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The SAINT™ Technology: Ideal for DNA, RNA & Proteins?

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Executive Summary

Brian Leuthner
CEO & President, Edge Therapeuitics

Edge Therapeutics: Transforming Off-Patent Drugs Into Targeted, Locally Delivered Therapies for Unmet Medical Conditions of the CNS

Founded in 2009, Edge Therapeutics Inc. is a private, New Jersey-based, specialty pharmaceutical company headquartered at the New Jersey Institute of Technology Enterprise Development Center (NJIT-EDC) Incubator. The company focuses on transforming proven, off-patent drugs into targeted, locally delivered therapies that address unmet medical conditions of the central nervous system (CNS). Typically, current treatments for CNS diseases are given orally or intravenously and are only marginally effective in part because standard delivery methods do not provide adequate and sustained doses of protective drugs at the injury site in the brain. Higher doses that may be more effective cause side effects outside the brain and are unsafe. For many CNS diseases, a new method of delivery is greatly desired.

The Edge Management team brings unparalleled scientific and commercial expertise to the field of neurocritical care. Under the scientific leadership of R. Loch Macdonald (CSO, Co-Founder, and a world-renowned brain scientist and neurosurgeon) along with the commercial leadership of Brian Leuthner (a neurocritical care marketing expert), Edge is developing four preclinical acute care products.

Edge's lead product, NimoGel™, is being developed in collaboration with SurModics, Inc. (Nasdaq: SRMX) to prevent a complication called delayed cerebral ischemia (DCI). DCI is a catastrophic delayed series of events which typically occurs days after subarachnoid hemorrhage (SAH) which is the result of a ruptured brain aneurysm or head trauma. NimoGel is a locally delivered, sustained-release formulation of the calcium channel blocker nimodipine, designed to provide consistent and sufficiently high concentrations in the brain to prevent DCI. Edge has recently completed a proof-of-concept large animal study and expects to enter clinical studies in 2011. *Specialty Pharma* recently caught up with Mr. Leuthner to discuss how Edge Therapeutics plans to translate its preclinical therapies into life-saving medicines by streamlining its path toward clinical efficacy and how the recent Healthcare Reform act may impact Edge's products and the industry.

Q: ***How was Edge Therapeutics founded?***

A: It's often by chance how businesses get started, and that's the story with Edge. I was at an International Stroke Meeting when a mutual neuro-intensivist friend introduced me to my Co-Founder and current Edge Chief Scientific Officer Dr. R. Loch Macdonald. This colleague was aware of my commercial expertise in the neurocritical care marketplace and knew about Dr. Macdonald's 20 years of research exploring the causes and potential cures for secondary brain injury and thought we would be a good match. Little did I know that Dr. Macdonald's research had resulted in almost 500 peer-reviewed published articles. So after a few phone calls and a few years later, Edge was born. Shortly thereafter, Co-Founder Carl Soranno, Esq. brought a business development and contract negotiations background to round out the team.

Q: ***Can you please describe Edge's products and the needs they address?***

A: Despite major advances in medical care throughout the past few decades, there are still many acute CNS diseases in which patient outcomes could be improved if there was an effective way to overcome the limitations of systemic drug delivery. The most

common limitation of systemic delivery is the inability to get appropriate and sustained drug concentrations at the injury site without causing unwanted side effects in other parts of the body. Lack of effective treatments continues to cause death, disability, increased hospital costs, and increased cost to societies around the world.

Edge believes that local, sustained-release delivery of medicine directly to the injury site would prevent certain delayed complications, improve patient outcomes, and significantly reduce healthcare costs.

The first CNS disease Edge is addressing is the aforementioned delayed cerebral ischemia (DCI), which starves the injured brain of oxygen.

The clinical course of DCI all too often ends with catastrophic consequences. For example, a not uncommon situation is exemplified by a 40-year-old mother of three small children who arrives at the Emergency Department describing a "thunderclap headache," the worst headache of her life, similar to how television personality Bret Michaels recently described his subarachnoid hemorrhage. Shortly after her arrival, doctors perform an angiogram and discovered a ruptured brain aneurysm. Despite this bleeding, cerebral blood flow is still sufficient to serve the oxygen needs of her brain. After undergoing neurosurgery to secure and stop her bleeding aneurysm, she begins recovery. Three to four days following surgery, she is progressing well and talking to her family. On day 7, things take a turn for the worse and later, depicted in her angiogram, this woman developed cerebral vasospasm, despite doctors' best efforts to save her, she dies, leaving her husband and three small children. That's why DCI is so devastating; patients and their families might believe they are out of the woods, and this terrible delayed complication arrives with devastating effect.

Today, current treatment to improve patient outcome consists of giving a drug called nimodipine either orally or intravenously. Unfortunately, oral nimodipine treatment is only marginally effective because it does not achieve appropriate concentrations at the site of injury to prevent DCI. Higher doses that might be more effective cause dangerous side effects in other parts of the body, such as low blood pressure (hypotension) and fluid pooling in the lungs (pulmonary edema). Despite current improvement in medical care, nearly two-thirds of patients die or suffer permanent brain damage by day 30. However, it appears that the problem is not the drug nimodipine; it is a drug delivery problem.

Edge is overcoming systemic limitations of oral nimodipine with NimoGel. NimoGel consists of the generic calcium channel blocker nimodipine formulated in a proprietary biodegradable polymer carrier composed of FDA-approved materials. It can deliver apprpriate and sustained nimodipine concentrations to the site needed in the brain, without causing unwanted side effects in other parts of the body. The medicine is delivered during standard brain surgery, so the change in neurosurgical practice is minimal.

Q: ***What is the potential market size for NimoGel, and how does Edge plan to address it?***

A: According to the World Health Organization and estimates from other brain injury organizations, 2 million people each year are at risk of DCI, generally caused by a ruptured brain aneurysm or head trauma. Typically, these at-risk patients are younger adults in their 30s, 40s, and 50s in the prime of their lives, and many will be dead or permanently brain damaged within 30 days. Blast vasospasm, another type of vasospasm caused by blast waves from improvised explosive devices, is also a major concern for military doctors and an area of intense interest for the Department of Defense.

Because all of Edge's current products target well-defined patient populations that are already stabilized and under the care of neurosurgeons or neurointensivists at major urban hospitals, this affords easy access with a small specialty sales force.

Q: ***What other products does Edge have in the pipeline?***

A: In addition to NimoGel, Edge has a robust pipeline. Upon obtaining additional funding, Edge plans to advance EG-1964 into preclinical development. EG-1964 is another locally delivered treatment to prevent another type of secondary brain injury after a subdural hematoma. EG-1960 is a locally delivered treatment to prevent hematoma expansion, another secondary complication following another type of brain hemorrhage. All products have worldwide sales forecasts in excess of $500 million.

Q: ***How is Edge funding clinical development?***

A: To date, Edge has raised almost $1.5 million from private investors and through grants. In late 2009, Edge was awarded a $500,000 grant from the New Jersey Commission on Science and Technology, and another $100,000 in a convertible note from the New Jersey Economic Development Authority and is currently awaiting results from NIH and State grant applications. We also recently spoke to physicians at the Department of Defense (DoD) and received high interest for all of our products and will be pursuing DoD funding later this year. In the future, Edge will rely on private investors, non-dilutive financing, strategic investments, and venture capital investments to fund clincal development.

Q: ***What role is there for partnerships and licensing in Edge's business model?***

A: Edge's business strategy has been clear since its inception: develop products alone or in partnership with other companies through Phase II clinical trials and generate significant value for its shareholders by (1) acquisition or collaboration with a larger pharmaceutical company, (2) a structured deal via private equity, or (3) through a public offering. So to answer that question, partnerships and licensing will play a significant role for Edge Therapeutics and at the end of 2012 or early 2013, we expect to have proof-of-human efficacy and safety information in approximately 50 patients with NimoGel.

Edge is well positioned to take advantage of the patent cliff that many larger pharmaceutical companies will be approaching in 2014 and 2015. The fact that our business model takes a streamlined regulatory and clinical path, and the way in which our products are already de-risked, with proper funding, Edge could have three different $500-million specialty products ready for US launch in 2015 or 2016.

Q: ***What has Edge accomplished in the 18 months since its inception?***

A: In the short time since its founding, we have accomplished several meaningful milestones including the folowing:

- Demonstrated proof-of-concept for NimoGel in a large animal model of subarachnoid hemorrhage.
- Raised $600,000 in non-dilutive grant funding.
- Established SurModics to be our formulation development company in February 2010.

Since signing the agreement in February, Edge and SurModics have successfully achieved important development milestones including:

- Encapsulated nimodipine in polymer microspheres.
- Developed multiple formulations optimizing initial and sustained-release of drug.
- Demonstrated that nimodipine microspheres can be terminally sterilized by gamma irradiation.
- Manufactured initial scale-up batches.

Following NimoGel optimization and additional scale-up, Edge expects to complete its IND-enabling study in 2011.

Q: ***What is the long-term objective of the company?***

A: Edge's vision is to be a drug development company. We believe there is a need for small companies to translate promising ideas into potentially life-saving therapies. Right now, we are extremely focused on advancing NimoGel into the clinic, and depending on the results, will consider its options, including early licensing of its products or selling of the entire company.

In the future as we grow and continue to demonstrate to others our ability to rapidly and cost-effectively advance products through Phase II and then sell or license the products to larger pharmaceutical companies, we believe our product development opportunities will grow.

Edge knows drug development is a risky business, but we also know there are patients and families who are depending on companies like Edge to come up with new treatments to change the way medicine will be practiced in the future.

Q: ***What impact might the new healthcare reform legislation have on Edge?***

A: What this new bill says to me is that spending research dollars on incrementally better drugs will stop. I believe the FDA and payers have already begun to set the bar higher for pharmaceutical manufacturers with regard to FDA approvals and also with an eye on reimbursement. I believe in the future, there will be significantly more scrutiny on costs, getting closer to the European markets, where getting a drug approved by the regulatory agencies is the first step, and getting the drug reimbursed is the most important step. At Edge, all of our products address large, unmet medical needs that cost society billions of dollars annually in direct healthcare costs. The indirect healthcare costs, such as loss of productive work years and long-term care costs, may be as much as four times direct costs as several of the conditions our drugs target strike people in their 30s, 40s, and 50s and leave 70% to 80% dead or permanently brain damaged within 30 days.

One recent study published in August 2010 out of Duke Medical Center concluded that patients who suffer severe vasospasm (part of just on the biochemical pathways that leads to DCI) have approximately $40,000 in additional direct hospital costs. Applying their numbers to the different severities of vasospasm, annual US direct costs of vasospasm exceed $1.3 billion. If NimoGel could just prevent 50% of the cases of vasospasm, it could save over $600 million annually in direct US healthcare costs and obviously improve the outcomes of many patients and their families. ■