

COURSE CODE:	VCT 601
COURSE TITLE:	Veterinary Obstetrics
NUMBER OF UNITS:	2 Units
COURSE DURATION:	Two hours per week

COURSE DETAILS:

Course Coordinator:	Dr. Abimbola Adetokunbo Oloye D.V.M, M.V.Sc.
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Other Lecturers:	Prof. V.O. Sekoni; Dr. (Mrs.) T.A. Ajadi; Dr. S.A. Olurode

COURSE CONTENT:

Gestation length, parturition, accidents and diseases incidental to parturition. Dystocia and obstetric manipulations. Involution of the uterus. Abnormal conditions of the placenta. Pregnancy detection methods. Synchronization of oestrus. Embryo transfer. Small animal contraception. Care of the newborn. Udder health management and dairy farm analysis.

COURSE REQUIREMENTS:

This is a compulsory clinical course for all students undertaking the professional phase of the DVM programme. In view of this, students are expected to participate in all the course activities and have minimum of 75% attendance to be able to write the final examination.

READING LIST:

1. Roberts, S.J. Veterinary Obstetrics and Genital Diseases. Ithaca New York. Edwards Brothers, 1971.
2. Noakes, D. Fertility and Obstetrics in Cattle. Oxford. Blackwell. 1986.
3. Peters, A.R. and Ball, P.J.H. Reproduction in Cattle. Massachusetts. Blackwell Science. 1995.
4. Jackson Peter G.G. Handbook of Veterinary Obstetrics. New York. Saunders. 2004.

5. Root Kustritz, M.V. Small Animal Theriogenology. Missouri. Elsevier Science. 2003.
6. Youngquist, R.S. and Threlfall, W.R. Current Therapy in Large Animal Theriogenology. Missouri. Saunders Elsevier. 2007.
7. Kahn, W. Veterinary Reproductive Ultrasonography. London. Mosby-Wolfe. 1994.

LECTURE NOTES

PREGNANCY AND ITS DIAGNOSIS IN COMPANION ANIMALS

Breeding management - is an important component of successful planned reproduction in dogs. Mismanagement rather than infections accounts for many of the breeding problems encountered in practice.

This is so because of the wide variation seen in normal canine reproductive cycles, thus it is not surprising that management issues confuse breeders as well as veterinarians alike.

REVIEW OF CANINE ESTROUS CYCLE-

- Bitches become sexually matured(PUBERTY) when the structural composition and hormonal activity of the ovaries are continually changing as a result of Hormones, called gonadotropic hormones, produced by the anterior pituitary gland within the brain.
- The estrous cycle of an intact (unspayed) and non pregnant bitch is divided into four separate phases namely: Proestrus; Estrus; Diestrus; Anestrus.
- Proestrus average duration is 9 days. Female has bloody to serosanguineous vulvar discharge; does not allow copulation and vaginal epithelium increasingly cornified.
- Estrus average duration is 9 days. Female allows copulation and vaginal epithelium is fully cornified.
- Diestrus average duration is 60 days. It is characterized by abrupt return to non cornified cells.
- Anestrus average duration is 90-150 days. It is the period of mandatory endometrial repair.
- Remember that Interestrus is diestrus +Anestrus =5-7months.

FACTORS TO CONSIDER BEFORE BREEDING-

- Availability of good and comfortable homes for puppies.
- Behavioral problems – both the bitch and the male dog should be of sound temperament.
- Age of the pair (the bitch and the male dog should be sexually and physically matured).

- Hereditary Disorders – clearance from any hereditary disorders that are common to dogs breed (e.g. canine hip dysplasia) should be obtained before breeding.
- The pair's (the bitch and the male dog) medical and reproductive history. . They should also have up to date vaccinations and be free of diseases and physical abnormalities, including healthy reproductive tracts.
- The pair's body weight should be considered.
- Pelvic capacity of the bitch- this should be large enough to allow the passage of normal dimension fetuses.

ROUTINE PRE-BREEDING LABORATORY TESTS-

- Brucella canis screening testing should always be part of a pre-breeding workup in both male and female dogs especially in all outside bitches coming to a stud dog.
- It is also very important to do a vaginal culture before an outside bitch is bred, however this may not be necessary if the bitch has no clinical signs or previous history of reproductive dysfunctions.

SCHEDULING THE BREEDING-

There are some basic tools that are helpful in scheduling bitches for breeding that will result in successful mating and consequently pregnancy.

Methods for timing a breeding include:

- Behavior of the bitch, such as flagging the tail and standing to be mounted.
- Physical signs such as: vulvar swelling and bloody discharge.
- Vaginal cytology- estrus coincides with the predominant presence of cornified vaginal epithelial cells and an increase in serum progesterone levels to 2ng/ml. Full cornification continues throughout estrus until the “diestrals shift” occurs 7-10 days after the LH surge, signifying the first day of diestrus.
- The vaginal smear then changes abruptly, with appearance of neutrophils and epithelial cells changing from full cornification to 40-60% immature (parabasal and intermediate) cells over the next 24-36 hr.
- If vaginal cytology is performed until the diestrals shift is observed, the LH surge, ovulation, and the fertile period can be analyzed retrospectively.
- Hormone assay for progesterone using serum progesterone enzyme-linked immunosorbent assay (ELISA) 2ng/ml coinciding with LH surge and 5ng/ml and above indicating occurrence of ovulation.
- It is noteworthy to mention that while vaginal cytology is fairly reliable; all other methods are unreliable except for hormone assay.

FACTORS TO CONSIDER DURING MATING-

- **Place of mating-** taking the female to male's established territory normally encourage a degree of aggression which is necessary for coitus to occur.

- **Timing of mating-** once the day of the LH surge is determined (to be considered Day 0), ovulation will occur on Day 2. Maximal litter size is achieved when the bitch is bred 2 days after ovulation (Day 4 following the LH surge). A single insemination 2 to 3 days following ovulation will result in pregnancy in the healthy reproductive bitch.
- The reason that optimal conception occurs 2 days following ovulation is because when ovulation occurs, the ova are immature (primary oocyte) and must undergo two meiotic divisions before they can be fertilized. These divisions can take up to 48 to 72 hours to occur. Once matured, the ova remain viable for another 2 to 3 days.
- Frequency of mating- it's been noted that conception rate following a single mating may be approximately 60 percent rising to greater than 80 percent with two matings. However because normal sperm (spermatozoa) of the male delivered by natural insemination can live in the reproductive tract for at least 5 to 7 days, successful conception may occur if a bitch is bred from 2 days prior to ovulation to 4 days after ovulation.
- **Mating behavior-** if truly the bitch is in estrus she will stand to be mated after a period of courtship.

PHYSIOLOGY OF CANINE AND FELINE PREGNANCY –

Following a successful mating, the following events take place:

- ✓ Sperm cells enter the oviducts within 25 seconds of breeding. They do however, need around 7 hours to capacitate, before they are actually ready to fertilize. Sperm cells can live up to 5- 7 days within the bitch's uterus.
- ✓ The released oocyte remains in the uterine tube 3 to 5 days in the dog and 4-5 days in cats, during which fertilization takes place within 3 days in dogs and 2 days in cats.
- ✓ Migration of the early embryo into the uterus takes place from 9 to 13 days in dogs and 4- 8 days in cats.
- ✓ From 9-13 to 20-21 days, non fixed mobile uterine stages of the blastocyst is formed in dogs and 4-12 days in cats.
- ✓ Implantation takes place 18-20 days in dogs and 12-14 days in cats while embryonic vesicles are formed up till 23 days in dogs and 15-20 days in cats.
- ✓ Individual gestational sacs are formed from 20 to 30-35 days in dogs and 15 to 30-35 days in cats while confluent gestational sacs , continues to be formed up to 45 days in both species.
- ✓ From 30-32 days, embryogenesis ends in dogs while it takes 28-32 days in cats and ossification commences 40-42 days in dogs and 38-40 days in cats.
- ✓ Beginning of mammary development is from 30-42 days in dogs and up to 45 days in cats.
- ✓ Detection of fetal movement with abdominal palpation is from day 45-55 in both species.

Summarily, there are three developmental stages of pregnancy which are:

- **Period of Ovum-zygote development:** Day 2-17 post fertilization. It starts with formation of zygote, cleavage in oviduct and entrance of developing embryo into the uterus at 16 cell stages.
- **Period of Embryo development:** Day 18-35 post fertilization. It starts with implantation and ends with the completion of organogenesis.

- **Period of fetal development:** Day 35 to term. Ossification of fetal bones and characteristic fetal features develop and maximum growth occurs until term.

ENDOCRINOLOGY OF PREGNANCY (COMPANION ANIMALS)-

1. Progesterone: this is needed throughout pregnancy until day 56.

- Ovariectomy before day 56 will result in abortion.
- Progesterone levels peak at day 25 of pregnancy (30-60 ng/ml) and decrease gradually to 4-5 ng/ml about 3 days before parturition.
- Progesterone levels decrease to 2 ng/ml or less before parturition; this phenomenon accounts for Prepartum decrease in temperature.

2. Prolactin: Increase 4-5 fold at day 35 and peaks at day 50 of gestation following decreases in progesterone levels before whelping. This hormone is required at all stages of mammary development, and also involved in ensuring maternal behavior, including the preparation for delivery and care of the litter thereafter.

3. FSH and LH; Prostaglandin F_{2a}; and Cortisol: Increase in FSH activity has been reported in the pregnant bitch during the later part of pregnancy; this may account for moderate increase in estradiol during late gestation.

- An initial fetal cortisol rise alters placental progesterone production into estrogen. The estrogen causes a release of prepartum prostaglandin.
- The prostaglandin, or the abrupt decline in progesterone, has a hypothermic effect on the bitch; an effect observed in a drop of the rectal temperature of during the first stage of labor.

4. Relaxin: Six weeks after mating there is a difference in relaxin concentrations between pregnant (3.5 ng/ml) and non-pregnant bitches (<0.5 ng/ml). This is usually produced from the fetoplacental unit, important in relaxation of the soft tissues around the pelvis and declines abruptly at parturition.

PREGNANCY DIAGNOSIS (COMPANION ANIMALS)-

Numerous methods are available to confirm that the patient is really pregnant.

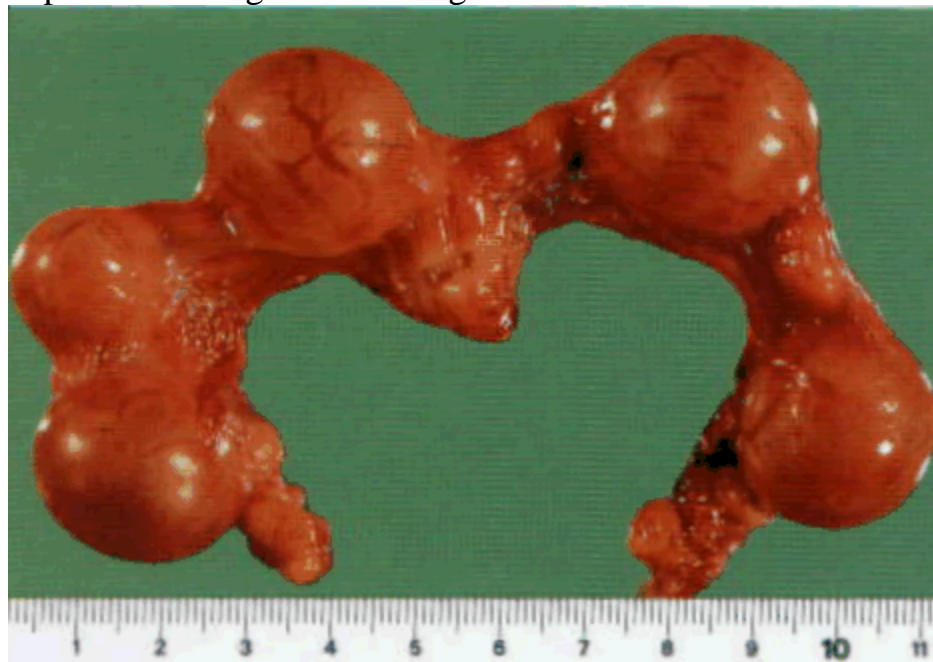
1. Abdominal Palpation: Though commonly used method in veterinary practice, accuracy of the method increases with gestational age and experience of the palpator.

- The method is most useful in small, docile animal, with relaxed abdomen. Palpation is usually difficult in tense or obese mothers.
- This is best performed during days 22-30 of pregnancy.
- Day 18: uterine swelling at implantation site appears as pear shaped bead like vesicles (N.B. *Uterus same size as in pseudopregnant dog*).
- Embryos evenly spaced from one another; evidence of trophoblastic attachment.

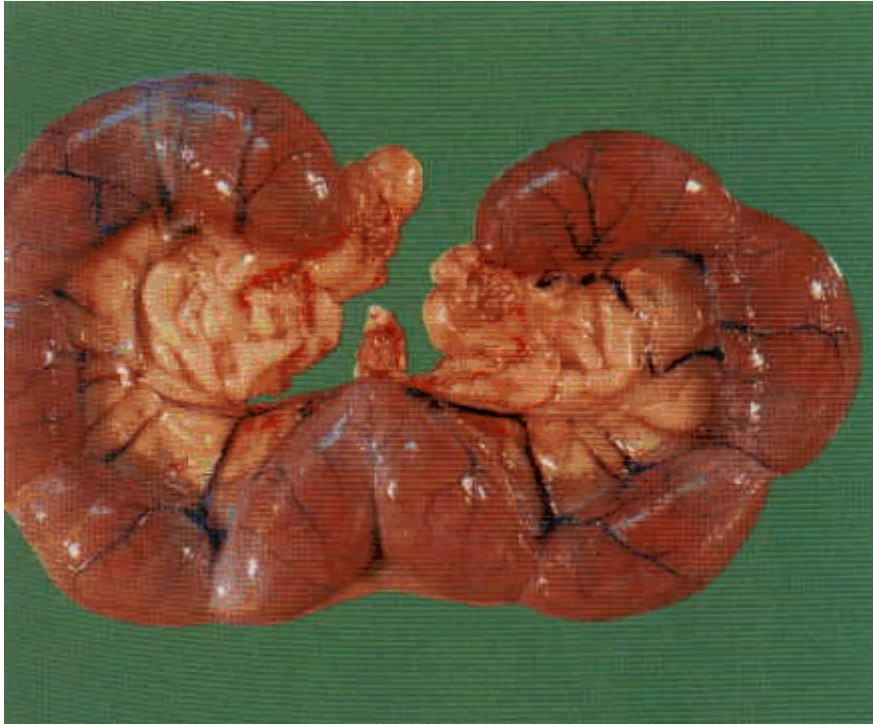
- Day 21: conceptual swelling is close to 1 cm in size.
 - Day 28: conceptual swelling is 2 cm in diameter.
 - Day 28: Accuracy of detection better at this stage. A string of ping-pong balls. Uterine swelling 3cm in size.
 - Day 30-35: Uterine swellings elongated and confluent. Uterine swelling 3.5 x 5 cm. Pregnancy diagnosis fairly difficult from this stage onwards.
 - Day 55-63: Fetuses easily palpable. Fetal movements in abdomen visible.
- **Note differential diagnosis: pseudopregnancy, pyometra, fecal balls, neoplastic conditions (e.g., granulosa cell tumors) and ascites.**

Canine Abdominal Palpation

A photo showing the distinct gestational sacs



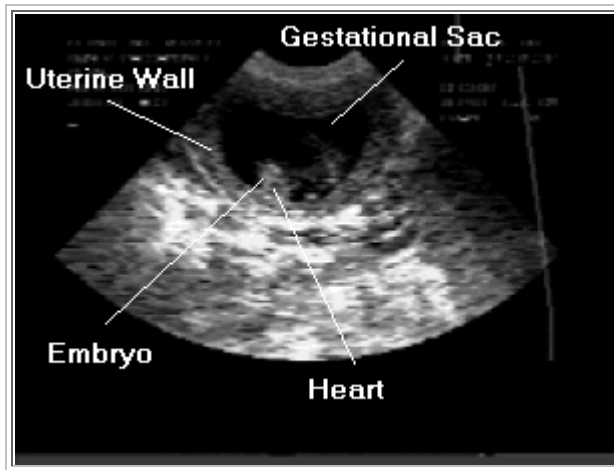
A photo: showing how the gestational sacs become confluent after day 31 of pregnancy, therefore difficult to palpation.



2. Ultrasonography scanning of the abdomen: this has become the gold standard technique for early pregnancy diagnosis and evaluation of fetal viability in dogs and cats. It is accurate from as early as day13-15 after mating in the queen and19-21 after LH peak in the bitch..

- Ultrasonography is the application of high frequency, but low intensity sound waves to various regions of the body.
- For the purpose of pregnancy diagnosis the sound waves are transmitted into the tissues of the abdomen.
- Different tissues on receiving the sound waves,reflect the waves back to the ultrasound machine which in turn creates a 2 dimensional gray(anechoic area) and white(hyper-echoic area) pictures of the abdominal contents viewed on the screen.
- Method: The bitch is placed on her back (in a dorsal recumbency), the belly hair clipped and a water based coupling gel applied to improve imaging; scan ventral midline or lateral to the nipple line with an ultrasound transducer(or probe) which transmits the sound waves into the tissues.
- **N.B.** A-mode scanning is mostly used in swine reproductive ultrasonography and exclusively for ophthalmic examinations.
- Real time B-mode scanning: this is the best technique for assessment of fetal viability, using a linear transducer with a frequency of 7.5MHz in small breed and 5.0MHz in large breeds.

Canine Ultrasound Early Pregnancy Image - Key



- Embryonic vesicles or gestational sacs can be visualized as early as 15-17 days post mating appearing as anechoic circles of approx 1mm in diameter and increases in size.
- Commonly, ultrasonography is performed at day 24-30 post mating when fetal heart beats (150-200beats/min) is visualized within the vesicles.
- Advantage of ultrasonography is that it is non invasive and free from radiation hazards. It provides quick, instant and dynamic visualization and assessment of the fetuses.
- Doppler: can detect fetal heartbeats from day 29-35 of pregnancy. Accuracy increases from 85% at 40 days to 100% at 43 days to term. Fetal heart rates are detectable around 5 weeks of gestation using the hand-held Elite Doppler in dogs and cats. The Doppler detects the motion of the beating heart; translating the motion into an audible heart beat, and digitally displayed heart rate.

3. Radiography: This is an accurate method of pregnancy diagnosis, but only during the later stages of pregnancy (after 35 days of pregnancy), when organogenesis is complete.

- Radiography of the entire abdomen will enable a count of fetal numbers to be made.
- Most useful at day 48 when calcification of fetal skeleton is sufficient to show contrast.
- Advantages of radiography: detection of fetal death; determining sizes of fetuses; counting number of pups (skulls of vertebral columns).
- Fetal death is indicated by overlapping of fetal skull bones, intrafetal or perifetal gas collection and abnormal fetal posture.

- Disadvantage is exposure to radiation hazards.

4 Acute Phase Protein: Sample taken between days 28-37 from last breeding is useful in pregnancy diagnosis by measuring “acute phase proteins.”

- The presence in maternal blood of healthy bitch indicates pregnancy.
- Inflammatory process like pyometra also cause elevation of acute phase proteins thus may adversely affect the accuracy of the test.

5. Relaxin: this is a pregnancy specific hormone that comes from both the placenta and ovaries; however it is primarily of placental origin.

- This is a hormone found in the blood of pregnant animals from day 25 of pregnancy.
- Relaxin can readily be detected by ELISA test. In pregnant bitch (3.5 ng/ml) and non-pregnant bitches (<0.5 ng/ml)

CHANGES IN BODY SYSTEM DURING PREGNANCY -

1. Body Weight Changes-

- During pregnancy, the body weight increases dramatically between the 4th and 6th week. The average weight gain from estrus to parturition is 36 % (range 20-55%) in a well fed bitch.
- Note that moderate gains may be seen with increased feeding, pseudopregnancy, pyometra, ascites or abdominal tumor.

2. Behavior and Temperament- Changes in behavior and temperament may be indicative of pregnancy.

- Some bitches may exhibit mild abdominal pain (due to growing fetuses), anorexia, and vomiting between the 3rd and 5th week of gestation (note this is the period when most pyometra episodes are also diagnosed).
- Some bitches become tranquil and affectionate and develop increased appetite during early pregnancy.
- Note that bitches that are obviously very lethargic with prominent abdominal distention 2-6 weeks post mating should be examined for pseudopregnancy or pyometra.

3. Mammary Gland: Changes in the mammary gland may be indicative of pregnancy.

- In the pregnant bitch the nipples show reddening, enlargement and engorgement starting from the 28th day of pregnancy.

- Mammary growth commences around day 35 and is more pronounced during the second half of pregnancy.
- These changes are more obvious in the primiparous bitch and may also be associated with pseudopregnancy.

4. Hematologic Changes during Pregnancy: these changes are not specific for pregnancy diagnosis, but rather indicators for pregnancy; also useful in differentiating pregnancy from pseudopregnancy and pyometra.

- **Erythrocytes:** Number of erythrocytes decrease from day 21 to term (pregnancy anemia).
- These changes are more pronounced in young bitches, and in bitches poorly fed during pregnancy.
- **Leukocytes:** Increases in leukocytes (mostly neutrophils) start from day 21, reach maximum around day 49, and then decrease.
- **Coagulation Factors:** Factors VII, VIII, IX and XI increase in first 4-6 weeks; then decrease until parturition.
- **Fibrinogen:** Increases 2-3 fold during pregnancy (increases rapidly to maximum at day 30, declines near term and increases again at parturition).
- **NOTE** that all these changes in body system are mere indicators of pregnancy not to be used for pregnancy diagnosis.

CANINE PSEUDOPREGNANCY AND ITS DIAGNOSIS

Pseudopregnancy literally means ‘false pregnancy’. A condition characterized by the development of all the signs of pregnancy without the presence of an embryo.

- It is also called pseudogenetra, overt pseudopregnancy, or pseudocyesis.

Though the most frequently used term to describe this clinical condition in bitches is pseudopregnancy unfortunately, the single term "pseudopregnancy" does not distinguish the clinical condition from "covert pseudopregnancy", i.e., the "physiological

- pseudopregnancy" that occurs in every non-pregnant ovarian cycle in bitches (thus the most appropriate term is “OVERT PSEUDOPREGNANCY” AND “CLINICAL PSEUDOPREGNANCY”).
- This is because each time a bitch enters estrus; she is designed to become pregnant, so she goes into a luteal pseudopregnancy. Thus the prolonged luteal phase of non fertile ovulatory cycle (Diestrus) is called “A COVERT PSEUDOPREGNANCY”.

Overt pseudopregnancy can be defined as that clinical condition

- Characterized by the extreme of the physiological changes that normally occur during diestrus resulting in changes similar to those seen in late pregnancy or the early post-partum period; typified by clinical signs such as weight gain,

mammary enlargement, nesting, lactation and maternal behavior in non-pregnant bitches about 6 – 12 weeks after estrus.

- It should therefore be noted that the clinical condition of overt pseudopregnancy actually represents the extreme of physiological changes that normally occur during late diestrus; resulting in extreme maternal behavior and atypical mammary activity seen in late pregnancy or early post-partum period.
- Overt pseudopregnancy may also be influenced by age, parity, nutritional practices as well as environmental factors.

POSSIBLE CAUSES OF OVERT PSEUDOPREGNANCY-

- A previous prolonged, and in most cases a very recent, exposure to elevated levels of progesterone such as normally required for mammary enlargement.
- Idiopathic increase in sensitivity to the endocrine changes that normally occur in late diestrus, i.e the normal progressive decline in progesterone and modest elevation in prolactin.
- Pseudo-luteal phase induced by exogenous progestins.
- Progesterone withdrawal caused by:
 - Ovariectomy during diestrus.
 - Termination of long- term or short- term prostaglandin –induced abrupt luteolysis.
 - Anti progestin therapy.
 - Idiopathic hyperprolactinemia associated with pituitary microadenomas.
- Psychogenic or reflexive hyperprolactinemia occurring in response to stimulation by surrogate neonates or other visual, physical or social stimulation.

PATHOPHYSIOLOGY OF PSEUDOPREGNANCY –

It is generally admitted that anterior pituitary hormone prolactin (PRL) plays a central role in pathophysiology of overt pseudopregnancy (OPDP}, but its exact role is not completely understood.

- A number of clinical studies suggest that circulating PRL levels rise in overtly pseudopregnant bitches compared to those in unaffected bitches in diestrus. The cause being attributed to a more rapid than normal decline in progesterone levels in the end of a normal diestrus. The prolactin concentration is inversely related to the progesterone concentration. As progesterone falls, prolactin rises.
- However individual differences in peripheral sensitivity to PRL or even the existence of molecular variants of canine PRL with different bioactivity versus immunoreactivity ratios are involved in the variation of the incidence and severity seen within and among breeds.

- Spaying or ovariectomy during the luteal phase of diestrus has been known to induce OPDC in some bitches. So also administration of Progestin for treatment of OPDC has been noted to result in full blown recurrence following withdrawal of therapy.

CLINICAL SIGNS OF OVERT PSEUDOPREGNANCY-

Most common signs observed are pre-partum like and maternal-like behaviours. In some cases the physical signs are noted before the behavioral signs. These are:

- Nesting, digging, over affection, over protectiveness, over defensiveness, aggression, licking, mothering of inanimate objects.
- Mammary enlargement and distension, lactation and milk release. Mammary hypertrophy is usually more evident in the most caudal pair of glands although the entire mammary chain can be involved.
- Weight gain and anorexia.

Less and more severe signs may include:

- Emesis, abdominal enlargement, abdominal contractions diarrhea, polyuria, polydypsia.

DIAGNOSIS OF OVERT PSEUDOPREGNANCY –

The diagnosis is basically based on presence and extent of clinical signs exhibited by the bitch. However the following points should be noted:

- Diagnosis should be in diestrus non –pregnant bitches.
- Other conditions of the luteal phase such as pyometra, or recent pregnancy and abortion should be ruled out by ultrasound or radiography; a complete blood cell count and additional ancillary testing including vulva and vaginal examination should be carried out.
- Other causes of galactopoiesis associated with hyperprolactinemia (though not well characterized in dogs) should also be ruled out.

TREATMENT OF OVERT PSEUDOPREGNANCY -

- Not treating is best since it is mostly self limiting symptoms cease 2-3wks so mild cases are usually managed by discouraging maternal behaviors.
- Remove all physical causes such as self nursing by the bitch. Sometimes placing Elizabethan collars to prevent licking of the mammary glands is recommended.
- Massage of the mammary glands by the owner, hot packs on the mammary glands, and milking the glands out should all be avoided since they are potential stimuli for lactation. Water removal

overnight for 5 to 7 nights promotes fluid conservation and also helps to terminate lactation.

- Non-phenothiazine tranquilizers can be used to calm the bitch. Phenothiazine tranquilizers can cause more milk release because they are dopamine antagonists and dopamine is a prolactin antagonist, so it will result in more lactation.

However considering the possible relationship between pseudopregnancy, and subsequent development of mammary tumors it may be advisable to pharmacologically treat even mild cases of pseudopregnancy in bitches with repeated episodes. The basic therapeutical principles used in treatment of mild to severe cases of overt pseudopregnancy are:

1. **Sex steroids therapy-** though these have been traditionally used, but the side effects usually outweigh any benefits of the medication.

- High doses of sex steroids exert negative effects on mammary development either by permanently suppressing pituitary prolactin or decreasing sensitivity to it.
- The most frequently used sex steroids in the past were veterinary preparations of estrogens, androgens and progestin.
- Estrogens such as diethylstilbestrol, estradiol benzoate or estradiol cypionate have been used.
- They are no longer recommended may cause signs of proestrus or estrus and uterine disease such as pyometra.
- Androgens such as testosterone and synthetic androgens such as Mibolerone have been shown to reduce duration of pseudopregnancy by suppressing lactation.
- However their side effects included clitoral hypertrophy, other forms of virilization and epiphora. Thus they are no longer recommended.
- Progestin such as Megestrol acetate and Medroxyprogesterone acetate administered orally has been used to suppress signs of overt pseudopregnancy.
- There could however be a rebound in symptoms including lactation when treatment is discontinued, with the progestin withdrawal mimicking the normal endocrine changes at parturition.
- So also Progestin can cause cystic endometrial hyperplasia-pyometra complex. Thus administration of progestin is no longer recommended.

2. **Prolactin- Suppression therapy-** the use of ergot alkaloids (Dopamine agonists) for inhibition of prolactin. This had brought revolution to the treatment of overt pseudopregnancy.

- Secretion of prolactin by pituitary is mainly under tonic inhibitory control of the hypothalamus, mediated by direct action of dopamine, the major prolactin inhibiting factor (PIF).
- The most common ergot compounds used clinically to inhibit prolactin secretion are Bromocriptine and Carbergoline which have direct action on dopamine receptors of the lactotroph cells of anterior pituitary.

- Mertergoline is another ergot alkaloid used which is a serotonin antagonist and thus have a dopaminergic effect reduces prolactin secretion when administered at high doses.
- Bromocriptine (Parlodel^R) - result in more dopamine, less prolactin, and less lactation. The dose is 20ug/kg for 8-10 days. Side effects include vomiting, but this is apparently not as severe as some of the earlier reports indicated.
- Carbergoline (Dostinex^R) is also a dopamine agonist. It has fewer side effects than Bromocriptine. The dose is 5ug/kg SID for 5-10 days.
- Mertergoline is a serotonin inhibitor and also inhibits prolactin. The dose is 2 mg BID for 10 days. It may cause whining and aggression.
- NOTE: that these above mentioned drugs are marketed as human drugs.

3. Ovariectomy/Ovariohysterectomy – predisposed bitches not intended for breeding should be spayed, since this is the only permanent preventive measures. This should preferably be done during anestrus, if done during diestrus may provoke another episode of pseudopregnancy 3-7 days after the surgery.

SEQUELAE TO OVERT PSEUDOPREGNANCY

- Mastitis.
- Mammary hypertrophy.
- Mammary tumor.

An increased risk of mammary neoplasia associated with pseudopregnancy might be explained by a continuous mechanical distension of, and the accumulation of carcinogenic products within, the mammary acini caused by the formation and retention of milk

CARE OF THE BITCH DURING PREGNANCY

The pregnancy or gestation period starts from the time of successful mating to parturition. Thus, the owner should be familiar with the basics of prenatal care, parturition (whelping) as well as emergency procedures during this period. Thus the owners should ensure:

1. Health of the dam- pregnancy is not a disease state but a physiological reproductive process. Thus health should be good throughout the duration. Although in some bitches, a period of mild illness (reduced appetite, vomiting and increased thirst) may be seen about the third or occasionally as late as the fifth week of pregnancy.

A thorough physical examination should be done three times during pregnancy on all animals with high risk pregnancies (i.e. pregnant bitches with systemic disease, obesity, small litter size or a history of dystocia.) and radiography should be done late in pregnancy to assess fetal size as well as litter size.

Note that:

- Pregnancy toxemia has been reported to occur in bitches carrying large litters.
- Ketosis develops during late pregnancy in bitches that are not able to meet the requirements of pregnancy and thus develop a negative energy balance.
- Anorexia during late pregnancy should always be taken seriously. Affected bitches must be provided with parenteral nutrition otherwise pregnancy should be ended by elective cesarean section.
- There are certain drugs that are incompatible with pregnancy, thus should be avoided. Such drugs include :
 - Amino glycosides antibiotics which are neurotoxic.
 - Chloramphenicol which decreases bone marrow development.
 - Tetracycline which causes malformation of bones and teeth.
 - Intravenous anesthetics which may produce respiratory depression in the fetuses.
 - Corticosteroids may cause abortion ,fetal death and abnormalities such as cleft palate.

2. Vaccination-make sure the bitch vaccination against distemper, hepatitis, leptospirosis and parvovirus is up to date right before mating. This will ensure passive immunity to the pups which will give them some resistance to these diseases before they are old enough to be vaccinated.

Note: avoid vaccines and drugs during pregnancy.

3. Feeding- a pregnant bitch requires additional food to support the growth of pups inside her as well as lactogenesis and galactopoiesis. However her appetite remarkably increases in the last 3 weeks of pregnancy, when she may need to be fed 2-3 times a day (ensuring the diet is rich in proteins vitamins and energy) because of inadequate room in her stomach. Excessive calorie intake should be avoided because it may result in heavy fetuses and increased risk of dystocia.

4. Comprehensive deworming- bitches pass worms to their pups through the placenta and milk. Thus it is very important to deworm them against roundworms, hookworms and tapeworms usually 2 weeks before and after whelping. Ensuring, that the drugs used are safe during pregnancy.

5. Control of external parasites- it is essential that the pregnant bitch and the environment should be free from any ectoparasites. Infestation of fleas, ticks, lice or ear mites can easily spread to the puppies. Thus it is recommended to dip or line susceptible dam preferably 2-3weeks before whelping.

6. Exercise – active exercise should be maintained throughout pregnancy but exercise tolerance and agility are reduced towards the end of gestation.

7. Monitoring the pregnant bitch – owners should be instructed to monitor changes in behavior (prolonged restlessness), food intake, excessive mammary development, excessive abdominal distension, onset of lactation and abnormal vulvar discharge in their pets so as to report any abnormalities promptly.

Monitoring of the pregnant bitch should also include prediction of onset of parturition (determination of LH peak or first day of diestrus helps reduce the variability in pregnancy length).

N.B. Nesting behavior is usually displayed within a week before whelping.

Rectal temperature usually falls up to 37.4°C within 8-24hrs indicating onset of parturition. Thus temperature to be monitored three to four times daily starting at 54days post mating.

8. Whelping accommodation- ideally a whelping box (or more practical a whelping area)in a warm quiet but accessible room should be provided. The box should have raised sides and sufficient size to accommodate both the bitch and pups before weaning.

The box should be raised above ground level to prevent draughts and insulate the puppies from the cold floor. One side of the box, the entrance should have a slightly lower wall to allow access by the bitch.

Strict attention to hygiene in the whelping quarters is essential. During birth newspaper provides a useful and disposable floor covering and can be changed at intervals.

NORMAL BIRTH (EUTOICIA) IN THE BITCH

GESTATION LENGTH AND PREDICTING THE WHELPING DATE-

- The bitch is considered to have a variable gestation length. This variability is mostly because of errors in noting the exact day when conception occurred.
- If breeding dates are used to measure gestation, then gestation can be as variable as 57-71 days. This is because estrus is 9 days long and breeding can take place during any day of estrus.
- The most accurate day to measure from is the day of ovulation. Gestation lasts 63 days from ovulation. Ovulation is however, hard to determine in many cases.
- However if the LH peak is known, gestation can be measured as lasting 65 days from the LH peak.

- Gestation length can also be accurately measured from the first day of cytologic diestrus. Up to 80% of bitches whelp 57 days from the first day of cytologic diestrus.
- However If behavioral signs of the female rejecting the male are used to determine the first day of diestrus, then gestation will be more variable. This variability is can be 2-3 days different than the first day of cytologic diestrus.

PHYSIOLOGY/ENDOCRINOLOGY OF PARTURITION-

- Induction of normal parturition in bitch results from a complex cascade of endocrinologic events.
- Although the exact mechanism is not completely known, but it's thought to be initiated by the fetuses thus if the litter is too small or fetuses are dead, labor may not be initiated.
- During the last 5-10 days of gestation, the fetuses become stressed perhaps from crowding or hypoxia that occurs when fetal oxygen requirements exceed that of placental delivery capability.
- In response to fetal stress, fetal pituitary gland secretes adrenocorticotrophic hormones (ACTH) which in turn induces secretion of glucocorticoids primarily cortisol from the fetal adrenal gland.
- Cortisol acts on placenta to cause decreased production of progesterone concurrent with an increased production of estrogen 12-48hrs before parturition.
- Both fetal cortisol and placental estrogen promote synthesis and release of prostaglandin locally in the placenta and endometrium which are potent luteolytic agent which in turn results in fall of progesterone to less than 1-2 ng/ml. This concurrently results in drop in rectal temperature usually up to 37.4°C within 8-24hrs indicating onset of parturition.
- Estrogen apart from enhancing prostaglandin synthesis also increases myometrial contractility by sensitizing the uterus to oxytocin through an up elevation of oxytocin receptors.
- Uterine contractions in turn propel the fetus caudally. The cervix dilates in response to the presence of estrogen, PGF₂alpha, uterine contractions and presence of fetal head.
- Stretching of the cervix stimulates a nervous impulse termed (Ferguson's reflex), leading to the secretion and release of more oxytocin.
- Uterine contractions and dilation of the cervix causes positive feedback on the pituitary to promote further oxytocin release.

- Relaxin is a peptide hormone produced by the fetoplacental unit. It increases during the third week of pregnancy and peak by mid gestation and remain elevated to term. It declines at parturition and reach non detectable levels 1-6 weeks postpartum.
- Relaxin functions to promote myometrial quiescence, before term, to soften the cervix at term and to induce oxytocin receptors in the myometrium.

NORMAL PARTURITION OR EUTOCIA-

Stage I

- Stage I of parturition is the preparatory phase for whelping. It averages approximately 6-12 hour long but can be as long as 24 hours.
- This stage begins with the onset of uterine contractions and ends when cervix is fully dilated.
- The uterine contractions occurring at regular but progressively shorter intervals which may not be visible externally.
- The bitch is usually restless and temperature decline may be seen. This temperature drop is related to prostaglandin release and the abrupt decline in progesterone as earlier mentioned.

Stage II

- Stage II is the active propulsive stage of delivery, when the bitch pushes the puppies out. It lasts approximately 20 minutes to 1 hour per puppy but, not more than 2 hours should elapse between deliveries of each puppy.
- Stage II usually lasts a total of 3-6 hours depending total no of pups but, may be as long as 24 hours total.
- The onset of this stage is usually marked by visible efforts to expel puppies with visible abdominal muscle contractions with the bitch either on her side or squatting position.
- The pup engages the cervix and anterior vagina, which initiates the Ferguson reflex (uterine contractions). The presentation of the puppies is 60% anterior in bitch and 60% posterior in queen.

Stage III

- Stage III is the expulsion of the placenta.
- During this phase, the fetal membranes are expelled usually within 15 minutes of delivery of a fetus.
- You may see pup-placenta-pup-placenta or pup-pup-placenta-placenta. There can be 6 hours between deliveries in the bitch, and the queen can go overnight between deliveries, but use 2hours to diagnose a dystocia.

- Differentiation between resting in Stage III and completed parturition is difficult. You may need to take radiographs or ultrasound the bitch to be sure. Best to have films the last week of pregnancy.

COMPLICATIONS THAT MAY DEVELOP DURING WHELPING

Complications that arise during pregnancy and whelping are infrequent but when they do occur may constitute immediate and life-threatening situations to both the dam and the puppies. These may include:

- Prolonged gestation.
- Primary uterine inertia.
- Secondary uterine inertia.
- Pre-eclampsia/eclampsia (hypocalcaemia).
 - Torsion, uterine rupture or Hemorrhage.
- Pelvic canal obstruction (i.e. anatomical or due to fetal over-size).
 - Premature placental separation.
 - Fetal distress.

Prolonged gestation

- Diagnosis of prolonged gestation rests heavily on subjective information from the owner/breeder.
- Prolonged gestation may be considered, but the reference point in counting the gestation duration is critical in determining the whelping date. Is the first day of diestrus known or is gestation being calculated from breeding dates?
- Rule out pseudopregnancy, incorrect breeding date, incorrect calculation of breeding date in determining if gestation is prolonged.
- If ultrasound or radiographs indicate viable fetuses, then waiting may be the best course but if otherwise, cesarean may be the best option.

Primary uterine inertia

- Primary uterine inertia is a delay in starting the second stage of labor after the first stage signs have been established. This occurs because the uterus is not contracting.
- If there is no response to feathering the vagina, give oxytocin (1-2 IU oxytocin or a total of 4 units over the entire whelping. More doses may not be advisable, because it may result in clonic contractions of the uterus and results in ineffective expulsive efforts.)
- It may be repeated at 20 to 30 minute intervals for up to three doses, but if there is no response, a cesarean is usually the best course of action.

Secondary uterine inertia

- Secondary uterine inertia is the delay in resuming stage II labor after one or more births (for example more than 4-6 hours since the preceding delivery) it is caused by the uterus being exhausted after prolonged delivery. This prolongation may be from low calcium, low blood glucose, or an old bitch.
- Laboratory work may be helpful in assessing the dam. Take samples for PCV, WBC, TP BUN, and Glucose. If the bitch is 'sick', take samples for a CBC and a serum chemistry panel.
- Rule out obstruction or completed delivery using vaginal examination, radiographs, and/or ultrasound

Preeclampsia/eclampsia

- Also known as puerperal tetany.
- It is often seen in small bitches with large litters.
- It is caused by hypocalcemia, but the underlying causes are poorly defined.

Differential Diagnosis

- Rule out other causes of tonic and tonic/clonic seizures.

Clinical signs

- Onset characterized by restlessness and panting progressing to muscle stiffness and ending in complete tonic paralysis with legs in hyperextension.
- Hyperpyrexia (107°F).

Treatment

- Administer calcium gluconate 10% @ 1 cc/30 lb IV with Glucose 10-50% 1cc/30lb, followed in 5 minutes by 1-2 IU oxytocin for a total of 4 units over the entire whelping. (We used to give more, but these doses cause clonic contractions.) If there is no response in 45 minutes, repeat the calcium gluconate. If there is still no response after another 45 minutes, a cesarean is probably the best treatment. You can probably even skip this and go right to C-section.
- The probability of the bitch requiring surgery in cases of secondary uterine inertia is high.
- Prognosis for the puppies and the bitch depends on the status of the bitch on admission.
- Prolonged dystocia will usually result in exhaustion, toxemia, and death of fetuses in utero.

Pelvic canal obstructive dystocia

- Obstructive dystocia is when the bitch is pushing hard but there are no puppies. (not pushing = inertia) This may either be due to anatomical or fetal size.
- Guidelines for examination/intervention
- 30 minutes of strong contractions with no pups delivered.
- 2-3 hours of weak and infrequent expulsive efforts failing to produce a pup.
- 4 or more hours between pups.
- Obvious problem (pup hanging out etc.)

Management of Obstructive Dystocia

- Do not give oxytocin, because if a puppy is lodged in the birth canal, you may cause a uterine rupture.
- Consider assisted delivery by vagina using instruments or digital manipulation when your examination suggests that delivery can be accomplished within 20-30 minutes subsequent to your manipulations, and the subsequent delivery will proceed normally.
- It is essential that you be very clean and use adequate lubrication. A contaminated procedure may result in metritis.
- You may have to perform an episiotomy to open the vulva sufficiently to remove a puppy in case of fetal oversize.
- Cesarean section is always a viable option.
 - Pups born as little as 2 days early (timed C-section) do not have surfactant and probably will not live.

Warning signs of non-emergency whelping complications:

When the bitch has reached her estimated due date and there is no body temperature decrease or signs of labor.

- There are no signs of first stage labor (uterine contractions/cervix dilation) within 12-18 hours of a body temperature decrease.

Warning signs of emergency whelping complications:

Circumstances Requiring Immediate Medical Evaluation	Potential Cause
<ul style="list-style-type: none">• The bitch has failed to progress to second-stage labor (delivery of pups) after 6-8 hours of first stage labor	obstruction
<ul style="list-style-type: none">• No pups have been whelped, but the bitch is passing thick, black-green discharge from the vulva	premature placental separation
<ul style="list-style-type: none">• The bitch is passing a heavy, persistent flow of fresh blood from the vulvar	Hemorrhage due to uterine rupture
<ul style="list-style-type: none">• The bitch experiences muscle weakness, muscle-spasms, muscle-tremors, or muscle-rigidity, or seizures	eclampsia (hypocalcaemia)
<ul style="list-style-type: none">• The bitch has been straining for more than 20 minutes or has had weak intermittent abdominal contractions for 1 hour but has not produced a pup or has only expelled membranes	obstruction
<ul style="list-style-type: none">• It has been more than 1 hour between delivery of pups with no further sign of active labor, yet it is known that there are more pups	uterine inertia
<ul style="list-style-type: none">• The bitch demonstrates evidence of intense abdominal pain and symptoms indicative of shock such as pale mucus membranes, rapid and thready pulse, sudden drop in body temperature (below the 37.4°C associated with whelping) or collapse	uterine torsion

Medical Management of Complications Affecting Whelping-

Early recognition of warning signs followed by immediate medical treatment goes far in preventing fatality to the dam as well as increasing the survival of the puppies.

Assessment of the dam should entail a detailed history of:

- Bitch's age
- Breed
- Reproductive history (previous litters? prior cesarean delivery?)
- Previous or chronic medical conditions and treatments
- Date of bitch's preovulatory serum progesterone/LH peak?
- Last bitch's meal and/or drink?
- Any vomition?
- Has she urinated/defecated?
- Has oxytocin been administered?
- The color of the vaginal discharge.

Having obtained the detailed history, thorough clinical examination of the dam as well as fetal monitoring should be done noting the following:

1. Ensure you are working with an accurate whelping date - in the absence of preovulatory screening for serum progesterone/LH peak, estimations of due date can be quite variable ranging from 57 to 72 days from the original breeding date.

Note that high serum progesterone levels (> 2 ng/ml) would be indicative that gestation is incomplete and contraindicate the use of cesarean surgery.

As a precaution, fetal monitoring may be employed to ensure the well-being of the fetuses. However, bitches that are receiving exogenous progesterone therapy for treatment of insufficient luteal phase will not demonstrate a decrease in serum progesterone until therapy is discontinued.

2. Be able to differentiate emergency from non emergency conditions- Time is of the essence when evaluating emergencies associated with pregnancy and whelping. Any immediate, life-threatening conditions affecting the bitch must receive priority medical attention to avoid the potential of losing the dam as well as the pups.

3. Fetal monitoring- it is recommended that fetal monitoring commence as soon as the initial examination of the bitch is completed (within 10 minutes of presentation). Evidence of fetal distress (indicated by heart rates lower than 150 beats per minute [bpm]) is a good indication that immediate surgical intervention utilizing cesarean section is required (in place of further diagnostics or allowing the bitch more time to progress in labor) to ensure fetal survival.

Fetal monitoring is performed using transabdominal ultrasound. However, if fetal monitoring indicates that none of the puppies are experiencing distress, then this will allow more time to perform further diagnostics and/or attempt a more conservative approach of assisted delivery.

4. Diagnostic approach - once fetal monitoring indicates that the fetuses are in no immediate danger, further diagnostics that will in most cases identify the cause of why the labor has failed to proceed normally. Routine diagnostics include the following:

Blood work. Because many bitches may become dehydrated or hypoglycemic during delivery or may experience internal hemorrhage, blood analyses to determine packed cell volume (PCV), total protein, blood glucose, and nitrogen waste products in the blood will assist in diagnosing such conditions. Additionally, these tests are also helpful in identifying bitches with underlying conditions that may necessitate cesarean section even in the absence of acute delivery complications. Blood work results indicative of dehydration or hemorrhage will necessitate the use of intravenous fluid therapy.

Excessive panting during labor may result in metabolic disturbance of serum calcium levels. Even slight decreases in serum calcium can result in inefficacy of muscle contractions that may slow the progress of labor.

Therefore, if there is access to in-house serum calcium testing, this assessment is recommended. In absence of testing, but in the presence of symptoms suggestive of low calcium levels, administer calcium supplement to compensate for the metabolic imbalance.

Radiographs. Ideally, two views of the abdomen by survey radiography (x-ray) are usually sufficient for determining the number, size (in relation to the dam's pelvis), and position of fetuses as well as detect fetal death (skeletal collapse).

As such, radiographs are helpful for distinguishing between conditions that may be managed by conservative approaches (i.e. obstetrical manipulation, oxytocin, calcium supplementation) and those that require surgical intervention (cesarean delivery).

DYSTOCIA AND ITS MANAGEMENT

Dystocia is abnormal birth or difficult parturition to the point of needing human intervention before delivery is achieved. Causes include:

- Maternal factors- uterine inertia (i.e. sluggishness of uterine contractions during labor) and inadequate size of the dam's birth canal.
- Fetal factors- fetal oversize, abnormal orientation of the fetus in the birth canal (i.e. malposition of puppy or 2 puppies presenting at the same time).

Dystocia is usually suspected on observing the following:

- Stage I labor for more than 12 hours.
- Strong stage II labor for more than 30 mins without a pup.
- Weak stage II labour for more than 4hrs before first neonate born.
- More than 2hrs between offspring.
- History of dystocia.
- Abnormal vulvar discharge

- Digital vaginal examination reveals pup obstructing birth canal.
- Bitch systemically ill.

Diagnostic tests should include abdominal radiograph or ultrasonography.

Treatment options for dystocia include:

A. Use of Obstetrical Manipulation – though this may be difficult because of their small size. However in big sized breeds, the bitches could be assisted by gripping (with fingers only; forceps are not recommended) the puppy under the mandible or around the shoulders (if the puppy is presenting in the head-first position) or around the hocks or pelvis (if the puppy is presenting in the feet-first position) and applying gentle tension as the bitch pushes to expel the puppy and continuing the tension between contractions to prevent the puppy from slipping back to its previous position.

On the other hand, when size is a contributing factor to delaying progression of birth, gentle stretch of the tissues of the vaginal wall is applied in an attempt to widen the birthing canal in front of the puppy. If the vulvar opening is too narrow, an episiotomy may be performed.

Contractions may also be stimulated by "feathering" (applying gentle, backward scrapping with a finger) the vaginal wall; this may be particularly helpful to move a puppy that may be just out of reach to a position where it may be grasped.

Other strategies may include elevating the bitches' forelegs and chest, which will occasionally move a puppy within reach. If two puppies are presenting at the same time, elevating the hindquarters may move the second of the puppies back into the uterus and allow room for the first puppy to proceed.

B. Medical therapy-

1. Use of Oxytocin- is a naturally occurring hormone in the bitch that induces uterine contractions. Suckling stimulates the release of endogenous oxytocin. Therefore, to increase contractions and speed-up the progress of labor, it is recommended that newborn puppies be allowed to nurse between subsequent deliveries.

When endogenous levels of oxytocin are not sufficient to stimulate effective uterine contractions, exogenous oxytocin treatment is often successful in increasing the efficacy of contractions.

It is usually administered (0.25- 4 IU) intramuscularly, given at 20-30mins interval not giving more than three doses if no effect is seen. However, certain criteria must be present for the safe and effective use of oxytocin treatment in a pregnant bitch as

stated below:

Safe Criteria for Use of Oxytocin in Bitches with Ineffective Uterine Contractions:	Conditions that Contraindicate the Use of Oxytocin
<ul style="list-style-type: none"> • the cervix is dilated 	<ul style="list-style-type: none"> • the bitch is already demonstrating strong uterine/abdominal <ul style="list-style-type: none"> • contractions
<ul style="list-style-type: none"> • there are no vaginal obstructions (fetal or anatomical) 	<ul style="list-style-type: none"> • Secondary uterine inertia
<ul style="list-style-type: none"> • the dam and puppies are stable 	<ul style="list-style-type: none"> • the cervix has not fully dilated
	<ul style="list-style-type: none"> • presence of an obstruction (fetal or anatomical)
	<ul style="list-style-type: none"> • depressed fetal heart rates (i.e. fetal distress)

2. **Use of Calcium-** For proper function and response, neuromuscular tissues are dependent upon a normal balance of electrolytes within the body. In particular, uterine contractions are dependent upon adequate levels of calcium.

In cases where calcium metabolism has been compromised (i.e. by inadequate diet, by dietary supplementation of a nutritionally balanced diet with exogenous calcium during pregnancy, or by extended periods of uterine contractions as seen in long deliveries),

Mildly depleted levels of serum calcium within a whelping bitch may inhibit the normal progression of delivery by interfering with uterine contractions. In this situation, calcium supplement will be administered by a subcutaneous injection.

Because of the potential dangers associated with intravenous administration of calcium (cardiac arrhythmias and sudden death), it is only recommended when a bitch presents with clinical symptoms of life-threatening hypocalcaemia (indicated by: muscle spasms, tetany [muscle rigidity] or seizures), or if low serum calcium levels have been confirmed by laboratory analysis.

C. Surgical therapy- this is done by carrying out Cesarean section and there are some situations that require immediate surgical intervention to prevent demise of the dam, fetuses or both. The following are:

- Uterine inertia unresponsive to oxytocin or calcium supplement
- Fetal oversize of one or more pups in relation to the dams pelvic width
 - Anatomical obstructions of the birth canal.
 - Fetal malposition that precludes vaginal delivery
 - Uterine torsion or rupture
- Depressed fetal heart rates (below 150 beats per minute (bpm)) upon initial examination.
 - - Good initial result of fetal heart rate (greater than 150 bpm) but subsequent monitoring indicates a progressive or sudden deterioration of heart rate (to less than 150 bpm)

On the other hand, there are other conditions that may warrant elective cesarean section which include:

- The bitch has a history of uterine inertia, complicated deliveries, or cesarean section
- The bitch has a congenital or traumatic malformation that has narrowed the birth canal
 - A breed or family history of over-sized fetuses.
- Radiographs taken in the last weeks of pregnancy indicating fetal over-size in one or more puppies.

Immediate postpartum care

- Palpation and, if necessary, radiography should be used to determine that all puppies or kittens have been delivered.
- The routine postpartum administration of oxytocin or antibiotics is unnecessary in healthy dams with nursing neonates, unless the placenta has been retained.
- The dam's body temperature and the character of the postpartum discharge or lochia and milk should be monitored.
- Normally, the lochia is dark red to black and is heavy for the first few days after parturition. It is not necessary that the dam consume the placentas.
- The dam will normally clean up her pups but where she is weak(C/S patients) or is a bad mother, should be assisted by proper cleaning up of the pups.
- Ensure the pups suckle within 1st 24hrs of delivery so as to get passive immunity from the dam's colostrums.

- Disinfection of the neonatal umbilicus with tincture of iodine helps prevent bacterial contamination.
- The neonate should be weighed accurately as soon as it is dry and then twice daily for the first week.
- Any weight loss after the first 24 hr indicates a potential problem and should be given immediate attention (e.g., supplemental feeding, assisted nursing, and evaluation for sepsis).

NOTE - in cases whereby neonates are delivered distressed , neonatal resuscitation is very essential which should entail the following:

- Clean membranes and fluid from oral cavity and nostrils by swab or suction.
- Can swing body and head in downward arc to clear fluid from airway.
- Rub neonate with towel to stimulate respiration and to dry.
- Check for heartbeat and breathing .
- Give few drops of 50% glucose if not responding well.
- Ligate umbilical cord if it bleeds when clamp is removed.
- keep warm check for congenital defects.

PERIPARTURIENT AND POSTPARTURIENT PROBLEMS IN COMPANION ANIMALS

Postpartum Period is the time from parturition to 1st fertile estrus which is normally influenced by a lot of factors such as body condition pre and postpartum, plane of Nutrition, Lactation stress etc. The uterus returns to normal size by approximately 9 weeks postpartum and uterine involution is histologically complete by 12 weeks postpartum.

Retained placenta

- Retained placenta is often suspected when in fact the placenta has already been eaten by the mother, it seldomly causes severe problems unless when accompanied by fetal retention or infection.
- It is associated with prolonged whelping or dystocia, and is more often seen in toy breeds.
- There is persistence of greenish-black discharge for longer than 24-26 hours after parturition.
- Normally the discharge should be rust colored 48 hours postpartum.
- A diagnosis that a placenta is actually retained may be difficult, because great reliance is placed on the owner counting the placentas as they are passed. Since placentas are not necessarily passed with each pup and the bitch commonly eats the placentas, it is easy for the owner to miscount.

- Palpation is not reliable to diagnose a retained placenta but occasionally a portion of the placenta may be felt on vaginal examination.
- Ultrasound may be used, but it is very subjective in determining if a placenta is retained.
- Exploratory celiotomy may be used to definitively diagnose retained placenta.

Therapy

- Calcium gluconate (10%) 3-10 ml IV slowly. Followed by oxytocin, 5-25 IU, IM
- Oxytocin (5-25 IU IM) may be given routinely to all bitches once delivery has been completed. This has been suggested to aid in the expulsion of remaining placentas, and even retained fetuses!
- If placenta can be palpated in the vagina, it may be removed by gentle traction.

Postpartum metritis

- It is highly associated with invasion of a compromised uterus by opportunist pathogens.
- Postpartum metritis is associated with a variety of organisms and is seen at a higher incidence when contaminated instruments, dirty digital manipulations, and unsanitary environment.
- It is complicated by tissue traumatized during manipulations and the degree of uterine inertia. The less uterine inertia, the less lochia is expelled and involution is hampered.
- The bitch that had an abortion, retained fetus, retained placenta, dystocia, and manipulations runs a higher risk of developing a postpartum metritis.
- There may be a lack of interest in the pups by the bitch.
- The pups may cry and have red, edematous ani.
- The bitch may show depression, anorexia, toxemia, and/or tenesmus.
- The temperature is 103-105° F., but often the bitch's temperature is normally up to 104°F in the first two days postpartum, however in a normal postpartum period the bitch is not sick.
- The pulse is rapid and frequently weak.
- The mucous membranes are congested.
- The vaginal discharge may be thin or thick, fetid, reddish to chocolate brown. Normal lochia should be brown-reddish (green shortly after whelping) with no odor.
- The milk flow may be diminished or absent.
- You may see puppies dying, because of toxins being absorbed from the uterus.
- The leukocyte count is usually elevated with a left shift, but may be decreased in extremely ill bitches.
- If a fetus is retained, it will be evident with radiographs.

Diagnosis

- Diagnosis is usually based upon the clinical signs which include a dark sanguine-purulent vaginal discharge with a foul offensive odour seen in a postpartum bitch.
- Ultrasound and radiology may help in visualizing an enlarged uterus full of fluid.

- Culture and sensitivity from anterior vagina may aid in choice of antibiotic, but treatment should be started immediately with empiric antibiotics.

Therapy

- Early recognition and prompt treatment is imperative for successful results.
- Fluid therapy should be instituted in most bitches, as dehydration is a common occurrence.
- Antibiotics selection should be based on culture/sensitivity, but administer broad spectrum antibiotics until culture/sensitivity results are obtained.
- Ampicillin (20 mg/kg QID) trimethoprim or oxacillin are good choices, with oxacillin and ampicillin being safe for nursing pups.
- Evacuation and involution of uterus can be hastened by use of ergonovine maleate (0.2 mg BID, p.o., for 5 d) (oxytocin gives peristaltic contractions)
- Prostaglandin (0.025-0.10 mg/kg) SID or BID for 3-5 days can also help evacuate the uterus.
- Puppies should be hand fed, because toxins passed through milk may kill the pups (toxic milk syndrome).
- Advanced cases are fatal due to toxemia and/or peritonitis from necrosis of the uterine wall.
- Ovariohysterectomy after stabilization of the bitch is an alternative.

Sub-involution of placental sites (SIPS)

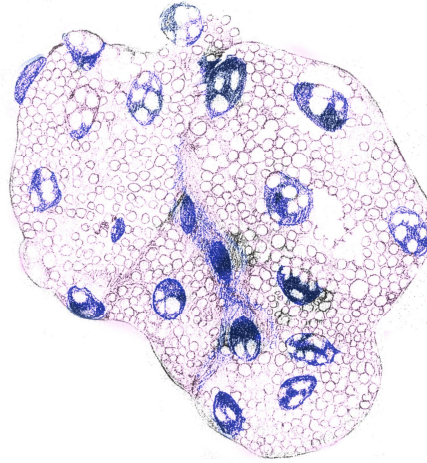
- Bitches normally have a lochial discharge for approximately 4-6 weeks postpartum . The uterus returns to normal size by approximately 9 weeks postpartum and uterine involution is histologically complete by 12 weeks postpartum.
- With SIPS the postpartum hemorrhage continues for 8-16 weeks postpartum.
- The continued hemorrhage occurs due to a failure of the normal thrombosis and normal occlusion of endometrial blood vessels caused by damage to these vessels by persistence of trophoblast-like cells.
- The trophoblast cells (also called decidua-like cells) do not degenerate and invade the endometrium and myometrium causing hemorrhage.

Clinical Signs

- Bitch is bright, alert, and responsive (BAR)

Diagnosis

- Differential diagnoses include metritis, vaginal inflammation, neoplasia, and even proestrus.
- Perform a CBC to rule out metritis..
- With SIPS, the bitch is not sick.
- Presence of decidua-like cells in the vaginal smear.
 - Multinucleated, vacuolated.



Single multinucleated vacuolated cell

Therapy -

- No good clinical studies to determine the optimal therapy.
- Ergonovine maleate (0.2 mg BID or TID for 5 d) can be administered.
- Prostaglandins have been suggested (0.25 mg/kg SC SID 5 days).
- Ovariohysterectomy is an alternative for the non breeding bitch.

Puerperal tetany (eclampsia)

- Puerperal tetany usually occurs 2-4 weeks postpartum, but may also occur prepartum.
- It is often seen in small bitches with large litters.
- It is caused by hypocalcemia, but the underlying causes are poorly defined.

Differential Diagnosis

- Rule out other causes of tonic and tono/clonic seizures.

Clinical signs

- Onset characterized by restlessness and panting progressing to muscle stiffness and ending in complete tonic paralysis with legs in hyperextension.
- Hyperpyrexia (107°F).

Therapy

- Calcium gluconate (can mix with 10% glucose 1:1), given slowly (1.0-1.5 ml/kg or until vomiting or recovery). The hypoglycemia associated with the condition may be helped by adding the glucose to the calcium gluconate. You must monitor the heart and interrupt injection of calcium gluconate if arrhythmia or bradycardia occurs.

- A respiratory alkalosis may cause lack of response to calcium therapy. Sedation will prevent hyper-ventilation.
- Glucocorticoids are contraindicated because they decrease intestinal absorption of calcium and enhance renal excretion of calcium.
- Prevent nursing for 24-48 hours, and then alternate nursing and hand feeding the puppies.
- Recurrence is common during the same, or subsequent, lactation
- Send the bitch home on 1-3 g calcium lactate or calcium gluconate and 10,000-25,000 Units oral Vitamin D daily.

Mastitis

Etiologic agents - coliforms, staph. strep.

Clinical signs

- One or more of the mammary glands is enlarged, painful, hot, and red.
- The bitch is febrile
- The bitch may neglect the pups.
- The bitch may be asymptomatic in mild cases, but the pups fail to thrive.
- Monitoring puppy health by weight
 - Puppies should be weighed at birth.
 - They should gain about 10% of that weight daily. (i.e. if they weigh 300 gms at birth they should gain about 30 grams daily).
 - If they are not gaining that much they should be examined and/or supplemented individually.

Diagnosis

- Examination of the mammary glands will reveal that they are enlarged, painful, hot, and red. The milk may be off color.
- There may be a leukocytosis

Therapy

- Perform a culture/sensitivity of milk.
- Treat with antibiotics that distribute to the milk. Mastitic milk is usually acidic, and bases distribute better into acidic milk. Ampicillin or oxacillin are good choices until a culture and sensitivity results are back.
 - Acute Mastitis Bitch without nursing pups
 - Aerobic bacteria
 - Gram-negative infection - Broad-spectrum cephalosporin (second- or third-generation), quinolones, chloramphenicol
 - Gram-positive infection - Lactamase-resistant penicillins, amoxicillin—clavulanic acid, first-generation cephalosporin, erythromycin, chloramphenicol

- Anaerobic bacteria - Penicillin, metronidazole, clindamycin, cefoxitin, chloramphenicol, erythromycin
- Bitch with nursing pups
 - Aerobic bacteria
 - Gram-negative infection - Cefoxitin, chloramphenicol
 - Gram-positive infection - First-generation cephalosporins, erythromycin
 - Anaerobic bacteria - Cefoxitin, erythromycin, chloramphenicol
- You may want to keep the pups nursing the bitch if possible, because this will keep the glands drained.
- If there is an open abscess or gangrene, then remove pups and hand feed. Treat the abscessed gland as open wound.

Non-septic mastitis

- The mammary glands are engorged and sensitive.
- There is usually no fever and the bitch is not sick.
- Encourage nursing by the pups.

Galactostasis/Agalactia

- With galactostasis you see hard, caked glands because the bitch is not producing milk.
- Give symptomatic relief by soaking the glands, analgesia for the bitch, and encouragement of nursing by the pups.
- Lactation can be stimulated if treatment is prompt.
- Mini-dose oxytocin (0.5-2.0 U/dose, SC, every 2 hr) should be administered.
- The neonates should be removed from the dam prior to each injection and returned 30 min later.
- The neonates should be supplemented adequately to ensure survival, but not excessively, so that they will suckle vigorously.
- Gentle hand stripping of the mammary glands should take place if suckling is not vigorous.
- Concurrent administration of metoclopramide (0.1-0.2 mg/kg, SC, TID-QID) promotes prolactin release.
- Acepromazine at mild tranquilization dosages may also facilitate milk letdown.
- Therapy should continue until lactation is adequate, usually 12-24 hr later

Uterine Torsion

- Usually occurs in a gravid uterus, etiology unknown.
- Signs -acute abdominal pain, vomiting, severe depression and collapse, shock.
- Diagnosis- supposedly can feel rotation on vaginal exam, but more likely to be diagnosed on exploratory.
- Treatment –Ovariohysterectomy (OHE) +/- cesarean section..

- Prognosis- High mortality, especially if sequelae to peritonitis due to rupture.

Uterine Prolapse

- Rare
- Usually occurs at labor or within 48 hrs.
- Signs -one or two tubular masses protruding from vulva. May be in shock if intra-abdominal bleeding is present.
- Treatment - If uterus looks healthy, flush with warm saline and lubricate with a water soluble jelly.
- Gently manipulate uterus to manually reduce. Recurrence is rare.
- If manual reduction fails or the uterus is necrotic, amputate the uterus.
- A smooth, cylindrical object is placed in the uterine lumen and 4 stay sutures are placed at equidistant points around the prolapsed uterus.
- If uterus is replaced but uterine tissue is damaged or there is internal bleeding, may need OHE.

PECULIARITIES OF EQUINE PREGNANCY

Physiology of mare's pregnancy

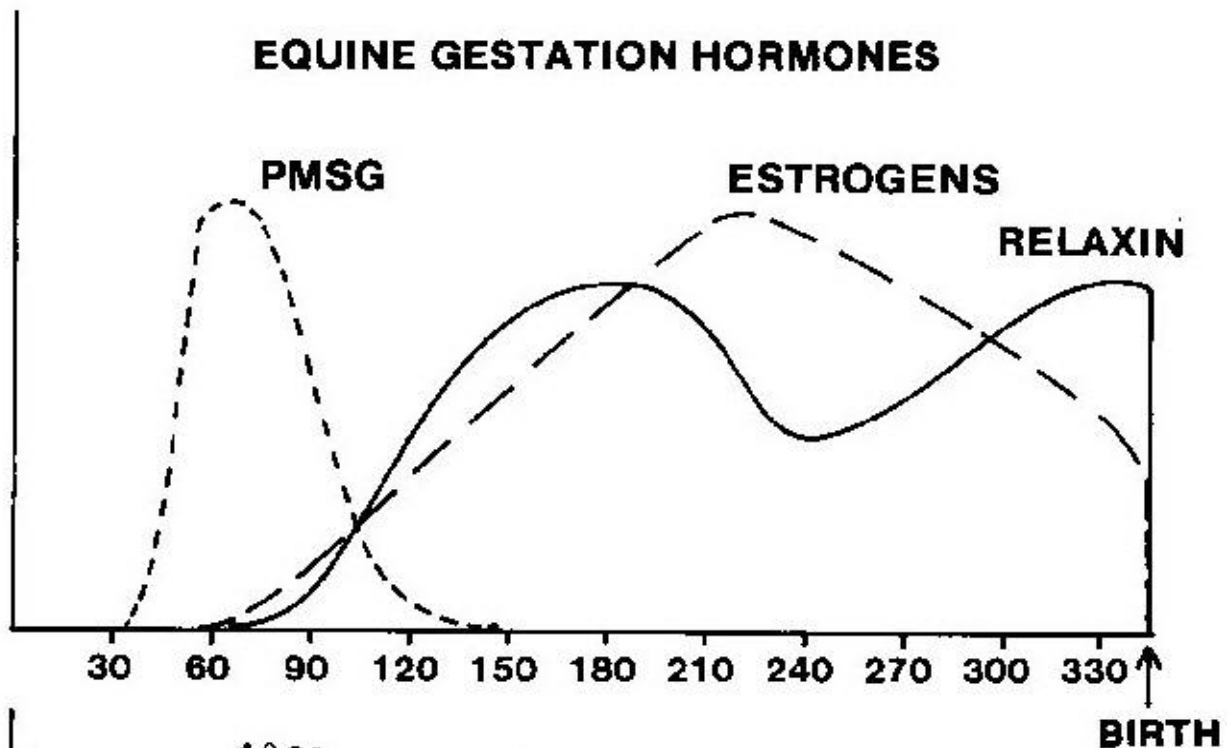
The endocrine changes in the mare during pregnancy are particularly unusual when compared with other domestic species because of the development of temporary hormone – producing structures called the Endometrial cups.

The Endometrial cups and Pregnancy Hormones

After ovulation and the formation of the corpus haemorrhagicum and thereafter the corpus luteum, **plasma progesterone** rises to 7-8ng/ml by 6 days. They persist at about these levels for first 4weeks of gestation but there is frequently a transient fall at about 28 days after ovulation to 5ng/ml followed by a later rise. In the early part of 2nd trimester of pregnancy, the endometrial cups are formed. These are discrete outgrowth of densely packed tissue within the gravid horn, derived as a result of the invasion of foetal trophoblast cells into endometrium where they subsequently give rise to the endometrial cup cells. Usually, there are about 12 cups present at the junction of the gravid horn and body as circumferential bands. The endometrial cups produce Pregnant Mare Serum Gonadotropin (PMSG) which is now referred to as **Equine Chorionic Gonadotropin (eCG)**. First demonstrable in blood 38-42 days after ovulation reaches maximum at 60-65 days, declines thereafter and disappears by 150 days of gestation. The endometrial cups formed from invasion of the endometrium from the trophoblastic girdle of embryo provoke a reaction by the maternal tissue and leads to dehiscence of the endometrial cups at about day 140. The immunological importance of the endometrial cups in protecting the foreign conceptus has been demonstrated. In inter species transfers of fertilized eggs between horses and donkeys no

endometrial cups were formed and the donkey fetus died at 80-90 days. eCG has both FSH-like activity (mainly in other species) and LH-like activity and it is generally assumed that in association with pituitary gonadotropin, it provides the stimulus for the formation of accessory corpora lutea. These structures start same way that the CL of dioestrus is formed or as a result of luteinization of anovulatory follicles. Because of the presence of the accessory corporal lutea the progesterone (P4) concentration in their peripheral circulation increases to reach and maintain a plateau from about 50 days - 140 days and then decline. By 180 -200 days the concentrations are below 1ng/ml and they remain so until about 300 days of gestation when they increase rapidly to reach a peak just before foaling and subsequent decline rapidly to very low level immediately after parturition.

Concentration of total oestrogens in the peripheral circulation during the 1st 35 days of pregnancy is similar to those of dioestrus although there is a temporary production of oestrogen by the embryo at 12-20 days. After this time they increase to reach a plateau between 40-60 days at values slightly above those that occur before ovulation, about 3ng/ml; the rise is probably due to the increased follicular development associated with eCG production. After day 60, it is likely that the increase is due to activity of the fetus or placenta. Maximum values are observed at about 210 days, the main source being the fetal gonads, with a gradual decline towards the time of foaling and a precipitous fall post partum. The main oestrogens in the mare are oestrone and a ketonic steroid equilin, oestradiol-17 β , oestradiol-17 α and equilinine are also present. Prolactin levels show no distinct pattern there are considerable variations within and between mares but there is some evidence of a slight increase towards the end of gestation.



The endocrinology of late gestation and parturition in the mare has been described, but unlike other domestic animal species, the factors that initiate parturition in the mare have not been elucidated. In contrast to ruminant species, maternal estrogen and progesterone concentrations do not change markedly, and a well-defined fetal cortisol surge is not observed just prior to parturition in the mare. Parturition is associated with large increases in prostaglandin and oxytocin concentrations, which induce uterine contractions and delivery of the foal.

Source of Progesterone

The main source of progesterone (P4) in early pregnancy is the true corpus luteum (CL) and the accessory Corpus Luteum (CLu). The true CL is active for the first 3 mths of gestation and regresses at the same time as the accessory CLu. The placenta must take over the production of P4 after regression of the accessory CLu and although the concentrations fall in the peripheral circulation, they remain high in the placental tissue and must maintain pregnancy by virtue of a localized effect.

When ovariectomy is performed after 50 days, the response is variable, whilst between 140 -210 days pregnancy is continual uninterrupted to terms. Thus after 50days there is evidence of a non ovarian source of P4 and by 140 days the ovaries are no longer necessary for the maintenance of pregnancy.

Changes in genital organs

Ovaries

* Conception to 40 days: CL can only be palpated per rectum for 2-3 days after its formation. Thereafter it cannot be identified even though it persists for 6 months. In pony mares there is some palpable follicular development at about 15 days while during next 14 days there is quite a marked increase in folliculogenesis giving rise to a large number of follicles giving the ovaries a bunch of grapes appearance. Ovulation during this period is rare.

*40 days to 120 days: period characterized with marked ovarian activity with multiple follicular development causing one or both ovaries to become temporarily larger than during estrus, in some cases very much larger. Ovulations forming accessory CLs and luteinization of anovular follicles occur. Follicular activity has usually subsided by 100 days and the CLs begin to regress

*120days to term: With gradual regression of all luteal elements and follicles the ovaries become progressively smaller and harder and are drawn forwards and backwards by the gravid uterus. The ovaries can be palpated throughout pregnancy except in large mares.

Uterus

*Conception-40 days: uterine tone increases to a maximum at 19-21 days, when the conception causes a soft thin walled ventral corneal swelling close to the uterine body. The horn involved is not necessarily on the same side of the ovary that produces the ovum. Here is good evidence that implantation usually occurs on the opposite side of the previous pregnancy. Conceptual swelling of the horn protrudes ventrally and cranio-caudally but not dorsally and grows solely during the faster and swelling progressively extends of the pregnant horn. In twinning, the conceptuses are usually disposed to the base of the two horns each with different endometrial cup. If both are however on the same horn one endometrial cup suffices.

*40-120 days: By 60 days conceptus occupies pregnant horn. After, the uterine body and non pregnant horn are invaded by the allanto chronic membrane. By 100 days the fluid –filled uterus is a somewhat tense swelling on the amniotic floating in a relatively large volume of allantoic fluid

*120 – term: Anterior border of uterus sinks downwards and forwards. Tension of the utero-ovarian ligaments caused by uterine distention by fetus normally assumes an anterior longitudinal presentation and ventral position. Fremitus can be detected in the uterine arteries though it is less obvious than in the cow.

Vagina and Cervix

Conception – 40 days: Vagina become progressively paler, dryer and covered by thin tacky mucus. Cervix is small and tightly closed; the external os is gradually filled by a plug of mucus and points eccentrically.

Pregnancy Diagnosis in Mare

Use of teaser Stallion at 16 days post serving and continued for a further 6 days. Failure of mare to return to estrus may confirm pregnancy.

False positive- if mare has a silent heat, if mare becomes anoestrus as a result of lactation or environmental factors, if mare has a prolonged dioestrus yet has not conceived, if mare has prolonged luteal phase associated with embryonic death referred to as pseudopregnancy.

False negative – few mares will show estrus although pregnant

Vaginal examination using speculum. Vaginal mucosa is pale, pink, scanty, sticky, small and tightly closed cervix; external os gradually filled with thick, tacky mucus, although it is not really apparent as a plug and points eccentrically.

False positive – early pregnancy (vagina not too different from what is seen in dioestrus), errors in prolonged luteal phase and pseudopregnancy.

Rectal palpation: Follicles are normally present during the 1st 3 months of gestation and given considerable size to ovaries. This may be confused with situation suggesting return to heat 3 weeks after service. Uterine tone is marked at 12-21 days of pregnancy; conceptus palpable at 12-21 days, by 100 days one can ballotte the foetus as it floats in the foetal fluid of the uterine body.

Ultrasonography: Doppler A mode ultrasonography is of little or no value in the mare, however B mode has been extensively used in this species.

Laboratory investigation: a). milk or blood progesterone. In pregnant mare plasma progesterone concentration remains elevated just before or during the time when the mare would have returned to estrus. Shortly after ovulation, a Corpus Luteum (CL) forms and produces progesterone. The progesterone concentration remains high (more than 1.5ng/mL) throughout pregnancy. A non-pregnant mare has progesterone concentrations which rise and fall as she cycles. Her progesterone concentration will be low when she is about to ovulate and is normally in heat. Therefore, a non-pregnant mare will have a low progesterone concentration every 19-24 days. A mare who is both pregnant and in heat will have a high progesterone concentration. A low progesterone concentration (less than 0.1ng/mL) 19-24 or 44-48 days after breeding indicates that the mare is not pregnant. A mare cannot carry the fetus if the progesterone is low. A high progesterone (more than 1.5ng/mL) 19-24 or 44-48 days post breeding indicates that the mare is pregnant at the time that the sample was taken. Most pregnant mares will have progesterone concentrations of greater than 3.0ng/mL.

False positive – prolonged luteal phase.

b) Blood and urine estrogen: by 85 days of gestation, concentration of estrus exceeds the maximum values obtained in non-pregnancies. A pregnant mare begins to produce estradiol (also called E2) about 60-70 days of gestation. The E2 concentration peaks and remains high (usually more than 800pg/mL) by 140 days of gestation. A high estradiol concentration (more than 350pg/mL) more than 140 days post breeding indicates that the mare is pregnant, and that the pregnancy is proceeding as it should. Often, clinicians will monitor both progesterone and estradiol throughout problem pregnancies. Progesterone and E2 come from different biochemical pathways in the mare and fetus.

c) Serum early pregnancy factor (EPF): this is an immunosuppressive glycoprotein associated with early pregnancy. Using the Rosette inhibition test, it has been possible to

detect the presence of EPF in the serum from peripheral blood from as early as 7-10 days after ovulation.

Twinning in mares

Twin ovulations are very common in mares where they can occur in up to 25% of ovulations. The birth of live twins is relatively uncommon, ranging between 0.8 and 3% depending upon the breed. The reasons for the discrepancy are:

- Fertilization failure
- Death of one or both embryo before or after fixation
- Death of one fetus, which is relatively uncommon.
- Abortion of both fetuses. This is the most common sequela and is obviously the most costly.

The use of B-mode ultrasound is quite appropriate for the detection of double ovulations and this has enabled better management hence presentation of the problem. However it is still possible for double ovulations to go undetected. Early identification of twin embryos, preferably between 12 and 14 days before fixation occurs, can enable more effective management of the problem. For this reasons, it is important to scan the whole of the uterine horns. This accurate detection is important because it often results in abortion and secondly even if both fetus survive and are carried to term many are dysmature, resulting in a high neonatal mortality rate. A further complication is that if embryonic foetal death occurs after the formation of endometrial cups, this latter maintained resulting in pseudo pregnancy. Studies using trans-rectal ultrasound imaging have shown that there is a wide disparity between births. Most embryo reduction occurs in the same horn and when the conceptuses are of unequal size.

Management

- Reduction by manual destruction.
- Use of PGF2& after fixation but before day 30 and both conceptuses must be in the same horn.
- From day 37 when twin pregnancy becomes complicated do the following:
 - * Dietary energy restriction
 - *Surgical removal of one vesicle
 - * Intra-cardiac injection

* Trans-vaginal ultrasound guarded needle puncture.

Characteristics of parturition in mares

GESTATION PERIOD IN THE MARE IS AVERAGELY 335(305-405) DAYS

Stage 1 is characterized by restlessness, walking, frequent urination, sweating, the mare is anxious, looking at her abdomen, getting up and laying down, rolling.

- Most mares will rise at least once after going down, but repeatedly getting up and down may signal a problem.
- The foal has an active role in its final positioning, going from dorso-pubic to dorso-sacral.
- The duration of Stage 1 is usually about an hour or a little longer (10 min - 5.5 h).
- Stage 1 ends with the rupture of the chorio-allantois at the cervical star.

Stage 2 consists of 15 to 30 min of very forceful expulsive efforts.

- The foal is presented in the intact amnion, usually with one forelimb about 6 in. behind the other.
- The long umbilical cord remains intact until the mare rises.
- It was once thought that significant blood flow, up to 1 liter, occurred through the cord after birth and people were cautioned about
- It was once thought that significant blood flow, up to 1 liter, occurred through the cord after birth and people were cautioned about breaking the cord too soon.
- However, more recent studies have shown that there is no significant blood flow in the cord after birth and there is no difference in the PCV between foals in which the cord is broken soon after birth and those in which the cord is left intact.

Stage 3 typically appears as a tranquilizing effect post-delivery.

- The placenta is usually passed in less than 3 h after parturition.
- After delivery, the navel should be disinfected with 2% chlorhexidine.
- Non-tamed iodine is associated with an increased incidence of patent urachus, and other problems because it is too harsh.

- Povidone iodine does not disinfect adequately.
- Good colostrum has a specific gravity >1.06 and adequate intake should be observed. Inspection of the placenta should be routine.
- Make sure that the placenta has been passed.
- Check for signs of placentitis. Any abnormal areas may indicate septicemia of the foal.
- Treatment should begin immediately, before clinical signs appear in the foal. Also check for other abnormalities in the placenta. Areas of aplastic or hypoplastic villi are an indication of uterine pathology.

- **Postpartum care**

Provision of clean dry, draft free area protected from excessive sun and wind

Need for exercise to promote uterine involution and stimulate appetite and gastrointestinal function. Living them in the stall may cause metritis. If this must be done because the foal is ill then 10-20ml of oxytocin must be given.

Light feeding 1st few days after foaling. Preferably laxative feeds such as bran mashes to reduce incidence of constipation.

Deworm with Broad spectrum antiparasitical compounds such as ivermectin. This will not be necessary in a farm with parasite control programme (every 45-60 days)

Colostrum management: As the foal depends on absorption of adequate quantities of colostal immunoglobulin for protection against disease during the first month of life, the quantity and quality of colostrums needs to be assessed. Colostrums with a high immunoglobulin concentration is thick and sticky with either a yellow or gray-tinged appearance.

Treatment of mares with postpartum complications:

*Retained placenta – manual removal has been reported to be the treatment of choice. Antibiotics are also recommended. It aids in prevention of metritis. Most conservative treatment for retained foetal membrane is the use of oxytocin

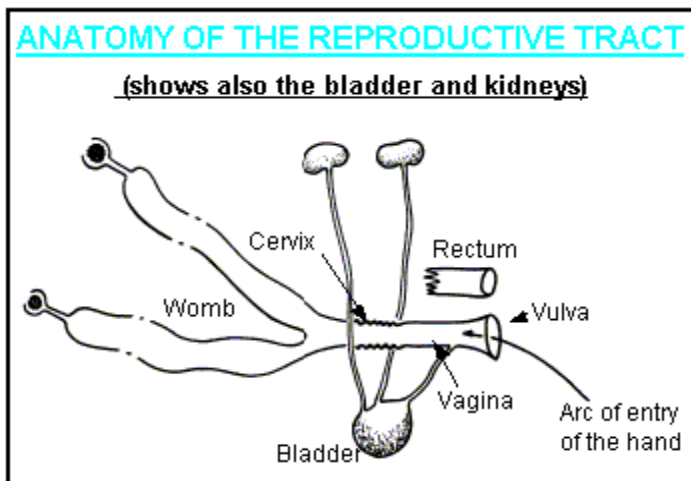
*Rupture of Uterus – immediate treatment of haemorrhagic shock or dehydration is indicated. Antibiotics and non steroidal anti-inflammatory drugs should be given to control sepsis. Best treatment for salvaging both life and breeding potential of a mare is laparotomy and surgical repair of the uterine rupture. Abdominal lavage can be performed to reduce contamination following repair. Uterus should be massaged every 24 hours to prevent formation of adhesions.

*Gastrointestinal complications (rupture of the caecum or right ventral colon, colonic torsion, Ischaemic necrosis of the small colon). The GIT may be traumatized during parturition when it is full of ingesta or distended with gas. Mostly affected is the caecum followed by the large colon and rectum. They are ruptured apparently by the explosive increase in intra abdominal pressure. Affected Mare appears normal after parturition. To treat rupture or severe trauma to the large bowel is virtually impossible, some preventive measure before foaling are helpful like reducing quantity of hay feed.

Contusions of the small intestine or colon can occur during parturition. This may produce mild transitory system of colic and may go unrecognized. Exploratory colomy is recommended if mesocolonic rupture is suspected

G) Postpartum Haemorrhage - multiparous mares over 10 years are primarily affected.

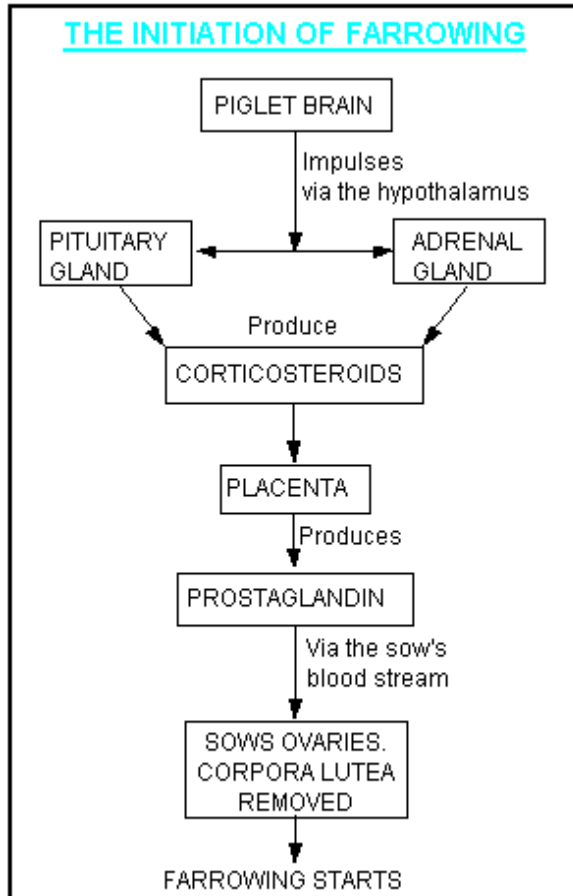
Peculiarity of swine parturition



(Fig.8-10)

Anatomical adaptation at parturition

- * As farrowing approaches the vulva becomes enlarged
- * The vagina that leads to the cervix becomes enlarged too.
- * A small lubricated hand and arm can be inserted into the vagina to just beyond the cervix without damage.
- * The neck of the cervix opens into the two long horns of the womb that contain the piglet.
- * The umbilical cord of the piglet terminates at the placenta which is attached to the surface of the womb.
- * Nutrients pass from the blood of the sow across the placenta and into the developing piglet.
- * The placenta also extends around the piglet as a sac which contains fluids and waste materials, produced by the piglet during its growth.
- * The placenta and the sac are referred to as the afterbirth.



(Fig.8-11)

Initiation of parturition

- *The piglet activates its pituitary and adrenal glands to produce corticosteroids.
- *These hormones are then carried via its blood stream to the placenta.
- *The placenta then produces prostaglandins which are circulated to the sow's ovary.
- *The corpora lutea in the ovaries are responsible for the maintenance of pregnancy.
- *Prostaglandins cause them to regress, thus terminating the pregnancy
- *This allows the hormones that initiate farrowing to commence.

Length of pregnancy

- *Mean length in the sow - 114 - 115 days (Range from 111-120).
- *Gilts tend to have a shorter pregnancy.

*The variation within the range is influenced by the herd, environment, breed, litter size (it tends to be shorter in larger litters and longer in smaller litters) and the time of year.

The farrowing process

Three stages - the pre-farrowing period, the farrowing process and the immediate post-farrowing period (afterbirth expulsion).

Stage 1 - The pre-farrowing period

The preparation for farrowing starts some 10 to 14 days prior to the actual date, with the development of the mammary glands and the swelling of the vulva. At the same time teat enlargement occurs and the veins supplying the udder stand out prominently. The impending signs of farrowing include a reduced appetite and restlessness, the sow standing up and lying down and if bedding is available chewing and moving this around in her mouth. If she is loose-housed on straw she will make a bed. Within 12 hours of actual delivery of piglets, milk is secreted into the mammary glands and with a gentle hand and finger massage it can be expressed from the teats. This is one of the most reliable signs of impending parturition. A slight mucous discharge may be seen on the lips of the vulva. If a small round pellet of faeces is seen in the mucous and the sow is distressed, farrowing has started and it is highly likely the first piglet is presented backwards. This small pellet is the meconium or first faeces coming from the rectum of the piglet inside. **An internal examination is immediately required.** The final part of stage 1 is the opening of the cervix to allow the pigs to be pushed out of the uterus, through the vagina and into the world.

Stage 2- The farrowing process

This can range from 3 to 8 hours and piglets are usually delivered every 10 to 20 minutes but there is a wide variation. Consult the sow and litter card to see if there have been any previous problems at farrowing. For example if a sow has had high stillbirth rates, monitor her more closely and take any necessary actions. There is often a gap between the first and second piglet of up to three quarters of an hour. The majority of pigs are born head first but there are more pigs presented backwards towards the end of the farrowing period. Immediately prior to the presentation of a pig the sow lays on her side, often shivering and lifting the upper back leg. This is an important point to take note of because it may indicate the presence of a stillborn pig. Twitching of the tail is seen just as a pig is about to be born.

Stage 3- Delivery of the placenta

This usually takes place over a period of one to four hours and is an indication that the sow has finished farrowing although some afterbirth will sometimes be passed during the process of farrowing. Once the sow has completed the farrowing process there are certain signs that should be observed. She appears at peace, grunts and calls to the piglets. **The shivering and movement of the top hind leg ceases. If this is still occurring it is likely that a pig is still presented.**

After the placenta has been delivered there will be a slight but sometimes heavy discharge for the next 3 to 5 days. Provided the udder is normal, the sow is normal and eating well ignore it, it is a natural post-farrowing process. Occasionally a pathogenic organism enters the uterus causing inflammation (endometritis). This may cause illness, requiring treatment.

Problems at farrowing

Uterine inertia - This is where the womb has just stopped contracting. Usually there will be two or three pigs waiting just beyond the cervix. If they are in an anterior presented position place the hand over the head with the first and second fingers around the nape of the neck. If the piglet is presented in a breech or backward position raise both hind legs and clamp the hands around using the first and second fingers as leverage around the points of the hock.

Difficult presentations - Occasionally (particularly in gilts) a large piglet is presented that is too big, but in most cases with gentle traction such a pig can be delivered. The best method is to use a piece of cord, 2 metres long (clean disinfected nylon cord is satisfactory) and loop the centre of it around the end of the third finger. Using plenty of lubricant, pass the cord into the vagina to approximately 50mm behind the head of the piglet. The cord is then placed behind the left and right ears and finally brought down beneath the jaw. Twisting it lightly under the piglets chin may help to secure it. Traction can then be applied in a downward movement to bring the pig out. This is an excellent and simple technique and I would recommend that you familiarise yourself with it by cutting off the end of a wellington boot, place a dead piglet inside with its head presented to you and practice placing the cord around the neck.

Rotation of the horns of the womb - This sometimes occurs when very large litters are present. One horn crosses over the other. This distorts the cervix so that piglets cannot be pushed through and 2, 3 or 4 pigs form into a pouch below the cervix itself (many are presented backwards). When the hand is passed through the cervix (which has become elliptical) the pigs can be felt by reaching downwards and back towards yourself. In such cases it is necessary to take the arm full length into the sow (sow standing) and work hard to bring three or four piglets up. Once the piglets have been removed with the sow standing use a closed hand on the side of the abdomen, swing it to try and realign the piglets and horns of the uterus. If the sow has not passed further piglets within half an hour re-examine.

Stimulating a piglet to breath - If a piglet is delivered and it fails to breath take a small piece of straw and poke it up the nose. This will in many cases elicit a coughing reflex and remove mucus that has blocked the windpipe. Alternatively place the third finger across the mouth of the piglet with its tongue pulled forward. Place the rest of the hand around the head and hold the back legs. Swing the pig with a firm downward movement to propel any mucous from the back of the throat and the windpipe.

What to do when there are farrowing problems

Step- 1: Recognise that the sow is in difficulty. This is shown either by lack of piglets being born, the sow panting heavily and obviously in distress or blood and / or mucus at the vulva.

Failure to deliver the piglets can be due to the following:

A large litter and inertia of the womb; Very large piglets and a small pelvis; Two or more pigs presented in the birth canal at the same time; Illness of the sow, for example acute mastitis. Rotation of the womb; Failure of the cervix to relax and open; Dead pigs inside the womb; Mummified pigs; Failure of the womb to contract (uterine inertia); Nervousness An over fat sow.

Step-2: Investigate. Never carry out an internal examination without a container of clean warm water containing a mild antiseptic and use a soft soap or preferably a special obstetrical lubricant. Do not use detergents, they are irritant and **never** be tempted to try and force a dry arm into the vagina of the sow.

Step- 3: Wash the hands and arm well and in particular ensure the finger nails are short. It is preferable to use a plastic arm sleeve because this reduces contamination from the hands.

Examine the sow as she is lying down on her side. It is easier to use your left hand if she is on her left hand side and your right hand if she is on her right side. Occasionally you may have to examine the sow in a standing position.

Hold the fingers of the hand together and introduce the arm into the vagina in an arc as shown in Fig.8-10. Progress to the cervix and beyond so that you can feel the entrance to each horn of the womb. To do this your arm will have to enter up to the armpit.

Step- 4: If after a manual examination you suspect some degree of uterine inertia, (through fatigue or some other reason the uterus has stopped contracting strongly) or the sow appears to have given up trying, a small injection of oxytocin (0.5ml) may be given. Normally it is not necessary because the pressure of the arm in the vagina stimulates further contractions. Well grown piglets passing through the vagina have the same effect but small mummified piglets do not, hence a stillborn piglet may follow after a mummified piglet. Piglets suckling the sow's teats also stimulate uterine contractions so gentle massage of the udder and teats with your hand may be helpful.

Step- 5: If an internal examination has been necessary and the farrowing process has been completed an injection of antibiotic should be given. An injection of long-acting penicillin (10-15ml) should be adequate to prevent any potential infection.

If there have been dead possibly infected piglets present two antibiotic pessaries should be deposited through the cervix at the end of the third stage.

Step- 6: Always monitor the sow frequently over the next 24 hours to make sure that infection is not developing in the udder or womb, and that the placenta has been expelled and the sow is suckling her litter normally.

Pre natal Obstetrician check list

Are they fresh or decayed

↓

Presence of foetal parts

↓

Identification of foetal parts

E) Vaginal examination

Consider epidural anaesthesia

↓

Consider administration of clenbuterol

↓

Clean perineum and vulva

↓

Commence vaginal examination

↓

Foetus absent

↓

fetus present

↓

↓

Assess vulval relaxation

methodical palpation (presentation

↓

position, posture)

Assess vaginal relaxation

↓

↓

↓

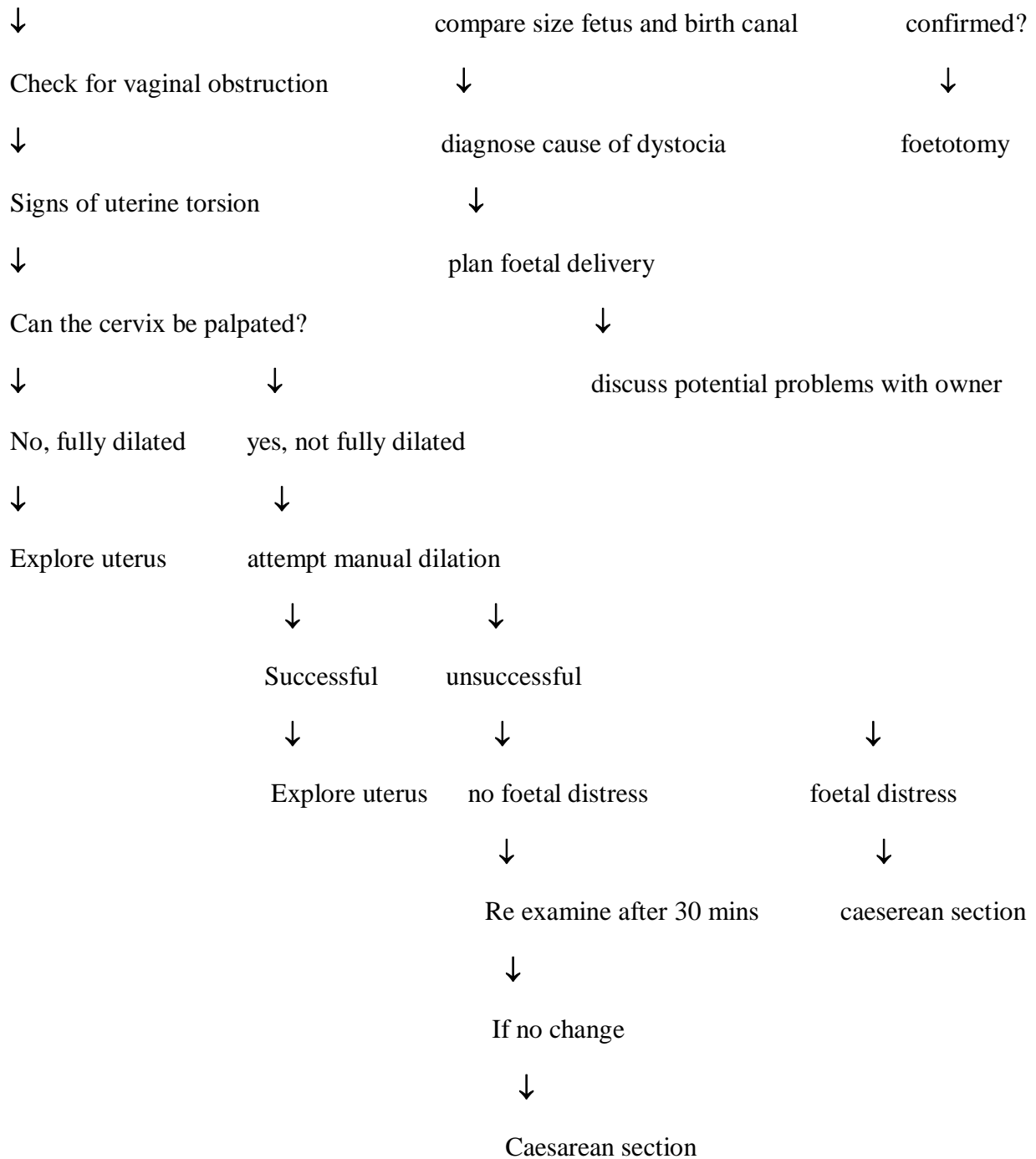
evidence of foetal life

suspicion of foetal death

Check for vaginal damage

↓

↓



Post natal obstetrical check list (Neonate)

A) Visible signs of life

Spontaneous breathing: monitor and watch for signs of acidosis

↓

Heart beating but no respiration: stimulate respiration

↓

Clear foetal airway: raise hindquarters or apply suction

↓

Attempt stimulating first gasp: cold water on head or needle infiltrum

↓

Administer doxapram HCl IV or under tongue

↓

Artificial respiration: manual /intubate/resuscitator/esophageal tube

↓

Inflate and apply artificial respirator

↓

Monitor blood Po₂ to tongue/ear and pulse: apply pulse oximeter

↓

Watch for spontaneous respiration

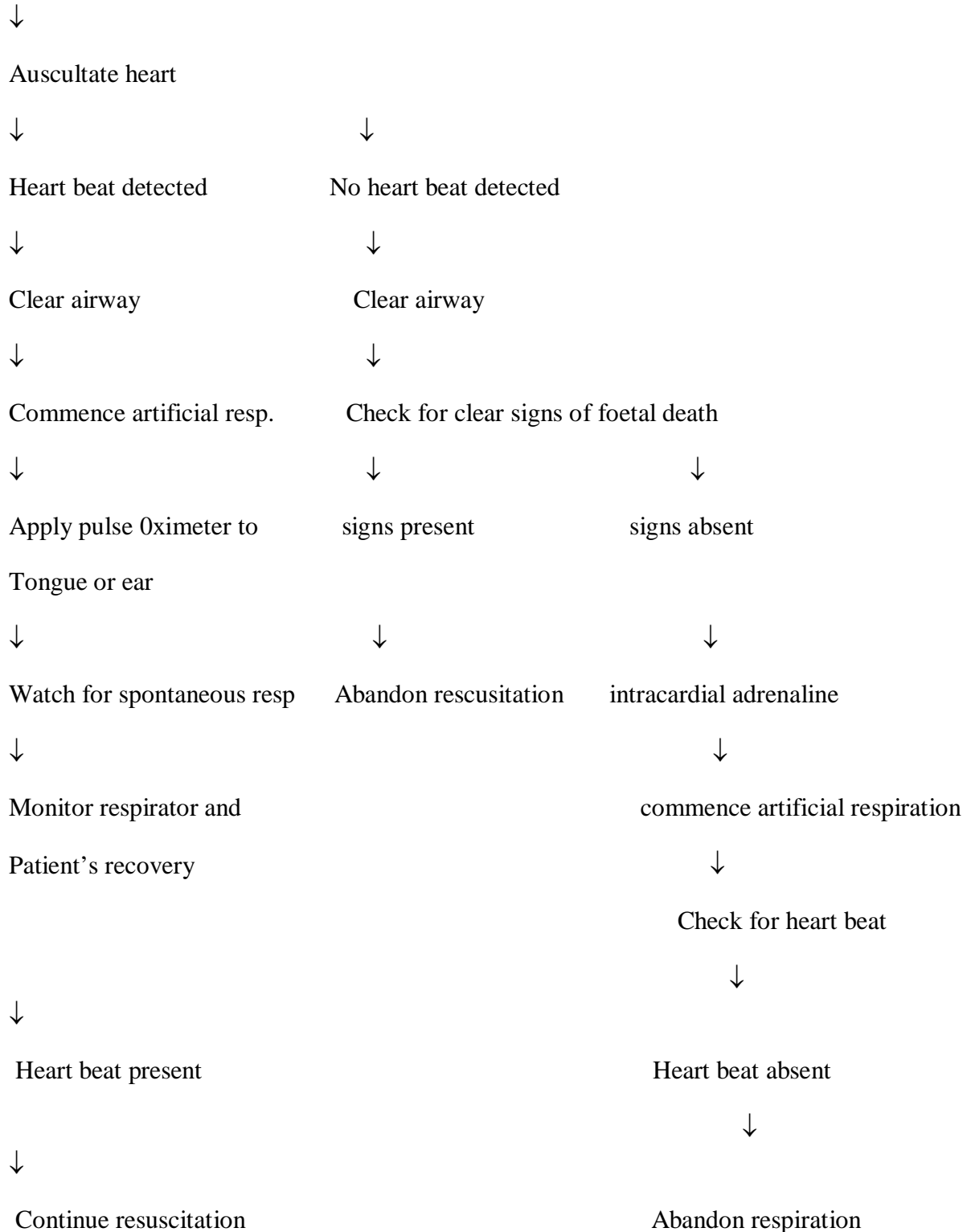
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Monitor respiration and patient's recovery

↓

No visible signs of life

Check fetus for heart beat: Observe/palpate chest wall



Post natal obstetrician check list (Dam)

Explore uterus for further fetus (es)



Assess and deliver further (fetuses)



Ensure uterus is empty



Check for vaginal and uterine discharge



Repair any accessible damage



Assess myometrial tone



Administer oxytocin if tone is poor



Consider need for analgesia



Administer calcium if necessary



Treat mastitis if present



Arrange pre breeding days after (depending on the species) for evidence of cycling