INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Heparin Reversal Agents

TECHNOLOGY NUMBER: 2020-227

Accelerate Blue Foundry - 2025 (Life Sciences)

OVERVIEW

Our technology is a new universal heparin reversal agent, identified from a library of molecules that use smart, customizable binding sites anchored on a biocompatible polymer to safely and effectively counteract anticoagulant agents. Our molecule reverses multiple types of heparin anticoagulants—drugs commonly used to prevent and treat dangerous blood clots—addressing an urgent clinical need for safer, more predictable reversal. Further, in contrast to the currently employed reversal agent, our molecule is effective against low molecular weight heparins.

DESCRIPTION

These new agents work by using specially designed, charge-switching chemical groups attached to a safe, body-friendly polymer backbone. The technology allows these positive charges to remain "off" during normal circulation (making them safer and reducing unwanted effects) which then switch "on" to bind and neutralize heparin only when needed. This precise “on-demand” activation is achieved by tuning how and when these chemical groups gain their charge, and by adjusting how closely these charges are spaced on the polymer. The polymer backbone is scalable to multi-kilogram batches.

Heparins (unfractionated heparin, low molecular weight heparins, and fondaparinux) are the most-widely employed anticoagulant drugs for preventing and treating thrombosis (dangerous blood clots) due to their rapid onset of activity, effectiveness, and established safety. , These drugs are commonly used to protect patients undergoing procedures such as surgery or dialysis, and in those at high risk for arterial (including heart attack and stroke) or deep venous thrombosis. However, risk of significant bleeding complications is associated with heparin therapy, which these new reversal agents aim to address by offering safer, more adaptable treatment options. No antidotes are currently available for low molecular weight heparins and fondaparinux.

Our rodent studies have shown safe, dose-dependent, quantitative reversal of heparin in vivo. Furthermore, they support the concept that heparin can be re-administered to patients shortly after reversal if urgently needed.

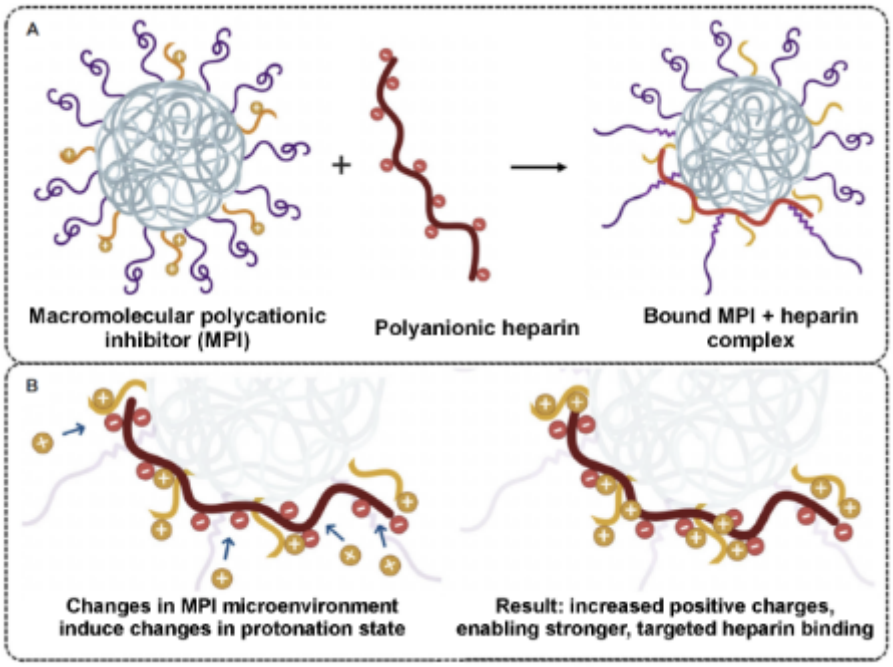
Technology ID
2020-227

Category
Therapeutics and Vaccines
Life Sciences
Accelerate Blue Foundry - 2025/Life Sciences

Inventor
Jim Morrissey

Further information
Stefan Koehler
shkohler@umich.edu

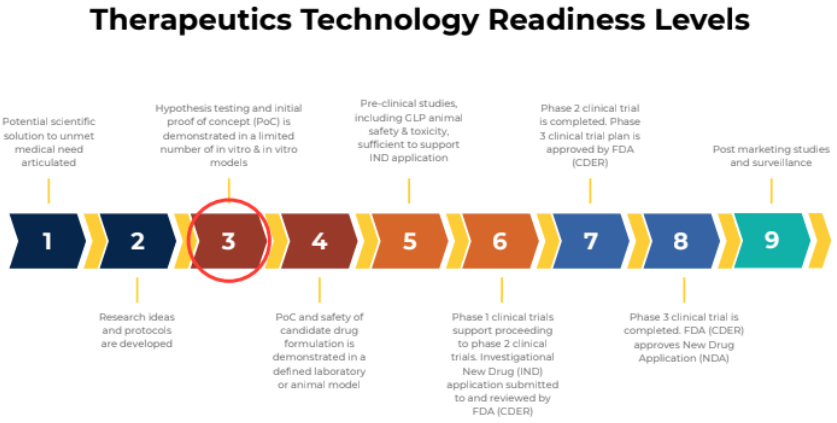
View online



VALUE PROPOSITION

- **Universal Heparin Antidote**: Designed to safely reverse the effects of multiple heparin types (including low molecular weight heparins which currently have no antidote), overcoming the narrow applicability of current heparin antidotes and thus expanding the scope of the treatment.
- **Reduced Side Effects**: The innovative structure remains inactive (low toxicity) until encountering heparin, which minimizes off-target interactions and associated bleeding or allergic complications.
- **Customizable and Safer Dosing**: Tunable chemistry allows for precise adjustment, ensuring effective reversal at higher or lower doses without dangerous over-correction.

TECHNOLOGY READINESS LEVEL



INTELLECTUAL PROPERTY STATUS

Explore other available products test at University of Michigan

Patent applications pending.

MARKET OPPORTUNITY

There is a major clinical and pharmaceutical need for safer, broader-spectrum heparin reversal agents, as current therapies are limited, associated with adverse events, or fail to address all forms of heparin. Hospitals, emergency medicine, cardiovascular surgery, dialysis providers, and drug developers urgently require better antidotes both for routine care and to manage complications or overdoses. This technology could have high impact and commercial value in hospital settings, surgery centers, and among manufacturers of anticoagulant drugs worldwide.

The global anticoagulant market is large and growing (projected over $47B by 2030), with regulators and clinicians seeking improved safety and wider-acting reversal strategies as rates of anticoagulant use rise.

REFERENCES

- "External Trigger Free Charge Switchable Cationic Ligands in the Design of Safe and Effective Universal Heparin Antidote"
- "Smart thrombosis inhibitors without bleeding side effects via charge tunable ligand design"