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Afebrile *P. falciparum* Parasitemia decreases Absorption of Fortification Iron but does not Affect Systemic Iron Utilisation: A Double Stable Isotope Study in Young Beninese Women

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Abstract

Anemia affects many young women in sub-Saharan Africa. The aetiology of anemia in Africa is multifactorial, but the major cause is low dietary iron bioavailability from monotonous, cereal-based diets exacerbated by chronic parasitic infections such as malaria. Malaria causing chronic inflammation and therefore reducing iron bioavailability could be the reason for the blunted effect of iron fortification in fortification trials in sub-Saharan Africa. Many women in malaria endemic areas do not develop acute febrile malaria when infected with *P. falciparum*; rather, they exhibit asymptomatic parasitemia which has an unpredictable and often protracted course. Asymptomatic parasitemia potentially could reduce iron absorption and/or utilisation by causing subtle inflammatory changes. Therefore we measured the effect of asymptomatic parasitemia on host iron absorption and utilisation.

The study site was Natitingou in northern Benin. Subjects were: 1) female; 2) age 18–30 y; 3) body weight < 65 kg; 4) not pregnant or lactating; 5) no chronic medical illnesses; 6) no medicinal iron at the time of entry into the study; 7) a positive malaria smear (asexual *P. falciparum* parasitemia > 500/ μ L blood without clinical symptoms; 8) no soil-transmitted helminthes infection. Iron absorption and utilisation was measured using stable isotope technique. Subjects were studied while infected, then they were treated, and then they were restudied.

Clearance of parasitemia was associated with a reduction in low-grade inflammation, with a slight improvement in erythropoiesis and a significant 70% increase in dietary iron absorption. No effect on systemic utilisation of iron was observed with clearance of parasitemia.

Asymptomatic malaria may exacerbate nutritional iron deficiency by limiting iron absorption from diets that are already low in bioavailable iron. Thus the benefit of intermittent treatment of malaria on anemia rates is not only due to the suppression of acute malarial anemia, but also to the periodically clearance of asymptomatic parasitemia and thereby improving dietary iron bioavailability.

Keywords: Anemia, benin, iron absorption, iron utilisation, malaria