberty commences at an early age in boars ~ 6 months.
• By 7-8 months of age, the ejaculation volume is 150 ml containing 300 million spermatozoa per ml.
• Semen volume: up to 250 ml with 400-500 million spermatozoa/ml at 9-12 months.

How is sperm produced? Which are the hormones involved? How is sperm transported and ejaculated?
Figure: Showing Female Reproductive Organs
Surrounds each ovary & acts as a funnel to collect ova and divert them to the oviduct

To produce female germ cells ova & hormones progesterone & oestrogen

2-3 ft each, act as passageway for sperm to reach the oviduct & are the site of fetal development

Site of semen deposition. Dilated during heat but constricted during the remainder of the estrous cycle & during pregnancy.

6-10 inches long and acts as the site of fertilization
Oestrous Cycle

- Time between the on-set of one oestrous (heat) to another
- The cycle length is normally 21 days but may range from 18-24 days.
- Young female may have cycle from 5 months of age
- Oestrous cycle is controlled by FSH, LH, oestrogen & progesterone
- Autoregulatory feedback mechanism in the absence of fertilization.
Group Discussion

Task: What are the symptoms of heat?

• 3 Groups of 6
• 5 minutes
• Oestrogen produces symptoms of heat or oestrous behaviours
  - more restless
  - mounts on other pigs
  - grunts frequently.
  - vulva swells and reddens and
  - sometimes associated with mucus discharge

• At this moment, the sow will respond To the standing test
  - Stands firmly when someone pushes on the hindquarters
  - Will not attempt to move as would be usual when astride her
• ovulation occurs between 18-40 hours after the onset of oestrous
• Mating or artificial insemination must take place little before ovulation as the life of ova is just 2-3 hours.

What are the factors affecting ovulation rate?

• Spermatozoa may live for 48 hrs in the uterus

Figure: Hormonal action and ovulation. (Source: Singleton & Diekman, 1997)
- When the boar is introduced to the sow, following behaviours are observed: