Alert Dogs

Dogs who know when your blood sugar is low

Dr Tim Welborn

We once had a fine Blue Heeler-Kelpie cross called Ben, who used to know when I was coming home. After leaving my Endocrinology Practice at a variable time each evening, it took me 10 minutes to drive home. My wife noticed that Ben would get up well in advance of my arrival, stretch and shake, and go to the back door to wait for me. Then in 1999 I found a book at the local library entitled "Dogs That Know When Their Owners Are Coming Home". This publication did not easily explain Ben's telepathy, but it did contain a half page about dogs who could recognise if their diabetic master or mistress had a low blood sugar level.

As a doctor treating people with diabetes, this topic fascinated me, because hypoglycaemia unawareness in my insulin-requiring patients was always of great concern. Most people with a low blood sugar level will experience an abrupt "sympathetic arousal" due to circulating adrenaline, with a sudden sense of anxiety, sweating, rapid pulse, and tremor. These warning symptoms usually occur well in advance of neurological impairment such as slurred speech and poor coordination, which follows if the low sugar levels continue to fall. Sugar by mouth is curative.

Hypoglycaemia unawareness arises in patients with long-standing Type 1 Diabetes. They are often very well controlled, but they experience frequent episodes of hypoglycaemia, and they can lose the typical warning symptoms. Over the years, with blood sugar levels running at the lower limit of normal most of the time, it is as if the alarm mechanism turns off. Hypoglycaemia unawareness is a dangerous condition that can lead to traffic accidents, stroke-like symptoms, prolonged coma, and sometimes, death.

I phoned my friend and colleague Dr Alan Stocks in Brisbane to tell him about "dogs that know". It sparked his interest, because he treated a large number of

patients on insulin injections, some of whom had the condition of hypo-unawareness. He undertook a personal survey of some 800 of his patients on insulin, finding that one in three were dog owners, and 70% of these claimed that their dog knew when their blood sugar levels were low. His survey was conducted 20 years ago, when the new technology of continuous glucose monitoring using implanted subcutaneous sensors was just being introduced. These early models were extremely expensive, and at scientific meetings we had some fun debating with the sensor enthusiasts that owning a dog could be a cheaper option.

Dr Alan Stocks pursued the matter with further research, undertaking experiments with skin patches to try to determine what it was that the dogs recognised in their owners when they had low blood sugar levels. Eventually, he enlisted the help of a biochemist colleague Professor Frank Bowling, who considered that there must be a volatile substance or molecule that the dogs identified. Together they devised an ingenious method to further their studies. Patients, in the course of experiencing a severe hypoglycaemic episode, were asked to save in a plastic bag one item of clothing, usually a T-shirt, that they were wearing at the time. One day later, when their blood sugar levels were normal or high, they saved a similar item of clothing. These materials were analysed and compared for biomarkers in Professor Bowling's laboratory. He claims that he was close to identifying a molecule, which was not adrenaline based, but possibly a steroid. But then he had to leave Queensland to take up the position of Director of Pathology at the Royal Melbourne Hospital.

"Paws for Diabetics" is an Australian organisation that teaches dogs to detect hypoglycaemia. I became aware of this about 10 years ago, when one of my patients told me she was getting a trained Labrador to help her. She was a 60-year-old woman who lived alone and had severe hypoglycaemia unawareness. She was comforted by the knowledge that with the dog she would be much safer especially when asleep, until she could obtain an insulin pump and continuous monitoring sensor with an alarm system.

Recently I tracked down Sharon Scott, who is Director of Training for "Paws for Diabetics". Her husband helps her with her work, and they have a son age 28

with type 1 diabetes who lives at home with them in the town of Orange, New South Wales. I arranged to meet with Sharon when she flew over to Perth to conduct an annual accreditation of one of her charges. She met with me, and came with Kaylene, a West Australian with established hyper- and hypo-unawareness, accompanied by her supportive husband and a Whippet wearing a smart dog-coat labelled “Diabetic Alert Service Dog”. Kaylene used to have at least eight urgent admissions to Perth hospitals every year with her condition, until she obtained her first dog 11 years ago. Now she has a second dog and a continuous sensor linked to her insulin pump, and her visits to the Emergency Department are very rare now.

Paws for Diabetics was set up in Queensland in 2005 by two women who wanted their “aware dogs” to be officially recognised as “Assistance Dogs” so that they would be allowed to accompany their owners in shops and on public transport and planes. Sharon, who used to breed, train, and “show” her dogs, started training dogs for “Paws” and is clearly very talented in this field. In 2006 she became Paws’ Area Coordinator for NSW, and then the national Director of Training two years later. She has trained about 200 dogs in the last 15 years, and she usually has some 30 dogs under supervision in Australia each year.

“Scent training” is basically quite easy, Sharon says. The dogs choose their own behaviour to alert the owners, and this is usually pawing or nuzzling or licking. She discourages any “vocalisation” such as barking or whining which can be disturbing in the public setting. With the assistance of a compliant owner, and blood glucose monitoring, she claims she can train dogs to identify blood sugar levels in the borderline low range of 4.5 to 5.5 mmol/L, commenting that they will alert more actively as blood sugar levels fall into the danger zone of less than 3.5 mmol/L. It is important that the owners are trained with the dogs. There is a 30% dropout rate, which is usually due to human failure. The training program is as intensive as the one used for Guide Dogs for the Blind. The dogs must be of suitable temperament and compatible with other dogs. The selection of breed is personal, but popular choices are Whippets, Poodles, and Labradors. There is even a trained Chihuahua. Sharon says that it is important that the dogs are recognised as dedicated assistance dogs, and they should not be considered as pets.

Similar organisations in Australia include “Diabetes Alert Dogs”, “Smart Pups”, and “Mind Dogs”. Clearly a regulatory body and accreditation of these organisations is desirable, the problem being that Diabetes Australia insists on accurate scientific documentation of the animals abilities, rather than the substantial anecdotal evidence available, and such information would be extremely difficult to compile.

There is an Endocrinologist in Melbourne who has a sniffer dog in his office to help him identify whether any of his diabetic patients have low blood sugar levels. He contacted Paws for Diabetics to get accreditation for his dog. I found this intriguing, for when I was practising, I often had the concern that a patient leaving my office might then have an accident driving, because of severe hypoglycaemia that neither I nor the patient recognised. But I would usually check their blood sugar levels before they left.

When I was closing my practice, and saying farewell to patients with type 1 diabetes, some of whom I had managed for perhaps 30 to 40 years, it was quite pleasing to note that many were well controlled and free of complications, because of the modern advances in diabetes treatment, and the benefits of a multidisciplinary team. But hypoglycaemia unawareness continues to be a complication of longstanding diabetes with good control, and is much more common in these people. Recently when seeing my patient Annette, I complimented her on her excellent self-management over many years, and the lack of any severe low blood sugar episodes. “Oh” she said, “two months ago I did have a severe hypo in the middle of the night, but my cat woke me up scratching my arm!” Perhaps there should be another organisation “Mogs for Diabetics”? But I doubt that cats can be trained as easily as dogs.

Diabetes Australia recently conducted a voluntary survey on this topic via social media channels. There were 40 respondents, and the results were of interest. 32 dog owners replied, 28 of whom acknowledged that their pets were aware when their blood sugar levels were low. Of 21 cat owners, 13 stated that there pet was aware. The dogs or cats alerted with pawing, vocalising, sniffing the

breath of the owner, or jumping on the owners' chest. Three of the pets could recognise hypoglycaemia through a closed door.

Professor Frank Bowling, now settled in Melbourne, is keen to take up his research again hoping to identify "the molecule". He feels that this may yield unexpected insights about hypoglycaemia, and in addition there could be implications for human disease beyond diabetes. Indeed we know that dogs can identify epileptics about to convulse, and they can recognise cancer sufferers, and even patients with neurological disorders such as Parkinson's disease. Professor Bowling's research is complex, but he has a large grant to investigate molecules affecting the human brain, using state-of-the-art equipment that includes a sophisticated Mass Spectrometer. He is an avid adventure trekker, and he is proud to admit that he has had type 1 diabetes for 60 years. Next year, with the help of Diabetes Australia, he will work with volunteers who have obvious hypoglycaemia unawareness. He believes that finding a way to identify low blood sugar levels in diabetic patients with hypo-unawareness in advance of mental impairment or coma is one of the most important research areas in diabetes management today.