Effects of Animal Source Foods, with Emphasis on Milk, in the Diet of Children in Low-Income Countries

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This review evaluates evidence for benefits of including animal source foods (ASFs) in the diets of children in developing countries. In observational studies, a higher usual intake of ASFs in such countries is associated with better growth, status of some micronutrients, cognitive performance, motor development and activity. Only three randomized trials supplemented children with milk and compared outcomes with a nonintervention control group (table 1). Both height and weight growth were improved, although in Kenya height was increased only in younger schoolchildren who were stunted at baseline. Meat supplements have been evaluated in only two randomized controlled trials, in Kenya and Guatemala (mean baseline age: 8 years and 1 year, respectively); growth was no better than in an equicaloric control group. Meat improved cognitive function and activity in Kenya; milk was less effective than meat for improving cognitive function and physical activity, perhaps due to its lower content of iron, zinc, or riboflavin. Meat and especially cow’s milk are excellent sources of vitamin B₁₂, a micronutrient commonly deficient in populations which consume low amounts of ASFs but long-term ASF supplementation is needed to show improved B₁₂ status. Benefits of adding fish to children’s diets have been little evaluated, but there was no effect on growth or micronutrient status when added to a weaning cereal in Ghana. No trials have evaluated the benefits of increasing egg intake. Other micronutrients such as iron have been added to cow’s milk, which improved nutritional outcomes for children. Cow’s milk can be a good fortification vehicle for micronutrients, such as iron, supporting its positive effects on child growth. Potentially problematic but relatively minor issues concerning the use of cow’s milk in children’s diets have been poorly explored in the developing country context.
Table 1. Interventions with supplements of milk or meat vs. a nonsupplemented or equicaloric control group for children in developing countries

<table>
<thead>
<tr>
<th>Reference</th>
<th>Location</th>
<th>Subjects</th>
<th>Age at entry</th>
<th>Intervention</th>
<th>Outcomes</th>
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</thead>
<tbody>
<tr>
<td>[1]</td>
<td>New Guinea</td>
<td>33</td>
<td>7–8 years</td>
<td>Daily for 13 weeks (1) 75 g skim milk + normal diet (2) Normal diet (high in taro and sweet potato)</td>
<td>Height and weight change in control group = twice that of controls</td>
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<td></td>
<td>Bac Ninh province, Vietnam</td>
<td>454</td>
<td>7–8 years</td>
<td>(1) 500 ml unfortified milk (2) 500 ml MMN fortified milk providing 5.5 mg Zn, 6.5 mg Fe, 6.7 µg vitamin A, 165 mg vitamin C, 13 mg vitamin E/day (3) Control (no supplementation)</td>
<td>Weight-for-age and height-for-age z scores improved significantly in both milk groups compared with control Short term memory scores significantly higher in children in milk groups, with superior scores in fortified milk group Parent-reported health-related quality of life improved significantly with milk intervention</td>
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<td>[3–5]</td>
<td>Embu district, Kenya</td>
<td>544</td>
<td>5–14 years</td>
<td>Seven school terms (2.25 years) daily (1) Githeri (maize and bean-based porridge) with finely ground beef (2) Githeri with one glass UHT milk (3) Githeri with added vegetable oil (4) Control (no supplement)</td>
<td>Significant increase in plasma B\textsubscript{12} in meat and milk groups Significantly increased weight gain in all supplemented groups Significantly better performance on arithmetic tests and highest level of physical activity in meat group</td>
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<td>[6]</td>
<td>Guatemala City</td>
<td>302</td>
<td>12 months</td>
<td>9 months, supervised feeding at 1 meal/day, 5 days/week for 9 months (1)</td>
<td>No effects of beef or B₁₂ fortification on any child outcomes in a</td>
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<td>Ground beef (72 g, 102 kcal/day, providing 0.56 µg B₁₂) (2) Fruit + veg. (92</td>
<td>B₁₂-deficient population Cow’s milk intake from usual diet positively</td>
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<td>kcal/day, fortified with 0.86 µg B₁₂) (3) Fruit + veg., unfortified (92 kcal/</td>
<td>predicted B₁₂ status, while breast milk intake was a negative predictor</td>
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<td>day)</td>
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<td>[7]</td>
<td>Mangochi district, Malawi</td>
<td>630</td>
<td>2.5–7.5 years</td>
<td>12-month dietary diversification strategy including (1) Increased consumption</td>
<td>Significant improvement in mid-upper arm circumference z score and reduced</td>
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<td>of ASFs (esp. whole dried fish) and orange-red fruits (2) Control (no intervention)</td>
<td>prevalence of inadequate vitamin B₁₂, Ca, and Zn intake after intervention</td>
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<td>Hb significantly higher, incidence of anemia and common infections</td>
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<td>significantly lower in the intervention group than control</td>
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<tr>
<td>Study</td>
<td>Location</td>
<td>Sample Size</td>
<td>Age</td>
<td>Duration</td>
<td>Intervention Details</td>
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<td>[8]</td>
<td>Peri-urban Lima, Peru</td>
<td>137</td>
<td>12–17.9 years</td>
<td>9 months</td>
<td>(1) Community-based, behavioral and dietary intervention to increase heme iron, total iron and ascorbic acid intake (2) No intervention</td>
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<td>[9]</td>
<td>Ghana</td>
<td>208</td>
<td>6 months</td>
<td>6 months, daily; local cereal from maize, soy, peanuts</td>
<td>(1) Cereal + 20% whole fish powder (2) Cereal + MMN (3) Cereal (4) Cross-sectional nonintervention</td>
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<td>[10]</td>
<td>Northern Cape province, South Africa</td>
<td>183</td>
<td>7–9 years</td>
<td>6 months, school days only</td>
<td>(1) 25 g bread spread containing marine fish flour (892 mg DHA/week) (2) 25 g bread spread without fish flour</td>
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MMN = Multiple micronutrient; EPA = eicosapentaenoic acid; DHA = docosahexaenoic acid.
References


