THE CONTRIBUTION OF ASCORBIC ACID TO URINARY OXALATE IN HUMANS

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Introduction

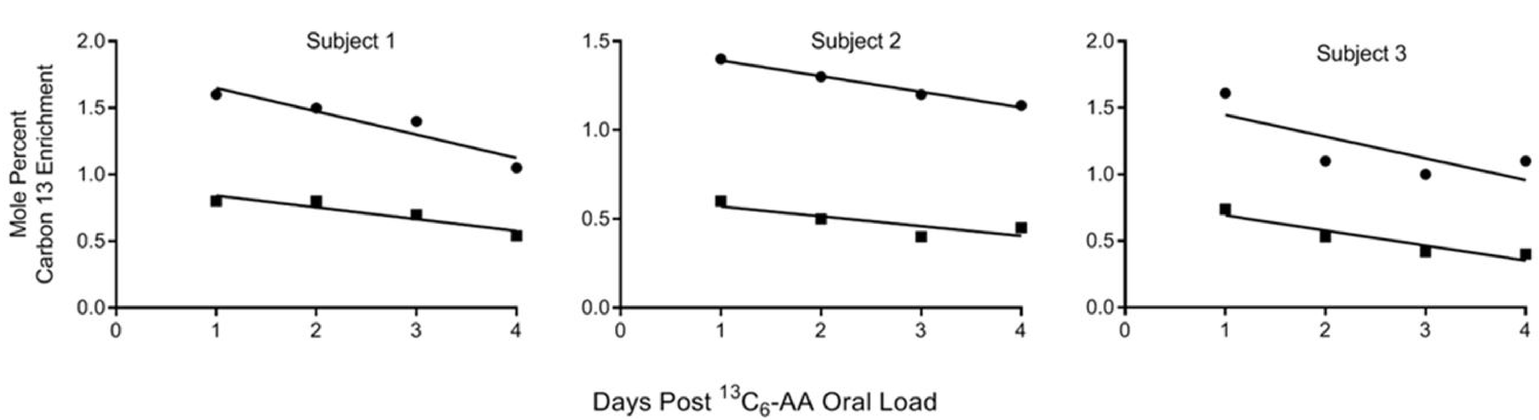
Oxalate is a major component of most kidney stones and urinary oxalate excretion is a major determinant of stone formation. About 50 % of oxalate in urine is derived from dietary sources and the other 50 % from endogenous oxalate synthesis. There are several studies which demonstrate a positive association between ascorbic acid (AA) intake and urinary oxalate excretion. Ascorbate can undergo non-enzymatic conversion to oxalate. Our hypothesis is that AA breakdown to oxalate is a major contributor to the urinary oxalate pool derived from endogenous synthesis.

Methods

Three lean, non-stone forming healthy male adults (BMI 25 ± 2)were recruited into the clinical research unit at the University of Alabama. They consumed a 6 day controlled diet with ultra low oxalate (22 mg/day), normal calcium (1000 mg), 90 mg of ascorbic acid, and similar macronutrient and micronutrient content. This diet limits the contribution of diet to the urinary oxalate pool. On Day 3 (allowing 2 days of equilibration), subjects consumed 1 mg of 13C6-AA/kg body weight. 24 hour urine and daily plasma samples were obtained for 4 days to measure the plasma enrichment of 13C6-AA and the urinary enrichment of 13C2-oxalate. These were measured using ion chromatography linked to mass spectroscopy. The contribution of AA breakdown to the urinary oxalate pool was calculated by dividing urinary mole percent enrichment by the matching plasma mole percent enrichment.

Results

Figure 1 demonstrates the change with time of the mole percent enrichment of the plasma AA pool with 13C6-AA (circles) and urinary oxalate pool with 13C2-oxalate (boxes) following a single oral dose of 1 mg/kg 13C6-AA. Fasting plasma AA was 58 ± 9 μM. The contribution of AA to urinary oxalate excretion for Subject 1, 2 and 3, was 50 ± 2%, 41 ± 2%, and 43 ± 5%, respectively.



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Discussion

AA breakdown contributes significantly to the urinary oxalate pool. Further studies are needed to understand what drives differences amongst individuals, especially stone formers, and if this conversion can be attenuated to reduce stone risk.

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

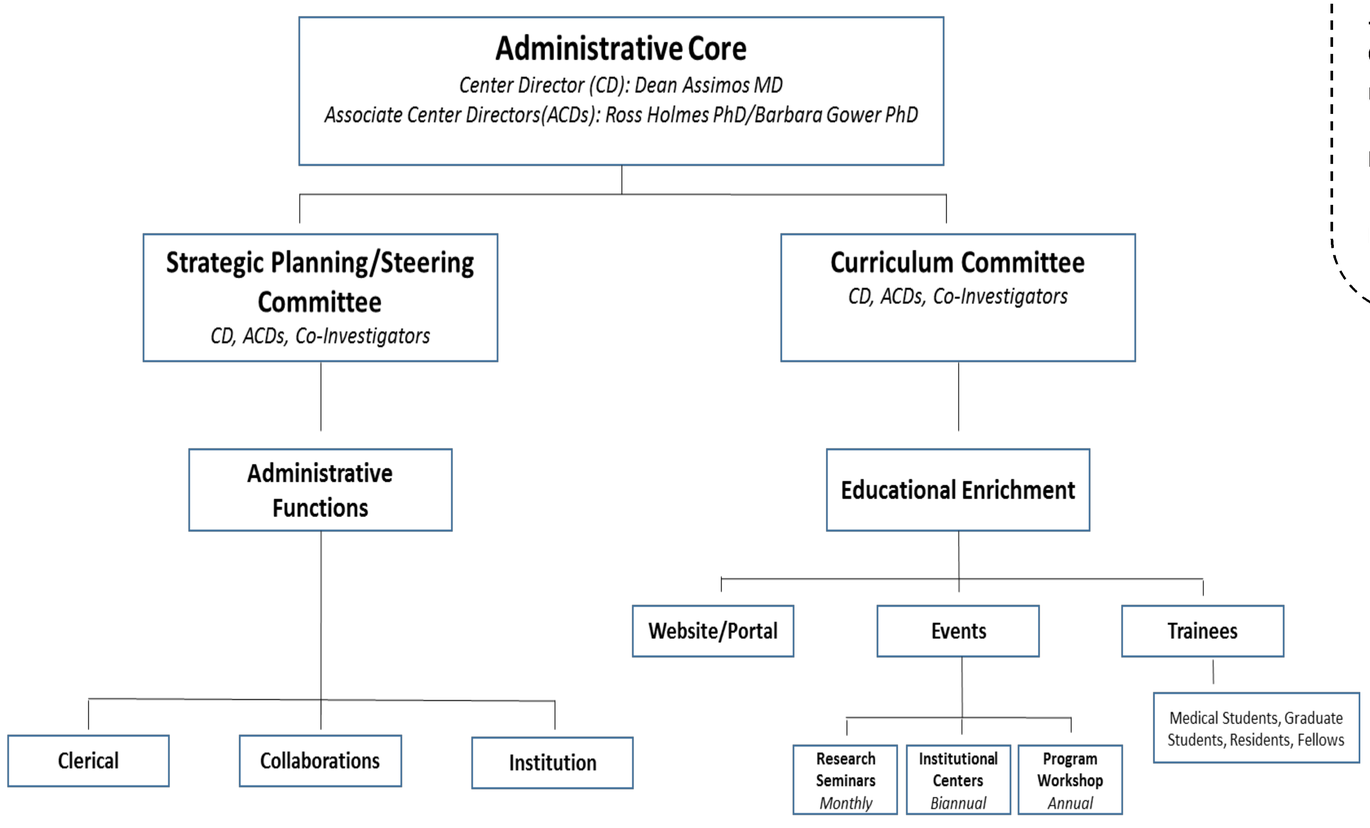
P20: INFLUENCE OF OBESITY ON ENDOGENOUS OXALATE SYNTHESIS

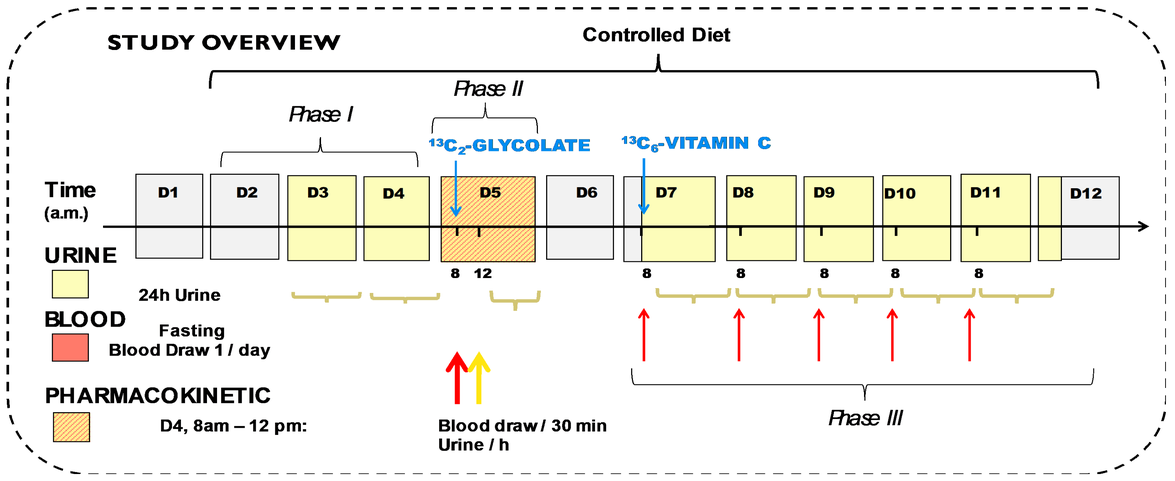
Principal Investigators: Ross Holmes, Barbara Gower, Dean Assimos
University of Alabama: Department of Urology, Department of Nutrition, Nutrition and Obesity Research Center

COOKS (Center for research on Obesity and Oxalate Kidney Stones)

Specific Aim 1: To establish a broad based network of scientific expertise to elucidate the relationships between obesity and endogenous oxalate synthesis.
Specific Aim 2: To provide administrative and educational platforms to enhance expertise on this subject, attract others into this field of research, and promote intra/extra institutional collaborations.
Specific Aim 3: To conduct a research project that will illustrate the value of this interdisciplinary approach and provide critical preliminary data for a successful R01 or Program Project Grant submission.

Center for research on Obesity and Oxalate Kidney Stones
(COOKS)





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Nutrition and Obesity Research Center
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