

UCSD Researchers Participate in Multi-Million Dollar Study In Genetic Studies, Environment and New Technologies

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Two runners head out for a jog. One has high blood pressure. And, it's a hot, smoggy day in San Diego, California. How will environmental and genetic factors affect each runner? That is just one of many questions researchers hope to answer through a new study: Genes, Environment and Health Initiative (GEI), a unique collaboration between geneticists and environmental scientists, funded by National Institutes of Health (NIH).

"Researchers have long known that our genes, our environmental exposures and our own behavioral choices all have an influence on our health," said Department of Health and Human Services Secretary Mike Leavitt. "This new initiative will use innovative genomic tools as well as new instruments for measuring environmental factors – from diet and physical activity to stress and substance addiction – in order to begin sorting out how these different factors affect a person's risk for a number of health conditions."

The University of California, San Diego School of Medicine, working with The California Institute for Telecommunications and Information Technology, received \$666,000 of the \$48 million grant to develop better ways to measure environment and activity.

"Our hope is to develop a user-friendly system that does a better job of tracking people, both individuals and groups, as they go about their daily routine," said Kevin Patrick, MD, professor, Department of Family and Preventive Medicine, UC San Diego School of Medicine. "This system will likely involve a heart rate monitor and a GPS monitor (global positioning system) in connection with a cell phone to find out exactly what's happening where and how and who is more or less at risk."

The Monitoring Device: PALMS

How much energy does a person use at home? Commuting to and from work? How do individuals doing the same physical activity vary in their response? How does a particular medical condition affect the outcome?

To answer these questions requires a method of measurement that is capable of simultaneously capturing data while continuously monitoring location. The aim of this research is to develop such a system: a Physical Activity and Location Measurement System (PALMS), aimed at measuring participants in everyday life for long enough periods of time to detect patterns in physical activity and energy expenditure, at least 2-3 days and perhaps as long as two weeks.

"Previously, we've not had the ability to continually measure physical activity, very precisely, in time and space, to get idea of what impact the environment and activity has on an underlying disease," said Patrick.

This portion of the project will be performed by an interdisciplinary group of researchers, commercial organizations and consulting investigators with expertise in physical activity and exercise science, active living research, software engineering, cell phone technologies, GPS and GIS research and spatial data analysis.

The UC San Diego Division of the California Institute for Telecommunications and Information Technology (Calit2), with industry partner Respironics, will supply critical expertise in systems engineering and wireless communications.

"Adapting wireless and sensor technologies for use in medical research is now a prime area of investigation within Calit2," said Calit2 researcher Phillip Rios. "The PALMS project will give us the opportunity to take some of our innovations in the automotive and disaster-response fields and tailor them to the needs of researchers who must monitor patients' physical activity in the context of the precise location where that activity takes place."

Background on GEI

To identify the genetic risks, researchers will use the rapidly evolving technologies used in genome-wide association studies to focus on common conditions, such as tooth decay, heart disease, cancer and diabetes. This strategy relies on the new-found ability to swiftly identify genetic differences between people with an illness and those who are healthy, leading to an understanding of the underlying genetic contribution to the disease.

The environmental component of GEI will begin by developing new technologies that accurately measure personal exposures with small, wearable sensors that can be used to assess environmental agents.


The final component of the research strategy is to determine whether the effect of genetic variants that increase disease risk is different in the presence of environmental exposures.


"Common human diseases such as cancer and diabetes result from a complex interplay between genes and environmental risk factors," said David A. Schwartz, M.D, co-chair of the NIH coordinating committee for GEI and director, National Institute of Environmental Health Sciences

(NIEHS). “The goal of this program is to develop the technology to better understand how environmental exposures affect disease risk.”

Further Information

The California Institute for Telecommunications and Information Technology, a partnership between UC San Diego and UC Irvine, houses more than 1,000 researchers organized around more than 50 projects on the future of telecommunications and information technology and how these technologies will transform a range of applications important to the economy and citizens’ quality of life. For more information, visit www.calit2.net .

NIEHS, a component of the National Institutes of Health, supports research to understand the effects of the environment on human health. For more information on environmental health topics, visit <http://www.niehs.nih.gov/> .

The National Institutes of Health (NIH), the nation's medical research agency, includes 27 Institutes and Centers and is a component of the U. S. Department of Health and Human Services. It is the primary Federal agency for conducting and supporting basic, clinical, and translational medical research, and it investigates the causes, treatments and cures for both common and rare diseases. For more information about NIH and its programs, visit <http://www.nih.gov> .

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