**Canine Theriogenology: What the general practitioner needs to know**

Dr. Margaret V. Root Kustritz, DVM, PhD, DACT
Professor, Small Animal Reproduction
University of Minnesota

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**Introduction**

Garret Pachtinger, VMD, DACVECC
COO, VETgirl

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**Introduction**

Justine A. Lee, DVM, DACVECC, DABT
CEO, VETgirl

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  - garret@vetgirlontherun.com
  - justine@vetgirlontherun.com
Introduction

Dr. Margaret V. Root Kustritz, DVM, PhD, DACT
Professor, Small Animal Reproduction
University of Minnesota Veterinary Medical Center

**PYOMETRA**

Margaret V. Root Kustritz, DVM, PhD, DACT
University of Minnesota

**Pyometra**

- **Pathogenesis**
  - Primary pathologic change = cystic endometrial hyperplasia (CEH)

- CEH develops due to prolonged exposure of the estrogen-primed uterus to progesterone.
- CEH develops due to unique cycle of the bitch, can also occur after administration of exogenous estrogen and/or progesterone.
Pyometra
- Pathogenesis
  * Secondary pathologic change = infection
  
  - *E. coli*
  - Beta-hemolytic *Streptococcus* sp.
  - Alpha-hemolytic *Streptococcus* sp.
  - *Pasteurella* sp.
  - *Staphylococcus* sp.
  - *Proteus mirabilis*
  - *Streptococcus* sp.
  - *Corynebacterium* sp.
  - *Pseudomonas aeruginosa*
  - *Klebsiella* sp.
  - *Mycoplasma* sp.

Pyometra
- Common question – Did she get this from the stud dog? – No, because…
  
  - The bacteria causing the secondary infection are invariably those of the bitch’s normal flora and CEH / are more common in nulliparous bitches than in pluriparous bitches.

Pyometra
Pathogenesis timeline ->

- CEH present – bacteria ascend during proestrus / estrus and colonize the abnormal uterus – cervix closes at onset of diestrus – progesterone inhibits uterine contractility, promotes secretion of endometrial glands, makes endometrium "hyper-reactive" – subsequent disease dependent on cervical patency

Pyometra
Incidence?

- Reported incidences are 15.2% in dogs greater than 4 years of age and 23-24% in dogs 10 years of age or older.
Pyometra
- Presentation
  Bitch greater than 5-6 yrs of age
  In heat 1-12 wks ago

- Breed predisposition?
  - Rottweiler, rough collie, Cavalier King
  Charles spaniel, golden retriever, chow chow,
  St. Bernard, Bernese mountain dog, English
  cocker spaniel at increased risk
  - German shepherd dog, dachshund at
decreased risk

Pyometra
- Clinical signs
  Anorexia, vomiting
  Fever, depression
  Polyuria / polydipsia
  +/- abdominal distension
  +/- purulent vulvar discharge

Pyometra
- Diagnosis
  CBC - Leukocytosis with left shift
  Reported in 70-87% of cases. More
  severe in cases with closed cervix.
  Palpation / Radiography / Ultrasound -
  Uterine enlargement

Pyometra
Pyometra

- Diagnosis
  CBC - Leukocytosis with left shift
  Palpation / Radiography / Ultrasound - Uterine enlargement
  Chemistry profile - Azotemia
  Renal disease develops secondary to endotoxemia, with decreased renal tubular function and formation of antigen/antibody complexes causing glomerulonephritis

- Treatment
  Closed cervix = Ovariohysterectomy is best in all cases
  Successful medical therapy of closed cervix pyometra has been reported. Possible complications include uterine rupture or movement of purulent fluid through the uterine tubes into the abdomen – both of the above will be cause peritonitis.

  Open cervix = Ovariohysterectomy is best; prostaglandin therapy is possible

  Ovariohysterectomy always is the best therapy for pyometra. Medical therapy will not cause resolution of CEH. The bitch will be predisposed to pyometra after each subsequent estrus.
Pyometra
- Treatment
  Medical therapy with prostaglandins may be considered if:
  * The cervix is open, evidenced by vulvar discharge.
  * The bitch is of breeding age.
  * The bitch is valuable in a breeding program.
  * The bitch is not azotemic.

Pyometra
- Assess uterine size.
  Palpation, imaging

Pyometra
- Assess uterine size.
- Culture vulvar discharge, if present.

Pyometra
- Assess uterine size.
- Culture vulvar discharge.
- Institute antibiotic therapy and correct fluid deficits.
  - Administer PGF2-alpha at a dose of 250 mcg/kg SQ once to twice daily x 2-7 days.
  - Give twice daily if serum progesterone concentration > 2 ng/ml. Treat until uterine size nears normal or until no fluid is visible in uterine horns by ultrasound.

Pyometra
- Assess uterine size.
- Culture vulvar discharge.
- Institute antibiotic therapy and correct fluid deficits.
  - Administer PGF2-alpha at a dose of 250 mcg/kg SQ once to twice daily x 2-7 days, until uterine size nears normal.
  - Leave on an appropriate antibiotic for one month.
Pyometra
Other medical therapies?
- Aglepristone
  Progesterone receptor blocker
  Available in Europe and South America
  Reported successful in 81.8 – 92.8% of cases (with antibiotic therapy)

Pyometra
- At the bitch’s next season:
  - Perform anterior vaginal culture early in proestrus, institute appropriate antibiotic therapy
  - Breed her – pregnancy is protective against development of pyometra
  - If she does not become pregnant, consider treatment with prostaglandin to lyse CL and decrease progesterone exposure.

Pyometra
- What kind of fertility can we expect after medical treatment for pyometra?
  Recurrence averages 31.5% within one year of treatment – usually due to same organism
  Reported conception rate after medical treatment for pyometra is 40-68%.

Pyometra
- Perform ovariohysterectomy as soon as the bitch’s breeding life is over.

VAGINITIS: AN UPDATE
Margaret V. Root Kustritz, DVM, PhD, DACT
University of Minnesota

VAGINITIS
* Prepuberal (puppy) vaginitis
* Adult-onset vaginitis
PREPUBERAL (PUPPY) VAGINITIS

There is no evidence that dogs that exhibit puppy vaginitis are more likely to suffer from adult-onset vaginitis.

There is no evidence that the tucked-up (juvenile) vulva seen in dogs spayed young and sometimes associated with perivulvar disease is permanently changed by allowing a dog to go through one heat cycle.

If clinical signs are mild to moderate, conservative therapy is best:
- Collect vaginal culture sample and treat only if there is significant growth
- Clean the perivulvar area as needed with baby wipes or non-alcohol otic cleanser
- +/- of going through one heat cycle?

If clinical signs are severe, more aggressive therapy may be warranted:
- As for conservative therapy
- Consider use of estrogens (close growth plates in young dogs) or glucocorticoids (altered pharmacokinetics and perhaps increased side-effects in young dogs)

ADULT-ONSET VAGINITIS

- Spayed dogs
- Onset of clinical signs variable
- Most common presenting complaints are passage of mucoid vulvar discharge and vulvar licking, +/- urinary incontinence

VAGINITIS

For adult-onset vaginitis, the most common underlying conditions are:
- Urinary tract infection
- Vaginal anatomic anomalies
VAGINITIS
Dogs are not reported to get yeast vaginitis, as is common in women, in North America.

VAGINITIS
Diagnosis
- Digital vaginal examination
- Vaginal culture and cytology, urine culture and UA (cysto)
- Vaginoscopy
- Vaginography?

VAGINITIS
- E. coli
- Beta hemolytic Streptococcus sp.
- Alpha hemolytic Streptococcus sp.
- Pasteurella sp.
- Staphylococcus sp.
- Proteus mirabilis
- Alcaligenes sp.
- Corynebacterium sp.
- Pseudomonas aeruginosa
- Klebsiella sp.
- Mycoplasma sp.

VAGINITIS
When evaluating for vaginal anatomic anomalies, which is best?

- Urine pooling
- Site of inflammation on vaginoscopy

VAGINITIS
How do we determine if a vaginal anomaly is a significant contributor to disease in a given case?

One study defined “significant” stricture in the vagina as a vestibulovaginal ratio of less than 0.20. A subsequent study identified many asymptomatic dogs with strictures that would be defined as moderate to severe using this scheme.


What about changes in vulvar conformation and subsequent perivulvar dermatitis?

In dogs presenting with a recessed vulva and subsequent perivulvar dermatitis and associated chronic UTIs or vaginitis, 13 of 20 dogs (65%) showed clinical improvement in one study and 28 of 34 dogs (82%) in another study.


Treatment - May resolve spontaneously

- If an underlying cause can be identified, treat for that.

UTIs – treat for underlying causes of recurrent UTI, appropriate culture and therapy

Surgical repair of vaginal anomalies?

- If no underlying cause is identified or if the problem continues:
  - Antibiotics
  - DES and/or PPA
  - Glucocorticoids
  - Treatment for atopy?
VAGINITIS
Treatment
- If no underlying cause is identified or if the problem continues:
  Antibiotics – based on culture and sensitivity – consider low-dose long-term therapy at night, as for chronic UTIs

- If no underlying cause is identified or if the problem continues:
  DES and/or PPA – as for urinary incontinence – subclinical urinary incontinence as cause of inflammation?

- If no underlying cause is identified or if the problem continues:
  Glucocorticoids – not used in dogs with significant urinary incontinence

- If no underlying cause is identified or if the problem continues:
  Treatment for atopy? – work-up for allergies or treatment trial with diphenhydramine or hydroxyzine

DYSTOCIA

Margaret V. Root Kustritz, DVM, PhD, DACT
University of Minnesota

CESAREAN SECTION
 Planned (elective)
 Emergency
CESAREAN SECTION
Planned (elective)
Reasons
Timing
Emergency

CESAREAN SECTION
Planned (elective)
Reasons – bitch or breed predisposed to dystocia, excessively small or large litter size – history of C-section?
Timing
Emergency

CESAREAN SECTION
Planned (elective)
Reasons
Timing – Surfactant not laid down until 57-60 days of gestation – cannot take pups prematurely!
Emergency

CESAREAN SECTION
Planned (elective)
Reasons
Determination of term pregnancy
Ovulation timing
Decline in serum progesterone
Radiographs / ultrasound

BREEDING MANAGEMENT
- Physical changes
- Vaginoscopic changes
PROGESTERONE ASSAY
- ELISA - Quick, +/- accurate
- RIA - Slow, +++ accurate

PROGESTERONE CONCENTRATION (ng/ml) EVENT
< 1.9 Anestrus or early proestrus; must re-test
1.0 – 1.9 May be three days prior to ovulation; re-test
2.0 – 2.9 Two days prior to ovulation
3.0 – 3.9 One day prior to ovulation
4.0 – 10.0 Ovulation day
> 10.0 with cornified cytology Within 5 days of ovulation; breed ASAP
> 10.0 with non-cornified cytology Diestrus

CESAREAN SECTION
Planned (elective)
Determination of term pregnancy
Ovulation timing
Decline in serum progesterone
Radiographs / ultrasound

PARTURITION
- Onset of parturition is an endocrine event, initiated by the fetus(es)
- Progesterone decline prior to parturition causes a transient decrease in body temperature; rectal temperature will fall to less than 99-100°F within the 24 hrs preceding onset of parturition.

CESAREAN SECTION
Planned (elective)
Determination of term pregnancy
Ovulation timing
Decline in serum progesterone
Radiographs / ultrasound
CESAREAN SECTION

Planned (elective)

Reasons
Timing – Ovulation timing, decline in progesterone, radiography or ultrasonography

Emergency

NORMAL PARTURITION

- Onset of parturition is an endocrine event, initiated by the fetus(es)
- Progesterone decline prior to parturition causes a transient decrease in body temperature; rectal temperature will fall to less than 99-100°F within the 24 hrs preceding onset of parturition.

NORMAL PARTURITION

- Three stages:
  Stage I = cervical dilation
  Stage II = expulsion of fetuses
  Stage III = expulsion of placentas

- Bitch restless, panting, may vomit
- Abdominal contractions not visible
- Length variable; may last 6-12 hrs
NORMAL PARTURITION
- Stage II = expulsion of fetuses
  - Abdominal contractions strong and coordinated
  - Length variable; dependent on litter size
  - Pups usually born every 30-60 minutes; should deliver first pup within 4 hrs of onset of stage II, subsequent pups within 2 hours

NORMAL PARTURITION
- Stage II = expulsion of fetuses

NORMAL PARTURITION
- Stage II = expulsion of fetuses

NORMAL PARTURITION
- Stage III = expulsion of placentas
  - Usually pass within 5-15 minutes of fetus
  - Bitch may eat them; no known physiologic value

NORMAL PARTURITION
- Normal postpartum discharge = lochia
  - Slight elevation in body temperature

DYSTOCIA
"Dys" = difficult
"Tokos" = birth
DYSTOCIA
Maternal causes
- Obstruction of passage
- Abnormal uterine function – primary versus secondary uterine inertia
- Abnormal pregnancy

DYSTOCIA
Fetal causes
- Obstruction of passage
- Developmental abnormality
- Abnormality of presentation

DYSTOCIA
Is dystocia present?
- Obvious malpresentation
- Timing
  - Stage I more than 12 hrs
  - Stage II more than 4 hrs (weak contractions)
  - Stage II more than 30 min (strong contractions)
  - Time between pups greater than 2 hrs
  - Rectal temperature drop more than 24 hrs ago

DYSTOCIA
Is dystocia present?
- Abnormal vulvar discharge
- Labor not progressing
- Bitch systemically ill
- Prolonged gestation
- High risk pregnancy
- Client concerned
DYSTOCIA
Diagnostics
* Complete physical examination
* Digital vaginal examination
* Radiographs
* Ultrasound? Calcium? Others?

DYSTOCIA
Manipulative treatment
- Feathering
- Digital manipulation
- Instruments

DYSTOCIA
Pharmacologic treatment
- Oxytocin
- Calcium
- Glucose

DYSTOCIA
Surgical treatment
- Cesarean section

CESAREAN SECTION
- With medical therapy as first choice for treatment, over 50% of bitches will eventually go to C-section anyway because of lack of complete response to medical therapy
- Breeds at greatest risk are Boston terrier, English bulldog and French bulldog
- Scheme for dystocia management
Key for dystocia management:
1. The puppy is present in the birth canal and can be manipulated for delivery — 2
2. The puppy is not present in the birth canal or cannot be manipulated for delivery — 3
3. Attempt delivery with lubrication and gentle traction. After that pup is passed or if other pups are present in
   uterus — 3
4. Perform Cesarean section.
5. Abdominal radiographs have been taken — 6
6. Abdominal radiographs have not been taken — 7
7. Fetal heart rate is less than 150 beats per minute — 4
8. Fetal heart rate is 150 beats per minute or more — 5
9. Pups are too large to pass or are malpositioned — 4
10. Pups are not too large to pass and are not malpositioned — 6
11. Take abdominal radiographs and go to — 6
12. Four or fewer pups are present — 9
13. More than four pups are present — 4

CESAREAN SECTION
Anesthesia — prep and pre-oxygenate bitch
Hysterotomy versus en-bloc ovariohysterectomy
Contraindications to OHE (spay) at time of C-section?

PUPPY RESUSCITATION
Stimulation and removal of fluids
External source of heat
Oxygen

PUPPY RESUSCITATION
Stimulation and removal of fluids — Rub, rub rub
— suction of nose and mouth
External source of heat
Oxygen

PUPPY RESUSCITATION
Stimulation and removal of fluids — Hypothermia
— Hypothermia associated with slow heart rate, lack of
— oxygenation of tissues, metabolic pH changes —
— all of these hamper resuscitation
Oxygen

PUPPY RESUSCITATION
Stimulation and removal of fluids
External source of heat
Oxygen
Apgar scores in pups?

Pain management after C-section and possible effect on pups?

Non-steroidal anti-inflammatories contraindicated

Opioids?

QUESTIONS?

Dr. Peggy Root Kustritz
Ph = 612-624-7290
Fx = 612-624-0751
Email = rootk001@umn.edu
Website = https://sites.google.com/a/umn.edu/margaret-v-peggy-root-kustritz/home

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