From Sunlight to Sustainability:

How algae can pave the way to sustainable human nutrition

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V.P. Algae Production Operations
Qualitas Health, Inc.
Imperial, TX algae farm

- 360 acre parcel, of which roughly 55 acres is currently in-use
- Water source = Cenzoic Pecos Aquifer, an ‘underground ocean’
- Brackish water not usable for farming or drinking
- Desert scrubland not suitable for agriculture

- Raceway ponds, ~1-2 acres in size
- Retractable shade cloths protect algae during hot summer months
Almega PL™ technical snapshot

Omega-3 rich oil from algae
(Nannochloropsis oculata)

- 25% EPA
- >15% polar-lipids (phospholipids and glycolipids)
- Contains additional phytonutrients
  - Omega-7
  - Carotenoids
  - Chlorophyll
- Viscous, dark-green oil
- Applications: soft-gel capsules, functional foods
- FDA filed New Dietary Ingredient Notification (NDIN) – May 2014 = approval for USA

Unique, EPA-rich vegetarian composition
How Almega PL™ stacks up compared to other omega-3s

- Krill oil
- Fish oil
- Almega PL
- Algal DHA

Bioavailability / value added

Market trend

Sustainability / vegetarian
Nannochloropsis oculata Composition
(after AlmegaPL™ extraction)

High nutritional content
- Protein and peptides
- Fats = including omega-3 fatty acids
- Carbohydrate = fiber, sugar and polysaccharides
- Minerals = including trace minerals
- Other = chlorophyll, carotenoids
**Nannochloropsis** protein profile

<table>
<thead>
<tr>
<th>Amino acids Essential</th>
<th>%</th>
<th>Amino acids Non-Essential</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arginine</td>
<td>6</td>
<td>Alanine</td>
<td>3</td>
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<tr>
<td>Histidine</td>
<td>2</td>
<td>Aspartic acid</td>
<td>11</td>
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<tr>
<td><strong>Isoleucine</strong></td>
<td>4</td>
<td>Cystine</td>
<td>1</td>
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<tr>
<td>Leucine</td>
<td>9</td>
<td>Glutamic acid</td>
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<tr>
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<td>8</td>
<td>Glycine</td>
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<tr>
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<td>Hydroxyproline</td>
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<td>Proline</td>
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<tr>
<td>Threonine</td>
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<td>Serine</td>
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<tr>
<td><strong>Valine</strong></td>
<td>6</td>
<td>Tyrosine</td>
<td>3</td>
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</tbody>
</table>

**Highlights:**
- Balanced amino acid profile
- Relatively high in BCAA’s

Representative amino acid distribution on 100% protein basis

**Bold** are Branched-Chain Amino Acids (BCAA’s)
More mouths to feed...

...With a growing appetite

1960
- 22 lb/capita
- 22 lb/capita

2012
- 57 lb/capita
- 44 lb/capita

2030 (projected)
- 81 lb/capita
- 80 lb/capita

The narrative:
“Made from plants is more sustainable”
5,948 pounds of protein EAAs are produced by farmed marine microalgae per acre land per year, while only 71 pounds of EAAs per acre are produced by beef and 20 pounds of EAAs per acre are produced by peas.

5 gallons of fresh water are required to produce one pound of protein EAAs from farmed marine microalgae, while as much as 17,744 gallons of fresh water are required to produce a pound of EAAs from beef.
Replacing 30% of US consumed Beef with alternative meats, considering the protein nutritional value of equivalent amount of essential amino acids (EAA):


Peas
39 million acres
23% of Texas

Soybeans
1.3 million acres

Nannochloropsis
138 thousand acres
0.08% of Texas

Peas
3 trillion gallons
31% US use

Soybeans
939 billion gallons

Nannochloropsis
3.7 billion gallons
0.04% of US use
ADDITIONAL SLIDES
Vegetarian

- All marine omega-3’s originate from algae
- Omega-3s are concentrated in the animal flesh as they move up the food chain (krill, fish)
- Other environmental contaminants like dioxin, PCBs, heavy metals, etc. are also concentrated as they move up the food chain

Almega PL™ delivers omega-3 straight from the source
Human clinical trial results

Change in ug per ml

Time (hours)

Area under the Curve
Krill = 202 ug
Almega PL™ = 314ug
p = 0.08 (T-test)