ENABLE INJECTIONS AND FLEX SET AMBITIOUS PLANS FOR LARGE VOLUME DRUG DELIVERY

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The delivery of high volumes of biologics outside of the clinical setting remains a key challenge in the industry. Here, John Love, Vice-President of Product Development and Operations, Enable Injections, Mark Lee, PhD, Health Solutions Group Chief Technology Officer, Flex, and Amy Boyle, Vice-President of Marketing, Flex, discuss how the enFuse™ on-body injector, developed by Enable in partnership with Flex, may be the answer.

Enable Injection's enFuse™ drug delivery technology is set to redefine the standard of wearable injection devices (Figure 1). However, unlike many disruptive new medical device concepts, which often demand a change to practice, enFuse does not. It achieves great strides towards the goal of infrequent, large-volume injections of biologics, is easy to use and has wide-ranging benefits that are immediately evident. It can deliver large doses – up to 50 mL (Figure 2) – of the most viscous biologics subcutaneously, with no needle in sight and with minimal to no discomfort.

Figure 1: Enable's enFuse high-volume wearable injector technology.

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enFuse allows health facilities to treat more patients who either choose or need treatment in the clinic, freeing up nursing time and increasing patient throughput and saves healthcare systems money whilst doing so. It allows pharmaceutical companies to decrease their drug development time and extend their commercialised products' lifecycles. It allows patients to potentially skip the infusion centre once therapy has been established and

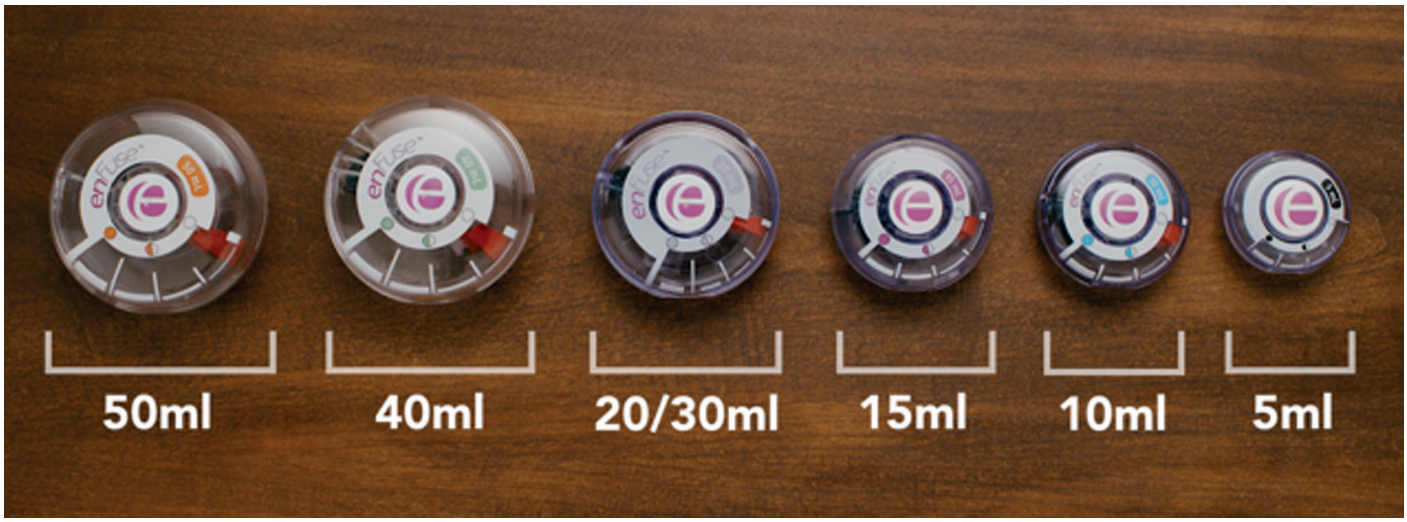

Figure 2: The enFuse platform handles dose volumes from 5 mL through to 50 mL.

self-administer their prescribed biologic at home or work, in a way that is easier, more comfortable and more convenient than intravenous (IV) administration and, most importantly, enFuse allows them to have agency over their own treatment and improve their quality of life.

Armed with the smallest, most advanced connected technology platform available for delivery of high-volume biologic drugs, Enable Injections is showing all the tell-tale signs of a startup that can meet the demands of the rapidly expanding industry for large-volume wearable injectors. Enable has an in-house manufacturing facility, as well a partnership with major international contract manufacturer Flex for the large orders anticipated, and a swiftly increasing number of development projects and feasibility studies.

enFuse is a technology that could result in better patient care in terms of improved compliance that will likely lead to better outcomes and enhanced patient satisfaction.

RISING DEMAND FOR COMBINATION PRODUCTS

A new, patient-centric way to administer the ever growing number of large-molecule biologics, as presented by enFuse, is sorely needed. Thus, combination products have been trending in the pharma market to catch up with this unmet need. According to Grand View Research, the drug-device combination market is expected to reach US$178 billion (£127 billion) by 2024. The research firm says it expects an "unprecedented adoption rate of these combination products" as a consequence of their many benefits.

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THE ENABLE – FLEX PARTNERSHIP

Anticipating the high adoption rate of this new technology, Enable Injections sought out the world's largest medical device contract manufacturer, Flex. Flex's expertise in the miniaturisation of electromechanical pump systems, precision plastic moulding and connectivity technology supports present and future generations of the innovative enFuse delivery device platform, developed by Enable based on dozens of human factors studies for ease of use and patient comfort.

In particular, Flex's skill at miniaturisation ensures one of enFuse's major differentiators: its small size. The 10 mL device is about the size of an Oreo cookie, which makes the wearable large volume injector comfortable for any sized person to wear while carrying on with their day-to-day, no longer tethered to an IV at an infusion facility (Figure 3).

Flex's singular, rigorous quality system, conditioning know-how and large-scale manufacturing capabilities made the company an ideal partner to address manufacturing complexity and scalability. Their collaboration and joint engagement to establish material handling, pre-control of critical variable signals and manufacturing

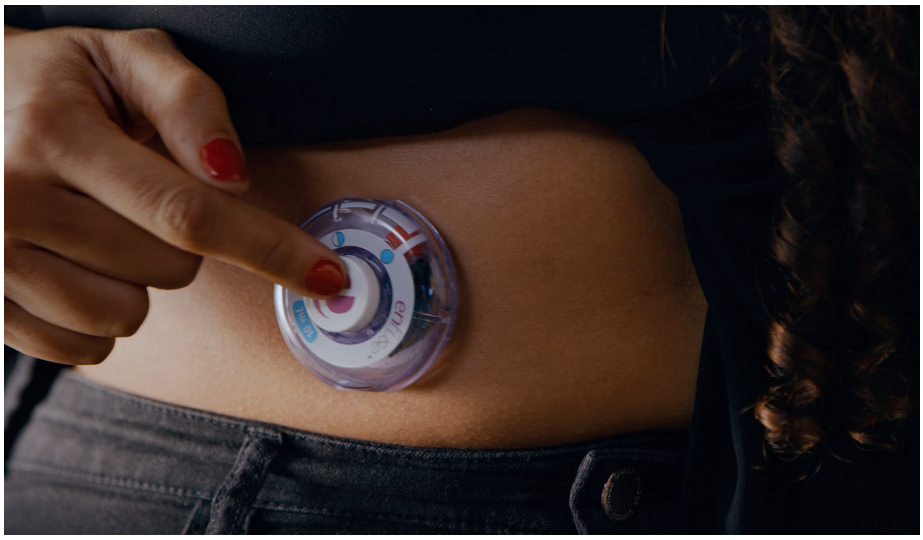

Figure 3: enFuse is small, convenient and comfortable.

requirements during the design phase set the stage for successful manufacturing from the very beginning. In addition, Flex has experience in combination on-body devices, ISO 11608 and regulatory requirements. Flex and Enable's partnership also helped to develop a competitive cost of goods across unique components, precision plastics, automated assembly and device packaging.

Through to this partnership, Enable's enFuse device boasts a full suite of digital health and connectivity capabilities, powered by Flex Digital Health's fully HIPPA compliant BrightInsight™ platform. These features provide avenues through which usage and compliance insights can be gleaned and patient's outcomes can be improved. This innovation expands market opportunities, allowing Enable's pharma partners to provide greater therapeutic value to their patients by facilitating a more outcomes-based approach to treatment decisions.

PROGRESS TOWARDS MARKET

After the companies collaborated on design, the work transitioned back to Enable in 2017 to prepare the versatile platform for clinical trials. As demand from pharma increases, Enable will provide clinical builds and initial production from its Cincinnati HQ and then transfer high volume production to Flex.

A Growing IP Portfolio

A series of granted patents and pending applications in the US, Europe and Asia-Pacific for Enable Injections' enFuse On-Body Delivery System technology solidifies the company's position as a leader in the large volume wearable drug delivery market. The most recently granted is a relatively rare utility patent issued by the US Patent and Trademark Office.

Development And Feasibility Studies

Enable has engaged with most pharma companies, from small start-ups to well-established global players. Extensive feasibility studies evaluating device performance and patient acceptance have been conducted, resulting in several development projects to date. Discussions are ongoing with current and future pharma partners to extend the collaboration to more products in the near future.

Ensuring Cost-Effectiveness

From the beginning, the development of enFuse focused on final product costs to maximise return on investment (ROI) for Enable's pharma partners. Utilising Flex's strength in global supply chain management and a continuous improvement mindset, the companies have developed a five-year strategy to ensure timely market entry of a product at a competitive price.

Built-In Technology Transfer

In drug development, time is always of the essence. As the patent life of newly discovered drugs continues to shrink, drug developers are forced to minimise drug development time. One bottleneck that often delays time to clinic is technology transfer. Manufacturing transfer expertise is essential to quickly ramp-up production for launch execution. In the event of earlier than expected regulatory approvals or accelerated adoption, special expertise and flexibility in production ramp-up speed is required.

The close collaboration between Enable and Flex ensures minimal production delays. When large volume production of enFuse units is required, it can be quickly integrated into any one of Flex's international production facilities with Class 8 cleanrooms. Technology transfer is built in for rapid response to pharma needs.

INTEGRATE DELIVERY EARLY IN DRUG DEVELOPMENT

The enFuse platform is available now for faster drug development and for investigational use. Nearly 60% of pharmaceutical combination product experts say that the time to add the delivery device constituent is in early stages of drug development. Introducing a delivery platform at the early clinical stage provides an opportunity to engage patient populations that much sooner, improving the product's ability to meet patient needs and thereby improving the likelihood that the outcomes align with the expectations of governments and payers. It also enables the pharmaceutical company to answer contextual questions regarding the patient sooner, and thus decrease cycle time for new product development.

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An early start will also reward formulation teams. Today's more advanced technologies and wearable devices can reduce time to market by months or even years. They provide the means to more easily:

- Deliver drug product in high volumes
- Deliver much higher viscosities
- Address biologics' greater propensity to precipitate out of solution.

PATIENT TREATMENT EXPERIENCE

From the patient perspective, how a drug is delivered (method, frequency, device, etc) is often the defining element of the treatment experience. In today's clinical trials, the patient should always be at the centre. It's become much more important to have the treatment experienced by someone representative of the target patient population. Physiological data is of course gathered, but patients are now reporting back on how the treatment experience feels, how it could be made easier for them and what they liked and disliked about it.

In pharmaceutical company patient panels, enFuse was preferred to many other delivery methods, primarily due to its comfort and convenience.

LOOKING AHEAD

The result of the Enable – Flex partnership is an advanced, patient-centric biologics delivery platform that is an effective therapeutic solution to delivering high volume biologic drugs. The world's ageing population and rising incidence of chronic diseases has made the need for a product like enFuse inevitable. The need to reduce healthcare expenditures along with the increasing popularity of point-of-care treatments are also fundamental shifts underlying the rapid growth in the drug-device combination products market.

Looking forward to advances in on-body delivery device combination products, we can expect more connectivity to improve user experience, disease management, provider and caregiver interaction and communication with an electronic health record (EHR). Now and in the future, pharmaceutical companies can employ these innovative products with very low risk and cost of entry.

ABOUT THE COMPANIES

Enable Injections is a late-stage start-up company that has developed a disposable wearable injector to deliver high-volume, high-viscosity biological drug products (up to 50 mL) to the subcutaneous tissue. The system uses standard container closures (syringes or vials) and can automatically mix solutions or solubilise lyophilised product. Founded by medical device veterans the company has R&D, operations and manufacturing facilities in Cincinnati, OH, US.

Flex is the Sketch-to-Scale™ solutions provider that designs and builds Intelligent Products for a Connected World™. With approximately 200,000 professionals across 30 countries, Flex provides innovative design, engineering, manufacturing, real-time supply chain insight and logistics services to companies of all sizes in various industries and end-markets. Flex partners with a broad spectrum of healthcare OEMs to provide complete innovation, design, build, service and data solutions that make its customers more competitive in the areas of medical devices, drug delivery, diagnostics and medical equipment.

ABOUT THE AUTHORS

John Love is Vice-President of Product Development and Operations at Enable Injections. He has over 30 years of leadership, R&D and operations experience in the medical device industry. Prior to joining Enable Injections, he was VP of Operations at Triangle Manufacturing, directing a 240-person medical device CNC contract manufacturing facility. He has also held executive positions in R&D, engineering, operations, quality, regulatory and medical scientific affairs at Aesculap Implant Systems, Cordis Corporation, Novoste Corporation, Ethicon Endo Surgery and Baxter Laboratories.

Dr Mark Lee, PhD, is Chief Technology Officer at Flex's Health Solutions Group. His responsibilities cover human-factors-based user needs definition through innovation and design, ramp-up, full scale production, and supply chain management. Prior to Flex, Dr Lee was the Global Head of R&D for Johnson & Johnson, where he led research and development activities across the pharmaceutical, medical device and consumer health segments and identified new growth areas. Dr Lee has also held leadership roles in R&D with fortune 100 medical device companies including Baxter, GE medical and Amgen, where he developed the combination product design process for all of Amgen's pipeline molecules.

Amy Boyle is Vice-President of Marketing at Flex Health Solutions Group. She leads business development, promotional efforts, education and business growth strategy for all of Flex's health related business. Prior to joining Flex, Ms Boyle filled executive global marketing roles at Coloplast, IMRIS, St Jude Medical, and Medtronic. Over her career, she has launched well over 100 products and created and led associated market development and education initiatives.

Meet enFuse™

Actual Size

A launch enabling and value enhancing wearable device.

enable injections

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