

# Measuring Dietary Iron Absorption From Edible *Tenebrio molitor* and Assessing the Effect of Chitin on Iron Bioavailability: A Stable Iron Isotope Study in Young Women

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**Objectives:** Iron deficiency is estimated to affect up to 1.5–2 billion people worldwide. Edible insects can be a rich source of iron and may have a smaller environmental food print than other animal source foods. Mealworm (*Tenebrio molitor*) larvae are recognized as an edible insect, but iron bioavailability in humans has not been investigated. Chitin, a major component of insect biomass, is a known iron binder. Our primary objective was to measure fractional iron absorption (FIA) from *T.molitor* with and without chitin in young women. Secondly, we aimed to assess the effect of the presence of mealworm biomass on iron absorption from iron present in low-phytate maize porridge.

**Methods:** Non-anemic females (18–45 years, body weight < 65 kg) were recruited and FIA was measured as erythrocyte incorporation of stable isotopes tracers in red blood cells 14 days after test meal administration. Using a randomized cross over design, three different meals were administered to each subject, consisting of A) a low phytate refined maize porridge with <sup>54</sup>FeSO<sub>4</sub>; B) intrinsically labelled (<sup>57</sup>Fe) *T.molitor* with native chitin and extrinsic <sup>58</sup>FeSO<sub>4</sub>; C) intrinsically labelled (<sup>57</sup>Fe) *T.molitor* with reduced chitin and extrinsic <sup>58</sup>FeSO<sub>4</sub>.

**Results:** Median serum ferritin concentration in the participating subjects (n = 21) was 22.7 µg/L. Iron content in *T.molitor* larvae was FIA from meals B (<sup>58</sup>Fe, 5.28%) and C (<sup>58</sup>Fe, 4.55%) in which mealworm biomass was given in combination with maize porridge did not significantly differ to FIA from maize porridge fed alone (5.84%). In case of intrinsic labelling, FIA from meals B (<sup>57</sup>Fe, 4.11%) and C (<sup>57</sup>Fe, 4.03%) were significantly lower compared to maize meal A (P < 0.001).

**Conclusions:** FIA from *T.molitor* was similar to low-phytate containing maize. Presence of mealworm biomass did not enhance or inhibit the FIA of iron present in the maize meal. Furthermore, a chitin reduction process did not show any discernible effect on FIA. *T.molitor* larvae could be a viable source of iron in the human diet, but iron absorption may be similar to plant-based foods. The study was registered at clinicaltrials.gov as NCT04510831.

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