

Plantibodies claims to be revolutionizing molecular culture

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Molecular agriculture is an idea as old as transgenesis. Attempts to have tobacco, rice, or corn produce therapeutic molecules have been made many times, but the results have been few and inconclusive. A French startup, Plantibodies, is proposing a new approach: instead of extracting the target molecule from the plant, the idea is to grind the spinach leaves that contain it into a powder.



Plantibodies is a young French biotechnology start-up founded in 2020 which plans to produce ‘therapeutic bioproteins’ in genetically modified plants. Its ambition is to be able to offer oral immunotherapies within the next ten years or so. Recombinant proteins – particularly antibodies – are intended for the treatment of inflammatory or autoimmune diseases of the gastrointestinal tract. According to the Presse Agence^{[1](#)} website, there are 300,000 people with inflammatory bowel disease (IBD) in France and 10 million worldwide.

Beyond conventional molecular culture

The idea of creating transgenic plants to produce proteins of therapeutic interest is not new^{[2](#)}. So-called ‘conventional’ molecular culture involves several stages: cultivation, extraction, purification and formulation of an injectable protein. To date, it has never been successfully implemented on a large commercial scale.

Plantibodies’ approach is no longer to engage in ‘conventional plant-based protein production’ – which poses numerous technical problems and economic difficulties^{[3](#)} (see box below) – but to use

the plant itself as an oral dosage form. By 'oral dosage form', we simply mean a capsule administered orally to patients. In practical terms, Plantibodies aims to grow plants in 'controlled' greenhouses that produce the therapeutic protein directly within the cells of edible plants. This means that, rather than extracting the protein from the plant, the plant's leaves will be transformed into an oral medicine that releases the protein in the colon.

Put another way, the patient will ingest the genetically modified plant directly, in the form of a powder or a standardised tablet. Plantibodies is thus bypassing part of the molecular culture production chain and hopes, through this approach, to accelerate the development and market launch of its medicine.

The challenges of 'conventional' plant-based production

Using plants or animals to produce therapeutic molecules is not a new idea. Plant-based production has long been presented as a low-cost alternative to bioreactors using microorganisms. In practice, however, this promise faces several major obstacles and, ultimately, few molecules are produced by plants in the field.

First pitfall: growing pharmaceutical plants in open fields raises concerns about contamination of food supply chains, as well as contamination of related weeds. Once harvested, the issue of confusion between 'pharmaceutical' and 'food' batches is a well-documented reality.

Second pitfall: proponents claim that the production cost for plants is 10 to 100 times lower than that for microorganisms grown in a contained environment. This fails to take into account the additional biosecurity costs (containment, strict separation of supply chains, enhanced analytical procedures), as well as the potential costs of contamination or a large-scale product recall.

Third pitfall: this benefit has never actually been demonstrated. Furthermore, the purification stage is more complex with plants than with micro-organisms. "Purifying a low-abundance protein from a very rich protein mixture in a complex multicellular organism such as maize would have entailed high costs," as we noted back in 2018.

Finally, plant-based protein production has its own technical limitations: incomplete control over plant glycosylation to faithfully reproduce human profiles, and significant variability in yields depending on species and agronomic and climatic conditions, etc.

The plants targeted by Plantibodies are edible species belonging in particular to the genera Brassica (cabbages), Lactuca (lettuces) and Spinacia (spinach), selected for their use as food and their ability to accumulate recombinant proteins in their leaves. The patent relating to this project is currently under examination⁴.

Plantibodies raised nearly €290,000 in 2022 from various business angels (also known as 'angel investors') from the Grandes Écoles (BADGE), Bpifrance and Angels Santé, and subsequently raised a further €500,000 in 2026⁵ from these same networks and the company Investessor. According to the company, this fundraising is primarily intended to finance a strategic co-development partnership signed in late 2025 with a Nasdaq-listed biotech company, the name of which has not been made public. This company specialises in rare gastrointestinal diseases, and the partnership centres on a preclinical programme including studies on biodistribution, toxicology

and initial in vivo efficacy signals.

These medicines are not due to be brought to market any time soon

To carry out this project, Plantibodies has joined forces with another start-up, Orius. Together, they responded to the call for proposals entitled 'Innovations in Biotherapies and Bioproduction' as part of the France 2030 initiative. Having been selected as winners, they have set up the PhytomAbs⁶ project. Orius is a Toulouse-based start-up specialising in 'plant cultivation and optimisation'. It manages what it calls 'biomecells' – large cultivation chambers where technicians vary climatic conditions to identify the most optimal ones. In practical terms, Plantibodies modifies the plants so that they produce antibodies or therapeutic molecules. It then transfers them over to Orius, which is responsible for optimising the cultivation conditions most favourable to these plants within its biomecells.

Together, Plantibodies and Orius are currently at the pre-clinical research and development stage: a technology platform is being established, industrial partnerships are being formed, and in vivo and safety studies are underway, but no clinical trials have yet been announced. It is worth noting that clinical trials for this type of research can often take between eight and ten years.

These genetically modified plants, intended for use as medicines, represent a new phase in the evolution of medicine. We have moved on from herbalists (whose practices are partly banned) to chemists, and for the past few decades we have been modifying plants in an attempt to produce molecules of pharmaceutical interest. This development is similar to that of plant breeding: from landrace seeds selected in farmers' fields to hybrid seeds, and then to GMOs in different forms. At each stage, practitioners' autonomy is eroded and living organisms become increasingly artificialised and privatised.

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 - + Annick Bossu, « [Plantes OGM usines à vaccins : entre promesses et réalité](#) », *Inf'OGM*, 12 November 2021
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 - + Patent US20250136691A1, « [Genetically modified organism for recombinant protein production](#) »
 - + Plantibodies, « [Plantibodies raises €500k from leading business angel networks to advance plant-based oral immunotherapies for gastrointestinal diseases](#) », 8 January 2026
 - + Léna Saoui, « [La startup toulousaine Orius et Plantibodies s'attaquent aux maladies inflammatoires chroniques de l'intestin](#) », *L'Opinion Indépendante*, 18 March 2026.
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