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How Beautyâ??s NAMs Playbook Is Reshaping Life Sciences

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What began as a regulatory constraint in the cosmetics and personal care industry has quietly evolved into one of the most formative case studies in modern life sciences. Beauty companies forced to move away from animal testing years ahead of most sectors, validated, and scaled new approach methodologies (NAMs) in real-world development environments. The lessons learnt from skin-focused NAMs are informing applications far beyond cosmetics. What started as a solution for localised exposure and safety testing is increasingly shaping how the broader life sciences industry thinks about risk assessment, early-stage screening, and model selection. The result is a shift from NAMs as a niche alternative to a foundational research infrastructure. The question now is how quickly the rest of life sciences can follow that lead.



New approach methodologies (NAMs) are scientific approaches that replace, reduce, or refine the use of animals in research and safety testing. These methods rely on systems such as primary human cell cultures, three-dimensional tissues, organotypic models, and other human-based platforms designed to generate data that more closely reflects human biology.

While NAMs have been used in cosmetics and personal care for at least 15 years, their influence is now expanding across life sciences as researchers and developers search for more predictive and scalable testing strategies.

Why Cosmetics Became the First Large-Scale Test Case

The cosmetics industry emerged as an early proving ground for NAMs due to a convergence of regulatory, commercial, and scientific factors.

In Europe, cosmetic testing on animals was banned as early as 2004 for finished products and 2009 for ingredients, leaving companies no choice but to adopt alternative approaches. While regulations in the United States were less explicit, state-level bans and market expectations made animal testing increasingly untenable.

At the same time, global brands could not maintain separate testing pipelines for different regions. Products needed to meet the strictest regulatory standards across markets, making human-relevant NAMs the only viable path forward.

Scientifically, skin biology offered a tractable system for early NAM validation. Because cosmetics are typically applied topically, researchers could focus on localised exposure rather than systemic effects, creating an environment in which NAMs could be validated with clear, regulator-accepted endpoints. Together, these factors turned cosmetics into a real-world testing ground for non-animal approaches.

What Cosmetics Got Right and Why It Matters Now

The cosmetics industry succeeded with NAMs not by attempting to replace animal models one-to-one, but by starting with the right scientific questions. Companies focused first on identifying the endpoints that NAMs could address more accurately than animal tests. They expanded complexity only after gaining regulatory and industry confidence, allowing scientific validation and regulatory trust to grow together.

In doing so, cosmetics also raised expectations for NAM quality. The industry established standardised starting material requirements, emphasised donor metadata transparency (including age, ethnicity, phototype, and anatomical site), prioritised lot-to-lot reproducibility, and aligned methods with OECD and ISO guidelines. Additionally, tissue quality, traceability, and donor diversity are more than technical details — they are competitive differentiators increasingly scrutinised by regulators, further raising expectations for quality. This gradual sequencing created a repeatable blueprint for adoption across life sciences.

How Cosmetics NAMs Are Informing Broader Life Sciences Use Cases

The same skin-based NAMs used in cosmetics are now being applied in other areas of life sciences research. In pharmaceutical and biotechnology applications, these models are increasingly employed for transdermal and localised drug development, including studies of skin penetration, irritation, toxicity, and targeted therapeutic delivery. While many aspects of the study design may resemble those used in cosmetic testing, the objectives differ.

Therapeutic topicals are formulated with the goal of delivering active pharmaceutical ingredients to precise layers of the skin or underlying tissues, where they can exert a targeted physiological effect. This often involves optimising the formulation for controlled penetration, taking into account factors such as molecular size, lipophilicity, excipient selection, and the use of penetration enhancers. The depth and rate of delivery are carefully tuned to ensure efficacy while minimising systemic exposure and unwanted side effects. In contrast, cosmetic products are generally designed to act at or near the skin's surface, addressing attributes such as texture, hydration, pigmentation, or appearance. While some cosmetic formulations may allow limited penetration into the epidermis to support benefits like exfoliation or antioxidant activity, they are not intended to alter the skin's structure or function in a way that would classify them as drugs. Instead, penetration is restricted or incidental, occurring only to the extent necessary to achieve the desired aesthetic outcome.

NAMs validated in cosmetics support early-stage decision-making in drug development. They are used to generate mechanistic insight before systemic studies and to reduce animal use earlier in the pipeline. Despite different end goals, cosmetics and pharma often rely on similar NAM architectures, highlighting the transferability of these systems.

The Often-Overlooked Foundation: Primary Human Biospecimens

A defining advantage of cosmetics NAMs has been the large-scale integration of primary human cell types and tissues, including keratinocytes, fibroblasts, melanocytes, sebocytes, corneal epithelial cells, and immune cells. Unlike immortalised cell lines such as HaCaT cells, primary cells retain native receptor expression, physiologic cytokine signaling, and human metabolic enzyme activity. These demonstrate more accurate inflammatory responses, maintain differentiation capacity, and better reflect true structure and function.

Companies have also developed standardised models using surgically acquired donor skin, complete with metadata on age, ethnicity, anatomical site, and Fitzpatrick phototype, enabling models that reflect real-world human variability. This approach reduces translational risk and generates insights that animal models cannot replicate.

What Comes Next for NAMs Adoption Across Life Sciences

Regulators are now signaling greater openness to NAMs while tightening scrutiny around animal testing justifications. Potential changes under FDA Modernisation Act 3.0 and similar global efforts may further narrow pathways for continued animal use. As expectations shift, NAMs built on primary human biospecimens are emerging not just as alternatives, but as more human-relevant standards. The remaining challenge is no longer technical feasibility, but industry readiness and acceptance.

Over the next 12–36 months, translation from cosmetics to broader life sciences is expected to accelerate through:

- Refinement of established, regulator-trusted NAMs
- Expansion into longer-term and more complex exposure models
- Cross-industry learning between cosmetics, pharma, and biotech
- Increased use of NAM data to reduce animal testing earlier in development

The cosmetics and personal care industry did more than adopt non-animal methods, it demonstrated how they can work at scale. Validating NAMs under real regulatory and commercial pressure allowed beauty companies to create a playbook that is now shaping applications across the life sciences.

As regulatory pressure grows and demand for human-relevant data increases, the question for life sciences is no longer whether to learn from cosmetics, but how quickly those lessons can be translated into broader practice.

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