



สวทช  
NSTDA

# การวิจัยและพัฒนาผลิตภัณฑ์

อาหารฟังก์ชันและอาหารเสริม  
ที่เน้นความยั่งยืน

**ดร. กอบกุล เหล่าเท็ง**  
BIOTEC, NSTDA

คลินิก อย. & สมอ. ด้านอาหารและอาหารเสริม

3 ก.พ. 2568





# HEALTH & WELLNESS

**BIOTEC**  
a member of **NSTDA**

01



**Support overall  
immune function**

02



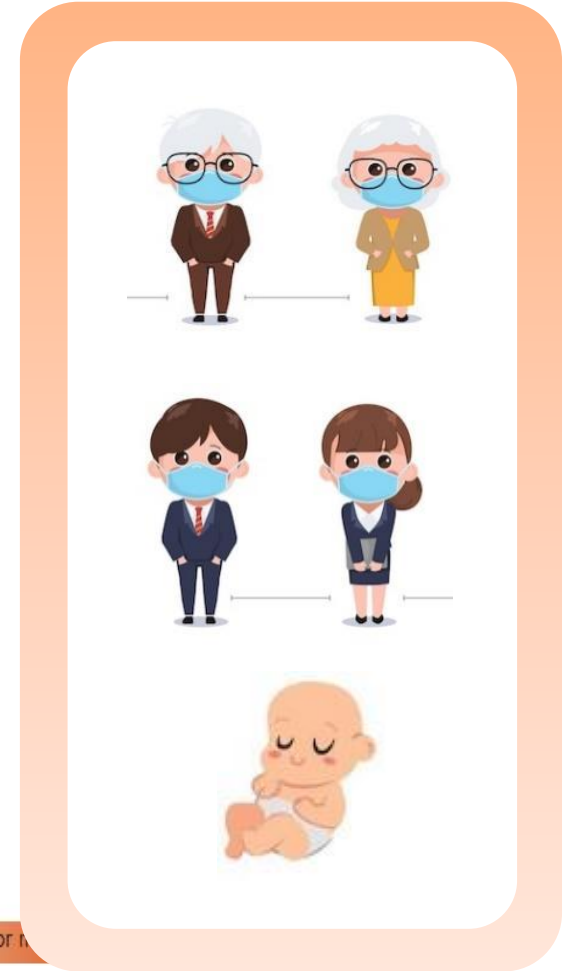
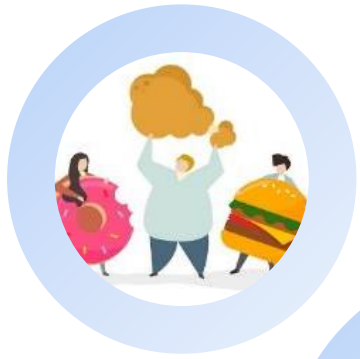
**Protect against  
the harmful stress**

03



**Maintain overall  
physical health  
& mental health**

# CHALLENGING & OPPORTUNITY



+4% or n



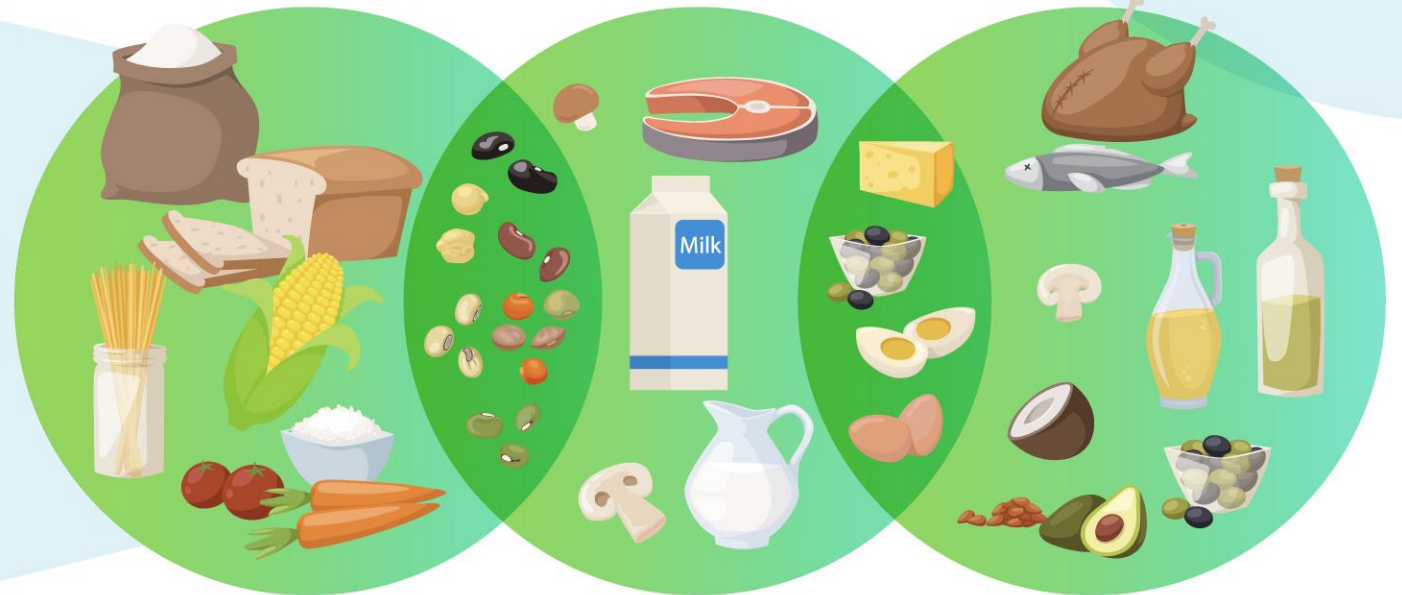
## Healthy Food Functional Food & Beverage

## Future Food Novel Food

Customized & robust design of  
ingredient blend for applications

# Functional Ingredients

A positive health outcome  
..... beyond basic nutrition



**Dietary supplements**



**Nutraceuticals**





# Biodiversity



Green & natural



Microbes



Marine source



Animal

Technology for Biomanufacturing



Integrative expertise throughout the development/innovation chain



Production process adhered to standards



Linkage to stakeholders for commercialization

# Innovation in Functional Food Ingredient & Dietary Supplement



# Functional Foods & Food Ingredients

## ORIGIN

- **Storytelling**
- **Transparency**
- **Sustainability**  
(Renewable)

## SAFETY

- **Long track records**
- **No toxicity**
- **No harmful agents**
- **Allergen labelling**

## FUNCTION

- **Nutrition**
- **Specialized functions**
- **Advanced applications**
- **Compatibility with others**

R & D



EATING WELL

GET ENOUGH SLEEP

ACTIVITY AND EXERCISE

BE SOCIABLE

MANAGE STRESS

AVOID ALCOHOL, SMOKING AND DRUGS

HELPING OTHERS

ASK FOR HELP

## Market-driven Trends

*Cleaner technology*  
*GREEN technology*  
*Circularity technology*

*Water-based extraction*

*Supercritical CO2 fluid extraction*

*Ultrasound-assisted extraction*

*Microwave extraction*

*Low-polarity-based extraction*

*Enzymatic hydrolysis*

*Food processing*

*Microbial fermentation*

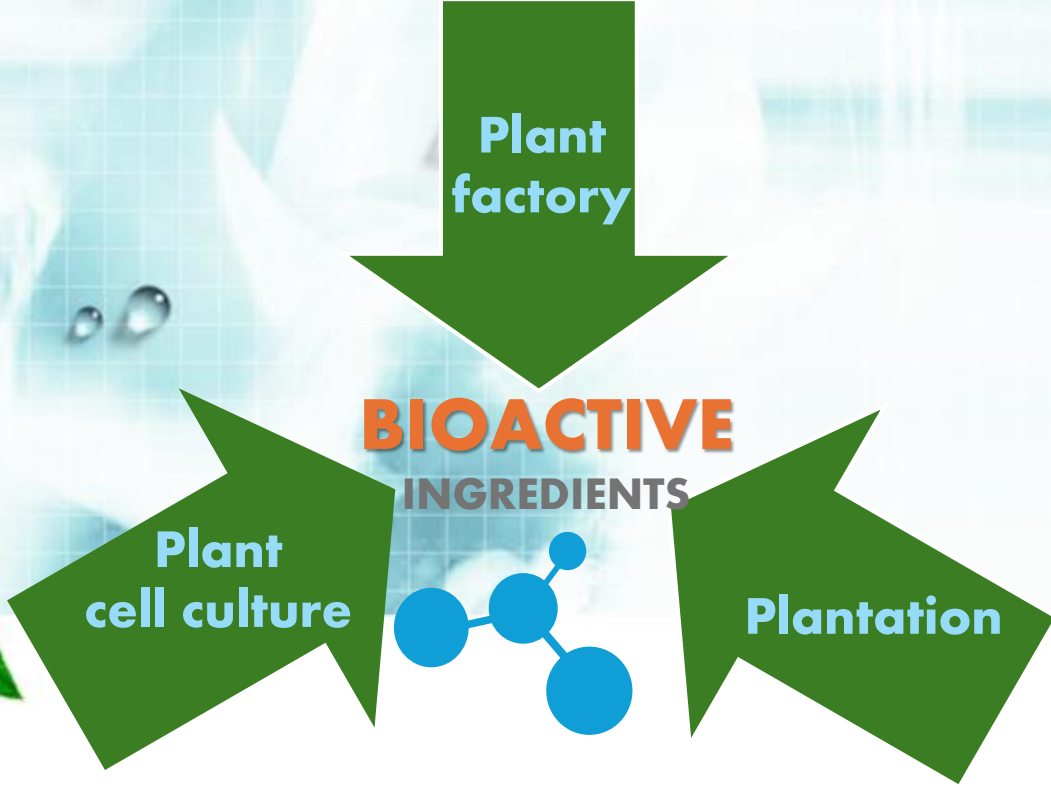
## Technology-driven Trends

*Membrane-based & molecular distillation*

*Filtration, distillation, evaporation*  
*Crystallization/precipitation*



# Aromatic, herbal, medicinal plant extracts

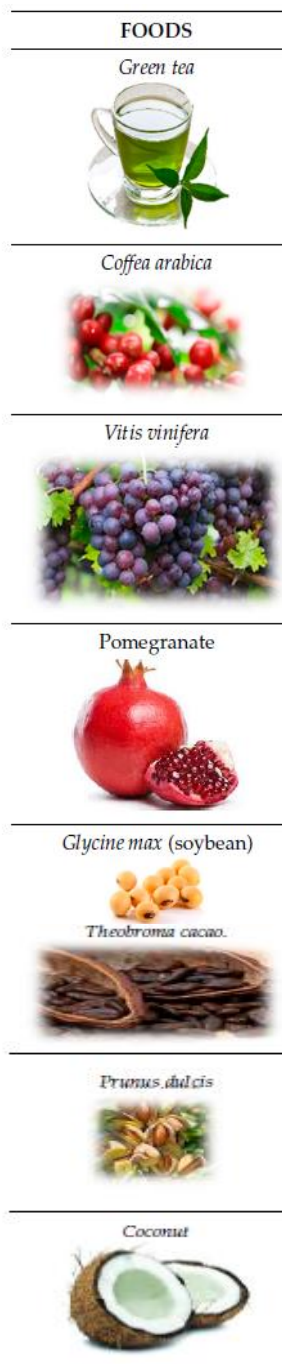


phenolic acids, polyphenols, triterpenes, stilbenes, flavonoids, steroids, steroidal saponins, carotenoids, sterols, fatty acids, sugars, polysaccharides, peptides



# FOOD-based EXTRACTS

- Green tea: catechin derivatives
- Coffee arabica: antioxidant compounds
- *Vitis vinifera*: resveratrol with antioxidant activity
- Soybean: isoflavone genistein
- Coconut: saturated fatty acids with sun protection
- *Carica papaya*: flavonoids & phenolic acids with ROS scavenging & anti-inflammation effects
- Hen's eggs, meat, dairy products & fermented soybean: vitamin K
- Rice and other plants: botanical placenta extract  
(*Angelica keiskei*, *Eisenia arborea*)

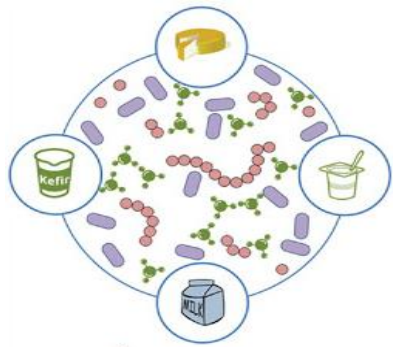


Modified from Dini & Laneri,  
Molecules 2021

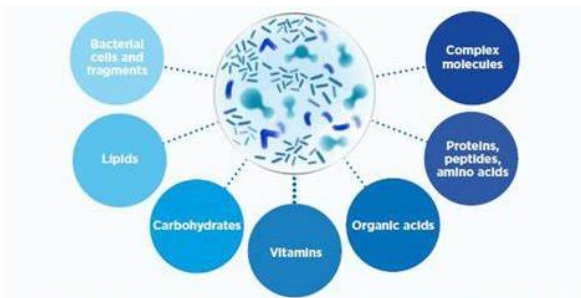
# Microbial Production of Functional Ingredients

## BIOMASS FERMENTATION

### Probiotics & Culture starter



### Postbiotics (Ferment filtrate/lysate)



### Mycoprotein

Edible fungi & mushrooms



## PRECISION FERMENTATION

### Functional INGREDIENTS



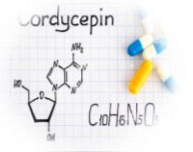
### Omega-6 PUFAs

GLA & STA production by engineered yeast  
DGLA production by engineered fungus



### Secondary metabolites

Cordycepin by engineered fungus



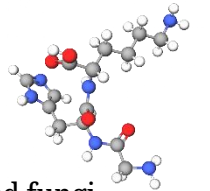
### Biopigment

Indigoidine by engineered fungus



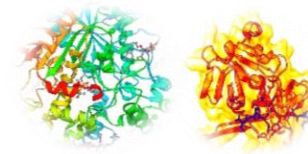
### Functional Peptides

ACV tripeptide, milk proteins by engineered fungi

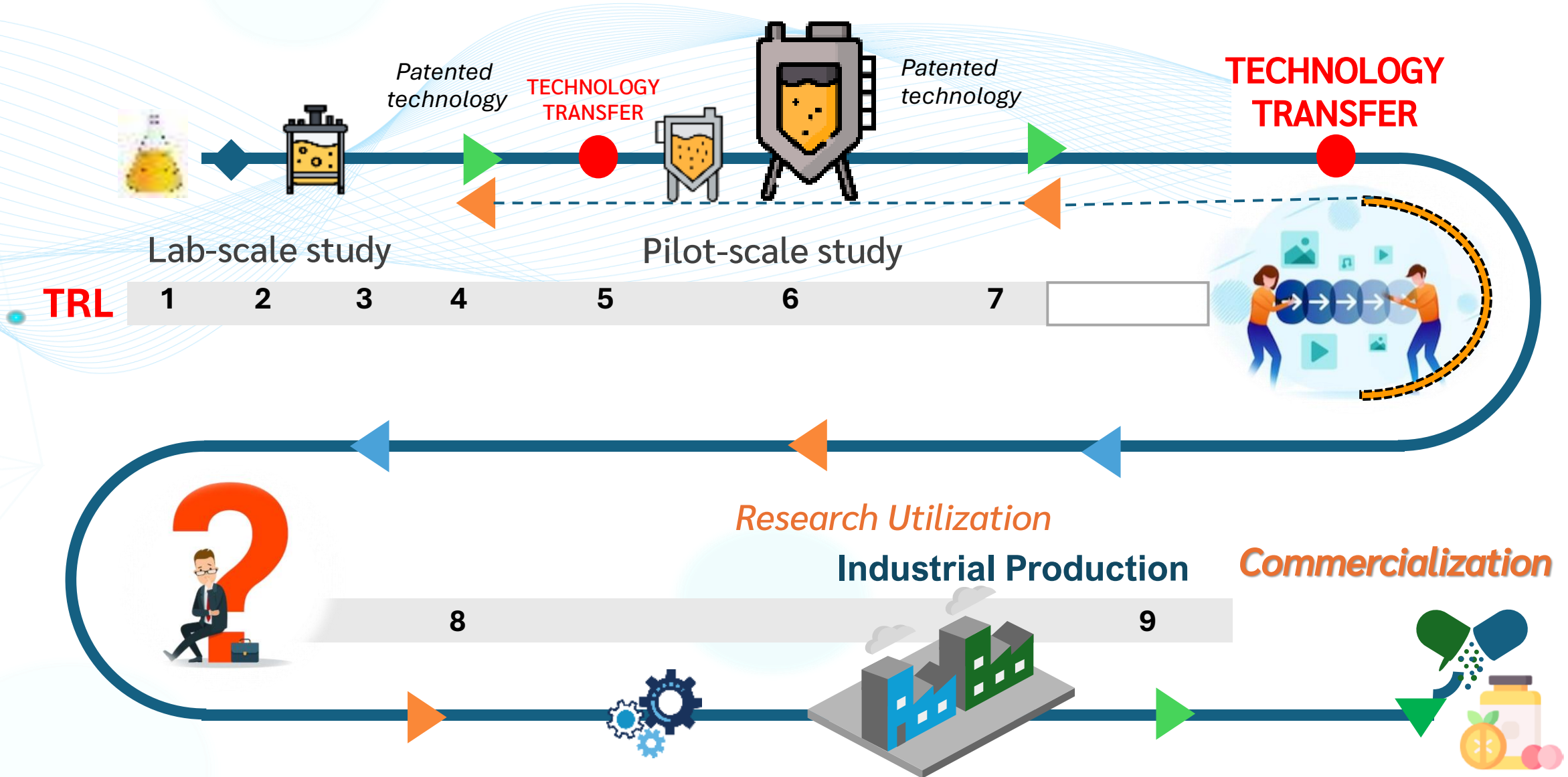


### Food enzymes

TAG lipase & protease by engineered fungi



# Journey from Lab to Industrial Production





### Commercial Production

- Pain point/Market proposition (e.g., fortification, innovation)
- Product type
- Product registration
- Price/Cost



### Experimental Design

- Scientific reviews
- Raw materials
- RM Supply
- Process adoption
- Analytical methods



### Process/Product Development

- Process Optimization
- Cost optimization
- Applicable process
- Analytical methods



### Prototyping

- Process fine-tuning
- Process V & V
- Scalability
- Cost estimation
- Waste disposal
- Practical application



### Testing & Documentation

- Efficacy
- Quality
- Stability & Shelf-life
- Safety
- Product specification
- COA



TRL

1

2

3

4

5

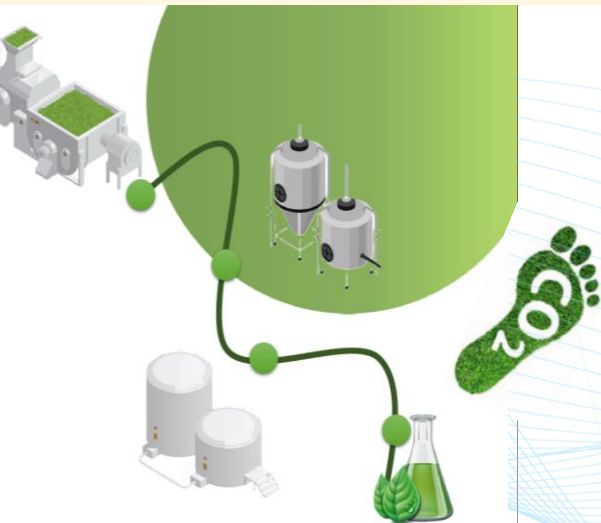
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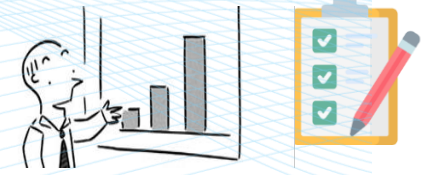
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# TRANSLATIONAL RESEARCH

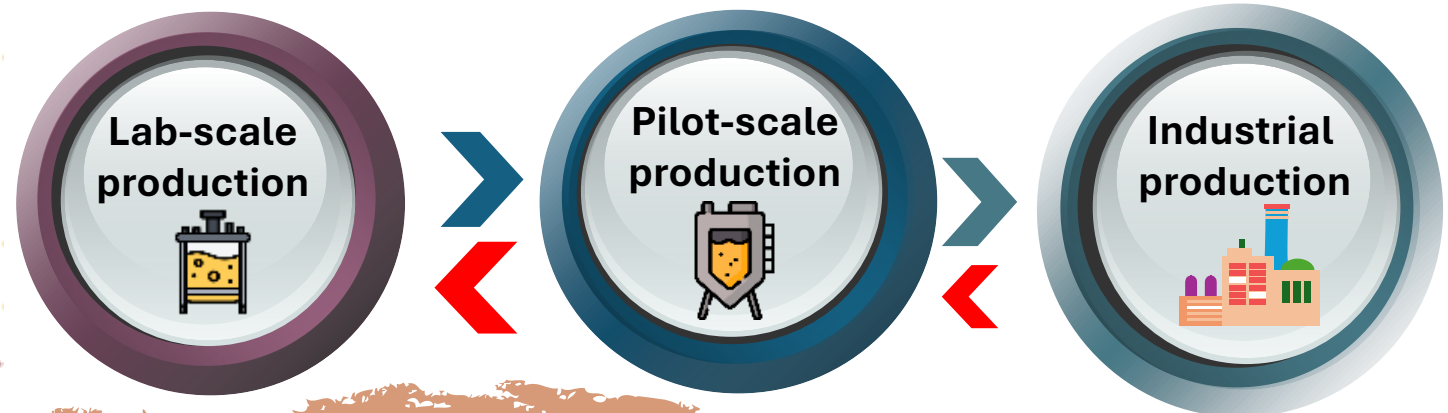
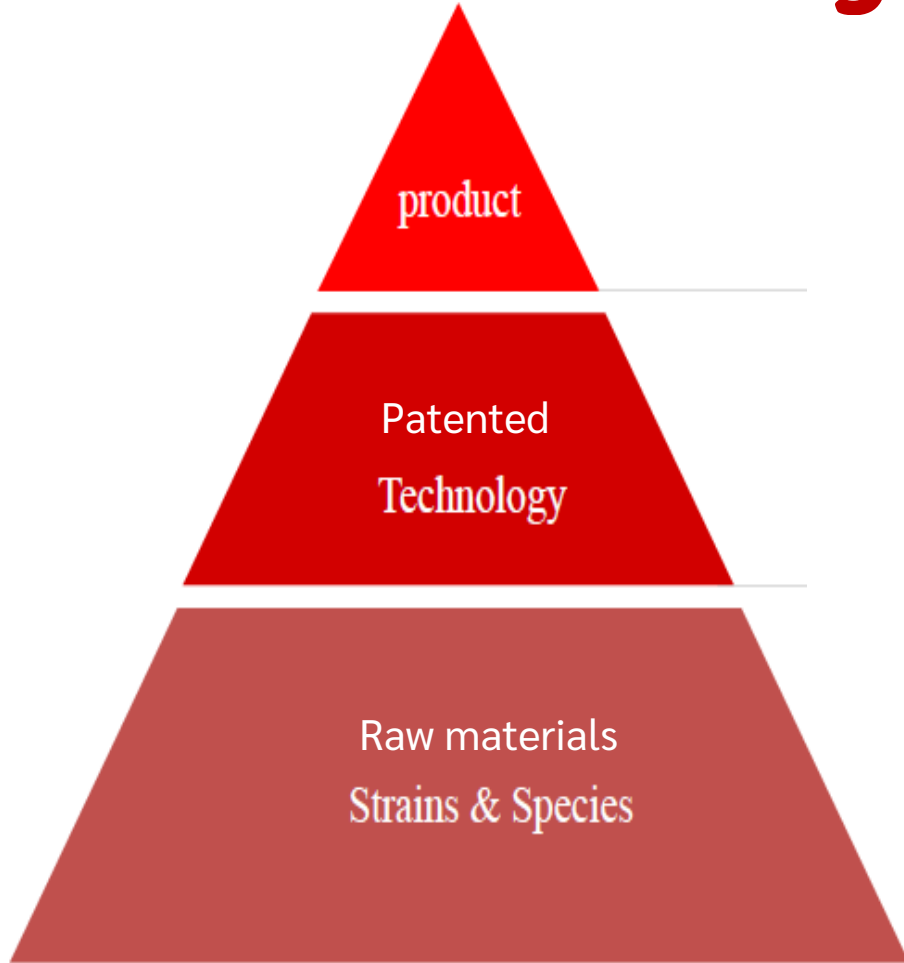


BCG Economy  
Economy of Scale  
Speedy Economy

Economic feasibility    Product Registration



# Technical Challenges



# Processing & Operational Control



Origin, Supply & Safe

**Raw materials**



Standard

**Biomanufacturing**



State-of-the-art  
Process equipment/  
facilities

Expertise/ Know-how  
Cross-disciplines

Tailored-made process  
(strain-to-strain)  
(product-to-product)

Efficiency

**Process Control & Monitoring**



Qualified expertise

**Operation**





# Functional Ingredients Production

 Yield/Productivity

 Reliability

 Cost

 FTO





# Standard & Customer requirements



FDA compliance



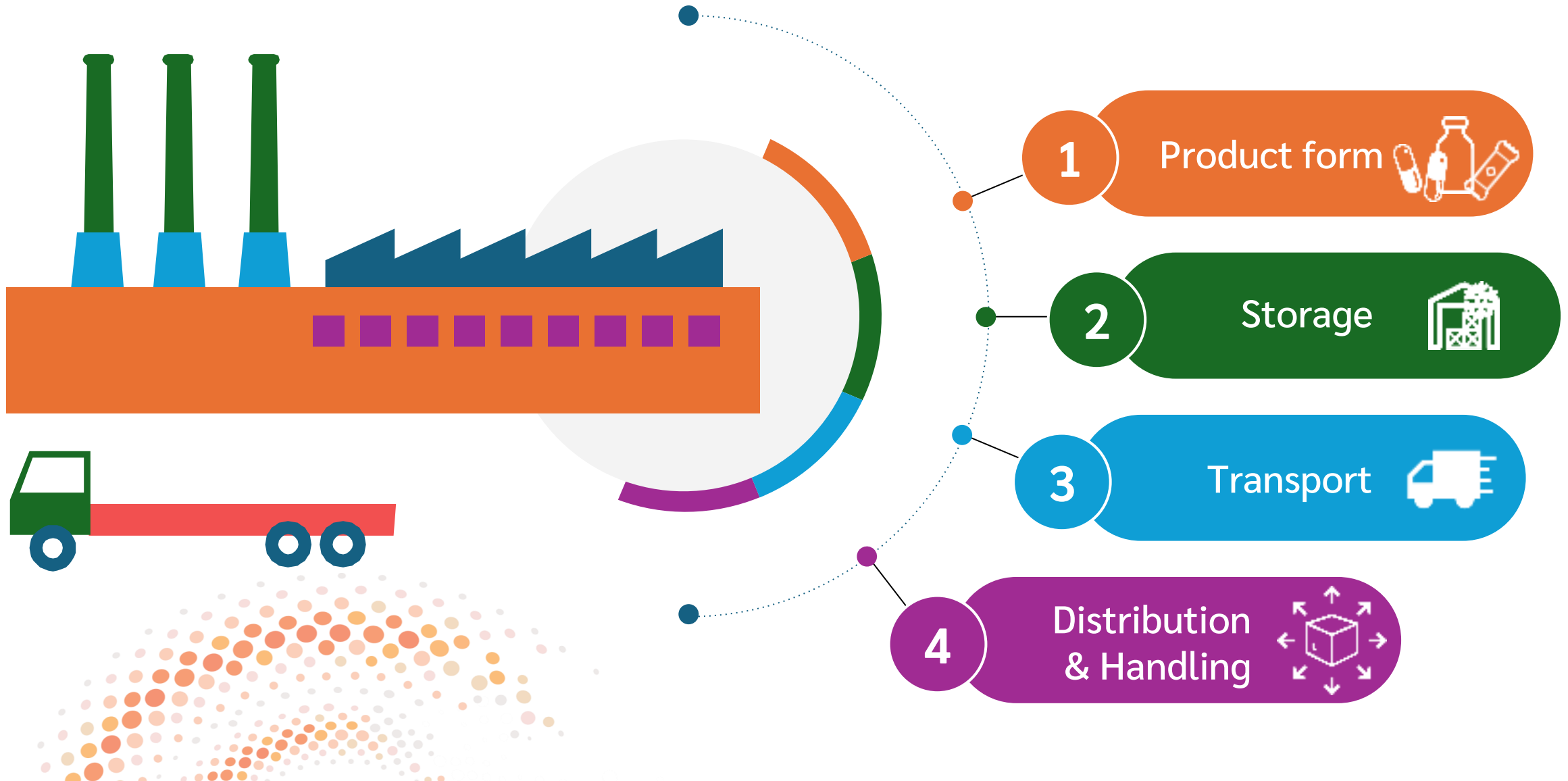
Vegan/ Vegetarian products



Allergen-free  
i.e. diary, soy, gluten, and nuts

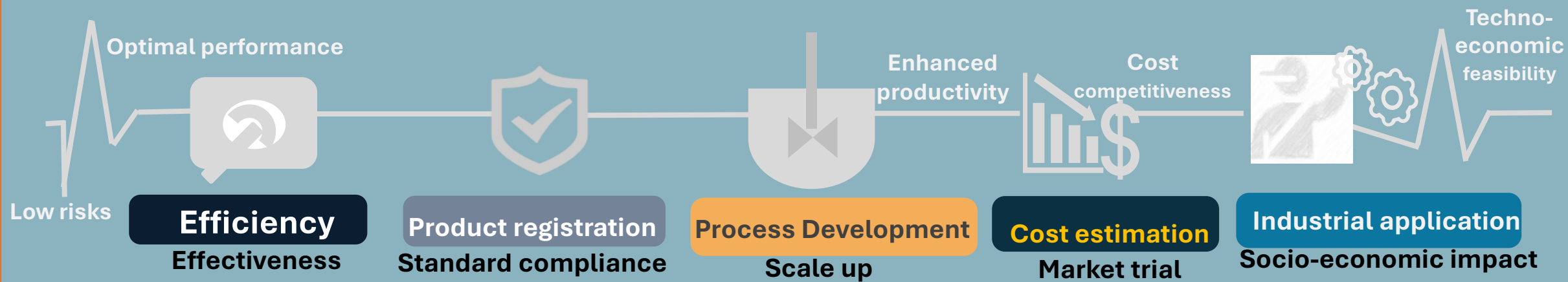


# Food Safety Delivery/ Storage





# R & D Ecosystem for Sustainable Food industries



**Cost reduction**

**Import substitution**

**Increased competitiveness**

**Novel product development**

**Value creation**

**Economic impact**

# 1 One-stop Service



1 **ส่วนผสมฟังก์ชัน**  
**Functional ingredients**  
Probiotic & starter service package

2 **โปรตีนทางเลือก**  
**Alternative proteins**  
Prototyping & testing services

3 **อาหารเฉพาะกลุ่ม**  
**Foods for specific group**  
Prototyping & testing services

# foodSERP

Service Platform for Food, Functional Ingredients & Cosmeceuticals



# โรงงานต้นแบบชีวกระบวนการไบโอเทค



สถานที่ผลิตอาหาร



กลุ่มวัตถุเจือปนอาหาร ผลิตภัณฑ์เสริมอาหาร และสารอาหาร



**Scale up RDI**

Process validation  
Techno-economic feasibility



**PROTOTYPING**

Efficacy, Quality & Safety testing



**Production & registration**

Market trials  
Product registration



**Training & Consultation**

Up-skilling





מכון  
NSTDA



BIOTEC  
a member of NSTDA

# Thank you

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**BBF**  
BIOTEC Bioprocessing Facility

**food**  
SERP

