A method for early and easy detection of Alzheimers disease

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Principal Investigators

LIU, GANG

Institution

NANOMEDIC, INC.

Contact information of lead PI
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USA

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Research Abstract

Abstract. Alzheimer’s disease (AD) is one of the leading causes of death among aged people, and currently, more than 5 million people have AD in the US alone. Although there is no cure for AD, studies indicate that clinically proven medicines have the ability to slow AD’s progress,

especially if they are administered early on. Obviously, to develop diagnostics that are able to detect AD at its earliest stages, long before AD symptoms appear, will have significant impacts on the disease’s management. Also, being able to monitor the disease’s progression over time will greatly help in finding new and improved medicines and treatment strategies for AD patients at all stages. Despite great progress in current clinical AD diagnosis using brain imaging or body fluid measures with amyloid-? (A?, whose plaques in the brain are a hallmark of AD) as an AD biomarker, there are concerns over these methods, which involve radioisotopes, expensive imaging equipment and complicated laboratory analyses. It is still hoped that an easy, cost effective, minimally invasive approach for routine A? tests could be found and used as another common tool of preventive medicine. To fill this need, we will further develop and translate our nanoparticle biomolecular detection technology, patented in the US, into commercial clinical tools as a simple, non-invasive approach to in vivo image A? deposits in the skin, which can provide more specific, sensitive and rapid results than current AD diagnostics. We hypothesize that A? deposits in the skin of AD patients can serve as biomarkers and be specifically captured by A? antibodies labeled with near infrared (NIR)-quantum dots (Qdots) in vivo; the NIR-Qdots can provide very stable, strong signals, and be detected easily by common imaging systems with high signal/noise ratio, thus enabling to in vivo spot the A? deposits at very low levels. This hypothesis is based on evidence including: (1) the A? does not just exist in the brain, causing AD, but rather “”systemically”” presents in the whole body, (2) A? deposits have been detected in vitro by immunoassays in skin specimens of AD patients, and (3) NIR-Qdots with surface targeting modalities can serve as ultrasensitive probes to detect targets both in vitro and in vivo. To prove our hypothesis, an aim is proposed: to generate effective A? probes by conjugating its antibodies with NIR-Qdots and characterize them, then to in vivo visualize the dermal A? deposits after intradermal injection of the probes into AD mice at different disease stages via fluorescent imaging systems (blood, brain, spinal fluid and skin A? levels will be evaluated ex-vivo for comparison), and finally to examine the NIR-Qdots’ potential toxicity by testing their biodistribution in vivo. The probe generation will be conducted based on methods we have used before, and the in vitro and in vivo studies will be performed following standard protocols. We believe that this SBIR Phase I study will demonstrate the proof of concept and lay the foundation for the following Phase II study towards commercialization. Our study will impact AD prevention, management and drug development.

Further information available at:

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