



# **A Health-Conscious Approach to Develop Rice Based Products**

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# Introduction

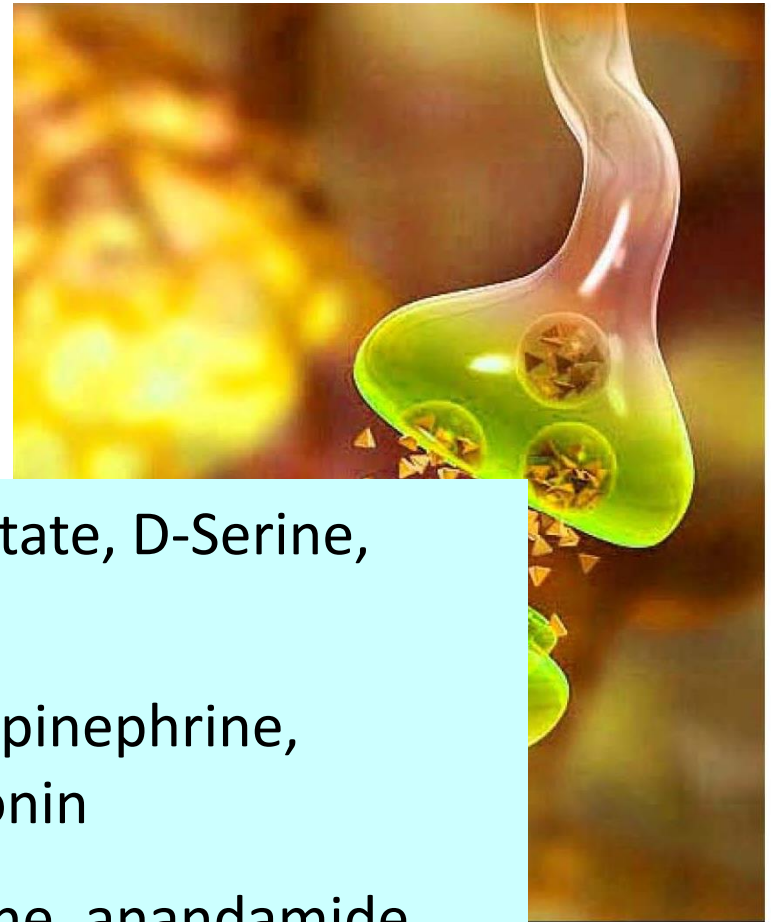
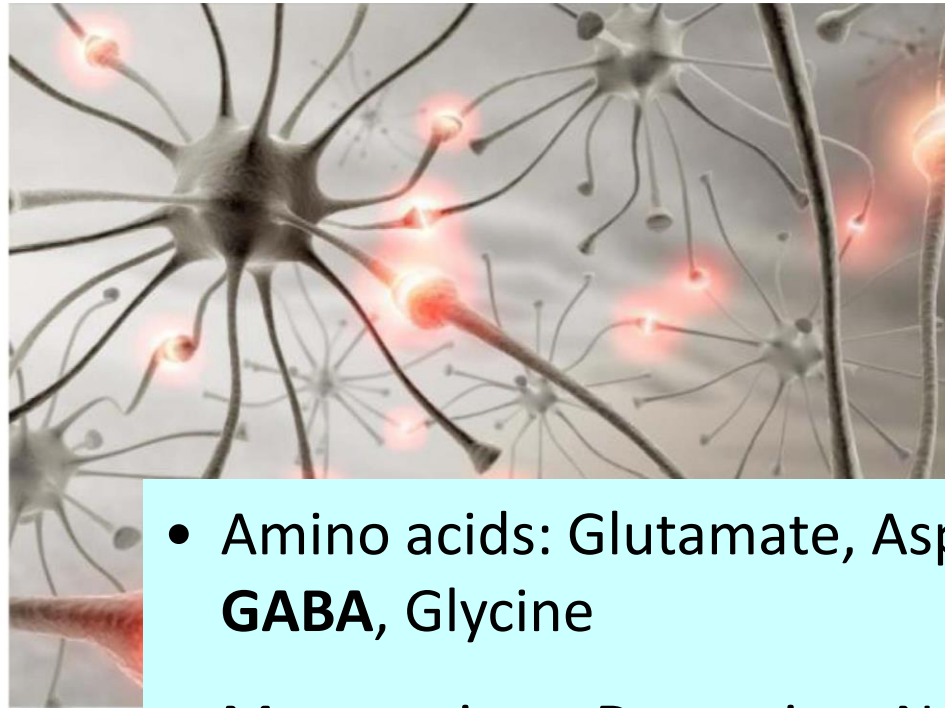
# What is GABA?

- $\gamma$ - Aminobutyric acid(GABA) is an important ubiquitous non-protein amino acid in both prokaryotic and eukaryotic organisms, and is produced by glutamate decarboxylase from glutamic acid.
- GABA acts as a major role in regulating cerebral neurotransmitter in the central nervous system.

# Functions of GABA

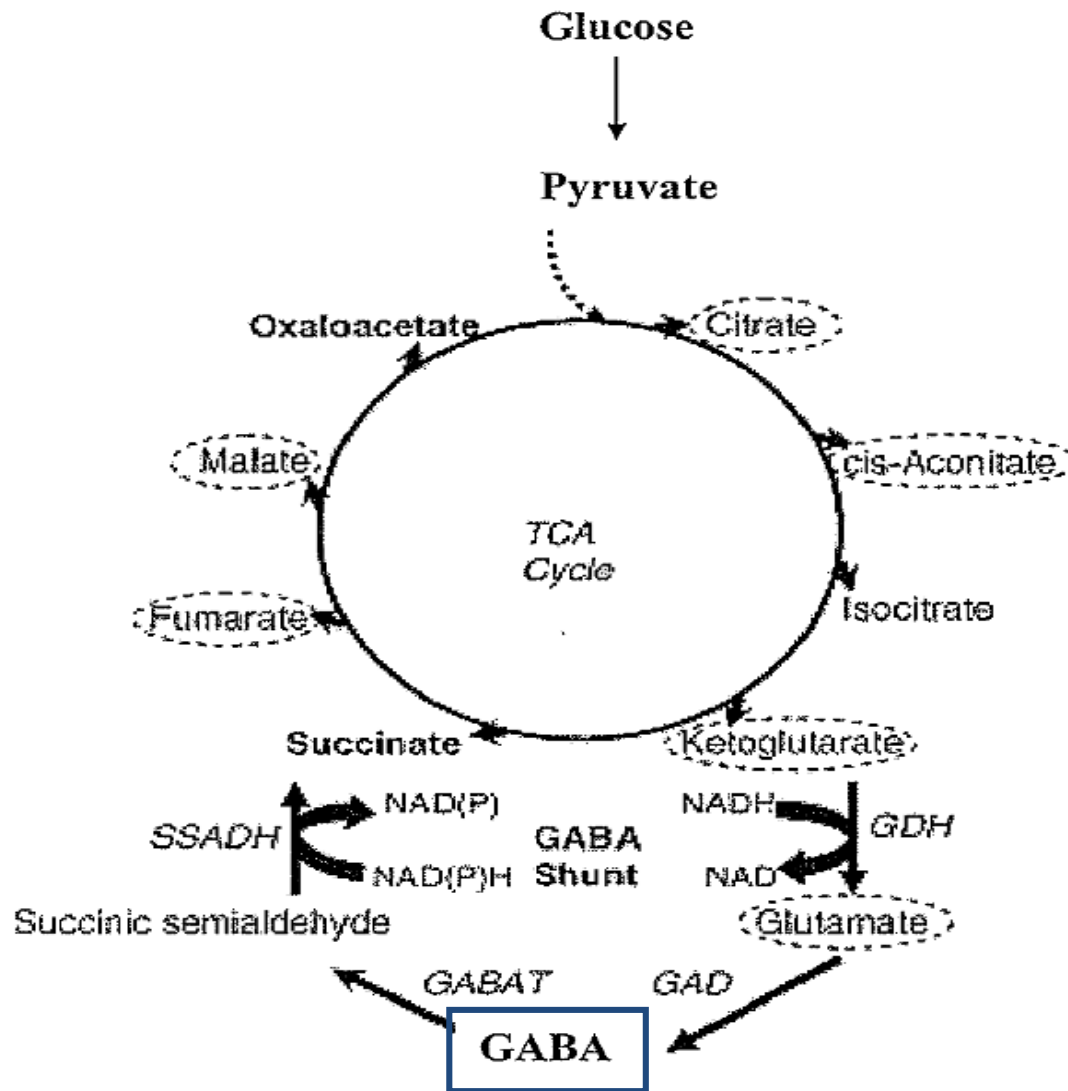
- Acceleration of metabolism in brain.
- Hypertensive effect.
- Improvement of sleeplessness.
- Prevention of climacteric disorder.
- Inhibition of cancer cell proliferation.
- Prevention of Alzheimer's disease.
- Amelioration of liver and kidney disease.
- Improvement of autonomic disorder observed
- Inhibition of the increase of neutral fat.  
(Stanton, 1963; Oh and Oh, 2004; Mody *et al.*, 1994; Zhang *et al.*, Okada *et al.*, 2000 ; Choi *et al.*, 2006)

# Neurotransmitters

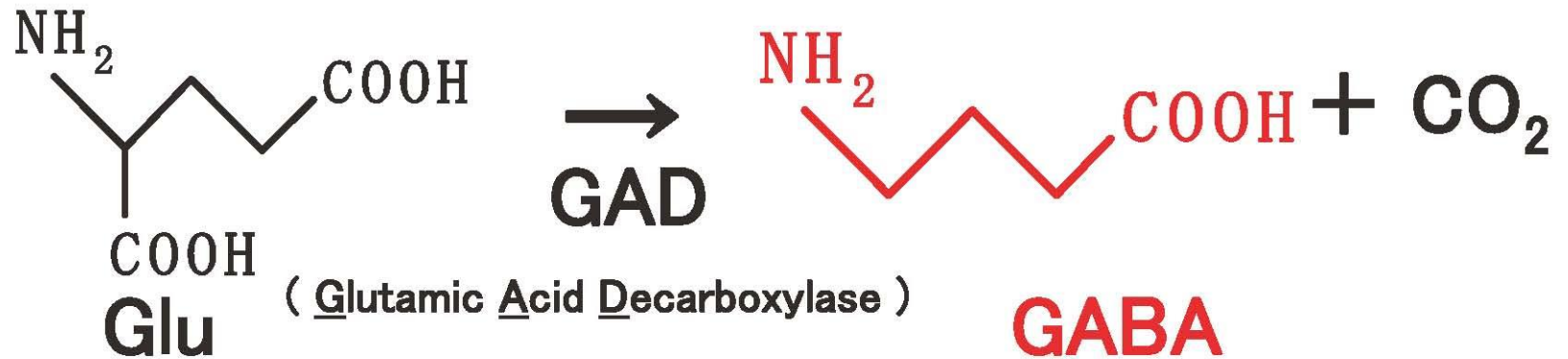


- Amino acids: Glutamate, Aspartate, D-Serine, **GABA**, Glycine
- Monoamines: Dopamine, Norepinephrine, Epinephrine, Histamine, Serotonin
- Others: Acetylcholine, adenosine, anandamide, Nitric oxide

# GABA in metabolic pathway



# 麸氨酸 → GABA





## GABA from germinated rice



# What happens when cereal is germinated?

- Antioxidants are released or new antioxidants are formed
- Dormant enzymes are activated
- Amounts of functional components such as GABA, inositol, phytic acid, food fiber and  $\gamma$ -oryzanol increase

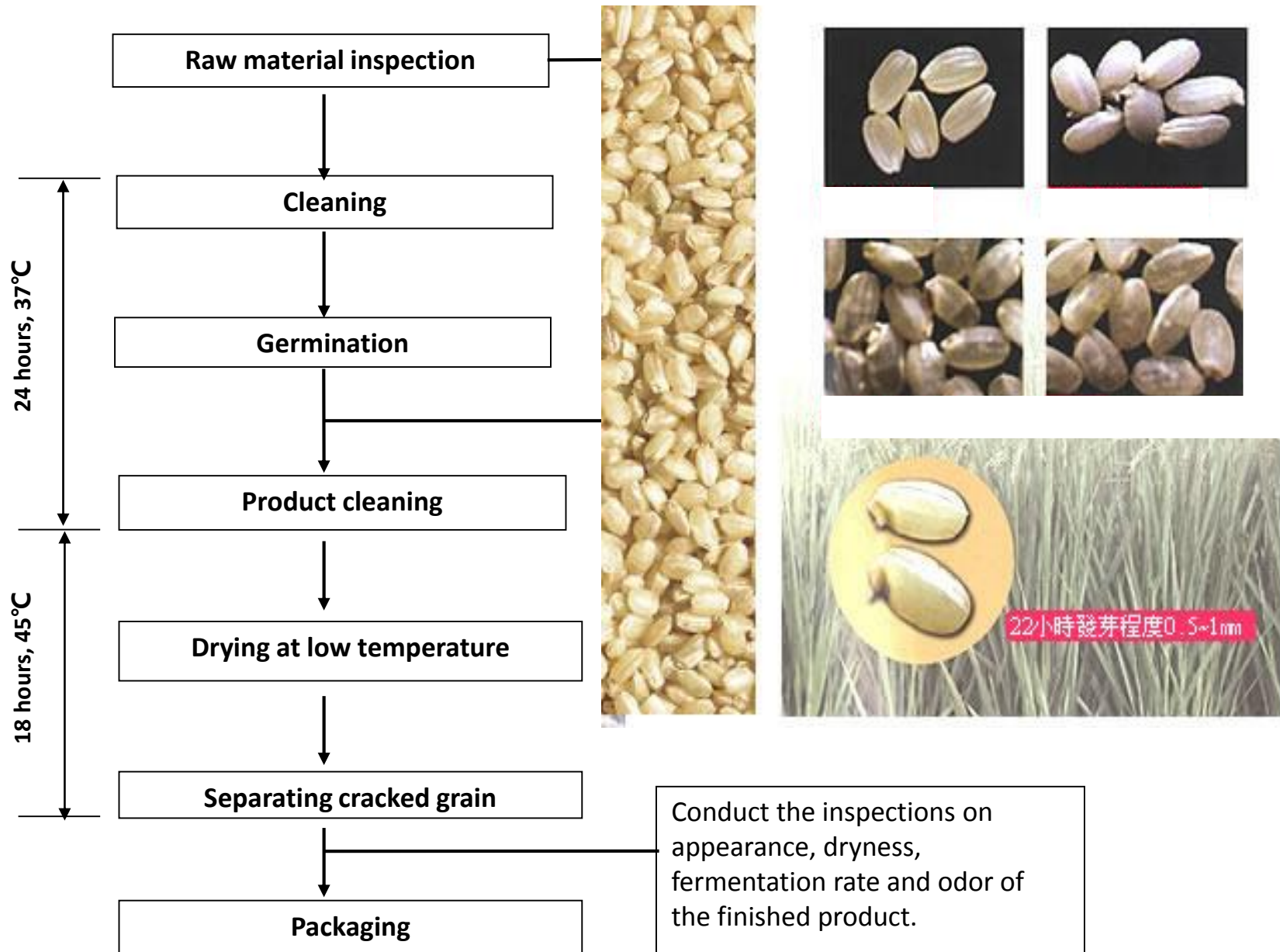
# Nutrient components of rice

Nutrient (per 100g)	Multiple germinated brown rice / white rice	White rice	Germinated brown rice	Multiple germinated glutinous rice / glutinous rice	Glutinous rice (sticky rice)	Germinated glutinous rice (sticky rice)
Calorie	0.95	312kcal	297kcal	0.97	313kcal	305kcal
Carbo-hydrate	0.98	67g	66g	0.85	66g	56g
Protein	1.05	6.0g	6.3g	1.34	7g	9.4g
Fat	3.2	0.78g	2.5g	3	0.9g	2.7g
Vitamin B1	3.7	0.07mg	0.26mg	-	0	0.7mg
Vitamin E	5	0.34mg	1.5mg	7.5	0.24mg	1.8mg
GABA	11	1.3mg	14.2mg	11.8	1.0mg	11.8mg
IP6	5	82.6mg	388.7mg	5.5	67.5mg	371.5mg
Dietary fiber	12	0.34g	4.0g	4.1	0.95g	3.9g
Ma	3.3	18.9mg	63mg	4.7	23.2mg	109.2mg
Fe	3.7	0.26mg	0.95mg	5.3	0.34mg	1.8mg
Ca	1.6	4.3mg	7mg	1.46	10.3mg	15.0mg

- In 2000, research team of Dr. Lu studied on the project “**Comparison of the Physicochemical Properties and Antioxidative Activities of Germinated Brown Rice Induced by Two Sources of Light** “, supported by the Council of Agriculture Executive Yuan, R.O.C.
- In 2007 , the GBR was industrialized and promoted to markets.

# Industrial production of germinated brown rice

## – Asia Rice Biotech, Taiwan



# Key points of industrial rice germination

- Design the apparatus for sterilizing and sprouting grains
- Wash grains with **filtered water** and **ultrasonic waves**
- Apply **ozone** to water to sterilize grains
- **UV** sterilization

# Cleaning of Raw Material





# Industrialization of GRB





# Germination



# Packaging

