Interactions between nutrition and immune function: using inflammation biomarkers to interpret micronutrient status

Summary of research

**Location:** Global

**What we know:** Both clinical and sub-clinical inflammation affect the plasma concentration of many nutrients. This complicates assessment of nutritional status and interpretation of nutrition intervention impact, particularly in those who are apparently well but at risk of or recovering from infection.

**What this article adds:** A review used two acute phase proteins (CRP and AGP) to determine the presence of inflammation and assist interpretation of plasma retinol, ferritin and zinc concentrations in healthy HIV+ Kenyan adults. Iron deficiency was significantly under-estimated in uncorrected data; serum zinc concentrations only increased in response to supplementation in people without inflammation. The authors recommend that CRP and AGP measurement should accompany micronutrient status measurement in apparently healthy subjects and that correction factors should be applied in interpreting their data.

The immune response promotes a complex series of reactions by the host in an effort to prevent ongoing tissue damage, isolate and destroy the infective organism and activate the repair processes that are necessary for restoring normal function. The process is known as inflammation and the early set of reactions that are induced are known as the acute phase response (APR). The APR has marked effects on the circulation, liver metabolism and the plasma concentration of many nutrients. The changes in nutrient concentrations follow a cyclic pattern; they occur before any clinical evidence of disease, being at their most pronounced during the disease, and remain in convalescence when all evidence of disease or trauma has disappeared. Therefore, where susceptibility to disease is high as in people who are HIV + but still apparently healthy, obtaining an accurate measurement of nutritional status may not be possible.

Accurate measurements of nutritional status are important for national statistics to plan for the proper utilisation of government resources and they are especially important to evaluate the effectiveness of nutritional interventions. Many acute phase proteins (APP) are synthesised during inflammation and they are used to monitor the progress of disease and recovery but individually, none of their lifecycles compare well with those of the nutritional biomarkers. Nevertheless, recognising the presence of inflammation can help interpret data. A recent review paper illustrates methods developed using two APPs to assist interpretation of plasma retinol, ferritin and zinc concentrations in apparently healthy, HIV + Kenyan adults.

In essence, the review found that the use of two APPs, C-reactive protein (CRP) and alpha(1)-acid glycoprotein (AGP), to identify subjects with inflammation enabled the researchers to show that iron deficiency was significantly under-estimated in uncorrected data and that the presence or absence of inflammation determined whether absorbed iron was stored as ferritin or utilised for haemoglobin (Hb) synthesis, respectively. In the case of zinc supplementation, serum zinc concentrations only increased in response to the supplement in people without inflammation. In the case of plasma retinol (used to measure vitamin A status), there was a large fall (up to 40% in women who had undergone uncomplicated orthopaedic surgery). Inflammation can be present in many apparently healthy infants and children in developing countries which can lead to an overestimate of vitamin A
deficiency. All the results illustrate that where sub-clinical inflammation is present, it should be identified to correctly evaluate nutritional status and interpret the effects of intervention.

In conclusion, the authors suggest that all workers measuring micronutrient status in apparently healthy subjects should measure the two proteins CRP and AGP and apply correction factors in interpreting their data. Even if the correction factors cannot be calculated, e.g. if there were insufficient people in the reference group, or the corrections fail to influence their data because of small sample sizes, examining subjects with inflammation separately from those without can reveal some interesting differences in the way micronutrient status sometimes responds in people with and without inflammation.

Footnotes

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www.ennonline.net/fex/50/micronutrientsimmunity

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