Gene Therapy Used in Dogs to Treat Type 1 Diabetes
-- First Successful Large Animal Study Adjusts Blood Glucose with No Hypoglycemia--

Alexandria, VA (April 23, 2013) – In a major advance in the use of gene therapy for treating type 1 diabetes, researchers have shown that this approach can provide beneficial therapeutic effects in dogs for up to four years, without causing hypoglycemia, according to a study published in the May issue of the journal *Diabetes*.

Researchers from the Universitat Autonoma de Barcelona, led by Dr. Fatima Bosch, had previously shown positive effects using gene therapy to regulate glycemic control in mice. This study was the first to show long-term beneficial effects in large animals (beagle dogs), a major step toward ultimately testing the procedure in humans.

“Moving from mice to large animals is a big step,” said Bosch, who is the Director of the Center of Animal Biotechnology and Gene Therapy. “If something works well in large animals, we have reason to believe, based on the previous experience in the field of gene transfer, that it is likely that we will see a similar outcomes in humans. For example, gene therapy that worked well in large animals to treat hemophilia is now seeing positive results in clinical trials with humans. We hope that in a few years, we’ll be able to test this therapy for type 1 diabetes in humans as well.”

Bosch and her team injected five lab dogs with two genes – insulin and glucokinase – using an adeno-associated virus (AAV) vector. The vector, or vehicle for DNA transmission, comes from a virus that is non-pathogenic and is able to “infect” cells in the animal’s skeletal muscle with the two genes. Because skeletal muscle cells do not divide, the genes remain there long-term. This means the animal only needs to be injected once and the genes can continue to do their work, acting as “glucose sensors”, continuously releasing low levels of insulin and expressing glucokinase, which helps regulate glucose uptake in response to rising and falling circulating glucose levels, for years.

In this study, the treated dogs maintained normal blood glucose levels for more than four years after injection, without showing signs of hypoglycemia, a risk associated with other treatments that seek to achieve tight blood glucose control. This is also the first time a single therapeutic intervention has been used to achieve long-term maintenance of normoglycemia after development of diabetes, the authors said.

Treating the dogs with just one gene did not achieve the same results, the researchers said, noting that both were needed to keep blood glucose levels in the normal range. The next step is to test the procedure on “companion animals,” different breeds of dogs that have type 1 diabetes and live with families, rather than in the lab. In this
study, researchers will test their ability to better adjust the insulin doses in different size and breeds of dogs living in “real life” situations. Once they are able to determine how to adjust the therapy in this context, the investigators will be ready to test the treatment on humans, Bosch said.

“Overall the report by Bosch and colleagues is a substantial advance in the attempts to develop clinical gene therapy for type 1 DM,’’ writes Timothy O’Brien, Director of the Regenerative Medicine Institute, at the National University of Ireland, Galway, in a commentary accompanying the study in *Diabetes*. He notes that “substantial challenges” remain in pursuing this type of treatment, but that “they are worthy of pursuit given the ultimate prize if the approach is successful.”

Bosch notes that gene therapy does not represent a “cure” for type 1 diabetes because it does not regenerate beta cells, but rather could lead to an effective long-term treatment. Maintaining blood glucose levels in the normal range is critical for managing diabetes and for preventing serious complications associated with the disease, such as nerve damage, heart and kidney disease.

This study also holds promise for treating dogs with diabetes, Bosch said. As it has in humans, diabetes has been increasing in recent years in dogs, she noted.

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For further information on gene therapy, please see a video developed by Dr. Bosch at: http://www.clinigene.eu/video-intro-gene-therapy.html

*Diabetes* publishes original research about the physiology and pathophysiology of diabetes. Published by the American Diabetes Association, it is the leading peer-reviewed journal of basic research into one of the nation’s leading causes of death by disease. Diabetes also is a leading cause of heart disease and stroke, as well as the leading cause of adult blindness, kidney failure, and non-traumatic amputations.

The American Diabetes Association is leading the fight to Stop Diabetes and its deadly consequences and fighting for those affected by diabetes. The Association funds research to prevent, cure and manage diabetes; delivers services to hundreds of communities; provides objective and credible information; and gives voice to those denied their rights because of diabetes. Founded in 1940, our mission is to prevent and cure diabetes and to improve the lives of all people affected by diabetes. For more information please call the American Diabetes Association at 1-800-DIABETES (1-800-342-2383) or visit www.diabetes.org. Information from both these sources is available in English and Spanish.

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