

Karunya Kandimalla, Ph.D.

Florida Agricultural and Mechanical University

Tallahassee, Florida

Multifunctional Nanoprobe to Diagnose and Treat Cerebral Amyloid Angiopathy

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After Alzheimer's disease, cerebral amyloid angiopathy (CAA) is the second most common cause of dementia in elderly individuals. CAA is characterized by deposits of amyloid plaque in the blood circulation of the brain, which can lead to stroke, brain hemorrhage or dementia. At the current time, there is no definitive way for physicians to diagnose CAA, and currently available treatments have severe side effects and limited efficacy.

Karunya Kandimalla, Ph.D. and colleagues are developing a probe based on nanotechnology that is intended to specifically bind to amyloid deposits in the brain circulation. Such a probe may be able to deliver specific dyes to the plaques, which can then be visualized using magnetic resonance imaging (MRI). The probe may also be able to deliver drugs directly to the plaque, reducing the side effects and toxicity associated with injection of drugs into the general circulation.

Dr. Kandimalla's team has developed a nanoparticle probe with an attached antibody that recognizes beta-amyloid, the primary component of amyloid plaque. They have demonstrated that this probe can permeate the blood-brain barrier and gain access to the tissues lining brain blood vessels, where the amyloid plaque accumulates. With this proposal, the researchers plan to test how well the probe labels plaques for detection using MRI. They will also attach drugs to the probe to determine if it is capable of delivering those drugs to the specific regions affected by plaques.