

**Guidelines for Risk Management and
Control of *Burkholderia gladioli* pathovar
cocovenenans and Bongkreki Acid**

唐菖蒲伯克氏菌椰毒病原型及邦克列酸風險管控指引 (英文版)

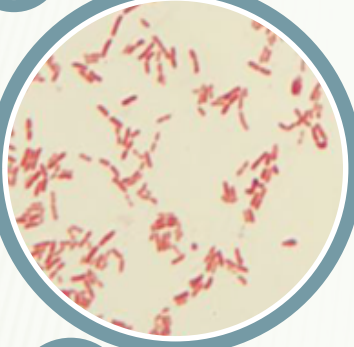
Guidelines for Risk Management and Control of *Burkholderia gladioli* pathovar *cocovenenans* and Bongkreki Acid

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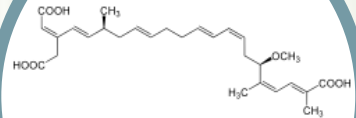
Burkholderia gladioli

Burkholderia gladioli is a Gram-negative, rod-shaped, non-spore-forming, motile, aerobic bacterium found widely in nature, such as in soil and hay. It exhibits interspecies diversity, but only *B. gladioli* pv. *cocovenenans* produces highly lethal toxins, making it the only foodborne pathogen within the *Burkholderia* genus.



Bongkreikic acid

Bongkreikic acid (BA), produced by *B. gladioli* pv. *cocovenenans*, is a highly unsaturated tricarboxylic fatty acid. It is colorless, odorless, tasteless and heat-stable, classified as a polyketide compound. BA induces mitochondrial dysfunction by inhibiting ADP/ATP translocase, by blocking phosphorylation of ADP and preventing hydrolysis of ATP. It is a potent respiratory and mitochondrial toxin.



Bongkreikic acid
(BA)

- Colorless, odorless
- Highly heat-stable
- Lethally toxic

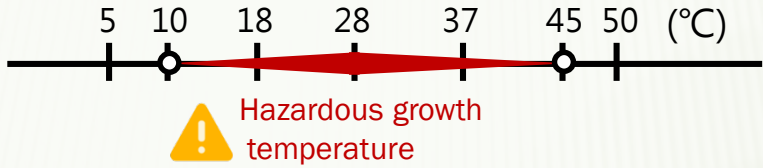
Symptoms of BA poisoning

- Latent period: 1-10 hours
- Primary symptoms: discomfort, dizziness, drowsiness, excessive sweating, palpitations, abdominal pain, vomiting, diarrhea, bloody stool, nausea, and general weakness
- Severe symptoms: hematuria, jaundice, unconscious, convulsions, shock, and death, with diffuse cellular dysfunction and multiple organ failure observed in fatalities
- **Mortality rate: 40-60%**

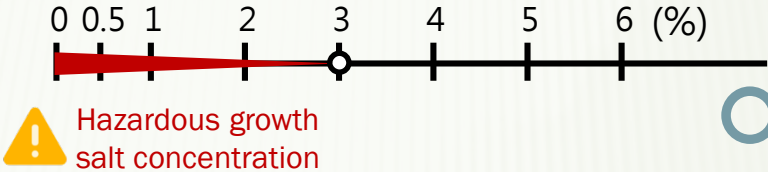
Optimal Growth Conditions for *B. gladioli*



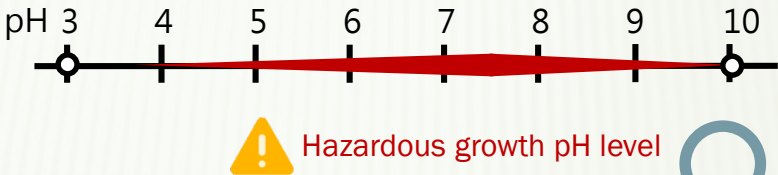
Temp. °C



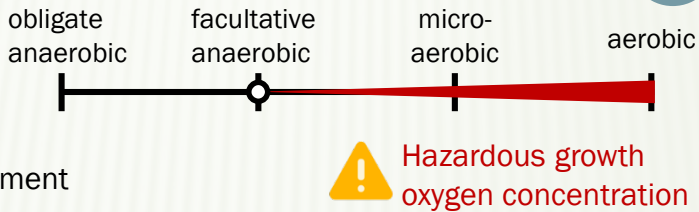
Salt conc.



pH level



Oxygen requirement



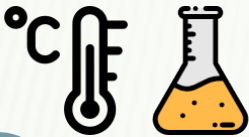
Conditions that inhibit the growth of *B. gladioli* pv. *cocovenenans*

- Temperature < 10°C, > 45°C
- Salt concentration > 3%
- pH < 3.0 or > 10.0
- Anaerobic environment

Special conditions for BA production



B. gladioli pv. *cocovenenans* **strain**



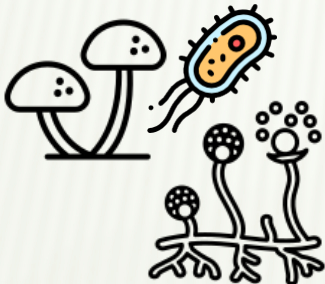
Optimal environment and growth conditions for strain

- Warm and humid environment
- Near-Neutral pH level
- Starch-rich foods sources



Suitable fatty acids

- Glycerol, oleic acid, lauric acid, myristic acid, palmitic acid, linoleic acid, a-linoleic acid
- Oil promote BA production



Coexistence with specific fungi

- *Aspergillus brasiliensis*
- *Rhizopus oligosporus*
- *Rhizopus oryzae*
- *Auricularia heimuer* (wood ear fungus)
- *Tremella fuciformis* (silver ear fungus)

Seven Key Principles for Preventing BA Poisoning



① Choose safe materials



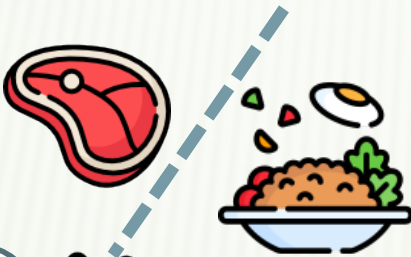
② Wash hands with soap



③ Rehydrate dry food materials at low temperature



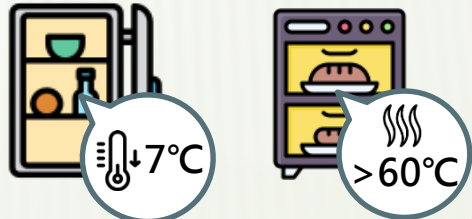
④ Refrigerate sauces after portioning



⑤ Separate raw and cooked food



⑥ Thoroughly cook food to >70°C



⑦ Store food at safe temperatures

Risk Management and Process Controlling for Prevention BA Poisoning

1 Safe food materials

- Purchase from trusted, certified suppliers
- Avoid buying food materials that are susceptible to contamination



Maintain appropriate cold chain temperature

2 Check freshness



- Packaging is intact
- Within expiration date



- Check food materials
Inspect food materials by appearance (look) and smell (sniff) to ensure they have not deteriorated



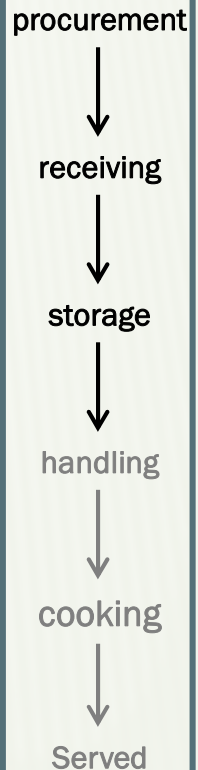
3 Smart storage



Follow first-in, first-out principle

Store at the correct temperature

Separate raw and cooked foods



Risk Management and Process Controlling for Prevention BA Poisoning (contd)

④ Careful food material handling



Wash hands with soap to maintain cleanliness



- Control rehydrated food materials: monitor temperature and time
- Use clean water and cover appropriately

Sauce portioning

- Ensure proper storage
- Label expiration dates
- Discard if spoiled



Post-processed food materials
Use promptly or seal and refrigerate



- Thoroughly wash
- Separate raw and cooked

⑤ Thorough cooking



Ensure thorough heating
(Core >70°C)

⑥ Consume freshly



- Avoid leaving at room temperature for long
- Consume within 2 hours
- Refrigeration at < 7°C
- Limit reheating to once

procurement

receiving

storage

handling

cooking

Served

Control Measures to Prevent the Risk of BA Poisoning

Procurement

- Purchase food materials from trusted, certified suppliers
- Transport food materials at the correct cold chain temperature, and keep the vehicle clean



Special attention must be given when handling high-risk food materials

- Epidemic areas: Indonesia, China, etc.
- High-risk food materials: silver ear fungus, wood ear fungus, rice noodles, corn wine, fermented rice cakes, liangpi (cold skin noodles)

Receiving

- Carefully inspect and accept ingredients upon delivery



If food materials are spoiled, decayed, or expired, they should be returned and rejected

- Abnormal characteristics: mold growth, foul odor, slimy surface, sour smell, etc

Storage

- Follow the first-in, first-out principle for usage
- Store food materials under correct conditions



Wet-processed starch-based rice products, prone to spoilage or deterioration, should be purchased with planning and used promptly

- Examples: noodles, rice noodles, rice cakes, rice sticks, vermicelli, hefen (flat rice noodles), liangpi (cold skin noodles)

Handling

- Before preparing ingredients, or whenever hands are contaminated, wash hands thoroughly with soap to maintain cleanliness
- Ensure all utensils (e.g., knives, cutting boards, pots) are thoroughly cleaned and rechecked for cleanliness before use; it is recommended to disinfect them again with boiling water at 100°C.

Control Measures to Prevent the Risk of BA Poisoning (contd)

Handling

- Inspect food materials carefully before use; If spoiled, decayed, showing abnormal characteristics, or past the expiration date, discard immediately.



For food materials that require soaking (e.g., dried silver ear, dried wood ear mushrooms), rinse thoroughly, then soak in refrigerated clean water that meets drinking water standards and cover appropriately; change the water periodically during soaking.

- Control food material preparation at low temperatures (<20°C), and minimize exposure of perishable food materials (e.g., high-starch or protein foods) to hazardous temperatures (7~60°C) to less than 2 hours
- Prevent cross-contamination between raw and cooked foods during food preparation.



Pay special attention to storage for homemade or portioned sauces:

- Label with expiration dates
 - Do not reuse or add back to the original container
 - Store in refrigeration to prevent spoilage
- For homemade fermented products, ensure the starter culture is hygienically safe, and carefully control fermentation conditions and temperature to prevent contamination and spoilage.

Cooking

- Thoroughly heat food materials during cooking, with a core temperature >70°C.
- After cooking, store food at <7°C and avoid leaving it at room temperature.

Served



- Before serving, staff should thoroughly wash hands with soap and maintain hand hygiene at all times.
- It is recommended to consume the food within 2 hr; any leftovers should be promptly refrigerated, and reheating should be limited to once.

Review of BA poisoning Incidents

Location	Year	Food source
Java/Indonesia	1895-1988	Tempe bongkrek
Shanxi /China	1982	Mildew millet flour
Hebei/China	1982	Fermented corn flour
Hebei/China	1983	Fermented cornmeal
Inner Mongolia Autonomous Region/China	1982	Fermented cornmeal
Sichuan/China	-	Tangyuan (rice dumplings)
Shandong /China	1984	Spoiled silver ear fungus
Henan/China	1984	Spoiled silver ear fungus
Henan/China	1984	Spoiled silver ear fungus
Central Java/Indonesia	2007	Fermented Soybean Milk
Yunnan/China	2014	Fermented cornmeal snack
Southern Africa/ Mozambique	2015	Brewed corn flour alcoholic beverage
Guangdong/China	2018	Rice noodles (unfermented or spoiled)
Guangdong/China	2019	Rice noodles (expired)
Heilongjiang/China	2020	Fermented corn flour
Daganna/Bhutan	2020	Brewing corn alcohol (suspected)
Taiwan	2024	Rice noodles (suspected)

Conclusion

Food poisoning caused by Bongkrelic acid from *B. gladiolus* pv. *cocovenenans* presents a serious food safety risk.

To prevent this, select certified food materials, monitor expiration dates, practice good personal hygiene, wash hands frequently with soap, and carefully control soaking time and temperature for rehydrated food materials. Sauces should be portioned, labeled with expiration dates, and stored in refrigeration.

To effectively inhibit the growth of *B. gladioli* pv. *cocovenenans* in foods, it is recommended to store moist, processed starch-based rice products, wood ear mushrooms, or fermented foods in low-temperature conditions. Additionally, adding a moderate amount of salt, adjusting pH to more acidic or alkaline levels, reducing oil content, or using vacuum packaging can help maintain food safety.

**Prevent Bongkrelic acid food poisoning
Protecting our health**

Taiwan Food and Drug Administration cares about you~

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