University of East Anglia

NORWICH SCIENCE FESTIVAL At home

LEAF EXPRESSIONS

Introduction:

Plants are nature's bioreactors! Not only are they a source of food for us to eat and oxygen for us to breathe, but they can also be used to produce medicines to make us better when we fall ill. Leaf Expression Systems is a company based in Norwich that has found a way to manipulate plants to make different types of medicines by using Hypertrans (R), a type of plant molecular farming.

What medicine would you make?

You can draw it or describe it here – use your imagination!
What would it cure? How would you take it? What does it look like? How does it work?

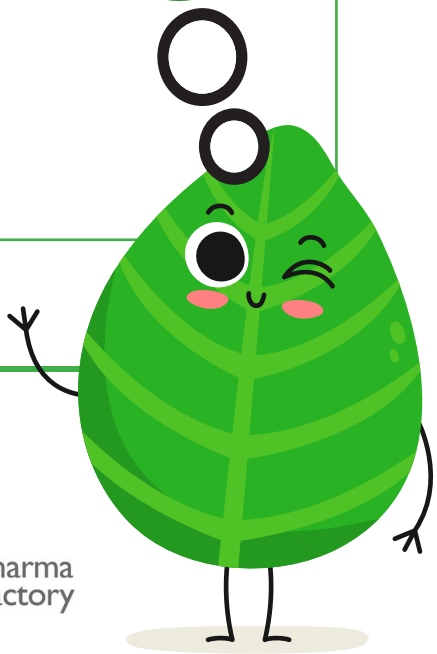
In what type of bioreactor?

You can draw it or describe it here – use your imagination!

Would you grow it in a plant? In a leaf? In a root? In algae? In fungi? In yeast? In something else?

WHAT IS A BIOREACTOR?

An apparatus for growing organisms (yeast, bacteria, or animal cells) under controlled conditions. Used in industrial processes to produce pharmaceuticals, vaccines, or antibodies.



Tweet your answers to:
#myPharmaFactory #NorwichSciFestAtHome

This activity sheet is a collaboration between Leaf Expression Systems on the Norwich Research Park and the University of the Arts, London.
The Norwich Science Festival at Home activity sheets were brought to you by the University of East Anglia and the Norwich Research Park. For more information, visit norwichsciencefestival.co.uk.

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Leaf Expression Systems
Pharma Factory

PLANT MOLECULAR FARMING

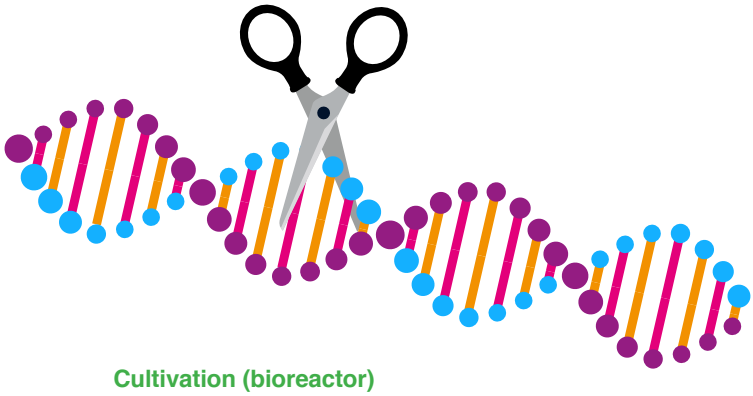
Plant Molecular farming is an exciting technology that uses the power of plants to produce new medicines, also known as pharmaceuticals. These pharmaceuticals can be complex proteins - such as vaccines and antibodies – or they can be simple chemicals like aspirin.

The technology used to produce plant-made pharmaceuticals involves tricking the plants into making proteins that they don't normally make. We do this by introducing genes that encode these proteins into the plants, by hiding it inside a friendly bacterium called agrobacteria.

Plants can be grown cheaply, quickly and in large amounts, which makes this a very interesting area for pharmaceutical companies, who are looking for new ways to produce medicines.

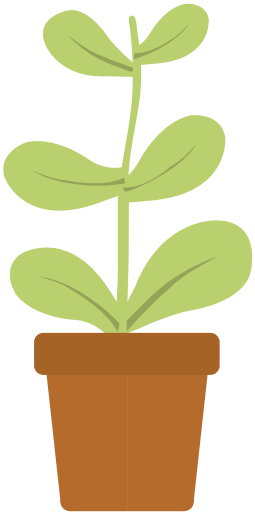
Recombined DNA

A 'gene of interest' is inserted into a plasmid and placed inside the agrobacterium (soil bacteria).



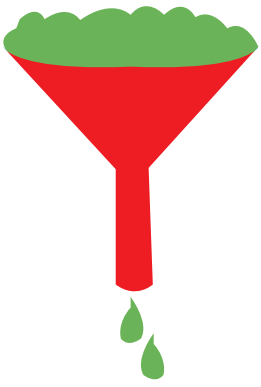
Cultivation (bioreactor)

The plant is grown in a secure green house acting as a 'bioreactor' (producing proteins).



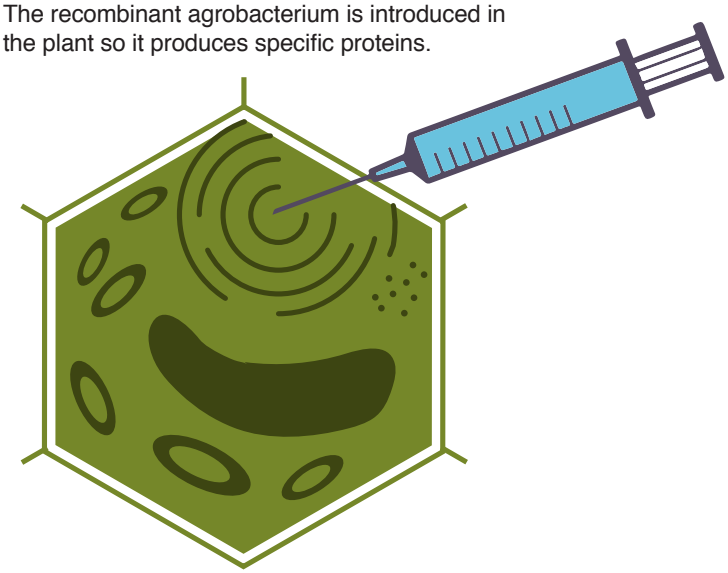
Purification

The proteins are separated from all other plant materials so they are pure enough to use in medicines.



Agroinfiltration

The recombinant agrobacterium is introduced in the plant so it produces specific proteins.



Extraction

The plants are blended to form a liquid from which proteins can be extracted.

Production of medicines

The purified proteins are added to a stabilizing solution (excepient) and packaged, ready for medical use.

CREATE A CHATTERBOX

Plants are just one of the ways we can make new medicines to help sick people and fight diseases. The chatterbox below will help you and your friends find out about many of the different ways in which scientists can use biology and chemistry to make these new medicines.

Instructions to create your chatterbox

Either print out this page on to paper, or draw on the designs as illustrated below.
Then cut to make your paper square with a pair of scissors and fold as shown here: