Making Critical Therapies More Accessible with Nasal Sprays

Insight provided by

Álvaro López

Business Development Director, Curida

Álvaro López joined Curida as Business Development Director in January 2025. In this role, Álvaro will be fully responsible for overseeing Commercial Operations, including Sales, Marketing, and Business Intelligence. With over 20 years' experience in Business Development and Sales within the healthcare and pharmaceutical industries, Álvaro brings a wealth of expertise in sterile liquid technologies, particularly in BFS technologies and nasal sprays. He has previously held several senior commercial positions, including Sales & Marketing Director and Business Development Director, within the CDMO sector. Álvaro holds a degree in Law, a postgraduate qualification in International Business, and an Executive MBA from IE Business School.

Nasal drug delivery is gaining traction

as a preferred route across a wide spectrum of therapies—from emergency interventions to chronic and neurological conditions. Its appeal lies in the combination of rapid absorption, non-invasive administration, and improved adherence. But as scientific interest in intranasal delivery grows, so do the challenges of bringing these products to market. Success demands more than a good molecule—it requires formulation expertise, precise device integration, scalable GMP manufacturing, and strong regulatory competency. Álvaro López, Business Development Director at Curida, offers his perspective on why nasal delivery is on the rise—and what it takes to do it right.

The pharmaceutical industry is increasingly investing in nasal delivery platforms, driven by increased interest in their clinical benefits, patient convenience, and therapeutic possibilities. “Drug developers are recognising distinct advantages of this route of administration, including rapid drug absorption through the blood–brain barrier, avoidance of first-pass metabolism, direct brain targeting, and enhanced patient compliance through convenient, non-invasive delivery,” says López.

According to López, part of nasal delivery’s appeal is based on the unique anatomy of the nasal cavity. Vascularised and lined with a thin epithelial layer, the nasal mucosa offers a direct pathway to systemic circulation, allowing drugs to bypass hepatic metabolism and achieve faster onset and greater bioavailability—particularly critical for emergency treatments requiring fast-acting delivery.

Pharmaceutical Technology

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Beyond emergency care, nasal delivery is gaining traction for chronic conditions due to its ease of use and suitability for self-administration.

With applications spanning neurology, endocrinology, immunology, and respiratory/allergy care, nasal delivery offers a versatile and increasingly recognised treatment approach. “The pharmaceutical industry is embracing its potential,” says López, noting that Curida’s end-to-end solutions support both acute and chronic therapies through optimised formulations and robust analytical and regulatory services.

NASAL DELIVERY PATHWAYS

“There are two primary absorption pathways,” López explains. “Paracellular transport permits small, hydrophilic molecules to pass between cells, while transcellular transport allows lipophilic drugs to diffuse directly across cell membranes—the faster and more efficient route.”

These mechanisms make nasal delivery highly effective for acute treatments—such as seizures, severe pain, hypoglycaemia, or opioid overdose—where rapid action is essential.

NOSE-TO-BRAIN DELIVERY AND EXPANDING APPLICATIONS

“The nasal cavity offers a non-invasive entry point to the central nervous system (CNS) via the olfactory and trigeminal nerve pathways, bypassing the blood–brain barrier—one of the biggest challenges in CNS drug development,” López explains. This opens the door to new treatments for neurological and psychiatric conditions such as migraine, epilepsy, anxiety, depression, Parkinson’s disease, and Alzheimer’s.

Nasal delivery enhances patient comfort and adherence. It is needle-free and painless, making it especially suitable for paediatric, geriatric, and needle-averse populations. “It’s also proving viable for delivering larger molecules, including peptides and proteins such as insulin, oxytocin, and other hormones that are often ineffective when taken orally,” says López.

Another important application is for the administration of controlled substances for rapid pain relief. Nasal sprays provide fast-acting delivery of drugs such as fentanyl, offering effective symptom management for patients with severe, chronic, or terminal illnesses.

According to López, nasal delivery of vaccines represents another area of growing interest. “They can stimulate both systemic and mucosal immunity.” This approach is being explored for respiratory infections such as influenza and COVID-19.

In response to the rising prevalence of respiratory allergies, nasal corticosteroids and antihistamines remain staples in the management of allergic rhinitis and sinusitis, says López.

López highlights that Curida is well positioned to partner with pharmaceutical companies early in development

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to evaluate nose-to-brain potential, select excipients, and optimise drug properties for uptake—particularly in challenging molecules and biologics. The company offers preformulation screening, compatibility studies, and mucoadhesive technologies to enhance absorption and stability while maintaining patient tolerability.

DEVICE INNOVATION

Device innovation is also playing a critical role, López explains. "Micro-dosing systems, propellant-free sprays, and user-friendly delivery devices are improving dosing precision, safety, and patient comfort." López notes that Curida guides partners through device selection, compatibility testing, and performance evaluation, rigorously testing drug–device combinations to ensure consistent dosing, precise spray patterns, and ease of use—key for regulatory approval.

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Accurate dosing relies on metered-dose pumps delivering consistent volumes, optimised spray patterns for even mucosal coverage, controlled droplet size to prevent dripping or lung inhalation, effective priming mechanisms, and manageable actuation force for all patient groups, he explains. Human-factor considerations are equally critical for patient compliance, necessitating devices that are intuitive to operate, comfortable to use, and convenient to carry. Incorporating elements such as visual instructions, integrated dose counters, and sensory feedback mechanisms enhances usability and supports accurate administration. "Curida's integrated approach," says López, "ensures drug and device work together seamlessly, delivering nasal products that meet efficacy, safety, and patient experience goals while facilitating regulatory success."

DEVELOPMENT & MANUFACTURING CONSIDERATIONS

Despite its advantages, nasal drug delivery is not universally suitable for all drug types, López cautions. One of the most significant limitations relates to molecular size. Larger molecules, including biologics and monoclonal antibodies exceeding 1 kDa, often struggle to cross the nasal mucosa due to tight intercellular junctions and limited transcellular permeability. "While some progress is being made with absorption enhancers and specialised formulations, this remains a significant challenge," says López.

In addition to molecular size, several physiological and physicochemical barriers can hinder effective nasal absorption. "The nasal cavity's natural mucociliary clearance mechanism can rapidly remove a drug before it has time to be absorbed, while enzymatic activity can degrade certain types of molecules," he says.

Solubility and permeability are also concerns. To be effectively absorbed, a compound must dissolve readily in nasal secretions and traverse the mucosal barrier. "Highly insoluble or strongly polar compounds may struggle to achieve therapeutic levels via this route."

López highlights that Curida assists partners with predictive modelling and *in vitro* testing to assess

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absorption potential, alongside careful selection and in-house evaluation of permeation enhancers, mucoadhesive polymers, and viscosity modifiers.

Formulation and Manufacturing Challenges

Drug developers face several challenges when formulating nasal sprays, particularly for peptides, biologics, and other labile compounds. “Formulators must ensure the active pharmaceutical ingredient is both sufficiently soluble or suspended to ensure stability over the product’s shelf life,” says López.

Achieving adequate mucosal permeation often requires excipients like permeation enhancers and mucoadhesive polymers—but these must be carefully selected to avoid irritation or toxicity.

The nasal cavity’s relatively small volume further limits dose size, pushing developers to concentrate drug content while maintaining tolerability. “Some formulations or excipients may irritate or damage the mucosa, affecting comfort and adherence,” says López. Nasal congestion or inflammation can also impair absorption, reducing therapeutic consistency.

Excipients play a pivotal role in the safety, efficacy, and comfort of nasal formulations. “Mucoadhesive polymers can extend contact time, while permeation enhancers transiently open tight junctions to increase absorption,” López explains. Viscosity modifiers help improve spray behaviour, and isotonic, pH-neutral formulations reduce the risk of stinging and dryness. Flavouring agents may be used to mask unpleasant taste if the formulation reaches the throat—an often-overlooked factor in adherence.

Curida collaborates closely with partners to overcome formulation and manufacturing challenges in nasal drug delivery, says López. Their formulation scientists design stable, mucoadhesive products tailored to nasal physiology, with careful attention to solubility, stability, pH, osmolality, and viscosity. “Leveraging an extensive excipient library and deep nasal delivery expertise, Curida conducts pre-formulation screening, excipient compatibility studies, safety assessments, and sensory evaluations to balance therapeutic performance with patient comfort.”

To meet the growing demand for preservative-free products, Curida employs validated aseptic manufacturing processes—including sterile filtration, filling, and cleaning—conducted under strict GMP conditions. “Our infrastructure supports both clinical trial material and commercial-scale production,” says López. In-process controls and robust analytical methods ensure consistency in key parameters such as drug content, spray pattern, viscosity, particle and droplet size distributions, delivered dose uniformity, and sensory attributes like taste and post-nasal drip.

Device Design

Equally important to the success of nasal products is the design of the delivery device. “Device design is paramount in ensuring accurate dosing and patient compliance,” says López. Precision-engineered components—such as metered-dose pumps—are critical for delivering consistent volumes, while nozzle design determines spray pattern and plume geometry to ensure even mucosal coverage and minimise loss through dripping or misdirection, he explains.

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Droplet size is also a key factor. “Particles that are too large may exit the nostril, while those that are too small can be inhaled into the lungs, potentially leading to unintended systemic exposure.”

Other key design elements—like priming mechanisms and manageable actuation force—support consistent performance across patient populations, including children and the elderly, says López. “Simple, intuitive, and comfortable-to-use devices significantly increase the likelihood that patients will use the product as prescribed.” Compact, discreet designs improve portability, while visual or tactile feedback reassures users the dose was delivered. Together, these design elements make treatment more convenient and patient-friendly—supporting better adherence and outcomes.

“Curida partners with clients to integrate drug and device into a cohesive, patient-centred product,” says López.

CONCLUSION

“Ultimately, the success of nasal drug products hinges on a holistic approach that integrates sophisticated formulation science, precise device engineering, scalable manufacturing, and stringent regulatory compliance—all while prioritising patient safety and comfort,” says López. Strategic partnerships with specialised CDMOs like Curida are key to overcoming these complexities and bringing effective nasal therapies to market.

About Curida

Curida is a trusted CDMO based in Norway, offering end-to-end development and contract manufacturing of both biologics and small molecule sterile and non-sterile liquid pharmaceuticals. With 50 years of expertise in Nasal Spray and Blow-Fill-Seal technologies, Curida supports everything from formulation and tech transfer to commercial scale-up. Its separate Bio-CDMO unit provides manufacturing of monoclonal antibodies for preclinical and diagnostic use.

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