

Metabolomics in nutrition research: assessment of metabolic status, response to treatment, and predictors of mortality in malnourished children

Primary authors: Dr. FREEMARK, Michael (Division of Pediatric Endocrinology and Diabetes, Duke University Medical Center), USA

Co-authors:

Presenter: Dr. FREEMARK, Michael (Division of Pediatric Endocrinology and Diabetes, Duke University Medical Center), USA

OBJECTIVE: Malnutrition is a major cause of morbidity and mortality in infants and young children. To identify and target those at highest risk there is a critical need to elucidate the pathogenesis of severe acute childhood malnutrition and to characterize biomarkers that predict complications prior to and during treatment.

METHODS: We applied targeted and non-targeted metabolomic analysis to characterize the hormonal and metabolic status of malnourished Ugandan infants and young children prior to and during nutritional therapy. Children ages

6mo-5yr were studied at presentation to Mulago Hospital and during inpatient therapy with milk-based formulas and outpatient supplementation with ready-to-use-food. We assessed the relationship between baseline hormone and metabolite levels and subsequent mortality.

RESULTS: 77 patients were enrolled in the study; a subset was followed from inpatient treatment to outpatient clinic.

Inpatient and outpatient therapies were associated with significant increases in weight/height z scores, but 12.2% of the children died during hospitalization. The levels of more than 100 metabolites were measured in samples of 1 ml of plasma. Treatment was accompanied by striking changes in the levels of fatty acids, amino acids, acylcarnitines, inflammatory cytokines, and various hormones including leptin, insulin, growth hormone, ghrelin, cortisol, IGF-1, GLP-1, and peptide YY. Multivariate regression analysis controlling for HIV and malarial infection identified a number of biochemical factors that were associated with, and may predict, mortality during treatment.

CONCLUSIONS: Metabolomic analysis provides a comprehensive hormonal and metabolic profile of severely malnourished children prior to and during nutritional rehabilitation. Metabolomics can be used to identify biomarkers associated with mortality and may thereby facilitate the targeting and treatment of those at greatest risk.