## Applications

Brands can add a science-backed ingredient by formulating EpiCor® postbiotic into dietary supplements and functional foods and beverages. This pH, heat, and shelf stable ingredient delivers the beneficial properties consumers want, and the formulation flexibility brands need.

GRAS for: Bars, breads, coffee, cookies, creamers, dry cereals, hard candy, juice drinks, milk products, soups/broth, sport/fitness/protein beverages, tea, tofu, yogurt, and more.

### Qualifications and Certifications

- Manufactured in 21 CFR 111 (supplement) and 21 CFR 117 (food safety) cGMP compliant facility certified by NSF International
- GRAS determination 928
- NDIN 351 (New Dietary Ingredient Notification) on file with FDA
- Non-GMO Project Verification
- Allergen-free (American and EU standards)
- Vegan
- Gluten-Free
- Kosher (OU certified)
- Halal certified
- BSE/TSE-free
- HACCP/Food Safety Plan
- Made in the USA

**Dose**
Humans: 500 mg per day.
Pets: 125 mg per 40 lbs or 7 mg/kg of body weight per day.

**Safety**
Food/beverages: FDA GRAS no objection for ages 2+.
Supplements: FDA NDIN for ages 4+.


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EPICOR®
#1 POSTBIOTIC BRAND
a Cargill brand

# EpiCor® Postbiotic Stability

## Guidelines and Implications for Formulation into Functional Foods


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EpiCor® postbiotic is a dried yeast fermentate comprised of a unique fingerprint of metabolites including proteins, polyphenols, vitamins, minerals, amino acids, beta-glucans and mannans.

Due to the complex nature of EpiCor® postbiotic, Cargill has completed a variety of tests meant to mimic the most common processing conditions associated with functional food manufacturing.

The production of functional foods often requires harsher processing conditions than those used in the production of typical dietary supplements. Both the individual ingredients and the finished product may be exposed to high heat, varying pH levels, extreme pressure, and elevated water activity. To ensure EpiCor® postbiotic is up to the challenge, Cargill conducted shelf life, non-aqueous heating, and aqueous heating tests (under a range of acidity) to analyze stability and provide guidance to food and beverage manufacturers.

**The enclosed information is meant to demonstrate the durability, versatility and stability of this ingredient.**

**Ingredients that measure up.**

To support our food and beverage partners, the team of experts at Cargill have reviewed EpiCor stability under standard processing parameters, including:

- Shelf life of at least 3 years from manufacture date.
- Heat stability under processing conditions like those found in functional foods.
- EpiCor in water under various processing conditions including time, temperature, and pH.

## Stability Assays

**Polyphenols:** EpiCor postbiotic contains polyphenols, a class of compounds known for their powerful antioxidant capabilities and health benefits. These well-known compounds are relatively easy to measure and can serve as a useful stability marker for EpiCor® postbiotic. Polyphenol measurements were performed at Alkemist Labs using the established Folin-Ciocalteu method.[1]

**Beta-glucan:** Yeast cell walls from the *Saccharomyces cerevisiae* strain EpiCor is derived from contain beta-1,3/1,6-glucan. These beta-glucans are known to impact immune response and may contribute to EpiCor's mode-of-action. Beta-glucan measurements were performed at Eurofins using specialized assay kits from Magazyme.

**Identity:** Cargill uses cutting edge technology, Buchi Analytical Fourier Transform Near Infra Red spectroscopy (FT-NIR), to verify product identity. This technique is used worldwide by the pharmaceutical industry to meet regulatory compliance standards. In addition, FT-NIR is accepted by the FDA as a method of proving identity of dietary supplements.

FT-NIR spectroscopy is a non-destructive and economically viable method to perform quality measures using special frequency ranges of light to create a unique, mathematical fingerprint. This method can be used to identify and qualify materials prior to use in production processes, and to confirm identities and consistencies of finished products in a pass/fail test.

The FT-NIR fingerprint of EpiCor® postbiotic represents the chemical and physical properties of the material. When unknowns are tested a statistical analysis can be applied to spectral data to establish limits of acceptance. By using similar materials in a calibration model, the software algorithm will differentiate them and prevent incorrect materials from receiving a 'Pass' result.

1. Singleton, V. L. O., et. al. Analysis of total phenols and other oxidation substrates and antioxidants by means of folin-ciocalteu reagent. In Methods in Enzymology 1999, 152-178.



**Powerful in powder.**

## Non-aqueous Heat and Pressure Stability

Autoclaving and baking are two common conditions under which to test an ingredient's stability through harsh heat. An autoclave is a pressure chamber used to carry out industrial processes requiring elevated temperature and pressure for sterilization purposes.

**Method:** A typical lot of EpiCor was chosen for heat stability analysis. The lot was tested under two different conditions and compared against control: dry EpiCor® postbiotic powder that did not undergo any heat or pressure treatment.

**Results:** For each treatment and assay, the percentage increase (+) or decrease (-) compared to control was identified. The % change for both polyphenols and the beta-glucan content was acceptable, and each treatment received a 'pass' ID when tested with FT-NIR.

| | Polyphenols % Change from control* | beta-glucan % Change from control* | ID by NIR |
|---|---|---|---|
| EpiCor autoclaved for 15 minutes at 250° F (121° C) under 15 psi (100 kPa) pressure | -5.4 | -9.6 | PASS |
| EpiCor oven-baked at 325° F (163° C) for 30 min | +4.6 | -2.7 | PASS |

**Long-lasting in liquid.**

## Aqueous Heat Stability

Material in an aqueous phase can be especially susceptible to chemical reactions. Popular functional food products include pasteurized liquid applications and powder applications meant to be added to hot water. Therefore, the stability of EpiCor® postbiotic was assayed in an aqueous environment after heating to the boiling point using two commonly used methods: microwave and heat plate.

**Method:** Three EpiCor postbiotic lots were used. Each lot was tested under five different conditions and compared against control: dry EpiCor postbiotic powder, room temperature (RT).

**Results:** After treatment, all aqueous samples were dried to a powder using the proprietary drying system used during the production of EpiCor® postbiotic. Stability assays were performed and an average increase (+) or decrease (-) among the three postbiotic lots identified. The % change for both polyphenols and the beta-glucan content was acceptable, and each treatment received a 'pass' ID when tested with FT-NIR.

| | Mean Polyphenols % Change from control* | beta-glucan % Change from control* | ID by NIR |
|---|---|---|---|
| EpiCor mixed in tap water, RT | +0.86 | +0.81 | PASS |
| EpiCor mixed in tap water heated to 100°C for 10 minutes in microwave and then cooled to RT | +3.92 | -1.50 | PASS |
| EpiCor mixed in tap water heated to 100°C for 10 minutes in microwave | +0.95 | -0.69 | PASS |
| EpiCor mixed in tap water heated to 100°C for 10 minutes on heat plate | +1.46 | -0.21 | PASS |

* Cargill accepts a polyphenol % change of +/- 15 and a beta-glucan % change of +/- 10. This takes into consideration the testing variability and the complex nature of EpiCor.

Tested, to the core.

## Processing Stability Assessment

Additional assessments of EpiCor in water were performed. These methods took into consideration various processing conditions including time, temperature, and pH.

**Method:**

1. EpiCor samples were processed and analyzed
2. Processing conditions and background information
   a. pH 3.5: Used to substantiate stability of acidified beverages and gummies.
   b. pH 4: Used to substantiate stability of tomato soup and similar.
   c. pH 7: Used to substantiate stability of neutral beverages and dairy.
   d. HTST: High Temperature (160° F) Short Time (15-30 seconds).
   e. Hot fill at 190° F.
   f. Retort: Sealed in container and sterilized under high temperature: 266° F for 10 minutes.
   g. UHT: Ultra High Temperature: 284° F for 6 seconds.

**Results:**

The % change for both polyphenols and the beta-glucan content was acceptable in each of the processing conditions. Each method received a 'pass' ID when tested with FT-NIR.

# Conclusion

## Based on the data shown, the stability of EpiCor® postbiotic did not significantly change when processed under a representative set of industry conditions.

## Based on these findings, it is highly probable that the stability of EpiCor® postbiotic would not significantly change in functional food production.