Selected literature


Contact information

The Antares Team works in close partnership with our customers to meet their needs.

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Web page: www.tpgs.com
Our web site provides additional information and access to documents including:
• Material Safety Data Sheet (MSDS - USA and international)
• Nutrient Data Sheet, Kosher Certificate
• Allergen Statement
• Residual Solvents (Organic Volatile Impurities, OVI)
• Current Good Manufacturing Practices (cGMP) Statement
• Certificate of Analysis (COA)

Antares Vitamin E TPGS FG

Properties and Applications

FOOD AND BEVERAGE

DIETARY SUPPLEMENTS

ANIMAL NUTRITION

PERSONAL CARE & COSMETICS
Antares Vitamin E TPGS (d-α-tocopheryl polyethylene glycol 1000 succinate), is a water-soluble derivative of the natural form of d-α-tocopherol. In addition to serving as water-soluble source of vitamin E, TPGS has unique properties due to its dual combination of lipophilicity and hydrophilicity, similar to a surface-active agent. Its applications include formulation of lipophilic and poorly soluble nutrients and natural compounds and enhanced absorption and bioavailability. TPGS has a proven record of safety and efficacy in dietary supplements, food and beverage, personal care and cosmetics, and animal nutrition products.

**Properties**

**Chemical properties**
Antares vitamin E TPGS is the polyethylene glycol 1000 ester of d-α-tocopherol succinate.

<table>
<thead>
<tr>
<th>Chemical structure</th>
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<tbody>
<tr>
<td><img src="image1" alt="Chemical structure" /></td>
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<table>
<thead>
<tr>
<th>Chemical name</th>
<th>d-α-tocopherol polyethylene glycol 1000 succinate</th>
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<table>
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<tr>
<th>Synonyms/Acronyms</th>
<th>Vitamin E TPGS or TPGS, Tocopherosilan (INCI and USAN)</th>
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<table>
<thead>
<tr>
<th>Molecular weight</th>
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<tr>
<th>Solubility in water</th>
<th>Soluble (up to 20 weight %)</th>
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<table>
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<tr>
<th>Heat stability</th>
<th>Stable up to approximately 199 °C</th>
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<tr>
<th>Sterilization</th>
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<table>
<thead>
<tr>
<th>Viscosity</th>
<th>Constant and low viscosity within a wide range of concentration and temperature (10 - 20% TPGS weight basis in water, 20 - 45 °C)</th>
</tr>
</thead>
</table>

**Physical properties**
Antares vitamin E TPGS is a pale yellow water-soluble waxy solid with low melting point.

<table>
<thead>
<tr>
<th>Physical form</th>
<th>Waxy solid, white to light tan (as solid)</th>
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</table>

<table>
<thead>
<tr>
<th>Specific gravity</th>
<th>1.06 at 45°C, approximate</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Melting point</th>
<th>38 °C approximate (range 37-41)</th>
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</table>

**Surfactant, forms micelles**

As an amphiphile, vitamin E TPGS emulsifies lipids and helps solubilize poorly soluble compounds. In addition, it forms micelle like particles which increase absorption and bioavailability.

![Micelles in aqueous solution](image2)

**Nutritional characteristics**

Vitamin E TPGS supplies in water-soluble form the natural d-α-tocopherol which is universally accepted as more potent than the synthetic form dl-α-tocopherol.

**Vitamin E TPGS** supplies 372.447 IU/g from 250-300 mg d-α-tocopherol/g. Published clinical studies showed that Vitamin E TPGS is absorbed well by patients with liver and pancreatic insufficiency which causes malabsorption of vitamin E.

The A summary of the nutritional characteristics which may be used in labeling products containing vitamin E TPGS is available at [www.tpgs.com](http://www.tpgs.com).

**Food and beverage**

Vitamin E TPGS is used to fortify foods and formulate nutrients and nutraceuticals especially beverages, sports drinks, juices and water. Major applications include:

- Beverages, sports drinks, juices and water fortified with vitamin E or multivitamin/mineral and nutraceuticals. As water soluble, ethanol free, with neutral taste and water, TPGS is preferable over other products especially in water and clear drinks.
- Foods such as bars, puddings, yogurt and others which aim to supply highly absorbable vitamin E and other lipophilic nutrients and nutraceuticals.

**Animal nutrition**

Vitamin E TPGS supplies highly absorbable and bioavailable vitamin E for animals which do not absorb efficiently the traditional forms of vitamin E including zoo animals, especially elephants and black rhinoceros and other animals and pets that require highly absorbable and bioavailable vitamin E. Major applications include:

- High vitamin E supplements in the form of liquid, powder, gel, tablet and others.
- Premixes, concentrates and other forms that can be used in feed fortification.

**Safety and regulatory status**

Vitamin E TPGS has a record of safety based on decades of use in animals and humans and on reported toxicology studies. Studies in humans included dosing of cholestatic children at 25 IU/kg/day (equivalent to 64 mg TPGS/kg/day) for over two years. It is safe for transportation, storage and handling. Vitamin E TPGS has a self affirmed GRAS (Generally Recognized As Safe) status when used as an oral dietary supplement of vitamin E. The United States Pharmacopeia published a monograph for vitamin E TPGS in the USP/NF Supplement #9 dated of November 15, 1998.

In Canada, vitamin E TPGS is approved as a form of vitamin E. In the European Community it is approved as API (Active pharmaceutical Ingredient); for the treatment of vitamin E deficiency due to digestive malabsorption in pediatric patients; and for use in foods for special medical purposes. In Japan it is approved as a pharmaceutical excipient for oral drug formulations.

**Packaging, storage and shelf-life**

Antares Vitamin E TPGS is available in 1 kg, 5 kg, and 15 kg tamper-evident, plastic-sealed containers. The containers are heat tolerant at least 50 °C. The containers may be stored in room temperature and should be opened only when necessary and with extreme care to avoid contamination. Antares Vitamin E TPGS FG is labeled with a 4 year shelf-life from the date of manufacturing when stored in the original sealed unopened container.
**Antares Vitamin E TPGS** (d-α-tocopheryl polyethylene glycol 1000 succinate), is a water-soluble derivative of the natural form of d-α-tocopherol. In addition to serving as a water-soluble source of vitamin E, TPGS has unique properties due to its dual combination of lipophilic and hydrophilic groups, similar to a surface-active agent. Its applications include formulation of lipophilic and poorly water-soluble lipids and water-soluble vitamins, such as vitamin E, as well as emulsifying, solubilizing, and enhancing absorption and bioavailability. TPGS has a proven record of safety and efficacy in dietary supplements, food and beverage, personal care and cosmetics, and animal nutrition products.

## Properties

### Chemical properties

- **Antares vitamin E TPGS** is the polyethylene glycol 1000 ester of d-α-tocopherol succinate.
- **Chemical name**: d-α-tocopheryl polyethylene glycol 1000 succinate
- **Synonyms/Acronyms**: Vitamin E TPGS or TPGS, Tocophersolan (INCI and USAN)
- **Molecular weight**: 1513 (approx)
- **d-α-tocopherol**: 25% minimum weight basis; range 25-30% d-α-tocopherol
- **Chemical stability**: Stable when exposed to oxygen, heat, light, and oxidizing agents and under the conditions of heat sterilization. Unstable to alkali

### Physical properties

- **Antares vitamin E TPGS** is a pale yellow water-soluble waxy solid with low melting point.
- **Physical form**: Waxy solid, white to light tan (as solid)
- **Specific gravity**: 1.06 at 45°C, approximate
- **Melting point**: 38°C approximate (range 37-41)
- **Solubility in water**: Soluble (up to 20 weight %)
- **Heat stability**: Stable up to approximately 199°C
- **Sterilization**: Stable when exposed to approximately 125°C for 1 hour
- **Viscosity**: Constant and low viscosity within a wide range of concentration and temperature (10 - 20% TPGS weight basis in water, 20 - 45°C)
- **Solubility**: Forms solutions with water at concentrations up to approximately 20% (weight basis) beyond which liquid crystalline phases may form

### Nutritional characteristics

- **Antares vitamin E TPGS** supplies in water-soluble form, ethanol free, natural d-α-tocopherol and does not affect the taste and color of foods and beverages. High levels of vitamin E and other lipophilic nutrients and nutraceuticals are absorbable and bioavailable. Major applications include:
  - Emulsifies and enhances the absorption of other lipophilic nutrients and nutraceuticals.
  - Fortifies foods and formulate nutrients and nutraceuticals especially beverages, sports drinks, juices and water. Major applications include:
    - Beverages, sports drinks, juices and water fortified with vitamin E or multivitamin/mineral and nutraceuticals. As water soluble, ethanolic free, with neutral taste and odor, TPGS is preferable over other products especially in water and clear drinks.
    - Foods such as bars, puddings, yogurt and others which aim to supply highly absorbable vitamin E and other lipophilic nutrients and nutraceuticals.

### Surfactant, forms micelles

As an amphiphile, vitamin E TPGS emulsifies lipids and helps solubilize poorly soluble compounds. In addition, it forms micelle-like particles which increase absorption and bioavailability.

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## Applications

**Vitamin E TPGS** offers unique advantages in product development.

1. **Food and Beverage**
   - **Vitamin E TPGS** is used to fortify foods and formulate nutrients and nutraceuticals especially beverages, sports drinks, juices and water. Major applications include:
     - Beverages, sports drinks, juices and water fortified with vitamin E or multivitamin/mineral and nutraceuticals. As water soluble, ethanolic free, with neutral taste and odor, TPGS is preferable over other products especially in water and clear drinks.
     - Foods such as bars, puddings, yogurt and others which aim to supply highly absorbable vitamin E and other lipophilic nutrients and nutraceuticals.

2. **Animal Nutrition**
   - **Vitamin E TPGS** supplies highly absorbable and bioavailable vitamin E for animals which do not absorb efficiently the traditional forms of vitamin E including zoo animals, especially elephants and black rhinoceros and other animals and pets that require highly absorbable and bioavailable vitamin E. Major applications include:
     - High vitamin E supplements in the form of liquid, powder, gel, tablet and others.
     - Premixes, concentrates and other forms that can be used in feed fortification.

3. **Dietary Supplements**
   - **Vitamin E TPGS** has been used to formulate supplements especially those designed to overcome malabsorption of vitamin E and other lipophilic nutrients and nutraceuticals. Major applications include:
     - Liquid vitamin E or liquid multivitamin/mineral supplements.
     - Other forms of vitamin E or multivitamin/mineral dietary supplements such as tablets, softgels, bars and others.

4. **Personal Care and Cosmetics**
   - The properties of vitamin E TPGS as emulsifier, solubilizer and formulation excipient, coupled with its safety profile make it a strong formulation tool for topical including cosmetics. Major applications include:
     - Creams, lotions and other products for topical application of vitamin E and other formulated actives.
     - Eye drops, nasal sprays, syrups and others primarily in formulating active compounds.
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