July 30, 2012

Lilly Supports Research to Determine What a Dog's Nose Knows About People with Diabetes and Severe Hypoglycemia

Data to inform assistance dog training procedures and to explore future treatment possibilities for people with type 1 diabetes

INDIANAPOLIS, July 30, 2012 /PRNewswire/ --

News Highlights

- Lilly and ICAN begin research to probe changes in human sweat, detectable by dogs, that signals low sugar in people with T1 #diabetes
- Lilly supports a volunteer program where employees help reinforce the skills of assistance dogs to help people with #diabetes

A young black Lab named Pete sleeps at the feet of Dr. Dana Hardin, medical director and pediatric endocrinologist, at Eli Lilly and Company (NYSE: LLY) campus in Indianapolis. Though he looks at home, Pete is not Hardin's pet. He's an assistance dog in training, one of several at Lilly being socialized in real-life situations by employee volunteers under the guidance of the Indiana Canine Assistance Network (ICAN). Through ICAN (www.ICANdog.org), Pete is learning to detect hypoglycemia, a dangerously low level of blood glucose (sugar), in people with diabetes.

As a hypoglycemia alert dog, Pete is also part of research Lilly began in June to better understand why dogs are able to sense severe blood sugar events in their owners and to identify the compound or compounds they smell as part of those events.

Hypoglycemia Alert Dogs — A Furry Blood Sugar Testing Back-up System
For years, people with vision and hearing impairments, as well as other disabilities, have benefited from the help and companionship of trained assistance dogs. Only recently, however, have hypoglycemia alert dogs been available to help people with diabetes, typically those with type 1, which is usually diagnosed in children or young adults. These dogs are trained to identify low levels of blood sugar and alert their owners by nudging or making contact with them in some specific way.

This training and application is important for many living with type 1 diabetes, as over time (approximately five years), people can develop "hypoglycemia unawareness," in which the body loses the ability to sense an impending low blood sugar event.[i] This type of event is usually characterized by tremors, sweating, confusion and irritability, feelings that would normally cause someone with diabetes to check their blood sugar. If left unchecked for too long, dangerously low levels of blood sugar can cause seizures, loss of consciousness and in some cases, death.

"When people who have had diabetes for a number of years lose their ability to sense an oncoming low blood sugar event, the consequences can be severe," said Dr. Hardin. "Considering children under the age of 15 are at greatest risk for developing type 1 diabetes, this 'unawareness' is happening in children who are very young. For a caregiver, this is a constant, everyday fear that doesn't go away."

Currently, it is unclear how the dogs are able to sense hypoglycemia in humans, but some think the dogs are reacting to scents created by chemical changes related to low blood sugar.

The Nose Knows — New Research to Uncover Subtle Changes in Human Chemistry
The ability to smell is based on the number of olfactory cells adapted to receive smell molecules — the more olfactory cells there are, the more acute the sense of smell.[ii] Compared to humans, who have approximately five million olfactory cells, dogs may possess up to 220 million.[iii] That means, depending on the compound being detected, a dog's nose may actually be more than 1,000 times more sensitive than humans.[iv]

For someone with diabetes, the sensitivity of a trained dog's nose can mean peace of mind, especially during the overnight hours, and at its extreme, can be life saving. Lilly Diabetes recently examined this remarkable sense of smell and presented corresponding data at the American Diabetes Association's 72nd (the Association) Scientific Sessions.

The study examined the frequency and severity of hypoglycemic events as well as the emotional response in one person with severe hypoglycemia in the two weeks prior to receiving a trained dog and in the six weeks post-dog placement.[v] Data showed a clear correlation between the number of alerts the dog gave and the number of hypoglycemic states that were detected and thus prevented over the duration of the study.[vi] Ultimately, the dog accurately detected the onset of hypoglycemia and alerted the subject so steps could be taken to restore normal blood sugar levels.[vii]

"We understand some of the biochemical changes which occur with hypoglycemia, but we do not yet have a full picture of the timing of these changes, nor do we understand what exactly the dog is sensing," said Hardin. "The scent seems to be very specific, in fact, dogs are trained to their owner's individual scent. So if we can identify what the dogs smell, it may be possible to expose them to larger quantities of that compound for faster, more efficient training. But, what's exciting still is how that may apply to finding a practical treatment solution for people with diabetes. That's at the heart of everything we do."

Earlier this month, as a result of a Lilly supported Innovation Day for Global Statistical Sciences, ICAN and Lilly employees launched another study to examine the reproducibility of hypoglycemia recognition with a newly trained group of dogs. The goal of the study is to show reproducibility of the dogs' ability to recognize hypoglycemia from multiple samples in a laboratory setting. This is the first step to validate this mode of hypoglycemia therapy. Studies are also planned to determine what the dogs sense and to measure the dogs' impact on patients as they are placed using Lilly's proprietary measurement questionnaire.

Unique Approach to On the Job Training
While the need for dogs to assist people with diabetes is growing, training a single alert dog can cost up to $25,000 or more.[viii] But, thanks to donations from public and private donors, plus hours of volunteer time from employees like those at Lilly, ICAN provides trained dogs to qualified families for a one-time fee of $1,300 for the life of the dog.[ix]

At ICAN, dogs are trained by carefully screened inmates at the Indiana Women's Prison over a two year period. Dogs are taught skills such as picking up objects from the floor, opening doors, tugging clothes off, and helping with balance/mobility issues. At roughly 8 months old, they also start working on the diabetes alert training protocol using ICAN's proprietary method. Many of these dogs are then exposed to real-life situations by Lilly Diabetes employees during work time hours over a period of two to three weeks. Through this process dogs practice the skills learned such as walking without pulling or staying in a "sit" position during greetings with new people. ICAN is accredited by Assistance Dogs International, a coalition of organizations that train and place assistance dogs.

This unique arrangement is part of Lilly's commitment to the organization and serving people with diabetes in the local community. Currently, seven employees are trained to work with ICAN canines, and at any one time up to three employees have dogs actively training at Lilly. Each volunteer employee participates in a series of classes where they learn to handle the dogs, and then are asked to commit to a minimum of six additional classes per year for continuing education.

However, that can be a challenge, because while dogs in training thrive on routine, Lilly operates a mobile work environment — on any given day, an employee may sit at a different work station among a variety of co-workers. The company has employed this philosophy to promote more active collaboration.

To marry the two, Lilly Diabetes volunteers proactively created an additional level of support so that they can establish routine for the animals and still maintain a productive work environment. Activities include regular in-person and e-mail check-ins so lessons learned can be shared. The group also meets prior to any new dog's arrival to review how to handle difficult situations, tips on handling people with allergies or fear of dogs, and how to maintain the dog in a busy work setting.

"Lilly Diabetes has taken our training a step further to fit the unique needs of their organization," said Sally Irwin, executive director, Indiana Canine Assistance Network. "Our goal is to train and place as many dogs with children and adults with disabilities as we can, and we couldn't be happier with our 10-year partnership with the company. Training of this nature takes love and patience. These dogs are VIPs at Lilly."

For learn more information about Lilly Diabetes, visit www.lillydiabetes.com. For more on assistance dogs, visit www.assistancedogsinternational.org.

About Lilly Diabetes
Lilly has been a global leader in diabetes care since 1923, when we introduced the world's first commercial insulin. Today we work to meet the diverse needs of people with diabetes through research and collaboration, a broad and growing product portfolio and a continued commitment to providing real solutions—from medicines to support programs and more—to make lives better. For more information, visit www.lillydiabetes.com.

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urgent medical needs. Information about Lilly is available at www.lilly.com.

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[v] Hardin, DS., Hillman, D., Cattet, J. "Hypoglycemia Alert Dogs — Innovative Assistance For People with Type 1 Diabetes." Abstract presented at the American Diabetes Association 72nd Scientific Sessions, Philadelphia, PA. June 9, 2012.

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[vii] Ibid.

[viii] Dogs for Diabetics. Frequently Asked Questions. http//:www.dogs4diabetics.com. Accessed: July 9, 2012.

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