National Aeronautics and Space Administration:

Blood Glucose Monitoring

NASA technology for Earth orbital atomic oxygen interactions is being applied to advanced concepts for blood glucose monitoring which would use blood analyte-responsive detection method in which blood only contacts the end of an optical fiber.

Lead Agency:

National Aeronautics and Space Administration (NASA)

Agency Mission:

NASA's mission is to pioneer the future in space exploration, scientific discovery and Aeronautics research.

Principal Investigator:

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Partner Agency:

QuestStar Medical Inc.

General Description:

This is a spinoff application that has been developed as a direct result of NASA's research on low Earth orbital atomic oxygen interactions with spacecraft materials. The contribution consists of a practical and effective method of constructing microscopic cones on the surface of optical fibers that are necessary for a fiber optic blood glucose monitoring device to function. Blood glucose monitoring for diabetics is typically performed by piercing the skin of a finger with a lance and applying a droplet of blood on a reagent pad or test strip. The quantity of blood that is required to perform the test determines size and depth of the cut required. The amount of blood required for blood glucose monitoring could be significantly reduced using this new technology. Advanced concepts for blood glucose monitoring are being considered which would use blood analyte-responsive detection method in which blood only contacts the end of an optical fiber. The process makes use of knowledge space environmental interactions and the atomic oxygen test facilities that exist at NASA's Glenn Research Center.

Excellence: What makes this project exceptional?

The technology developed by NASA Glenn Research Center to produce inexpensive glucose monitoring devices that require much smaller quantities of blood than conventional lance and

absorbent strip devices will invite more frequent monitoring and thus better potential for control of blood glucose levels because of affordability and the fact that samples can be taken from almost anywhere on the body with reduced pain associated with blood sampling.

Significance: How is this research relevant to older persons, populations, and/or an aging society?

The National Institutes of Health reports that 7% of the U.S.A. population has diabetes (14.6 million diagnosed and 6.2 million undiagnosed) in 2005. For the same year 20.9% of the population aged 60 years or older is reported to have diabetes. Diabetes was the 6th leading cause of death in 2002. The total cost of diabetes in the U.S.A. in 2002 was a staggering $132 billion for direct medical costs and indirect costs (disability, work loss, and premature mortality).

Effectiveness: What is the impact and/or application of this research to older persons?

The surface modification technique used for the blood glucose optical fibers cannot be accomplished by conventional chemical or mechanical means because of the small scale and high aspect ratio (cone height-to-width ratio) shape of the morphology required. However, NASA technology developed for space simulation is both applicable and potentially cost effective to produce a glucose monitor that can function on an order of magnitude less blood than conventional monitors. It is for this reason that the development of the blood glucose monitor by QuestStar Medical has had numerous Reimbursable Space Act Agreements with NASA Glenn Research Center to assist in the development of the monitor.

Innovation: Why is this research exciting or newsworthy?

The US population developing diabetes is growing.