First-of-its-kind approach nanomedicine design effectively targets cancer with decreased toxicity

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Researchers at Brigham and Women's Hospital (BWH) are the first to report a new approach that integrates rational drug design with supramolecular nanochemistry in cancer treatment.

Supramolecular chemistry is the development of complex chemical systems using molecular building blocks. The researchers utilized such methods to create nanoparticles that significantly enhanced antitumor activity with decreased toxicity in breast and ovarian cancer models.

"This work is effectively moving beyond using nanotechnology as drug 'delivery' vehicles to reengineering drugs themselves so that they become nanomedicines." said Shiladitya Sengupta, PhD, MSc, BWH associate bioengineer, and senior study author.

The study is published in this week's issue of the Proceedings of the National Academy of Sciences (*PNAS*).

The researchers used cisplatin—a drug of choice for first and second line chemotherapy—as a template.

They designed a cisplatin nanoparticle that incorporated various components, namely a unique platinum (II) tethered to a cholesterol backbone, that helped foster an environment that facilitated efficient nanoparticle assembly.

The researchers found that the innovative nanoparticles they developed were more effective compared to carboplatin or cisplatin in vitro, and remained active in cisplatin-resistant conditions.

"In the last 30 years, there have only been three platins that have been approved for use in almost all cancers," said Sengupta. "A fourth platin that homes preferentially to the tumor, is more potent, but is safer to use at the same time can have major impact on chemotherapy."

Given that platinum-based chemotherapies serve as the frontline therapy for many cancers, the researchers are optimistic that the increased efficacy and toxicity profile demonstrated by their design may lead to the next generation platinum-based agents in the fight against cancer.

Provided by Brigham and Women's Hospital

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