

Blood Glucose Hounds: Dogs Alert Vulnerable Diabetes Patients

Marcia Frellick | October 06, 2015

Every night, as 12-year-old twins Jade and Brooke Bordman of Cambridge, Ontario, sleep, their yellow Labrador retriever, Nettle, wanders periodically between their rooms.

Those patrols could save their lives. Maybe they already have.

Nettle is a glucose alert dog, trained by the [Lions Foundation of Canada Dog Guides](#), to warn when she smells a chemical change on the girls that means their blood sugar has dropped dangerously low.

The girls were diagnosed with type 1 diabetes when they were 3, and they are also among the subset of diabetics who are hypoglycemia unaware — meaning they don't experience the symptoms most get when their blood glucose levels are too low.

They sleep so soundly that their father, Terry, said he and his wife, Beata, who both have full-time jobs, had to sleep in shifts for 7 years so they could monitor the girls. "Crashing" or hitting low sugar levels can lead to coma, unconsciousness, or even death.



**Jade and Brooke
Bordman and
Nettle [Source:
Terry Bordman]**

Nettle, who has been with the family for almost 2 years, is trained to alert if the girls' blood glucose level hits 4.5 mmol/L (81 mg/dL). While having the dog hasn't eliminated the worry completely, it has allowed more sleep and peace of mind, Mr Bordman told *Medscape Medical News*.

If Nettle senses a low, she first tries to wake the girls, but if they won't wake, she is also trained to wake their father. She can also fetch a sugar kit, and that's one of the regular drills the family practices. "She's never missed," Mr Bordman said.

Her first test came 3 days after she moved in. Nettle started nudging Terry at 3 AM, and he assumed she was having trouble adjusting to the new house. He knew they had tested the girls 3 hours earlier and they were both at 12 mmol/L (216 mg/dL). But he grabbed a blood sugar kit anyway.

When he tested again, Jade was at 3.2 (58 mg/dL). "If they start getting into the 2s they can slip into a coma and not come out of it," Mr Bordman explained. By late August of this year, Nettle had alerted 12 times, every time with accuracy.

It's hard for Terry Bordman to put into words what Nettle means to their family. "There's someone else in the house looking out for the girls. We wouldn't give her up for anything."

Programs in Several Countries

Nettle is one of nine glucose alert dogs trained by the Lions dog guides charity, the only such facility in Canada accredited by the International Guide Dog Federation and Assistance Dogs International. The program is one of many in several countries with different fees, philosophies, training methods, and standards. The patients the dogs can benefit most are type 1 diabetics who are hypoglycemia unaware.

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The first person to successfully train a dog to alert for low glucose was Mark Ruefenacht, 53, a forensic scientist in

Concord, California. Mr Ruefenacht, who has had type 1 diabetes since he was 28, had a hunch that dogs could be schooled for this purpose, just as they are trained to sniff for bombs and drugs. He found through research, largely self-funded, that the scent of low blood glucose is universal.

He founded [Dogs4Diabetics](#) (D4D) in 2004 and acts as president in his spare time. The first dog Mr Ruefenacht trained, Armstrong, is listed in *Guinness World Records 2015* as the world's first diabetic alert dog. Armstrong died in January, 2012 and worked until his last day, Mr Ruefenacht told *Medscape Medical News*.

Meantime, back in Canada, Jenny Gladish, a Lions spokesperson, said they graduated their first glucose alert dogs in 2013.

She told *Medscape Medical News* the dogs, which cost Can \$25,000 (US \$20,000) to breed, raise, train, and follow up are available at no cost to eligible Canadians starting at age 10. Applicants must have type 1 diabetes and be hypoglycemia unaware. The organization receives no government funding and relies on individual and corporate donations and service club contributions.

Mr Ruefenacht said costs for breeding, training, and follow-up of his D4D dogs — which are Labrador retrievers, golden retrievers, and crosses of the two breeds — are about \$35,000, but clients pay only \$150, and that helps pay for supplies. The dogs typically work until they are 10 to 12 years old.

Dogs4Diabetics has placed about 150 dogs over the past 11 years, and they have an accuracy record of between 80% and 90% for detecting blood glucose deviations, with a 99.7% confidence interval. Families come to train with dogs over 12 weekends.

In the UK there is a similar program, called [Medical Detection Dogs](#), which is fully dependent on donations.

It trains dogs to detect blood glucose drops and gives them to clients free of charge.

It covers England, Wales, and Scotland and lists wait times at about 3 years; it includes not just glucose alert dogs, but animals that alert for other conditions, including narcolepsy and severe allergic response. Applicants should be between 5 and 70 years old, according to the organization.

Not Enough Trained Dogs to Go Around

Unfortunately, there are many more patients requiring diabetes assistance dogs than there are animals available, with the result that those wanting such a "super pet" have to go on a waiting list, sometimes for several years.

D4D has about 10 eligible people requesting dogs for every dog available, Mr Ruefenacht said.

"We have had four clients waiting for dogs who have died due to complications associated with hypoglycemia," he explained.

"One was a teenage boy. These are wake-up calls to me to ensure our programs are efficient and effective to serve as many clients as possible as fast as safely possible."

If a dog dies or the owner retires the dog, they are prioritized for receiving a new dog. D4D works with each client in preparation for the loss of a dog, and they have a licensed therapist available.

This fall, Boy Scouts are building a memorial garden at the D4D Nylabone training center, and there will be a rosebush for each dog that passes away along with a plaque remembering their service, Mr Ruefenacht said.



Although diabetes dogs are of most benefit for type 1 diabetic patients who are hypoglycemia unaware, Mr Ruefenacht said they also have had success with young people, at least 12 years old, who are aware when their glucose drops but who benefit from the extra help the dogs provide. The animals can teach them to manage their diabetes and help them build good habits throughout life.

And about half of the dogs at D4D detect high blood glucose as well as low. "We've been trying to figure out what the common element is between the smell of low and high," he said.

High blood sugar, with a sweet, fruity smell, is easy for dogs to detect, so the dogs are specifically trained for the low-glucose detection.

Ruefenacht's own dogs are trained to alert to keep him at a blood glucose level of between 100 and 200 mg/dL, he said.



Mark Ruefenacht
[Source: Yellow
Neener
Photography]

"We want people actively engaged in managing their disease," he explained. "We have those clients who run themselves fairly low because they don't want the complications from the higher blood sugars. We also look at clients who run their blood sugars high because they're terrified of lows."



**Dr Steve Wolf and
Kermit** [Source:
Yellow Neener
Photography]

Family Physician Benefits and Gives Back to Dogs4Diabetes

One doctor who is convinced of the benefits of diabetic service dogs is Steve Wolf, MD, 46, a type 1 diabetic and family physician at Sutter Medical Group of the Redwoods in Santa Rosa, California.

In 2012, Dr Wolf was driving the 10-minute commute from his work to home. As always, he checked his blood sugar before he got on the road. It was 120 mg/dL, perfectly normal for him. Two miles down the road, he couldn't remember how to coordinate the stick shift and the clutch. He pulled over, checked his blood sugar, and it was 40.

"Forty is low enough that I could easily lose control of my car," he explained, adding that he doesn't know what caused the rapid drop.

He used to get the symptoms of hypoglycemia but for the past several years, he has lost that sensitivity.

He had heard about Dogs4Diabetics and said the concept made perfect sense to him: "You think about a bloodhound that can follow a trail laid down days or weeks before; search-and-rescue dogs that can find someone buried under rubble. It makes total sense that a dog would be able to detect a very faint signal that is unique to a process in our body."

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Months after the freeway incident, Dr Wolf was paired with Kermit. The first time Kermit alerted on him, it appeared at first more like disobedience — Kermit goes to work with him every day, and when it was time to drive home that evening, Dr Wolf pulled on the head lead but Kermit wouldn't get in the car.

Then he remembered the dogs are trained in "intelligent disobedience." He checked his blood sugar and it was 60.

Learning to contradict orders under certain circumstances is an area where glucose alert dogs may differ slightly from other types of guide dogs, he explained.

Kermit has allowed Dr Wolf more freedom to travel, since he can take him on a plane under the same access rules set for other service dogs under the [Americans with Disabilities Act](#).

But Kermit's help extends to his inner circle as well.

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"He allows my friends and family to relax. They don't have to worry that I'm not going to wake up," he explained. And "I don't have to worry that I'm not going to wake up."

When he takes Kermit to work, his young patients love to interact with the dog. Kermit has even alerted when patients have had low blood glucose levels.

And now Dr Wolf serves on the board for Dogs4Diabetics and helps lead a support group for the organization's families.

Programs Growing Globally; Checklist Important



**Armstrong
[Source: Yellow
Neener
Photography]**

Mr Ruefenacht has consulted for four similar programs in Europe, and Dogs4Diabetics is starting a partner program in Australia.

He said standards vary widely and he advises that people considering any program should ask several questions. Among them are:

- What are they charging? Some for-profit programs charge up to \$50,000. Ask what the money is used for.
- How much experience do they have training assistance dogs? And how extensive is trainers' knowledge of diabetes?
- Do they offer a guarantee of the dog's skills over their working lives?
- If they do guarantee accuracy, at what level? 50% accuracy is meaningless, he noted, because that's equivalent to flipping a coin for a service that could mean the difference between life and death.
- What kind of dogs are they placing? Some places train dogs that may not have the maturity or necessary skills to perform reliably.

Mr Ruefenacht also works with Guide Dogs for the Blind, which provides the dogs for Dogs4Diabetics.

This year, a joint program between the two organizations graduated what Mr Ruefenacht said is the world's first dog trained, starting at 8 weeks, to both lead the blind and detect drops in blood glucose. Diabetes is a leading cause of blindness.

Mr Ruefenacht said people are often surprised that, given the scope of the program, Dogs4Diabetics is not his primary job.

He described the dual loyalties this way: "One job pays my bills and the other job pays my soul."

