



# Biotechnology:

building a base for innovation



CRODA



# Building a base for biotechnology innovation

We exist in a rapidly changing and turbulent world. Developments in technology, science and society have caused major changes to traditional systems, structures and ways of working and exciting new opportunities are emerging. These trends are changing the nature of how industries develop and formulate with ingredients, the types of science and research used in those processes, and the landscape within which science enables product development and delivery.


Within this environment several themes are emerging. One is the increasing role of sustainability in how consumers choose the products they buy. Another is the increasing demand for new and innovative products as consumers seek out more novel and effective creations – be they for personal care, home care or fragrances, for example. The first is driving more research into the replacement of petrochemical derived ingredients with bio-based ones. The second is inspiring researchers to look at new ways to deliver novel products and enhance the performance of existing ones. Both may find answers from naturally-sourced raw materials but much of the progress needed relies on taking a different approach and biotechnology is one of the most exciting.

For the purposes of this article, we define biotechnology as the use of non-animal living organisms' cellular and biomolecular processes to develop products for industrial use. Biotechnology takes advantage of the ability of certain living organisms to take in a substance or substances and, via their inbuilt biological processes combined with additional ingredients, convert them into useful industrial products. It opens the possibility for a wide range of new ingredients to be derived from biological feedstocks, that

could replace ones that require conventional extraction processes or are derived from petrochemical feedstocks.

As the sustainability agenda of consumers grows, biotechnology is looking like a very relevant innovation toolkit for replacing existing molecules and finding brand new ones.

Over the past 12 months, Croda has looked at this trend from the perspective of three major industries, all driven by the sustainability requirements of consumers, and all looking beyond chemistry for new innovations that can deliver on these requirements and more without reducing performance.

A female scientist with long brown hair, wearing a white lab coat and safety glasses, is focused on looking through a microscope. The lab coat has a logo on the pocket that says "sederma". The background shows a laboratory environment with various pieces of equipment and framed pictures on the wall.

## Biotechnology in personal care

The first is personal care. The use of biotechnology for personal care products is by no means a new development or restricted to niche players. Over the past thirty years, blending advanced technology with natural raw materials has become more common and is now a regular source of new and replacement ingredients in this industry. This is enabling personal care companies to see biotechnology as a new innovation toolset to discover bio-based ingredients that perform equally or better than their petrochemical-derived alternatives, all whilst being more sustainable. This includes some game-changing anti-ageing products such as resveratrol and plant extracts. It is why personal care products now contain more bio-based ingredients than ever before – up to 40% of the ingredient list according to current research . Many of these could potentially be derived from biotechnology processes instead.

## Biotechnology in home care

The second is home care. The global pandemic has accelerated growth in the home care industry. Consumers are more aware of hygiene priorities and self-care than ever before, and their demand for products that improve both cleanliness and wellness at home, from laundry detergents to antibacterial cleaners, has rocketed. Mirroring the experience in personal care, consumer interest in product ingredients has grown in line with product demand for home care products and home care companies cannot avoid the trends other sectors have had to embrace.

They must find ways to improve sustainability – from ingredients to manufacturing processes without reducing product performance. As a result, the home care sector has become one of the most promising areas for biotechnology innovation within the broader chemicals industry.

## Biotechnology in fragrances

The third is fragrances. The technology of olfaction is big business and like the other two industries already mentioned, sustainability is making its mark. Many of the most potent and desirable scents have long-used a variety of, and inspiration from, natural raw materials, much of which is either in natural decline from climate change or over-farming. This has driven growth in the burgeoning relationships between fragrance companies and biotechnology firms, and biotechnology is now becoming regarded as an exciting new toolkit for fragrance innovation with potential beyond the limits of traditional chemistry. At the same time, large chemicals and fragrance companies have all made acquisitions or invested significantly in-house to find ways of bulking up their fermentation knowledge and expertise. They want to create natural fragrances without negatively impacting the people, plants or places; and craft scents that deliver an effective experience for consumers.

But the opportunity extends beyond sustainability alone. Fragrances are used in many sectors – including home care and personal care products to ensure they smell appealing and relevant to the effects consumers expect them to deliver. But consumers now want fragrances to provide an experience, not just a smell. This is driving a move in the industry from fragrances to ‘scents’ and it embodies the desire by consumers to build more emotional connections to the products around them. Engineering that kind of effect requires new ingredients. And that, in turn, requires a new toolkit.

# Biotechnology: in conclusion

Again, biotechnology can help by providing greater control over the development of novel ingredients. Biochemists can now use fermentation and biocatalysis-derived molecules as starting points to get exactly what they want. And due to the huge variety of potential organic feedstocks available, biotechnology offers a way to explore a wider variety of new scent profiles, each of which can be created to fit particular requirements that encourage specific emotions or feelings from consumers when they smell different products. They can also be designed to achieve a specific perceived performance. If you wash your clothes in a detergent that makes your clothes smell like a summer meadow for longer, your perception will be that the clothes are cleaner for longer, when in fact it is just the scent that is lingering.

But if biotechnology is becoming more important for all three of these industries, why is it still responsible for just a small percentage of the ingredients they use? Across them all, there are some common challenges that explain its slow progress.

Skills is one – a very niche combination of skills and expertise is required to use biotechnology processes to deliver the outcomes these industries need. Finding them is not simple and the creation of multidisciplinary teams requires technical and non-technical experts to understand each others' languages and perspectives. Another barrier is the cost of scaling up to industrial levels of production. The inability to industrialise is holding biotechnology back in all these markets. Several approaches are showing promise but none are available at the magnitude required to compete with petrochemical processes.

But one challenge that is easier to overcome is the lack of collaboration. These three markets are all working towards the same goals yet sharing

ideas, new findings, and skillsets is not yet commonplace. Companies in other industries including agriculture and pharmaceuticals are also using biotechnology as a route to solving a range of challenges. Their efforts could equally impact in the three markets above but only if there is a cultural shift to sharing for common progress. For example, if a new biotechnology-derived molecule is developed for personal care application why not scan it to determine if it has fragrance properties too? That kind of collaboration could accelerate the progress of biotechnology's impact on a considerable range of products.

The issue of a lack of connection between different industries is indicative of a broader challenge for this field – the separation of research, manufacturing, and formulation. Very few organisations design biotechnology-derived ingredients, produce them, and formulate with them too. That separation exacerbates the lack of understanding and collaboration between different parts of the value chain. And while that isn't preventing biotechnology innovation taking place it is likely to reduce the speed at which that innovation delivers results. Organisations that can offer all three (or at least more than one) of the above are going to have a better understanding of the other elements of the process on which the end user experience relies. That can speed up feedback; increase customer understanding; and reduce waste in the innovation process. A connected approach makes sense in any environment. Where biology, technology and chemistry intertwine to create innovative opportunities for change, it is a critical factor for success. Those companies that can blend these roles into a single approach, and integrate work in different industries, will hold all the cards for the future of biotechnology innovation.





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