Concerns, myths and misconceptions of rice fortification

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Is rice fortification safe?

**Definitions from IOM 2000, p. 3**

**EAR**: Estimated Average Requirement; **RDA**: Recommended Dietary Allowance / **RNI**: Recommended Nutrient Intakes; **UL**: Tolerable Upper Intake Level.
Is rice fortification safe?

Percent of Non-pregnant Adults (≥19 Years) in USA with Folic Acid Intake above Tolerable Upper Intake Level (UL)

- Overall: 2.7%
- Mandatory: 0%
- Mandatory + voluntary: 0%
- Mandatory + supplements: 5.5%
- Mandatory + voluntary + supplements: 9.4%

Mandatory folic-acid fortification of cereal grains (including rice) is safe. Only people consuming supplements had intake levels above the UL.

Yang 2010; It is recommended that pregnant women consume 400 mcg folic acid daily;
- Mandatory: wheat flour, maize flour, rice;
- Voluntary: ready-to-eat foods.
Is rice fortification safe?

- Fortification with iron is safe for people with blood disorders.
- Fortification with folic acid does not mask vitamin B12 deficiency.

Fortification is safe.
Can rice fortification eliminate all micronutrient deficiencies?

Percentage of Mexican Women with Iron Deficiency after Six Months of Consuming Fortified Rice or Milled (unfortified) Rice

Rice fortification will help reduce micronutrient deficiencies
Rice fortification will not eliminate micronutrient deficiencies in their totality
Population should strive to eat a healthy diet
Some population groups will need additional interventions

Hotz 2008
What is the difference between fortified and bio-fortified rice?

<table>
<thead>
<tr>
<th>Added nutrients</th>
<th>Fortified</th>
<th>Bio-fortified</th>
</tr>
</thead>
<tbody>
<tr>
<td>When</td>
<td>During industrial processing</td>
<td>During its development via plant breeding or genetic modification (GM)</td>
</tr>
<tr>
<td>Time frame</td>
<td>Now</td>
<td>After breeding/GM (years-decades)</td>
</tr>
<tr>
<td>Which</td>
<td>Virtually any can be added</td>
<td>Iron(^1), zinc(^1), beta-carotene(^2) (mainly)</td>
</tr>
<tr>
<td>Levels</td>
<td>Higher</td>
<td>Lower</td>
</tr>
</tbody>
</table>

These are complementary strategies to reduce micronutrient deficiencies

Nestel 2006; Ye 2000; \(^1\)Through plant breeding; \(^2\)Through genetic modification: Golden Rice
Why not eat parboiled rice or brown rice instead of fortified rice?

Brown rice and parboiled rice are more micronutrient-rich than milled rice. 

USDA Nutrient Data Bank; fortified rice as USDA commodity requirements 2014; Vitamin A, folate, vitamin B12 content is negligible in milled, brown or parboiled rice.
Why not eat parboiled rice or brown rice instead of fortified rice?

Fortified rice is more micronutrient-dense than milled rice, brown rice and parboiled rice

USDA Nutrient Data Bank; * Fortified rice per USDA (2014) requirements for international food assistance programs; Vitamin A, folate, vitamin B12 content is negligible in milled, brown or parboiled rice; can be significant in fortified rice
Why not eat parboiled rice or brown rice instead of fortified rice?

Despite recommendations, consumption of whole grains is low.
Is fortified rice only needed by low-income groups?

Percent of Non-pregnant Vietnamese Women (15-49 Years) with Iron Deficiency, by Socioeconomic Status (SES)

Nutrient deficiencies affect all socioeconomic strata. All could benefit from fortified rice.

Laillou 2012
Can any variety of rice be fortified?

Any variety of rice can be fortified—Requires tailoring of fortified kernel.
Is fortified rice acceptable to consumers?

Acceptability Scores for Fortified and Non-fortified Rice: Sensory Evaluation by Indian Children 8-11 Years

No statistically significant differences between fortified & non-fortified rice

Fortified rice tastes, looks and smells like non-fortified rice

Radhika 2011; extruded rice
Are the nutrients in fortified rice retained after preparation and cooking?

Percent Retention of Nutrients Exposed to Different Preparation and Cooking Methods: Average for Coating, Cold Extrusion & Hot Extrusion

<table>
<thead>
<tr>
<th>Method</th>
<th>Percent Retention</th>
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<tbody>
<tr>
<td>30 min soaking before boiling in excess water and discarding water</td>
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</tr>
<tr>
<td>Boiling in excess water and discarding water</td>
<td></td>
</tr>
<tr>
<td>Boiling and letting rice absorb water</td>
<td></td>
</tr>
<tr>
<td>Washing before boiling and letting rice absorb water</td>
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<tr>
<td>Frying before boiling and letting rice absorb water</td>
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</tbody>
</table>

Wieringa 2014
Conclusions (1)

- Rice fortification is safe
- Rice fortification will increase nutrient intake but cannot eliminate all micronutrient deficiencies
- Rice fortification & bio-fortification are different and complementary interventions
- Fortified rice is designed to be more micronutrient-rich than brown, parboiled or milled rice
Conclusions (2)

- Rice fortification can benefit all strata of society who have nutrient deficiencies (or are at risk)
- Any variety of rice can be fortified
- When properly produced, fortified rice tastes, smells and looks the same as non-fortified rice
- Most nutrients (except Vitamin A) in fortified rice (coating, extrusion) are retained after preparation and cooking
Thank you
Terima kasih
Salamat Po
References