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Estimation of the net acid load of the diet of ancestral preagricultural Homo sapiens and their hominid ancestors.

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BACKGROUND:

Natural selection has had < 1% of hominid evolutionary time to eliminate the inevitable maladaptations consequent to the profound transformation of the human diet resulting from the inventions of agriculture and animal husbandry.

OBJECTIVE:

The objective was to estimate the net systemic load of acid (net endogenous acid production; NEAP) from retrojected ancestral preagricultural diets and to compare it with that of contemporary diets, which are characterized by an imbalance of nutrient precursors of hydrogen and bicarbonate ions that induces a lifelong, low-grade, pathogenically significant systemic metabolic acidosis.

DESIGN:

Using established computational methods, we computed NEAP for a large number of retrojected ancestral preagricultural diets and compared them with computed and measured values for typical American diets.

RESULTS:

The mean (+/- SD) NEAP for 159 retrojected preagricultural diets was -88 +/- 82 mEq/d; 87% were net base-producing. The computational model predicted NEAP for the average American diet (as recorded in the third National Health and Nutrition Examination Survey) as 48 mEq/d, within a few percentage points of published measured values for free-living Americans; the model, therefore, was not biased toward generating negative NEAP values. The historical shift from negative to positive NEAP was accounted for by the displacement of high-bicarbonate-yielding plant foods in the ancestral diet by cereal grains and energy-dense, nutrient-poor foods in the contemporary diet-neither of which are net base-producing.

CONCLUSIONS:

The findings suggest that diet-induced metabolic acidosis and its sequelae in humans eating contemporary diets reflect a mismatch between the nutrient composition of the diet and genetically determined nutritional requirements for optimal systemic acid-base status.