

PRAL-independent diet effects on NEAP: Acid base considerations in stone-age sweet potato eaters, modern-day sweet potato eaters, and high-protein consumers

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Net endogenous acid production (NEAP) comprises of 2 major components: the principally anthropometrically predictable organic acid anion (OA) component and the dietary predictor PRAL (potential renal acid load). While it is widely accepted that the PRAL component can be calculated from the dietary intakes of minerals and protein, there is still some uncertainty whether particular foods or rather extreme diets may affect OA excretion irrespective of anthropometrics.

To examine PRAL-independent influences on the OA component of NEAP, literature was surveyed, measurements of dietary intakes and urinary 24-h OA excretions were performed in participants of the DONALD study, and a controlled diet experiment on the effect of a single meal of 345 g sweet potatoes on acid base status, 24-h OA and mineral excretion was conducted in 8 healthy females (32 ± 13 years).

Published data indicate that phenolic and benzoic acids found in higher amounts in certain fruits like blackcurrants, cranberries, and plums may contribute relevantly to the amount of OAs excreted. The detoxification product of benzoate, i.e., hippuric acid, has been reported to be excreted in huge amounts in some Papuan tribes of New Guinea eating predominantly highland sweet potatoes. However, despite clear changes in 24-h potassium output (+24.6 mmol/d, $P < 0.0001$) and NEAP (-7.6 mEq/d, $P < 0.05$), only small increases of 1-2 % were seen for total OA ($P < 0.05$), hippurate ($P < 0.05$), oxalate ($P < 0.01$), citrate ($P < 0.1$) and urate ($P < 0.2$) in the sweet potato diet experiment. Literature findings suggest a higher OA excretion on higher protein intakes in formula-fed compared to human milk-fed infants and in body builders. Significant positive associations were also seen between protein intake and 24-h OA excretions ($P < 0.0001$) in the currently studied groups of DONALD participants.

Irrespective of the strong dietary PRAL effect on NEAP, some particular plant foods as well as marked variations in protein intake could additionally add to variation in acid base status via alterations in OA. This may have relevance in future specification of the PRAL-NEAP model.