Systematic Review and Meta-Analysis of Protein Intake and Bone Health
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Disclosures

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• Dr. Taylor Wallace – Food & Nutrition Blog

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Presentation Outline

• The controversy around protein:
  – Are higher protein intakes beneficial or detrimental to bone?
  – Do animal and plant proteins differ?

• Systematic review and meta-analysis:
  – Methods
  – Results
  – Conclusion and future work
The Controversy

- Protein makes up roughly 1/3 of bone mass
- Protein increases urinary calcium excretion
  - Early metabolic studies show that high protein intakes do not improve calcium absorption such that the increase in urinary calcium can be accounted for the the improved absorption efficiency (metabolic vs. tracer studies)
- Animal proteins have a greater amount of sulfur-containing amino acids

The Problem

- Most studies are not designed to correctly address the issue:
  - Hormone replacement therapy (HRT)
  - Oral contraception
  - Weight loss studies
  - Isoflavones
- Confounding across other published meta-analyses

Objective

- Systematically review randomized controlled trials (RCTs) and prospective cohort studies that test the effects of protein intakes above the current RDA on bone health
  - Fractures
  - BMD/BMC
  - Urinary calcium
  - Bone turnover markers

Exclusion Criteria

- Exclusion Criteria:
  - Studies designed to examine outcomes in response to protein type but not protein quantity (i.e., protein source comparison only)
  - Studies supplementing protein in the form of full isoflavone soy (i.e., isoflavones not removed or minimized)
  - Acute feeding studies of 24 hours or less
  - Studies of bone health in women where oral contraceptive use or HRT is not excluded, not stratified, if allowed, or not controlled for in analysis, if allowed

Exclusion Criteria

- Exclusion Criteria:
  - Protein intake in excess of 35% of calories or 2.5 g/kg and no study arm with a lower intake value
  - Protein intake less than 0.66 g/kg/d
  - Review articles, case reports, cross-sectional studies, commentaries, and etc.
Flow Diagram of Article Selection

Records Identified (n=1,220)  Duplicates (n=140)
Potential Articles (n=1,080)  Title/Abstract Excluded (n=970)
Reference Lists (n=0)  Full Text Excluded (n=86)
Full Text Articles Screened (n=110)  Articles Included (n=24)

Results – Urinary Calcum

Urinary Calcium in Treatment vs. Control

Results – Urinary NTx

Urinary NTx in Treatment vs. Control

Results – Hip Fractures

Hip Fracture: RR for Highest vs. Lowest Category of Intake

Conclusions

• Future work:
  – Assess BMD/BMC outcomes across prospective cohort studies
  – Describe other markers that were not appropriate to meta-analyze in the manuscript

• These data support intake of protein above the current RDA as a structured intervention for hip fracture reduction.

Thank You!

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Questions?

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