Introduction to micronutrient fortified rice

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ILSI and ILSI Japan
International Life Sciences Institute Japan

- ILSI: Founded in 1978 (Washington, D.C.)
- Nonprofit, worldwide organization
- 17 Regional branches

- ILSI Japan: Funded in 1981 (NPO in 2001)
- Supporting companies: 63 food, pharmaceutical and chemical companies

- Four thematic areas provide focus:
  - Nutrition, health and well-being
  - Food and water safety
  - Sustainable agriculture and nutrition security
  - Toxicology and risk science

- Scientists from:
  - Academia
  - Government
  - Industries
  
gather in a neutral forum to advance scientific understanding
Began in 1997 as a focused effort to reduce the global problem of iron deficiency through food fortification

Aims to reduce iron deficiency anemia by adding iron to commonly-consumed and commercially-produced condiments and staples based on the dietary patterns unique to each country

Consists of research efforts from technology development to implementation

Has been implemented in five countries: China, Vietnam, Cambodia, the Philippines and India.
## Condiment fortification

<table>
<thead>
<tr>
<th>Country</th>
<th>China</th>
<th>Vietnam</th>
<th>Cambodia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner</td>
<td>China CDC</td>
<td>NIN</td>
<td>RACHA</td>
</tr>
<tr>
<td>Food</td>
<td>Soy sauce</td>
<td>Fish sauce</td>
<td>Fish / Soy sauce</td>
</tr>
<tr>
<td>Fortificant</td>
<td>NaFeEDTA</td>
<td>NaFeEDTA</td>
<td>NaFeEDTA</td>
</tr>
<tr>
<td>Progress</td>
<td>- Stability</td>
<td>- Stability</td>
<td>- Stability</td>
</tr>
<tr>
<td></td>
<td>- Efficacy</td>
<td>- Efficacy</td>
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<td></td>
<td>- Effectiveness</td>
<td>- Effectiveness</td>
<td>- Effectiveness</td>
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<td></td>
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<td></td>
<td>A mandatory standard for iron fortified fish sauce and soy sauce was issued in 2015</td>
</tr>
</tbody>
</table>
## Staple food fortification

<table>
<thead>
<tr>
<th>Country</th>
<th>Philippines</th>
<th>Vietnam</th>
<th>India</th>
<th>Cambodia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner</td>
<td>FNRI</td>
<td>NIN</td>
<td>St. John’s Research Institute</td>
<td>RACHA</td>
</tr>
<tr>
<td>Food</td>
<td>Rice</td>
<td>Rice</td>
<td>Rice</td>
<td>Rice</td>
</tr>
<tr>
<td>Fortificant</td>
<td>Micronized ferric pyrophosphate</td>
<td>Iron and Zinc</td>
<td>Iron, lysine and others</td>
<td>Zinc, Folic Acid, thiamin</td>
</tr>
<tr>
<td>Progress</td>
<td>- Stability</td>
<td>- Stability</td>
<td>- Pilot study on lysine and iron</td>
<td>- Preliminary study in May 2017</td>
</tr>
<tr>
<td></td>
<td>- Efficacy</td>
<td>- Efficacy</td>
<td>- Estimation of lysine intake</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Effectiveness</td>
<td>- Effectiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Market trial</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Regional-wide launch in Mindanao Island in 2013</td>
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Rice Fortification Process

**The first step**

Rice power, micronutrients and others

Mix → Extruder → Premix rice (4mgFe/g)

**The second step**

Blending premix rice with ordinary rice at a ratio of 1:200

→ Fortified rice (2mgFe/100g)
Fortificants of Taiyo Kagaku

- Minerals (iron and zinc)
  - Super dispersion technology
  - High bioavailability
  - High stability
  - Minimize color change
  - No unpleasant flavor

The Cost of Rice Fortification

- Estimated incremental cost of fortifying rice
  - A 1.5-10% increase in the current retail price of rice

  [Muthayya 2012 and Milani 2014]

- Affordability
  - Consumers in the Philippines accept a 5% increase in the current retail price of rice

  [Agdeppa 2011]
Micronutrient deficiencies

• Micronutrient (vitamin and mineral) deficiency affects more than 2 billion people globally

In Cambodia

• The most important micronutrients in global public health and their prevalence among women of reproductive age in Cambodia

[CDHS 2014, UNICEF 2015]

<table>
<thead>
<tr>
<th>Significant Public Health problems</th>
<th>Not significant public health problems</th>
</tr>
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<tbody>
<tr>
<td>✓ Zinc: 62.8%</td>
<td>✓ Vitamin A: 3.2%</td>
</tr>
<tr>
<td>✓ Folate: 19.2%</td>
<td>✓ Iron: 2.6%</td>
</tr>
<tr>
<td>✓ Thiamin (vitamin B1): 18.0-38.0%</td>
<td></td>
</tr>
<tr>
<td>✓ Iodine: 78.0%</td>
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</tbody>
</table>
Health consequences of micronutrient deficiencies

- **Mothers and children**: increased maternal mortality, prematurity, early neonatal mortality
- **Young children**: delays in physical and cognitive development
- **Adults**: reduced physical endurance and productivity

Etiology of micronutrient deficiencies

- Inadequate dietary intake
- Poor dietary diversity
- Others: Infections, genetic, etc
Poor dietary habits of women of reproductive age

- High consumption of rice often reflects,
- Poor dietary diversity which results in,
- A high risk of micronutrient deficiencies
- Lower priority on meal times

Garment factory workers

- have limited time for lunch, thus,
- Consume sugary desserts or packaged food as snacks and/or meals

[FNG-WFP, 2017]
Nutrition Policies

• Sustainable Development Goals: Goal 2
  End hunger, achieve food security and improved nutrition and promote sustainable agriculture (2016-2030)

• Cambodia: National Strategy for Food Security and Nutrition 2014-2018
  Council for Agricultural and Rural Development (CARD)
  ✓ Objective 2: Improve use and utilization of food
  ✓ iii Expand fortification of food
Workplace Nutrition Project in Cambodia

Objective:
To improve the nutritional status of female factory workers by providing fortified rice at lunch time and nutrition education

- Rice fortification
  - Vehicle: Rice (823g of cooked rice /day /person)
  - Fortificants: Zinc, Folic acid and Thiamin
  - Population group: Women of reproductive age

- Nutrition education
  - Improve dietary diversity (Minimum Dietary Diversity for Women)
  - Improve general knowledge of nutrition
Partners

• Ministry of Planning - NSCFF
• GMAC
• Reproductive and Child Health Alliance (RACHA)
• Nutrition Japan Public Private Platform (NJPPP)
• International Life Sciences Institute Japan (ILSI Japan)
• Taiyo Kagaku Co., Ltd.
• DSM Japan K.K.
Business Model

Factories in Cambodia

Fortified rice at lunch time

On-site mixing
Producing Fortified Rice

FNRI in the Philippines
Producing Premix Rice

Taiyo Kagaku / DSM
Selling micronutrients

Nutrition education

Increasing productivity
Reducing the rate of absenteeism
Improving nutritional status

ILSI Japan / RACHA
Developing nutrition education modules

Increasing the sales of micronutrients
## Schedule

<table>
<thead>
<tr>
<th>Year</th>
<th>Activities</th>
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</table>
| 2017 | Feasibility study  
✓ Identifying partners  
✓ Discussion with partners on the project  
✓ Economic study |
| 2018 | Pilot study  
✓ Producing premix rice and fortified rice  
✓ Blending test (homogeneity)  
✓ Storage test  
✓ Developing nutrition education modules |
| 2019 | ✓ Effectiveness study (1 year) |
| 2020 | Implementation  
✓ Advocacy  
✓ Implementation of the rice fortification and nutrition education program in factories |