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The effects of micronutrient-fortified complementary/replacement food on intestinal permeability and systemic markers of inflammation among Zambian infants

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Early life nutrition, especially during the first 2 years, is critical for human development. Micronutrient deficiencies are well-documented among infants in Zambia^(1,2). The prevalence of stunting is 25% among 6–8-month-old and 59% among 18–23-month-old according to the most recent Demographic Health Survey⁽³⁾.

The Chilenje Infant Growth, Nutrition and Infection Study (CIGNIS) investigated the effects on gut integrity and systemic inflammation of randomly-assigned basal and richly micronutrient-fortified complementary/replacement foods among Zambian infants from 6 to 18 months of age. All infants (*n* 743) donated blood samples at 6 and 18 months for the assessment of serum C-reactive protein (CRP) and α 1-acid glycoprotein (AGP). A subsample of 502 infants, selected from the main cohort to include a larger proportion of infants with HIV-positive mothers, was assigned to lactulose/mannitol gut permeability tests at 6, 12 and 18 months. Lactulose mannitol ratio (L:M) analyses were adjusted for baseline urinary L:M, socio-economic status, mother's education, season of birth and baseline stunting, and stratified by maternal antenatal HIV status, concurrent breastfeeding status and anaemia at baseline. There was no significant difference in geometric mean L:M between the richly-fortified and basal-fortified porridge arms at 12 months (0.47 [95%CI 0.41, 0.55] v. 0.41 [0.34, 0.49]; *P* = 0.16 adjusted). At 18 months, the richly-fortified porridge group had significantly higher geometric mean L:M than the basal-fortified group (0.23 [95%CI 0.19, 0.28] v. 0.15 [0.12, 0.19]; *P* = 0.02 adjusted). This effect was evident for all stratifications, significantly among boys (*P* = 0.01), those who were not anaemic at baseline (*P* = 0.03) and among the infants of HIV-negative women not concurrently breastfed (*P* = 0.01). CRP, but not AGP, was positively associated with L:M but there were no significant effects of diet on CRP or AGP. In conclusion, a richly-fortified complementary/replacement food did not benefit and may have worsened intestinal permeability.

1. van Rheenen PF, de Moor LT, Eschbach S *et al.* (2008) *Eur J Clin Nutr* **62**, 1379–1387.

2. Kafwembe EM, Chipipa J, Njunju E *et al.* (2009) *Int J Vitam Nutr Res* **79**, 40–47.

3. Central Statistical Office, Ministry of Health, Tropical Diseases Research Centre *et al.* (2009). *Zambia Demographic and Health Survey 2007*. Maryland, USA: CSO and Macro International Inc.