

# Limonen-E

D-Limonene for GERD Relief | VA-122



## Key Features:

D-limonene has been shown to be effective in relieving occasional heartburn and gastroesophageal reflux disease (GERD).

- **Ultra-Purified D-Limonene (>99.5%).**
- 1 g of D-limonene (~24 drops) daily or every other day for 2 weeks has been clinically shown to achieve complete relief of symptoms
- Inclusion of vitamin E to stabilize d-limonene from oxidation.

**Quantity: 30 mL | Dosage Form: Liquid**

### Ingredients (per 24 drops):

D-Limonene (from *Citrus sinensis* peel).....1000 mg  
Vitamin E (from alpha-d-tocopheryl acetate).....2.4 IU

### Suggested Use:

Take 24 drops daily with water, or as recommended by your health care practitioner.

## Description:

Citrus oil gives a pleasant and refreshing smell, and it is commonly used in aromatherapy to uplift and energize people's spirit. However, most people are not aware of that citrus oil has many other applications due to one of its major constituents – d-limonene.

D-limonene is a monocyclic monoterpene (Figure 1) that contributes to the aroma of citrus oils. D-limonene is commonly used as a fragrance and flavoring agent in esthetic products and beverages, and therefore, it is generally recognized as safe (GRAS) for ingestion. It is also commonly used as a natural cleaning agent due to its organic solvent property.

Upon ingestion, it is rapidly distributed to different tissues in the body (ie. liver, lung, kidney, adipose tissue) and readily metabolized (up to 83% within 48 hours). Clinical trials have determined that d-limonene has no toxicity or side effects in humans at 100 mg/kg.<sup>1</sup>

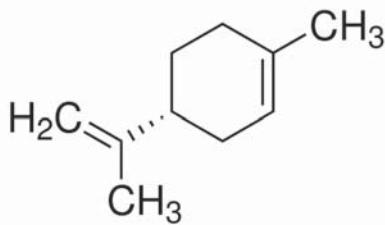


Figure 1. D-limonene chemical structure.

### Not All D-Limonene Extracts Are Made Equal

#### Non-Food Grade vs. Food Grade vs. High-Purified vs. Ultra-Purified Grade

D-limonene can be categorized into 4 grades of purity: 1) non-food grade (aka technical grade), 2) food-grade, 3) high-purified grade, and 4) ultra-purified grade. (Figure 2 - see the next page)

Non-food grade d-limonene is produced from the citrus peel via steam distillation. The purity is usually not standardized and, therefore, residual pesticides/herbicides on the peel may be present. This grade of d-limonene is usually used for cleaning purposes.

Food grade d-limonene is obtained from vacuum distillation of fragrance compounds from cold-pressed citrus oil, which is derived from the flesh of the orange. This process can achieve 95% purity of d-limonene.

Food grade d-limonene can further undergo another vacuum distillation process to yield High-Purified Grade (98.5%).

**Ultra-Purified Grade (99.5%)** is obtained from undergoing **triple vacuum distillations** to remove almost all of the impurities and yield the purest form of d-limonene.

### Clinical Applications

#### Gastroesophageal Reflux Disease (GERD)

D-limonene has been used to relieve heartburn due to its potential to protect mucosal surfaces and its ability to support healthy peristalsis.<sup>2,3</sup>

In a double-blind, placebo-controlled study (n=13), 1,000 mg d-limonene once daily or every other day for 2 weeks was shown to yield complete relief of GERD symptoms in 86% of the subjects. Moreover, improvement was noticeable after only 4 days of administration.<sup>2</sup>





# D-Limonene Manufacturing Process

## CITRUS FRUIT

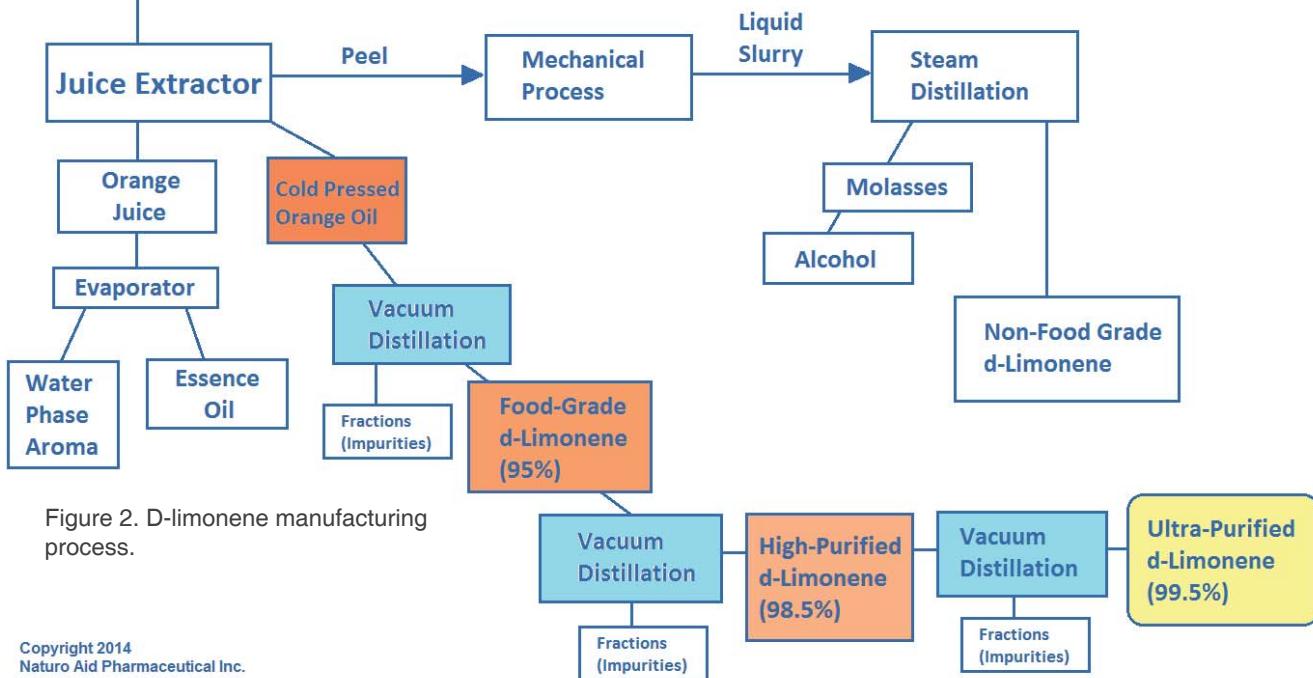


Figure 2. D-limonene manufacturing process.

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In another clinical trial, 19 patients suffering from chronic heartburn or GERD were prescribed 1000 mg d-limonene every day or every other day after discontinuing any OTC or prescription heartburn medications. After 14 days, 89% of subjects reported complete relief of symptoms.<sup>2</sup>

### Potential Cancer Prevention & Tumor Therapy

D-limonene was able to prevent progression of both breast and liver cancers in cancer-induced animal models.<sup>4</sup> It was also tested as a mammary tumor therapy in preclinical models and resulted in regression of >80% of the carcinoma little host toxicity.<sup>1</sup>

### Gallstone Dissolution

D-limonene is known to be a good solvent to dissolve cholesterol. In a study involving 200 patients with gallstones, d-limonene administered via direct infusion was shown to significantly dissolve the stones in 141 of the patients; 96 patients with

complete dissolution of stones.<sup>5</sup>

### Caution:

Some people may experience a slight tingling sensation; in which case, take with water. Since the content in this product is flammable, keep heat and fire away.

### Reference:

1. Crowell PL, Elson CE, Bailey HH, et al. Human metabolism of the experimental cancer therapeutic agent d-limonene. *Cancer Chemother Pharmacol* 1994; 35:31-37.
2. Wilkins JS Jr. Method for treating gastrointestinal disorders. U.S. Patent (6,420,435). July 16, 2002.
3. Lis-Balchin M, Ochocka RJ, Deans SG, et al. Bioactivity of the enantiomers of limonene. *Med Sci Res* 1996;24:309-310.
4. Gould MN. Cancer chemoprevention and therapy by monoterpenes. *Environ Health Perspect* 1997; 105(4): 977-979.
5. Igimi H, Tamura R, Toraiishi K, et al. Medical dissolution of gallstones. Clinical experience of d-limonene as a simple, safe, and effective solvent. *Dig Dis Sci* 1991;36:200-208.

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