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Sowing the seeds of a new industry: Protein production in plants

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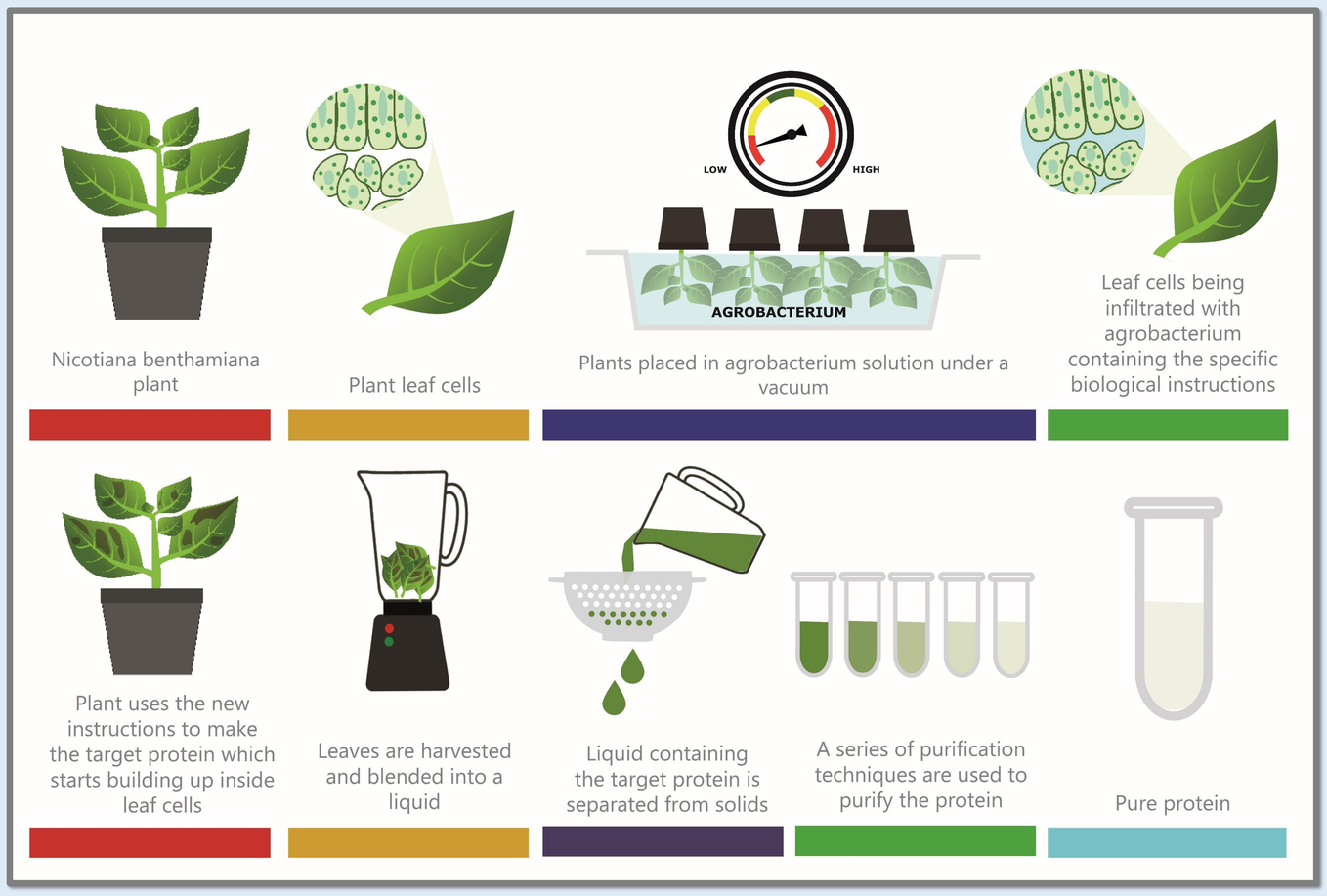
Plants have a long history of use in medicine, with many important drugs being based on chemicals identified or extracted from plants. However, the use of whole plants as a source of therapeutic biologics has gained only modest traction since the inception of 'molecular pharming'. Molecular pharming turns an individual plant into a miniature bioreactor capable of producing a wide range of recombinant proteins. Using a proprietary transient expression technology, target protein is produced inside the cells of whole plants in a highly scalable process with lower upstream costs compared to traditional protein production technologies. Our protein expression platform is proven in the production of a variety of biologics covering therapeutic agents, vaccines and diagnostic tools. Scaling up is the next step in the future of molecular pharming.



Process workflow: From plant to purified protein

The DNA sequence of a target protein(s) is inserted into our SupraVec® transient expression vector. This vector is transformed into agrobacterium, a plant pathogen with biological machinery capable of infiltrating plant cells. Agrobacterium transfers the DNA of our target protein, encoded within the SupraVec® vector, into the leaf plant cells via a process known as 'infiltration'. The target DNA is then processed within the plant cell to produce recombinant target protein. The protein accumulates in the leaf cells over time (3-6 days). Leaves are harvested and target protein extracted via clarification and purification technologies. Purified protein is the end-product.

Our growth rooms

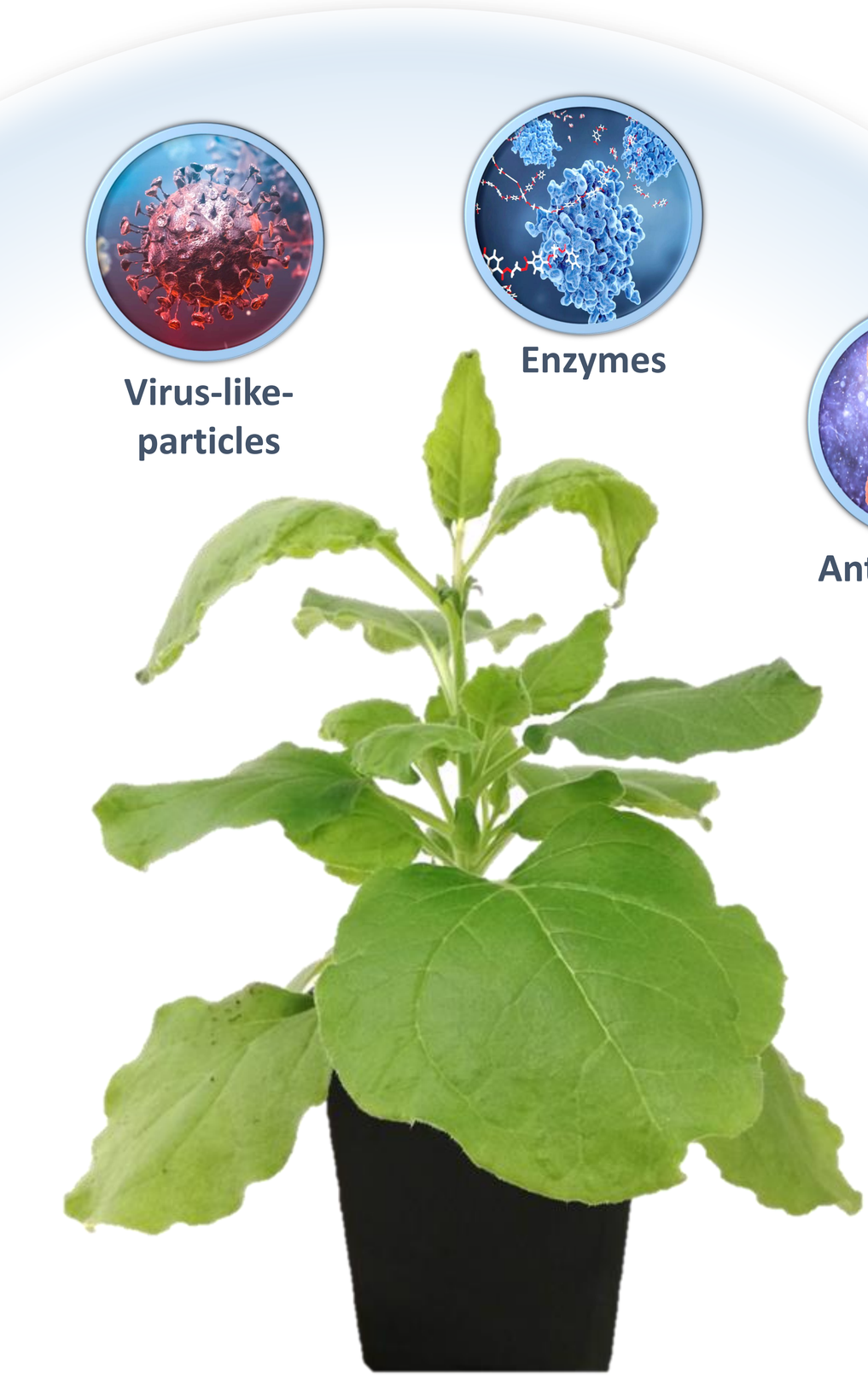
Small scale infiltration

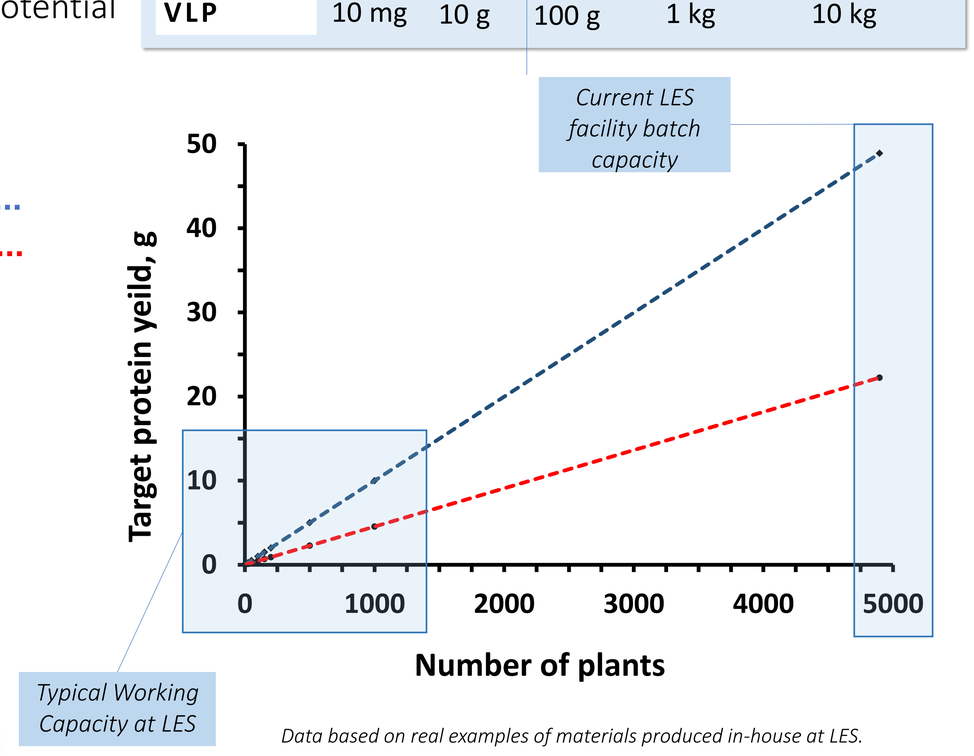
Infiltrated leaves

Scaling up

Examples of proteins made using plant transient expression in our (LES) pilot scale facility and at various potential production scales.

	Pilot Scale		Manufacturing Scale		
Plants Antibody	1 4.5 mg	1000 4.5 g	10,000 45 g	100,000 0.45 kg	1,000,000 4.5 kg
Plants VLP	1 10 mg	1000 10 g	10,000 100 g	100,000 1 kg	1,000,000 10 kg





Data based on real examples of materials produced in-house at LES.

Meeting demand

Promising area: Plant production of vaccines

Typical vaccine dose: **50 µg**

LES maximum batch capacity:

~5000 plants **1 million doses**

Manufacturing scale

1 million plants: **200 million doses**

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