



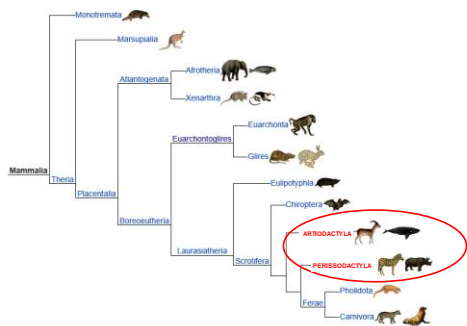
Home Office PIL A course Camelids

Chris Trower BVetMed DSHP DipECSRHM MRCVS

1

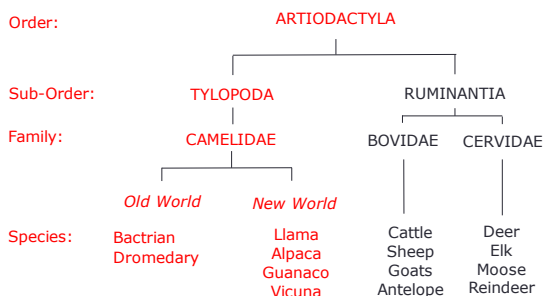
2

Camelids are Ungulates



3

Ungulates



4

Camelids

Camelids originated in North America, but migrated to South America, Africa and Asia around 2-3 million years ago.

The indigenous camelids in North America died out after the last ice age, along with horses and mammoths.

Camels were domesticated in Egypt and llamas and alpacas in South America, around 5,000 years BCE.

Camels and llamas were kept as pack animals, as well as for food and clothing.

Alpacas were kept primarily for fibre production in South America

5

Old World Camels

Dromedary (or Arabian)

94% of all camels are dromedaries

All dromedaries are domesticated

North Africa and central Asia (feral in Australia)



Bactrian

Only 6% of all camels

Found only in Central Asia.

Mostly domesticated, but a few in wild (may be a different species?)



6

LO: 3.1.1

7

Camels

Typically have humps, which act as an energy reservoir

Adapted to desert conditions - able to withstand heat and cold (-20°C to +30°C), and drought conditions.

Used as pack animals in Asia - on the "silk road" connecting Mediterranean through Persia to China

Imported into Australia in 19th century as pack animals

Released into wild in Australia in early 1900's and became feral

1 million in 2008 but culling reduced these to 300,000 by 2013

7

LO: 3.1.7

8

New World Camelids

Guanacos and vicunas are wild camelids found across South America

Vicunas (*Vicugna vicugna*)

Smallest and rarest of the SA Camelids

80% of vicunas live in Peru

Guanacos (*Lama guanicoe*)

Larger than vicunas

80% of guanacos live in Patagonia



8

LO: 3.1.1

9

New World Camelids

The Alpaca (*Lama pacos*)

Domesticated from the vicuna.

Male - Macho
Female - Hembra

Adults weigh 50-90 kgs

Huacaya

95% of all UK alpacas
Short, crimped "fluffy" fibres

Suri

5% of all UK alpacas
Longer, straight fibres in curly locks

Huacaya



Suri



9

LO: 3.1.7

10

New World Camelids

Llamas (*Lama glama*)

The largest of the SA camelids.

Believed to have originally been domesticated from the guanaco

Adults weigh 125- 200 kgs

Height to shoulder - 1.2 metres

May be multi-coloured

Life span 15-20 years



10

LO: 3.1.7

11

New World Camelids

Do not possess humps

Thin and very long-legged

Very long neck

10,000 alpacas in the UK

4,000 llamas in the UK

Both are used in research



11

12

Module 3.1

Basic and Appropriate Biology of Camelids

12

LO: 3.1.1 13

Anatomy

Camelids are not ruminants. They differ in the following respects:

- Do not possess horns or antlers
- Possess canine teeth on upper and lower jaws
- Split upper lip – each half moves independently
- Have a 3 compartment stomach
- Soft, leathery digital foot pads (toes)
- Toes possess nails, not hooves



13

LO: 3.1.1 14

Anatomy

- Covered in dense hair (fibre)
- No lanolin (cf sheep wool)
- Fused metacarpals and metatarsals
- Tolerate up to 25% loss of bodyweight due to loss of water
- Conserve water by concentrating urine and producing very dry faeces



14

LO: 3.1.1 15

Dentition

Incisors:	1/3
Canines:	1/1
Premolars:	2/2
Molars:	3/3



Difficult to inspect teeth as mouth doesn't open wide.

15

LO: 3.1.1 16

Dentition

Camelids have dental pads (like ruminants)

But possess canine teeth and also lateral incisors on the upper jaw, which are shaped like canine teeth (unlike ruminants)

Fighting Teeth

Canines and upper lateral incisors
Larger in males than females
All teeth are erupted by 6 years

Incisors are open-rooted and continually grow until around 8 years of age



16

LO: 3.1.1 17

Dentition

Incisor teeth

Molar teeth

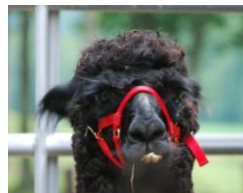


17

LO: 3.1.1 18

Dentition

Tooth abnormalities in camelids are common



18

LO: 3.1.1

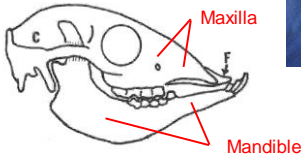
19

Prognathiaism Undershot (monkey mouth)

Prognathiaism is common

Mandible is **longer** than the maxilla

Teeth extend beyond the dental pad



19

LO: 3.1.1

20

Brachygnathiaism Overshot (parrot mouth)

Mandible is **shorter** than the maxilla

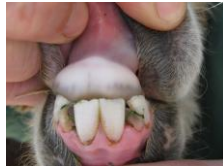
Incisor are 1/2" or more behind the dental pad



20

LO: 3.1.1

21



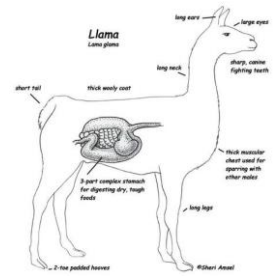
21

LO: 3.1.1

22

Digestive system

- Strict herbivores
- Fore-gut digesters
- Short tongue (cf. cattle)
- 3 chambered stomach
 - C-1 = rumen
 - C-2 = reticulum
 - C-3 = abomasum
- Chew the cud
- Very efficient grazers of rough pasture



22

LO: 4.10 & 3.1.1

23

Reproductive system

Females mature at around 12-18 months of age

Males mature slightly later (around 2 years of age)

May breed all year round, but usually in summer in UK

Do not exhibit oestrus, but are induced ovulators

Ovulation induced by penile penetration of vagina and cervix

Mate in a prone "kush" position (sternal recumbency)

Female will "spit-off" the male if not receptive

23

LO: 3.1.1

24

Reproductive system

- Gestation length of around 11½ months
- But can be anything from 320-380 days
- Only carry a single cria
- Ultrasound pregnancy diagnosis - from 60 days of gestation
- Conception highest if mated 20-30 days after parturition
- Embryo transfer and AI both possible



24

LO: 4.10 & 3.1.1

25

Biological data

	Alpaca	Llama
Adult weight (kgs)	50 - 90	120 -250
Adult height to withers (cms)	76 - 100	150 - 180
Life span (years)	15 - 20	15 - 20
Gestation (days)	320-380 (average 342)	
Birth weight of cria (kgs)	6 - 9	10 -14
Rectal Temperature	38.5 - 39.5°C	
Respiratory rate (breaths/minute)	10-30	
Heart rate (beats/minute)	60-90	

25

Module 4

Animal Care, Health and Management



26

LO: 4.2

27

Environmental conditions

(Ventilation, Temperature, Humidity, Lighting, Noise)

- SA camelids are normally kept outdoors throughout the year in the UK
- They can survive in sub-zero temperatures, but should be provided with shelter from rain and sun
- Can suffer from heat stress if unshorn
- May become recumbent, with panting and colic signs
- Provide shade and water for cooling (pond). Showers are not effective, as coat too thick for water to penetrate

27

LO: 4.2

28

Housing

- Camelids are herd animals with a distinct social hierarchy
- Need social and visual interaction with other animals
- Don't house singly, unless entire males.
- Don't overcrowd - need space to avoid dominant animals
- No HO guidelines on stocking densities for camelids
- Outdoors - fencing needs to be 5-6 feet high
- Indoors - allow plenty of headroom to rear up.

28

LO: 4.1

29

Enrichment

- The provision of rock salt licks is both an enrichment and helps to prevent urolithiasis in males
- Toys and playthings can work for young camelids, but adults may soon tire
- Deep straw bedding provides comfort, drainage and allows natural foraging behaviour
- Sand for bedding or cattle "comfort mats" are also suitable for indoor resting areas



29

LO: 4.6

30

Feeding

- Camelids need fodder with a high fibre content for normal digestion and metabolism.
- Long fibre better than chopped fibre (i.e. hay or silage)
- Rough grazing is better than lush grazing
- Grass that is too rich can lead to metabolic imbalances, indigestion, and the development of behavioural disorders.
- Camelids with ad-lib access to hay/pasture do not usually develop these stereotypes.

30

LO: 4.6

31

Estimated daily requirements of roughage for camelids

Body weight (kgs)	Ryegrass hay		Lucerne (Alfalfa) hay		Maize silage	
	(as fed)	(dry matter)	(as fed)	(dry matter)	(as fed)	(dry matter)
10	0.4	0.3	0.2	0.15	0.7	0.2
20	0.6	0.5	0.4	0.3	1.2	0.4
40	1.0	0.8	0.7	0.6	2.0	0.8
50	1.2	1.0	0.8	0.7	2.4	1.0
75	1.6	1.3	1.0	0.9	3.1	1.1
125	2.2	1.8	1.5	1.4	4.6	1.4
175	3.0	2.6	2.0	1.75	5.9	1.7
225	3.5	3.2	2.4	2.2	7.2	2.0
250	4.0	3.5	2.6	2.4	7.7	2.3

31

LO: 7.1 & 4.7

33

Handling

- May suffer from heat stress if chased around for too long
- Best to gather the whole herd into a compound and then separate the animal/s required
- May use a race or a crush (chute)
- Not usually a job for a single person



33

LO: 4.6

32

Feeding

- Camelids can live on grass alone (hay in winter)
- Concentrate feeds can lead to obesity unless restricted
- However, supplement with concentrates if young or pregnant
- Use sheep nuts, or "Camelibra" (with added Vitamin D)
- High mineral contents in Andes vegetation. May need to supplement with minerals to prevent deficiencies in UK
- Make sure animals have sufficient room to all eat at the same time
- Clean water must always be available

32

LO: 7.1 & 4.7

34

Handling

- Additional restraint may be given by gently squeezing an ear – acts as a "twitch"
- Animals may sink to their knees ("kush") at any time
- Make sure you can rapidly release the head if this happens in a crush
- Use support straps under belly to prevent "kushing"



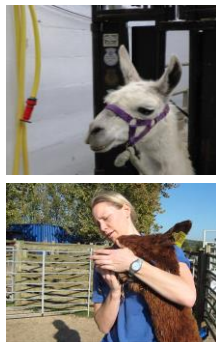
34

LO: 7.1 & 4.7

35

Handling

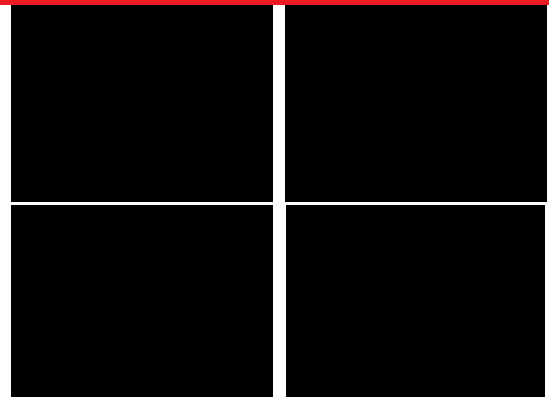
- Most camelids can be trained to a halter
- Some llamas may need sedation before they can be safely handled
- Llamas and alpacas can "spit" and kick at handler
- Often will adopt the kush position but may suddenly spring up to try and escape



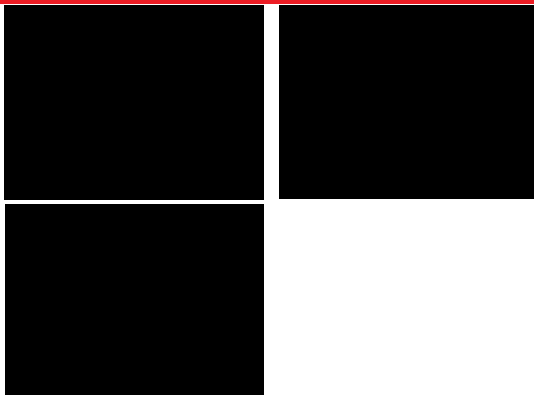
35

LO: 7.1 & 4.7

36



36



37

Health

Camelids are NOT listed in Schedule 2
"Buyer Beware"

- 1) Clinical examination for:
 - appearance - limb deformities
 - dentition
 - tooth abscess
 - fleece
 - body condition score
- 3) Laboratory tests:
 - blood sample
 - faecal sample
 - skin scraping



38

Body Condition Scoring

- Feel over the lumbar region and around the pelvis and ribs
- CS1 (emaciated) – CS5 (obese)
- Record the scores for future reference
- Condition scoring is an essential tool for assessing body condition
- Needs regular practice to achieve consistency



39

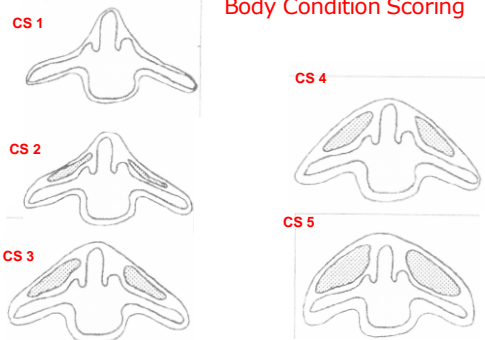
Body Condition Scoring

Score	Animal Description	Frontal Profile	Rear Profile	Spines to Transverse Process	Paraspinal Fossa
Emaciated 1.0	No visible or palpable fat in muscle between skin and bones. Ribs, dorsal spines and transverse processes, and pelvic bones are readily prominent. Extreme loss of muscle mass.	Protrusion of fat	Acutely tapered	Deep depression	Deep depression
Poor 1.5					
Thin 2.0	Slight cover over bony structures. Ribs, spine processes still visible and easily palpated as sharp, fine muscle mass loss.		Graded lifting of fat		Shallow depth
Borderline 2.5					
Moderate 3.0	Overall smooth appearance. Slight fat cover over ribs and other bony processes. Ribs and spine processes not so prominent as thin process. No muscle mass loss present.			Smooth curve	Shall depth
High Moderate 3.5		Moderate fat	Moderate fat		
Excess 4.0	Fleecy appearance with visible coverage of fat. Moderate to firm pressure necessary to palpate bony structures under skin.			Smooth edge	No chaff
Fat 4.5				Sharply fat	Ear hanks identifiable
Grossly Obese 5.0	Excessive fat cover over entire body with smooth, rounded appearance. Heavy pressure is needed to palpate, even with firm pressure. Bludging the point visible around tailhead.	Stagnant	Stagnant fine bulging fat	Rounded	Rounded edge

Adapted from Edrington et al., JER 1999;2109 and Hanel, A. Body condition scoring sheep. *Sheep and Goat Practice* 1991.

40

Body Condition Scoring



41

Shearing

- Alpacas should be shorn annually
- Usually in early summer (May)
- Fibre is very fine and valuable for clothing
- Vicuna fibre reserved for Inca kings
- Llama fibre coarser and less valuable
- Shear to prevent overheating during the summer in UK



42

Foot Care

- Overgrowth of toenails is common
- May need to be trimmed regularly



43

Infectious Diseases

- Bacterial** Clostridial – tetanus and enterotoxaemias
Bovine Tuberculosis – M.bovis
Johnes disease (M. avium paratuberculosis)
Caseous lymphadenitis
Enzootic Abortion of Ewes (EAE)
- Viral** Bovine Viral Diarrhoea and Border Disease
- Fungal** Ringworm

44

Internal Parasites

- Nematodes** - Roundworms
- Trematodes** - Liver fluke
- Cestodes** - Tapeworms
- Protozoa** - Coccidia and Toxoplasma



Camelids harbour the same species of internal parasites as sheep, so take care when cross-grazing with these.

Camelids with parasites are less likely to scour than sheep, as they are very efficient at resorbing water in the large intestine.

45

External Parasites

- Mange**
Due to Sarcoptes, Psoroptes or Chorioptes mites
- Lice**
Biting and sucking lice
- Ticks**
- Nasal bots**



46

Other Camelid Conditions

- Stomach ulcers (found in C3)
- Tooth root abscessation (usually aged 2-5 years)
- Ricketts (Vitamin D deficiency) from lack of sunlight in young
- Trace element deficiencies –may need mineral supplements if only fed home-grown roughage



47

Aids to diagnosis

- Ultrasound scanning
- Laboratory examination
 - Faeces
 - Blood
 - Milk
 - Other tissues (urine/hair)



48

LO: 5.2

49

Vaccination

Clostridial diseases

Ubiquitous environmental bacteria that cause fatal diseases such as tetanus, enterotoxaemias, blackleg and gas-gangrene

It is essential that all camelids are vaccinated against clostridia

Use a 4 in 1, 7 in 1 or 10 in 1 sheep vaccine

Primary course - 2 doses, 4-6 weeks apart from 8 weeks

Boosters - Annually

49

LO: 5.2

51

Methods of assessing pain

Objective methods

Measure

- Physiological stress responses (eg, plasma cortisol levels)
- Changes in levels of biochemical markers (eg, acute phase proteins)
- Changes in temperature, respiration and heart rate
- Clearly defined patterns of behaviour (vocalisation).

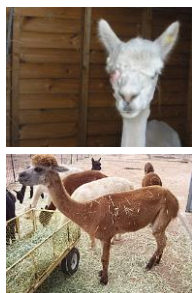
51

LO: 5.2

53

Recognition of pain in camelids

- Camelids can tolerate severe injury without necessarily showing overt signs of pain or distress.
- When ill, they usually become isolated from the herd
- Reduced eating and drinking, and decreased "cudding".
- They may grunt, but generally don't grind their teeth
- Don't usually vocalise



53

50

Module 5

Recognition of Pain, Suffering and Distress

50

LO: 5.2

52

Methods of assessing pain

Subjective methods

These are value judgements. They require the evaluation of behaviour, posture and other clinical signs.

- May grade the level of pain (0 to 10).
- But these judgements are open to operator variability
- Become more repeatable and reliable with appropriate experience and training.
- Must have a consistent approach to pain assessment.

52

LO: 5.2

54

Recognition of pain in camelids

There may also be changes in:

- posture (guarding abdomen or change posture frequently)
- movement (lying down, reluctance to move, lameness)
- facial expression – increased lip-curling (**grimace scale**)
- ear position (down)
- breathing (rapid and shallow)
- behaviour (increased agitation)

54

Module 7

Minimally Invasive Procedures Without Anaesthesia

55

LO: 8.1

Administration of substances

- Oral
- Subcutaneous
- Intramuscular
- Intravenous



56

LO: 7.5

Oral dosing

Camelids cannot open mouth very wide

May need to use a mouth gag

Tongue is short and difficult to examine

Do not possess a large dorsum to tongue

May use a syringe or drench gun



57

LO: 7.5

Subcutaneous injections

Under the skin of the lower neck or
over the thoracic wall

19 gauge 1 inch needle

58

LO: 7.5

Intramuscular injections

Give into the semimembranosus, semitendinosus or
triceps muscles

May be painful – restricted to small volumes

Use a 19 gauge, 1 inch needle in adult alpacas

Use a 19 gauge 1.5 inch needle in adult llamas

59

LO: 7.5

Intra-venous injections

Long necks but no jugular groove as
in ruminants, due to lack of muscle

Jugular vein not usually visible

Venepuncture more difficult than in
cattle and sheep and there is a
greater risk of complications

Use an 18-19 gauge, 1 inch needle
for adults

Insert needle at 45-60° angle



60

LO: 7.5

61

Intra-venous injections

High venepuncture (upper 1/3 of neck)

Skin thinner,
Vein more superficial
Separated from the carotid artery



Low venepuncture (lower 1/3 of neck)

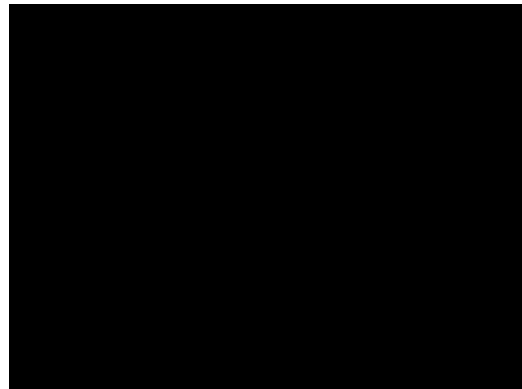
Vein larger
Site easier to palpate
Vein runs close to carotid artery



61

LO: 7.5

62

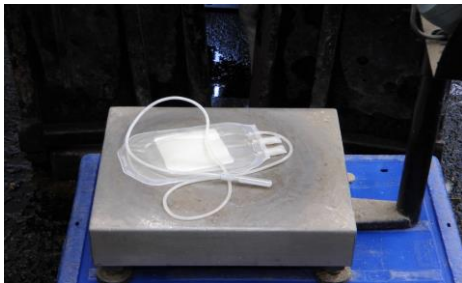


62

LO: 7.5

63

Collection of Blood



63

Sedation, Analgesia Local and General Anaesthesia in Camelids

64

LO: 20.1

65

Sedation

1) Xylazine, (also Medetomidine, Detomidine and Romifidine)

Powerful sedatives in camelids

Alpacas less susceptible than llamas

Also has some analgesic properties

Good muscle relaxation

Dose related effect - will cause recumbence at higher doses

Prolonged recovery at high doses, but antagonist available



65

LO: 20.1

66

Sedation

2) Other sedatives

Butorphenol (Torbugesic)

Safe sedation without recumbancy

Diazepam (Valium)

Safe but effects can be variable

Acepromazine

Safe but may cause recumbency at high doses

66

LO: 20.12

67

Analgesia

1) Non-steroidal anti-inflammatories (NSAIDs)

Flunixin	-	Finadyne
Meloxicam	-	Metacam
Carprofen	-	Rimadyl
Ketoprofen	-	Ketofen



67

LO: 20.12

68

Analgesia

2) Opioids

Buprenorphine – Vetergesic (CD)

Butorphanol – Torbugesic

Both are good for moderate to severe pain



68

LO: 20.1

69

General Anaesthesia

Pre-anaesthetic management

Adults

Withhold food for 12-18 hours

No need to withhold water

Do not starve crias

Approximately 25% will regurgitate despite fasting
Place in sternal recumbence (or right lateral)

69

LO: 20.1

70

General Anaesthesia

Induction

- 1) Ketamine and Xylazine mixture (+ Butorphanol?)
- 2) Propofol i/v
- 3) Alfaxalone i/v

70

LO: 20.1

71

General Anaesthesia

Maintenance

Isoflurane

Camelids should be intubated for any anaesthesia lasting longer than 5 minutes.

However, intubation is difficult in camelids

Need a long ET tube.

71

LO: 20.6

72

Anaesthetic risks

Inhalation pneumonia: Regurgitation
Salivation

Bloat: Not normally seen

Impaired respiration: Weight of abdominal viscera on the diaphragm

Impaired venous return: Weight of abdominal viscera on the posterior vena cava

72

LO: 6.1.2

73

Schedule 1 methods of killing

ALL UNGULATES (Camelids, Ruminants, Pigs and 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 a licenced slaughter-person**

73

LO: 6.1.2

75

Confirmation of death

- 1) Permanent cessation of the circulation
- 2) Exsanguination
- 3) Onset of rigor mortis

Dislocation of the neck and instantaneous destruction of the body in a macerator are not applicable methods of confirming death in ungulates

75

LO: 6.1.2

74

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.

74

LO: 6.1.2

76

Further Reading

- 1) Hoffman E - The Complete Alpaca Book
ISBN 0-9721242-1-7
- 2) Bromage G - Llamas and Alpacas - A guide to management
ISBN 978 1 86126 884 6
- 3) Birutta G - Storey's Guide to Raising Llamas
ISBN 978 1 58017 328 5
- 4) Fowler M - Medicine and Surgery of South American Camelids
ISBN 0 8138 0393 4
- 5) British Alpaca Society www.bas-uk.com
- 6) British Llama Society www.britishllamasociety.org

76