

## Editorial: Micronutrient supplementation for malaria control – hype or hope?

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Prevailing poverty and lack of functioning health services are the main reasons why malaria remains a major contributor to morbidity and mortality in many regions of the world, particularly in sub-Saharan Africa (WHO 1997). Despite renewed interest in malaria control since the 1990s the armoury against malaria remains limited and existing tools such as drugs and insecticides are rapidly losing their efficacy (Marsh 1998). New tools for malaria control would thus be very welcome, and nutritional interventions have been considered to be promising candidates (Shankar 2000). So what is the evidence for changes in nutritional status being effective in malaria control?

Malnutrition is known to cause one-third to one-half of childhood deaths and substantial proportions of infectious disease morbidity in developing countries (Rice *et al.* 2000), where young children and pregnant women are the groups most affected by both poor nutrition and malaria. Impoverished, disease-prone environments, low levels of income and weak public health systems interact in a detrimental triangle. The question of strategic health policy remains in this larger context; what role for specific interventions, and what emphasis on change of the larger context of poverty and health environment itself?

The association between malaria and protein-energy malnutrition (PEM) has been discussed controversially for a long time. While from the 1950s until the 1980s a number of experimental and epidemiological studies provided substantial evidence for PEM being associated with reduced malaria morbidity and mortality, this has not been confirmed in more recent studies (Tshikuka *et al.* 1997; Man *et al.* 1998; Shankar 2000). There is also an

old debate on iron and a more recent one on vitamin A and zinc regarding their relation to malaria. In earlier studies iron supplementation was found to be associated with an increased risk for malaria, a finding which could not be confirmed in more recent investigations (Murray *et al.* 1978; Oppenheimer *et al.* 1986; Menendez *et al.* 1997; Ekvall *et al.* 2000). In a current meta-analysis which included 13 trials, iron supplementation was not associated with increased malaria infection or morbidity, but with a rise in haemoglobin levels by an average of 1.2 g/dl and with a reduction in anaemia by 50% (Shankar 2000).

Vitamin A and zinc deficiencies are common in young children in low-income countries, and both micronutrients are considered essential for the normal functioning of the immune system (Levin *et al.* 1993; Shankar & Prasad 1998). Consequently vitamin A supplementation has been shown to reduce infectious disease morbidity and all-cause mortality in young children of developing countries, and this intervention is now being widely implemented (Beaton *et al.* 1993; Levin *et al.* 1993). Zinc supplementation, given to pregnant women or young children, reduces morbidity attributed to gastrointestinal and respiratory infections and has been considered likely to also reduce all-cause mortality in children of developing countries (Zinc Investigators' Collaborative Group *et al.* 1999; Umata *et al.* 2000; Müller *et al.* 2001; Osendarp *et al.* 2001). However, results from large community-based studies on the effects of both vitamin A and zinc on malaria are inconclusive. While Shankar *et al.* (1999, 2000) reported on reduced malaria morbidity associated with both vitamin A and zinc supplementation in pre-school children of Papua New Guinea, such effects were not

seen in young children of West Africa (Binka *et al.* 1995; Müller *et al.* 2001).

So what are the policy implications of these findings? Clearly, iron supplementation should continue to be recommended for prophylaxis and treatment of anaemia irrespective of malaria endemicity. In addition practicable and cost-effective vitamin A and zinc supplementation should be administered alongside routine malaria control measures in areas where both micronutrient deficiencies and malaria are public health problems. But instead of developing ever more complex supplementation schemes for malnourished populations, it appears to be more appropriate to address the PEM problem more broadly. Economic development supporting broad-based income growth goes a long way towards reducing PEM and child malnutrition, but it does not go far and fast enough (Wiesmann *et al.* 2000). As Alderman *et al.* (2001) find, child malnutrition rates (in terms of low weight-for-age) would be cut by about 15% in 2020, if per capita income growth were 2.5% per annum until then. Fast and effective reduction of undernutrition requires both economic growth in low income countries and direct action. The latter includes sustainable community-based multisectorial programmes on dietary modification and diversification; attention to water management, especially in irrigated agriculture; and improving public health. The links between macro and micro conditions for nutritional improvement are still poorly understood. Research into these might have a high pay-off, exceeding that focused on perfecting specific nutrient interventions.

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