Trilostane: A therapeutic consideration for canine hyperadrenocorticism

Choices in medical therapy for dogs with hyperadrenocorticism can be limited. Studies have shown that trilostane provides another option for treating this disease—as well as alopecia X.

Audrey K. Cook, BVM&S, MRCVS, DACVIM, DECVIM-CA

In 2001, trilostane, a synthetic steroid analogue, was licensed in the United Kingdom for treating canine pituitary- and adrenal-dependent hyperadrenocorticism. Trilostane is currently undergoing Food and Drug Administration (FDA) review for the same purposes in the United States. In this article, I briefly review the diagnosis and treatment of hyperadrenocorticism and then present the current knowledge on trilostane, discuss therapeutic considerations, and address possible adverse effects.

HYPERADRENOCORTICISM
Hyperadrenocorticism is a clinical syndrome arising from chronic, excessive exposure to glucocorticoids. It is also referred to as Cushing’s syndrome in recognition of the work done by Dr. Harvey Cushing, a pioneering neurosurgeon, in the early 1900s. There are three types of hyperadrenocorticism.

• Pituitary-dependent hyperadrenocorticism (PDH) involves excessive cortisol secretion in response to an inappropriate release of adrenocorticotropic hormone (ACTH) by a pituitary tumor

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Illustration by Dan Rogers
TABLE 1

Clinical Signs of Hyperadrenocorticinism

- Increased thirst and urination
- Increased appetite
- Abdominal distention
- Panting
- Muscle wasting and weakness
- Plantigrade stance
- Thinning skin
- Comedones
- Calcinoisis cutis
- Pyoderma
- Truncal alopecia

(usually a benign adenoma). This form of hyperadrenocorticinism is also called Cushing’s disease.

- Adrenal-dependent hyperadrenocorticinism involves excessive cortisol secretion by an adrenocortical tumor and can be benign or malignant.

- Iatrogenic hyperadrenocorticinism is due to exogenous glucocorticoid administration—oral, parenteral, or topical. It resolves when glucocorticoids are discontinued.

Diagnosis

In patients with the clinical signs of hyperadrenocorticinism (Table 1) and supportive findings on routine laboratory tests (Table 2), the diagnosis must be confirmed before therapy is considered.

The two screening tests commonly used to diagnose hyperadrenocorticinism are the ACTH stimulation test and the low-dose dexamethasone suppression test. The ACTH stimulation test (Table 3) is quicker and requires less venipuncture, but it may be less sensitive than the low-dose dexamethasone suppression test. However, it is the only way to identify a patient with iatrogenic hyperadrenocorticinism, and it provides information for post-treatment comparisons. The advantage of the low-dose dexamethasone suppression test (Table 4) is its potential for differentiating PDH from adrenocortical tumors.

It is important to determine whether a patient has PDH or an adrenocortical tumor. The easiest way to answer this question is by performing an abdominal ultrasonographic examination. A competent scanner can easily identify both adrenal glands and assess their size and shape. Bilaterally normal or enlarged glands support PDH; asymmetry with a mass on one gland and atrophy of the other gland indicates an adrenocortical tumor.

| TABLE 2 |

Laboratory Abnormalities Associated with Hyperadrenocorticinism

<table>
<thead>
<tr>
<th>Serum chemistry profile</th>
<th>Complete blood count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased alkaline phosphatase activity</td>
<td>Mild polycythemia (PCV 45% to 55%)</td>
</tr>
<tr>
<td>Increased alanine transaminase activity (generally &lt; twice the upper end of the normal range)</td>
<td>Mature neutrophilia</td>
</tr>
<tr>
<td>Increased triglyceride concentration</td>
<td>Lymphocytopenia</td>
</tr>
<tr>
<td>Increased cholesterol concentration</td>
<td>Thrombocytosis</td>
</tr>
<tr>
<td>Decreased blood urea nitrogen concentration</td>
<td>Urinalysis</td>
</tr>
<tr>
<td>Specific gravity &lt; 1.020</td>
<td>Bacteriuria</td>
</tr>
<tr>
<td>Proteinuria</td>
<td></td>
</tr>
</tbody>
</table>

ACTH Stimulation Testing Methodology and Interpretation

**Test methodology**

- The patient should be fasted before testing.
- Check all samples carefully for hemolysis and lipemia.
- Promptly spin and separate the serum or plasma before refrigeration.
- Obtain a baseline blood sample.
- Inject 5 µg/kg of cosyntropin intravenously or intramuscularly.
- Collect a second blood sample 60 minutes later.

**Test interpretation**

- A post-stimulation cortisol concentration > 22 µg/dl is consistent with hyperadrenocorticinism.
- A post-stimulation cortisol concentration < 15 µg/dl is not supportive of hyperadrenocorticinism.

**Note:**

- 20% to 30% of patients with hyperadrenocorticinism stimulate below 22 µg/dl.
- Nonadrenal disease can elevate the post-stimulation cortisol concentration.
- The results of an ACTH stimulation test must be reviewed in light of other findings.


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ways to differentiate between PDH and an adrenocortical tumor include measuring endogenous ACTH concentrations (normal or elevated in patients with PDH, low in patients with hyperadrenocorticism due to an adrenocortical tumor) and performing a high-dose dexamethasone suppression test (suppression supports a diagnosis of PDH). Abdominal radiography may reveal calcification associated with an adrenal mass but is not a sensitive test for this purpose.

**Treatment**

Surgical removal of the affected adrenal gland is the treatment of choice for patients with hyperadrenocorticism caused by an adrenocortical tumor. If the tumor is inoperable, distant metastases are detected, or the patient is an unsuitable anesthetic candidate, medical therapy can be used to control clinical signs.

In the United States, medical therapy is the mainstay of treatment of dogs with PDH. But in people, endoscopic removal of the underlying pituitary tumor is the standard of care and is curative. A successful method for hypophysectomy (rather than tumor removal) has been reported in dogs with hyperadrenocorticism, but it requires substantial expertise and is unlikely to be routinely performed.  

Medical therapy controls the signs of hyperadrenocorticism; it does not cure the disease. Lifelong treatment will be necessary, and owners need to commit to regular follow-up examinations. All of the options have side effects or limitations (Table 5), so provide clients with detailed information before initiating treatment.

Because of negative experiences or poor responses, some veterinarians are reluctant to recommend treatment in dogs with hyperadrenocorticism. Although studies have not documented improved longevity with therapy, the quality of life for both patients and clients appears to be substantially improved if the disease is successfully controlled. Complications from untreated hyperadrenocorticism include hypertension, diabetes mellitus, glomerulopathy, and thromboembolism; effective regulation of cortisol secre-

**TABLE 4**

**Low-dose Dexamethasone Suppression Testing Methodology and Interpretation**

<table>
<thead>
<tr>
<th>Test methodology</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- The patient should be fasted before testing.</td>
<td></td>
</tr>
<tr>
<td>- Check all samples carefully for hemolysis and lipemia.</td>
<td></td>
</tr>
<tr>
<td>- Promptly spin and separate serum or plasma before refrigeration.</td>
<td></td>
</tr>
<tr>
<td>- Obtain a baseline blood sample.</td>
<td></td>
</tr>
<tr>
<td>- Inject 0.01 mg/kg of dexamethasone intravenously (dilute in 0.9% sodium chloride solution for dosing accuracy).</td>
<td></td>
</tr>
<tr>
<td>- Collect a second blood sample four hours later.</td>
<td></td>
</tr>
<tr>
<td>- Collect a third blood sample eight hours later.</td>
<td></td>
</tr>
</tbody>
</table>

**Test interpretation**

- An eight-hour cortisol concentration > 1.4 μg/dl is consistent with hyperadrenocorticism.
- A four-hour cortisol concentration < 1.4 μg/dl with an eight-hour concentration > 1.4 μg/dl supports PDH.

**Note:**

- Failure to suppress at four hours does not differentiate adrenocortical tumors from PDH.
- Nonadrenal disease can affect the test results.
- The results of the low-dose dexamethasone suppression test must be reviewed in light of other findings.

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1. The synthesis of steroid hormones. The brown arrows show the site of action of 3-beta-hydroxysteroid dehydrogenase.
tion may protect patients from these debilitating problems.

When selecting a treatment for hyperadrenocorticism, consider likely efficacy, the cost of care (including monitoring), and the risk of adverse events. In general, both ketokonazole and selegline demonstrate low efficacy and are not widely regarded as appropriate first-line therapies. Choosing between mitotane and trilostane requires careful thought; complications can occur with both drugs, and regular patient evaluations will be necessary. In experienced hands, mitotane is often successful, but its variable intestinal absorption, long half-life, and cytotoxic effects can be problematic. Deciding when to switch from induction to maintenance therapy with mitotane can be difficult, and clients must promptly identify changes in thirst and appetite to prevent overdose. In contrast, trilostane has more predictable pharmacokinetics and is not directly cytotoxic. Daily medication costs may be higher with trilostane, but monitoring expenses may be lower.

**TRILOSTANE**

Trilostane (4-alpha, 5-alpha-epoxy-17-beta-hydroxy-3-oxoandrostane-2-alpha-carbonitrile) is a synthetic steroid analogue. It is a competitive inhibitor of 3-beta-hydroxysteroid dehydrogenase, an enzyme that catalyses several crucial steps in the synthesis of cortisol from cholesterol (*Figure 1*). When therapeutic concentrations of trilostane are present, cortisol synthesis is dramatically reduced. Although 3-beta-hydroxysteroid dehydrogenase is also required for the synthesis of aldosterone, production of this mineralocorticoid is generally spared at standard therapeutic doses. It is thought that the zona glomerulosa (the site of aldosterone production) may be less sensitive to trilostane or that cellular uptake by this region of the adrenal cortex is different.

Trilostane was previously licensed for use in the United States for people with adrenal disorders but was voluntarily marketed in the United States for people with adrenal disorders but was voluntarily withdrawn from the market in the United States.

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Work done in the late 1990s in Europe demonstrated trilostane’s efficacy in managing canine adrenal disease, and it is presently an approved therapy for dogs with adrenal- and pituitary-dependent hyperadrenocorticism in the United Kingdom and Ireland.

Trilostane is administered orally and appears to be rapidly absorbed. Peak serum concentrations occur one-and-a-half to two hours after dosing and return to baseline within 18 hours; inhibition of steroid synthesis is reported to last less than 20 hours.⁸ Trilostane undergoes hepatic metabolism, and the pharmacokinetics may be altered in patients with liver dysfunction.

The manufacturers state that trilostane should not be used in patients with primary hepatic disease or renal insufficiency.⁹ It should be used with caution in anemic patients and avoided in pregnant or nursing bitches or any animal intended for breeding.

**Starting therapy**

Trilostane is supplied in 10-, 30-, 60-, and 120-mg capsules. The initial dosage is based on body weight (*Table 6*) and is given once a day with food.⁹ The dose is then adjusted based on clinical response and ACTH stimulation test results. Most patients show clinical improvement within seven days, with resolution of polydipsia and polyphagia. Re-evaluate all patients, irrespective of clinical status, within the first two weeks. At this time, perform a physical examination, serum chemistry profile including electrolytes, and an ACTH stimulation test. The timing of the ACTH stimulation test is crucial; for the results to be meaningful, it must be started four to six hours after trilostane administration.¹⁰

**Monitoring**

Dose adjustments are based on the patient’s clinical status and post-ACTH stimulation cortisol concentrations. Several different target ranges have been described, but the general consen-
sus suggests that a post-ACTH stimulation cortisol concentration between 1.5 and 5.5 μg/dl indicates optimal control. According to the U.K. package insert, the acceptable post-ACTH stimulation cortisol concentration range is 1.5 to 9 μg/dl, but clinical experience indicates that patients may manifest some signs of hyperadrenocorticism at cortisol concentrations above 5.5 μg/dl. If the cortisol concentration is below 0.7 μg/dl, withhold trilostane until signs of hyperadrenocorticism recur, and closely monitor the patient for signs of hypocortisolemia. If the post-ACTH stimulation cortisol concentration is 0.7 to 1.5 μg/dl, suspend therapy for 48 hours, and then restart it with a 50% dose reduction. If the patient is inadequately controlled, dose increases of 50% to 100% are generally appropriate. Repeat the clinical evaluation and ACTH stimulation test two weeks after dose adjustment and then every three to six months (Table 7).

A small number of dogs may have a post-ACTH stimulation cortisol concentration within the optimal range but still show signs of hyperadrenocorticism. In these cases, the dose should be divided and given twice daily and then adjusted based on subsequent ACTH stimulation test results. One recent report indicated that routine twice daily therapy achieved acceptable control of the hyperadrenocorticism with a lower total daily dose, but more work is needed to clarify this issue.

Response to therapy
More than 85% of dogs have shown both clinical and biochemical improvement (decreased alkaline phosphatase activity and cholesterol concentration) after a month of trilostane therapy, with substantial improvements in post-ACTH stimulation cortisol concentrations. Survival times for patients treated with trilostane (662 to 930 days) compare favorably with those receiving mitotane (708 days).

Adverse effects
Reports indicate that trilostane is generally safe and effective, but complications can occur. The most common is transient hypocortisolemia, which manifests as anorexia and lethargy. Clients must be instructed to discontinue trilostane if such signs occur, and an ACTH stimulation test and serum electrolyte panel should be performed. The drug should be restarted with a 50% dose reduction when the patient is again eating and active.

Although trilostane seems to preferentially inhibit cortisol synthesis, aldosterone production can also be compromised. If this occurs, serum electrolyte

### Table 5

**Medical Therapy Options for Canine Hyperadrenocorticism**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Mode of Action</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitotane, α,β-DDD</td>
<td>Cytotoxic</td>
<td>• Not FDA-approved for use in dogs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Close monitoring required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Variable absorption</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Can cause nausea, anorexia, and weakness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Teratogenic; cytotoxic</td>
</tr>
<tr>
<td>Ketoconazole</td>
<td>Inhibits steroid synthesis</td>
<td>• No veterinary-approved products are available</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Generally low efficacy in hyperadrenocorticism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Commonly causes anorexia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Teratogenic</td>
</tr>
<tr>
<td>L-deprenyl, selegiline</td>
<td>Monoamine oxidase inhibitor</td>
<td>• FDA-approved for use in dogs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Low efficacy in hyperadrenocorticism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Low risk of negative effects</td>
</tr>
<tr>
<td>Trilostane</td>
<td>Enzyme inhibitor</td>
<td>• Undergoing FDA review</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Periodic monitoring required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Good efficacy documented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Adrenal gland necrosis reported</td>
</tr>
</tbody>
</table>

### U.S. importation process of trilostane from the United Kingdom

Trilostane is not licensed in the United States. However, you may write to the FDA to request permission for importation on a case-by-case basis.

- The prescribing veterinarian must contact the FDA Division of Compliance (attn. Michael Zimmerman) and complete the required 13-part letter. There must be a new letter for each request for each specific patient.
- The FDA will review a request for a small, noncommercial quantity of the drug, which is generally considered to be a six-month supply or less. Approval for importation usually takes three or four weeks.
- The U.K. supplier needs a faxed copy of the FDA authorization, a veterinary prescription, and credit card payment before it will ship the drug.

### Reference

abnormalities are evident (hyponatremia, hyperkalemia), and the patient may appear dehydrated and weak. Once again, discontinuing therapy should be curative, but any patient showing substantial compromise may need fluid support.

Rarely, trilostane has been associated with acute adrenal gland necrosis.\textsuperscript{16,17} The mechanism for this is not understood, as the drug is not expected to be cytotoxic. It is possible that complete shutdown of steroid hormone synthesis is somehow injurious to cell metabolism. This rare event does not appear to be dose-dependent because it may occur when therapy is first started or after several months.\textsuperscript{16,17} It is essential to promptly identify this syndrome and start appropriate treatment (fluid therapy, glucocorticoids, and mineralocorticoids). This complication is permanent and irreversible, and lifelong supplementation of both mineralocorticoids and glucocorticoids will be necessary.

**Switching from another therapy**

If a patient receiving mitotane, ketoconazole, or selegiline is poorly controlled or adverse effects are noted, a switch to trilostane is appropriate. To minimize complications, I recommend stopping the previous medication for two weeks, so that clinical signs of hyperadrenocorticism are evident before starting trilostane. In addition, an ACTH stimulation test should be done to confirm exaggerated adrenal gland function.

**Treating adrenocortical tumors**

Historically, functional adrenal tumors are resistant to medical therapy.\textsuperscript{18} High doses of mitotane may be required to reduce hypercortisolemia, and some patients show no response at all.\textsuperscript{18} It should be noted, however, that mitotane may have a direct cytotoxic effect on neoplastic adrenal tissue, independent of its ability to effectively control cortisol production.\textsuperscript{19} Ketoconazole may control clinical signs in up to 30% of dogs, but side effects are commonly reported.\textsuperscript{20}

In contrast, trilostane has been demonstrated to control the clinical signs of hyperadrenocorticism in dogs with adrenocortical tumors, even in dogs with distant metastases.\textsuperscript{21,22} The drug will not slow tumor growth, but it can control clinical signs and improve patient well-being.\textsuperscript{21,22}

In dogs with operable adrenal tumors, surgical morbidity from infection and thromboembolism may be mitigated by pretreatment with trilostane, although this has not been evaluated systematically.\textsuperscript{22} I recommend a two-week course at the standard dose, with an ACTH stimulation test performed at day 10. I also recommend that trilostane be discontinued 24 hours before surgery, at which time the usual perioperative management for anticipated hypocortisolemia becomes necessary.

**Treating alopecia-X**

Alopecia-X is a dermatologic disorder usually described in Pomeranian, poodle, and husky breeds. It is related to an arrest in the normal hair growth cycle and has been associated with deregulation of both growth hormone and adrenal androgen synthesis.\textsuperscript{23} In classic cases, nonpruritic truncal alopecia occurs; no other signs or changes are noted.

Many of these dogs have elevated concentrations of the precursors to cortisol, particularly 17-hydroxyprogesterone. A recent study evaluating trilostane's effectiveness in 24 affected dogs (Pomeranians and miniature poodles) reported a 90% response rate within eight weeks.\textsuperscript{24} Trilostane was given once or twice daily, with a mean dose of 10.85 mg/kg/day.
No adverse effects were noted, and it was concluded that the hair growth was related to downregulation of adrenal steroid synthesis or inhibition of estrogen receptors within the hair follicles themselves. Twenty-three affected Alaskan malamutes showed similar positive responses when given 3 mg/kg trilostane twice daily.25

**Treating atypical hyperadrenocorticism**

Atypical hyperadrenocorticism is a recently described disorder in which patients manifest clinical signs suggesting hyperadrenocorticism, but the diagnosis is not supported by the results of standard screening tests (an ACTH stimulation test and a low-dose dexamethasone suppression test).26 If detailed steroid profiles are performed (e.g. University

**A case example of trilostane treatment for canine PDH**

Lady, a spayed female Old English sheepdog, received a diagnosis of PDH at the age of 9 and was initially treated with mitotane at a private referral practice in Virginia. However, her response to therapy was poor, with persistent signs of hyperadrenocorticism. Despite repeated periods of induction therapy, her post-ACTH cortisol concentration stayed over 15 μg/dl. A deliberate attempt to destroy the adrenal cortices using high doses of mitotane for a prolonged period (nonselective adrenocorticylis treatment protocol) was unsuccessful. After six months of treatment, she was profoundly cushingoid (Figure A), and her owners were considering euthanasia. Trilostane therapy was discussed, and the FDA granted approval for a three-month supply.

Lady began receiving trilostane at a dose of 120 mg orally once a day. At a check-up on day 10, she was doing well, and her post-ACTH stimulation cortisol concentration was 5.3 μg/dl. Within four weeks, she had dramatically improved; her thirst was normal, and her energy level increased. New hair growth was evident on her trunk, and she was able to get up onto the sofa at home.

At the six-month evaluation, Lady was clinically normal (Figure B). Her coat was thick, and she was active and energetic. Her post-ACTH stimulation cortisol concentration remained between 3 and 6 μg/dl, and trilostane was continued. At a 12-month recheck, Lady's post-ACTH stimulation cortisol concentration was 1.5 μg/dl. Although she was clinically well, the decision was made to decrease her dose by 50%. ACTH stimulation tests were performed every six months, and the post-stimulation cortisol concentration remained between 3 and 5 μg/dl. Lady was successfully maintained on 60 mg of trilostane once a day for the next four years with no recurrence of clinical signs.

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**NEW!**

<table>
<thead>
<tr>
<th>Lite Snackers Canine Treats</th>
<th>Gentle Snackers™ Canine Treats</th>
<th>Dental Chews™ Canine Treats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Now with 48% fewer calories per biscuit. Ideal for patients using:</td>
<td>For dogs with sensitive GI tracts or allergies. Ideal for patients using:</td>
<td>Proven to reduce tartar accumulation. Ideal for patients using:</td>
</tr>
</tbody>
</table>

*When compared to Purina Veterinary Diets® Lite Biscuits brand Canine Treats. Trademarks owned by Société des Produits Nestlé S.A., Vevey, Switzerland*
### TABLE 7

Monitoring and Dose Adjustment for Dogs Receiving Trilostane

<table>
<thead>
<tr>
<th>Post-ACTH Stimulation Cortisol Concentration</th>
<th>Dose Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.7 µg/dl</td>
<td>Stop the trilostane therapy. Do not restart it unless signs of hyperadrenocorticism are noted.</td>
</tr>
<tr>
<td>0.7-1.5 µg/dl</td>
<td>Stop the trilostane therapy for 48 hours, then restart the therapy at 50% of the previous dose.</td>
</tr>
<tr>
<td>1.5-5.5 µg/dl</td>
<td>Continue the present dose.</td>
</tr>
<tr>
<td>5.5-9 µg/dl</td>
<td>Consider a 50% increase in the dose if the patient shows clinical signs of hyperadrenocorticism.</td>
</tr>
<tr>
<td>&gt; 9 µg/dl</td>
<td>Increase the dose 50% to 100%.</td>
</tr>
</tbody>
</table>

### CONCLUSION

Dogs with hyperadrenocorticism that do not respond to mitotane or other forms of medical therapy may benefit from trilostane therapy. Any practitioner using trilostane should be familiar with the likely side effects and be able to adequately monitor patients during therapy. Prompt recognition of potentially life-threatening complications is imperative, and appropriate supportive care must be available. Clients must be informed that trilostane is not approved in the United States, educated on the warning signs of adrenal insufficiency, and given clear instructions about when to discontinue therapy and seek veterinary care.

### Editors’ note:

Dr. Cook is an educational and marketing consultant for Dechra Pharmaceuticals, PLC.

### REFERENCES

You can earn two hours of Continuing Education credit from Kansas State University by answering the following questions on hyperadrenocorticism and trilostane. Circle only the best answer for each question, and transfer your answers to the form on page 118 or take the test online at https://www.dce.ksu.edu/ce/vetmed/. This test expires March 1, 2009.

**Article #2**

1. Which clinical sign is not consistent with hyperadrenocorticism?
   a. Polydipsia
   b. Abdominal distention
   c. Pyoderma
   d. Anorexia
   e. Panting

2. Which laboratory finding is not consistent with hyperadrenocorticism?
   a. Neutrophilia
   b. Anemia
   c. Thrombocytosis
   d. Increased ALP activity
   e. Proteinuria

3. Which is not a recognized therapy for PDH?
   a. Mitotane
   b. Ketoconazole
   c. Trilostane
   d. Hypophysectomy
   e. Unilateral adrenalectomy

4. Trilostane lowers the serum cortisol concentration by:
   a. Inhibiting cytochrome P450 enzymes
   b. Competitive inhibition of 3-beta-hydroxysteroid dehydrogenase
   c. Destruction of 3-beta-hydroxysteroid dehydrogenase
   d. Direct damage to the cells of the zona fasciculata
   e. Direct damage to the cells of the zona glomerulosa

5. Which statement about trilostane is true?
   a. It is slowly absorbed after oral ingestion.
   b. It undergoes hepatic metabolism.
   c. It may be safely used in pregnant or nursing bitches.
   d. Peak serum concentrations occur 24 hours after administration.
   e. It preferentially inhibits aldosterone production.

6. Which tests are most appropriate when monitoring a patient receiving trilostane?
   a. A serum chemistry profile and an ACTH stimulation test
   b. A complete blood count and an ACTH stimulation test
   c. A serum chemistry profile and a low-dose dexamethasone suppression test
   d. A serum chemistry profile and a high-dose dexamethasone test
   e. A complete blood count and a serum chemistry profile

7. If a patient receiving trilostane becomes hyperkalemic, which of the following is the best option?
   a. Increase the dose by 50%.
   b. Decrease the dose by 50%.
   c. Stop trilostane, provide fluid support, perform an ACTH stimulation test, and consider glucocorticoid and mineralocorticoid supplementation.
   d. Continue trilostane, but give prednisone.
   e. Switch to mitotane.

8. The target result for the post-ACTH stimulation test cortisol concentration in patients receiving trilostane is:
   a. < 1.5 µg/dl
   b. 1.5 to 5.5 µg/dl
   c. < 0.7 µg/dl
   d. > 9 µg/dl
   e. Lower than the resting cortisol concentration

9. Which statement about alopecia X is false?
   a. It is due to an arrest in hair growth cycle.
   b. It is most often reported in Pomeranians, poodles, and huskies.
   c. It may respond to trilostane therapy.
   d. It is usually caused by an adrenal tumor.
   e. It may be related to changes in growth hormone synthesis.

10. Trilostane can be imported legally if:
    a. The veterinarian contacts the FDA for approval.
    b. The veterinarian writes a prescription.
    c. The drug is provided by an authorized supplier.
    d. The drug is only given to the animal named in the FDA application.
    e. All of the above

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See related content on Vetstream® including a client handout on canine hyperadrenocorticism and information about steroid hepatopathy in dogs.

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