FORMULATED SOLUTIONS

Small molecule Rx therapeutics

The foundations for innovation in small molecule Rx therapeutics:
The Formulated Solutions approach

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Executive summary

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Small molecule prescription (Rx) therapeutics remain the backbone of modern medicine, addressing a wide range of chronic and complex conditions where efficacy, safety and patient adherence are critical. In this eBook, we explore how early strategic decisions shape the success of Rx programs. Readers will learn how to navigate common formulation hurdles, such as solubility and bioavailability challenges, and gain insights into how patient-centric drug delivery systems can improve usability and adherence. We examine how phase-appropriate planning and adaptable infrastructure can reduce risks, accelerate development and set the stage for long-term success — an approach central to how Formulated Solutions supports partners across the small molecule Rx journey.

Preparing for the next Rx-traordinary breakthrough

The landscape of pharmaceutical development is vast and varied, encompassing everything from over-the-counter (OTC) medications to biologics, controlled substances and highly regulated small molecule prescription (Rx) drugs. While OTC products are readily available for self-treatable symptoms and supplements cater to general wellness, prescription drugs are specifically designed for severe or chronic conditions that require a prescription under the supervision of a licensed medical doctor. This fundamental difference means that the development of Rx drugs operates under a significantly higher level of regulation, overseen by bodies such as the U.S. Food and Drug Administration (FDA) and the European Medicines Agency (EMA), as well as numerous other governmental oversight bodies around the globe.

The core objective of a small molecule Rx drug product is to deliver a therapeutic to a specific target within the human body, focusing on balancing efficacy, toxicity and the bioavailability of the active ingredient within a clinically efficacious therapeutic window.

As Rx drugs are designed for specific medical indications and are tied to the specific dosage format being studied via human clinical trials, label claims are paramount and need to be supported by clinical data. Early-stage decisions regarding formulation design and drug delivery systems are critical. As an example, choosing between a semi-solid or a liquid formulation and dosage forms such as nasal or topical can have profound and long-lasting impacts on scalability, cost, patient adherence,patient-to-patient variability and, ultimately, clinical success.

Without the right foundational strategy, drug developers can expect to face significant hurdles or even outright failure later in the small molecule Rx drug development process. For instance, if the final delivery system is not considered early enough, it may lead to delays, additional costs or even a less effective product. Overcoming this at a later stage will require additional development with supporting clinical and stability data, which could take years to complete, potentially jeopardizing the entire project.

This makes early support from a capable contract development and manufacturing organization (CDMO) more valuable than ever. Proactive planning, flexible thinking and an experienced partnership are essential for reducing downstream risks and positioning small molecule Rx programs for long-term success. Understanding the nuances of regulatory pathways, from toxicology studies to Phase 1, 2 and 3 clinical trials, and then into commercialization, is a significant complexity in the development of Rx drugs, and often follows a non-linear path. A CDMO that can offer comprehensive support "under one roof" can significantly streamline this intricate process. Additionally, navigating formulation challenges, which are present in approximately 80% of drugs currently in development, and ensuring product stability throughout its shelf life are crucial elements that require specialized expertise [1].

Strategy for success:

Building the right foundations in small molecule Rx drug development and manufacturing

Successful drug development is a complex journey, where early strategic decisions lay the groundwork for long-term success. At Formulated Solutions, we understand that building the right foundations from the outset — across formulation, drug delivery system and infrastructure — is paramount to navigating challenges and accelerating your path to market.

Formulation:

How to get it right, right from the start

The heart of any small molecule Rx therapeutic lies in the combination of a clinically efficacious active pharmaceutical ingredient (API), combined with a formulation and drug delivery system that optimizes product performance with patient adherence. The new wave of APIs often presents significant formulation challenges, with approximately 80% requiring specialized expertise to ensure efficacy, bioavailability and stability [1]. Of drugs currently under development, an estimated 70–90% are poorly water-soluble, falling into developability classification system (DCS) Classes II (low solubility, high permeability) and IV (low solubility, low permeability) [2]. Addressing these complexities as early as possible in the drug development cycle is crucial and is typically balanced with phase-appropriate development strategies that would require risk-based planning prior to registration batches and commercial launch.

Early formulation work, including rapid screening, phase-appropriate analytical methods and small-scale prototyping, are crucial in building the knowledge base to understand how best to address critical drug product issues, such as bioavailability, solubility, manufacturability and drug product stability. Agile approaches enable formulation experts to quickly test and refine formulation strategies, striking a balance between speed and scientific rigor, adapting to evolving data. Remaining flexible as clinical insights emerge is key, ensuring that your program can pivot without derailing progress. This is even further accelerated today by advances in artificial intelligence and the ability to rapidly screen large data sets that would have previously been resource constrained. Extensive knowledge of various drug delivery methods, particularly for topicals and nasal applications, and the ability to overcome formulation challenges, sets pharmaceutical development companies up for success.

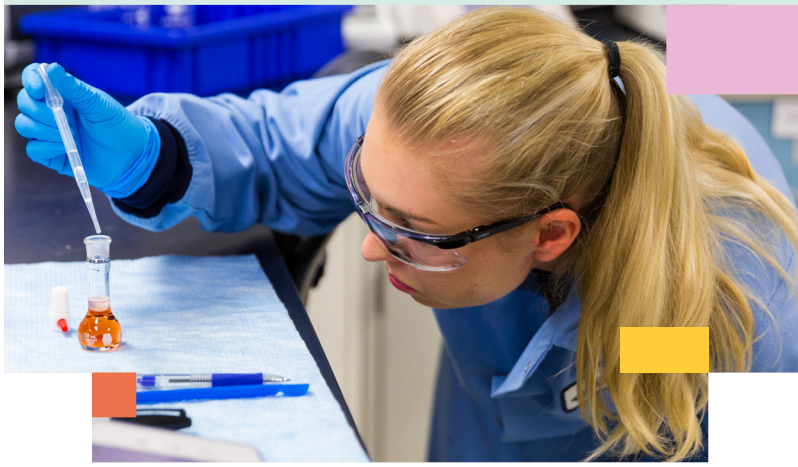
Apply the right formula and success is inevitable

Our development teams bring deep expertise in solving complex formulation challenges across topicals, nasal sprays, aerosols and non-sterile liquids. Whether improving solubility, enhancing bioavailability or stabilizing difficult actives, we're equipped to navigate the high demands of modern drug development.

Key capabilities include:

- Small-scale prototyping to test molecules efficiently
- Enhancing API bioavailability profiles
- Deep experience with DCS Class II & IV molecules, including formulation strategies tailored to these solubility-limited compounds
- Integrated formulation and packaging development, ensuring the delivery method supports both therapeutic performance and patient usability.

Our agile approach enables fast, informed decisions, so your formulation keeps pace with your program.



Delivery system:

Think beyond the molecule

Selecting the optimal drug delivery system early in development can be a daunting task, especially when formats like aerosols initially appear cost-prohibitive. However, thinking beyond the molecule itself to consider the broader patient experience, as well as the manufacturability and scalability of different delivery systems, helps accomplish this goal.

Exploring multiple delivery systems in parallel, for example, simultaneous prototyping and stability testing of a liquid formulation alongside an aerosol or topical or nasal version, offers strategic advantages. This approach provides a deeper understanding of your formulation and ensures that delivery system decisions are aligned with future commercial goals, minimizing risk. Although it may initially require more testing upfront, exploring different delivery systems in parallel can reduce overall project costs, ensuring better outcomes and ultimately leading to long-term cost efficiencies. By identifying the most suitable and effective delivery system early, companies can avoid costly rework or "going back to the drawing board" later in the development cycle.

Reinforcing the importance of patient-centric design, formats should not only be safe and effective but also intuitive, elegant and easy to use. In a Cochrane review, Haynes et al. stated, "Increasing the effectiveness of adherence interventions may have a far greater impact on the health of the population than any improvement in specific medical treatments" [3]. Additionally, the World Health Organization has declared medication adherence a global health issue and has urged policymakers and health managers to improve public health through adequate adherence support [4]. It is widely cited that nearly half of all prescribed medications are not taken as intended [5]. In practice, a range of physical, logistical and psychological barriers prevents patients from fully benefiting from their therapies.

To counteract this, pharmaceutical-grade quality standards should be combined with user-centered design principles that have been proven effective in patient health. By applying consumer packaged goods (CPG) and design-thinking methodologies, GMP manufacturers can create dispensing systems that simplify application, reduce dosing errors and significantly improve patient comfort. Examples include:

- Foam vehicles that are highly effective for topical medications on hair-bearing skin. They are meticulously engineered to achieve enhanced spreadability. Unlike traditional creams or ointments, these foams collapse into a light, non-greasy liquid or film upon contact with the skin and at body temperature, allowing for targeted delivery and versatility across various conditions. This design minimizes discomfort and reduces the mechanical abrasion and friction often associated with applying denser formulations to sensitive or inflamed skin. Enhanced spreadability coupled with a pleasant sensory appeal and ease of application leads directly to greater patient comfort and, in turn, better adherence.

- Engineered delivery formats for hospital use, such as unit-dose packaging and minimal-touch application systems, which are crucial for mitigating cross-contamination risks of product delivery. While this simplifies the process for healthcare professionals, its primary benefit is a safer and more secure treatment experience for the patient, providing peace of mind and contributing to a better overall care experience.

- Topical medications that are light, breathable and cosmetically elegant, and more readily integrated into patients' daily routines due to their pleasant sensory appeal and convenience, ultimately enhancing patient comfort, adherence and treatment outcomes.

Ultimately, a medication that isn't used as intended cannot deliver its intended result. By addressing both the functional and emotional dimensions of product use — everything from ease of handling to sensory appeal — Formulated Solutions designs solutions that doctors trust to prescribe and patients find convenient and easy to administer as prescribed. Our cross-functional expertise, drawing on formulation, Rx, OTC, regulatory compliance and patient adherence knowledge, informs more holistic drug delivery decisions, ensuring your product is therapeutically sound and desirable for patients.

Why patient-centric delivery matters

Innovations like our eN_2fused™ foam technology exemplify Formulated Solutions' commitment to patient-centric design. This proprietary, patented innovation enables the creation of whipped versions of even thick creams and ointments, making them significantly more spreadable. This is crucial for applying products to irritated or wounded skin, where traditional high-viscosity applications can cause pain or further damage. By reducing the mechanical abrasion associated with application, eN_2fused™ foam enhances patient comfort and helps promote adherence, showcasing a design-led approach to compliance-boosting delivery system innovation.

Infrastructure:

Plan for where you're going, not just where you are

Successfully advancing a small molecule Rx drug from early-stage development to commercial launch depends on numerous factors coming together, most important of which is successful clinical trial data, but also having the right infrastructure in place, both in terms of physical capacity and operational flexibility. As a product moves through development stages – IND-enabling early formulations, early-stage clinical trials, further formulation optimization, scale-up and readiness for late-stage clinical trials, marketing authorization approval and commercialization – its manufacturing, regulatory and logistical requirements shift. Infrastructure that can accommodate this evolution helps reduce risks, timeline delays and potential disruptions, ultimately saving costs.

Few CDMO partners offer end-to-end capabilities, including primary and secondary packaging for commercial distribution. Many are equipped for either early-stage work or commercial manufacturing, but not both. As a result, sponsors are often forced to transfer their program between multiple CDMOs, introducing complexity, cost and potential quality variability. A more integrated infrastructure, one that supports both small-scale clinical supply and large-scale production, allows the development team to retain and build on their product-specific expertise and can help maintain continuity throughout a program's lifecycle. This holistic, end-to-end approach also provides efficiencies in both cost savings and overall project timelines.

The physical characteristics of a facility can also influence project success. U.S.-based manufacturing sites, for example, may offer strategic advantages including streamlined logistics, reduced geopolitical exposure, and easier site access. Within those facilities, flexible GMP space that can be tailored to accommodate specific formats, batch sizes or processing equipment allows for greater adaptability, particularly as programs scale and evolve in both predictable and unexpected ways.

Quality oversight and regulatory compliance is another critical consideration. A unified quality management system that spans all development and manufacturing activities helps ensure consistency and compliance with regulatory expectations. Facilities with a strong track record of regulatory audits and adherence to FDA, EMA and ISO standards are typically better positioned to support complex Rx programs.

Ultimately, the infrastructure supporting Rx development must be able to accommodate the nuances of each project. From enhancing bioavailability or performing stability studies to selecting an appropriate delivery system, flexible infrastructure enables tailored approaches that align with each product's development trajectory and ultimate commercial goals.

Built to scale with you

Formulated Solutions offers end-to-end Rx drug development and manufacturing capabilities, all under one roof. From initial formulation and small-scale clinical supply to large-scale commercial production, our infrastructure is designed to adapt to your evolving needs. Our GMP manufacturing sites, based in Largo, Florida, and Cleveland, Tennessee, provide:

- Flexible GMP space with custom build-out opportunities tailored to unique formats and batch sizes.
- Scalable operations to support early-stage innovation and seamlessly transition to large numbers of commercial units.
- U.S.-based manufacturing for greater supply chain stability, easier travel access and reduced geopolitical risk.

Reinforcing the importance of quality, we operate under a strong, unified GMP quality system that overarches both of our facilities, ensuring consistency and compliance at every stage. Our regulatory history includes numerous audits from customers and regulatory agencies, demonstrating our unwavering adherence to FDA requirements and ISO certifications.

With these resources, we eliminate all the pitfalls associated with switching CDMOs mid-development, offering a consistent and capable partner from concept to commercialization.

Inside the Partner Innovation Suite

The Partner Innovation Suite is a testament to Formulated Solutions' commitment to collaborative development and innovation.

A dedicated on-site space in Largo, Florida, the Partner Innovation Suite allows client teams to work directly alongside our chemists, facilitating seamless knowledge transfer and ensuring that your drug product is nurtured with the utmost care and involvement. It provides a secure and inviting environment for client teams to co-develop, execute Design of Experiments (DOEs) and facilitate tech transfer alongside our experts.

Equipped with analytical tools and direct access to our full suite of resources, our Partner Innovation Suite ensures deep engagement and real-time learning, fostering a true partnership in bringing your Rx therapeutic to life.

Heading for the horizon in Rx development and manufacturing

As we look toward the future of small molecule Rx therapeutics, including semi-solids or liquids and various applications, such as topical or nasal, it becomes increasingly clear that successful drug development is not solely a triumph of scientific discovery. While groundbreaking science is undeniably the foundation, the journey from concept to commercialization is shaped by strategic decisions made early in the process, specifically concerning formulation, delivery system and the underlying infrastructure. These foundational choices dictate the trajectory, efficiency and ultimate success of an Rx program, as well as future life cycle management decisions for prescription drug products.

The value of partnering with an experienced CDMO that offers integrated support, cross-functional insight and flexible infrastructure cannot be overstated. Formulated Solutions brings a holistic approach to every stage of development, ensuring that early decisions are made with a clear line of sight to commercial viability and patient adherence. Our expertise spans the entire lifecycle, from the initial stages of formulation development and small-scale prototyping to large-scale commercial manufacturing.

Have you tried the Formulated Solutions approach to Rx?

In pharmaceutical development, innovation is constant, but success depends on more than scientific breakthroughs alone. It demands a strategic partner capable of navigating the complexities of formulation, drug delivery systems and manufacturing infrastructure. Formulated Solutions is that partner — a CDMO purpose-built for small molecule Rx innovators, offering end-to-end support from initial concept and formulation through full-scale commercial manufacturing.

What sets Formulated Solutions apart? Our differentiators are rooted in deep expertise and a commitment to your program's long-term success:

Deep expertise in complex formats

We possess unparalleled knowledge and experience in developing and manufacturing topicals, aerosols, nasals and small molecule liquid formulations. Our team's cross-functional background, spanning Rx, OTC and clinical trials, provides a unique perspective that informs more holistic and patient-centric delivery solutions.

Parallel-path delivery system development

We explore your molecule and optimize its delivery for maximum effectiveness. Our ability to prototype and test multiple drug delivery systems in parallel, even those initially perceived as costly, ensures you identify the most effective and patient-preferred format, minimizing future risks and accelerating your path to market.

Proprietary technologies

Innovations like our patented eN2fused™ foam, along with other flexible drug delivery approaches, exemplify our commitment to design-led, compliance-boosting drug delivery systems. These proprietary technologies offer unique advantages in patient comfort and adherence, setting your product apart in a competitive landscape.

Flexible, GMP-compliant infrastructure

Our state-of-the-art U.S.-based GMP facilities are designed to scale with you, from clinical supply to commercial launch. We offer flexible manufacturing spaces, including bespoke build-outs, and operate under a unified, robust quality system that ensures consistency and compliance at every stage. Our Partner Innovation Suite further underscores our dedication to hands-on, collaborative development.

The journey of an Rx therapeutic has many critical decision points. The strategic guidance, flexibility and technical insight provided by Formulated Solutions can make the most significant difference, especially when engaged early in your journey. We invite you to connect with us to explore how our integrated approach can de-risk your program, optimize your product and position you for a truly Rx-traordinary breakthrough.

Ready to build a stronger foundation for your Rx therapeutic?

Contact Formulated Solutions today to discuss your project and discover how our expertise can accelerate your path to success.

Contact us

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