



President: Zachary G. Forbes  
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## Executive Summary

Magnetic BioSystems (MBS) is proud to be developing a minimally invasive, targeted drug delivery system that uses magnetic implants and magnetic nanoparticles to administer repeatable and patient specific dosages of therapeutic agents to specific sites in the human body. Our primary application will be the development of a magnetic stent for treatment of restenosis, but future applications include magnetic implants for treatment of tumors, aneurysms, and other medical conditions. The magnetic stent provides a unique advantage in that drugs, gene vectors and other therapeutic substances, encapsulated inside magnetic nanoparticle carriers, can be administered by simple injection and trapped in high concentration near chosen sites in the body. Magnetic nanoparticles are an ideal vehicle for carrying drugs, since they can be injected into blood vessels without causing blockages or interfering with normal cardiovascular functioning. However, past attempts at localizing the nanoparticles have been unsuccessful because insufficient magnetic force could be applied. Through the use of internal implants patterned with tiny magnetic features, MBS technology has overcome past difficulties and has demonstrated for the first time the capture of a significant percentage of injected magnetic nanoparticles, sufficient to elicit a therapeutic response while minimizing toxicity to the rest of the body.

The first goal of MBS is to provide the physician with improved capabilities for treating cardiovascular disease in order to reduce the frequency of restenosis and return trips to the emergency room. In the proposed design, conventional stents made from 316L Stainless Steel or Nickel-Titanium, will be coated with magnetic materials. The magnetized stent is used to capture injected magnetic nanoparticles that are carrying desired drugs. The primary advantage over existing technology is that the doctor has the choice to administer tailored dosages of drugs and/or "drug cocktails" at future check-ups, depending on the patient's medical history and current symptoms.

The technology is owned by Drexel University, and MBS plans to "license-in" and improve upon this technology, while continuing to develop new proprietary technologies to compliment its existing technology base. As an L.L.C, MBS will "license-out" its intellectual property to established interventional cardiovascular device manufacturers, such as Guidant, Medtronic, Boston Scientific, and Johnson & Johnson. The revenue model is based on licensing royalties and contracting/consulting fees for MBS engineers. The total seed capital estimated for pre-clinical proof of concept stages is estimated to be \$1,000,000, obtained from local biotechnology initiatives, Small Business Innovation Research (SBIR) grants or Small Business Administration (SBA) guaranteed loans.

MBS plans to establish its niche in the medical device market of the Healthcare industry, and in emerging markets in cooperation with pharmaceutical companies to test new and potentially-life saving drugs. The US stent market alone is estimated to surpass \$10 billion over the next five years. Boston Scientific, one target licensee for the technology, currently controls 70% of the US stent market. As a conservative estimate, the goal for the first year of eventual product launch is to capture only 10% of the market. According to the licensing plan, MBS would be entitled to 5% of sales (approximately \$25 million in the first year) in exchange for the rights to develop and produce the magnetic stent and use the drug delivery system. In the medical device industry, this fee can reach 10%, but a 5% rate was selected based on our early stage of development and the desire to obtain an up front licensing fee. The fee selected is well below the 5% estimate of expected total revenues MBS would earn upon introduction into the US market. The first 1-2 years of operation is scheduled as a ramp up period with no revenue and with the hope of establishing contracts with a medical device manufacturer in the beginning of the second year.

The strength of Magnetic BioSystems is its expertise in magneto-mechanical systems, and its imaginative approach to integrating functions into biomedical devices. Along with Drexel University, MBS is currently in pursuit of multiple patents, and has numerous pieces of technology in legitimate proof-of-concept phases. As a business, its most promising technology is the magnetic stent. The conventional stent is already an FDA-approved product that has demonstrated vast improvement in the patient's quality of life through non-invasive surgical procedures, and MBS hopes to expand upon this technology. This product fortuitously finds a home in a substantial market, which gives MBS the ability to obtain high financial yields in the short term. The founders are well-educated, experienced entrepreneurs who are as familiar with the conference room as the laboratory. MBS is rooted in a wonderful academic environment in Drexel University, and is guided by experienced professors with faith in MBS technologies.

The MBS management team consists of company founders, Zachary Graham Forbes (President), and Benjamin Biron Yellen (VP). Zach Forbes is a Duke University Biomedical Engineering graduate, with an M.S. in Biomedical Engineering from Drexel University, and is planning to earn his Ph.D. in Biomedical Engineering in Spring 2005. He has management and industry experience from prior employment, and successfully operated a small business for 5 years. Benjamin Yellen is an expert in the field of magneto-mechanical systems and multi-body colloidal interactions, earning his Ph.D. in Electrical Engineering from Drexel University in September 2004. He successfully operated his own small business from 2000-2001.