

Emerging Company Profile**Bind Biosciences: One-step optimization**

By Erin McCallister
Senior Writer

The objective of most drug delivery technologies is to improve safety by targeting therapeutics to specific tissues to reduce systemic exposure, and/or to improve efficacy by preventing degradation of the drug before it reaches its target. **Bind Biosciences Inc.** is working on a nanodelivery technology to do both.

The basis of the technology is familiar: polymer encapsulation combined with surface molecules that act as targeting ligands specific for cells or tissues of interest. But the method of creating the particles allows for the creation of large, screenable libraries and simple, consistent manufacturing of a chosen particle, according to Bind.

"Traditionally, people have taken the approach of making the particle and then attaching the ligands onto the surface, but Bind uses a one-step process that allows us to vary each component to come up with the optimal particle," CEO Glenn Batchelder told BioCentury.

The particles are self-assembled in a single-step chemical reaction. A carboxyl-capped polylactic-co-glycolic acid (PLGA) is conjugated with the amine terminal of heterobifunctional polyethylene glycol (PEG), and the carboxyl end of this polymer is conjugated to the small molecule used for targeting. The resulting complex is mixed with the therapeutic compound, and the two components self-assemble in a water-based precipitation reaction that does not require post-particle conjugation steps.

Bind varies the components before mixture to generate libraries of particles with different characteristics such as particle size, ligand density, charge, hydrophobicity and release profile. The characteristics engineered into each particle ensure that it can evade the immune system upon administration, that the particle has the optimal density of ligands to reach its target, and that the compound is released effectively.

Each library contains thousands of

Bind Biosciences Inc.

Cambridge, Mass.

Technology: Targeted nanoparticle drug delivery

Disease focus: Cancer, cardiovascular, inflammation

Clinical status: Preclinical

Founded: 2006 by Omid Farokhzad and Robert Langer

University collaborators: None

Corporate partners: Undisclosed

Number of employees: 25

Funds raised: \$18.5 million

Investors: Polaris Venture Partners, Flagship Ventures, Arch Venture Partners and NanoDimension Management

CEO: Glenn Batchelder

Patents: 4 issued covering technology to construct, screen and optimize nanoparticles

particles specific for a target of interest. Bind screens the libraries using a set of assays that include physical chemistry, *in vivo* and *in vitro* screens. These screens allow the company to select the particle or particles with the best fit on all parameters.

Co-founder Omid Farokhzad believes the single-step process allows for reliable reproducibility and gives Bind a leg up over step-wise processes used by other companies.

"First they make the particle, then they surface functionalize it to make it stealthy, then they functionalize it to make it targeted. Every step introduces variability," he told BioCentury. Farokhzad is assistant professor of anesthesia at **Harvard Medical School**.

Bind uses small molecules as targeting ligands because they are easier to manufacture and control than proteins or other large molecules, Batchelder said.

The company's small molecule targeting ligands are developed and selected using proprietary chemistry.

Bind's nanoparticles remain in the vascular system until they find the target areas, where they exit via extravasation. This mode of action limits the particles to targets where the tissue is well vascularized. But CSO Jim Wright does not see that as an obstacle in the near term. "We have many more targets and indications to work on before that is an issue," he told BioCentury.

Bind's in-house pipeline will focus on nanoparticles that encapsulate approved small molecules and biologics for oncology, cardiovascular, inflammatory and infectious diseases. Its lead compound, Bind014, is an undisclosed cancer therapeutic in preclinical development. Bind expects to file an IND in mid-2009, with efficacy data expected in 2-4 years.

Products developed through partnerships are likely to be compounds that are still in development, or compounds that were shelved due to efficacy or safety concerns. The company has an undisclosed partnership in the cardiovascular space and will explore additional partnerships over the next 2-5 years.

"We will need a few select partners in order to fully exploit the technology," Batchelder said.

"In the long run, we will not be a one-product company or a delivery company—we will be a therapeutic company," Wright said.

Bind's technology is based on work by Farokhzad and co-founder Robert Langer, an institute professor of chemical and biological engineering at the **Massachusetts Institute of Technology**. The company has an exclusive license from MIT and Harvard to four issued patents to construct, screen and optimize the nanoparticles for different indications.

COMPANIES AND INSTITUTIONS MENTIONED

Bind Biosciences Inc., Cambridge, Mass.

Harvard Medical School, Boston, Mass.

Massachusetts Institute of Technology, Cambridge, Mass.

All press releases, news announcements and story inquiries should be submitted to our news room at pressreleases@biocentury.com. Editorial announcements emailed to the Editor-in-Chief and/or the Publisher may not receive immediate attention and potential stories will be delayed.