Nano World: Gold nano vs. Alzheimer's

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Gold particles only nanometers or billionths of a meter wide together with extremely weak microwaves can dissolve the abnormal protein clumps linked with Alzheimer's disease and potentially those linked with other degenerative illnesses as well, experts told UPI's Nano World.

These findings in test-tube experiments need further validation in animals before doctors can even consider applying them as therapies for humans, cautioned lead researcher Marcelo Kogan, an organic chemist at the University of Chile in Santiago.

Abnormal proteins that cluster into toxic fibrous clumps are hallmarks of diseases such as Alzheimer's, Parkinson's, Huntington's and type 2 diabetes. Alzheimer's alone "affects an estimated 4.5 million people in the United States, according to the National Institute on Aging. That figure is expected to rise dramatically as the population ages," Kogan said.

Prior research suggested nanoparticles could help battle disease. For instance, Nanospectra Biosciences in Houston has an exclusive worldwide license to nanoparticles known as "nanoshells" that heat up when exposed to near-infrared light. One hope is to deliver nanoshells into target cancers and cook a tumor from the inside by shining near-infrared light, which can penetrate the body without harm, from outside the patient.

Kogan and colleagues in Spain developed gold particles roughly 10 nanometers wide with peptides attached to them that specifically bond to

the kind of abnormal proteins found in Alzheimer's. These particles are small enough to penetrate cell membranes and can also absorb microwave radiation.

The scientists incubated the nanoparticles with the protein for up to a week, long enough for the protein to clump up. Using microwave frequencies at power levels six times lower than those used by conventional mobile phones, the researchers found that several hours of irradiation heated the nanoparticles enough to completely dissolve the toxic clumps. The nanoparticles alone showed no such effect, while the microwaves alone accelerated the growth rate of the abnormal fibers.

"This new technique could be considered as a kind of molecular surgery that could halt or slow the disease's progress without harming healthy brain cells," Kogan said.

Moreover, abnormal proteins treated with both nanoparticles and microwaves failed to clump up after at least a week, showing this treatment significantly reduced the ability of the protein to reassemble into fibers. Kogan and his colleagues are currently designing animal studies incorporating their technique. They published their findings in the Jan. 11 issue of the journal Nano Letters.

"It's a very interesting idea. It might not work, as many things don't, but it's a very exciting idea," said neuroscientist Claudio Soto at the University of Texas Medical Branch at Galveston.

Moreover, the fact that this potential therapy works thermally as opposed to chemically means that it could be adapted against far more diseases than a drug might. "This is a potential platform technology for developing many other kinds of therapies," Soto said.