Addressing key challenges of global growth with nutrition

Stephan Tanda
Basel, 27 September 2012
From 7 billion to 9 billion

Figure 1: World population is projected to reach 9 billion by 2050; unsustainable at a middle income level (global average).
Resource-constrained world

Scarcity of food, nutrition, land, water, resources, energy.

DSM is helping to address these global challenges, for example with *nutritional solutions*, as well as with sustainable materials and bio-based products.
DSM in Nutrition

Human
- Developed world
- Developing world

Animal
- Use of resources
- Animal welfare
- Productivity
- Environmental impact
DSM in Nutrition

Human
- Developed world
  - Developing world

Animal
- Use of resources
- Animal welfare
- Productivity
- Environmental impact
Longer, healthier, more active lives - DALE


<table>
<thead>
<tr>
<th>Country</th>
<th>Years*</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>74.5</td>
<td>1</td>
</tr>
<tr>
<td>France</td>
<td>73.1</td>
<td>3</td>
</tr>
<tr>
<td>Spain</td>
<td>72.8</td>
<td>5</td>
</tr>
<tr>
<td>Italy</td>
<td>72.7</td>
<td>6</td>
</tr>
<tr>
<td>Switzerland</td>
<td>72.5</td>
<td>8</td>
</tr>
<tr>
<td>UK</td>
<td>71.7</td>
<td>14</td>
</tr>
<tr>
<td>Germany</td>
<td>70.4</td>
<td>22</td>
</tr>
<tr>
<td>USA</td>
<td>70.0</td>
<td>24</td>
</tr>
<tr>
<td>Slovenia</td>
<td>68.4</td>
<td>34</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>68.0</td>
<td>35</td>
</tr>
<tr>
<td>Poland</td>
<td>66.2</td>
<td>45</td>
</tr>
<tr>
<td>Hungary</td>
<td>64.1</td>
<td>62</td>
</tr>
<tr>
<td>Ukraine</td>
<td>63.0</td>
<td>70</td>
</tr>
<tr>
<td>Russia</td>
<td>61.3</td>
<td>91</td>
</tr>
</tbody>
</table>

*Dysfunctional Life (9.6 yrs.)

Life Expectancy: 80 years
Healthy vs. Dysfunctional Life

Healthy People 2010

2010 - 2050 Number of disabled older persons in and out of institutions will approximately triple!
<table>
<thead>
<tr>
<th>Disease</th>
<th>Vitamin A</th>
<th>β-Carotene</th>
<th>Thiamine</th>
<th>Riboflavin</th>
<th>Niacin</th>
<th>Vitamin B5</th>
<th>Vitamin B6</th>
<th>Vitamin B12</th>
<th>Folate</th>
<th>Biotin</th>
<th>Vitamin C</th>
<th>Vitamin D</th>
<th>Vitamin E</th>
<th>Vitamin K</th>
<th>Dietary AO</th>
<th>Multivitamin</th>
<th>PUFA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aging</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Cancer</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Dementia</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Bone Health</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Diabetes</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>CVD</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>COPD</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>AMD</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Effect of vitamins on aging and Non Communicable Diseases (NCD)
Majority of people do not eat the ‘right things’!

Adapted from Krebs-Smith et al. 2010 JN
Micronutrient intake is inadequate also in Western countries.
Health benefit platforms drive growth
DSM in Human Nutrition

Human

Developed world

Developing world
Human Nutrition, context

- 1 out of 7 people go to bed hungry
- 2 billion people live with “hidden hunger” (micronutrient malnutrition)
- 200 million children are stunted (physical and cognitive)
- 3.5 million deaths of children could be prevented with better nutrition
  in other words: a plane crash every 20 minutes
- Rise of nutrition-related diseases: 366 mio people with diabetes
- 1.6 billion people are overweight and obese, increasingly also in developing world
The Burden of Knowledge: Nutrition and Cognitive Development

• Most brain growth happens in first five years, 80% in first 3 years
  - we are born with all the nerves we will ever have
  - brain develops in a clear, pre-programmed time sequence
  - special, critical periods when things develop extremely fast

• Nutrition during first 5 years and especially during the first 1000 days is critical (from conception to two years of age)

• Malnutrition during first 1000 days cannot be fixed later

• Malnutrition has key impact on NCDs later in life

• Proper early nutrition can add 2 - 3% of GDP
The Burden of Knowledge

Brain neurons in normal 3-yr old  
Brain neurons in malnourished 3-yr old

Source: Dr. Monckeberg in http://www.pediatraldia.cl/01Nueva_carpeta/desarrollo_a.htm
The Impact of Malnutrition

Annual lives lost

- 1.1 mio children <5 years
- 600,000 stillbirths
- 115,000 women during pregnancy

Vit. A & Zinc deficiencies
Iron deficiency anemia
Iron deficiency anemia

Annual lives impaired

- 18 mio babies born mentally impaired
- 350,000 children go blind
- 150,000 babies born with neural tube defects

Maternal iodine deficiency
Vit. A deficiency
Maternal folate deficiency
Global Hidden Hunger:
Worldwide, approximately 2 billion people are affected by Hidden Hunger.

Hidden Hunger refers to a lack or loss of dietary quality that leaves individuals or populations with deficiencies in essential micronutrients which negatively impact on health, cognition, function, survival, and economic potential.

Severity of Hidden Hunger was determined based on the proportion of under-fives affected by anemia, vitamin A deficiency, stunting as an indicator of zinc deficiency and school-aged children affected by goiter.

UNICEF State of the World’s Children 2009, WHO Global database on vitamin A deficiency and anemia, iodine deficiency
Successful innovations addressing malnutrition

Increase micronutrient content in WFP food basket, e.g. MixMe™.

Lipid-based complementary food supplements with micronutrients/enzymes.

Innovative approaches to reduce vitamin A deficiency in India.

WFP United Nations World Food Programme

gain Global Alliance for Improved Nutrition

vitamin angels

DSM BRIGHT SCIENCE. BRIGHTER LIVING.
Innovative approaches to provide nutritional solutions

Educational programs for a balanced nutrition **combined with fortification**

**Conventional fortification**
- Staple foods (flour, sugar, milk, oil, rice)
- Dairy (milk, yoghurt)
- Spreads (margarine)
- Condiments (salt)

**Home fortification**
- Crushable/soluble tablets
- Powder
- Spreads

**Bio-fortification**
- Agricultural products (rice, maize, sweet potato,...)
Investment in nutrition pays back

Micronutrient interventions to fight hunger ranked as the number 1 out of 16 investments that should receive top priority

Folate fortification is in place in more than 60 countries and has reduced prevalence of neural tube defects by 50-70%
DSM Partnerships in Human Nutrition

- Developed world
  - Human
- Developing world

Logos of various organizations including:
- WFP
- United Nations World Food Programme
- USAID
- Sight and Life
- Vitamin Angels
- Partners in Food Solutions
- AIM
- Scaling Up Nutrition
- Global Alliance for Improved Nutrition
- Project Laser Beam
- DSM
DSM in Nutrition

Human
- Developed world
- Developing world

Animal
- Use of resources
- Animal welfare
- Productivity
- Environmental impact
GDP and population growth increase demand for animal products

Source: FAO: The State of Food And Agriculture
Challenges in animal nutrition

Optimize utilization of resources

✓ Develop improved & alternative feedstuffs:
  - Reduction of anti-nutritional factors,
  - by-products from industrial processes

Feed Enzymes

Improve health and welfare of farm animals

✓ Reduction of morbidity/mortality:
  Sustain health of high-yielding breeds
✓ Increasing longevity:
  Extend life expectancy of breeding animals

Eubiotics
Challenges in animal nutrition (continued)

Sustain productivity of farm animals

✓ Establish Optimum Vitamin Nutrition:
  - Exploit genetic potential of high-yielding breeds
  - End-products with a high nutritional value
  - Productivity increase in small animal husbandry in developing countries

Vitamins and Carotenoids

Reduce environmental impact

✓ Reduction of ecological footprint:
  Find solutions for manure and reduce of ammonia & methane emissions

✓ Securing resources:
  Close nutrient cycles (e.g. nitrogen, phosphorus)
In conclusion

- Major challenge to feed a growing world population and satisfy increased demand for protein (meat, milk, egg, fish)
- Nutrition and health indisputably linked
- Investment in nutrition: guaranteed return for society
- DSM can help to address these challenges with human and animal nutrition solutions in developed and developing world
- Current DSM nutrition business 4 billion euros and growing
- DSM: Doing well by doing good
BRIGHT SCIENCE. BRIGHTER LIVING.™