

## Arcturus Closes \$5M Series A Round, Aims for Clinic in '15 with RNAi Drug

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By [Doug Macron](#)

**RNAi drugs startup** Arcturus Therapeutics this week announced that it has raised \$5 million in a Series A round of financing, which comes just months after the company pulled in \$1.5 million in seed money.

With the additional funding, Arcturus is now on track to unveil its lead product candidate early next year, with phase I testing beginning as early as 2015, company officials told *Gene Silencing News*.

Notably, the combination of the Series A funding and milestone payments from Tekmira Pharmaceuticals, which is using Arcturus' unlocked nucleobase analog technology in a hepatitis B drug candidate, is expected to give the nascent firm enough resources to move its first product to market without the need for additional financing or a bigger industry partner, Arcturus President and CEO Joseph Payne said.

Arcturus was founded early this year by Payne and CSO/COO Pad Chivukula, both of whom previously worked for Nitto Denko on that company's phase I siRNA-based fibrosis drug. By June, it had secured the seed money necessary to begin work in earnest to refine its proprietary lipid nanoparticle delivery technology ([GSN 6/6/2013](#)).

Looking for RNAi payload technology to go with its delivery vehicles, in August Arcturus announced that it had bought the intellectual property covering UNAs from struggling Marina Biotech ([GSN 8/15/2013](#)).

UNAs comprise acyclic ribonucleoside analogs in which the bond between C2' and C3' atoms is broken. The resultant change in sugar structure is designed to make the analogs flexible and reduce the binding affinity of, for example, siRNA strands. The result is a reduction in off-target effects and a boost in potency.

Since then, Arcturus has been conducting *in vivo* studies with the two technologies and generated data compelling enough to attract the additional investment, both from existing and new investors, in the form of the Series A.

According to Payne, a significant driver of the investor interest was the acquisition of the UNA IP, which not only provides Arcturus with a technology that falls outside of the scope of other companies' patent estates, offering it freedom to operate, but also a revenue stream in the form of Tekmira license payments.

As reported by *Gene Silencing News*, earlier this month Tekmira revealed that it had added an siRNA-based HBV therapy to its pipeline, and that it was on track to file an investigational new drug application on the agent in 2014 (*GSN* [10/10/2014](#)).

While Tekmira's management did not disclose that the drug candidate incorporated UNA technology — Tekmira picked up a non-exclusive license to UNAs from Marina in late 2012 (*GSN* [12/6/2012](#)) — Payne confirmed this week that it does.

As a result, Arcturus is entitled to the milestone payments and royalties Tekmira agreed to provide Marina under their arrangement.

"It's very important for our investors and Arcturus that Tekmira [is] utilizing UNA technology" in its HBV drug, Payne said. "We're expecting substantial revenues [from that license] to begin in 2014 and grow into the millions from then on." Should Tekmira's drug actually reach the market, Arcturus stands to receive "mid-single-digit" royalties on product sales, he said.

"The fact that [we'll be getting] a check to support our efforts is fantastic at such an early age," Payne added.

Alongside a dedicated and "deep-pocketed" investor base, this revenue stream is expected to allow Arcturus to move forward with its drug-development plans without additional dilutive funding and without a partner if necessary, he noted.

Leading those plans is the company's flagship product candidate, which has yet to be publicized but which Payne said is a UNA-modified siRNA molecule designed to treat a rare liver disease with no existing treatment.

"We wanted to pursue an indication wherein we had a high likelihood to succeed," he said, citing the lower regulatory hurdles for orphan drugs. At the same time, the cost of developing and marketing a treatment for a rare disease is significantly less than with a "mainstream indication," meaning that a big pharma partner is not a requirement for commercialization.

In addition to the details of its lead candidate, Arcturus also plans to announced early next year a second in-house drug candidate and, potentially, a third program — potentially in a large indication — that would be conducted with a partner.

And while negotiations are ongoing with a variety of companies interested in partnerships, Arcturus is also working on licensing deals for both the UNA technology, as well as the firm's lipid nanoparticles, Payne said.

Specifics about the delivery technology have not yet been made public, but Payne said that in *in vivo* studies, the company has generated data showing an ED50 at less than 50 micrograms per kilogram with UNA molecules.

"More important than that, at 1 mg/kg and 0.3 mg/kg we're getting almost complete knockdown of the [target] gene *in vivo*," he added. "We believe we have superior technology that is going to capture the attention of the community once we go public with it."

While Arcturus is currently focused primarily on delivery to the liver, Payne said that the company has developed a formulation process that enables the modification of particle size so that they distribute easily to different tissues such as the kidney.

Preclinical rodent data also indicates that the lipid nanoparticles are safe, with no toxicity even with multiple doses, Chivukula said.

Given the nanoparticles' biodegradability, "we see [them] readily clear, which was a huge challenge with early generations of lipid technology," he said.



Doug Macron is the editor of GenomeWeb's *Gene Silencing News*. He covers research and therapeutic applications of RNAi, miRNA, and other gene-silencing technologies. E-mail [Doug Macron](mailto:Doug.Macron) or follow his GenomeWeb Twitter account at [@Genesilencing](https://twitter.com/Genesilencing).