

# BRIDGING *the* SCIENCES

Research! America  
AN ALLIANCE FOR DISCOVERIES IN HEALTH®

## Diabetes Discoveries

Diabetes occurs when the body does not produce or properly use insulin, resulting in high blood levels of the sugar glucose. Managing blood glucose levels can reduce the risk of complications such as heart attack, blindness, kidney failure and nerve damage.

### The Challenge

- Reverse the growth trend in diabetes, which currently affects 21 million Americans
- Thwart the prediction that one in three children born in the U.S. in 2000 are expected to have diabetes in their lifetimes
- Prevent complications from diabetes—including adult blindness, kidney disease, nerve damage and lower-limb amputation
- Decrease medical expenditures for people with diabetes, which are nearly 2.5 times higher than for those without the disease

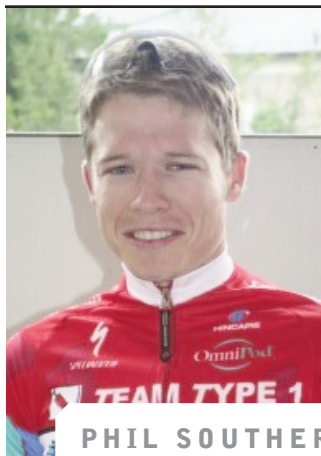
### Why INVEST

- The number of Americans with diabetes could rise to 50 million by the year 2025 and breakthroughs in research are needed to end the epidemic
- Preventive measures such as monitoring and controlling glucose levels are much less costly than treating complications from the disease
- Development of an artificial pancreas, which will continuously measure glucose levels and dispense the appropriate amount of insulin, will significantly improve the way people with diabetes manage their condition

### Why COLLABORATE

- Diabetes is a complex disease that affects the entire body, and collaboration across disciplines is necessary as researchers work toward a cure
- Diagnostic technologies such as glucose monitors require the integration of chemistry, physics, computer science, engineering and the life sciences

## Who Benefits



**PHIL SOUTHERLAND** Phil has seen significant advances in the

technologies to monitor and control his blood glucose in the 25 years since his diagnosis. It once took 2 minutes to get the results from a semi-accurate glucose test and 2 hours for painful insulin injections

“Thanks to new technologies, there is no dream too big for people with diabetes now.”

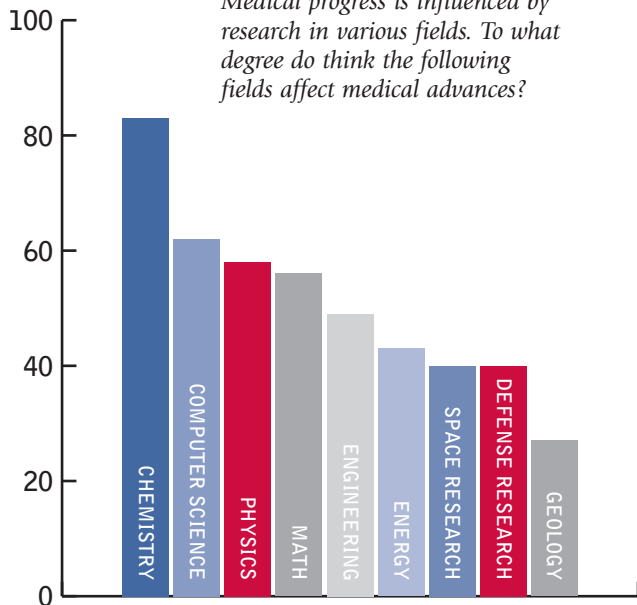
Phil Southerland was 7 months old when he was diagnosed with type 1 diabetes. To stay in good health and prevent complications from diabetes, he works hard to keep his blood sugar under tight control.

to work. Today his glucose monitor provides precise results in seconds and insulin that he administers through a wireless pump takes effect in 30 minutes. Phil is also participating in a clinical trial for a continuous glucose monitoring system that alerts him when his blood sugar is becoming too high or low.

Phil and 7 other competitive cyclists with type 1 diabetes biked in the 2006 Race Across America as Team Type 1, beating the previous corporate team record by more than a day, with a time of 5 days, 16 hours. In 2007, Team Type 1 raced again and beat their own record. Each member used a continuous glucose monitoring system to manage their blood sugar. “Thanks to new technologies, there is no dream too big for people with diabetes now,” says Phil.

# What AMERICANS ARE SAYING

**Medical Progress Affected by Many Fields of Science**  
*Medical progress is influenced by research in various fields. To what degree do you think the following fields affect medical advances?*



Source: Bridging the Sciences Survey, 2006  
 Charlton Research Company for Research!America

## A History of Innovation

**400 BC:** Hindu physicians described some people's urine as like honey—attracting flies and ants.

**1908:** Chemist Stanley Benedict developed a test to detect sugar in urine. Benedict's Solution was mixed with urine, boiled and the resulting color indicated the amount of sugar present.

**1960:** Ernest Adams developed the first test strip to detect glucose in blood.

**1971:** Engineer Anton Clemens received a patent for the first blood glucose meter.

**Today:** Glucose meters are small and virtually pain-free. Advanced technology accurately measures glucose in a blood sample 100 times smaller than that required by the original glucose meter. Some people are using continuous glucose monitors, which take measurements and track patterns in their glucose levels, allowing them to manage their diabetes even more precisely.

**Hope for the Future:** Continuous glucose monitoring that works with an insulin delivery system to replicate the normal function of the pancreas will help prevent the long-term effects of diabetes.

# Where RESEARCH IS THRIVING

## A Model for Collaboration

- At the University of Iowa's Optical Science and Technology Center (OSTC), scientists and engineers from many disciplines collaborate to solve complex problems by studying light.
- Light has many uses in health care, such as lasers as a less invasive surgical tool.
- The Director of OSTC, Mark Arnold, PhD, is leading the development of a glucose monitor that *would not* require pricking the finger. With support from the National Institutes of Health, his team is working on a sensor that measures the concentration of glucose in blood by passing a band of near infrared light through the skin.