



Daily consumption of fish sauce with selected iron fortificants improves iron status of anemic schoolchildren in Cambodia

Philippe Longfils¹⁾, Sol Sowath²⁾, *Yukiko Nakanishi³⁾⁴⁾, Visith Chavasit⁵⁾, Didier Monchy⁶⁾, Heike Weinheimer⁷⁾, Chan Theary²⁾, Klaus Schuemann⁸⁾

1) GTZ, Cambodia, 2) RACHA, Cambodia, 3) ILSI Japan CHP, Japan, 4) Showa Women's University, Japan, 5) Mahidol University, Thailand, 6) Pasteur Institute, Cambodia, 7) SAM, Germany, 8) ZIEL, Technical University of Munich, Germany

Abstract

Background: Students in agrarian villages of rural Cambodia are supposed to suffer high rates of iron-deficiency anemia in the context of a monotonous diet.
Objective: To compare the efficacy and safety of daily consumption of 10 mg of iron in form of FeSO₄ + citric acid and NaFeEDTA, each mixed in 10 ml of Khmer fish sauce as compared to a fish sauce placebo control with no iron added.
Methods: A total of 140 students aged 6 to 21 years were enrolled in double blind, placebo-controlled intervention trial. They were randomly allocated to one of three treatment groups, and followed for 17 weeks (6 days/week). During this time 104 meals with 10 ml of fish sauce added were offered to each participant. Initial and final measurements of body weight and spinal length, of the concentrations of haemoglobin, serum ferritin and C-reactive protein (CRP) were obtained. Prevalences of vomiting, diarrhea and acute respiratory infections were monitored weekly.
Results: The two different iron-fortified fish sauces increased Hb and serum ferritin concentrations significantly as compared to the control group. No significant differences were observed between FeSO₄ and Fe-EDTA fortification, neither regarding mitigation of iron-deficiency anemia nor regarding side-effects.
Conclusions: FeSO₄ and FeEDTA show equivalent efficacy and safety during the intervention study. The trade-off between both methods will be on issues of cost, control, and ease of production. National launch of IFFS is one of the promising strategies to combat iron deficiency anemia in Cambodia.

Introduction:

In Cambodia, anemia is a major problem. The Cambodian Demographic and Health Survey (CDHS) from 2000 showed a prevalence of 63% for anemia in children (6-59 months old). According to the Cambodian Nutrition Investment Plan (CNIP 2003-2007) prevalence of anemia among children is supposed to be reduced to 42% by 2007. However, The CDS from 2005 still showed a high prevalence of anemia as 61.8% in children (6-59 months old). Students in agrarian villages of rural Cambodia are supposed to suffer high rates of iron-deficiency anemia in the context of a monotonous diet. To ensure a higher coverage of iron intake, iron fortification of condiments and staple foods as well as based strategies need to be addressed. Fish sauce user survey was carried out by Reproductive and Child Alliance (RACHA) with 200 families in 20 villages in 4 districts in Kampot province in 2004. Ninety-five percentage of families used commercial fish sauce (average: 26 ml/meal/family) on average 6 days a week and 2.6 times a day. Fish Sauce is a promising vehicle to be fortified with iron in Cambodia.

Objective:

To compare the efficacy and safety of daily consumption of 10 mg of iron in form of FeSO₄ + citric acid and NaFe-EDTA, each mixed in 10 ml of Khmer fish sauce as compared to a fish sauce placebo control with no iron added.

Methods:

A total of 140 students aged 6 to 21 years were enrolled in double blind, placebo-controlled intervention trial. They were randomly allocated to one of three treatment groups, and followed for 17 weeks (6 days/week). During this time 104 meals with 10 ml of fish sauce added were offered to each participant. Initial and final measurements of body weight and spinal length, of the concentrations of haemoglobin, serum ferritin and C-reactive protein (CRP) were obtained. Prevalences of vomiting, diarrhea and acute respiratory infections were monitored weekly. **Diagnostic Assessment of Haematological and Iron Status:** Anemia was defined by a Hb concentration cut-off below 120 g/L. Iron deficiency was defined by plasma ferritin levels ≤15 µg/L. Children with non-iron deficiency anemia, defined by Hb concentrations below 120 g/L and ferritin level of above 15 µg/L were not included in the study. Only Iron deficiency anemic students were admitted in the trial. The cut-off to determine inflammation was CRP >8 mg/L. Higher CRP values indicate that plasma ferritin values may be due to inflammation. **Methods for Production of Iron Fortified Fish Sauce (10 mg Fe/ 10 mL):** Fish Sauce was routinely produced by Cambodian private fish sauce company and mixed with fortificants manually as the following:

Formulas for Iron Fortification of Fish Sauce
(10 mg Fe/10 mL FS)

<u>FeSO₄ + Citric acid</u>	<u>NaFeEDTA</u>
per 1L Fish Sauce	
+ 1.05 g FeSO ₄	+ 6.9 g NaFeEDTA
+ 0.3% Citric Acid	

Results:

The two different iron-fortified fish sauces increased Hb and serum ferritin concentrations significantly as compared to the control group.

There neither significant changes over time ($z > 0.05$) of CRP concentration in any group, nor were there significant differences between the 3 groups at baseline or study end.

No significant differences were observed between FeSO₄ and Fe-EDTA fortification, neither regarding mitigation of iron-deficiency anemia nor regarding side-effects.

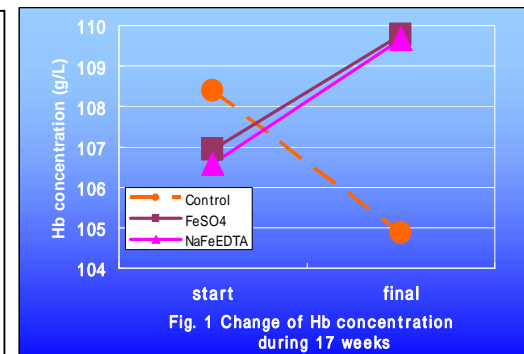


Fig. 1 Change of Hb concentration during 17 weeks

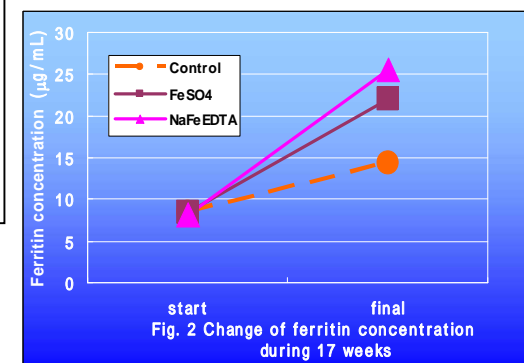


Fig. 2 Change of ferritin concentration during 17 weeks

Conclusions:

FeSO₄ and Fe-EDTA show equivalent efficacy and safety during the intervention study. The trade-off between both methods will be on issues of cost, control, and ease of production. National launch of IFFS is one of the promising strategies to combat iron deficiency anemia in Cambodia.

