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Doggie Parents Guide To Cushing's

Holistic Doggie
Dogs Love It Natural
Cushing’s Disease in Dogs

Dogs just like any other living organism are prone to suffering from a number of health conditions, one of the most common in older dogs is called Cushing’s disease. Hyperadrenocorticism or hypercortisolism, which are more commonly termed as Cushing’s disease is a type of disease in which the dog suffers from hormonal imbalance of a particular type of hormone, known as glucocorticoid steroid hormones (cortisol and cortisone). Hyperadrenocorticism or Cushing’s disease is named after an American neurosurgeon Harvey Cushing, who first described the disease while treating a 23 year old lady who was also suffering from the same disease. Ever since then, hyperadrenocorticism or hypercortisolism has been popularly termed as Cushing’s disease.

Cushing’s disease has also been reported among humans, cats, and few other animals besides dogs. Although cats can also suffer from Cushing’s disease, the disease is most common with older dogs. While some breeds like Jack Russell, Dachshunds, Boston Terriers, Yorkshire Terriers, Boxers, Staffordshires and Beagles are mostly prone to suffer from this disease, Cushing’s may effect a dog of any breed and at any age. However, adult dogs have been most commonly diagnosed with this disease.

About Cushing’s disease

Cushing’s disease or hyperadrenocorticism (HAC) is a hormonal disorder, in which the dog’s body starts producing more glucocorticoid steroid hormones than is needed for normal body functioning. For understanding Cushing’s disease better, owners must have a thorough or rather a clear concept about the hormonal or endocrinial system of a dog. Dogs just like humans, have a pituitary gland and two adrenal glands in their body. The pituitary gland is a small pea-sized gland located at the base of the brain, while the two adrenal glands are located just above the two kidneys. Endocrinial system is roughly
composed of glands and the hormones that they produce. There are numerous glands in a dog’s body, just as with humans and each gland is provided with the responsibility of producing different types of hormones to regulate body functions. Cushing’s disease amongst which is related to two glands, namely adrenal glands and the pituitary gland.

In normal condition, the pituitary gland, which is the one located at the base of the brain produces ACTH (Adrenocorticotropic hormone) as a signal to inform adrenal glands about the necessity of production of glucocorticoid steroid hormones (adrenal gland hormones). The ACTH is produced by the pituitary gland and released into the dog’s bloodstream, which then reaches the adrenal glands located above the kidneys and signals them to produce glucocorticoid steroid hormones (cortisol and cortisone). Although this process is vital for normal functioning of the body, this is not a continuous process. The pituitary gland produces the ACTH and signals the adrenal glands only when there is a necessity or demand of glucocorticoid steroid hormones in the body. This is where the problem with Cushing’s disease lies.

Cushing’s disease is the result of the condition in which the pituitary gland starts producing excessive ACTH, far more than what should be produced to signal the adrenal glands. It then starts acting like a faulty machine, which produces more ACTH, thereby sending a wrong signal to the adrenal glands to produce more glucocorticoid steroid hormones. Just as the saying goes, “excess of anything is bad”, excess of both ACTH and glucocorticoid steroid hormones can also lead to serious problems in the body.

Cushing’s disease however is not the result of just pituitary gland malfunctioning. This disease can also occur due to certain problems in the adrenal glands themselves. Now the real reason that caters to the faulty functioning of these glands is a tumor or more scientifically, an adenoma. The tumor is the real reason why these glands start behaving abnormally and fail to recognize the needs of glucocorticoid steroid hormones in the body. These tumors are mostly non-cancerous and are hence termed as adenomas. The root cause of Cushing’s disease was first reported in 1924 by a Soviet neurologist Nikolai
Mikhailovich Itsenko, when the neurologist was treating two patients suffering from pituitary adenoma. However, Cushing’s disease is not the result of just pituitary adenoma formation. This disease can also occur as a result of adrenal adenoma, in which a small tumor appears in the adrenal glands. However, the real reason behind the formation of these adenomas is not yet known.

**Role of ACTH (Adrenocorticotropic hormone) in Dogs**

ACTH or Adrenocorticotropic Hormone or more popularly, corticotropin is a type of 39 amino acid peptide hormone, which is secreted by the anterior pituitary gland to regulate the secretion of cortisol and cortisone from adrenal gland, or more precisely from the adrenal cortex. The production of ACTH in turn is controlled by Corticotropin Releasing Hormone (CRH), which in turn is controlled by various types of stress. Other than that, another type of peptide hormone that controls the production and secretion of ACTH is Vasopressin (AVP). Other than stimulating the adrenal glands for the production and secretion of glucocorticoid steroid hormones, ACTH is also important for cellular functioning.

**Effects of Excess ACTH in Blood**

Since ACTH acts as the primary hormone for regulating the production and secretion of glucocorticoid steroid hormones in a dog’s body, excess secretion of ACTH may misinterpret the necessity of glucocorticoid steroid hormones in the dog’s body. The adrenal gland in turn starts producing more glucocorticoid steroid hormones and leads to the creation of unnecessary complications in the entire endocrinal system.

**Role of glucocorticoid steroid hormones in Dogs**

Glucocorticoid steroid hormones (cortisol and cortisone) are two vital hormones for proper and normal functioning of your pet’s body. While in normal condition, these two hormones are required by the body to mobilize fat reserves and to maintain a normal blood sugar levels in the body, these two hormones can create havoc when present in
abnormally high levels. Other than that, these hormones also play a vital role in maintaining a healthy immune system and prevent inflammation. It regulates the process of metabolism and promotes wound healing. The two most vital roles that glucocorticoid steroid hormones play in a dog’s body are maintaining a proper brain functioning and providing support to the ligaments and muscles. This is the reason why excess of glucocorticoid steroid hormones in the body makes dogs suffer from various health disorders like weakened muscles and bones, hypertension and a disorganized mood and behavior.

Effects of excess glucocorticoid steroid hormones secretion

While glucocorticoid steroid hormones are vital for maintaining a healthy brain, ligaments and overall healthy functioning of the body, excess of these hormones can prove to be a bane for dogs. While normal glucocorticoid steroid hormones are essential for maintaining a healthy immune system, excess of these hormones can suppress the immune system, thereby making the body more susceptible to diseases. Similarly, it can weaken the muscles and ligaments, thereby making the dog appear pot-bellied. Excess of glucocorticoid steroid hormones in the body can also impair the functioning of your pet’s brain, thereby making him or her disorganized and moody. Other than that, excess of glucocorticoid steroid hormones in the body of your pet is also enough to make its skin thin, which is the exact reason why you may be noticing severe hair fall with your pet. This is also reason behind your furry friend’s sudden increase in thirst and tendency to urinate.

Types of Cushing’s disease

Cushing’s disease as you might be thinking still now is a single disease caused due to a single reason- adenoma formation, you may be partially true. While adrenal adenomas are more commonly observed in dogs, some dogs even suffer from pituitary adenoma. This is the reason why Cushing’s disease has been distinguished into two categories- adrenal dependent hyperadrenocorticism and pituitary dependent hyperadrenocorticism.
The types are named depending on the place that the adenoma is found. Hence, if your
dog is diagnosed with adrenal dependent hyperadrenocorticism, it means that the
adenoma or the tumor has been found within the adrenal glands and vice versa for
pituitary dependent hyperadrenocorticism.

Pituitary dependent hyperadrenocorticism (Cushing’s disease)

Pituitary dependent hyperadrenocorticism is the most commonly occurring type of
hyperadrenocorticism or the most common reason for Cushing’s disease. Almost about
85 to 90% of the dogs suffering from Cushing’s disease have been diagnosed with having
pituitary dependent hyperadrenocorticism. In this type of Cushing’s disease, the adenoma
or the tumor is formed within the pituitary gland. The size of the tumor or the adenoma
may vary and depending upon their size they are named as microadenoma and
macroadenoma.

Pituitary adenomas may be either benign or malignant. Dogs suffering from pituitary
dependent hyperadrenocorticism or Cushing’s disease can be kept alive healthy for a long
time, provided if they are kept under regular medications and under medical supervision.
In pituitary dependent Cushing’s disease, it is the adenoma or tumor which is located
within the pituitary gland causes the pituitary gland to secrete more ACTH, which in turn
sends a wrong signal to the adrenal glands. This results in excess secretion of
glucocorticoid steroid hormones (cortisone and cortisol) from the adrenal glands.

Pituitary dependent Cushing’s disease however, cannot be surgically removed to get
complete rid of the adenoma. Pituitary adenoma is located at a place which is virtually
inaccessible for the surgeons, which is why pituitary adenomas unlike adrenal adenomas
cannot be surgically resectioned. Other than that, surgical removal of pituitary adenoma
requires the surgeon to operate through millions of nerves and blood vessels that remain
connected to the brain and hypothalamus. All these factors make surgery of pituitary
adenoma increasingly difficult for the surgeon.

Pituitary microadenoma
Pituitary microadenoma are small benign tumors (micro= tiny and adenoma= tumor), which are so called, as they are less than 3mm in size. Most of the dogs diagnosed with pituitary adenomas and Cushing’s disease display adenomas or tumors of this size. It is due to their excessively small size and complicated placement that pituitary microadenomas cannot be surgically removed. However, these adenomas are rarely cancerous and their activity can be easily controlled with proper medication and regular medical checkup.

Pituitary macroadenoma

In less than 10-15% percent of the cases where dogs have been diagnosed with pituitary adenoma or Cushing’s disease, they have been noticed to bear a macroadenoma or a large tumor. These tumors are generally sized above 1cm and are hence termed as macroadenoma. While macroadenomas may provide the chance of resectioning to the surgeon, these are more critical to treat. Macroadenomas due to their comparatively larger size can make the patient display signs and symptoms which are not occasionally related to Cushing’s disease, such as neurological problems, blindness, seizures, incoordination and circling. All these symptoms appear within a dog suffering from pituitary macroadenoma due to the fact that the larger adenoma exerts pressure on the brain, which in turn makes the dog display neurological and other associated symptoms.

Adrenal dependent hyperadrenocorticism (Cushing’s disease)

Adrenal dependent hyperadrenocorticism is so named, as in this type of Cushing’s disease, the adenoma or the tumor is found within the adrenal glands. Adrenal dependent Cushing’s disease has been reported in only 15% of the cases. Adrenal adenomas can be easily surgically removed, as the positioning is apt for the surgeon to resection the gland.

Dogs suffering from adrenal dependent Cushing’s disease are diagnosed with a tumor or adenoma in adrenal glands. It is the due to the tumor that the adrenal glands start producing excess glucocorticoid steroid hormones. The adrenal gland which contains the adenoma and is producing excess cortisol and cortisone becomes much bigger in size as
compared to its normal size. On the contrary, the other adrenal gland shrinks and becomes excessively smaller in size, in order to compensate for the excess amount of glucocorticoid steroid hormones produced by the other adrenal gland.

In adrenal dependent Cushing’s disease, the excess production of glucocorticoid steroid hormones occurs as a result of the adenoma in the adrenal gland, and not because the pituitary gland sends faulty signals to the adrenal gland to produce more glucocorticoid steroid hormones.

**Causes of Cushing’s disease**

Cushing’s disease is a disease which has been related to the development of tumor or adenoma in adrenal glands or pituitary gland. However, the reason behind the development of the tumors is not yet known. Several hypotheses have been put forward, but none have been able to provide a full proof reason for the development of the tumor observed in dogs suffering from Cushing’s disease. Mentioned below are some valid reasons for the development of Cushing’s disease.

**Pituitary adenoma**

Pituitary adenoma is one of the most common causes of Cushing’s disease. In this case, the adenoma or the tumor appears in the pituitary gland and therefore makes the pituitary gland to secrete excessive ACTH. This in turn signals the adrenal glands to produce excessive glucocorticoid steroid hormones. Excess of glucocorticoid steroid hormones in a dog’s blood lead to the development of Cushing’s disease. In this case, small tumors may also be noticed in your pet’s adrenal glands.

**Adrenal adenoma**

Adrenal adenoma or adrenal Cushing’s disease can be witnessed in about 10-15% of the dogs suffering from this disease. In this case, the adenoma or the tumor develops within the adrenal gland. In this case, therefore the adrenal glands become faulty and keep on releasing the glucocorticoid steroid hormones, irrespective of the pituitary gland’s signal.
Iatrogenic cause

Iatrogenic Cushing’s disease is a case when a dog starts suffering from Cushing’s disease or displays symptoms associated with Cushing’s disease due to the treatments or medications administered by a vet to treat other diseases like allergies. Many dogs have been found to be allergic to pollen grains and other common types of allergens. This is the reason why owners often regularly administer corticosteroid drugs like prednisone to their pets. External administration of corticosteroid drugs results in an increase in the levels of glucocorticoid steroid hormones in the body, thereby making the dog display symptoms related to hyperadrenocorticism. However, this factor may not even make your dog suffer from hyperadrenocorticism (Cushing’s disease). This is because, in iatrogenic cases, it is the corticosteroid drug that is increasing the levels of glucocorticoid steroid hormones in your pet’s blood; the adrenal gland or the pituitary gland may not be the problem. Hence, in these cases the symptoms may improve on stopping the corticosteroid medications but they may not completely vanish.

Symptoms associated with Cushing’s disease

A dog suffering from Cushing’s disease either due to pituitary adenoma development, adrenal adenoma development or due to iatrogenic causes may display some of these below mentioned symptoms. However, the symptoms may vary and often go unnoticed or mistaken for other diseases.

Polydipsia and polyuria

One of the primary symptoms you may notice in your dog suffering from Cushing’s disease is a tremendous hike in his or her thirst (Polydipsia). Your dog may be visiting his or her water bowl too often and getting panicked to urinate in extremely short period of time (polyuria). These symptoms are often mistaken for kidney disorders and infections. However, in reality the problem that leads to this condition is the tremendous increase in your pet’s glucocorticoid steroid hormones. Glucocorticoid steroid hormones
when present in excess amount in your pet’s blood can increase the thirstiness of your dog, which in turn makes them urinate more often than what they normally do.

**Sparse skin coat (alopecia)**

This is one of the most clear symptoms and proofs of a dog suffering from Cushing’s disease. Excess glucocorticoid steroid hormones in a dog’s blood make the skin extremely thin, which in turn result in hair loss or even alopecia. The hair loss becomes so severe in cases that even an entire patch of skin may get revealed due to complete hair loss from that portion of the body. The hair loss is in most cases symmetrical, which means that the hair loss occurs in patches and that the patches appear in the same spot on both the sides of the body. The flanks and trunk are some of the most common areas where tremendous hair loss in patches can be observed.

**Polyphagia**

Dogs suffering from Cushing’s disease drastically gain weight. This is because, higher levels of glucocorticoid steroid hormones in blood increases the dog’s water retention tendency. Along with that, a hike in the dog’s thirst and appetite (polyphagia) also caters to his or her abrupt weight gain. This is the reason why your dog may not be able to climb up on your bed any longer.

**Muscle and ligament weakness**

Glucocorticoid steroid hormones when present in right amounts cater to stronger muscles and ligaments. However, the opposite may happen when the hormone gets secreted in excess. Excess amount of glucocorticoid steroid hormones lead to muscle protein breakdown. This is also one of the most prominent signs and symptoms of Cushing’s disease, wherein the dog displays a potbellied appearance due to the loosening of the ligaments in the belly. Other than that, the dog may also suffer from serious muscle weakness, as a result of which his or her movement may often become impaired.
Other than compromising your dog’s movement, muscle weakness also caters to increased respiration rate and panting. Dogs suffering from an uncontrollable condition of Cushing’s disease may also suffer from cruciate ligament rupture. Cruciate ligaments are situated behind the knee and rupturing of these ligaments may completely and seriously affect the movement of your dog.

**Impaired immune system**

A normal level of glucocorticoid steroid hormones in blood is crucial for maintaining a normal and active immune system. However, the scenario gets reversed in case of excess glucocorticoid steroid hormones secretion, just as an overflowing tank may kill all your fishes. Your dog suffering from Cushing’s disease may display increased susceptibility to allergies and infections. This often happens as excess glucocorticoid steroid hormones in blood suppress the immune system of the dog. Dogs suffering from Cushing’s disease often show more susceptibility to urinary tract, ear and skin infections. Other than that, juvenile dogs suffering from this disease may also become susceptible to demodectic mange, a type of parasitic infection that attacks dogs.

**Thromboembolism**

Several dogs which have been diagnosed with Cushing’s disease or are suffering from the disease from a very long time have been reported to become more susceptible to thromboembolism or blood clot formation in the blood vessels. Although this is not an obvious symptom with every dog suffering from hyperadrenocorticism (Cushing’s disease), studies revealed that dogs suffering from this disease are at a four-fold risk of developing clots in their blood vessels than normal dogs. This is because, the blood coagulation system in Cushing’s disease patient gets hyper activated.

**Indigestion**
Dogs that have been diagnosed with Cushing’s disease may show signs of indigestion. They may become prone to vomit frequently and suffer from many other digestive problems.

**Hypertension**

Hypertension or high blood pressure is also one of the most dangerous symptoms observed in dogs suffering from this disease. Dogs displaying too high blood pressure should be immediately taken to the vet or pet hospital.

**Calcification**

Other than visible gain in weight and hair loss, dogs suffering from Cushing’s disease may also display hardened patches under the skin or calcification. This normally happens due to calcium salt deposit in the soft tissues of the body. Increased levels of glucocorticoid steroid hormones in blood boosts the body’s calcium absorption rate, as a result of which, unwanted amounts of calcium salts get deposited in the skin and other soft tissues of the body where calcium is generally not deposited.

**Weaker bones**

Dogs suffering from Cushing’s disease may also display weaker or deformed bones. This is because; cortisol affects the protein matrix that bones are made of and increases the rate at which calcium is excreted by the kidneys. It also reduces the rate at which calcium absorption should take place at normal rate, thereby rendering the bones weaker.

**Low energy level**

You may often notice that your dog is not living an active life as he or she may use to live earlier. This is also one of the common symptoms of Cushing’s disease in dogs. Dogs suffering from this disease often display a serious lack of energy and may even behave uncoordinated. This may happen due to a number of reasons like increased water retention, obesity, weakness in muscles including panting and shortness of breath and
excess pressure on the brain. Pituitary adenomas when they grow beyond a certain size, exert excess pressure on the brain, as a result of which, the dogs suffering from Cushing’s disease often display uncoordinated behavior. This may also get extended to serious health losses like blindness.

Hyperglycemia

Hyperglycemia is the medical term used for high blood sugar. Almost 10-20% of the dogs diagnosed with Cushing’s disease have been reported with hyperglycemia. Hyperglycemia or more precisely, secondary diabetes may evolve as a symptom in dogs suffering from Cushing’s disease. The relation between Cushing’s disease and diabetes is a complex one.

The reason why dogs suffering from Cushing’s disease may accompany diabetes mellitus as a symptom is because of excess cortisol secretion from the adrenal glands. In normal conditions, adrenal glands are provided with the responsibility of increasing blood sugar levels when needed. The body gets a signal to synthesize non-sugar sourced glucose (gluconeogenesis) with the secretion of cortisol. Excess production of glucose in turn triggers the pancreas to produce insulin, which tries to control the excess blood sugar. However, continuous secretion of cortisol triggers continuous production of glucose, which in turn makes the production of insulin a continuous process. The pancreas in normal state produces enough insulin to combat the extra glucose. However, when the process of glucose formation becomes constant, the pancreas gets exhausted and stops the production of insulin. Continuous secretion of glucose is also capable enough to completely damage the pancreas. However, the pancreas sustains the pressure in certain cases, in which cases the sugar levels can easily be reduced by checking the production of excess cortisol.

Diagnosis of Cushing’s disease

Cushing’s disease is a gradually developing disease. However, the signs and symptoms of the disease appear at a pretty older stage in life. Dogs that are 10-11 years old are most
susceptible to suffer from this disease. However, Cushing’s disease being a hormonal disorder can appear at any stage of life.

This disease can attack dogs at a pretty early stage, as early as even 5 years. Dogs suffering from pituitary adenoma or pituitary dependent Cushing’s disease are likely to display the signs and symptoms from an age of 5-11 years. On the contrary, the dogs that are suffering from adrenal dependent Cushing’s disease display the symptoms at a later phase of life, usually from 11-12 years.

Although dogs of any age and any breed can suffer from any of the types of Cushing’s disease, smaller breeds have been mostly diagnosed with pituitary dependent Cushing’s disease and larger breeds with adrenal dependent Cushing’s disease. However, due to the slow surfacing of the signs and symptoms, owners and vets often mistake the symptoms for symptoms of some other diseases like senility, kidney disorder, etc. In order to help the dog survive longer in a better way, faster diagnosis both on the part of the vet and the owner is essential. Mentioned below are some of the common diagnostic procedures used by vets to determine the presence and type of Cushing’s disease the dog is suffering from.

**Physical examination**

The first and foremost test that vets run on a dog suspected to be suffering from Cushing’s disease is a thorough physical examination. Physical examinations of the suspected dog will include checking for pot-bellied appearance, enlarged liver (hepatomegaly), infections and rashes on skin that do not heal easily, weakened bones, enlarged lymph nodes and bruising at places (hematoma). It is only after getting these physical deformities that vets move ahead to run clinical tests to get a better view of the cause of symptoms.

**Blood test**

Owners should regularly take their pets to undergo a routine blood test in order to detect and fight with the signs of Cushing’s disease as soon as possible. This is because, a blood
test may provide you with all the answers to your questions like why is your dog urinating so frequently and why is his or her urine so abnormally dilute. A vet may ask you to run your pet through some of these below mentioned blood testing order to identify whether the symptoms and signs displayed by your pet are actually those related to Cushing’s disease.

1. **Blood sugar test**

   Cushing’s disease has a very strong link with blood sugar or more appropriately, blood glucose levels. This is because an excessive amount of cortisol in blood will also boost the levels of blood glucose. Hence, almost 30-40% of the dogs suffering from Cushing’s disease display a sudden hike in their blood sugar levels.

2. **Cholesterol**

   Cholesterol levels go up considerably in dogs suffering from Cushing’s disease. The reason for this one being the same as for the increase in blood sugar levels due to Cushing’s disease. High levels of cortisol in blood damages the liver cells, thereby rendering them inactive and they no longer are able to process blood cholesterol. Moreover, insulin deficiency that is also caused by excess cortisol in blood results in the production of more cholesterol. Hence, vets recommend a blood cholesterol test for the same.

3. **Blood Alkaline Phosphatase (ALP) Test**

   This is prescribed by the vets as a sure shot way to learn about the conditions of the dog and to identify whether the patient is suffering from Cushing’s disease. Alkaline phosphatase is an enzyme, which is secreted by the liver. Since higher levels of cortisol in the blood damages the liver cells, it also increases the levels of alkaline phosphate levels in the blood.

4. **BUN (Blood Urea Nitrogen)**
This test is usually conducted in order to understand the dog’s behavior of urinating multiple times and to detect why the urine is so diluted. BUN or blood urea nitrogen is a waste product, which is produced by the liver and excreted by the kidneys. Hence, a normal BUN level can rule out all the chances of kidney diseases in the dog, thereby taking the vet a step ahead to determining the cause of the symptoms.

5. Creatinine

Creatinine is also a type of waste material released from the muscles and excreted through the kidneys. A lower or normal level of blood creatinine level also rules out kidney disorders. The interesting fact is that creatinine and blood urea nitrogen (BUN) levels rise up at the same time due to kidney disorder.

X-Ray

Vets also sometimes recommended subjecting the patient to an X-ray of the abdomen, wherein a large liver can be easily spotted, which is a common symptom in dogs that are suffering from Cushing’s disease. Other than that, an x-ray of the abdomen also reveals calcium deposit patches near one of the adrenal glands, which is a symptom of adrenal tumor.

Low Dexamethasone Suppression Test (LDDS)

This is one of the most effective means of learning where the tumor is located and which type of Cushing’s disease the dog is suffering from. For this test, the dog is required to stay at the hospital for 8 hours. LDDS test should be ideally carried out after subjecting the patient through urine cortisol:creatinine ratio test. In LDDS test, the vet administers dexamethasone, a type of synthetic compound which is similar to natural cortisol into the pet’s body. The dexamethasone acts like real cortisol, thereby instructing the pituitary gland to indicate the adrenal glands to stop the cortisol production. This process results in
a slight drop in cortisol levels in normal dogs. However, the problem can be detected if the cortisol levels remain high in the blood.

This problem can occur either due to a faulty adrenal gland, wherein the adrenal glands fail to recognize the signal of the pituitary gland to stop cortisol secretion. Or else, the problem lies with the pituitary gland, wherein the pituitary gland fails to detect the presence of cortisol in the blood. Vets carry out high dose dexamethasone suppression to detect the type of Cushing’s disease.

Urine cortisol:creatinine ratio test

This is generally carried out as the first test to determine if the dog displaying symptoms is really Cushingoid. This is one of the cheapest tests available and provides a clear view to the vet about the pet’s condition. In this test, the amount of urine cortisol is compared to that of the creatinine, both of which are excreted through urine. While creatinine levels remain constant in a cushingoid dog, the urine cortisol levels remain constantly high.

ACTH Stimulation test

ACTH stimulation test has been proven to be the most effective and reliable tests for determining whether the patient is really suffering from Cushing’s disease. However, this test cannot accurately determine the type of Cushing’s disease. In this test, synthetic ACTH is injected into the dog’s blood stream. A sample of the dog’s blood is taken prior to administering the injection. The other blood sample is taken 2 hours after the injection has been administered. The synthetic ACTH signals the adrenal glands to produce more cortisol, which raises the levels of cortisol after the injection is administered. The difference in blood cortisol levels before and after the test determines whether the patient is cushingoid. This test can also determine whether the patient is naturally cushingoid or displaying signs due to iatrogenic reasons.

Treatments
Treatment for Cushing’s disease is generally not immediately started by vets if the dog results positive for these above mentioned tests. Vets administer the treatments only when the pets show symptoms of the disease or if owners insist on improving the lifestyle of their furry friends. Some of the medications used to treat this disease may have serious side effects. The treatment procedures adopted by the vet usually depends on the type of Cushing’s disease the dog is suffering from.

**Surgery**

Surgery is used as a treatment option for dogs suffering from adrenal dependent Cushing’s disease. Adrenal tumors can be surgically resectioned due to their comparatively larger size and uncomplicated placement. In this process, both the tumor and the affected adrenal gland are removed and the tumor never affects the other unharmed adrenal gland. However; the surgery can often become more complicated, as most dogs diagnosed with Cushing’s disease are elderly and may fail to survive the risks. Moreover, dogs that are surgically treated are administered prednisone throughout their life.

Surgery is not generally used as a treatment for pituitary dependent Cushing’s disease, as pituitary tumors or adenomas tend to be very small in size and their complicated placement just below the brain makes it increasingly difficult for the vet to surgically resection the gland. Moreover, pituitary tumors are very slow-growing and rarely lead to any deadly effects even when left untreated. Pituitary dependent Cushing’s disease is therefore mostly treated with medications.

**Medications**

Although surgery may sound as an effective treatment, it is generally avoided due to the associated side effects. Mentioned below are some medications used to treat Cushing’s disease in dogs:

1. Lysodren or Mitotane
Mitotane is the generic name for lysodren medication. This is one of the most popular and oldest drugs that have been in use to treat Cushing’s disease. This is also one of the cheapest drugs available for the same. Lysodren can effectively control the symptoms of Cushing’s disease. However, this drug can lead to serious complications in the patient like vomiting, incoordination, anorexia (lack of interest in eating), lethargy, weakness and diarrhea.

Lysodren acts by gradually thinning and destroying the second and third layer of adrenal cortex, as these are the regions which are mostly responsible for the excessive production of cortisol. This drug should be ideally given with food, as fat enhances the absorption of the medicine. Dogs administered with lysodren should be closely monitored for side effects, so that the vet can change the medicine or alter the dosage as needed.

2. Ketoconazole

Ketoconazole is an anti-fungal medicine, which is mostly used when other medications used to treat Cushing’s disease lead to extremely serious side effects. This medicine can be administered for both pituitary dependent and adrenal dependent Cushing’s disease. However, the benefits of this drug have been found to be temporary. The dosage of this medication is generally increased after closely monitoring the dog for a week. If the dog doesn’t display any serious side effects like anorexia and vomiting, the dosage is increased.

3. Trilostane

Trilostane is a new entry into the world of drug market for treating Cushing’s disease. Although trilostane works in almost the same way as lysodren, it has been found to have fewer side effects than lysodren. This drug works by inhibiting the activities of an enzyme called 3-beta-hydroxysteroid dehydrogenase, which is associated with stimulating the production of various steroids, including cortisol.
This drug is more expensive than lysodren and is now the mostly used drug to treat Cushing’s disease.

4. L-Deprenyl

L-Deprenyl or Anipryl is used only to treat pituitary dependent Cushing’s disease. This drug is generally used as an alternative of lysodren, as it has been found to possess lesser side effects as compared to lysodren. L-Deprenyl works by enhancing the levels of dopamine, a type of neurotransmitter that signals the pituitary gland to produce ACTH. When dopamine levels in pituitary gland and brain is high, the pituitary gland stops secreting ACTH, which in turn stops the secretion of cortisol from the adrenal glands. Probable side effects related to this medicine are occasional hearing loss, restlessness, digestive problems and disorientation.

Radiation

Just like treating human cancer, radiation is also used to treat pituitary tumors. This treatment option is generally used if the tumor becomes extremely large and spread to the other parts of the brain. However, this treatment option is generally avoided as it has many associated side effects and some dogs may even fail to bear the pain of undergoing this treatment. An MRI is carried out before proceeding with the therapy. With this treatment, the symptoms vanish. However, in real case the tumor shrinks but doesn’t disappears.

Other medications

Apart from the above mentioned maledictions, physicians and vets sometime prescribe other medications to deal with the symptoms the dogs exhibit.
**Cabergoline**

Cabergoline is a drug which acts in almost the same way as L-Deprenyl. Although this drug has been mostly used for human patients, it has been found to be effective for more than 40% of the cases involving Cushingoid dogs. This drug is a dopamine receptor agonist and acts in the same way to stop cortisol production as L-Deprenyl. Although Cabergoline has shown effective results as a long term treatment therapy, the patient is needed to be observed closely for side effects and dosage alterations. Despite its effectiveness, this drug can only be used to treat pituitary dependent Cushing's disease.

**Retinoic acid**

Retinoic acid is thought to be a boon for Cushing's disease patients. A clinical study where dogs were administered with retinoic acid for 180 days revealed that most of the signs and symptoms initially exhibited by the dogs were suppressed and their condition improved considerably. Their cortisol:creatinine urine ratio and other clinical signs and symptoms improved during the study. Retinoic acid is a compound which is similar to vitamin A and its regular administration improves the signs of Cushing's disease in dogs. However, excessive use of retinoic acid should be avoided, as it is toxic in excessive amount and recommendation of the vet is inevitable for the administration of this drug.

**Alternative treatments**

**Homeopathy**

Cushing’s disease can also be treated with several homeopathic medications. Although the results would never be so quick and the homeopathic medications would never be able to cure the root cause, the dog will probably not have to suffer from innumerable side effects associated with Cushing’s disease medications. Some of the effective homeopathic medicines for this disease are Mercurius for treating diarrhea, irritability, bladder infection and thirst. Arsenicum for excessive thirst and urination rate (polyuria).
Sulphur for reducing thirst, improving digestion and skin allergies. Last but not the least; Hepa Sulph is used for healing wounds and infections.

**Herbs**

Some herbs like dandelion, astragalus and burdock can be used to normalize adrenal, kidney and liver functions. These herbs also detoxify the body, normalize blood sugar levels, strengthen the immune system, soothe irritated skin and regulate blood pressure levels, thereby providing an all-round therapy to the patient.

**Lignans**

Lignans are plant antioxidants and estrogens, which when administered regularly to Cushingoid pets, reduce the levels of steroid and male and female hormones. Lignans’ effectiveness in treating Cushing’s disease has also been scientifically established. However, no controlled measures of administering lignans have been formulated.

**Holistic drops**

A few companies have evolved, who are manufacturing, or rather to be precise, tailor making special holistic drops to prevent and treat the symptoms of Cushing’s disease. These drops address most of the symptoms of Cushing’s disease and are tailor made by hand to meet the requirements of each dog. Some of these premium quality drops provide duration guarantee to improve the symptoms of Cushing’s disease. Being formulated with herbs and homeopathy medicines, these drops are completely safe for use and should be used if you want to avoid the side effects of medications, yet bring about faster improvements in your dog’s condition. One such natural medication which is has been proven to be the best in the industry is Cushalin.

**Cushalin:** Cushalin is the best alternative medicine available in the market for dogs suffering from Cushing’s disease. It is completely natural and is formulated with the highest quality and pharmaceutical grade herbs and other ingredients. The fact that Cushalin is completely herbal makes it completely
safe for dogs and no matter what type of Cushing's disease your dog is suffering from, Cushalin's beneficial properties can be reaped for every type of Cushing's disease.

Other than being made of completely natural ingredients, every bottle of Cushalin is tailor made to suit the specific and different needs of different types of Cushingoid dogs. This is because, not all dogs suffering from Cushing's disease exhibit the same symptoms and hence, their requirements are also different. The experts at Cushalin therefore make it a point to formulate every bottle differently and according to the requirements of the dog and the symptoms they exhibit. Moreover, every bottle of the supplement is always scientifically formulated, with ingredients which have been clinically proven to show beneficial results for treating Cushing's disease.

Cushalin has been a boon for Cushingoid dogs and their owners, ever since the company started marketing its products from 2008. Cushalin provides visible results and their only motto being to provide a better and problem-free life to Cushingoid dogs, the company provides a no question asked money back guarantee to their customers. What'smore, the supplement being completely natural and tailor made, is far safer than the medications prescribed by doctors. Cushalin doesn't have any adverse side effects like that of the medications used to treat Cushing's disease and continuous use of this supplement ensures to suppress most of the signs and symptoms of Cushing's disease. Hence, if you truly love your dog and is ready to do anything to provide him or her with a better and pain free life, make sure that you try Cushalin. Moreover, with Cushalin's money back guarantee, you won't have to risk a single penny of yours or your dog's life and health.