Identifying the transition from ante-mortem to post-mortem odor in cadavers cadavers in an outdoor environment

Dr. Darshil Patel[1] & Dr. Shari Forbes[2]

[1]Assistant Professor

[1]Forensic Science Program, Department of Criminal Justice

[2]Department of Chemistry & Biochemistry, University of Windsor

Introduction

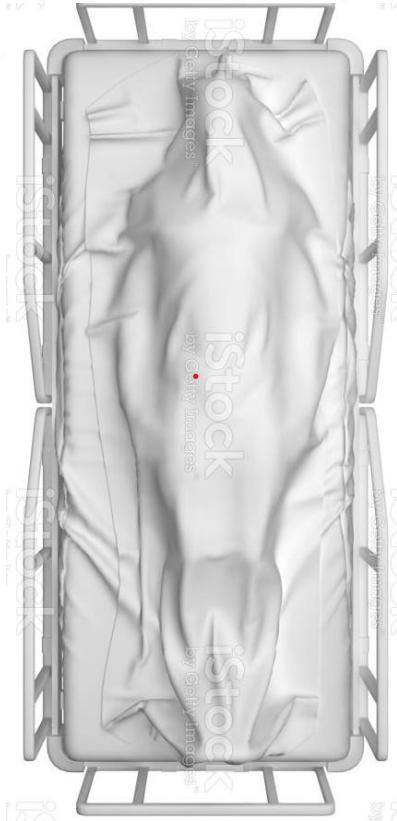
Ante-mortem odour

Death

?

?

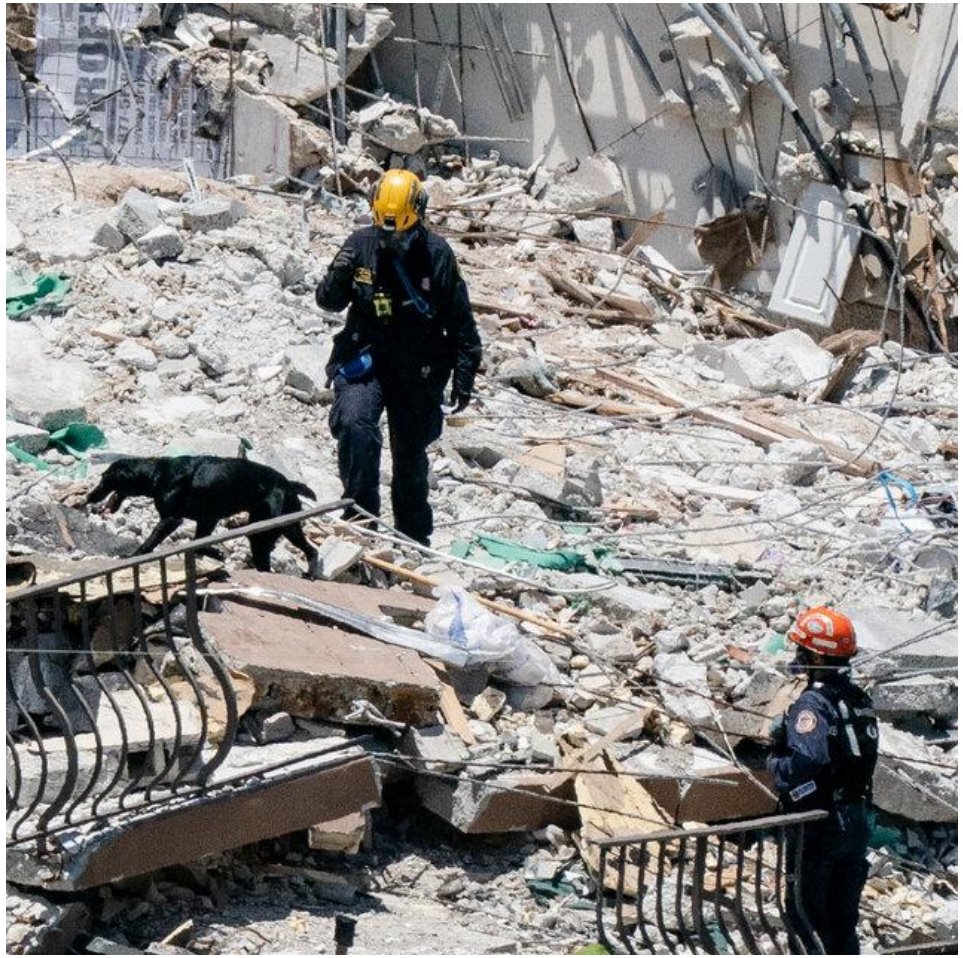
?



Post-mortem odour

Transition from ante-mortem odour to post-mortem odour

Implications to search and rescue operations



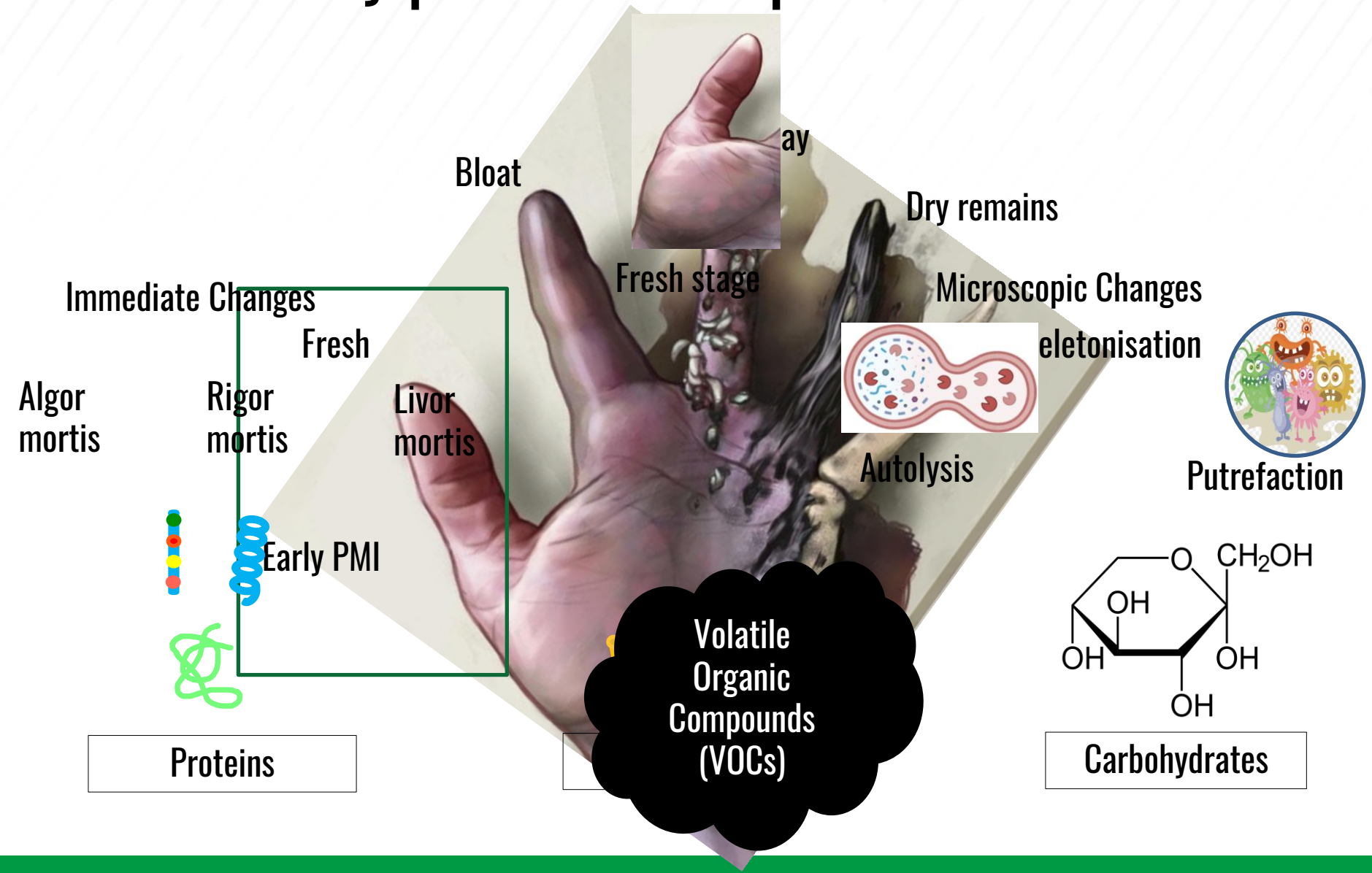
Photos from Miami Surfside Building Collapse

Implications to search and rescue operations

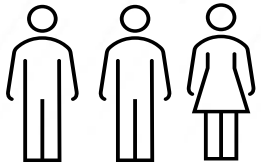
Aims

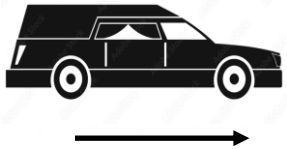
- Identify VOCs collected during the early post-mortem period
- Track the evolution of donor VOC profiles to identify the transition of human scent to post-mortem odor

Introduction: Early post-mortem processes



Experimental Design



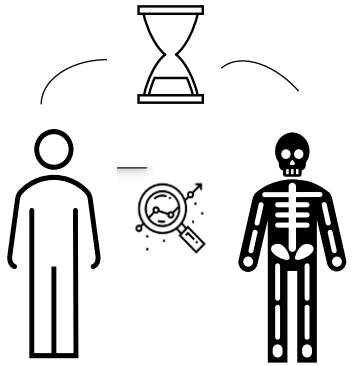


Number of donors

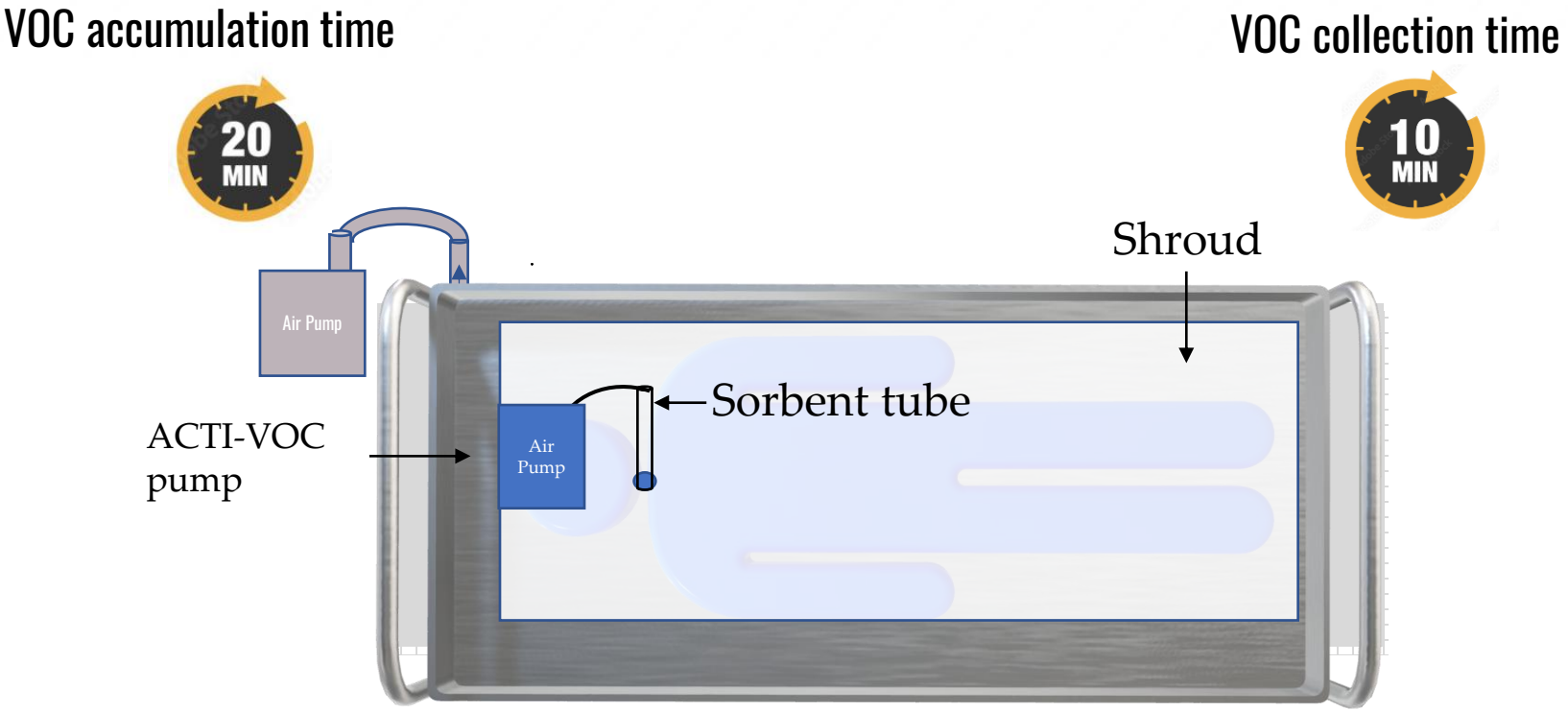
DÉPARTEMENT D'ANATOMIE de l'Université du Québec à Trois-Rivières

REST

VOC sample collection at outdoor facility



Sample Collection at the morgue and REST facility



Analytical Parameters

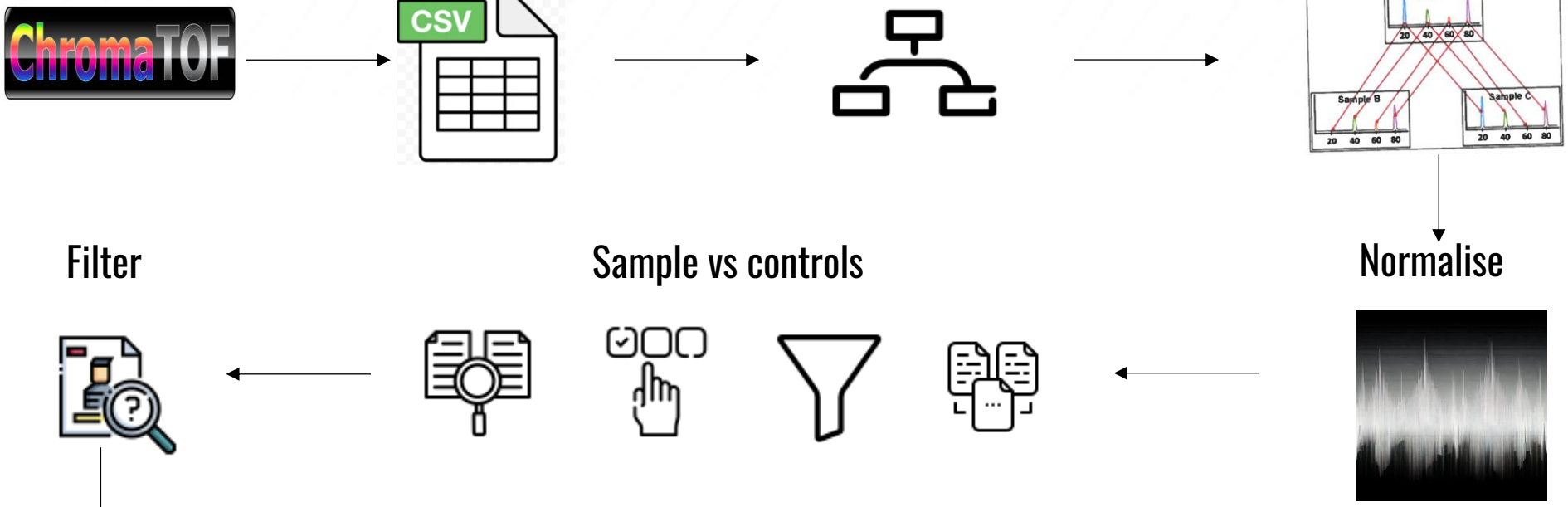
TD-GC×GC Method	
Desorption Temperature	300 °C (4 min)
Trap Low	-10 °C
Trap Desorption	280 °C @ Total split 11:1 (3 min)
Carrier Gas	He@ 17.8 psi (2.0mL/min) constant pressure
Columns ^{1}D **Column ^{2}D**	Rxi®-624Sil MS 30 m × 0.250 mm (ID), 1.40 µm film thickness (df) (Restek Corporation, Bellefonte, PA, USA) Stabilwax® column 2 m × 0.250 mm ID, 0.25 µm df (Restek Corporation, Bellefonte, PA, USA)
Temperature Program	40 °C (2 min), ramp 4 °C/min to 230 °C (5 min) Secondary oven maintained +10 °C relative to primary oven
MS Method	
Ion Source Temperature	250 °C
Ionization Mode	EI (70 eV)
Mass Range	29-300 amu
Acquisition Rate	250 spectra/s

Data processing workflow: ChromaToF and Rstudio

Export

Classify

Align



Normalise

Sample vs controls

Filter

Merge

Final list

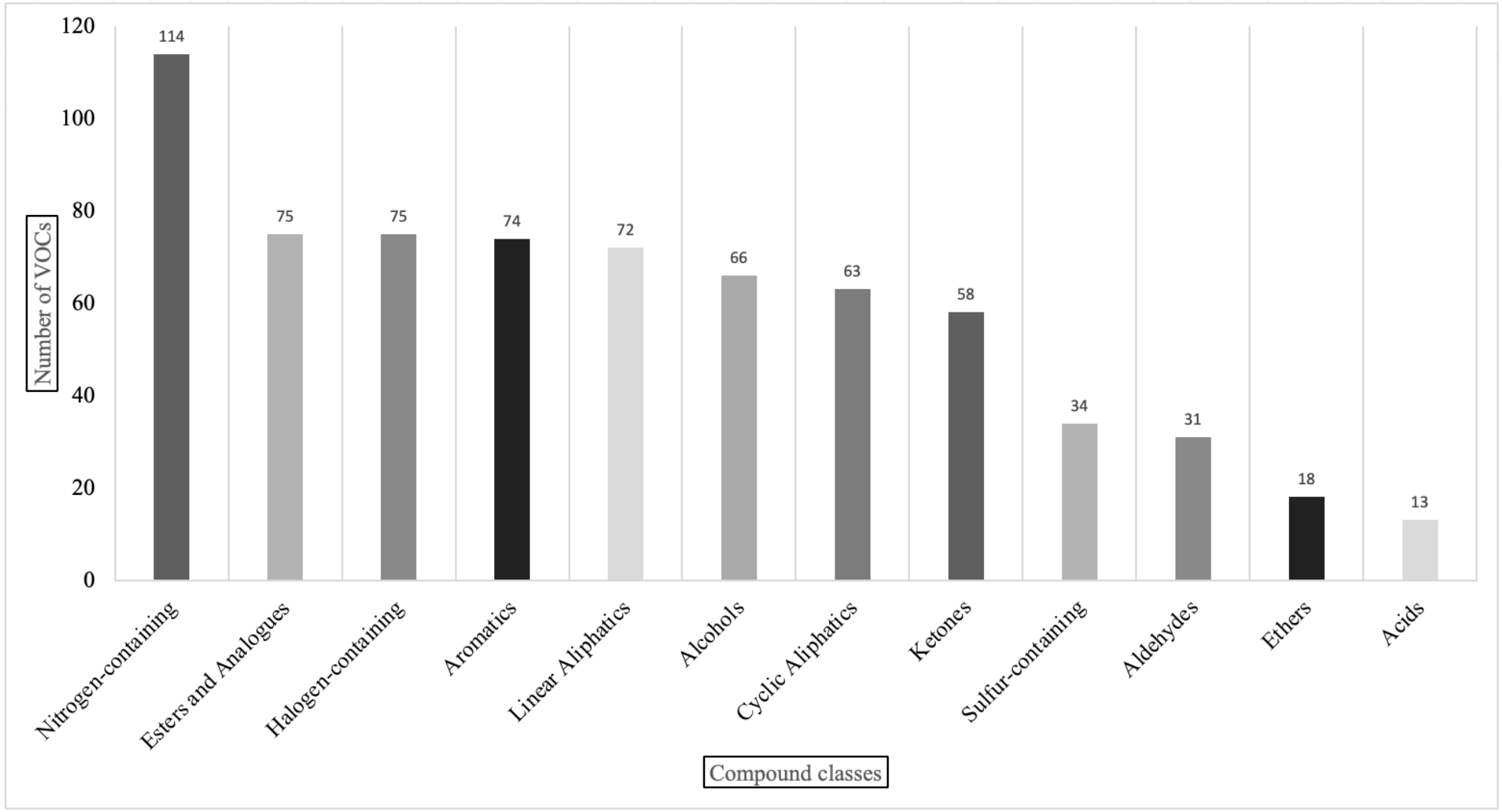
Manual verification

Results

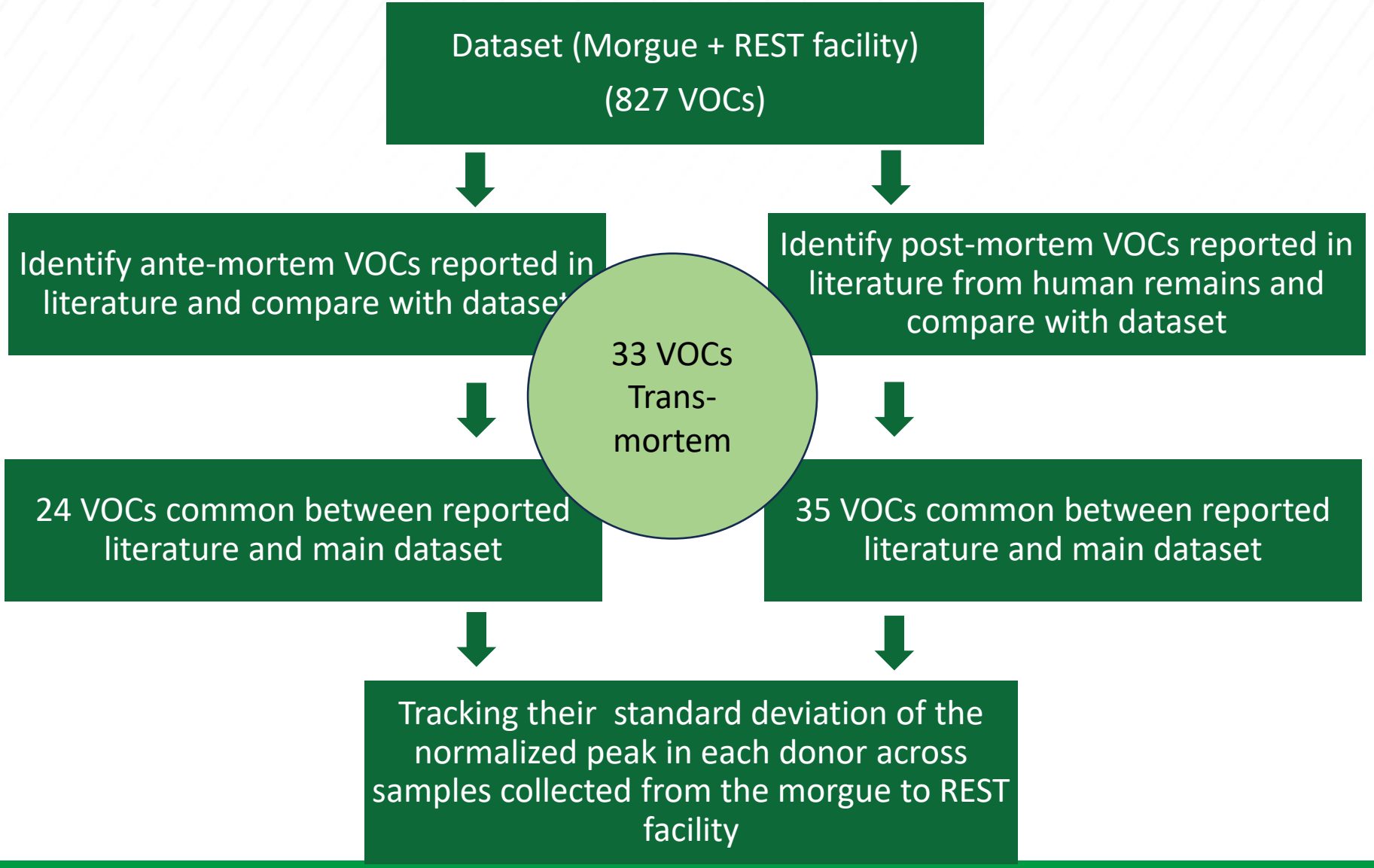
Decomposition Patterns

Donor ID	Cause of Death	Decomposition patterns observed	Anatomical landmarks showing these patterns	Experimental days (ED) on which these patterns were recorded
H7	Metastatic cancer in lungs and prostate	Skin slippage	Face	4
H8	Likely thrombosis of lower limbs, dementia	Venous marbling	Lower limbs	3
H9	Malignant arrythmia	Greenish discolouration	Face	3

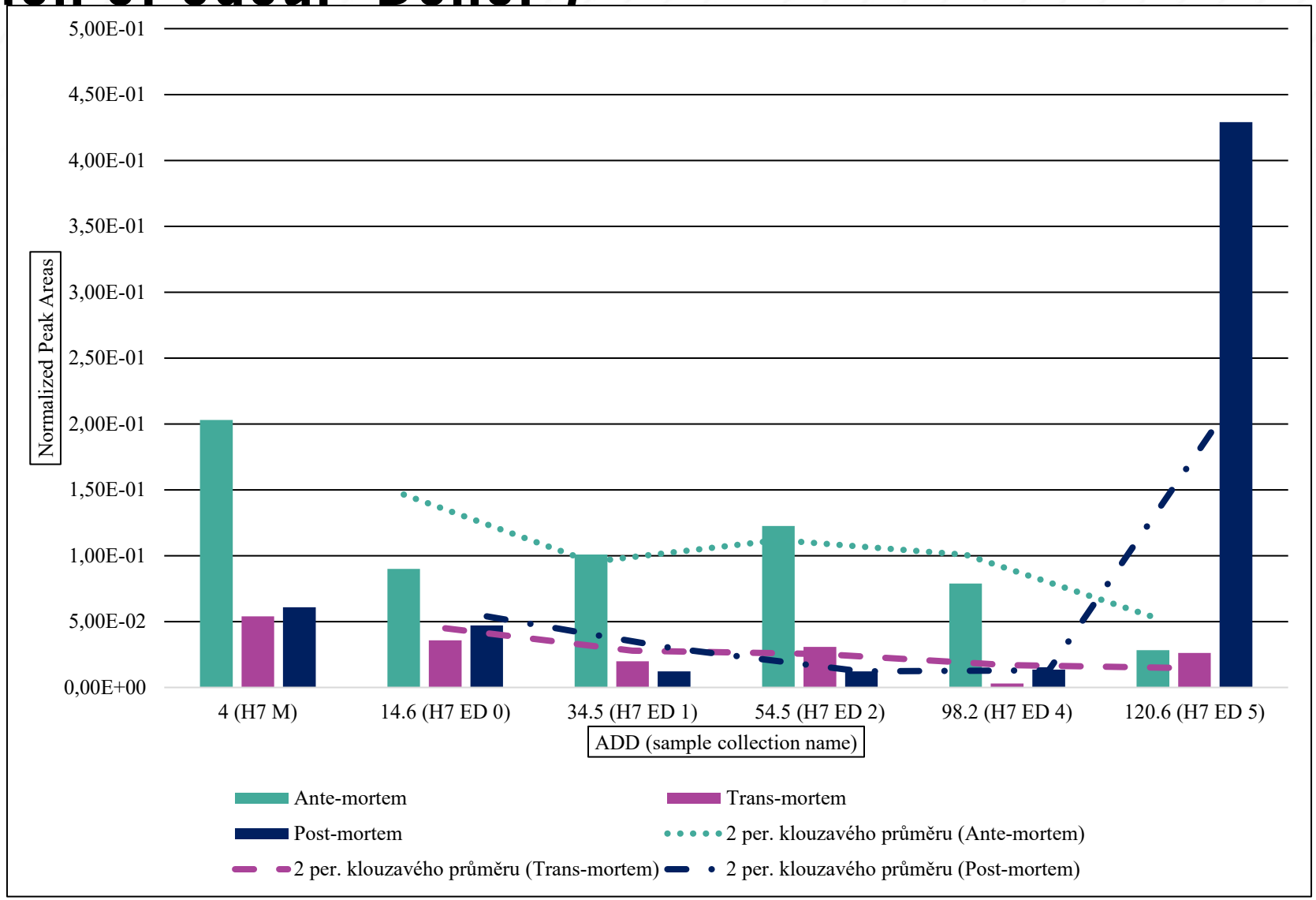
Early post-mortem VOC profile



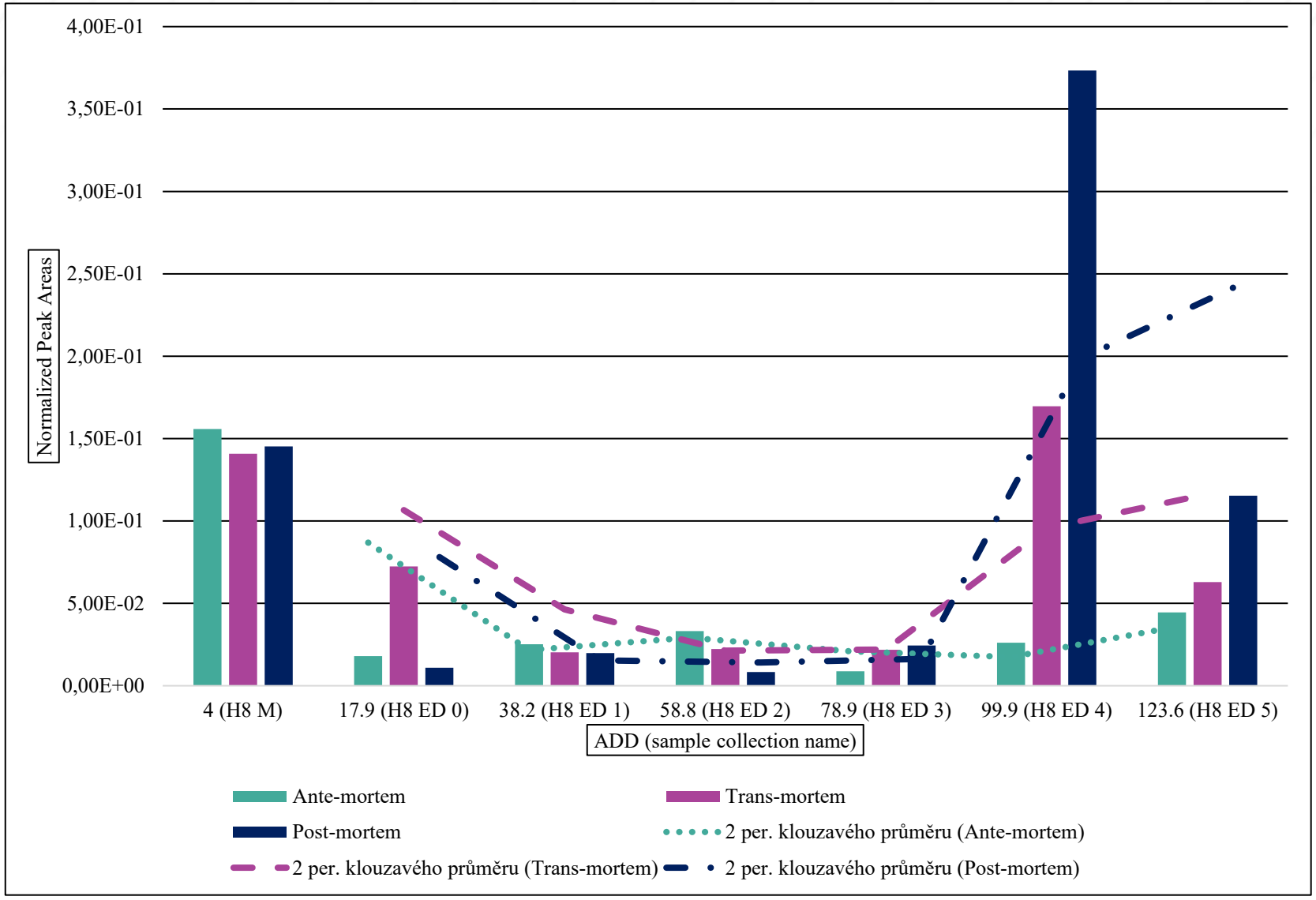
Tracking the transition of the odor: Targeted Approach



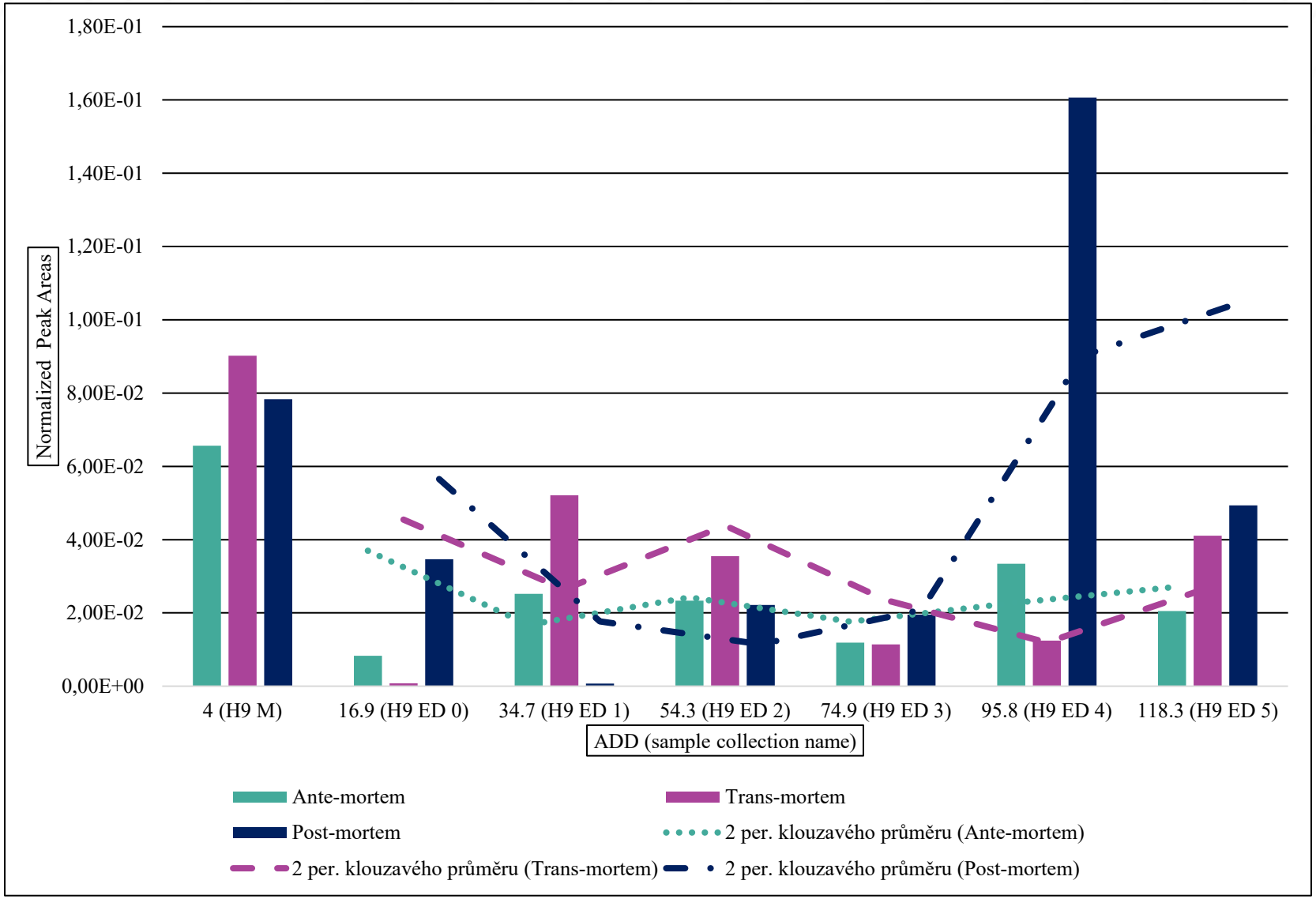
Transition of odour: Donor 7



Transition of odour: Donor 8



Transition of odour: Donor 9



Conclusions

- Ante-mortem and Trans-mortem VOCs were identified in majority of samples
- Post-mortem VOCs became more prominent after ADD 73.4 (ED 3)
- Further research is needed to standardize methods and assess odor transitions across diverse environments and seasons.

Acknowledgements

- UQTR Body Donation Program
- Dr. Rushali Dargan
- Forbes Research Group
- Multidimensional Gas Chromatography Community
- Funding Agencies

UNIVERSITY OF NORTH DAKOTA

Thank You