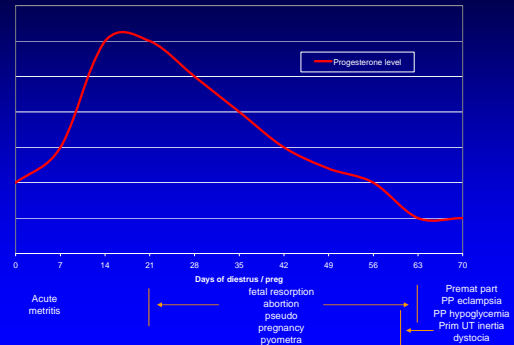


## Reproductive Problems: Diestrus and Pregnancy

## Conditions during diestrus/preg



## Subfertility Abnormalities of Diestrus

- Pseudopregnancy
- Acute metritis
- Cystic endometrial hyperplasia (CEH)
  - "Pyometra Complex"
    - CEH
    - Cystic glandular hyperplasia
    - Endometritis
    - Pyometra

## Pseudopregnancy

- Nonpregnant bitch
  - Physical and behavioral condition
    - Intensification of diestrus signs
      - Mammary development
      - Lactation
      - Change in behavior
    - Common nulliparous bitch (2-6 years)
  - Triggered at end of diestrus
    - Withdrawal of progesterone
    - Increased prolactin (production or sensitivity)

## Pseudopregnancy

- Clinical signs
  - Occur commonly 4-6 weeks after estrus
  - Increase in weight or abdominal distention
  - Mammary development + lactation
  - Restlessness, lethargy, increased affection
  - Increased or decreased appetite
  - Minimal mucoid vaginal discharge
- Abnormal behavioral signs
  - Nesting
  - Nursing (self or inanimate objects)
  - Anorexia

## Pseudopregnancy

- Diagnosis
  - History and clinical signs
  - Rule out pregnancy or pyometra
    - Abdominal palpation
    - Radiographs or ultrasound
    - Bloodwork
    - Vaginal culture

## Pseudopregnancy

- Treatment
  - Mild signs
    - Self limiting, regression in 1-3 weeks
  - Intense signs
    - Symptomatic treatment
      - Sedation
      - Furosemide, until lactation ceases
      - Mibolerone, suppresses psychological signs
      - Prolactin inhibitors (bromocriptine, cabergoline)
  - Prevention
    - Breed next estrus
    - Ovariohysterectomy

## Acute Metritis

- Few days after end of estrus
  - Septicemia
    - Hyperthermia
    - Hyperpnea
    - Dehydration
  - Dark red malodorous vaginal discharge
- Diagnosis
  - History of recent estrus
  - Vaginal cytology and culture
  - CBC (left shift)
  - Radiograph or ultrasound

## Acute Metritis

- Treatment
  - Systemic broad spectrum antibiotics
  - Fluid therapy
  - PGF<sub>2</sub> $\alpha$  100-250 mcg SQ Q12-24hr x 2-3 days
  - Ovariohysterectomy

## Cystic Endometrial Hyperplasia-Pyometra Complex

- Progressive
  - Cystic endometrial hyperplasia
  - Cystic glandular hyperplasia
  - Endometritis
  - Pyometra
- Bitches of all ages
  - More common 5-10 years

## Cystic Endometrial Hyperplasia

- Clinical signs
  - Copious mucoid vaginal discharge (+/- blood)
    - Diestrus and anestrus
- Infertility
  - Irregular estrous cycles
  - Small litter size
  - Early embryonic death
  - Abortion
  - Potential to progress to pyometra
    - Bitches > 6 years



## Cystic endometrial hyperplasia

- Treatment
  - Mibolerone x 10-30 days
    - 30 mcg/d for dogs up to 50lbs
    - 180 mcg/d for dogs over 100lbs
  - Ovariohysterectomy

## Endometrial Hyperplasia Endometritis

- History
  - Conception failure
  - Irregular cycles
  - Pseudopregnancy
  - Embryonic death
  - Stillbirth/fetal mummification
- Clinical signs
  - Fetid vaginal discharge 30-90 days post estrus
    - Cytology: neutrophils, lymphocytes, bacteria, parabasal cells
  - Slight increase in body temperature

## Endometrial Hyperplasia Endometritis

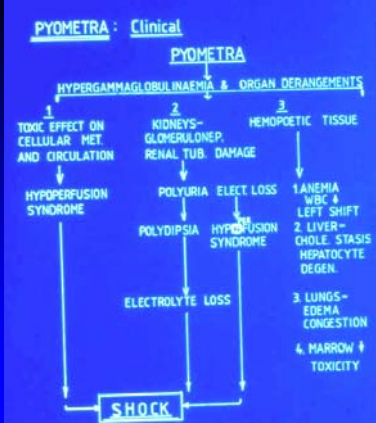
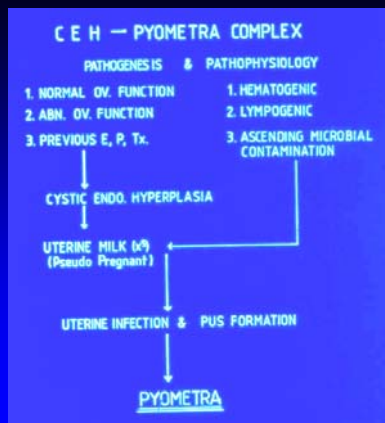
- Management
  - No effective therapy
  - Systemic antibiotics x 2-3 weeks
  - Antibiotic vaginal infusion daily for 3-5 days
  - Ovariohysterectomy

## Pyometra

- Hormone mediated diestrual disorder
  - Uterine infection overlying CEH
    - Accumulation of pus in the uterus
      - Open or closed cervix
      - Closed pyometra severe systemic illness
    - Diestrus (most common)
      - 3-9 weeks after estrus
    - Anestrus
      - Range 1-4 months post estrus
  - Two syndromes
    - Older bitch (8+ years)
    - Younger bitch (hx estrogen/progestin tx)

## Pyometra

- Causes
  - Exposure of the reproductive tract to high concentrations of progesterone
    - Uterus
      - Pathological changes
      - Predisposed to infection or sepsis
    - Secondary to abnormal ovarian function
    - Exogenous progesterone/progestins
    - Exogenous estrogens (mismatching)



## Pyometra

- **Clinical signs**
  - Lethargy, anorexia
  - PU/PD
  - Vomiting/diarrhea
  - Abdominal distention/pain
  - Vulvar enlargement
  - Purulent vaginal discharge
    - 4-8 weeks post estrus
  - Septic shock/toxemia
    - Closed pyometra
- **Laboratory findings**
  - Leukocytosis
    - Degenerative left shift
    - 20,000-100,000
  - Anemia
    - Bone marrow suppression
  - Azotemia
  - Hyperalbuminemia
  - Hypercholesterolemia
  - Increased ALP

## Pyometra

- **Diagnosis**
  - History
    - Previous estrus or exogenous hormone therapy
  - Vaginal cytology
    - Large numbers of toxic degenerate neutrophils
    - Culture: E. Coli (most common)

Bitch	Age (years)	Breed	Before prostaglandin treatment	On the last day of prostaglandin treatment	1 month after prostaglandin treatment
1	7	Cocker spaniel	32.3	ND	ND
2	6	German shepherd	8.6	10.7	7.3
3	4	Bernese mountain dog	21.5	15.5	8.6
4	8	Sheltie	17.8	ND	ND
5	5	Great dane	12.0	11.5	9.3
6	4	German shepherd	21.1	11.5	9.5
7	11	Irish setter	19.7	ND	ND
8	7	German shepherd	16.4	9.7	9.4
9	5	Bernese mountain dog	15.7	7.7	8.2
10	6	Cocker spaniel	15.9	14.4	10.2

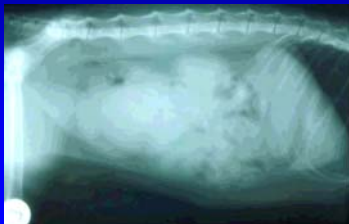
ND Not done, ovariectomy on the eighth day of treatment.  
WBC White blood cell count.

TABLE 3. Data on previous oestrus and progesterone concentrations in 10 bitches

Dog	Interval between end of previous oestrus and admission (weeks)	Etiology	Plasma Progesterone concentration (ng/ml)	
			At Admission	At the end of therapy
1	5	E. COLI/KLEB SP	9.58	2.89
2	8	E. COLI	4.65	4.22
3	8	E. COLI	1.60	0.61
4	12	STAPH. INTER/alpha HEM STREP.	2.82	1.74
5	8	E. COLI	1.33	0.40
6	4	E. COLI	3.04	0.00
7	-	(prolignestone therapy)	6.17	3.97
8	14	E. COLI	0.04	0.00
9	4	E. COLI/KLEB SP.	3.49	0.54
10	9	PROTEUS/beta HEM STREP.	0.00	0.00

## Pyometra

- **Diagnosis**
  - Abdominal palpation
  - Radiographs or ultrasound



## Pyometritic uteri



Thin walled



Post P4 Tx

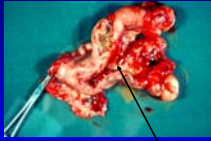


Thin walled



Unicornual

## Pyometritic uteri



suture



Lobulated horns

## Pyometra

- **Management**
  - Ovariohysterectomy
  - **Medical therapy (open pyometra)**
    - Prostaglandins ( $PGF_2\alpha$ )
      - 100-250 mcg/kg SQ Q24hr x 5-7 treatments
      - 20 mcg/kg IM TID
    - Myometrial contractions, cervical relaxation allowing evacuation of the uterus within 24-96 hours
    - Side effects: restlessness, hypersalivation, panting, defecation, tachycardia, abdominal cramping
      - » Observed within the first hour of treatment
  - Parenteral antibiotics x 10-20 days
  - Breed next estrus

## Uterine Stump Pyometra

- Requires ovarian remnant (progesterone)
  - Incomplete removal of uterine body/horns
- History
  - Estrous behavior after spay
- Diagnosis
  - Abdominal palpation
  - Radiographs, ultrasound
- Treatment
  - Resect residual ovarian and uterine tissue

## Problems of Gestation

- **Pregnancy loss**
  - Fetal resorption
  - Abortion
  - Prolonged gestation
  - Dystocia

## Pregnancy Loss

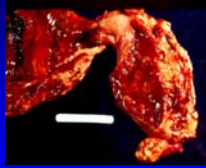
- **Any stage of gestation**
  - Embryonic death/resorption
  - Abortion dead or live pups
  - Stillborn pups
  - Fetal death/mummification
- Depends on
  - Cause
  - Stage of gestation
  - Maternal and fetal response

## Pregnancy Loss

- **During the first month**
  - Resorption occurs
- **Second half of pregnancy**
  - Abortion or stillbirth
- **Late gestation**
  - Fetal maceration, emphysematus, mummification
- **Periparturition fetal loss**
  - Stillbirths
    - Incidence 2-7% (increases with dystocia)

## Fetal Resorption

- Positive pregnancy diagnosis at 3-4 weeks
  - Followed by fetal loss in first half of gestation
- Fetus resorption
  - Total loss; no whelping
  - Partial loss; several implantation sites with fewer pups
- Difficult to confirm
  - Most bitches that experience resorption were never pregnant
  - Reported incidence 10-13%



## Causes of Fetal Resorption

- Anatomic/genetic
  - Zygotes
  - Uterine environment
- Congenital/hereditary defects
- Metabolic
  - Hypothyroidism
  - Hypoprogesteronism
  - Ovarian failure
- Nutritional
- Infectious
  - Viral (herpes, parvovirus)
  - Brucella canis
  - E. coli, Strep spp,
  - Mycoplasma ureaplasma
- Systemic illness
- Drugs
  - Exogenous glucocorticoids

## Fetal Resorption

- Signs
  - May be none or mild signs
    - Anorexia, listlessness
    - Fever
    - Fetid vaginal discharge
- Diagnosis
  - Physical examination
  - CBC, chemistry, urinalysis
  - Radiographs, ultrasound
  - Vaginal culture
  - Serial progesterone assays (diestrus)
  - Serology
    - Brucellosis, canine herpes virus

## Fetal Resorption

- Management
  - Pre-breeding
    - Vaginal cytology and culture
    - Vaccines
    - Thyroid supplementation if hypothyroid
  - Adequate nutrition
  - Weekly progesterone assay
    - Hypoprogesteronism
      - Progesterone (in oil)
      - Synthetic progestins
        - » 17 $\alpha$ -ethyl nortestosterone
        - » Allyl-trenbolone

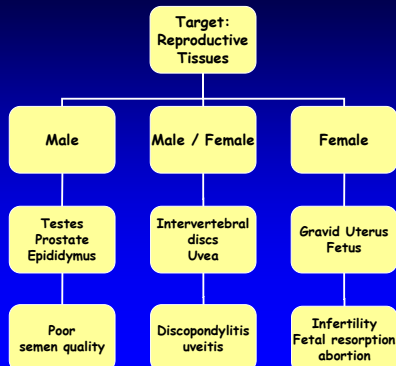
## Abortions

- Premature expulsion fetus
  - Living or dead
- Causes
  - Uterine disease
  - Infections
  - Drugs
  - Toxins

## Infectious Causes

- Brucella canis
  - Serological incidence 1-10% in all dogs in USA
  - Third trimester abortions (days 45-59)
    - Abortion storms
      - 80% of all susceptible dogs within a kennel
  - Transmission
    - Oral, nasal, conjunctival, vaginal, transplacental
      - Mating with an infected dog/bitch
    - Infected aborted fluids
    - Milk of an infected bitch

## Canine Brucellosis



## Brucella canis

- **Clinical signs**
  - History of failure to conceive
    - High incidence of embryonic loss
  - Abortions
    - Without premonitory signs
  - Systemic illness
    - Generalized lymphadenitis
    - Splenomegaly
    - Recurrent uveitis
    - Discopondylitis
    - Arthritis/polyarthritis



## Brucella canis

- **Diagnosis**
  - Serology
    - RSAT, TAT, ELISA, AGID
    - Negative
      - Highly reliable in females
    - Positive
      - Rapid slide agglutination test
        - » Cross-reactive with Bordetella sp, Pseudomonas sp
        - » Use mercaptoethanol tube agglutination test or culture to confirm a positive result

## Brucella canis

- Zoonoses
- Eradication of infected animals
  - Isolate and test any newly purchased dogs
    - One month isolation
    - Serology test twice
  - Infected dogs should be destroyed
  - Antibiotic therapy poor response

## Infectious Causes

- Miscellaneous bacteria
  - E. coli, Streptococcus spp,
  - Purulent vaginal discharge
  - Systemic illness
- Viral
  - Canine distemper (CDV)
  - Canine adenovirus (infectious hepatitis)
  - Canine herpesvirus (CHV)
    - Early pregnancy---fetal death/mummification
    - Mid-pregnancy---premature birth
    - Infected during passage through vagina---death

## CDV, CHV, and canine adenovirus

- All implicated in abortions
  - Isolated from aborted fetuses and placentas
- CDV and CHV
  - Cross placenta and infect fetus
- Pregnant bitches
  - DO NOT use modified live vaccines

## Drugs

- **Estrogens**
  - Requires large doses
  - **DO NOT** use during pregnancy
- **Corticosteroids**
  - **AVOID** during pregnancy
    - Dexamethasone 5mg Q12hr x 10 days results in fetal death
    - Hydrocortisone
      - Teratogenic effects
- **Prostaglandin F<sub>2</sub>α**
  - **Abortive** in repeated doses for several days

## Prolonged Gestation

- **Gestation**
  - >70 days from first breeding
  - >60 days from day 1 of diestrus
- **Causes**
  - **Fetal factors**
    - Small litter size with failure of fetus to initiate labor
    - **Oversized fetus**
      - Genetics
      - Prolonged gestation
    - **Malpresentation**

## Prolonged Gestation

- **Fetal factors (cont.)**
  - Mummified fetuses



## Prolonged Gestation

- **Maternal factors**
  - **Excessive nervousness**
  - **Uterine inertia**
    - Primary (overweight, sluggish dogs)
    - Secondary (myometrial exhaustion, hypocalcemia, hypoglycemia)
  - **Anatomic**
    - Uterine torsion, pelvic stenosis, vaginal mass
  - **Metabolic**
    - Hypoglycemia, hypokalemia
  - **Iatrogenic**
    - Progestin therapy in late gestation

## Prolonged Gestation

- **Diagnosis**
  - **History**
    - Estrous cycle
    - Check ovulation and breeding dates
  - **Physical signs late gestation**
    - Mammary gland development
    - Presence of milk
  - **Imaging determine fetal age and viability**
    - Radiographs
    - Ultrasound

## Prolonged Gestation

- **Treatment**
  - **C-section**
  - **Induce parturition**
    - PGF<sub>2</sub>α
- **Prevention**
  - **Regular exercise**
  - **Accurate records**
  - **Monitor for signs of whelping**

## Dystocia

- Difficult birth or problem with parturition
- Signs
  - Stage I labor >24 hours
    - Without progression to stage II
  - Greenish discharge from vulva
    - No pup within 30 minutes
  - Strong abdominal contractions
    - No pup delivered within 30-60 minutes
  - More than 4 hours since birth of last pup
  - Labor with an abnormal degree of pain or depression



## Dystocia

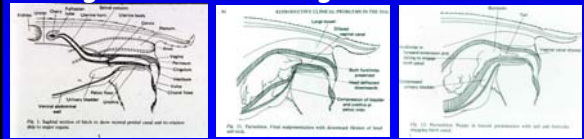
- Causes
  - Increased risk
    - Older bitches
    - Breeds (Bulldog, Dachshund, Chihuahua)
  - Primary uterine inertia
    - Lack of uterine contractions
    - Overdistension
    - Hypocalcemia
    - Overweight or insufficient exercise
  - Secondary uterine inertia
    - Exhaustion
    - Obstruction
    - Nervous bitch

## Dystocia

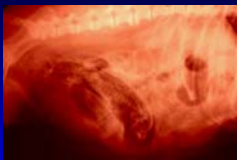
- Management
  - Differentiate between contributing causes
  - History
    - Estrous cycle, breeding dated, calculated due date
    - Gestation
    - Previous gestational/parturition history
    - Treatments
  - Presenting clinical signs

## Dystocia

- Physical examination
  - Be clean, quick, but thorough
- Vital signs
- Abdominal palpation fetus and uterus
- Mammary chain
- Digital vulvar and vaginal exam



## Dystocia



- Radiographs
- Ultrasound
  - Heart beats <150-160 bpm = fetal distress
  - Normal heart rate = 170-230 bpm
- Bloodwork if indicated and depend on timing

## Dystocia

- Criteria for diagnosis
  - Prolonged gestation
    - >60 days of diestrus
  - Parturition failure
    - 36-48 hours after temperature falls in late pregnancy
  - Pelvic obstruction
  - Strong contractions
    - >1 hour without the birth of a puppy
  - Weak or infrequent contractions
  - Puppy malposition
  - Fetal death
  - Large pup

## Dystocia Management Strategies

- Manipulative
  - Manual extraction of fetus
    - Lubrication
    - DO NOT use undue force
    - Concurrent abdominal and rectal palpation



## Manipulations



## Instrument delivery



## Dystocia Management Strategies

- Manipulative
  - Induction of labor
    - Oxytocin 10 IU/L 5% dextrose IV over 30 minutes
    - Monitor for uterine tetany

## Dystocia Management Strategies

- Medical treatment
  - Uterine inertia
    - Stimulate rhythmic uterine contractions
    - RULE OUT obstruction, malposition
  - Oxytocin
    - Endogenous release---feathering vagina
    - Exogenous---2-20 IU IM or SQ (alt 2 IU/kg up to 20 IU)
      - Results within 20 minutes
      - Repeat in 30-45 minutes
      - Third dose given with 5-10mL IV dextrose (slow)
      - No response after 3<sup>rd</sup> dose----proceed to C-section

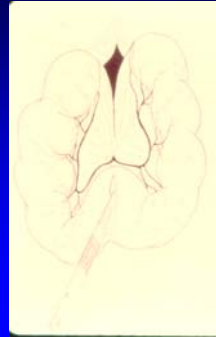
## Dystocia Management Strategies

- Medical treatment
  - Calcium borogluconate
    - 10% Ca gluconate 2-10mL IV slow infusion
      - Given in 5% dextrose/water
    - Monitor with continuous ECG
      - Stop if cardiac arrhythmias noted
    - Safer alternative 10% Ca gluconate
      - 1-5 mL/dog SQ
  - Calcium can be give before or after oxytocin

## Dystocia Cesarean section

- **Recommended**
  - Prolonged gestation
    - Oversized fetus
    - Pelvic obstruction
  - History of dystocia
  - Fetal death/putrefaction
  - No response
    - Oxytocin (3 injections)
    - Calcium gluconate
  - Previous caesarean section

## C-section delivery



## C-section delivery



Questions ???

## Reproductive Problems: Postpartum and Anestrus

## Complications Postpartum Period

- Postpartum hysteria
- Postpartum hemorrhage
- SIPS
  - Subinvolution of placental sites
- Postpartum Endometritis
  - Acute metritis
- Postpartum hypocalcemia
- Agalactia/hypogalactia
- Galactorrhea
- Postpartum Mastitis
  - Septic
- Mastitis/galactostasis
  - Nonseptic
- Mammary gland tumors

## Postpartum Hysteria

- More common in primiparous animals
  - Poor mothering ability
  - Rejection of pups
  - Biting or mutilation
  - Killing of pups
- Rule out
  - Retained pups or placenta
  - Painful mammary glands

## Postpartum Hysteria

- Treatment
  - Sedation/tranquilization
  - Remove pups between feedings
  - Foster pups to another female
  - Treat mammary problems
  - Supplemental feeding

## Postpartum Hemorrhage

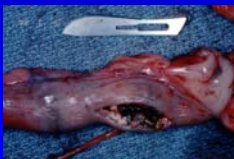
- Moderate to profuse bleeding from birth canal
- Causes
  - Vessel rupture
  - Laceration
  - Following C-section
- Management
  - Oxytocin 5-10 IU, repeat 2-4 hr, x 3 treatments
  - Exploratory laparotomy
    - Suspect uterine rupture

## Subinvolution of Placental Sites

- Post whelping
  - Delay in placental degeneration and endometrial reconstruction
    - Failure of implantation sites to resorb
    - Bleeding from placental sites
- Clinical signs
  - Serosanguineous vulvar discharge
    - Persisting from 3-12 weeks post-parturition
    - Normal lochia discharge persists ~3 weeks
  - More common in younger bitches
  - No fever or malaise

## Subinvolution of Placental Sites

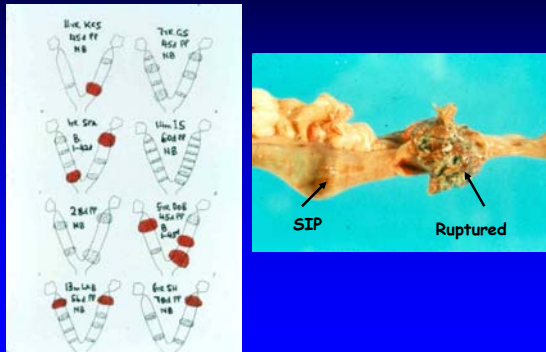
- Diagnosis
  - Persistent Serosanguineous vulvar discharge
  - Bitch otherwise normal
  - Abdominal palpation
    - Enlarged noninvolved implantation sites in uterus



## Subinvolution of Placental Sites

- Diagnosis
  - Vaginal cytology
    - RBCs, WBCs, parabasal cells
    - No bacteria
  - Vaginoscopy
    - Dark, clotted blood in anterior vagina

## Subinvolution of Placental Sites



## Subinvolution of Placental Sites

- Differential diagnosis
  - Metritis, vaginitis, cystitis
  - Trauma, coagulopathy
  - Neoplasia
- Treatment
  - Spontaneous remission in 5-6 weeks
  - Prophylactic antibiotics
  - Progesterone therapy
    - Rule out infection
  - Oxytocics
  - Ovariohysterectomy
- Prognosis for future reproduction is good

## Postpartum Metritis

- Acute and severe bacterial infection of uterus
  - Uterine contamination
    - During immediate post-partum period
  - Predisposing factors
    - Dystocia
    - Obstetric manipulations
    - Retained puppy or placenta
    - SIPS

## Postpartum Metritis

- Clinical signs
  - Systemic illness
    - Fever, toxemia
    - Depression, anorexia
    - Vaginal discharge (bloody to purulent)
    - Decreased or no milk
    - Bitch has no interest in pups
  - CBC: leukocytosis to leukopenia
  - Vaginal cytology: neutrophils, debris, bacteria

## Postpartum Metritis

- Clinical signs
  - Radiographs: enlarged uterus
  - Rule out retained fetus



## Postpartum Metritis

- Treatment
  - Fluid therapy
  - Broad-spectrum antibiotics
  - Open cervix
    - Uterine irrigation
    - Oxytocin 5-10 IU, first 24 hrs post-partum
    - PGF<sub>2</sub>α 0.25 mg/kg SQ Q24hr x 3-5 days
  - Closed cervix
    - Stabilize and OHE
  - Puppies will need foster care during illness

## Hypocalcemia

- **Decreased circulating calcium concentration**
  - **Acute life-threatening disease**
  - **Associated**
    - Improper perinatal nutrition of the bitch
    - Heavy lactation from large litters
  - **Occurrence**
    - Generally 2-6 weeks post-whelping (large litter)
    - Usually after 3 weeks of lactation
    - Rarely late gestation
    - May reoccur during subsequent lactation

## Hypocalcemia

- **Diagnosis**
  - Calcium <7 mg/dL (normal, 9-12)
  - +/- hypoglycemia
- **Clinical signs**
  - Restlessness, nervousness, whining, panting
  - Hypersalivation, facial pruritus
  - Muscle tremors, stiff gait
  - Recumbent, dilated pupils, decreased PLR
  - Seizures and death

## Hypocalcemia

- **Treatment**
  - 10% calcium gluconate
    - Immediate, 5-10mL IV slowly (continuous ECG)
    - Muscle relaxation should be immediate
    - A total dose of 20mL may be necessary
  - **Follow up**
    - Calcium gluconate in saline SQ TID
    - Calcium lactate, chloride, carbonate orally until weaning
      - » 30-100mg/kg/day
  - **Puppies > 3 weeks**
    - Remove and bottle feed
    - Provide high quality, balanced, nutrition for bitch
- **Prevention**
  - Prophylactic oral calcium salts

## Septic Mastitis

- **Inflammation of mammary gland**
  - Post-partum or pseudopregnant bitch
  - Single or multiple glands involved
  - Acute, gangrenous, or chronic
  - Staph, Strep (hemolytic), E. coli
  - **Increased risk**
    - Poor hygiene
    - Trauma from pups

## Septic Mastitis

- **Clinical signs**
  - Bitch systemically ill
  - **Mammary glands**
    - Swollen, warm, discolored, painful, ulcerated
    - Milk is thin, yellow/brown, clots, WBC, RBC
  - Puppies ill, crying (lack of milk, toxic milk)
- **Diagnosis**
  - **Bacteria and/or leukocytes in milk**
    - Milk cytology and culture
  - **CBC: neutrophilic leukocytosis**

## Septic Mastitis

- **Treatment**
  - **Broad spectrum antibiotics**
    - Empirical therapy—ampicillin, oxacillin
    - Chronic consider erythromycin, clindamycin, TMS
    - Evaluate milk pH
    - Based on culture and sensitivity
  - **Cold/hot packs**
  - **Strip infected gland(s) 4-6 times per day**
    - Oxytocin 2-10 IU
  - **Bottle feed pups or foster mother**

## Agalactia/Hypogalactia

- Failure of milk production or to lactate
  - Congenital defect in mammary gland
- Failure of milk let down
  - Blocked teat, mastitis, post-anesthesia
  - Psychologically impaired
    - Young or anxious bitch
    - Unwilling to allow nursing
- Pups are malnourished

## Agalactia/Hypogalactia

- Determine cause
  - Failure of milk production
  - Failure of milk let down
- Treatment
  - Nervous bitch
    - Tranquilize bitch
    - Slow introduction of puppies
  - Failure of milk production
    - Foster puppies or hand raise
  - Failure of milk let down
    - Oxytocin 5 IU IM (milk flow 1-5 minutes post-injection)

## Non-septic Mastitis Galactostasis

- Milk stasis
  - Swollen, enlarged, painful mammary gland
  - May follow acute weaning of puppies
  - Bitch is not ill
- Treatment
  - Decrease food intake for 24 hours
  - Furosemide 1mg/kg BID

## Galactorrhea

- Excessive or inappropriate milk production and release
  - Depends on abrupt decrease in progesterone
    - Luteal regression in diestrus bitch
    - OHE (diestrus)
    - Cessation of progesterone treatment
- Treatment
  - Resolves in several days without treatment
  - Natural manifestation due to acute progesterone removal
    - Resolve in 2-3 weeks
  - Block prolactin release and stop lactation
    - Reoccurrence with withdrawal of therapy
    - Megestrol acetate (Ovaban®)
    - Mibolerone (Cheque®)

## Inappropriate lactation



## Mammary Gland Tumors

- Most common cancer in female dogs
  - Older and intact dogs higher incidence
    - Average age 10 years
    - Spay <2.5 years decreases incidence to 12%
    - OHE prior to 1<sup>st</sup> estrus decreased incidence to 0%
  - 25-50% multiple gland involvement
  - Caudal glands most commonly affected
  - Tumors
    - Benign: Fibromas or adenomas
    - Malignant: Carcinoma, adenocarcinoma, sarcomas
      - Highly metastatic to regional LN

## Mammary tumors



## Mammary Gland Tumors

- Clinical signs
  - Mammary glands enlarged, swollen
  - Ulceration, painful
- Treatment
  - Radical mastectomy (+/- regional LN removal)
  - OHE after 2.5 years, no bearing on progression
  - Prognosis if malignant guarded

## Subfertility Abnormalities of Anestrus

- Canine Vaginitis
  - Common cause of infertility in the bitch
  - Types
    - Prepuberal bitch
    - During proestrus, estrus
    - During anestrus
    - Old or spayed bitches

## Canine Vaginitis

- Causes
  - Altered vaginal defense mechanisms
    - Vaginal anatomic anomalies
    - Clitoral hypertrophy
    - Foreign bodies
    - Vaginal tumors
    - Urine pooling
  - Secondary
    - Metritis, endometritis
    - Ascending urinary tract infection



## Canine Vaginitis

- Clinical signs
  - Chronic vaginal discharge
  - Persistent licking of vulva
  - Scooting of perineum on the floor
  - Male dogs may show interest
- Diagnosis
  - Vaginoscopy
    - Vaginal mucosa hyperemic and congested
    - Erosions, vesicles, and ulceration
  - Vaginal cytology
    - Parabasal cells, small intermediate cells
    - Large number of neutrophils and lymphocytes
  - Vaginal culture
    - Heavy growth of pathogenic bacteria and/or Mycoplasma spp

## Canine Vaginitis

- Bacteria of the genital tract
  - Normal vaginal flora
    - Originate from bowel or skin
    - Mixed cultures (2-5 species)
      - Proestrus, estrus, diestrus, pregnancy
        - » E. coli and P. multocida
      - Proestrus, estrus, pregnancy, post-partum
        - » Hemolytic strep
      - Post-partum
        - » Staph intermedius

## Canine Vaginitis

- **Treatment**
  - **Correct predisposing factors**
    - Prepuberal vaginitis resolves with first estrus
  - **Infection confirmed**
    - Vaginal flushing with antibiotic infusion
    - Systemic antibiotics 14-21 days
  - **Increase vaginal resistance**
    - Low level estrogen therapy (DES)
    - Estrone Sulphate - Premarin

## Subfertility Abnormalities of Anestrus

- **Hypothyroidism**
  - Prevalence 0.2%
  - **Familial disorder**
  - **History**
    - Prolonged anestrus, irregular cycles, short cycles
    - Prolonged or abnormal proestral bleeding
    - Poor conception rates, mummified fetuses
    - Infertility

## Hypothyroidism

- **Diagnosis**
  - Resting total T4, free T4, and TSH
    - Low total and free T4, high TSH
- **Treatment**
  - Levothyroxine 0.01-0.02 mg/kg BID
  - Periodic monitoring
  - **Overdose**
    - Hyperactivity, panting, and tachycardia

## Population Control

- **Mismated bitch**
- **Prevention of ovarian cycle**
  - OHE
  - Estrus Suppression
  - Vaginal devices
  - **Immunization**
    - Antibody against zona pellucida
  - **Pregnancy termination**
    - Prostaglandins
    - Bromocryptine

## Mismated bitch

- **Diagnosis**
  - **Accurate history**
    - Stage of cycle, evidence of mating
  - **Vaginal smear**
    - Proestrus, diestrus, anestrus (unlikely fertile)
    - Presence of spermatozoa or sperm heads
      - 24-36 hrs post-mating

## Mismated bitch

- **Treatment**
  - OHE
  - **Prostaglandins**
    - Bitch proven 30 days pregnant
      - U/S or Reprocheck
    - PGF<sub>2</sub> $\alpha$
    - PGF<sub>2</sub> $\alpha$  and bromocryptine
    - Cloprostenol

## Estrus Suppression

- Prevents estrus and false pregnancy
- Steroid hormones
  - Megestrol acetate (Ovaban®)
    - Progestin
  - Mibolerone (Cheque®)
    - Androgen

## Megestrol acetate (Ovaban®)

- Anestrus or first 3 days of proestrus
- Disadvantages
  - Incorrect timing results in therapeutic failure
  - Do not use in pubertal or pregnant bitches
  - Risk of pyometra or uterine tract infection
  - Do not use for 2 consecutive cycles
  - Side effects
    - Insulin resistance, DM (do not use if bitch diabetic)
    - Lethargy, polyphagia, weight gain
    - Mammary gland enlargement, lactation

## Mibolerone (Cheque®)

- Anestrus
  - Begin >30 days prior to onset of proestrus
  - Does not arrest proestrus or estrus
- Disadvantages
  - Daily administration
  - Do not use in prepubertal bitches
  - No recommended in dogs with liver or kidney disease
  - Side effects
    - Clitoral hypertrophy, mating behavior, voice change
    - Masculinization of female fetuses
  - Post treatment
    - Ovarian cycles resume 1-7 months

Questions???