Screening of biological tissues for chemicals of emerging concern

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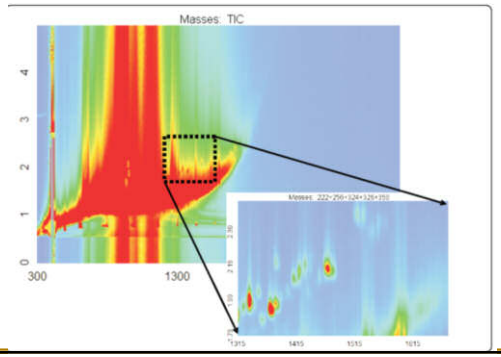


Background

- Vast majority of biological monitoring efforts only measure pollutants from a set list
- Recent studies provide evidence for pollutants that likely bioaccumulate but are not monitored
- Rarely do studies incorporate screening of "unknowns" into their design

Objective

- Use two-dimensional gas chromatography mass time-of-flight spectrometry (GC X GC TOF) to screen estuarine & marine tissue samples for emerging pollutants
  - Allows for resolution of complex mixtures
  - Growing mass spectral libraries will assist with unknown ID
- Major questions
  - A: Which chemicals have the potential to impact humans and aquatic life and should be monitored?
  - B: What potential for impacts on humans and aquatic life exists due to contaminants in estuarine and marine ecosystems?

Approach

- Year 1
  - Harbor seal sample collection by the Marine Mammal Center (Sausalito, CA)
  - Archived bottlenose dolphin samples provided by NOAA Southwest Fisheries Center (La Jolla, CA)
  - Plan and conduct mussel deployment in SF Bay
  - Method refinement using California Sea lion blubber and serum control materials
  - Apply method to harbor seal and bottlenose dolphin samples (blubber and liver)

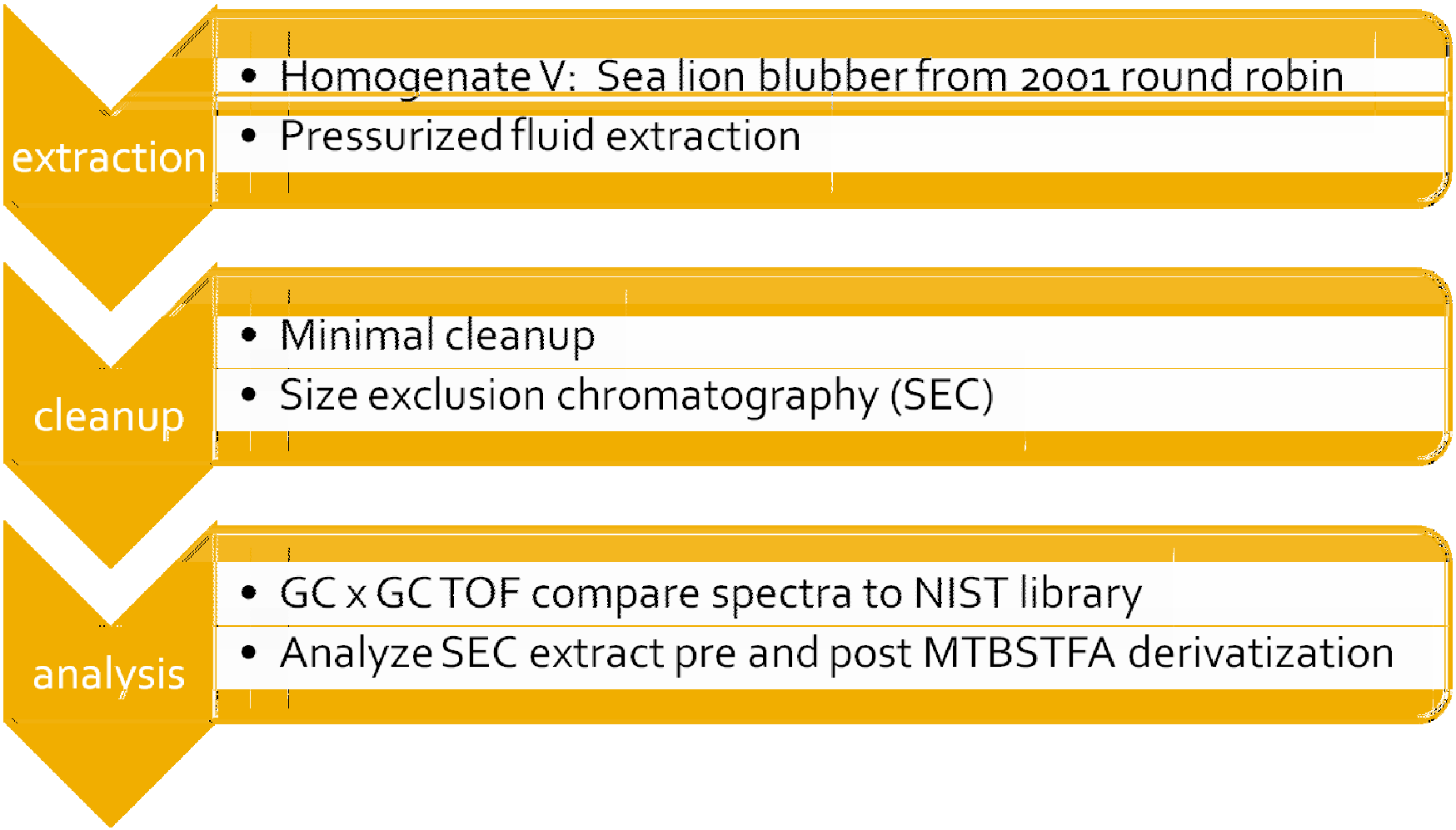
Progress to date

- Collaborating with NOAA Fisheries & The Marine Mammal Center to obtain
  - SF Bay harbor seal samples
  - Bottlenose dolphin (inshore SoCal Bight) samples
- Coordinated GC x GC TOF work
  - NIST/Gaithersburg (E. McGaw): human serum screening
  - SCCWRP/SDSU (Dodder/Hoh): sea lion blubber screening
- Shared method development initiated March 2010
  - "Front end" (sample) processing (NIST/SCCWRP/SDSU)
  - "Back end" mass spectral data processing (SCCWRP/SDSU)

Future plans

- Spring/summer: continue method development
  - construct broadscan library
- Fall/winter:
  - apply method to marine mammal samples
  - append library with newly discovered compounds
  - begin method development for mussel tissue
- 2011
  - Initiate mussel and complete marine mammal analysis
  - append library with new compounds
  - explore use of LC-QTOF
  - First manuscript

Proposed approach: blubber



Proposed approach: Serum or liver

extraction

- MMCM I: sea lion serum used in 2007 round robin
- Microwave extraction method for lipophilics

cleanup

- Normal cleanup for lipophilics (acidified silica, alumina)
- Raw serum, crash protein, remove supernatant, take to dryness and derivatize

analysis

- GC x GC TOF of lipophilic extract pre and post derivatization
- GC x GC TOF of derivatized, protein free serum
- Compare spectra to NIST library