



# Recent advancement in commercial production of synthetic food for global food security: Future prospective and challenges

Pankaj Singh<sup>1\*</sup>, Manikant Tripathi<sup>1</sup>, Pradeep Kumar Singh<sup>2</sup>, Monika<sup>1</sup>, Fareha Rayeen<sup>2</sup> and Neelam Pathak<sup>2</sup>

<sup>1</sup>Biotechnology Program, Dr. Rammanohar Lohia Avadh University, Ayodhya, India

<sup>2</sup>Department of Biochemistry, Dr. Rammanohar Lohia Avadh University, Ayodhya, India

\*Email: singhpankaj0984@rediffmail.com

## Background

Currently, we are facing huge pressures to fulfill the demands for nutritious, safe and cheaper food due to tremendous increase in total world population, limited agricultural land and food resources, unavailability of high yielding crop plant varieties and anthropogenic activities. Climatic changes in environment has affected livestock, crops, forestry, aquaculture, fisheries, and affects food security in complex ways which can cause economic consequences, eroded livelihoods, trade disruption and adverse health impacts.

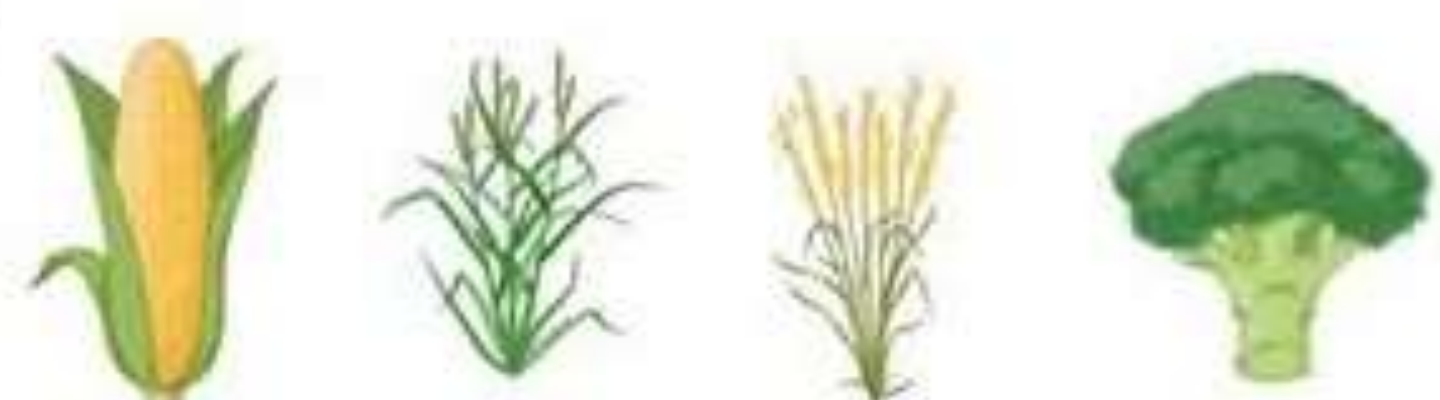
## Objectives

The aim of commercial synthetic food production is:

- To address global challenges such as food security, malnutrition, and environmental sustainability, need to develop innovative methods to produce alternative food components which can fulfill our current qualitative and quantitative nutritional food requirement.
- To address these unavoidable problems, in such a way that we can increase food production without any negative impact on environment.

### Plant based foods

Plant based foods has lower raw material costs, which can effectively reduce energy consumption and greenhouse gas emissions. It can also lower the risk of diseases.



### Cultured meat

Cultured meat relatively closed and controlled production environment minimizes susceptibility to contamination by food-borne pathogens.



## Types of Synthetic Foods

### Fermented foods

Foods are produced by fermentation process encompasses numerous uncontrollable factors, with the goal of enhancing fermentation efficiency and quality while minimizing the generation of unfavorable byproduct.



### Microalgae-based foods

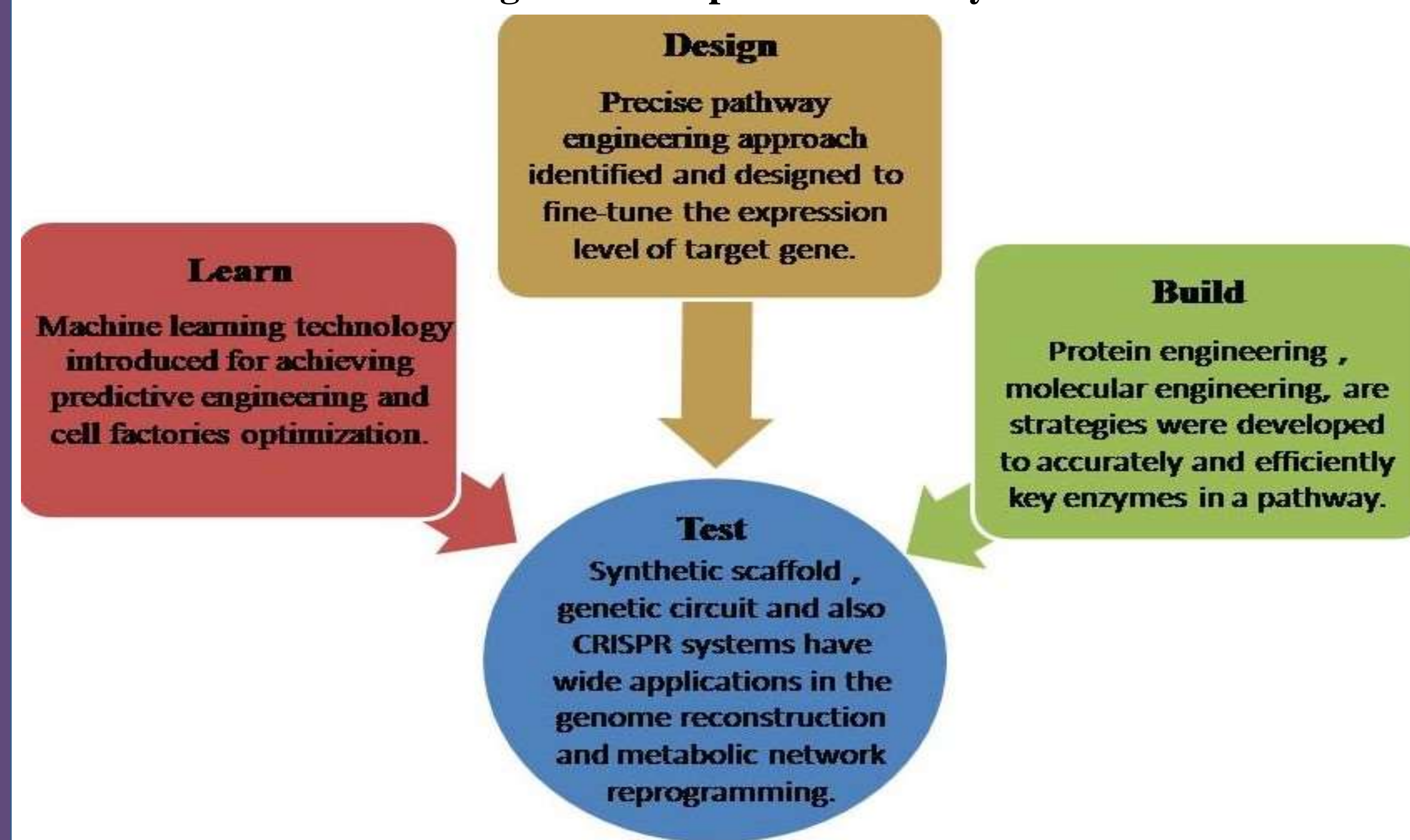
Photosynthetic unicellular organisms (*Chlorella*, *Arthrospira*, and *Spirulina*). Usually used as nutraceuticals, natural food colorants, extraction and purification.



## Expected Outcomes

- Synthetic foods are produced under controlled laboratory industrial conditions, it could reduce the need for land, water and pesticides.
- Synthetic foods will reduce the time for food production and the amount of waste products and also offer a more resilient food supply.
- Synthetic foods can be created to improve nutritional content, potentially leading to better foods customized for individual dietary needs.

## Technologies used in production of synthetic food



## Pros

- ❖ Synthetic food production could also help to address issues related to food security. As the global population continues to grow, there is increasing pressure to produce more food.
- ❖ Biotech companies aim to provide innovative synthetic products to meet the constantly evolving demands of consumers.
- ❖ Synthetic food production could be more cost-effective than traditional agriculture.
- ❖ Main advantage of synthetic food is its potential to reduce greenhouse gas emissions.

## Cons

- ❖ **Disrupt natural balance:** They might outcompete native species, disrupt food chains, and even alter ecosystems' dynamics, resulting in unintended ecological consequences.
- ❖ **Gene flow:** By introducing new genetic traits and potentially creating hybrids with unpredictable characteristics.
- ❖ **Allergenicity:** Genetic modifications can introduce new proteins or compounds into GMOs, potentially causing allergic reactions.
- ❖ **Ethical Concerns:** The manipulation of an organism's genetic makeup raises ethical debates about the limits of human intervention in the natural world and the consequences of altering life forms.

## Challenges

- Acceptance:** Synthetic food may not be widely accepted by consumers.
- Regulation:** Synthetic food will need to be regulated to ensure safety and quality of food. It will need to be tested for potential health risks and labeled appropriately.
- Cost:** Synthetic food may be more expensive than traditional food. The technology used to produce synthetic food may be expensive to develop and maintain.