



PIL A for Sheep and Goats



1

PILA elements

- Principles of care and use
- Biology and husbandry of relevant species.
- Common diseases in the relevant species.
- Recognition of wellbeing, pain, suffering and distress in relevant species.
- Health monitoring and disease prevention and control.
- Handling and restraint of relevant species.
- Conduct of minor procedures.
- Introduction to anaesthesia and analgesia.
- Humane methods of killing

2

LO: 4.2

UK sheep and goat industries



- Sheep are mostly kept for production of lamb meat.
- Most sheep are kept outdoors for nearly all of the year – some lambed indoors
- Predominantly found in Scotland, Wales and the West of England
- Goats are mostly kept for milk production
- Most are kept indoors/outdoors based on lactation status.
- Predominantly found in England (York, Somerset, Worcestershire)

3

Uses in research

- Sheep
 - Alternatives to rabbits to produce polyclonal antibodies
 - Synthesising bioactive compounds in milk for studies in parturition, neonates and reproduction
 - Orthopaedic/biomaterial implant model
 - Studies in prion disease
- Goats
 - surgical training and teaching.
 - used in medical, orthopaedic, psychological, chemotherapeutic, and physiologic research.
 - Studies in prion disease

4

LO: 3.1.1

Sheep and Goats in ASPA

- Sheep and goats are not on the Schedule 2 list, meaning they can be obtained from sources which do not purpose breed them for use in research procedures
- Audit of vendors advised before purchase



5

LO: 4.4.1

Code of Practice (CoP)

Section 3 Chapter 8 Farm animals (including equines)



Section 3, Chapter 8: Farm animals and equines

This chapter must be read in conjunction with the Introduction and Section 3 Chapter 1: Advice applicable to all animals.

1 Advice applicable to all farm animals except equines

In addition to the mandatory requirements covered in Sections 1 and 2 of this Code of Practice, in the case of farm animals, compliance with legislation relating to the identification, welfare, keeping, breeding, transport and slaughter of these species is necessary.

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6

LO: 3.1.1 7

Sheep and Goat Phylogenetic Classification



Class: Mammalia

Orders: Artiodactyla (even-toed ungulates)

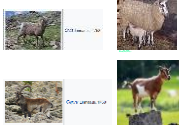
Sub-order: **Ruminantia (ruminants)**

Family: Bovidae (cloven hoofed ruminant)

Sub-family: Caprinae

Genus: Ovis (Sheep)

Capra (Goats)



7

LO: 3.1.1 8

Breeds of Sheep (UK)

Hill breeds	Scottish Blackface Welsh mountain	
Upland breeds	Cheviots Swaledale	
Lowland breeds	Down breeds Polled Dorset	

8

LO: 3.1.1 9

Breeds of Goat

- Milk
 - Alpine
 - LaMancha
 - Nubian
- Meat
 - Spanish
 - Boar
- Skin/Wool
 - Angora
 - Black Bengal

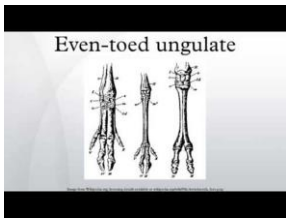


9

LO: 3.1.1 10

Ruminant

- Definition: even-toed ungulate mammal that chews the cud regurgitated from its rumen.



10

LO: 3.1.1 11

Ruminants

Sheep and goats are ruminants

As are cattle, deer, antelope and giraffe

They are closely related to camels and the South American camelids




11

LO: 3.1.1 12

Ruminant common characteristics

- Strict herbivores, with a modified gastro-intestinal tract to digest the cellulose in plants
- No upper incisor teeth – dental pad
- Produce copious quantities of saliva
- Large dorsum to tongue
- Unique four-chambered stomach:
- Regurgitate food for secondary digestion – chewing cud



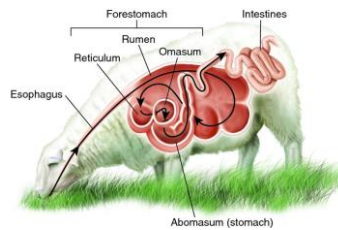
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LO: 3.1.1

13

Digestive system

Four chambers: Rumen, Reticulum, Omasum, Abomasum
Cellulose digestion occurs in the four chambered stomach



13

LO: 3.1.1

14

Digestive process

1. Plant material is initially taken into the **Rumen** where it, processed mechanically and exposed to bacteria that can break down cellulose.
2. The **Reticulum** allows the animal to regurgitate & reprocess particulate matter.
3. More finely-divided food is then passed to the **Omasum**, for further mechanical processing.
4. The mass is finally passed to the true stomach, the **Abomasum**, where the digestive enzyme lysozyme breaks down the bacteria so as to release nutrients.
 - The digestive process can take up to 100 hours!

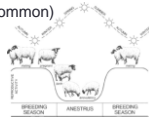
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LO: 4.10

15

Sheep Reproduction

- Seasonally polyoestrous short-day breeders
 - seasonal breeders – early autumn to late winter although breed variations (decreased day length)
 - Oestrus every 17 days
- Males and females become sexually mature between 5 to 8 months old (50 to 60% mature weight)
- First mated after 7 months or 19 months of age
- Natural service AI and ET rarely used, veterinary procedure
- Gestation length 145 days (approx. 5 months)
- Litter size 1-2 (lowland breeds 3 to 4 is not uncommon)



15

LO: 4.10

16

Goat reproduction

- Seasonally polyoestrous short-day breeders
 - September to March
 - Oestrus every 21 days
- Males and females become sexually mature at 6 months
- First mated at 18 month of age
- Natural service AI and ET can be used
- Gestation length 150 days +/- 5 days (approx. 5 months)
- Litter size 1-4 – born in spring

Pseudopregnancy 'cloudburst' – uterine and udder enlargement caused by build-up in fluid in uterus. Often resolved by sudden discharge of uterine fluid



16

LO: 4.10

17

Weaning

- Sheep – usually 12-16 weeks, but with some systems can be as early as 6 weeks (Dorsets)
 - Milking herds – lambs removed from ewe at 2-4 days and artificially reared on milk replacer before weaning at 4-5 weeks
- Goats – usually 8-12 weeks
 - Milking herds – kids removed from doe at 2-4 days and artificially reared on milk replacer before weaning at 2 months.



17

LO: 3.1.1

18

Sheep Behavior

- Grazers – eat grass and other herbaceous plants
- VERY flock conscious – usually driven together as a group
 - Protection - "Safety in numbers"
- Wide visual field (270 to 320°)
- Highly sensitive to excessive noise
- When angry, will stamp front feet or head butt (especially rams!)



18

Sheep Behavior & Handling

Different responses to handling based on breed

- 'Flocking instinct' – ability to be 'driven'
 - White-faced wool breeds (e.g. Cheviot) have greater flocking instinct
- 'Flight zone' - space around an animal which, when entered, causes the animal to move away from you.
 - Barn raised – shorter flight zone
 - Pasture raised –bigger flight zone



19

Sheep Restraint

- 'Drive' flock into small pen or enclosures
- Approach individual quietly and calmly
- **'Standing restraint'**
 - Catch by cup your hand under the lower jaw, elevating the head slightly and use the other hand to steady the back end.
 - Place your knee just behind the sheep's shoulder and your other leg against the sheep's side

NEVER grab a sheep or a mohair goat by the wool!



20

Sheep Restraint

- Use a standing restraint to gently guide animal into the desired area
- **Tipping to a 'sitting position'** is used to perform a safe and stress-free examination (e.g. head, genitalia, ventral abdomen) or perform routine tasks (e.g. hoof trimming, shearing)
 - Turn the head away from you so that it is next to its shoulder
 - Put downward pressure on the hips of the sheep
 - Continue to turn the head and use a rotating action on the sheep's body
 - Continue turning and rotating action until the sheep is sitting on the floor with its back against your legs.



21

Goat Behavior



- Browsers – eat different parts of woody plants and shrubs (at height, not on ground)
- NOT flock conscious –usually scatter when approached; but naturally bunch together
- Protection – Agile and fast
- Wide visual field of 320 to 340°
- Highly sensitive to excessive noise
- When angry, may vocalize, bite, kick, stamp front feet, arch back and lower head pointing horns

22

Goat Behavior – Warning signs!

- Hair raised along spine
- Stamping foot
- Sneezing/Snorthing
- Rearing up on hind legs



23

Goat Behavior and Handling



- 'Flocking instinct' - goats will not stay together when herded, they will scatter.
 - Best to identify the lead goat (usually a doe) and guide her into pen, the others will follow
 - Feed can also be used to lead goats into an enclosure
- 'Flight zone' - space around an animal which, when entered, causes the animal to move away from you.
 - Barn raised – shorter flight zone
 - Pasture raised –bigger flight zone
- Goats don't tolerate rough treatment – will try to head-butt

Always use the minimum amount of restraint necessary

24

LO: 4.7 & 7.1

25

Goat restraint

- Lead the flock into small pen or enclosure
- Approach individual quietly and calmly
- **'Standing restraint'**
 - A similar stance to the sheep may be used (hand cupped under chin with knee placed behind shoulder).
 - Alternatively, the goat's hindquarters may be backed into a corner
 - Hold the base of the head firmly and under the jaw to elevate the head.

NEVER

- grab a goat by the horns
- 'tip' a goat into a sitting position



25

LO: 4.1

26

Routine husbandry tasks

Lambs

- Tail docking – first week of life
- Castration
- Worm monitoring and control
- External parasite control – blowfly strike



26

LO: 4.1

27

Routine tasks

Adult sheep

- Shearing
- External parasite monitoring and control (e.g. mange and lice)
- Worm monitoring and control
- Foot/hoof monitoring and care



27

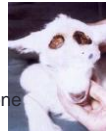
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28

Routine husbandry tasks

Kids

- Disbudding – vet procedure and must be done under general anaesthesia
- Castration – commonly carried out at the same time as disbudding
- Worm monitoring and control
- External parasite control



28

LO: 4.1

29

Routine tasks

Adult Goats

- External parasite monitoring and control (e.g. mange and lice)
- Worm monitoring and control
- Foot/hoof monitoring and care



29

LO: 4.2

30

Housing and Care for Sheep and Goats

CODE OF PRACTICE FOR THE HOUSING AND CARE OF ANIMALS

Temperature and humidity
Ventilation
Stocking densities
Lighting
Noise
Feeding
Bedding



30

Home Office Code of Practice

1.2 Sheep and goats being used in procedures

Table 2-6-2 will replace table 1-6-1

Weight of animal (kg)	Minimum floor area for one or more animals (m ²)	Minimum floor area per group housed animal (m ²)	Minimum partition height (m) ¹	Minimum length of feed rack or trough per animal (m)	
				Ad libitum feeding	Restricted feeding
<20	2.0	1.3	1.0	0.35	0.35
20-35	2.0	1.3	1.2	0.35	0.35
35-60	2.8	1.9	1.2	0.35	0.40
>60	3.0	1.9	1.5	0.35	0.50

¹Minimum partition height applies only to goats. Due consideration should also be given to providing adequate partition for certain agile breeds of sheep.

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1.2.1 Introduction
All those animals are susceptible to respiratory infections and other zoonotic diseases, and housing conditions, including those of individual animals, should be such as to minimise the risk of such diseases. The following minimum standards should be applied to the housing of sheep and goats. These standards apply to all sheep and goats, whether they are used for production or as pets.

1.2.2 Requirements
The requirements of this section are intended to be applied in the conditions in which the animals are kept. The standards are intended to be applied to all sheep and goats, whether they are used for production or as pets. The standards are intended to be applied to all sheep and goats, whether they are used for production or as pets. The standards are intended to be applied to all sheep and goats, whether they are used for production or as pets.

HO advice on housing, ventilation, temperature, etc.

31

Housing - sheep

- Survive well outdoors – susceptible to heat stress
- As per HO advice, should be provided shelter and dry laying area in inclement weather.
- Social animals so should be kept in groups within sight and sound of each other
- Don't mix horned and polled sheep to minimise bullying
 - Horned sheep need more space to be housed together



32

Housing - goats

- Less hardy than sheep - dislike rain so should be provided with sheltered and dry laying area
- Social animals so need to group housed within sight and sound of each other
- Don't mix horned and polled goats to minimise bullying
 - Horned goats need more space to be housed together



33

Sheep feeding

- Strict herbivores – ad lib fodder needed
- When lambing – ewes need extra energy from cereal-based concentrates – care with copper concentration
- Winter feed – silage, hay, turnips, kale
- For indoor feeding – must have sufficient room to feed simultaneously
 - Placing feed (e.g. hay) in feeders with mesh or hanging bags promotes grazing
- Water ad lib – prefer flowing water over static tanks



34

Sheep Environmental Enrichment

- Difficult – flock animals so always keep in groups
- Ad lib fodder allows natural grazing behaviour
- Deep straw bedding allows foraging behaviour
- Enrichment balls tend to be of limited value in sheep
 - When single housing is required, mirrors, feeder toys, familiar safe scents or herbs in the enclosure as well as soft music may be of benefit.
- The provision of rock salt licks is both an enrichment and helps to prevent urolithiasis in males



35

Goat feeding

- Strict herbivores – ad lib fodder needed
- Very inquisitive and will eat anything at a height!
 - Feeders preferably kept at a height to promote browsing
- When kidding – does need extra energy from cereal based concentrates – care with copper concentration
- Fresh clean ad lib water



36

Goat Environmental Enrichment



- More inquisitive and independent than sheep
- Social animals so should be group housed
- Provision of ad lib roughage at head height allows natural browsing behaviour
- Provision of a raised area – goats are natural climbers
- Toys suspended from height – goats are inquisitive



37

Health status

Conventional Farm

- Most are unknown health status
- "high" health status is voluntary through schemes

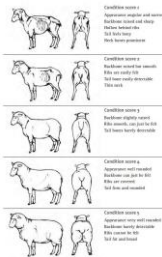
Animal Health checks (e.g. on arrival)

- History of illness
- Clinical examination should include:
 - body condition score
 - Appearance
 - Lameness
 - Breathing
 - Diarrhoea
- Laboratory tests - blood, faeces, skin scraping

38

Assessing Health: Sheep

Rectal Temperature 39.0 °C
 Respiratory rate 12-25 / minute
 Heart rate 60-120 / minute
 Blood volume 60ml/kg



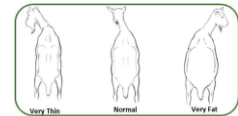
- Check limbs/feet
- Check eating/drinking/urinating/faeces
- Check weight or BCS
- Check skin
- Rectal examination if required

39

Assessing health: Goats

Rectal Temperature 39.5 °C
 Respiratory rate 15-30 / minute
 Heart rate 70-135 / minute
 Blood volume 60ml/kg

- Check limbs/feet
- Check eating/drinking/urinating/defaecating
- Check weight or BCS
- Check skin
- Rectal examination if required



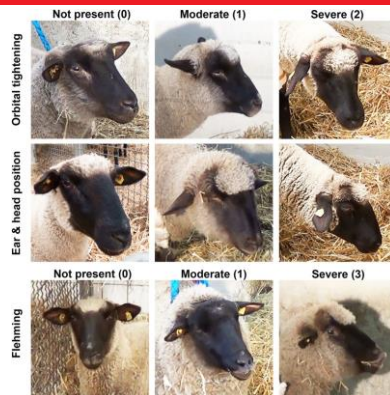
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Signs of pain – sheep and goats

- Prey species so will not often show signs of pain until disease is advanced
 - Reduced feed intake and rumination – **no chewing cud**.
 - Licking, rubbing or scratching painful areas.
 - Reluctance to move.
 - **Grinding their teeth** and curling their lips.
 - Altered social interactions.
 - Changes in posture to avoid moving or causing contact to a painful body area.
 - Sheep facial grimace



41



42

LO: 5.2

43

Signs indicating system affected

Respiratory - Coughing and sneezing, Ocular-nasal discharge, Raised temperature, Increased respiratory rate

Gastrointestinal – chronic weight loss, diarrhoea, dehydration, low temperature (common in calves)

Locomotor – lameness, feet abrasions, interdigital dermatitis

Nervous – tremor, head-tilt, circling, seizures



43

LO: 5.2

44

Mucous membranes

Colour

Pink	normal
Red	inflamed
White	anaemic
Yellow	jaundiced
Purple	septicaemic
Blue	cyanotic



44

LO: 5.2

45

Notifiable diseases - sheep

• A **notifiable disease** is any disease that is required by law to be reported to government authorities.

- REPORT TO DEFRA

• Examples:

- Anthrax
- Brucellosis
- Bluetongue
- Foot and Mouth disease
- Scrapie
- Scab (Scotland only)
- Tuberculosis (TB) – spillover host



45

LO: 5.2

46

Notifiable diseases - goats

• A **notifiable disease** is any disease that is required by law to be reported to government authorities.

- REPORT TO DEFRA

• Examples:

- Anthrax
- Bluetongue
- Foot and Mouth disease
- Goat pox
- Contagious agalactia
- Pest des petits ruminants
- Tuberculosis (TB)



46

LO: 5.2

47

Zoonotic Diseases

Diseases that spread between animals and humans

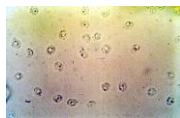
Skin: Orf

Abortion: Chlamydia, Toxoplasmosis (common)

Digestive: Cryptosporidia, Campylobacter, Salmonella, E coli O157

Respiratory: Tuberculosis (goats only)

Other: Leptospirosis



47

LO: 5.2

48

Common Ovine diseases

- Skin diseases – Orf, ectoparasites (lice, mites)
- Respiratory diseases – pasteurellosis,
- GI diseases – viral, bacterial, parasitic
- Reproductive – metritis, abortion, mastitis, twin lamb disease
- Neurological – tetanus, botulism
- Locomotor – foot rot (common), contagious ovine dermatitis



48

Common Caprine diseases

- Skin diseases – Orf, ectoparasites (lice, mites)
- Respiratory diseases – pasteurellosis,
- GI diseases – viral, bacterial, parasitic, MAP (Johne's)
- Reproductive – metritis, abortion (EAE, Toxo), mastitis
- Neurological – tetanus, botulism,



49

Disease prevention

Sheep Vaccines

Clostridial diseases – 10 diseases (tetanus etc.)

Pasteurellosis

Abortion agents (EAE and Toxoplasmosis)

Foot rot

Contagious pustular dermatitis (Orf)

50

Goat vaccinations

- Only 2 licences – Clostridium perfringens & Tetanus



51

Minor Procedures

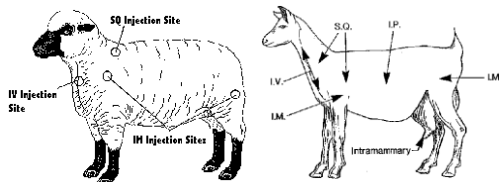
Administration of substances -

- Oral
- Subcutaneous
- Intramuscular
- Intravenous
- Intranasal
- Intraperitoneal



52

Injection sites



53

Minor Procedures

Jugular vein



Muscle injection sites



54

LO: 8.1 & 7.5

55

Needle selection:

- Influencing factors:
 - Age – young vs adult
 - Route of administration IM (longer) vs subcutaneous (shorter)
 - Viscosity of liquid to be injected – wider gauge needed for thick substances

Age	Gauge	Needle Length	
		Intramuscular injection	Subcutaneous injection
≤ 4 weeks old	20 to 22	½ inch	½ inch
4 to 16 weeks	20 to 22	5/8 to ¾ inch	½ inch
4 to 6 months	20 to 22	1 inch	½ inch
≥ 6 months	18 to 20 to 22	1 inch	½ inch

55

LO: 20.6

57

Local/regional anaesthesia

- Used in combination with sedation in sheep
- Goats (especially kids) very sensitive to local anaesthetic agents and overdose easy – not often used



57

LO: 20.5

59

Ruminants Pre-GA considerations



- Acclimatisation
- Health check (PiL responsibility)
- Fasting – controversial some recommend 24 hours to reduce the amount of gas produced
- Pre-medication – useful in ruminants
 - Diazepam, Midazolam, Acepromazine
 - Xylazine not recommended in Sheep and Goats due to a lower margin of safety and unpredictable results, as compared to cattle.

59

Anaesthesia in Small ruminants



56

LO: 20.11

58

Ruminants General Anaesthetic (GA) Risks



- Inhalation (aspiration) pneumonia - Regurgitation, salivation inhaled into lungs
- Bloat - Build up of rumen gases
- Impaired respiration - Weight of abdominal viscera on diaphragm
- Impaired venous return - Weight of abdominal viscera on Posterior Vena Cava

58

LO: 20.8

60

Anaesthesia agents

Sedation: Diazepam

Induction: Injectable generally advised

- Propofol
- Alfaxalone

Maintenance: volatile advised

- Isoflourane



Note ketamine + alpha 2 does not provide good surgical anaesthesia in ruminants so is best avoided.

60

61

Intra-operative considerations

- Positioning: flat, padded area, nose lower than body
- Ventilation – often used due to weight of rumen contents pressing on diaphragm
- Heat source
- Rumen tubes – release gas build up.
- Fluid support
- Monitoring – pulse oximetry, capnography, Blood pressure measurement

61

62

Analgesia

- Opioid
 - Not commonly used in ruminants as the effects vary and have a very short duration of action
- Non-steroidal anti-inflammatory drugs (NSAID's)
 - Flunixin (Finadyne solution)
 - Meloxicam (Metacam)
 - Ketoprofen (Ketofen)

62

LO: 1.12

63

Schedule 1 methods of killing

ALL UNGULATES (Sheep, Goats, Cattle, Pigs, Horses)

- 1) **Overdose of anaesthetic using a route and agent appropriate for the size and species of animal**
- 2) Destruction of the brain by a free bullet, **carried out by a veterinary surgeon**
- 3) Captive bolt, percussion or electrical stunning followed by destruction of the brain or exsanguination before return of consciousness, **carried out by a veterinary surgeon or licenced slaughter-man**

63

LO: 1.12

64

Confirmation of death

- 1) **Permanent cessation of the circulation**
- 2) Dislocation of the neck
- 3) **Exsanguination**
- 4) **Onset of rigor mortis**
- 5) Instantaneous destruction of the body in a macerator

65

64

Foetal or embryonic forms

The only Schedule 1 method for foetuses and embryos of ungulates is overdose of an anaesthetic, using a route and agent appropriate for the size and species of animal.

64

66

Any questions?



66