Question

Which of the following is not a common concurrent disease in cats with diabetic ketoacidosis?

- Hyperthyroidism
- Hyperadrenocorticism
- Cardiac disease
- Pancreatitis
- Bacterial infections

Explanation - The correct answer is hyperadrenocorticism. Hyperadrenocorticism commonly occurs in DKA of dogs, but not in cats. Pancreatitis and bacterial infections commonly occur in DKA dogs and cats. Cardiac disease can be a common concurrent disease in a cat with DKA. Hyperthyroidism commonly occurs in DKA cats, but not dogs.

Question

You have been presented with a 3-year old cat that was supposed to have been spayed at about 6 months of age. The current owner got her as a spayed cat, but every few months the cat is acting like she is in heat. Which of the following would help to confirm an ovarian remnant in this cat?

- Elevated serum lutenizing hormone level
- Low serum progesterone level
- Abdominal ultrasound
- Vaginal cytology showing mostly cornified epithelial cells
- Vaginal cytology showing bacteria and white blood cells with a low number of cornified epithelial cells

Explanation - The presence of cornified epithelial cells on a vaginal cytology swab helps to confirm that the cat is in estrus. The swab should be taken during the time the cat is exhibiting the behavior. In a queen under the influence of estrogen, you should see greater than 90 percent superficial cells.

If an LH level (lutenizing hormone) is low, an ovarian remnant is likely. If it is high it does not rule it out. Progesterone level is unlikely to be helpful because unless the cat ovulates, it will not rise. Abdominal ultrasound is not usually helpful due to the small nature of a remnant and also because the remnant isn't always located at the ovary; it can also have a piece transplanted into other tissue such as the liver or omentum and can be very difficult to find. It is best to try and diagnose with cytology and then via exploratory laparotomy.

Question

A 10-year old FS DSH cat presents with a history of PU/PD for 2 weeks and weight loss. She has not eaten in 2 days. Bloodwork shows blood glucose 457 mg/dL and her urine shows 3+ glucose, 2+ ketones. Which type of insulin would be recommended for this patient at this time?

- Humulin-N (NPH)
- Vetsulin
- PZI insulin
- Humulin-R (regular insulin)
- Glargine (Lantus) insulin

Explanation - This cat is in a state of diabetic ketoacidosis. Due to this status, the recommended insulin type is **Humulin-R, or regular insulin**. This is a shorter acting insulin which will help to get the ketonuria to resolve more efficiently. After the ketosis has resolved and the cat is hydrated, eating, drinking, and electrolytes are stable, the cat can be switched to a longer acting insulin. **Glargine or PZI** are the insulin types of choice for long term control in felines after the ketoacidosis has been corrected, but other insulin types can also be used.

Question

The following 4 cats present to you with signs of polyuria and polydipsia. Which of the following cats could you consider a DDAVP trial on?

- 9-year old DSH male castrated, 5% dehydrated, serum BUN- 35, creatinine-2.4, urine specific gravity-1.010
- 8-year old DSH male castrated, 7% dehydrated, serum BUN- 45, creatinine-2.7, urine specific gravity-1.050
- 6-year old DSH, female spayed, adequately hydrated, serum BUN-10, creatinine-0.7, urine specific gravity-1.007
- 5-year old DSH, female spayed, adequately hydrated, serum BUN-8, creatinine 0.9, urine specific gravity-1.040

Explanation - The correct answer is 6-year old DSH, female spayed, adequately hydrated, serum BUN-10, creatinine-0.7, urine specific gravity-1.007. A DDAVP trial is generally performed in animals that are polyuric and polydipsic after ruling out other causes (Diabetes mellitus, renal insufficiency, hypercalcemia, liver failure, hyperadrenocorticism, hyperthyroidism, etc) to determine whether the PU/PD is due to diabetes insipidus or psychogenic polydipsia.

The 6-year old cat is the only suitable candidate because he has normal renal values and a low urine specific gravity in the face of adequate hydration. Dehydrated patients should not be started on DDAVP. Diabetes insipidus does not usually lead to dehydration. Diabetes insipidus is rare in cats.

Patients with elevated renal values and isosthenuric urine should also not be tested because renal insufficiency is the likely cause of their PU/PD. Patients with concentrated urine also do not need a DDAVP trial because they are able to concentrate their urine.

Question

Which of the following is not a common post-operative complication of thyroidectomy for hyperthyroidism in cats?

- Horner's syndrome
- Esophageal stricture
- Laryngeal paralysis
- Hypocalcemia
- Hypothyroidism

Explanation - The correct answer is esophageal stricture. Esophageal stricture is not a common post-op complication of thyroidectomy. Hypocalcemia can occur due to damage or excision of the parathyroid glands. Horner's syndrome occurs when the sympathetic trunk running through the neck is damaged. Laryngeal paralysis occurs with damage to the recurrent laryngeal nerve running through the neck. Hypothyroidism can occur secondary to removal of the affected thyroid gland or glands.

Question

Which of the following is not a treatment for feline hyperthyroidism?

- Methimazole
- Thyroxine
- Thyroidectomy
- Radioactive iodine therapy

Explanation - The correct answer is thyroxine. Thyroxine is the medical treatment for canine hypothyroidism. Methimazole is the medical treatment for feline hyperthyroidism. Radioactive iodine therapy and thyroidectomy are treatment options as well.

Question

A 12-year old DSH presents for weight loss, lethargy, polydipsia, and vomiting. Urinalysis shows 3+ ketones and a large amount of glucose in the urine. Bloodwork reveals an increased blood glucose at 437 mg/dL. Which of the following is most likely directly associated with the disease this cat most likely has?

- Metabolic acidosis, azotemia, hyperphosphatemia

- Metabolic alkalosis, elevated T4, low serum BUN and creatinine
- Metabolic acidosis, electrolyte disturbances, hyperosmolality
- Metabolic alkalosis, osmotic diuresis, azotemia

Explanation - The correct answer is metabolic acidosis, electrolyte disturbances, hyperosmolality. This cat has diabetic ketoacidosis. Metabolic acidosis (low TCO2) occurs due to the presence of ketone bodies, which act as acids. Osmotic diuresis and polyuria cause electrolyte disturbances including hyponatremia, hypochloremia, and hypokalemia. Serum osmolality is usually increased due to the elevated glucose. A pre-renal azotemia may be present due to dehydration and the elevated BUN in that case will also contribute to elevated serum osmolality. Hyperphosphatemia does not occur with DKA unless there is concurrent renal failure. In fact, hypophosphatemia is often seen with DKA. An elevated T4 does not occur with DKA unless there is concurrent hyperthyroidism. Metabolic alkalosis does not occur with DKA.

Question

A 9-year old spayed female Siamese cat is presented to you for a 6-month history of polydipsia (the owner has documented water consumption of 110 ml/kg/day) and a 1 month history of weight loss and progressively decreasing appetite. Which of the following is a likely differential to explain these clinical signs?

- Diabetes mellitus
- Renal failure
- Hyperthyroidism
- Exocrine pancreatic insufficiency

Explanation - Renal failure is the differential most likely to be associated with pu/pd accompanied by decreasing appetite and weight loss.

Most cats with **DM have normal to increased appetites**.

Hyperthyroid cats can be pu/pd and have weight loss, but appetite is most often increased.

Some **EPI animals show pu/pd and most have weight loss, but most are ravenously hungry**.

Question

Which of the following is the screening test of choice for hyperthyroidism in the cat?

- Thyroid-stimulating hormone levels

- Total T4 level
- Free T4 by equilibrium dialysis
- Serum iodine levels

Explanation - The correct answer is total T4 levels. This test is routinely available and reliable in the vast majority of hyperthyroid cats for diagnosing hyperthyroidism and monitoring therapy. Free T4 by equilibrium dialysis can be increased with diseases other than hyperthyroidism, so this test should always be paired with a total T4. The total T4 should be increased or in the high end of the normal range in conjunction with a high free T4, in order to make a diagnosis of hyperthroidism. TSH levels are used to aid in the diagnosis of canine hypothyroidism (if they are increased), but they are not used in cats to diagnose hyperthyroidism.

Question

The 13-year old male neutered domestic short hair cat shown in this photo presents to you with a 6-month history of progressive weight loss and an unkempt hair coat. You question the owner regarding his activity level and she mentions the activity seems the same other than the fact that he is more easily agitated.

Which of the following values is most likely to be elevated in this cat?

- Serum creatinine
- Urine specific gravity
- Serum cholesterol
- Serum ALT

Explanation – The correct answer is serum ALT. This cat has several classic features of hyperthyroidism. You might expect to find a **palpable thyroid nodule** as well. In addition to an elevated T4, clinicopathologic features of hyperthyroidism include **erythrocytosis** and a **stress**

leukogram (neutrophilia, lymphocytosis) due to increased circulating catecholamines.

Increased catabolism of muscle tissue in hyperthyroid cats may result in increased BUN, but not creatinine. In fact, glomerular filtration rate (GFR) is increased in hyperthyroid cats, which may lower the BUN and creatinine and mask underlying renal insufficiency.

Although hyperthyroidism increases GFR, the effect of thyroid hormone excess on the urinalysis can vary. Most cats, however, will have decreased urine specific gravity and may exhibit polyuria.

The increased metabolic rate in hyperthyroidism results in **liver hypermetabolism**; therefore, serum activities of **liver enzymes are commonly increased (ALT, ALP) in 80-90% of hyperthyroid cats**. The increase in ALT is usually mild to moderate (100-400 IU/L). If the ALT is greater than 500, concurrent hepatic disease should be suspected. Serum cholesterol is usually normal, but can be moderately decreased, due to increased hepatic clearance mediated by thyroid hormones.

Question

You are starting insulin therapy for a newly diagnosed diabetic feline patient. Blood glucose is 520 mg/dL. Urinalysis shows 3+ glucose and is negative for ketones with a trace of protein. Which of the following tests should this patient and all diabetic patients receive upon initial diagnosis?

- Urine culture
- Thyroid panel
- Electrocardiogram
- Fructosamine
- Blood pressure

Explanation - All newly diagnosed diabetic patients should have their urine cultured. Diabetics are prone to getting urinary tract infections due to the chronic presence of glucose in their urine. Any underlying infection can lead to insulin resistance and make regulation of diabetes difficult to achieve.

Blood pressure and ECG are good tests for all patients in general but aren't necessarily tests that are directly related to diabetes regulation.

A thyroid level should be checked in all older cats, for general health screening, but hyperthyroidism is not associated with diabetes mellitus. If a patient has diabetes which is difficult to control, concurrent hyperthyroidism should be ruled out.

Fructosamine level is helpful in trying to determine if a cat actually has diabetes if their glucose level is elevated and also as a follow up to determine regulation. Cats that have markedly elevated glucose levels, glucosuria, and clinical symptoms of diabetes do not necessarily need to have a fructosamine checked at the time of diagnosis.

Question

You are treating a 5-year-old male neutered cat that has diabetes mellitus. He is eating well at home and is no longer polyuric and polydipsic. You are treating him with 2U PZI insulin twice daily. His body weight is stable compared to his last visit. He ate a normal amount of food this morning and received his insulin before coming to see you. His blood glucose on presentation, 1 hour after receiving insulin, was 301 mg/dL (normal is 60-125mg/dL). You evaluate a blood glucose curve with readings every 2 hours after the initial reading, and your results are: 274 mg/dL, 233 mg/dL, 130 mg/dL, 101 mg/dL, 248 mg/dL. What would you recommend to this cat's owner?

- Discontinue insulin, he is in diabetic remission
- Continue 2U PZI BID and recheck BG curve in 2 months
- Switch to glargine insulin 2U BID, and recheck BG curve in 1 week
- Decrease to 1U PZI BID and recheck BG curve in 1 week
- Increase to 3U PZI BID and recheck BG curve in 1 week

Explanation - The cat is doing well clinically. The BG nadir is 101 mg/dL, duration of insulin action is 9-10 hours, and the majority of your values are less than 250. All of these findings indicate good control of the diabetes, and no changes in treatment are necessary.

Question

A 12-year old cat presents with an abnormal gait and appears to be walking with the both hocks dropped down low to the ground. The owner says the cat has been losing weight and drinking a lot of water. What diagnostic test should you run?

- MRI of the brain
- Blood glucose
- BUN and Creatinine
- Echocardiogram

Explanation - This cat is presenting with a plantigrade stance with the hocks dropped low to the ground. This finding is most often associated with a diabetic neuropathy. A blood glucose test is fast and inexpensive, and helps rule diabetes mellitus in or out. Additionally, a urinalysis to check for glucose and ketones would be appropriate. The urinalysis will be especially helpful when trying to differentiate between stress and diabetes. Most patients with stress hyperglycemia will not have glucose in the urine. Chronic unregulated diabetes often results in weight loss, polyuria and polydipsia, and can lead to this plantigrade stance. Chronic renal failure, which also causes weight loss and polyuria and polydipsia, does not cause the plantigrade stance. Cerebellar disease may result in ataxia, but the gait usually appears hypermetric or exaggerated and may have a sway to it.

Echocardiogram would be an appropriate choice if you were suspicious of a saddle thrombus. This is a clot in the aorta, which typically blocks off blood flow at the inguinal region and results in cold

hindlimbs and loss of femoral pulses. The thrombus may affect one or both limbs depending on its location. This is most often associated with underlying cardiac disease, and, in this condition, the cat usually presents with dragging one or both hindlimbs. You will be unable to feel a femoral pulse in the affected limb(s), and the affected limb(s) is/are often painful.

Question

A 15-year old female spayed Siamese cat is diagnosed with hyperthyroidism based on clinical signs of weight loss and an unkempt hair coat, in conjunction with a palpable thyroid nodule and elevated serum T4. CBC, chemistry panel, and thoracic radiographs are within normal limits. Which is the most appropriate initial therapy?

- Thyroidectomy
- Sodium levothyroxine
- Oral methimazole
- Radioactive iodine (I131) therapy

Explanation - The correct answer is oral methimazole. Hyperthyroid patients should be treated with **oral methimazole initially** to unmask any occult renal insufficiency that could have been hidden by the hyperthyroidism (Renal Failure diagnosis is based mainly on high BUN and Creatinine values. These values are usually lowered due to hyperthyroidism increased GFR by kidneys). This is the safest initial treatment in that respect since its effects are reversible. Radioactive iodine therapy and thyroidectomy are irreversible. Sodium levothyroxine is thyroid hormone supplementation used in dogs with hypothyroidism.

Question

You have been presented with a 9-year-old female spayed domestic shorthair cat with a history of polyuria, polydipsia, and weight loss. She has been eating a dry cat food that the owner purchased at the grocery store, labeled for adult cats. The cat's blood glucose is 400 mg/dL (normal is 60-125mg/dL) and she has 3+ glucosuria (normal is negative for glucose in urine), diagnostic for diabetes mellitus. You start the cat on insulin. What should you recommend for her diet?

- A low carbohydrate diet
- A low fat diet
- A low protein diet
- A high fiber diet

Explanation - A low carbohydrate canned diet will help to improve glycemic control in a diabetic cat. It may even help to put the cat into diabetic remission for a period of time, where she will not require exogenous insulin. High fiber diets are helpful in the regulation of canine diabetes mellitus.

Question

A 3-year old male castrated domestic short hair cat presents to you for weight gain, polyuria and polydipsia over the course of 6 months. His previous veterinarian made a diagnosis of diabetes and has tried to control this with insulin but has not been successful. On examination, you detect prognathism, hepatomegaly, and a grade III/VI heart murmur. You suspect that the cat may have an underlying disorder that is contributing to his poorly-controlled diabetes. Which of the following diagnostic tests will be most helpful in confirming your suspicion?

- Serum T4 levels
- Serum insulin:glucose ratio
- Abdominal ultrasound
- MRI of the brain
- Serum folate and cobalamin levels

Explanation - This cat has clinical signs most consistent with **acromegaly** (weight gain, prognathism, organomegaly, and diabetes mellitus that is difficult to control). This condition results from **a growth hormone (somatotropin) secreting pituitary tumor**. GH or insuline-like growth factor (IGF) assays can be diagnostic but are not offered by many veterinary laboratories. Advanced imaging techniques (MRI) are the most reliable way to diagnose a pituitary mass in this instance. This cat is not likely to be hyperthyroid due to the history of weight gain. Hyperadrenocorticism as a cause of insulin-resistant diabetes mellitus is less likely given the cat's other clinical signs; nevertheless, adrenal function testing such as an ACTH stimulation test or dexamethasone suppression test to rule out hyperadrenocorticism should be considered.

Question

A 13-year old male castrated domestic long hair presents for polyphagia, weight loss, and vomiting. The owner notes that the cat appears restless, more active, and more aggressive than before. Which test would diagnose the most likely cause for these signs?

- Abdominal ultrasound
- Serum T4
- Gastroduodenoscopy and biopsy
- Liver panel
- Renal panel and urinalysis

Explanation - The correct answer is serum T4. This cat is most likely hyperthyroid. Polyphagia, weight loss, and hyperactivity are classical clinical signs in a cat with hyperthyroidism. Other signs might include a dull haircoat, PU/PD, vomiting, diarrhea, and aggression. Lethargy, anorexia, and weakness are uncommon but can occur in a condition apathetic hypothyroidism.

Question

Which of the following does not occur in cats with diabetes mellitus?

- Polyuria
- Cataracts
- Pelvic limb weakness
- Dull hair coats

Explanation - The correct answer is cataracts. Cataracts occur in dogs with diabetes mellitus, but not in cats. Plantigrade stance, pelvic limb weakness, and difficulty jumping are often clinical signs seen in cats with DM. Polyuria is not as common of a complaint in cats as in dogs because owners usually don't notice them going to the litter box more often. Polydipsia is usually more noticeable. Cats also often get dull haircoats with DM.

Question

A 9-year old female spayed domestic short hair presents for a glucose curve. The cat has been diagnosed with diabetes mellitus and has been getting 2 units of lente insulin BID. The cat is fractious and stressed at your clinic. What is the ideal next step?

- Draw blood for a fructosamine level
- Keep the cat for the day and perform a glucose curve
- Send the cat home and give the owner sedatives to administer to the cat next time they bring the cat in
- Give a sedative to the cat and then perform the glucose curve

Explanation - The correct answer is draw blood for a **fructosamine level**. A serum fructosamine should be drawn. Fructosamine concentration is a good indicator of glycemic control of the animal over the past 2-3 weeks. The stress hyperglycemia that occurs in stressed and fractious animals does not affect the results of a serum fructosamine test. Sedating the cat would most likely not eliminate the stress hyperglycemia. Diabetic patients that are prone to stress hyperglycemia can be managed with blood glucose curves taken at home by the owner, using commercially available lancets and glucometers.

Question

A 13-year-old female spayed domestic short hair cat presents for a geriatric screening. The owner reports that the cat is polyuric, polydipsic, and slightly lethargic recently. Physical exam reveals a nodule in the region of the thyroid gland and a thin body condition. Blood work is run with the following findings (normal ranges are within parentheses): T4 2.7 mg/dL (2.3-4.7 ug/dL), blood urea nitrogen 34 mg/dL (10-32 mg/dL), creatinine 2.1 mg/dL (0.5-2.2 mg/dL), total calcium 16

mg/dL (8-11 mg/dL), phosphorus 2.5 mg/dL (3.5-8.1 mg/dL). An ionized calcium is 1.8 mmol/L (1.12-1.32 mmol/L). A urinalysis shows a urine specific gravity of 1.010 and numerous calcium oxalate crystals. An ultrasound of the neck confirms a nodule within the region of the thyroid. What do you tell the owner?

- The cat has primary hyperparathyroidism and surgery is recommended.
- The cat has lymphoma causing the changes in blood work and staging tests are recommended.
- The cat is most likely hyperthyroid and methimazole is recommended. The T4 is within the normal range because of sick euthyroid syndrome.
- The cat is in renal failure and should be hospitalized on aggressive intravenous fluids.
- The cat has a urinary tract infection and antibiotics are recommended.

Explanation - The symptoms, physical exam findings, and blood work results are most consistent with primary hyperparathyroidism, which is most commonly caused by a **parathyroid gland tumor**. The elevated calcium causes the signs of **PU/PD.** Cats will commonly not show significant clinical signs and may be diagnosed incidentally on routine blood work evaluation.

This cat's clinical signs of PU/PD and slight lethargy are non-specific, but classic for primary hyperparathyroidism along with the blood work shown in the question, which depicts borderline or mild azotemia, high total and ionized calcium levels, and low phosphorus.

Question

A 12-year-old male neutered domestic long hair cat presents for ongoing evaluation of diabetes mellitus. The cat was diagnosed 6 months ago and has continued to be markedly polyuric, polydipsic, polyphagic, and has been gaining weight. The cat is currently receiving 10 units of glargine insulin every 12 hours. On physical exam, the cat weighs 15 pounds (6.8 kg) and has an enlarged head, abdomen, and paws. What imaging modality would be most appropriate to try and prove what you suspect is causing the uncontrolled diabetes and weight gain in this cat?

- Radiographs of the thorax
- Ultrasound of the abdomen
- Ultrasound of the neck
- Magnetic resonance imaging (MRI) of the head
- Computed tomography (CT scan) of the abdomen

Explanation - This cat has the signs and symptoms of acromegaly. Acromegaly is caused by excessive growth hormone release from the pars distalis from a tumor in the pituitary gland. Excessive growth hormone causes a defect in the insulin receptors on target cells causing insulin resistant diabetes mellitus. The enlarged head, paws, abdomen, and weight gain despite uncontrolled diabetes is due to the anabolic effects of the growth hormone.

Treatment for this condition includes **radiation therapy** to the pituitary tumor, high doses of insulin to try and control the diabetes, and somatostatin analogs (**octreotide**) to try and inhibit the release of growth hormone from the tumor. Surgical excision has been used as a form of treatment in people with pituitary tumors, but this has only been rarely reported in cats.

Question

Which clinical finding is most supportive of hyperthyroidism in a cat?

- Weight loss
- Palpable nodule in the area of the thyroid gland
- Polyphagia
- Restlessness
- Low body condition score

Explanation - The correct answer is palpable nodule in the area of the thyroid gland. A palpable thyroid nodule would be most supportive of hyperthyroidism in a cat out of all the answer choices listed. The other individual clinical findings alone are less specific to hyperthyroidism and are seen as signs in many other common diseases. Polyphagia can also be seen in diabetes mellitus, exocrine pancreatic insufficiency, intestinal parasitism, etc. Weight loss and low body condition can be due to cancer, diabetes mellitus, malnutrition, etc. Restlessness can be caused by pain, anxiety, pheochromocytoma, etc.

Question

A 9-year old female spayed Calico cat presents for weight loss. She is strictly indoors with one other cat. There is no travel history. She is hyperactive at home and has a ravenous appetite. You note she has lost weight from her previous visit. On examination you hear a II/VI parasternal murmur. Abdominal palpation is unremarkable. In house lab work shows an ALT of 240 IU/L, and ALP of 250 IU/L. Her complete blood cell count is unremarkable. Her blood pressure is 200 mmHg. What do you tell the owner regarding long term care?

- Lifelong therapy is necessary, and control is often successful.
- Palliative therapy can provide quality of life support, but long term outcome is poor.
- Supportive therapy often fails after a few weeks to months. Consider euthanasia when failure occurs.
- Lifelong therapy is necessary; management and control can be difficult.

Explanation – The correct answer is Lifelong therapy is necessary, and control is often successful. Ravenous appetite with weight loss, hyperactivity, heart murmur, and high blood pressure would most likely indicate hyperthyroidism; especially in an older cat. Medical management can be successful with methimazole daily for the rest of the cat's life. Other treatment options include

surgical thyroidectomy (not recommended since surgery can induce hypothyroidism) or radioactive iodine therapy. Hill's Y/D food has limited iodine, strict dietary management is required for any chance of success if using the Y/D as the treatment choice.

It is important to screen and rescreen for renal disease prior to and after starting methimazole. Hyperthyroidism can mask renal disease due to increased blood pressure and blood flow through the kidneys leading to increased glomerular filtration rate. Owner must be warned that even if no signs are seen prior to initiating treatment, renal disease may be diagnosed at a later time.

Question

An 8-year old female spayed domestic long hair presents for her yearly wellness examination. Her exam is within normal limits, but she is very stressed from the muzzle on her face and is difficult to examine due to her fractious nature. The owner states she has always been a "big drinker" but seems to be urinating normal amounts and otherwise acting fine. Her diet is Friskies and chicken. You perform a wellness blood profile, and the results show the following abnormalities: BUN 35 mg/dL, creatinine 2.4 mg/dL, glucose 285 mg/dL. Her CBC shows neutrophils 15,800/uL and lymphocytes 1,200/uL. Urinalysis shows USG 1.049, pH 6.0, negative for bacteria, leukocytes, glucose, crystals, and blood. Which of the following treatments are indicated for this patient?

- Twice daily insulin injections
- No treatments are indicated at this time
- Daily subcutaneous fluids and low protein, low phosphorus renal diet
- Broad spectrum antibiotics

Explanation - This patient likely has a stress induced hyperglycemia. Hyperglycemia in a stressed cat without the presence of glucosuria is strongly suggestive of a stress hyperglycemia rather than diabetes mellitus. The high specific gravity of the urine makes the mildly elevated renal values likely pre-renal (secondary to dehydration) and helps to rule out renal failure. Additionally, animals that are on a high protein diet can have an elevated BUN. The CBC findings are consistent with a stress leukogram. Given these findings, no treatments are indicated at this time. It may be a good idea to suggest a higher quality diet for an overall health benefit. Insulin injections should only be administered when diabetes mellitus has been confirmed. This is best confirmed with an elevated fasting blood glucose and glucosuria. If there is a question whether or not diabetes is occurring, a fructosamine level can sometimes help to differentiate this. Broad spectrum antibiotics are not indicated as this cat has no evidence of an infection.

Question

Which of the following is not a common concurrent disease in cats with diabetic ketoacidosis?

- Pancreatitis
- Cardiac disease
- Hyperthyroidism

- Bacterial infections
- Hyperadrenocorticism

Explanation - The correct answer is hyperadrenocorticism. Hyperadrenocorticism commonly occurs in DKA of dogs, but not in cats. Pancreatitis and bacterial infections commonly occur in DKA dogs and cats. Cardiac disease can be a common concurrent disease in a cat with DKA. Hyperthyroidism commonly occurs in DKA cats, but not dogs.

Question

You are presented with your long-term 13-year old male neutered domestic longhair patient. You are managing it for poorly controlled diabetes mellitus. At home, the cat is markedly polyuric, polydipsic, polyphagic, and has increased in weight from 7.2 kg (15.8 pounds) to 9.0 kg (19.8 pounds) over the last 3 months. The cat is currently receiving 15 units of protamine zinc insulin every 12 hours with meals. On physical exam, the cat is quiet and mentally dull. He has an enlarged head, paws, and liver on abdominal palpation. A blood glucose curve shows values between 400 mg/dL -500 mg/dL (normal range of 60-125mg/dL) on each reading throughout the day. What is the most effective treatment for the uncontrolled diabetes?

- External beam radiation therapy
- Surgical exploration of the abdomen
- Increasing the amount of insulin
- Decreasing the amount of insulin
- Iodine 131

Explanation - This cat has the signs and symptoms of acromegaly. Acromegaly is caused by excessive growth hormone release from the pars distalis from a tumor in the pituitary gland. Excessive growth hormone causes a defect in the insulin receptors on target cells causing insulin resistant diabetes mellitus. The enlarged head, paws, abdominal organs, and weight gain are due to the anabolic effects of the growth hormone.

The most effective way to treat a pituitary tumor in veterinary medicine is with **external beam radiation**. Other less effective treatments include high doses of insulin to try and control the diabetes, and somatostatin analogs (octreotide) to try and inhibit the release of growth hormone from the tumor. Surgical excision has been used as a form of treatment in people with pituitary tumors, but this has only been rarely reported in cats. Prior to instituting therapy, pituitary imaging (CT scan +/- MRI) should be performed.

Question

A 14-year old male castrated domestic long hair was diagnosed with hyperthyroidism in your clinic. What additional test should be run before starting treatment for hyperthyroidism?

- CBC
- Bile acids
- Thoracic radiographs
- Chemistry panel

Explanation - The correct answer is chemistry panel. A chemistry panel should be run first to get a baseline assessment of **renal function and liver function**. Occult renal insufficiency is often masked by the hemodynamics of hyperthyroidism. Hyperthyroidism often causes increased renal perfusion and increased GFR. In these cats, when hyperthyroidism is treated, the renal insufficiency is unmasked and they become azotemic. For this reason, most clinicians start treatment with methimazole, and recheck renal function when the T4 is normal. If there is no evidence of underlying renal disease, a permanent treatment for hyperthyroidsim can then be recommenced, such as **I-131** therapy.

The liver enzymes and liver function tests on a chemistry panel should also be assessed since medical management of hyperthyroidism with methimazole can be hepatotoxic. Hyperthyroidism itself can cause increases in liver enzymes, so it is ideal to have baseline liver enzymes before starting treatment.

CBCs in hyperthyroid cats are usually unremarkable. Bile acids test is not warranted. Thoracic radiographs may show cardiomegaly, pulmonary edema, or pleural effusion; however, cardiovascular effects of hyperthyroidism are usually reversible with treatment of the hyperthyroidism.

Question

A 12-year old male neutered domestic short hair cat presents for lethargy and inappetence. It has a history of diabetes mellitus that the owner has been treating with 2 units of PZI insulin subcutaneously twice daily. Your initial exam and lab work show the cat is in diabetic ketoacidosis. How should you treat the cat?

- Treat with frequent doses or a constant rate infusion (CRI) of regular insulin initially to get the cat under glycemic control
- Switch the PZI insulin to a longer acting insulin, such as ultralente, keeping the dosing the same
- Switch the PZI insulin to lente insulin and increase the dosing
- Send the cat home on an appetite stimulant and increased dose of PZI insulin
- Switch the PZI insulin to lente insulin but keep the same dosing

Explanation - The correct answer is to treat with frequent doses or a CRI of regular insulin initially to get the cat under glycemic control. Animals in DKA should be **rehydrated** with **IV fluids** and aggressively treated with frequent doses (or a CRI) of short-acting insulin (**regular insulin**) to

obtain glycemic control before making any alterations to its normal insulin regimen at home. Careful blood glucose monitoring should be instituted as well to make sure the animal does not become hypoglycemic. An underlying cause for its sudden poor glycemic control should also be investigated. Commonly, underlying conditions such as pancreatitis, urinary tract infection, or other underlying infections are responsible for disrupting a diabetic's glycemic control, making them go into DKA.

Question

A cat presents with mild clinical signs and physical exam findings suggestive of hyperthyroidism. A serum total T4 is in the normal range. Which diagnostic test would you run next?

- Free T4 by equilibrium dialysis
- Thyroid technetium scan
- Serum TSH
- Methimazole trial

Explanation - The correct answer is free T4 by equilibrium dialysis. A free T4 in conjunction with total T4 should be run. **Free T4 is a more sensitive test that is better at distinguishing mild hyperthyroidism from normal thyroid function**, and the equilibrium dialysis assay is superior to other assays. Occasionally elevated free T4s are seen in normal cats, so a total T4 should be run in conjunction. Thyroid technetium scan and/or methimazole trials should be run if the free T4 is normal. Serum TSH is run in canine patients suspected of hypothyroidism.

Question

A fractious diabetic cat is very stressed when it presents for a blood glucose curve, and the owner does not want to leave the cat in the hospital for the day. The cat is receiving 4 units of PZI insulin SID at home, and was fed and received insulin this morning before coming in to see you. For this cat, what would be a viable alternative to a glucose curve if the cat has been well regulated in the past?

- Stress has no effect on the glucose curve, and the curve is still the best option
- Check blood glucose once mid-way between insulin injections; this would be equivalent to the nadir
- Single serum fructosamine level
- Serial urine dipsticks by the owner at home to quantify glucosuria

Explanation - A fructosamine level measures the number of blood glucose molecules linked to protein molecules in the blood. This value is considered to provide an average of the blood glucose concentration **over the past 2 to 3 weeks**.

Urine dipsticks are not a reliable means of monitoring diabetes. Stress can greatly affect the glucose curves. In some instances the curve is still the best means of monitoring, especially for

unregulated patients.

The nadir or low point of the glucose curve can occur anytime during the curve, and with PZI is typically 5-7 hours after insulin administration. However, one blood sugar level does not provide a good means of evaluating regulation.

Question

A 12-year old cat with an unkempt haircoat and palpable thyroid slip presents with a history of weight loss. Appetite has been normal to increased. Bloodwork is unremarkable and total T4 level is 3.8 ug/dL. Although the value is within the reference range, you still suspect hyperthyroidism. Which other test could best support the diagnosis?

- Chest radiographs showing a valentine shaped heart, or evidence of HCM
- Free T4 by equilibrium dialysis
- Blood pressure if hypertension is present
- Ultrasound of the thyroid gland
- Serum thyroglobulin antibodies

Explanation - An elevated free T4 by equilibrium dialysis is a way to support the diagnosis of occult hyperthyroidism. In a small subset of cats, the free T4 is elevated due to non-thyroidal illness. Therefore, hyperthyroidism should not be diagnosed on a free T4 measurement alone. Most older cats have a thyroid level that is in the lower end of the normal range. The T4 in this cat is in the high end of the normal range. In combination with the exam findings and clinical signs, this raises suspicion for hyperthyroidism.
Many hyperthyroid cats have hypertension so this is a test that should be checked. However, many older cats also have hypertension that do not have hyperthyroidism so this would not confirm the diagnosis. The same applies with appearance of the heart on radiographs. Many hyperthyroid cats will have thickening of the ventricles and an enlarged heart on radiographs, but this radiographic finding would also be seen in cats with hypertrophic cardiomyopathy (HCM) as well as with other cardiomyopathies.

Ultrasound of the thyroid gland would not be of much benefit. It may show that the gland is enlarged but would not confirm that it is overproductive. Serum thyroglobulin antibodies are used to aid in the diagnosis of hypothyroidism, which is rare in cats.

Question

Which of the following is not a common reason for a hyperthyroid cat to have a T4 value in the normal range?

- Fluctuation of T4 early on in the disease
- Immune destruction of the thyroid gland causing a decrease of T4 into the normal range
- Concurrent disease causing euthyroid sick syndrome

- Mild disease in which there are subtle clinical signs and a T4 in the high normal range

Explanation - The correct answer is immune destruction of the thyroid gland causing a decrease of T4 into the normal range. **Immune destruction of the thyroid gland occurs in hypothyroid dogs but does not typically occur in cats**. Euthyroid sick syndrome occurs when concurrent illness causes T4 to decrease from being high down into the normal range, or from the normal range to below normal. Fluctuations of T4 down into the normal range can occur early on in the disease.

Occult hyperthyroidism occurs when the T4 is in the high normal range and the clinical signs are mild. In these pets, a free T4 by equilibrium dialysis can make the diagnosis of hyperthyroidism.

Question

You are treating Molly, an 8-year old feline, for hyperthyroidism. She is currently on methimazole 2.5 mg orally every 12 hours. Her labwork, including renal values, have been stable since diagnosis 2 months ago and her thyroid level is under control. The only concern is that Molly is experiencing extreme **facial pruritis** leading to **excoriations**. You believe this is due to a side effect of the medication. What other treatment option would be the best therapy for Molly?

- Levothyroxine
- Thyroidectomy
- Imidocarb
- I-131 therapy
- Tapazole

Explanation - The treatment of choice for hyperthyroidism in a case such as this would be radioactive iodine, or I-131 therapy. Molly would be a good candidate for this procedure since her renal values have remained stable while on methimazole.

Tapazole is a brand name for methimazole, which is her current medication.

Thyroidectomy can be performed, but many times some thyroid tissue is left behind or there is ectopic thyroid tissue, which means the hyperthyroidism continues or can recur at a later time. Also, this procedure carries more risk than does I-131 therapy.

Question

Which insulin is most similar in composition to feline insulin?

- Canine insulin
- Porcine insulin
- Bovine insulin
- Human insulin

Explanation - Feline insulin is closest in its amino acid sequence to bovine insulin, differing by only one amino acid in the A-chain. Canine insulin however is identical to porcine insulin in its amino acid sequence. It is quite dissimilar from feline insulin, differing by four amino acids. Feline and human insulin sequences differ by four amino acids.

Although feline insulin is closest in sequence to bovine insulin, some cats can be managed quite well on other forms of insulin. Insulin glargine (Lantus), an engineered human insulin, is the current recommended insulin for cats. ProZinc (a protamine zinc recombinant human insulin) is also an option and has been FDA approved for use in diabetic cats. PZI (bovine zinc insulin) is no longer manufactured.

Question

Which of the following conditions frequently results in hypercalcemia in a cat?

- Administration of a fleet enema to a cat
- Intoxication with cholecalciferol based rodenticide
- Ethylene glycol toxicosis
- Nutritional secondary hyperparathyroidism

Explanation - The correct answer is intoxication with cholecalciferol-based rodenticide. Cholecalciferol gets converted to active vitamin D to cause increased bone resorption of calcium and gut absorption of calcium leading to a sometimes fatal hypercalcemia.

Nutritional secondary hyperparathyroidism results when an animal's diet contains too much phosphorus resulting in decreased serum calcium. Ethylene glycol also causes hypocalcemia due to chelation of calcium by metabolites of ethylene glycol such as oxalate. Fleet enemas are also high in phosphorus and lead to a decrease in serum calcium due to the law of mass action.

Question

A 6-year old Somali cat was presented with a history of polyuria, polydipsia, weight loss, vomiting and lethargy (see image). The cat had not been eating well for the past 3 days. Physical examination found the cat approximately 8% dehydrated and mentally depressed. There was evidence of weight loss. Thoracic and abdominal examination was unremarkable. The retinas were normal.

Initial laboratory data:
PC - 55%;
Total protein - 8.5 g/dl
BUN labstick - 50-80 mg/dl
Glucose by labstick - 460 mg/dl
Sodium - 165 mEq/l
Potassium - 2.6 mEq/l
venous pH - 7.2
Bicarbonate - 8 mEq/l

Urinalysis:

Specific Gravity - 1.026
4+ glucose
2+ ketones
1+ protein
5 WBCs/hpf and intracellular cocci

Initial indirect blood pressure was 120/80 mmHg.

Which of the following two treatments are most important to the cat's immediate recovery?

- Calcium gluconate and colloids
- Crystalloids and insulin
- Low protein diet and phosphorous binders
- Bicarbonate and ampicillin
- Enalapril and methimazole

Explanation - You should recognize that this cat has many of the signs and findings of diabetic ketoacidosis. Specifically, those signs in this case include PU/PD, anorexia, weight loss, azotemia, cystitis, dehydration, ketonuria, and hyperglycemia.

The most important treatments for this cat are gradual correction of dehydration, typically with isotonic crystalloids such as **lactated Ringer's solution supplemented with potassium**. Concurrently with correction of dehydration, insulin therapy should be initiated with **regular insulin** at approximately 1 unit/kg/day with monitoring of blood glucose. This can be done with intermittent dosing or a continuous infusion of insulin. Parameters must be made in order to help

determine if more or less insulin is needed.

Bicarbonate is useful in some cases but should only follow rehydration as overzealous bicarbonate therapy can lead to alkaline overshoot, hypokalemia, hypocalcemia, paradoxical CSF acidosis, hypernatremia, and hyperosmolality.

Ampicillin is a good antibiotic choice due to bactericidal activity against Gram-positive cocci and high urine concentrations pending urine culture and sensitivity results. It is not the most important treatment initially.

Question

A 9-year FS Domestic Long Hair presents for lethargy, weakness, and 2 seizures. The owner states that yesterday she gave the cat an enema she picked up from the drug store. The owner thought she had been constipated because she hadn't defecated in several days and appeared uncomfortable.

She said it was a Fleet enema and that she had no problem administering it, but the cat vomited a few times afterward. Sassy is 5% dehydrated and obtunded on examination. She is having slight tremors. Your in-house laboratory won't have bloodwork available for 2 hours. Which of the following treatments will most likely be indicated?

- Potassium phosphate, IV fluid therapy, diazepam
- Potassium phosphate, IV fluid therapy, methocarbamol
- Calcium gluconate, IV fluid therapy, phosphorus binders
- Insulin and dextrose, IV fluid therapy
- Potassium phosphate, a plain warm water enema, IV fluid therapy

Explanation - There are different Fleet enemas, some of which contain hypertonic sodium phosphate and are contraindicated in cats. Cats develop an electrolyte disturbance caused by the absorption of sodium and phosphate from the colon. This results in hypernatremia and hyperphosphatemia.

The high phosphorus leads to precipitation of serum calcium and thus hypocalcemia. This hypocalcemia can cause weakness, lead to shock, and cause muscle tremors or seizures. The treatment for this toxicity is to correct the electrolyte disturbance and correct the dehydration. IV fluid therapy and calcium gluconate are the initial treatments, and many times phosphorus binders are helpful to more quickly decrease the serum phosphorus.

Unless the cat is actively seizing, diazepam would not be indicated. The administration of calcium should help to stop the tremoring this cat is exhibiting. Potassium phosphate is clearly contraindicated, since the phosphorus is already too high. Insulin and dextrose are sometimes used in severe cases of hyperkalemia, which is not suspected in this case.

Question

An 8-year old male castrated domestic shorthair presents for facial lesions. You diagnosed him with hyperthyroidism 1 month ago and he has been doing well on methimazole. The cat has been fed the same diet for the past 4 years. He is indoors only and on flea preventative. There have been no changes to his environment that the owner can think of. What of the following do you recommend?

- Discontinue methimazole and consider I-131 therapy
- Try a novel protein diet trial for 4 weeks
- Refer to a dermatologist for allergy testing
- Administer a Depo-medrol injection

Explanation - Facial pruritis leading to self-induced excoriations is one of the side effects that can be seen with methimazole therapy. If it occurs, it is typically seen during the first three months of therapy. Along with facial excoriations, clinical signs can also include crusting of the ears. The recommended treatment is to discontinue methimazole and either switch to the Hill's y/d diet or consider surgery or I-131 therapy.

Other causes of skin lesions include atopy, food allergy, and allergic flea dermatitis, but methimazole sensitivity should be considered in any cat with facial excoriations regardless of how long they have been taking the drug.

Question

A 21-year old cat with a history of hyperthyroidism, renal insufficiency, a heart murmur, recurrent urinary tract infections, and inflammatory bowel disease presents to you for a second opinion about the cat's facial excoriations and severe pruritus. You ask the owner about the cat's medications and she is unsure exactly what the cat has been receiving for those ailments. Which of the following medications is most likely responsible for the cat's signs?

- Metoclopramide
- Metronidazole
- Enrofloxacin
- Methimazole

Explanation - Methimazole (Tapazole), which is a medication for treating hyperthyroidism in cats, can cause intense facial pruritus as a side effect. This occurs in less than 4% of cats. Should this side effect occur, the medication should be discontinued and other treatment options considered.
Possible side effects of the other medications are the following:
Enrofloxacin (Baytril) at doses typically higher than 5mg/kg daily can cause blindness in some cats and should be used with caution. A study in 2007 revealed that doses of 10 times the recommended dose is acutely toxic to the outer retina.
Metoclopramide (Reglan) can cause head bobbing as a side effect, but this is extremely rare and mostly occurs in dogs.
Metronidazole (Flagyl) given at high doses can cause neurologic symptoms including nystagmus, ataxia, dilated pupils or even seizures.

Question

An 11-year old MN DSH in chronic renal failure has been treated with weekly subcutaneous fluids, a renal diet, an H2 blocker, and Azodyl. The renal values have remained stable over the past 6 months, but the cat is chronically losing weight. His thyroid tests were all normal, and his serum calcium and phosphorus are normal. The owner has no funds for testing parathyroid levels. Which of the following medications may be of benefit for this patient?

- Pancreazyme powder with A, D, E, K vitamins
- Methimazole
- High-protein supplement for weight gain
- Calcitriol
- Prednisolone

Explanation - An important part of the synthesis of Vitamin D is the kidney's ability to produce calcitriol, or the activated form of Vitamin D. Cats in chronic renal failure lose the ability to make calcitriol because their kidneys are no longer functioning properly. Calcitriol acts as a negative feedback to stop the production of parathyroid hormone (PTH). Thus, when the negative feedback is lost, the parathyroid hormone becomes excessively increased. This can lead to chronic weight loss in these patients.

Methimazole is a medication used to control hyperthyroidism in cats.

Prednisolone, although as a side effect can cause increased appetite, is not used for this purpose and is not a treatment for chronic renal failure.

Pancreazyme powder is used in patients with exocrine pancreatic insufficiency and helps with weight gain in those patients but would not be used in this case.

Cats in chronic renal failure should be placed on diets low in protein and phosphorus, so a high-protein diet or supplement would be contraindicated.
