

Can targeted therapies be applied to patients with Alzheimer's?

August 3 2024, by Joe Lafata



Tara Mastren, center, is leading research into developing targeted alpha-particle therapies for patients with Alzheimer's. The University of Utah professor of civil & environmental engineering is pictured here in her lab with graduate students Connor Holiski, left, and Aidan Bender. Credit: Dan Hixson, University of Utah

Alzheimer's disease, a debilitating brain disorder with limited treatment

options, has long challenged researchers. Specifically, researchers have struggled with slowing the buildup of [amyloid beta plaques](#), harmful clumps of proteins that exacerbate the disease by damaging brain cells and causing memory loss.

Led by the John and Marcia Price College of Engineering, University of Utah researchers have developed a groundbreaking approach to tackle these plaques and possibly slow this devastating neurodegenerative disease.

Inspired by targeted cancer treatment methods, their technique utilizes a form of radiation known as [alpha particles](#) to break down [chemical bonds](#) in [amyloid](#) beta plaques. Targeted Alpha Therapy (TAT) delivers these particles directly to the harmful plaques on the brain while aiming to minimize damage to healthy tissues.

Aidan Bender, a former graduate student in the college's Utah Nuclear Engineering Program, spearheaded this [pioneering research published July 25](#) in the *Journal of Nuclear Medicine*, the premier journal in the field. Co-authors included researchers from the U departments of Radiology and Chemistry.

"Aidan excelled in research and developed many skills and techniques needed to tackle this study," said the study's senior author Tara Mastren, an assistant professor of civil and environmental engineering. "The research from his publication is the first step in determining if this treatment method is feasible and has allowed us to move into testing *in vivo* models."

New hope for Alzheimer's patients

[Alzheimer's disease](#) is a leading cause of dementia in the United States, resulting in more than \$200 billion in medical expense a year. The

number of cases is expected to double by 2050, but the disorder's impact could be lessened if treatments can be developed to slow its progress.

The Utah researchers turned to theoretical nuclear medicine in search of answers.

Under Mastren's supervision, Bender's team started by developing a [chemical compound](#), called BiBPy, that can latch onto to the harmful amyloid beta plaques.

They attached a small amount of a radioactive isotope, bismuth-213, enabling the compound to emit alpha particles. This new compound, [213Bi]-BiBPy, was applied to the brain tissue of mice that were genetically modified to develop amyloid plaques similar to those in Alzheimer's patients.

The compound, when combined with bismuth-213, demonstrated properties that made it effective at binding to the mice's amyloid plaques.

Measured using two types of tests for the presence of amyloid beta, the treated brain tissues showed a significant reduction in amyloid beta concentration. These results suggest that the compound may be effectively applied as a potential TAT treatment for Alzheimer's and other neurodegenerative diseases, paving the way for further tests in live animals and eventually in humans.

Since earning his doctorate, Bender has joined the Center for Quantitative Cancer Imaging at Huntsman Cancer Institute where he works on radiopharmaceutical development for cancer imaging and therapy. By harnessing cyclotron-produced therapeutic radionuclides, auger electron therapy, and PET radiometals, his research may lead to new tools for detecting, diagnosing and treating cancer.

More information: Aidan A. Bender et al, Development of a²¹³Bi-Labeled Pyridyl Benzofuran for Targeted α -Therapy of Amyloid- β Aggregates, *Journal of Nuclear Medicine* (2024). [DOI: 10.2967/jnumed.124.267482](https://doi.org/10.2967/jnumed.124.267482)

Provided by University of Utah

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