Global Forensic Chemistry Perspectives
Warning
The following slides contain images of human and animal remains in various stages of decomposition
Forensic Chemistry

- Decomposition chemistry
- Soil and vegetation analyses
- Fire investigation
- Scavenging activity
- Chemical enhancement of fingerprints
- Entomology
- Geophysical investigation
Decomposition Chemistry

- Breakdown of body’s main constituents
  - Proteins
  - Lipids
  - Carbohydrates

- Decomposition models
  - Pig (*Sus scrofa*) carcasses
  - Shallow grave decomposition
  - Surface decomposition
  - Water decomposition
Postmortem Decomposition

Human remains

Early and late postmortem changes

Autolysis (early stage decomposition)

Putrefaction (late stage decomposition)

Liquefaction and Disintegration

Skeletonization
Lipid Degradation

Adipose tissue

Triglycerides

Unsaturated fatty acids

Saturated fatty acids

Aldehydes & Ketones

Adipocere (preservation)
Protein Degradation

Proteins
↓
Peptides
↓
Amino acids
↓
Histamine - Putrescine - Cadaverine - Tyramine - Spermidine
↓
Volatile organic compounds
## Analyses

### Soft tissue samples
- Fatty acids
- Drug concentrations
- Early postmortem period
- Predictable cycles
- Correlate with postmortem interval

### Soil samples
- Fatty acids
- Amino acids
- Later postmortem period
- Predictable cycles
- Correlate with postburial interval

### Clothing samples
Volatile Organic Compounds

- Decomposition scent signatures
- Human vs. pig carcasses
- Cadaver dog training
Vegetation

- Minimal vegetation
- Extensive vegetation
- Variations in flowering and fruiting patterns

Vegetation Analysis

• Difference in height of vegetation
• Difference in color of vegetation

• Two grass species found only on grave sites
  – Not found in plot or surrounding area
• Locating clandestine grave sites
Fire Investigation

- Determination of arson cases
- Accelerant signature
- Skin of deceased victims
- Portable detection instrument at the scene
Scavenging Activity

• Survey of small and large carnivores
• Effect of scavenging on decomposition
• Estimation of postmortem interval
Research Team

**Students**
- 1 Postdoctoral Fellow
- 1 International PhD student
- 5 Masters students
- 5 Honours students
- 1 Research Assistant

**Universities**
- University of Nebraska
- University of Bradford
- Macaulay Institute, UK
- University of Technology, Sydney
- University of Western Australia
- University of Munich

**Collaborators**
- Ontario Provincial Police
- Toronto Police Service
- Office of the Fire Marshal
- RCMP

[Image of a group of people with a van and some text about research collaboration.]