Failed HIV Drug Gets Second Chance with Addition of Gold Nanoparticles

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Researchers at North Carolina State University have discovered that adding tiny bits of gold to a failed HIV drug rekindle the drug's ability to stop the virus from invading the body's immune system.

The addition of gold nanoparticles to a modified version of a drug designed in the 1990s to combat HIV - but discarded due to its harmful side effects - creates a compound that prevents the virus from gaining a cellular foothold, say Dr. Christian Melander, assistant professor of chemistry at NC State, and doctoral student T. Eric Ballard.

Their findings appear online in the *Journal of the American Chemical Society.*

The drug, a compound known as TAK-779, was originally found to bind to a specific location on human T-cells, which blocks the HIV virus' entry to the body's immune system. Unfortunately, the portion of the drug's molecule that made binding possible had unpleasant side effects. When that portion of the molecule - an ammonium salt - was removed, the drug lost its binding ability.

That's when the researchers turned to gold as the answer. The element is non-reactive in the human body, and would be the perfect "scaffold" to attach molecules of the drug to in the absence of the ammonium salt, holding the drug molecules together and concentrating their effect.

"The idea is that by attaching these individual molecules of the drug with

a weak binding ability to the gold nanoparticle, you can magnify their ability to bind," Melander says.

The researchers' theory proved correct. They started with a modified version of TAK-779, which didn't include the harmful ammonium salt. After testing, they found that attaching 12 molecules of the modified drug (SDC-1721) to one nanoparticle of gold restored the drug's ability to prevent HIV infection in primary cultured patient cells. When only one molecule of the drug was attached to the gold nanoparticle, the compound was unable to prevent HIV infection, indicating that the multivalency of the drug was important for its activity.

"We've discovered a non-harmful way to improve the strength and efficacy of an important drug," Melander says. "There's no reason to think that this same process can't be used with similar effect on other existing drugs."

Source: North Carolina State University