

GFGG - Growth Factors Go Green – plant-based growth factor expression system for cultivated meat and pharma.

BACKGROUND Growth factors are essential components in cell culture medium for pharmacological products as well as for cultivated meat production and also pharmaceuticals on their own. Still, their application is hampered by their folding instability. For example, their half-life in aqueous solutions is in the minutes to hours range. Accordingly, a large fraction of product is lost already during production. Systematic screening and optimization of suitable expression hosts and manufacturing processes is a highly potent approach to alleviate this bottleneck and it complements existing protein engineering efforts (<https://acib.at/god-mode-growth-factors-cheat-the-nature/>). In the former context, plants can offer several unique advantages such as the absence of any animal-derived components in the process and the inherently low burden with human pathogens, e.g. viruses. In addition, plant cultivation is cost-efficient – even compared to bacterial hosts – and scalable even under GMP conditions. Therefore, we propose to use a plant molecular farming approach to manufacture growth factors for various food, feed and pharma applications.

TECHNOLOGY

Up to now, growth factors are often produced in microbial systems that can contain substantial quantities of toxic and harmful compounds such as endotoxins. Furthermore, these systems may fail to produce complex growth factors that require multiple disulfide bond formation and/or glycosylation, e.g. transforming growth factor beta-1 (<https://www.uniprot.org/uniprotkb/P01137/entry>). In contrast, growth factor production in mammalian cells can substantially distort their metabolism resulting in low product yields, increasing the anyway high production costs in such systems.

Here, we will use a high-throughput compatible screening tool based on plant cells to identify optimal expression conditions (promoters, UTRs, codon optimization, target compartment) and apply platform purification processes to obtain pure growth factors that can be tested in relevant cell culture settings. The purification will predominantly rely on cost-efficient and easy-to-scale membrane technologies and minimize the use of chromatographic purification.

After expression, growth factors are tested on relevant cell lines, where their biologic activity will be assessed with several complementary methods, e.g. immunofluorescence staining and qPCR for upregulation of specific cellular markers, and/or Western Blotting for activation of the downstream pathway targets.

Additionally, if desired, this offer can be combined with acib offer for high-end growth factor optimization using *de-novo* approach (<https://acib.at/god-mode-growth-factors-cheat-the-nature/>). Thermal stability/half-life of the optimized variants can be determined, in addition to characterising their biologic activity.

OFFER

The platform needs further 2-3 years for the development, during which a first set of growth factors will be expressed in plants, purified and subjected to comparative performance analysis in relevant cell culture settings. We are looking for partner(s) to bridge this transition from bench to application with a financing demand of 300,000 – 500,000 € in total. Potential partners will not only benefit from getting privileged early access to this technology, but also through joint IP-ownership.

KEYWORDS:

- disruptive technological innovation
- stable growth factors
- high throughput screening
- plant molecular farming
- design of experiments
- cultivated meat
- pharma
- advanced therapy medicinal products

EXPERTS:

- Dr. Aleksandra Fuchs,
- Prof. Dr. Dr.-Ing. Johannes Buyel

AVAILABLE FOR:

- Joint Research Project
- Contract Research
- Funding

DEVELOPMENT STATUS:

Technology Readiness Level: 4-5

IPR:

open for new partners

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