Product form

- Supplied as a fine white agglomerated, free-flowing powder with a mild spicy, aromatic odour.
- Heat stability results from a patented process where the Enviva® EO particles (droplet size < 1 μm in diameter) are in a maltodextrin matrix and encapsulated.
- Packed in 20 kg polyethylene / aluminium lined paper bags.
- Manufacturing certifications:
  - ISO9000/9001
  - HACCP
  - FAMIQS

Product application

- Recommended usage rate is 100 g/tonne feed, included either directly or via a premix. 100 g of product will provide a guaranteed minimum of:
  - 4.9 g cinnamaldehyde
  - 13.9 g thymol
- Heat stable to 85ºC, so ideal for pelleted feed applications (see figure).
- Stable when stored at temperatures of up to 22ºC (even in humid conditions) for at least:
  - 18 months in original packaging
  - 6 months in a vitamin/mineral premix
  - 3 months mixed in feed

Peer reviewed and trial references

2. Danisco Technical Report EO.CH.13.10, summarizing trials run at China Agricultural University, China 2014
5. Danisco Technical Reports D.C.OCH.586.01 trials at Biotechnologisk Institute, Kolding, Denmark and TR (no ref given) commercial feed mill, Germany.
7. Amerah et al. (2011), Br Poult Sci (1); 124-132

Contact your Danisco Animal Nutrition representative or distributor for recommendations about your specific application needs.

Enviva® EO is heat stable at processing temperatures up to 85ºC (185ºF)

| Thymol activity (%) retained in heat treated pelleted feed compared to non-heat treated mash feed |
|---------------------------------|---------------------------------|
| **Corn-based diets**            | **Wheat-based diets**            |
| 92%                             | 90%                             |

Processed at 85ºC (185ºF)

<table>
<thead>
<tr>
<th>Steam pressure &amp; Conditioning time &amp; Texts per temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 bar (29 psi) &amp; 30 seconds &amp; 4 texts per temperature</td>
</tr>
</tbody>
</table>

Thymol used as the marker.

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To find your nearest local office or distributor visit www.animalnutrition.dupont.com

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Danisco Animal Nutrition
SUPPORTS PROFITABLE AND HEALTHY PIG PERFORMANCE

Enviva® EO is heat stable at processing temperatures up to 85ºC (185ºF)
Enviva® EO
highly bio-efficacious essential oil blend which maximizes feed intake and supports pig gut health

- Improves piglet feed intake by up to 19%, live weight gain (>10%), resulting in net profit improvement of $25.96/tonne2 and net profit saving (19%+) comparable to Antibiotic Growth Promoters
- Supports gut health and food safety through reduced occurrence of diarrhoea and decreased E. coli counts in faeces1, 3
- Strong bio-efficacy achieved from high concentration blends, the active components of which are protected by patented "encapsulation" process making them heat stable up to 85°C5
- Free-flowing, dust-free and uniform particles are easily added to premixes or directly into the feed ensuring good distribution

Why essential oil feed additives can be "essential" additions to animal feed

Essential oil compounds (EOC) are aromatic molecules that have been extracted from specific plants or plant parts. Deemed "essential" to the plant because they offer varying degrees of antibacterial, antiviral, antifungal, anti-inflammatory and antioxidant properties, they can also offer healthy performance and food safety benefits to pig producers.

To achieve optimum benefits, you need to check the origin and composition of the oils, and the extent of in vitro and in vivo evidence in place to support product claims. The manufacturing process used to create the product is also very important. Essential oil compounds are volatile and prolonged storage or high feed processing temperatures can affect their stability. They can also be absorbed and metabolised rapidly by the animal. It is therefore important that they are used at a high concentration and that the active components are protected to maximize bioefficacy and stability.

Why choose Enviva® EO essential oil compounds?

Developed following intensive EOC laboratory screening and in vivo research across different diet types and ages of animal, Enviva® EO comprises carefully balanced, high concentration blends of thymol and cinnamaldehyde in nature identical form. Ongoing research has shown that Enviva® EO is a superior solution for resolving common production challenges.

Benefits at the feed mill and beyond

Enviva® EO is highly concentrated, and the patented encapsulation process used to protect its active ingredients, means that it is highly bio-efficacious and beneficial to the animal. This also guarantees economy and ease of use.

Benefits offered by encapsulation include:
- dust-free with a low odour, enabling safe and convenient handling in the feed mill
- improved dosage control
- reduced storage and transport costs due to low product volume
- guaranteed pelleting and processing stability at temperatures up to 85°C5

Its free flowing particles can also easily be added to premixes and it can be used for poultry as well as pigs, reducing logistics costs.

How Enviva® EO can help
- Proven increases in appetite and improved bodyweight gain (see figure 3, 4, 5) may be due to the aromas and flavours of thymol and cinnamaldehyde.
- Evidence shows that Enviva® EO supports the development of a positive gut microflora, which results in digestibility benefits4, 5 and helps to control populations of certain bacteria that may have a negative impact on production, especially for young animals raised under stressful environmental conditions.
- Trials suggest Enviva® EO application results in comparable weight gain and profitability levels to those achieved from Antibiotic Growth Promoter usage (see figure). Its gut health benefits — e.g. modulation of the intestinal microflora — have also been shown to reduce instances of diarrhoea and minimize E.coli counts in the faeces. (See table)

Challenges
- Production stress in young pigs can result in loss of appetite and weight loss.
- Newly weaned piglets’ immature immune and digestive systems are susceptible to disease-causing organisms which can disrupt gut integrity.
- The use of cheaper raw materials has been shown to result in digestive and gut health issues which, in turn, impacts healthy growth performance.
- Consumer pressure from food safety and health scares has called for bans or reduced use of in-feed antibiotics in some countries, so producers have to find other ways of achieving healthy growth performance.

Benefits offered by encapsulation include:
- dust-free with a low odour, enabling safe and convenient handling in the feed mill
- improved dosage control
- reduced storage and transport costs due to low product volume
- guaranteed pelleting and processing stability at temperatures up to 85°C

Its free flowing particles can also easily be added to premixes and it can be used for poultry as well as pigs, reducing logistics costs.

Effect of Enviva® EO on performance, diarrhoea frequency and microbial counts in the faeces of piglets

(Adapted from Li et al, 2012a)

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Control + Enviva® EO (50g/tonne)</th>
<th>Control + Enviva® EO (100g/tonne)</th>
<th>Control + Enviva® EO (150g/tonne)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average daily feed intake, kg</td>
<td>0.73±</td>
<td>0.78±</td>
<td>0.87±</td>
<td>0.84±</td>
</tr>
<tr>
<td>FCR</td>
<td>1.96±</td>
<td>1.90±</td>
<td>1.93±</td>
<td>1.87±</td>
</tr>
<tr>
<td>Final body weight, kg</td>
<td>23.49±</td>
<td>25.36±</td>
<td>26.58±</td>
<td>26.76±</td>
</tr>
<tr>
<td>Average daily gain, kg</td>
<td>0.37±</td>
<td>0.41±</td>
<td>0.45±</td>
<td>0.49±</td>
</tr>
<tr>
<td>Diarrhoea frequency, %</td>
<td>75.0±</td>
<td>4.54±</td>
<td>3.13±</td>
<td>3.33±</td>
</tr>
<tr>
<td>Lactobacillus, cfu of faeces x 107</td>
<td>1.93±</td>
<td>2.23±</td>
<td>4.42±</td>
<td>2.42±</td>
</tr>
<tr>
<td>E. coli, cfu of faeces x 106</td>
<td>4.78±</td>
<td>2.72±</td>
<td>2.27±</td>
<td>2.15±</td>
</tr>
</tbody>
</table>

P<0.05