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The science & business of drug development in specialty pharma, biotechnology, and drug delivery

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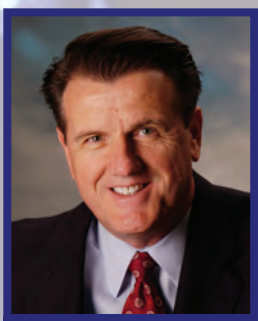
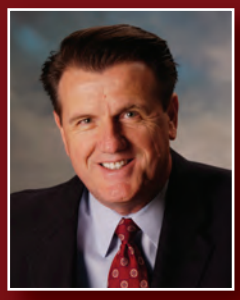


INTERVIEW WITH 4P THERAPEUTICS' FOUNDER STEVEN DAMON

DRUG DEVELOPMENT Executive

4P THERAPEUTICS: DEVELOPING NEW & INNOVATIVE TRANSDERMAL PRODUCTS



Steven Damon
Founder
4P Therapeutics

"Our in-house capabilities allow us to work with proven preclinical models either in vitro or in vivo and have the capability to move quickly to the clinic with a technology and formulation tailored for each specific transdermal product. We believe that the keys to success in the novel transdermal space are having the freedom to choose from multiple technologies and not be burdened with a one-size-fits-all platform technology as well as having world-class experience in transdermal formulation and product development."

In today's market, patent losses and faltering pipelines are causing pharmaceutical companies to reposition currently marketed drugs through reformulation using novel drug delivery technologies. In addition to reformulating products for lifecycle management, pharmaceutical companies are combining drug delivery technologies with their NCEs early in development. 4P Therapeutics is taking advantage of these market trends by providing its partners with novel drug delivery technologies and expertise in product development with fully integrated capabilities. Founded in 2012, 4P Therapeutics is a privately held company based in Atlanta, GA, focused on the development of innovative transdermal products. The company's team of scientists has vast experience in developing drug delivery products ranging from conventional transdermal systems to novel transdermal systems , utilizing technologies such as skin poration and microneedles. The company's team also has experience with developing oral drug delivery technologies, medical devices, diagnostics and vaccines. Drug Development & Delivery recently spoke with Steven Damon, Founder of 4P Therapeutics, to discuss his vision for the company and how 4P intends to create new and innovative transdermal products that meet the needs of patients, physicians, and payers.

Q: Can you provide our readers with some additional background on 4P Therapeutics?

A: We founded 4P Therapeutics to be a company based on taking innovative approaches to developing new transdermal products. 4P is not dependent on a specific platform technology but instead evaluates multiple different transdermal technology and formulation approaches to find the right match for a particular drug or biologic product being developed. Our in-house capabilities allow us to work with proven preclinical models either in vitro or in vivo and have the capability to move quickly to the clinic with a technology and formulation tailored for each specific transdermal product. We believe that the keys to success in the novel transdermal space are having the freedom to choose from multiple technologies and not be burdened with a one-size-fits-all platform technology as well as having world-class experience in transdermal formulation and product development. Current industry dynamics for transdermal product development and commercialization have led us to create a business model for 4P that takes advantage of our

own proprietary technology as well as the freedom to operate with multiple technologies. 4P has built an infrastructure that allows our experienced team to go from concept to proof-of-concept in humans in our Atlanta, GA, facility.

The 4P Therapeutics team is experienced in developing a broad range of drug delivery technologies, particularly novel transdermal technologies for compounds that are currently injected or administered by SC or IV infusion. These compounds consist of biologics, including proteins, peptides, other large molecules and water-soluble small molecule drugs that cannot be delivered using conventional transdermal systems. The team's experience in developing drug delivery products ranges from conventional transdermal systems for drugs such as nicotine, fentanyl, hormones and other small molecules to novel transdermal technologies, such as skin poration and microneedles for water-soluble drugs and macromolecules that are typically injected. The company's team also has experience with developing vaccines, medical devices and diagnostics.

Q: What are the opportunities in the drug delivery arena today?

A: Researchers have estimated that patent expirations will result in many billions of dollars of lost sales of branded products. These patent losses coupled with some faltering pipelines and expensive and risky development plans for NCEs create opportunities for and interest in the benefits of products enhanced by drug delivery through reformulation or a change in the route of administration using novel drug delivery technologies. Products using drug delivery technologies are designed to potentially enhance efficacy, improve safety, and extend patent lives for currently marketed products. This focus on drug delivery technologies provides a significant opportunity for 4P Therapeutics.

Q: What are the market opportunities for 4P Therapeutics?

A: As pharmaceutical companies continue turning to drug delivery technologies to develop new products, we undoubtedly believe novel transdermal products offer an attractive option for many drugs and biologics. Oral products remain simple and easy to use and are preferred by patients and physicians. However, market research has shown a strong preference for transdermal products as well. Transdermal versions of currently marketed oral, nasal and/or inhaled products may have value. Transdermal products that replace injections or infusions should be widely accepted by patients and physicians, and we believe they represent the best opportunities for growth in the transdermal space. The key is to understand the opportunity as it relates to all stakeholders, including patients, physicians, and payers. The goal is to develop products that have real market value while staying within the appropriate development spend and cost of goods necessary for a successful commercial product. 4P Therapeutics is positioned with the experience and capabilities to take advantage of the real opportunities in transdermal product development.

We are seeing a focus by pharmaceutical companies on the use of transdermal drug delivery technology to reposition currently marketed products and bolster their pipelines. We are also seeing an interest in the use of transdermal technology to deliver NCEs early in the clinical development program prior to pivotal safety and efficacy studies. 4P is uniquely suited to support our partners with proof-of-concept work early in the development program to provide direction for further product development.

Q: What makes 4P Therapeutics unique in developing drug delivery products?

A: Many companies in drug delivery consider themselves unique. The challenges we all face in developing drug delivery-enhanced products are often specific to a certain drug and/or therapeutic area. 4P Therapeutics has the expertise in developing various novel transdermal technologies and products. These include

products based on small molecules, proteins, peptides, carbohydrates, that are injected, infused, or otherwise delivered. We believe a key uniqueness is our ability to quickly and efficiently move through the proof-of- concept phases of development with minimal spend and major risk reduction before underwriting the high-cost pivotal studies that are required for regulatory approval.

In our approach to partnering with companies to develop new transdermal products, 4P Therapeutics utilizes our highly efficient "concept" to "proof-of-concept" model to assess the delivery of a drug using a transdermal technology. The model is designed to establish preclinical feasibility followed by proof-of-concept in human clinical trails – both conducted within our Atlanta-based facility. Potential partners interested in developing products with 4P Therapeutics are not required to invest significant capital and resources upfront. This step-wise approach has contributed to 4P Therapeutics' success with our partners.

Q: Can you explain further on your company's "concept" to "proof-of-concept" model?

A: Sure. Our model consists of efficient in vitro and in vivo screening to determine the feasibility of delivering a compound in preclinical and Phase I clinical studies. As an initial step, and based on our experience and knowledge of multiple transdermal technologies, we will determine the feasibility of delivering a compound through the evaluation of the compound's chemical characteristics and delivery requirements such as dose, pharmacokinetic profile and regimen. Additionally, our team has the expertise in selecting the technology that presents the best probability for development success before moving into in vitro testing.

After completing the in vitro testing phase, 4P Therapeutics conducts feasibility testing in our preclinical models. We optimize the formulation to meet the target delivery profile before moving into clinical proof-of-concept studies in human subjects. 4P Therapeutics has in-house capabilities to conduct these feasibility studies, including a vivarium for preclinical work and a Phase I clinical unit. In addition, we have formulation development and bioanalytical/analytical capabilities in-house, allowing us to obtain high-quality data with a rapid turnaround time.

Q: Are you able to discuss an example of one of your current collaborations?

A: 4P Therapeutics has entered into multiple partnerships with companies ranging from a global healthcare conglomerate to small biotech companies and academic institutions. An example would include our partnership with Medicure International, Inc., a specialty pharmaceutical company headquartered in Canada. The partnership with Medicure is initially focused on developing a transdermal patch for Aggrastat® (tirofiban HCl injection for intravenous use), Medicure's lead product currently marketed for the treatment of acute coronary syndrome.

4P Therapeutics initially partnered with Medicure to demonstrate the preclinical feasibility of delivering tirofiban transdermally as an alternative to its current IV delivery. After successfully completing the feasibility studies, 4P Therapeutics and Medicure entered into a product development and commercialization partnership. This approach allowed Medicure to assess the preclinical feasibility of delivering tirofiban transdermally and offered the flexibility to generate valuable data before entering into a broader partnership with 4P Therapeutics and committing additional resources to the project. This development program presents an important lifecycle management strategy for Aggrastat. Drugs in the Glycoprotein IIb/IIIa inhibitor class (GPI), including tirofiban, are currently only available for IV delivery. Transdermal delivery of a GPI promises to offer several benefits over IV delivery, including ease of administration using a transdermal patch that can potentially be self-administered, possible reduction in hospital length-of-stay to lower healthcare costs, and the potential for new indications that could lead to additional market penetration. 4P Therapeutics and Medicure have demonstrated in vivo proof of concept for transdermal tirofiban delivery. The

development program is now focusing on refining the transdermal tirofiban delivery system in preparation for initial human studies.

Q: What is the market potential for Medicure's transdermal tirofiban?

A: The global market for antiplatelet drugs is more than $8 billion per year, of which Aggrastat and the other IV GPIs make up approximately $500 million per year. The largest share of the market is held by oral antiplatelet drugs, such as Plavix® and Aspirin®, which by virtue of their route of administration can be used in a variety of settings in which IV administration is not feasible. While these treatments will continue to serve an important role in cardiovascular therapy, the use of oral antiplatelet drugs for some patients and conditions is limited by a number of drawbacks, including inter-individual variability, drug resistance, drug-drug interactions, and delays in reversal of effect. Transdermal tirofiban has the potential to avoid these problems and to carry the unique benefits of a GPI, including the ability to dissolve and to directly prevent formation of blood clots. For this reason, transdermal tirofiban has the potential to capture a significant share of as well as grow the GPI market.

Q: Does 4P Therapeutics have experience and capabilities for product development beyond proof-of-concept?

A: Yes, in addition to our efficient model to demonstrate preclinical feasibility and proof- of-concept in human subjects, 4P Therapeutics offers a complete solution for product development, ranging from preclinical to commercialization. The company's integrated capabilities include in-house preclinical feasibility, analytical sciences, bioanalysis, CMC development, QA/QC, pilot manufacturing, clinical development, regulatory affairs, and strategies for the development and registration of combination products. As mentioned previously, our Atlanta-based facility is equipped with a vivarium for preclinical testing, an in-house Phase I unit for clinical studies, laboratories for CMC development, and a pilot manufacturing facility for process development and early stage clinical manufacturing. Additionally, our team has experience with supporting late-stage clinical and commercial manufacturing.

Q: What should we expect from 4P in the future?

A: We have begun development of our own proprietary transdermal products. Now that we have established our capabilities and supporting partnerships, we are excited about 4P internal projects that are focused on some of our own ideas for valuable products with clinical and therapeutic benefit. We also recently acquired the rights to a continuous glucose monitoring technology we believe has great potential. In the future, we expect to successfully advance our partnerships and projects with the goals of getting multiple products approved and marketed.

Q: Why should a company partner with 4P Therapeutics?

A: Our team has experience with developing drug delivery products through clinical development with various pharmaceutical partners. These development projects include reformulation of currently marketed products to be delivered transdermally and the application of transdermal technologies for delivering NCEs still early in development. A primary focus is on developing novel transdermal products for compounds that have to be injected or infused and cannot be delivered using conventional transdermal systems. This expertise, coupled with the dynamics of today's pharmaceutical market, make us an ideal partner for companies seeking to develop new products to offset generic competition and to build pipelines. 4P Therapeutics can leverage its experience in drug delivery to successfully develop products designed to meet the needs of patients, physicians and payers. ◆

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