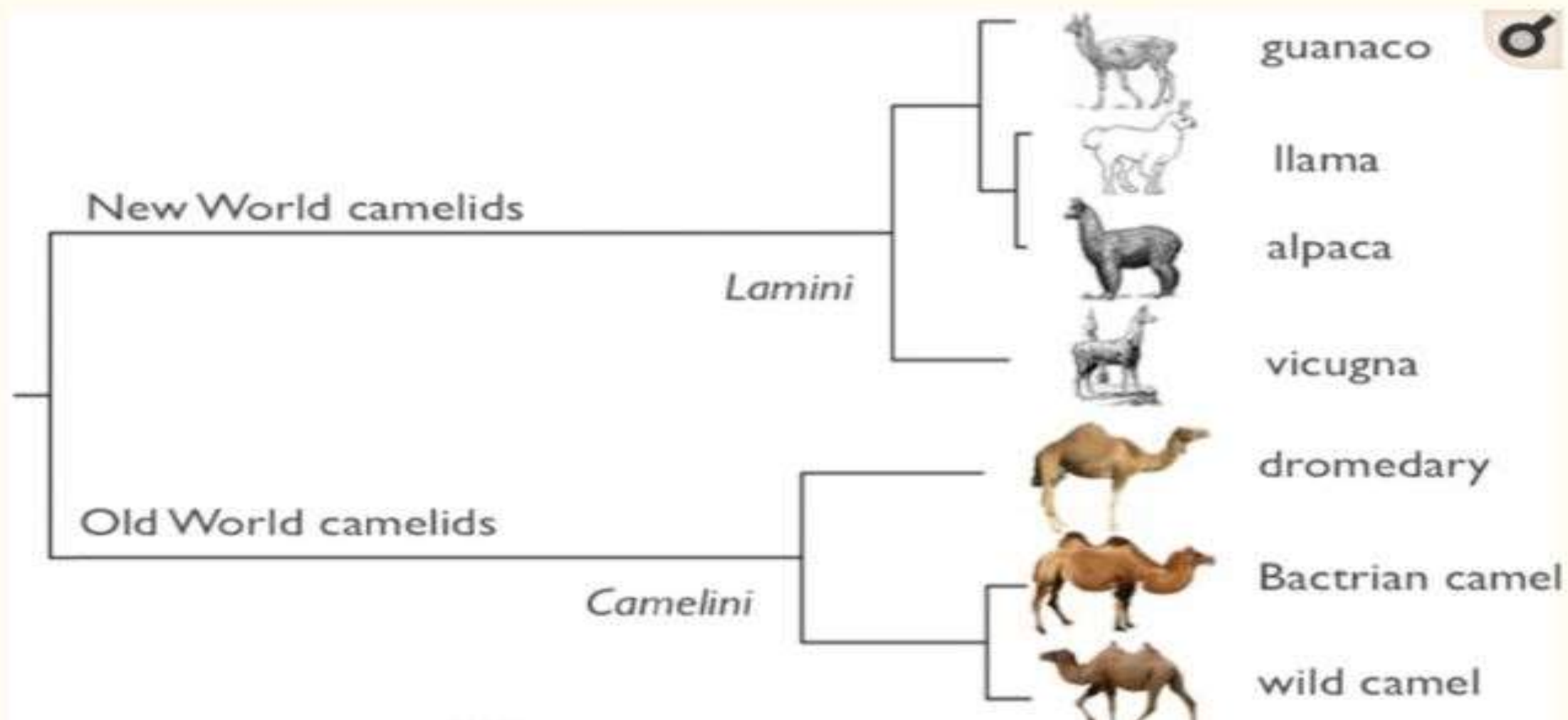




Camel Reproduction and Infertility

Prof G N Purohit



Camelus

Bactrian camel (<i>Camelus bactrianus</i>)		Central Asia (entirely domesticated)	300 to 1,000 kg (660 to 2,200 lb)
Wild Bactrian camel (<i>Camelus ferus</i>)		Central Asia (entirely wild)	300 to 820 kg (660 to 1,800 lb)
Dromedary or Arabian camel (<i>Camelus dromedarius</i>)		South Asia and Middle East (entirely domesticated)	300 to 600 kg (660 to 1,320 lb)

Lama

Llama <i>(Lama glama)</i>		(domestic form of guanaco)	130 to 200 kg (290 to 440 lb)
Guanaco <i>(Lama guanicoe)</i>		South America	c. 90 kg (200 lb)
<i>Vicugna</i>			
Alpaca <i>(Vicugna pacos)</i>		(domestic form of vicuña)	48 to 84 kg (106 to 185 lb)
Vicuña <i>(Vicugna vicugna)</i>		South American Andes	35 to 65 kg (77 to 143 lb)



South American camelids



Reproductive anatomy of female camels

- **Ovaries**
- Dorsoventrally flattened in adults
- Slightly convex in camel heifers
- Suspended by mesovarium
- Enclosed in the ovarian bursa
- Weight 2-5 g
- Length 2.5-6 cm





009 FRT Camel 2011



Cyclic CL absent in non-mated camels

Anovulatory follicles (hemorrhagic) 25-90 mm in non-bred females

CL formation 24-48 h after mating-slow development and early death (6-9 days)

Regression 8-12 days following infertile mating

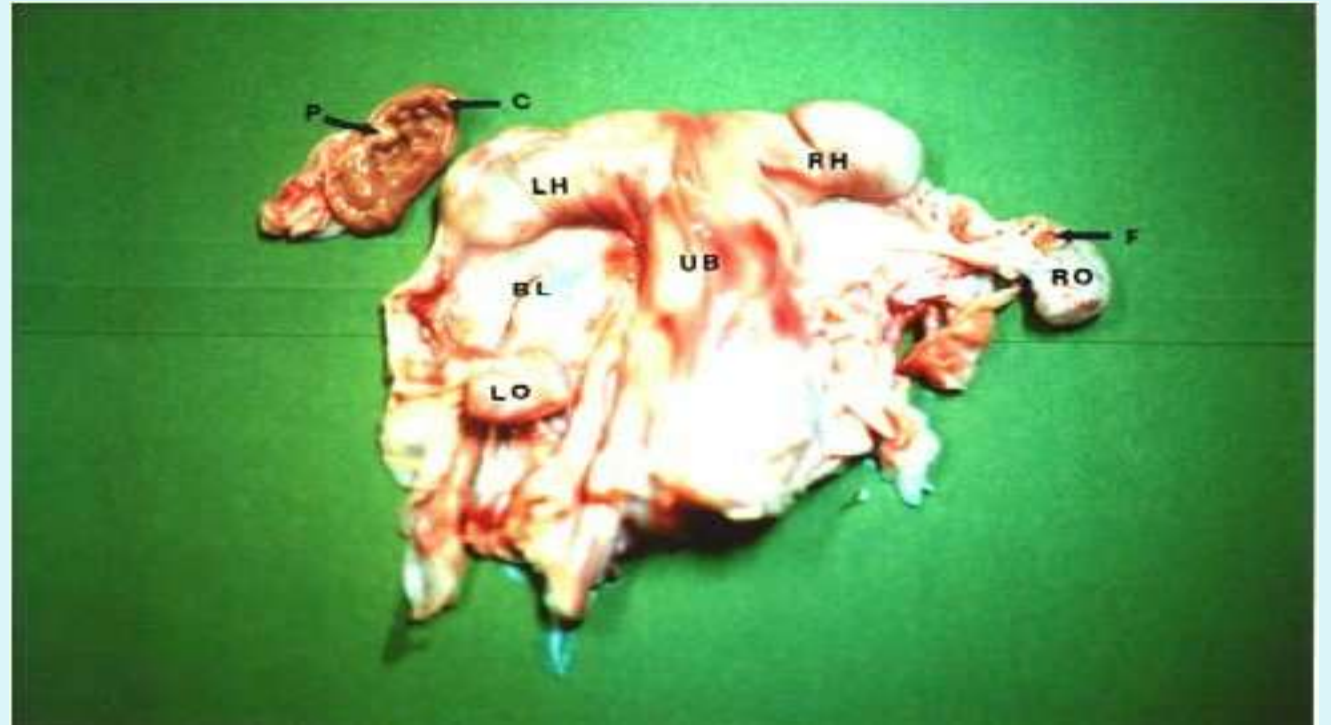
Follicles ovulate from 9 mm- 20mm

Large anovulatory follicles (25-90 mm) present on ovary in 30-50% non bred females



Oviduct

- Uterine end (Isthmus is well developed)
- Long and tortuous
- 17-22 cm long



Uterus

- T or Y shaped Left uterine horn longer
- Bicornuate
- Present at the brim of pelvic cavity
- Left horn longer in pluriparous females but of equal size in primipara

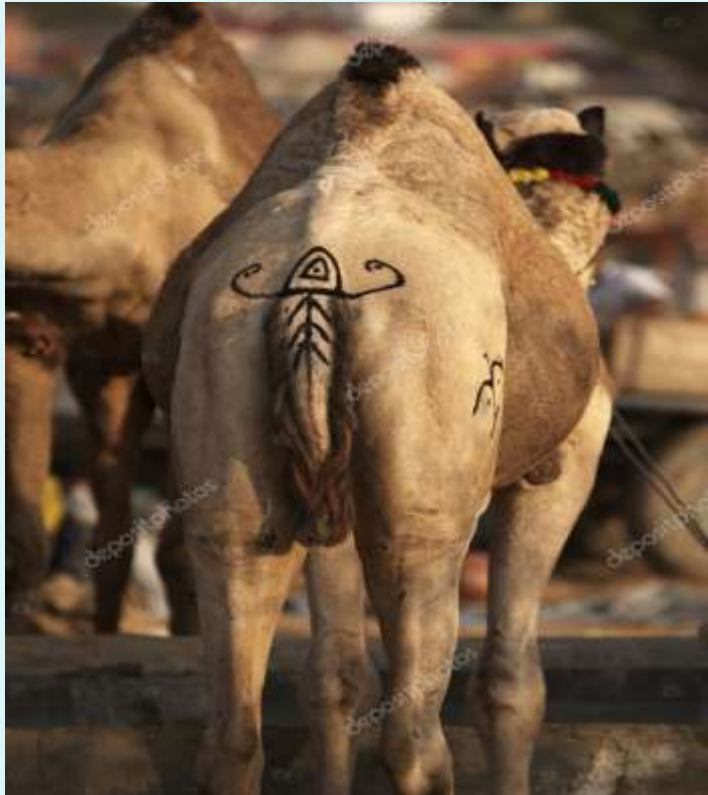


Cervix

- Soft with longitudinal folds 3 or 4 in number
- Consistency of cervix does not differ with that of the uterus which makes it difficult to identify by rectal palpation
- Cervix projects caudally in the vaginal cavity forming a fornix (1-1.5 cm)

Cervical canal presents longitudinal folds which extend on annular muscular projections and form the cervical rings

The external cervical orifice is surrounded by 1-2 circular indented rings of the cranial part of the mucosa of the vagina



Vagina

- Long 30 cm 2 vestibular glands on the lateral walls
- Contains many longitudinal folds
- Vulva opens below the anus, clitoris is small
- 4 teats in mammary glands
- Extra fetal membrane- epidermal membrane 1-2 mm thick attached to fetus at lips, nostrils, anus, vulva, prepuce, foot pad and umbilicus

Camels are seasonally polyestrus

- Puberty 3-4 years around 400 Kg weight

Breeding seasons

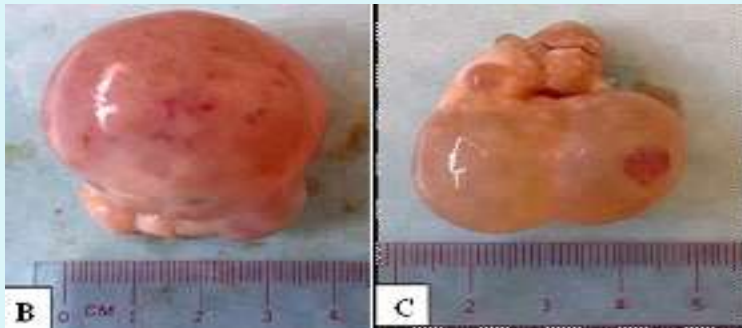
Location	Breeding season
Egypt	Dec – May
India	Nov – March
Pakistan	Dec – March
Kenya	Continuous
Somalia	May – June, Oct - Dec
Saudi Arabia	Dec – March
Sudan	March – Aug
Uniter Arab Emirates	Nov - April

Follicular dynamics

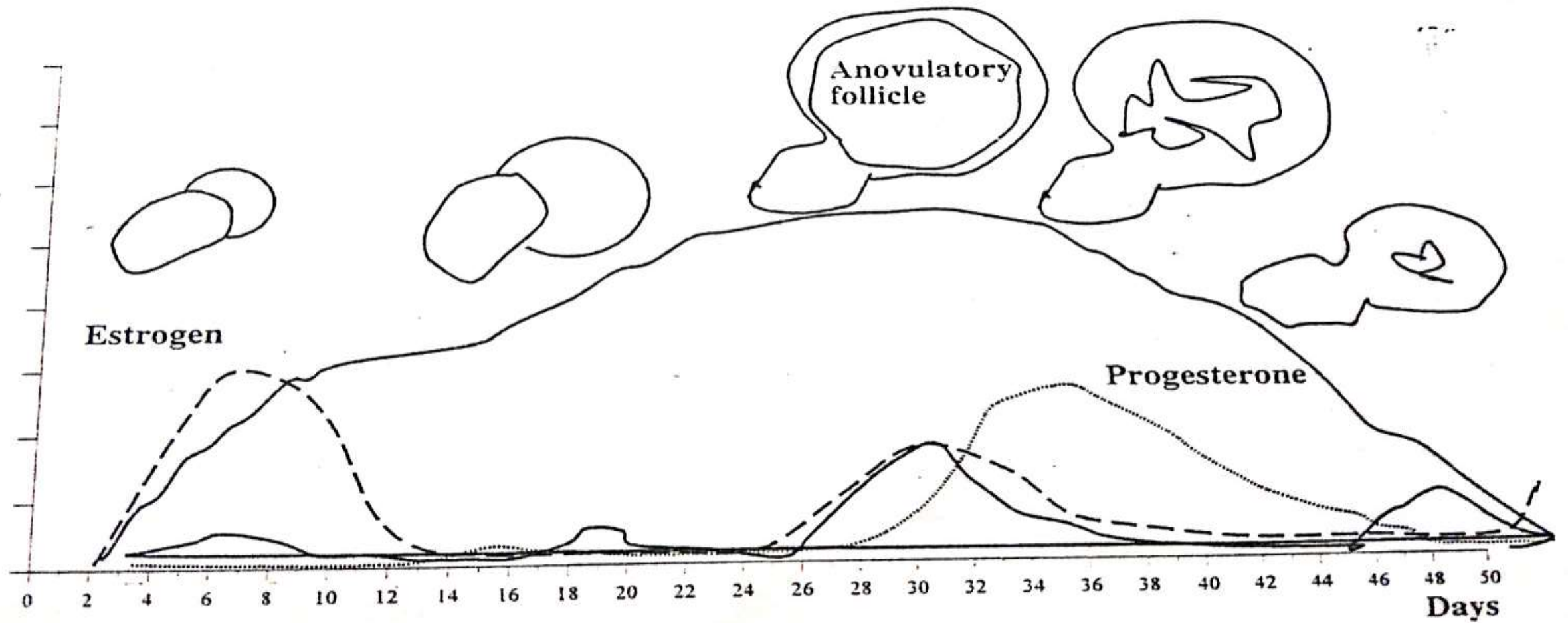
- Follicular growth during breeding season
- Follicular growth continuous during season
- Follicular activity continues in presence of an active CL
- USG findings suggest
 - Growth phase 10 days
 - Mature phase 7-8 days
 - Regression phase 12 days

- Follicular growth depends on mating
- No luteal phase in non-mated camels
- In mated non-pregnant camels luteal phase is short 6-9 days
- Follicular recruitment 2-4 days, growth 10-12 days and dominance at 6mm
- Follicles ovulate at 9-10 mm
- No follicle above 2-2.5 cm ovulates

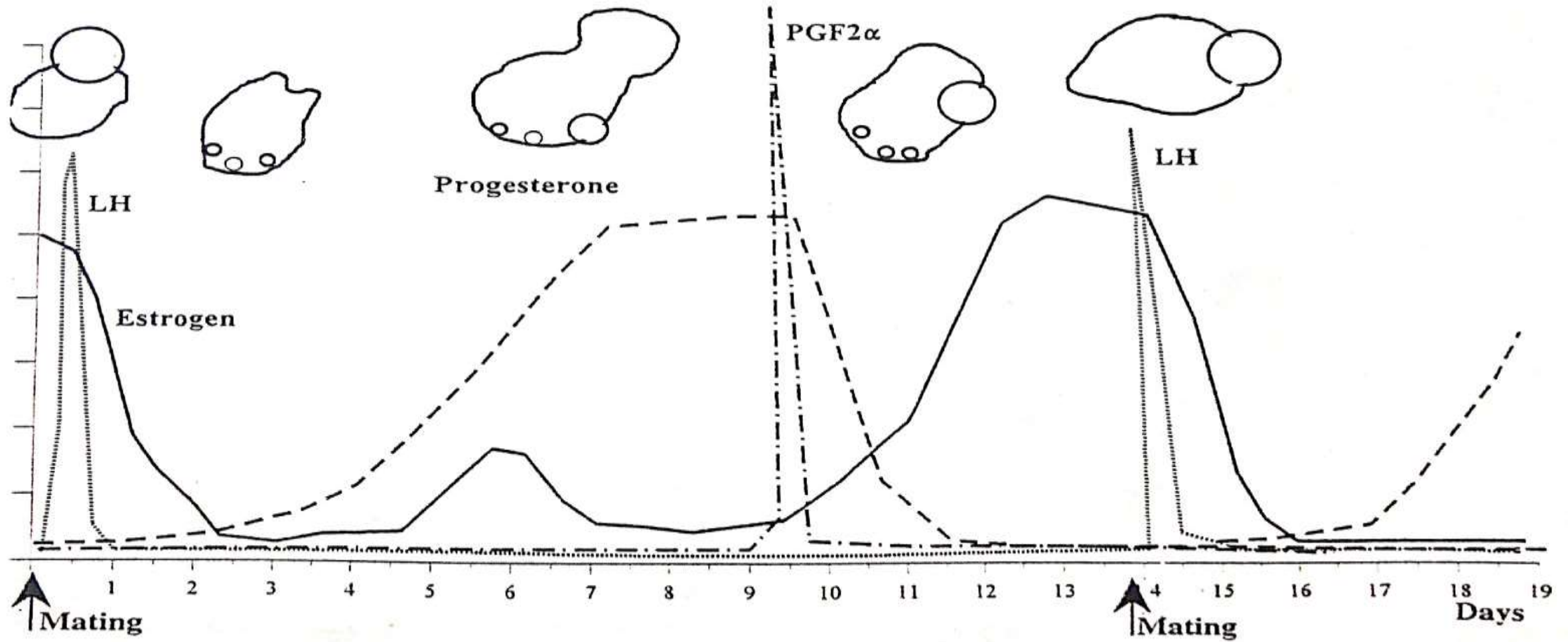
- Fate of dominant follicle in absence of mating is anovulatory follicle which may become hemorrhagic and may persists for many days and regresses in 4-18 days
- Follicular growth can occur in presence of a anovulatory follicle



Non-Mated camels



Mated camels

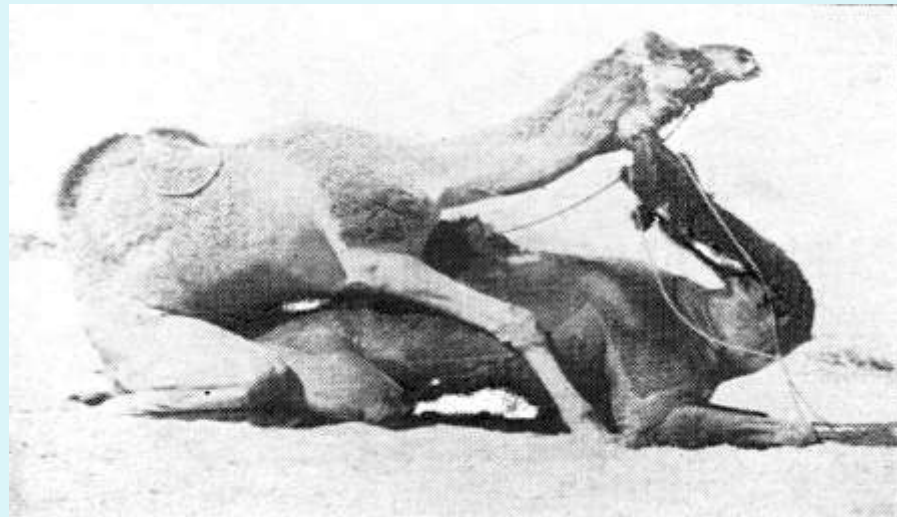
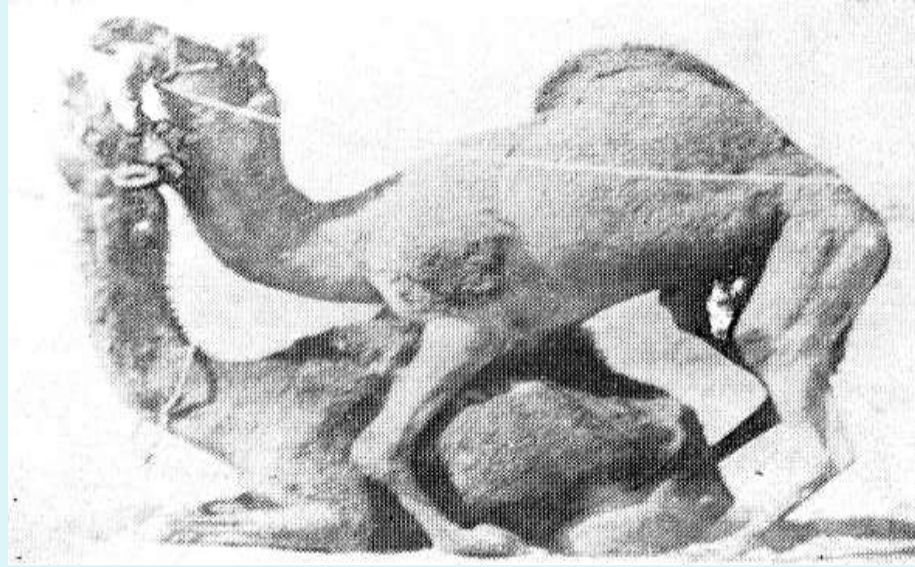
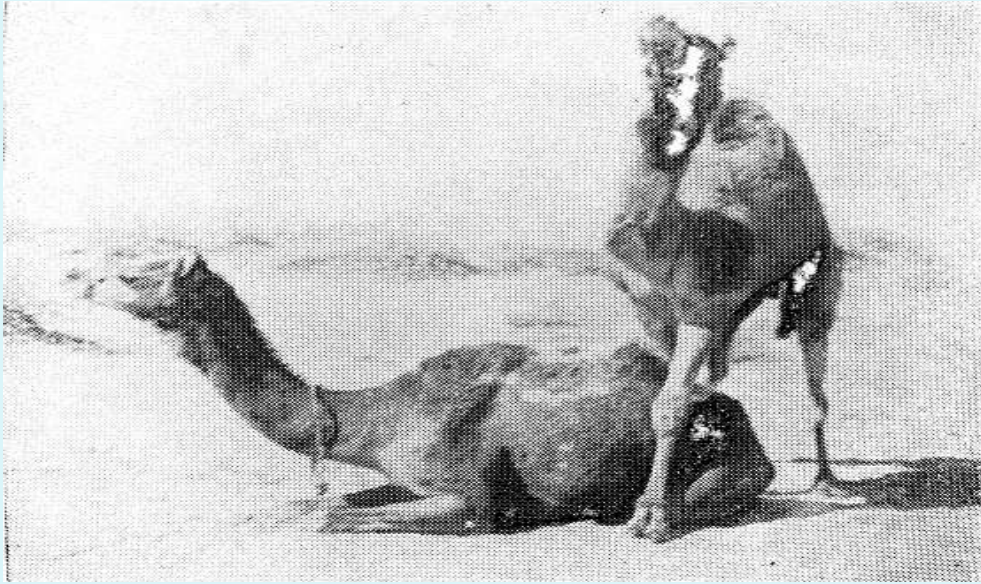


Estrus signs Strong in 55-60%

- Chasing other females
- Swelling of vulva
- Receptivity towards a male
- Restlessness, bleating
- Up and down movement of tail on approach of male and spraying of urine using the tail
- Kneels down in front of a male camel



Estrus and Mating





- Hand mating was reported to be the predominant mating method practiced
- The mean ratio of camel cows to a camel bull during the mating season was 47.8 cows per bull (Table 2). Mean length of mating was 26.3 minutes

Ovulation

- Induced in response to mating occurs 24-30 h after mating
- Size of ovulatory follicle 8-20 mm
- Follicle grows to ovulatory size in 6 days
- Inter-estrus intervals in non-pregnant mated camels is 13-14 days
- Estrogen peaks at estrus and progesterone rises after mating and peaks 6 days later

- Embryo descends in uterus at Day 6-7 of mating
- Embryo elongates at Day 9-10
- Implantation not known clearly Day 20
- Exclusive left uterine horn pregnancy
- Migration of embryos Day 15-18 post breeding
- Difference in the luteolytic properties of PG from left and right uterine horns
- Gestation 315-440 days
- Twins rare

Pregnancy diagnosis

A pregnant camel will show it by lifting and curving her tail (tail “cocking”) when a male camel advances toward her. First seen at 16-17 days of gestation



Transrectal palpation

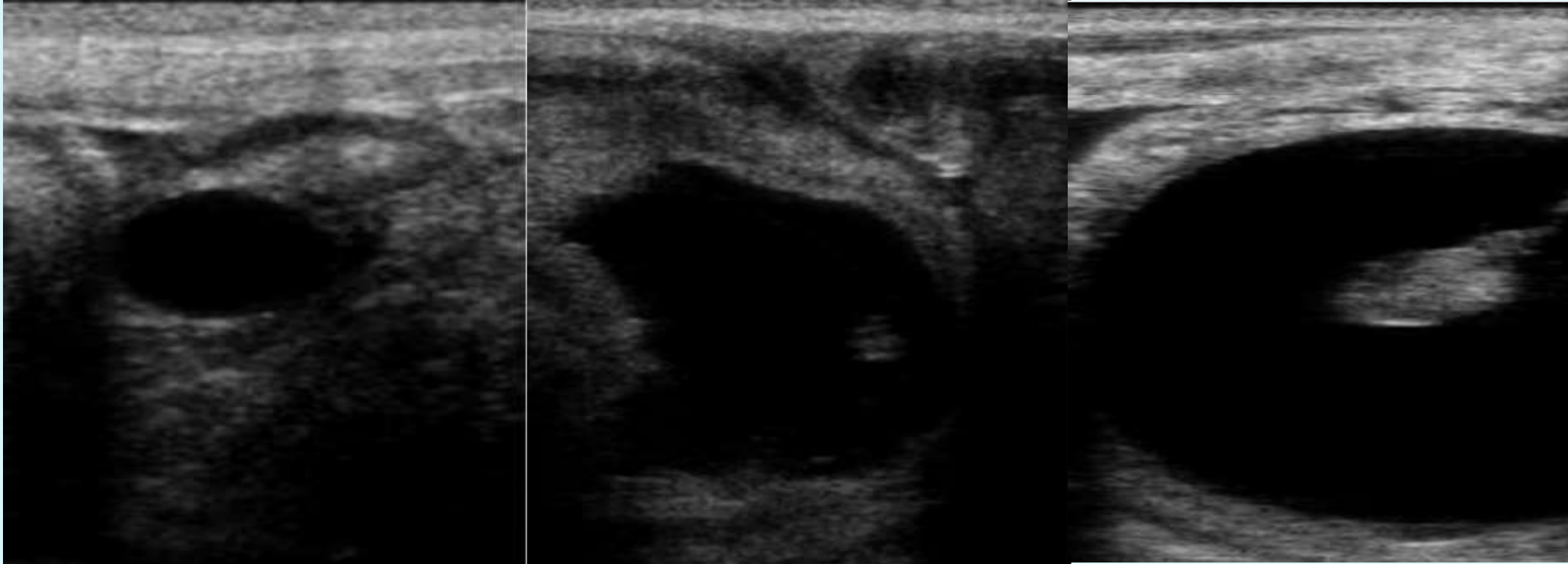
- Sitting
- Examination of camels
- Xylazine 0.5-2.0 mg/Kg IV
- Loss of lower lip tone



Transrectal Ultrasonography



Ultrasonography



Artificial Insemination in Camel

- Semen collection in sitting position tried using different methods, AV (with different liners), electro-ejaculation, female camel or artificial dummy for mounting.
- Artificial Vagina with rubber liners similar to bull, mounting over female camel in sitting position – better result.





Embryo transfer in camel

Arab World

- Yagil et al
- Skidmore et al.
- Mckinnon et al. (Tinson)
- Anouassi et al
- Wani et al.
- Nagy et al.

India

- Vyas et al

Superovulatory Protocol

Donors under induced Luteal phase

Day 0: hCG 3000 i.u.

Day 6/8: FSH-P (10 doses)

or Super-OV (8 doses)

Mating: 36, 48 & 60 h after last FSH

Recipients

Day 13/14: hCG 3000 i.u.

Non-Surgical Embryo Flushing

Day 7 or 8 after first mating

Sitting posture on inclined plane

18-gauge, 63 cm, flexible two-way Foley balloon catheter (equine)

Both horns are flushed simultaneously

1700-1800 ml DPBS

EmCon embryo filter, stereozoom microscope.

INFERTILITY

Table 1

Clinical findings in female camels examined for repeat breeding with regular heat interval (RB-R, n = 5444), refused mating (RM, n = 1299), repeat breeding with long heat interval (RB-L, n = 489), and difficulty or bleeding at mating (DM, n = 53).

Clinical findings	RB-R	RM	RB-L	DM	Total
	n (%)				
Clinical endometritis	1890 (34.7)	217 (16.7)	152 (31.1)	—	2259 (31)
Ovarian hydrobursitis	1650 (30.3)	140 (10.8)	245 (50.1)	—	2035 (27.9)
Vaginal adhesion	701 (12.9)	310 (23.9)	6 (1.2)	34 (64.2)	1051 (14.4)
Cervical stenosis	269 (4.9)	233 (17.9)	28 (5.7)	—	530 (7.3)
Cervical adhesion	270 (5)	214 (16.5)	5 (1)	—	489 (6.7)
Apparently normal genitalia	321 (5.9)	43 (3.3)	20 (4.1)	—	384 (5.3)
Unovulatory follicles	159 (2.9)	21 (1.6)	—	—	180 (2.5)
Inactive ovaries	50 (0.9)	85 (6.5)	—	—	135 (1.9)
Hydrosalpinx	87 (1.6)	6 (0.5)	33 (6.8)	—	126 (1.7)
Uterine adhesion	31 (0.6)	30 (2.3)	—	—	61 (0.8)
Pneumovagina	16 (0.3)	—	—	—	16 (0.2)
Persistent hymen	—	—	—	12 (22.6)	12 (0.2)
Vulvar atresia	—	—	—	5 (9.4)	5 (0.07)
Pelvic abscess	—	—	—	2 (3.8)	2 (0.03)
Total	5444	1299	489	53	7285

Repeat Breeding Syndrome

- Fertilization rates 80-85%
- A “repeat breeder syndrome” is generally defined as any camel that failed to conceive after at least three regular spaced services, with no clinical abnormalities.
- Causes
 - Improper breeding management
 - Ovulation failures
 - Inability to complete mating

- Ovarian cysts
- Early embryonic deaths
- Clinical endometritis-Barren multiparous females
- Ovarian hydrobursitis
- Vaginal septa
- Persistent hymen
- Vaginal adhesions



Vaginal affections

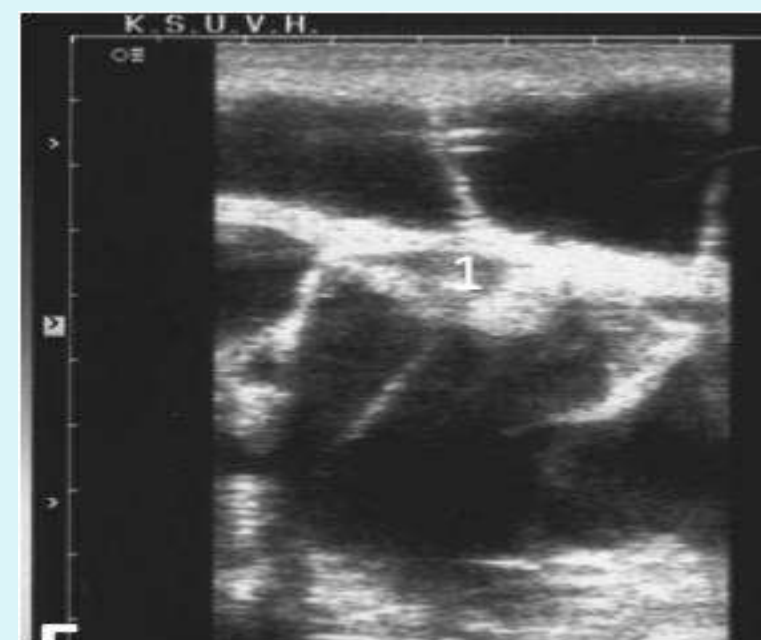
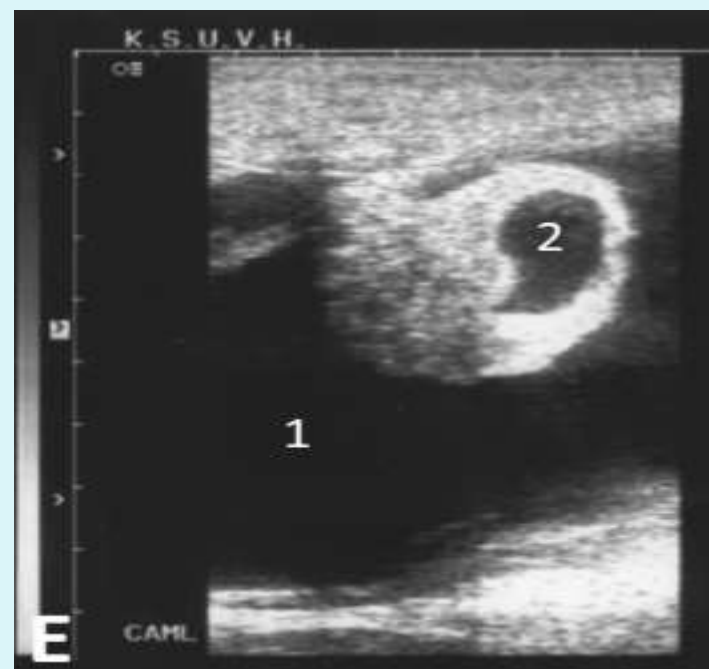
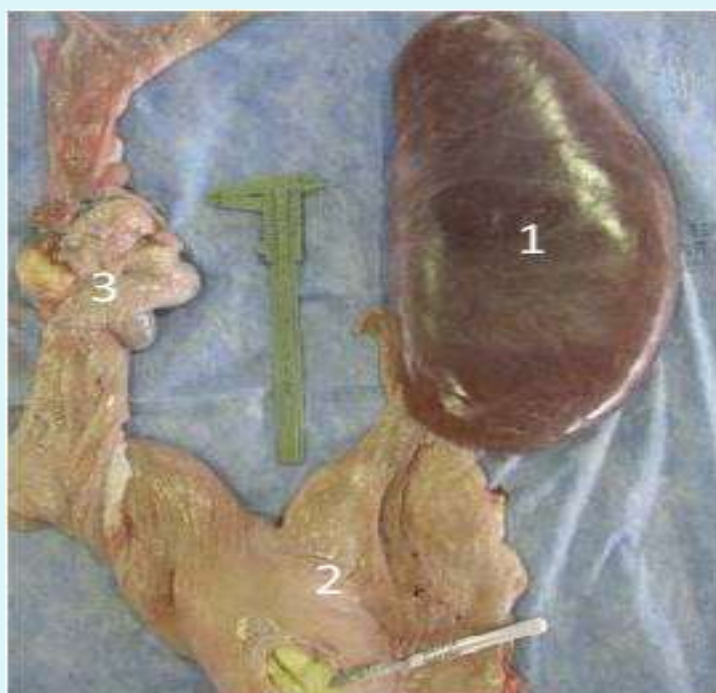
- Persistent hymen, vulvar atresia and vaginal adhesions
- Second most common problem with poor prognosis
- Bleeding at mating is the usual complaint
- Surgical correction with proper instruments is possible
- Vaginitis and vaginal tumors are rare

Uterine and cervical affections

- Cervical/Uterine congenital malformations rare
- Cervicitis associated with metritis/endometritis
- Metritis/endometritis
- Clinical endometritis is the commonest
- Uterine lavage/infusion of antibiotics/Iotagen
- Pyometra/mucometra have been recorded in camels

Ovarian abnormalities

- Ovarian cysts, tumors and hydrobursitis
- Hydrobursitis is the common problem
- Chlamydophila abortus and E Coli
- Surgical removal by flank laparotomy is suggested if the condition is unilateral
- Post-operative fertility is 40-50%

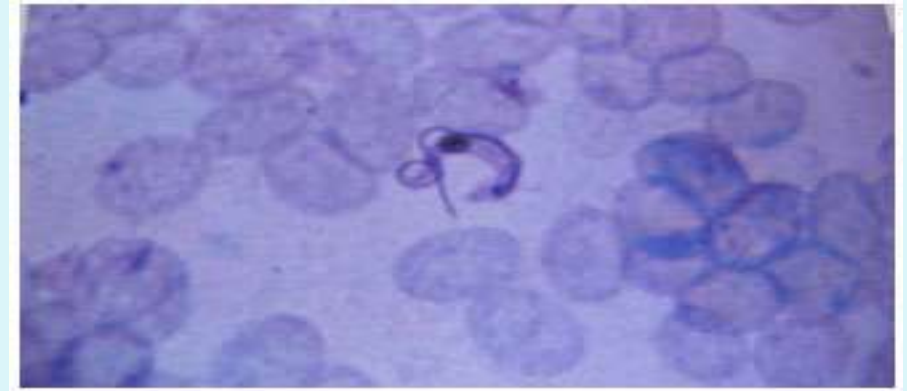


Refused mating syndrome

- Female curls her tail dorsally when approached by a male

Abortions in camels

- *Trypanosoma evansi*



Other causes of abortions

- Brucella
- Leptospira
- Chlamydophila
- Toxoplasma
- Twins



- The above lectures are also explained in video lectures at my YouTube Channel Govind Narayan Purohit
- Kindly share the videos and subscribe to my channel if you like them
- Thanks