

Long Term Whole Egg, but Not Egg White Supplementation Promotes Growth and Bifidobacteria and Lachnospira Without Increasing LDL-Cholesterol in Primary School Children

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Objectives: We aimed to determine long-term effects of egg supplementation on growth, blood lipoproteins, blood proteins, nutritional status, and microbiota in primary school children.

Methods: A randomized controlled, cluster study was performed at 6 rural schools in Central, Eastern, and Western Thailand. 635 students (8–14 years old) were recruited into the study. Subjects were randomly assigned into 3 groups, based on weight for age: 1) Whole eggs (WE) - consume 10 additional eggs per week [n = 238] 2) Egg substitute (ES) - consume yolk-free egg substitute equivalent to 10 eggs per week [n = 200], and 3) control group (C, [n = 197]). The anthropometric, biochemical indexes, dietary intake, and microbiota were measured at week 0 (baseline), week 13–14, and week 34–35.

Results: At baseline, 14% were under-weighted, 9% were stunted, and 16% were wasted. At 34–35 weeks, the increases in body weight and height were higher in WE group than those in C group (3.56 ± 0.93 kg, $P < 0.001$ and 5.11 ± 0.92 cm, $P < 0.001$). No significant differences in weight and height were observed between the ES and C groups. Prealbumin levels were higher (1.53 ± 0.33 mg/dL, $P < 0.001$) in WE but not ES as compared with C. There were significant decreases in total cholesterol, triglycerides, and LDL cholesterol in WE but not ES as compared with C. Additionally, HDL cholesterol tended to increase in WE (0.66 ± 0.99 mg/dL, *ns*) as compared with C. Bacterial diversity in WE, ES and C group was not significantly change neither alpha nor beta diversity. After whole egg supplementation, the overall relative abundance of the *Bifidobacterium* was increased up to 1.28-fold. The differential abundance analysis also indicated that *Lachnospira* significantly increased and *Varibaculum* significantly decreased after whole egg supplementation.

Conclusions: Long-term whole egg supplementation significantly enhanced growth in young children with no adverse effect on blood cholesterol levels. The result coincided with promoting health-benefit gut bacteria. However, further insight into the mechanistic effect of egg consumption on gut microbiota and growth is needed.

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