Leaching of Bisphenol–A From Polycarbonate Containers

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Funded By: The Subsurface Biosphere Initiative
The Problem

- Conflicting Experimental data:
  - Mice studies done by Dr. Patricia Hunt of WSU
  - EPA, FDA, and the Consumer Products Safety Commission
- Literature yielded similar conflicting conclusions

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Nalgene PC Water Bottle

Background
Is the Leaching of Bisphenol-A from polycarbonate containers exclusively a surface phenomenon?
Background: Bisphenol–A (BPA)

www.britannica.com

Bisphenol–A molecule

www.eng.ku.ac.edu

Bisphenol–A monomer
Experimental Procedure

Pre-Experiment

TGA

DSC
Sample Preparation

Bottle Preparation / Autoclaving
Sample Collection

1. Push treated water through
   Collect organics in membrane
   Dispose of treated water

2. Push DCM through
   Dissolve organics in DCM with DCM
   Capture organics in small amount of DCM

3. Blow air through vile to evaporate DCM via equilibrium
   Concentrate organics in DCM

Solid Phase Extraction (SPE)
Sample Analysis

HP 5890 GC/MS (C18 column)

GC/MS Flowchart
Detection Limit

~ 7,000,000

1 ppm BPA ↑

~400,000

←10 ppb BPA
~46,000

1st Autoclave ↑

~85,000

2nd Autoclave →
Identifying Organic Unknowns

Library Searched: C:\Database\NBS75K.L
Quality: 76
ID: Phenol, 4,4'-(1-methylene)bis-

Scan 2254 (15.967 min): PMB.D
Progress

- Determined a method for SPME of BPA from water samples
- Performed detection limit/calibration curve for GC–MS
- Detected Bisphenol–A in autoclaved PC bottles
- No definitive results at this time
Future Work

- Perform full detection limit test
- Continue surface phenomenon testing:
  - Perform multiple autoclaving procedures per bottle
  - Simulate the effects of surface degradation
  - Quantify leaching rates as a function of number of sterilization processes (autoclaving)
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Questions?