DSM and Evonik establish joint venture for omega-3 fatty acids from natural marine algae for animal nutrition

Bergen, Norway – 8 March 2017
DSM and Evonik combine complementary expertise

Joint development started in 2015

- Specialist for the cultivation of marine organisms including algae
- Biotechnology capabilities in development and operations

- Specialist in developing industrial biotechnology processes
- Know-how in operating competitively large scale manufacturing sites for fermentative amino acids.
50:50 Joint Venture Veramaris™

- DSM and Evonik to found a **50:50 joint venture** to be named **Veramaris™**, headquartered in The Netherlands
- Joint venture for high value omega-3 fatty acid products rich in **EPA** and **DHA** for **animal nutrition** produced from **natural marine algae**
- Facility is scheduled to **open in 2019**
- New facility will be built in the **United States**, at an existing site of Evonik
- Joint venture’s **capital expenditure** in the facility will amount to **around US$ 200 million** over the next 2 – 3 years
- Initial annual **production capacity** will meet roughly **15% of the total current annual demand for EPA and DHA** by the salmon aquaculture industry
- Finalization of the joint venture is **subject to regulatory approvals** and other customary closing conditions
The algal oil from DSM and Evonik enables the animal nutrition industry to keep up with the increasing demand for EPA and DHA omega-3 fatty acids without endangering fish stocks, while contributing to healthy animal nutrition as well as to the ecological balance and biodiversity of the oceans.
Algal oil as a high-quality source of omega 3 for the use in animal nutrition

- Highly concentrated (> 50%) algal oil with both omega-3 fatty acids EPA and DHA produced from natural marine algae
- High purity, free from fish-based ingredients and genetic modification
- Since algal oil can be applied in feed production like fish oil, it can easily be introduced by feed and pet food producers without process modification
- Broad use in animal nutrition from aquaculture to pet food
- DSM and Evonik pursuing applications for other aquatic and terrestrial animal species
- Broad IP protection of strain, product and process
Omega-3 fatty acids are essential for animal and human health

Salmon need EPA and DHA
• Nature’s choice – 2 omega-3s – key fatty acids found in natural balance
• Essential nutrients to support normal growth and health

EPA and DHA are key for human health
• Humans need – 2 omega-3s – essential at all life stages
• British Nutrition Foundation advises a weekly intake of 1.5 g EPA and DHA

Press event, Bergen, Norway | Algal oil breakthrough
EPA and DHA have numerous health benefits at all life stages

Relative importance of DHA and EPA for various health aspects*:

- Infant eye and brain development
- Immunity
- Mood
- Eye health
- Heart health
- Joint health
- Cognition
- Inflammation
- Cancer (some types)

* Includes ongoing research; Disclaimer: Not for purposes of claims or EPA:DHA ratios
The EPA and DHA deficiency world map shows regional differences

Based on analyses of red blood cells

We approach the entire value chain including influencers to create a strong market pull.
Fish is the most important and most efficient animal protein source in human diets

Development of global meat and fish supply

Source: FAO 2015
Demand for fish drives growth of aquaculture

Global wild catch and aquaculture production

<table>
<thead>
<tr>
<th>Year</th>
<th>Wild catch production</th>
<th>Aquaculture production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>20 million tons</td>
<td>20 million tons</td>
</tr>
<tr>
<td>1960</td>
<td>40 million tons</td>
<td>40 million tons</td>
</tr>
<tr>
<td>1970</td>
<td>60 million tons</td>
<td>60 million tons</td>
</tr>
<tr>
<td>1980</td>
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<td>2000</td>
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<tr>
<td>2010</td>
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<tr>
<td>2015</td>
<td>160 million tons</td>
<td>160 million tons</td>
</tr>
<tr>
<td>2030</td>
<td>180 million tons</td>
<td>180 million tons</td>
</tr>
</tbody>
</table>

Source: FAO (2016)
A supply-demand gap for fish oil will limit the growth of the aquaculture industry

Market size of fish oil and alternatives

Increasing demand for fish oil and alternative omega-3 sources

**supply-demand gap**
will emerge in the near future

approx. 1 million tons per year
limited supply of fish oil
as source of omega-3 fatty acids

Meeting the demand for omega-3 fatty acids by utilizing new and sustainable sources of EPA + DHA in the future.
Natural marine algal oil is a sustainable alternative solution for EPA and DHA

Conventional aquaculture

- Natural marine algae
- Zooplankton
- Fish
- Fishing vessel
- Fish oil
- Salmon aquaculture

DSM and Evonik breakthrough – shortening the natural food chain

Press event, Bergen, Norway | Algal oil breakthrough
Wild fish stocks are used on an industrial scale to produce fish oil and fishmeal.

16,000,000 tons wild fish

~17% of global wild catch is consumed for the production of fish oil and fishmeal

Sources: IFFO, FAO

Anchovy
Menhaden
Sprat
Blue Whiting
Herring
Sand eel

~ 5 million tons fishmeal
~ 1 million tons fish oil

Press event, Bergen, Norway | Algal oil breakthrough
By replacing fish oil by the algal oil, the fish-in-fish-out ratio could substantially be reduced

wild catch fish*  
2.6 kg  

fish meal / fish oil  
Our algal oil from natural marine algae  

farmed salmon  
1 kg

DSM and Evonik develop a new standard in aquaculture thanks to superior product properties

<table>
<thead>
<tr>
<th>Fish oil standard</th>
<th>DSM and Evonik breakthrough</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EPA</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>DHA</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>EPA + DHA (%)</strong></td>
<td>20% – 28%</td>
</tr>
<tr>
<td><strong>Product form</strong></td>
<td><strong>Oil:</strong> Typically derived from anchovies, sardines, herring, sprat, capelin, menhaden</td>
</tr>
<tr>
<td><strong>Handling properties</strong></td>
<td>+</td>
</tr>
<tr>
<td><strong>Concentration of EPA and DHA</strong></td>
<td>+/-</td>
</tr>
<tr>
<td><strong>Oxidation stability</strong></td>
<td>+/-</td>
</tr>
<tr>
<td><strong>Absence of dioxins and PCBs</strong></td>
<td>–</td>
</tr>
<tr>
<td><strong>GMO status</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Supply security</strong></td>
<td>+/-</td>
</tr>
<tr>
<td><strong>No price volatility</strong></td>
<td>–</td>
</tr>
<tr>
<td><strong>High flexibility in feed formulation</strong></td>
<td>+/-</td>
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</tbody>
</table>
Our measurable impact: preventing natural resources from further exploitation

1 kg of our EPA and DHA algal oil can replace 60 kg wild catch fish

Meeting roughly 15% of the EPA and DHA demand of the global salmon industry
Our Joint Venture contributes to five United Nations Sustainable Development Goals

Game changer for the aquaculture industry

1. 50:50 joint venture Veramaris™ created by two trusted industry partners

2. Setting THE industry standard with maximum purity product from natural marine algae

3. First alternative omega-3 fatty acid to contain natural balance of EPA and DHA

4. Commercial scale production facility in the United States with significant capacity