

# A rod-like nanoparticle drug delivery system for hydrophilic small molecules

## Unmet Need

New strategies to load small molecule drugs into nanoparticles are a powerful approach to improve the therapeutic efficacy of chemotherapeutics, and this has been a successful strategy for overcoming the limitations of poor drug solubility with hydrophobic drugs. While the delivery of hydrophobic drugs remains the most common target when designing nanoparticles, hydrophilic drugs also suffer from rapid renal clearance and premature *in vivo* degradation. Because of these limitations, multiple high-dose injections of hydrophilic chemotherapeutics are necessary to attain a therapeutically relevant concentration in a tumor, but the maximum dose is limited by systemic side effects to healthy organs. Hence, better methods to deliver hydrophilic chemotherapeutics are needed.

## Technology

Duke inventors have reported a nanoparticle drug delivery system intended to improve the therapeutic efficacy of hydrophilic chemotherapeutics. This is a recombinant asymmetric triblock peptide (ATBP) that self-assembles into rod-shaped nanoparticles which can then be used to conjugate diverse hydrophilic molecules. The polypeptides exhibit lower critical solution temperature phase behavior, enabling them to form gel-like depots that increase the half-life of their cargo. Mouse studies have demonstrated significantly longer plasma half-life and better antitumor efficacy using gemcitabine loaded ATBP.

## Other Applications

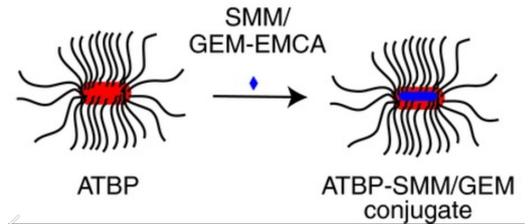
This technology can also be used to improve delivery of hydrophilic imaging agents.

## Advantages

- This technology can improve the delivery of hydrophilic small molecule drugs
- Improved plasma-half life and enhanced tumor accumulation demonstrated in animal studies
- Can deliver a wide range of hydrophilic molecules

# Duke

## LICENSING & VENTURES



## Duke File (IDF) #

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## Links

- [From the lab of Dr. Ashutosh Chilkoti](#)

## College

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## Publications

- [Encapsulating a Hydrophilic Chemotherapeutic into Rod-Like Nanoparticles of a Genetically Encoded Asymmetric Triblock Polypeptide Improves Its Efficacy \(Advanced Functional Materials, 2017\)](#)
- [US Patent App \(16/332,865\)](#)

## Patents

Patent Number: 11,135,301

Title: TRIBLOCK POLYPEPTIDE-BASED NANOPARTICLES FOR THE DELIVERY OF HYDROPHILIC DRUGS

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