Assessment of Fluoride Levels in Hair among Ethiopian Villagers

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Outline

• Fluoride Problem
• Hair as a Biomarker of Exposure
• Ethiopia Trip
• Hair Collection/Analysis
• Future Possibilities
Fluoride Problem

Amini et al, 2008 – Predicted probability of groundwater Fluoride exceeding the WHO guideline of 1.5 mg/L
Dental Fluorosis
Dental Fluorosis
Dental Fluorosis
Dental Fluorosis
Skeletal Fluorosis

http://makeiteighteh.files.wordpress.com/2011/01/skeletal-fluorosis.jpg
Hair as a Biomarker of Exposure

• Benefits of having a biomarker
  – Estimates body burden of F⁻
  – Intervention evaluation
  – Is water filtration enough?

• Why hair?
  – Unobtrusive
  – Characterizes long-term exposure
Hair as a Biomarker

• “Hair may be useful in assessing variations in exposure to fluoride over the long-term” (Stolorska et al, 2000)
• “Hair samples have the advantage of revealing longer-term exposure” (McKinney, 2000)
• “Fluoride in hair samples could be used as a biomarker of chronic fluoride exposure” (Mandinic et al, 2009)
Ethiopia Trip

- Study Design
- What we actually encountered
  - Community overviews
  - Local partnership
Local Partnership

- Addis Ababa University
- Catholic Relief Services
  - Meki Catholic Secretariat
- CARE Ethiopia

Invaluable aid:
- Language
- Culture
- Transportation
Water Collection
Water Collection
Ineffective Treatment

• Reasons
  – Broken equipment
  – High fuel prices
  – Education (Technology)
  – Lack of Chemical Availability
  – Taste

→ Inconsistent water sources
Rural Water Sources

- Community well
- Private well
- Town water
- Lake water
Hair Collection
Hair Sterilization
Hair Analysis

• Dissolve 500 mg hair in 15 mL of 1 N NaOH
  – Microwave
• Neutralize with 1 N HCl
• Analyze:
  – Ion selective electrode
  – Colorimeter
  – Commercial lab
• Work in progress

http://cmld.bu.edu/center/instrumentation/
Conclusions

• Hair may be a beneficial biomarker of F<br>because it takes into account total exposure, especially when water sources are inconsistent over the long-term

• Local partnership is necessary in order to succeed across cultures
Future Possibilities

• Finish assessment
• Establish a relationship between drinking water and hair F\textsuperscript{-} levels
• Conduct a long-term study accounting for body burden of F\textsuperscript{-}
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Questions ??