

Anemia protects African children against malaria

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Iron deficiency is the most common nutritional deficiency in the world and causes long-term adverse consequences in children. However, concerns remain about the safety of iron supplements, particularly for children in malaria-endemic countries lacking adequate access to health services. Researchers at the University of North Carolina at Chapel Hill have proven these concerns valid after finding iron deficiency anemia actually protects children against the blood-stage of *Plasmodium falciparum* malaria in Africa, and treating anemia with iron supplementation removes this protective effect. Their results were published in *EBioMedicine*.

The UNC researchers, along with colleagues from the Medical Research Council Unit in The Gambia, Africa, and the London School of Hygiene & Tropical Medicine, studied the red blood cells of 135 anemic children aged 6-24 months in a [malaria](#)-endemic region of The Gambia where sickle-cell trait was also common. The children received iron through micronutrient powder for 84 days as part of an iron supplementation trial. Red blood cells from the children were analyzed at baseline, day 49 and day 84.

Previous studies had shown a [protective effect](#) from malaria in children having the sickle-cell trait. However, the researchers found that on a population-wide basis anemia reduced the blood-stage of malaria by 16 percent while the sickle-cell trait only reduced it by 4 percent.

"Our finding that anemia offers greater natural protection against blood-

stage malaria infection than sickle-cell trait has led us to formulate the interesting hypothesis that the widespread prevalence of anemia in people of African descent is a genetic signature of malaria," said Morgan Goheen, Ph.D., the study's lead author and a graduate student in the UNC Department of Microbiology and Immunology.

Deficits in invasion and growth for blood stage *P. falciparum* were reversed when anemic [children](#) had received seven weeks of iron supplementation. Prior work by the same research team suggests that the increased invasion and growth rates following iron supplementation are caused by the parasites' strong preference for young [red blood cells](#).

"This study is elegant in its simplicity, yet remains one of the most substantial and systematic attempts to unveil the cellular-level relationship between anemia, iron supplementation and malaria risk," said Carla Cerami, M.D. Ph.D., lead scientist on the project at the MRC Unit in The Gambia.

These new field results consolidate the evidence that iron supplementation increases the risk of *P. falciparum* malaria and provide support for the use of malaria prophylaxis by [iron supplementation](#) programs, especially during the critical, early phases of the erythroid recovery.

More information: M.M. Goheen et al. Anemia Offers Stronger Protection Than Sickle Cell Trait Against the Erythrocytic Stage of *Falciparum* Malaria and This Protection Is Reversed by Iron Supplementation, *EBioMedicine* (2016). [DOI: 10.1016/j.ebiom.2016.11.011](https://doi.org/10.1016/j.ebiom.2016.11.011)

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