

Question

A 4-year old female Brittany Spaniel presents for further evaluation of suspected dystocia. Her gestation length is approximately 60 days and the owners note that she has been extremely restless, panting, and vomited once in the past 8 hours. On vaginal examination, there is no obviously obstructed puppy. Radiographs of the dog show no evidence of fetal gas or alteration in spatial relationship between the fetal bones. What is the best treatment for this dog?

- Administer intramuscular oxytocin
- Continue to monitor carefully without disturbing her and have the dog return in 24 hours if she has not delivered the puppies
- Perform a Caesarian section
- Administer intramuscular dexamethasone sodium phosphate

Explanation - Based on the history and clinical examination findings, this dog has presented in stage 1 of pregnancy. This stage is typically 6-12 hours of length and can persist for up to 36 hours. In this stage, it is expected for the dog to exhibit panting, trembling, nesting behavior, and restlessness. Occasionally dogs will also vomit. At this point, there is sub-clinical uterine contraction and dilation of the cervix.

Stage 2 will also last approximately 6-12 hours (and persist up to 36hr) and is characterized by abdominal straining which coincides with uterine contraction. Puppy delivery occurs during Stage 2 at an interval of 30-60min (up to 4 hours).

Stage 3 involves the expulsion of fetal membranes as well as involution of the uterus. Fetal membranes are usually passed 5-15 minutes after birth of a pup before another puppy can be delivered from the same horn.

Thick greenish discharge (lochia) is seen in all stages of labor and may persist for up to three weeks. Complete uterine involution and endometrial recovery occurs in approximately 3 months.

Question

The treatment of choice for an intact female Doberman with a closed pyometra is which of the following?

- Ovariectomy
- Ovariohysterectomy
- Prostaglandin therapy
- Broad spectrum antibiotics
- Uterine lavage and antibiotic therapy

Explanation - The correct answer is ovariohysterectomy. Ovariohysterectomy is the treatment of choice for pyometra. Ovariectomy alone does nothing therapeutically for the pyometra. Prostaglandin therapy can be attempted in open pyometras in which the owners insist on keeping

the animal intact with the intent to breed the animal in the future. Prostaglandin therapy is contraindicated in closed pyometras due to possible uterine rupture. Antibiotic therapy alone is not enough to treat a pyometra. Uterine lavage is sometimes attempted in open pyometras along with medical therapy with prostaglandins.

Question

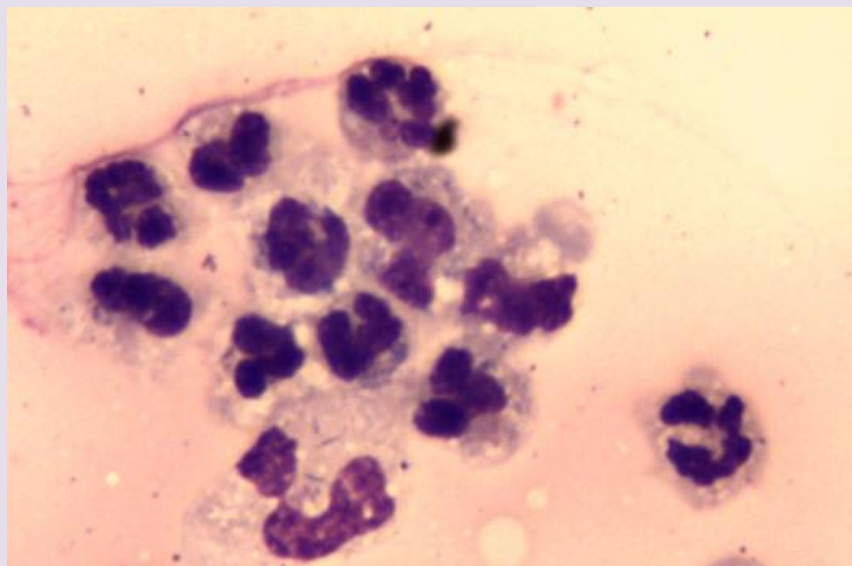
What is the most common cause of pyometra in dogs older than 8 years of age?

- Ovarian neoplasia
- Trauma
- Cystic endometrial hyperplasia
- Pregnancy

Explanation - The correct answer is cystic endometrial hyperplasia (CEH). Older intact females develop CEH from repeated exposure to progesterone. Progressive thickening occurs and glands become hypertrophied. This sets up the uterus for development of pyometra.

Question

A 4-year-old female Bernese mountain dog presents for lethargy and urinary accidents for 2 days. The owner reports she has been drinking more and urinating frequently. She has also vomited several times. Her temperature is 103.2 F, heart rate is 85 bpm, and she is panting. She has a purulent vaginal discharge, which you collect a sample of for cytology (shown below). Abdominal ultrasound shows a thickened and cystic endometrium with anechoic fluid inside the uterus. A complete blood count and chemistry panel are within normal limits except for an increased segmented neutrophil count of 23,000 cells/uL (normal is 4950-12,000/uL). The owner tells you that she does not wish to have the dog spayed. Which of the following would be most useful in the medical management of this problem?



- Haloperidol
- Prednisone
- Estradiol
- Tamoxifen
- Prostaglandin F2-alpha

Explanation - Although ovariectomy is the treatment of choice for dogs with pyometra because it is curative and preventative for recurrence, medical management of pyometra can be considered in dogs of appropriate breeding age that are reproductively valuable and free of life threatening complications including septicemia, endotoxemia, or organ dysfunction. Options include **prostaglandins** to induce regression of corpora lutea, which relaxes the cervix and stimulates myometrial contractions, promoting expulsion of the uterine contents. Additional options include **dopamine agonists (such as cabergoline and bromocriptine)**, which act to inhibit prolactin production from the pituitary gland. Patients should be monitored frequently during and after medical management of pyometra and should improve within 2-4 days. **Successfully treated bitches should be bred during their next cycle after treatment.**

Tamoxifen is an estrogen antagonist and has been associated with causing pyometra in dogs but is not an effective treatment. Haloperidol is a dopamine antagonist. Prednisone is contraindicated for pyometra.

Question

A 2 year old male Golden Retriever is presented for a physical exam before it is bred for the first time. The physical exam reveals a systemically healthy appearing dog, but only one testicle has descended into the scrotum. What should you tell the owner of the dog?

- Cryptorchidism is a heritable characteristic in dogs and his offspring may be affected.
- The dog is likely infertile since it only has one descended testicle, so breeding him will likely be unsuccessful.
- There are no significant problems associated with cryptorchid testicles. There is no health risk associated with leaving the testicle within the abdomen.
- Cryptorchidism is an anomalous finding that is not heritable. The dog's offspring are not more likely to be affected with cryptorchidism than a normal dog's offspring.

Explanation - The correct answer is cryptorchidism is a heritable characteristic in dogs and his offspring may be affected. Dogs with one testicle are not considered infertile. One testicle is enough to inseminate a bitch. Adverse health risks resulting from leaving a cryptorchid testicle in the abdomen includes the development of Sertoli cell tumors.

Question

A dark red vaginal discharge in a bitch 3 weeks after whelping indicates what process?

- Pyometra
- Retained placentas
- Subinvolution of placental sites
- Metritis
- Normal response

Explanation - The correct answer is normal response. Dark red vaginal discharge occurs normally for up to 6 weeks after whelping.

Subinvolution can cause fresh bleeding for 12-15 weeks post-partum.

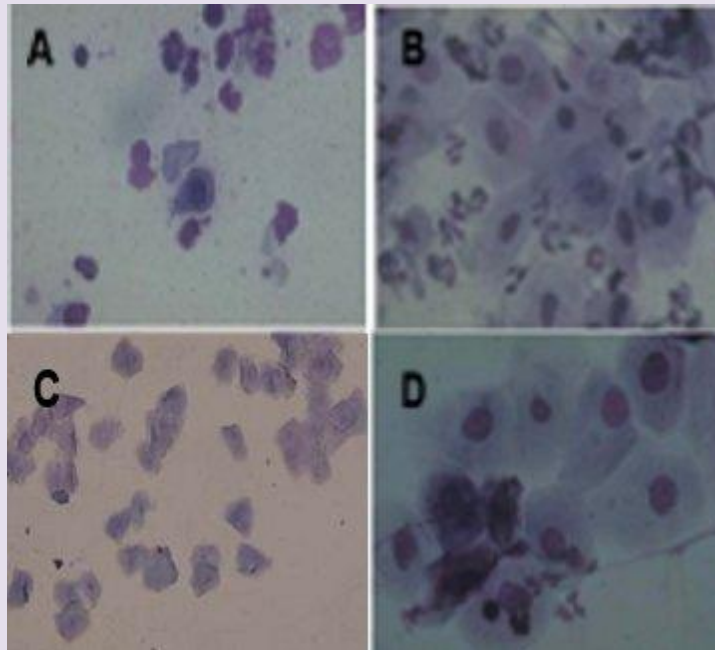
Metritis is usually accompanied by systemic signs and may have abnormal vaginal discharge but not usually hemorrhage.

Retained placentas typically do not occur in bitches.

Pyometras occur during the luteal phase when progesterone levels are high, up to 9 weeks after estrus, and would not occur post-whelping.

Question

A 3-year old Husky bitch comes to your clinic. The owner tells you that the bitch is in heat and has been receptive to males. Which of the following would you expect to see on vaginal cytology (A, B, C, or D)?

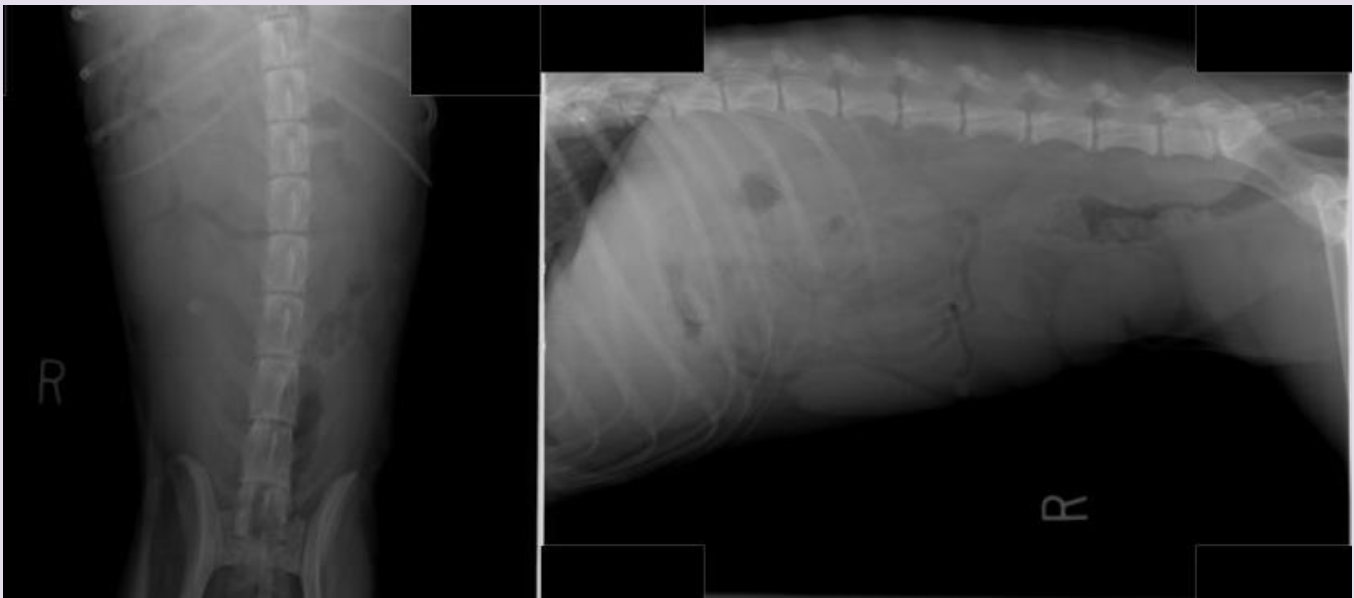


Explanation - Dogs in estrus should have cellular vaginal cytology consisting predominantly (>90%) of cornified epithelial cells. **This corresponds to image C.**

Image A is from a dog in anestrus, note that it is less cellular. Image B is from a dog in early diestrus. Image D is from a dog in diestrus.

Question

A 4 year old female Collie presents to you for lethargy. The owner reports she has been drinking more and urinating frequently. She has also vomited several times. Her temperature is 104F. An abdominal radiograph of the dog is shown below. What is the most appropriate treatment plan for this dog?



- Enterotomy or gastrointestinal resection-anastomosis
- Parenteral fluids and antibiotics
- Administer IV calcium gluconate
- Emergency ovariohysterectomy
- Splenectomy

Explanation - The correct answer is emergency ovariohysterectomy. The history and radiograph are consistent with a diagnosis of pyometra due to the presence of fluid-filled uterine loops in the caudal abdomen. Pyometra can be managed medically in some cases with hormonal and antibiotic therapy but in most cases, the treatment of choice is ovariohysterectomy to remove the infected tissue and prevent future pyometra at subsequent heats.

Question

A 1-year-old female Doberman pinscher presents to you with vulvar swelling and bloody vaginal discharge as shown in the photograph. She has not been receptive to males. Which of the following is the most likely explanation?



- Normal appearance of diestrus
- Normal appearance of estrus
- Presentation of open pyometra
- Normal appearance of proestrus
- Presentation of closed pyometra

Explanation - Vulvar swelling and edema occur with rising estrogen levels in proestrus. Bloody vaginal discharge occurs during proestrus due to diapedesis of blood from the engorged endometrium as blood travels through the cervix into the vagina. The bitch is not in estrus based on the lack of receptivity to males.

Question

During which phases of the estrus cycle does the female dog attract male dogs?

- Proestrus and estrus

- Diestrus only
- Estrus only
- Diestrus and estrus

Explanation - The correct answer is proestrus and estrus. During both of these phases, the female attracts males but she will only stand to be mated during estrus.

Question

A 9-year old intact female Pomeranian presents with a 4 day history of inappetance, vomiting, depression, and dehydration. Her temperature is 104 F, her heart rate is 120 bpm, and her respiratory rate is 42 bpm. She is quiet, alert, and responsive on examination. Her abdomen is sensitive on palpation and you note a mass affect mid-abdomen. She has a malodorous thick red discharge from her vulva. Her in-house lab work shows a white blood cell count of 50,000 with a neutrophil count of 30,000 and band neutrophils on a blood smear. Her liver, kidney, and electrolyte values are unremarkable. Abdominal Radiographs are available for review (see image). What is the likely diagnosis and how would you confirm it?

- Vaginitis, vaginal exam
- Pregnancy, ultrasound exam to detect fetal heart beats
- Pyometra, abdominal ultrasound
- Urinary tract infection, perform urinalysis and culture



Explanation - An intact female with malodorous and/or abnormal discharge should alert you to a likely pyometra immediately. Other differentials could be a urinary tract infection, vaginitis, or pregnancy that has been compromised (with infection, loss of fetal life, or abortion). Abdominal palpation should be done carefully to avoid rupturing the often friable distended uterus. Ultrasound would provide further identification of the mass affect and will typically show a distended fluid filled uterus with severe displacement of the other abdominal organs.

Emergency hysterectomy is necessary to try and save the animal. Some veterinarians have had success in medically managing a pyometra but this is not typically recommended as prognosis is grave and the bitch **MUST** be bred at the next heat cycle to prevent another pyometra from occurring.

Question

A 2-year-old Collie bitch presents for estrus evaluation. The owner reports that about 4 days ago, she noticed vulvar swelling and there has been mild to moderate hemorrhagic vaginal discharge. The bitch has not been exposed to males yet to assess her receptivity. You perform vaginal cytology and a representative field is shown below. What should you tell the owner?



- The dog appears to be anestrus
- The dog appears to be in diestrus
- The dog appears to be in proestrus

- The dog appears to be in estrus
- The dog appears to be metestrus

Explanation - The timing of the dog's clinical presentation and vaginal cytology findings are most consistent with proestrus. Proestrus is characterized by <90% cornified cells. The cytology here is predominantly parabasal and intermediate cells; it is common for early proestrus to be characterized by these cells and gradually transition until nearly 100% of the cells are cornified by estrus. It is also common to see bloody vaginal discharge and very few or no red blood cells on the vaginal smear.

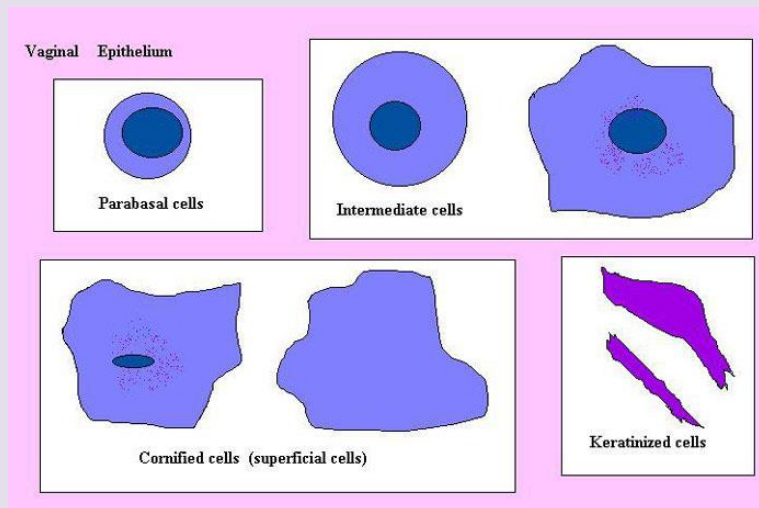


Diagram of the types of epithelium seen on vaginal cytology: parabasal, intermediate, cornified (superficial), and keratinized. The cornified epithelial cells are easily recognized because the nucleus is either very small or missing.

Each stage of the canine reproductive cycle has a distinct, predominant cell population. that is easily identified cytologically.

Proestrus: Predominant cell populations in early to mid proestrus include **nondegenerate neutrophils** and a mixture of **parabasal, intermediate, and superficial epithelial cells** (Fig. 1). The background of the slide contains an abundance of mucus. Variable numbers of extracellular bacteria represent normal flora. In late proestrus, the number of neutrophils declines and superficial cells begin to predominate (Fig. 2).

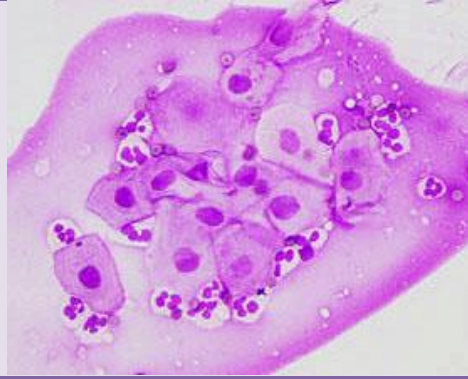


Figure 1. Early proestrus with a mixture of nondegenerate neutrophils; parabasal, intermediate, and superficial epithelial cells, erythrocytes, and mucus (Wright-Leishman stain).

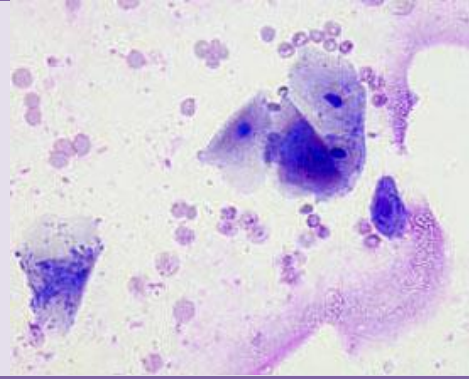
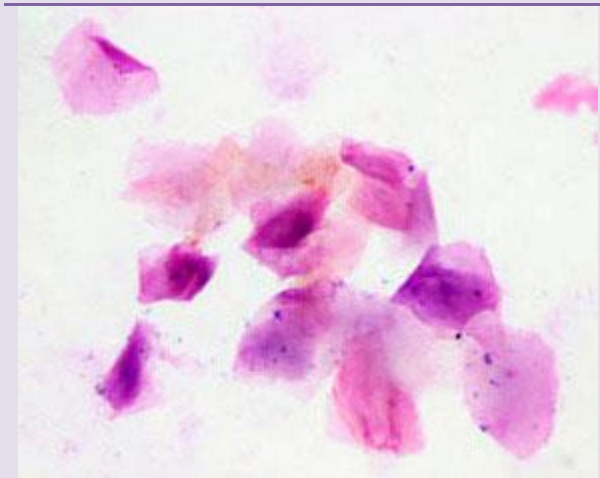
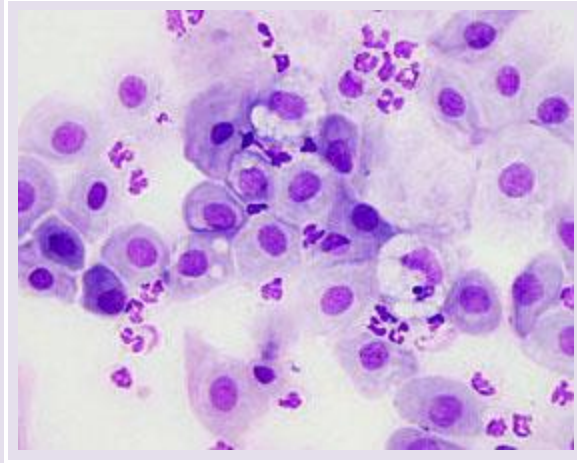


Figure 2. Late proestrus with erythrocytes, scattered superficial cells, and absence of neutrophils (Wright-Leishman stain).

Estrus: In estrus, the cell population consists of ~ 90% superficial cells and < 5% parabasal or intermediate cells (Fig. 3). Less mucus is present in the background of the preparation. Normal bacterial flora usually is present and organisms often are attached to the superficial cells.



Diestrus: Cell populations change abruptly in diestrus (Fig. 4). Superficial cells decrease by 20% and smaller intermediate cells increase in number. Neutrophils often reappear and may contain phagocytosed erythrocytes and bacteria. Cytologically, this stage of the reproductive cycle can look very similar to early proestrus. Therefore, serial cytologic sampling is required to make the distinction.



Anestrus: Parabasal and intermediate cells predominate during anestrus. Superficial cells are not present. Erythrocytes and neutrophils may be present in low numbers or are absent.

Question

A previously healthy lactating dog 2 weeks after whelping shows signs of restlessness, whining, fever, muscle spasms and convulsions. What is the most likely cause?

- Eclampsia
- Hypercalcemia
- Dystocia
- Pelvic fracture

Explanation - The correct answer is eclampsia. This should be suspected in a nursing dog with neurologic signs, pain or stiffness. It is due to reduction in serum-ionized calcium secondary to the demands of producing large amounts of milk. Treatment is with calcium supplementation.

Question

What is the hormonal profile of a female dog in estrus?

- Rising estrogen, rising progesterone
- Rising estrogen, falling progesterone
- Falling estrogen, rising progesterone
- Falling estrogen, falling progesterone

Explanation - The correct answer is falling estrogen, rising progesterone. This is what stimulates the LH surge and leads to ovulation and the behavioral change in estrus where a female will stand to be bred.

Question

What phase of the estrus cycle does pyometra usually occur in the dog?

- Proestrus
- Anestrus
- Estrus
- Diestrus

Explanation - The correct answer is diestrus. In diestrus, progesterone is the predominant hormone, and it promotes endometrial growth, suppresses myometrial activity, and inhibits leukocyte response to infection. This all predisposes the dog to development of pyometra.

Question

A 12 year old Jack Russell Terrier presents to your clinic after delivering 4 puppies out of a litter of 9. It has been approximately 5 hours since the last puppy. What is your next step?

- Caesarean section
- Administer oxytocin
- Administer fluids
- Perform radiographs

Explanation - The correct answer is to obtain a radiograph. This question can potentially be controversial as to what is the correct answer. In this case, radiograph is a good choice because you are dealing with an older small breed dog which would have a higher likelihood of malpositioning or malformation. Giving oxytocin to an animal when the fetus is unable to fit through the pelvic canal may result in uterine tear or rupture.

Question

An owner brings her 4-year old female Labrador Retriever to your clinic because she believes she might be pregnant. She does not remember when the dog's last heat cycle was. The dog's abdomen appears fairly distended and you take a lateral abdominal radiograph which is shown below. What would be the earliest time you would expect to be able to see fetal skeletons on abdominal radiographs in the dog?



- 23 days gestation
- 43 days gestation
- 33 days gestation
- 53 days gestation

Explanation - The correct answer is 43 days gestation. The fetal skeleton ossifies at 42-45 days in the dog and 35-39 in the cat.

In the dog, a mineralized fetus can usually be seen around 42-46 days. The scapula, humerus, and femur can be made out around 46-51 days. The ribs can be seen at 52-59 days. Teeth and toes can be seen at 58-63 days.

Question

A 1.5-year-old female Persian cat presents with dramatically enlarged mammary glands that the owner says have **developed over several weeks**. A brief ultrasound shows that the cat is not pregnant. What hormone is responsible for feline mammary hyperplasia (hypertrophy)?

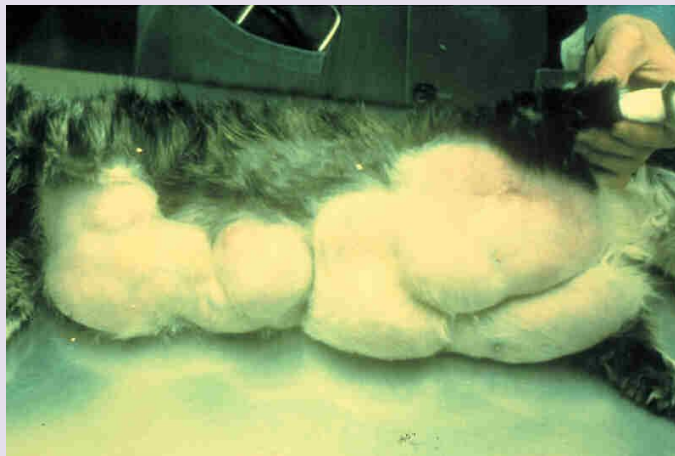
- Estrogen
- Progesterone
- Prolactin

- Testosterone

Explanation - Feline mammary hyperplasia, or fibroadenomatous hyperplasia, is a benign, often drastic enlargement of the mammary glands typically seen in younger cats. This syndrome classically has a rapid onset and is seen in pregnant and non-pregnant, unspayed females. It is uncommonly seen in males and spayed females.

In cycling females, this condition is caused by hormonal stimulation from a functional ovary producing **progesterone**. **Megesterol acetate** is a synthetic progesterone that can cause this side effect.

It is generally treated by **ovariohysterectomy**. If the mammary gland has become severely infected or ulcerated, a mastectomy may be required.



Question

A 6-year old domestic short hair cat has just given birth to 3 kittens. However, there are more kittens inside and four hours have passed since the last kitten. What is the best treatment option?

- Administer calcium
- Caesarean section
- Administer oxytocin
- Perform ultrasound

Explanation - The correct answer is administration of oxytocin. However, it would not be a bad idea to give calcium and perform an ultrasound to check the viability of the fetuses. Sometimes on boards you will see questions where all answers are correct, and it may be rather subjective which one you pick. In this case, oxytocin would be the best answer because it is most likely to lead to expulsion of the remaining fetuses. Performing radiographs would also be a good answer option to check for malpositioning or malformations.

Question

The 2-year old intact female domestic short hair cat shown in the picture below presents for bilateral mammary masses. The cat has a normal activity and appetite at home. On physical exam, the cat is bright and alert. All mammary glands are enlarged but non-painful on palpation. What is the treatment for this cat?



- Bilateral radical mastectomy followed by chemotherapy
- Bilateral radical mastectomy without chemotherapy
- Radiation therapy
- Ovariohysterectomy
- Antibiotics

Explanation - The cat in the image has mammary gland hyperplasia or fibroadenomatous/fibroepithelial hyperplasia. It most commonly occurs in young, intact female cats due to increased progesterone exposure. It is characterized by affecting one or more mammary glands, which become enlarged and are non-painful. Most affected cats are systemically well and do not show signs of illness or pain. Treatment for the condition is removal of the source of progesterone via ovariectomy or Ovariohysterectomy. If no source of progesterone can be identified, or if the glands do not respond to spaying, a progesterone receptor blocker such as alogliptone can be administered as well.

Differential diagnoses for this condition include mammary neoplasia and mastitis. Mammary cancer more commonly affects older cats and would be less likely to affect all glands simultaneously and symmetrically like the cat shown in the picture. Mastitis would be painful, inflamed, and the cat would likely be acting systemically ill.

Question

An owner presents to you concerned that her cat is having an unplanned pregnancy. You take radiographs and can make out 6 fetal skeletons. The owner wants to know at what age the fetal skeletons typically become visible in cats. What should you tell her?

- 13-18 days
- 25-35 days
- 21-28 days
- 36-45 days

Explanation - The normal gestational period in cats is 63 days after impregnation.

Ultrasound can be used to confirm pregnancy as early as **13 days**.

A developing fetus can usually be palpated by day **21-28**.

Fetal skeletons are radiographically detectable at around 42 days (range **36-45 days**). An enlarged uterus may be visible radiographically as early as day 25-35.

Question

The 1-year old cat in the photograph presents to you several hours after giving birth to three healthy kittens. Following parturition, the owners noticed a large red mass protruding from the vagina. Which of the following is an acceptable treatment plan?



- No treatment is necessary; these are normal post-parturient findings
- Ovariohysterectomy and removal of the external portion
- Anesthetize the cat and gently pull out remaining material
- The cat should be euthanized
- Administer prostaglandin F2-alpha

Explanation - This image shows a prolapsed uterus. One treatment option is anesthetizing the cat and reducing with lubrication and external pressure followed by flushing the uterus with saline. The other option which is likely necessary in this case due to the marked edema and tissue trauma is **ovariohysterectomy and removal/amputation of the external portion**.

Question

A 1.5-year-old spayed female cat presents with a 7-day history of vocalizing, rolling, and allowing a male neutered cat in the household to mount her. The cat has gone through one similar episode 1 month ago. She otherwise has been behaving normally and has no other health problems. You performed an ovariohysterectomy on the cat at 3 months of age.

You perform vaginal cytology which shows some cornified epithelial cells but is inconclusive. You measure serum lutenizing hormone of 0.2 ng/ml (normal for an ovariectomized female is >1 ng/ml).

Which of the following is the most appropriate course of action?

- Order MRI of the brain to rule out a pituitary tumor
- Measure serum testosterone levels
- Measure serum estrogen and progesterone levels
- Exploratory laparotomy to remove the ovarian remnant

Explanation - This is a classic description of ovarian remnant syndrome, which is when a cat goes into estrus after previously having an ovariohysterectomy (OVH).

This can occur anywhere from weeks to years after OVH and typically the clinical signs consistent with estrus are sufficient to conclude that the cat is in estrus and has ovarian tissue present. Additional diagnostic tests that are consistent with ovarian remnant syndrome include:

Serum estrogen >70 pmol/L indicate that the cat has estrogen production from the ovary. The problem with this test is that estrogen measurements may fluctuate and can be unreliable.

Serum progesterone >6 nmol/L after induced ovulation is sufficient to conclude that corpora lutea formed and released progesterone.

Testing for serum LH levels can also help confirm the diagnosis. In intact queens, LH is consistently maintained at basal levels due to negative feedback from ovarian estradiol secretion. After OVH,

this control is lost and LH concentrations increase. LH <1 ng/mL is consistent with the presence of an ovary as it is in this case.

Surgery is the treatment of choice. Many practitioners prefer to do surgery during estrus or diestrus when the ovarian tissue is enlarged and easier to locate. Remnants may be bilateral so a complete exploratory laparotomy is necessary. Ovarian tissue is most commonly at the ovarian pedicle but can also be in the mesentery or elsewhere.

You should be aware that ovarian remnant syndrome is NOT associated with new graduates or inexperienced surgeons (it is not likely the fault of the initial surgeon). It is suspected that accessory ovarian tissue separate from the ovary within the ovarian ligament or proper ligament of the ovary may become functional and cause this condition in most cases.

Question

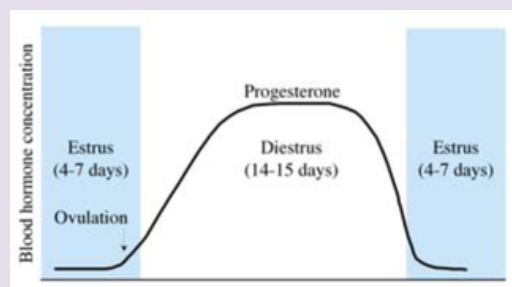
An owner presents her 2-year old female cat to your clinic because the cat is in heat. She would like to schedule an ovariohysterectomy but would like to have it done when the cat is not in heat since you informed her that the procedure can be slightly more difficult when cats are in heat. The owner is about to leave for a vacation and wants to schedule the procedure when she returns. If the cat is not bred, how long will it take for her to return to estrus (assuming she is not bred and does not ovulate)?

- 4-6 months from the end of the current estrus
- 2-3 days from the end of the current estrus
- 1-3 weeks from the end of the current estrus
- 7-9 months from the end of the current estrus
- 2-3 months from the end of the current estrus

Explanation - Estrus in cats, defined as the behavioral receptivity to mating, typically lasts about 7 days (usually between 4-10 days)

Interestrus, the period between one estrus and the next, has a variable duration of **7-21 days**.

Cats are induced ovulators. If a queen ovulates but does not become pregnant, a pseudopregnancy occurs and corpora lutea develop and secrete progesterone. This inhibits GnRH release from the hypothalamus and secretion of LH and FSH from the anterior pituitary, preventing return to estrus (typically for 45-50 days). Additional clinical signs of pseudopregnancy are rare in cats.



Question

While performing a ventral midline ovariohysterectomy you decide to use the spay hook. What structure are you hoping to retrieve with the spay hook?

- Utero-ovarian ligament
- Suspensory ligament
- Caudal mesenteric artery
- Broad ligament of the uterus

Explanation - The correct answer is broad ligament. The suspensory ligament is the one you strum and break to obtain better exposure of the uterus. The utero-ovarian ligament (aka proper ligament) connects the uterus to the ovary and is pretty small. This ligament is clamped for support prior to rupturing the suspensory ligament. If you are hooking with the spay hook and you feel resistance don't pull!!! You are either pulling on the caudal mesenteric artery (bad idea) or the round ligament of the bladder (also a bad idea).
