

# Chihuahua

## Update

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## Drug Treatment Offers Promise for Chihuahuas Affected by Hydrocephalus

**H**ydrocephalus literally means "water on the brain." Chihuahuas and some other toy breeds are predisposed to this serious condition in which "water," or actually cerebrospinal fluid, builds up pressure in the brain causing brain damage and often early death. The drug omeprazole is now being used successfully in dogs to improve this condition by reducing fluid production.

"It is really heartbreaking," says Nanette Lai of Toronto, Ontario, Canada, whose Chihuahua "Lexi" suffered from hydrocephalus. Lai is a passionate enthusiast who fell in love with the breed's larger-than-life personality.

When Lai acquired Lil Miracles Fancy Lexus from a breeder at 6 months old, she weighed just 1.5 pounds. She was sensitive to people touching her head, and Lai later learned this was due to multiple fontanels, or "soft spots" on the top of her skull. Fontanels are almost always present in dogs with hydrocephalus. She also had an irregular gait and difficulty putting on weight, weighing only 4.5 pounds as an adult.

As a 1-year-old, Lexi started having seizures, an unsettling experience for Lai. "I had to get her into a dark room by herself, stroke her and keep her calm. At first she came out of them in about 30 seconds, but it escalated and toward the end of her life the seizures were coming in clusters," Lai says.

Chihuahuas and other toy breeds with shortened heads, including the Cairn Terrier, Maltese, Manchester

Terrier, Pomeranian, Toy Poodle, and Yorkshire Terrier, as well as brachycephalic breeds, such as the Boston Terrier, English Bulldog, Lhasa Apso, Pekingese, and Shih Tzu, are considered at high risk for hydrocephalus.

### Signs of Hydrocephalus

**O**wners who observe these signs of hydrocephalus in their dogs should consult their veterinarians, who may refer them to a veterinary neurologist for further evaluation and testing.

- Delayed motor control
- Confusion
- Dullness
- Sleepiness
- Aggression
- Failure to house-train
- Altered gait
- Circling
- Loss of balance, falling over to one side

There are two types of hydrocephalus.

- **Obstructive hydrocephalus**, known as the non-communicating type, occurs when cerebrospinal fluid accumulates in the ventricles of the brain due to an obstruction along the brain's normal circulatory pattern. The fluid results in high intracranial pressure and causes serious neurological problems. The increased pressure within the skull presses on sensitive brain tissues and

can lead to permanent, irreversible brain damage and even death.

- **Nonobstructive hydrocephalus**, the communicating type, results from increased production or decreased absorption of cerebrospinal fluid.

This form puts less pressure on the brain than obstructive hydrocephalus and may not produce clinical signs.

Signs of hydrocephalus Chihuahua owners may recognize include delayed motor control, confusion, dullness, sleepiness, aggression, poor house-training skills, an altered gait, and circling or falling over. Often their eyes are bulging, and they are head pressers due to the excessive cerebrospinal fluid that builds up in their brain.

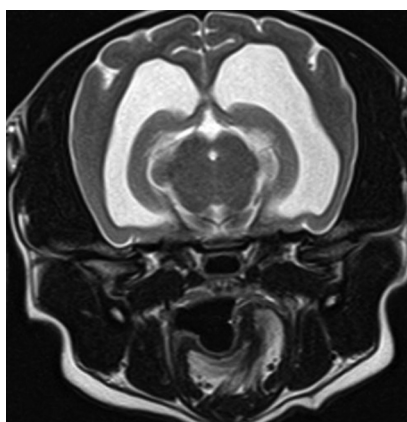
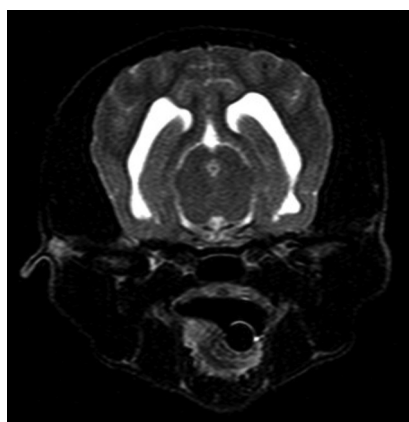
Seizures affect many dogs with hydrocephalus, and most dogs are stunted in growth and have a disproportionately large domed skull. Vision and hearing may be affected too.

Signs may appear at any point in a dog's life. In one study, 53 percent of 564 hydrocephalic dogs showed clinical signs by age 1.<sup>1</sup> In severely affected dogs, signs may be noticeable before 3 months of age.

"It's extremely variable," says Chad West, D.V.M., DACVIM, a neurologist at Animal Medical Center in New York City. "You will see it in some puppies, but other dogs won't present signs until they are in their geriatric years."

Open skull sutures and fontanels are present in dogs with hydrocephalus. Skull sutures, which join the bony plates in the skull and allow movement between the developing skull bones, should close at maturity. When a dog has an open fontanel, it does not automatically mean the dog has hydrocephalus. Many normal, healthy dogs have fontanels, but if a dog has hydrocephalus, there is a good chance it has open fontanels too.

Some dogs have mild hydrocephalus with no signs. However, trauma, hemorrhage or infection could make the condition worse. Hydrocephalus can be congenital or secondary, meaning it's acquired later in life. Researchers disagree about the distinction between congenital or acquired forms since infectious



These MRI images show a normal Chihuahua brain, left, and one affected by hydrocephalus, a serious condition in which cerebrospinal fluid builds up pressure in the brain causing brain damage and early death. Images provided by Animal Medical Center, New York City.

## Hydrocephalus

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agents may cause hydrocephalus in puppies in the womb.<sup>1</sup>

After Lexi was diagnosed with hydrocephalus, Lai contacted her breeder and discovered Lexi's dam had a second hydrocephalic puppy in her next litter. This puppy was blind, could not be house-trained and only lived about a year. Lai offered to adopt the dam and had her spayed.

While there has not been research into the genetics of this condition, it is considered hereditary and affected dogs, as well as healthy dogs with hydrocephalus in their line, should not be bred, according to information on the Canine Inherited Disorders Database website ([upei.ca/~cidd/intro.htm](http://upei.ca/~cidd/intro.htm)).

### Determining a Diagnosis

When a veterinarian diagnoses hydrocephalus, he or she bases the determination on physical, behavioral and neurological signs. Diagnostic tests, including skull radiographs, ultrasound, computed tomography (CT) or magnetic resonance imaging (MRI) scans, and electroencephalography (EEG) can confirm the disorder.

Skull radiographs help the veterinarian to see the open sutures and fontanel. Ultrasound can be done through the open sutures or fontanel to see the enlarged ventricles in the brain. CT and MRI technology provide detailed images, but are expensive and require general anesthesia. Though EEGs are useful, they are generally only available at veterinary referral centers.

West says he commonly sees

hydrocephalus in Chihuahuas, but in many of these cases, the condition does not cause any clinical problems. "If you took any number of Chihuahuas and did an MRI on them, you would diagnose hydrocephalus quite commonly, but they would not have any signs," he says.

Treatment depends on the severity of the condition and the disease progression. The goal of treatment is to re-establish the balance of production and absorption of the fluid in the brain. The brain has four ventricles, or fluid-filled spaces. Cerebrospinal fluid flows through these ventricles, bathing the central nervous system, eventually absorbing into the bloodstream at the base of the brain.

In recent years, the drug omeprazole has successfully reduced the production of spinal fluid in dogs, West says. "If you can reduce the amount of spinal fluid, you will reduce the pressure," he explains. "The majority of dogs, even those that have a moderately obstructive form of hydrocephalus, will respond dramatically to omeprazole."

Omeprazole works on the tissues in the ventricles in the brain that produce spinal fluid by stopping the pumps that push fluid out. This medication, known under the brand name Prilosec, is also taken by humans to reduce stomach acid. Prior to omeprazole, diuretics and corticosteroids were used to lower the pressure on the brain.

Anticonvulsants may be necessary to control seizures. Steroids still play a role in treatment today, but omeprazole has been shown to improve the condition in dogs that did not benefit from other medications, West says.

Surgery is a last hope for dogs with hydrocephalus that don't respond to medical therapy. "It's a last resort not just because it is expensive, but because there is a good chance that it is going to fail. It's not a definitive cure," says West.

A shunt can be surgically implanted to drain excess spinal fluid from the brain into the abdomen, where it can be absorbed. Unfortunately, shunts often have complications including infection and blockage from tissue or clots. If they are implanted in small puppies, they often require replacement as the dog grows.

Hydrocephalus can be difficult for dogs and their owners and usually results in a shortened life span. "If you have a dog that has this disease, try to make him as comfortable as you possibly can during the time you have with him," Lai advises. She also suggests staying in close contact with your veterinarian.

Unfortunately, after a series of seizure clusters, Lexi was euthanized in March 2012 at age 5. "It would be wonderful if someday researchers could find a way to prevent hydrocephalus," Lai says. ■

<sup>1</sup> Braund KG. Clinical Neurology in Small Animals – Localization, Diagnosis and Treatment Chapter on Developmental Disorders. [www.ivis.org](http://www.ivis.org)

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## Hypoglycemia Requires Quick Intervention in Toy Breeds

**T**oy-breed dogs are not only at risk for hypoglycemia, they can die from the low blood sugar disorder if they do not receive prompt treatment.

When a dog's blood sugar, or glucose, level drops, it can affect neurological function. Disorientation, tremors and coma may occur. Normally, hormones stimulate the breakdown of stored glycogen to supply the brain and other tissues with fuel. In toy breeds, this process may not happen fast enough, and hypoglycemia results.

Juvenile hypoglycemia occurs in puppies less than 3 months of age. Because puppies have not fully developed the ability to regulate blood glucose concentration and have a high requirement for glucose, they are

vulnerable. Stress, cold, malnutrition and intestinal parasites also may trigger juvenile hypoglycemia.

Signs of hypoglycemia are loss of appetite, extreme lethargy, lack of coordination, trembling, muscle twitching, weakness, seizures, and discoloration of skin and gums. Most dogs will not eat or drink when they are in low sugar shock.

Simple cases of hypoglycemia can occur when a dog is overly active with too much time between meals or fasts before vigorous exercise. Hypoglycemia also may occur secondary to another condition. Other causes include Addison's disease, insulin-producing tumors of the pancreas, severe liver disease, and glycogen storage diseases. If an underlying illness causes hypoglycemia, veterinarians first treat this condition.

Veterinarians are likely to conduct a complete medical history and physical examination to determine the cause in dogs that develop chronic hypoglycemia. Other tests include a complete

blood count, blood glucose concentration, urinalysis, routine biochemistry, and blood insulin concentration.

An ultrasound may be taken of the abdomen to try and identify a pancreatic or other type of tumor that could cause hypoglycemia.

Puppies and adult dogs that appear to be in a stupor or coma during a hypoglycemic attack should immediately be given sugar water or an oral concentrated solution of glucose, such as corn syrup or Nutri-Cal. Owners of toy breeds should have a glucose source readily available. In an emergency situation, owners should dab sugar water on or under the tongue. The sugar is absorbed directly through the tissue into the bloodstream.

Breeders and owners should proactively look for signs of hypoglycemia in their puppies and should frequently feed toy-breed puppies as a preventive measure. Breeders also are encouraged to include information about hypoglycemia in packets they send with puppies going to new homes. Sharing information may help save a dog's life. ■

### Signs of Hypoglycemia

- Loss of appetite
- Extreme lethargy
- Lack of coordination
- Trembling
- Muscular twitching
- Weakness
- Seizures
- Unusual behavior
- Dilated pupils
- Stupor or coma