Evaluating the Stability of Volatile Organic Compounds During Storage in Thermal Desorption Tubes by Mass Spectrometry

Oscar Ayrton[1], Sophie L. F. Doran[1], Ilaria Belluomo[1], Michael Hewitt[1], Geng-Ping Lin[1], George B. Hanna[1]

[1] Department of Surgery and Cancer, Imperial College London

Imperial College London

Background

Established relationship between Volatile Organic compounds in breath and Disease state.

Difficulties in analysis:

Multi-centre clinical trial- nalophan bags have only 4 hours before samples deteriorate, making transport and storage of samples difficult.

Solution:
Thermal Desorption Tubes

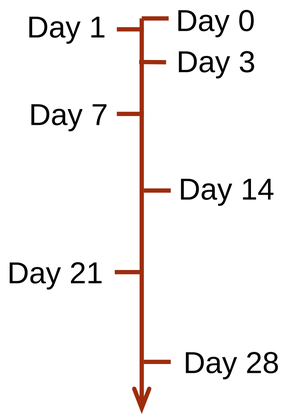
Can Thermal Desorption tube samples be stored over an extended period of time?

Hypothesis

Volatile Organic Compounds can be stored in thermal desorption tubes for a month without significant deterioration of the sample occurring

Methods

- Blanks: Conditioned as per manufacturer's instructions
- Standards: as for blanks but then loaded with a standard mixture of benzene, phenol, acetone, butanal and decanal, prepared by means of a permeation unit.
- Stored at -80°C, -20°C, +4°C, Room Temperature, and +37°C.
- Time-points were as follows:

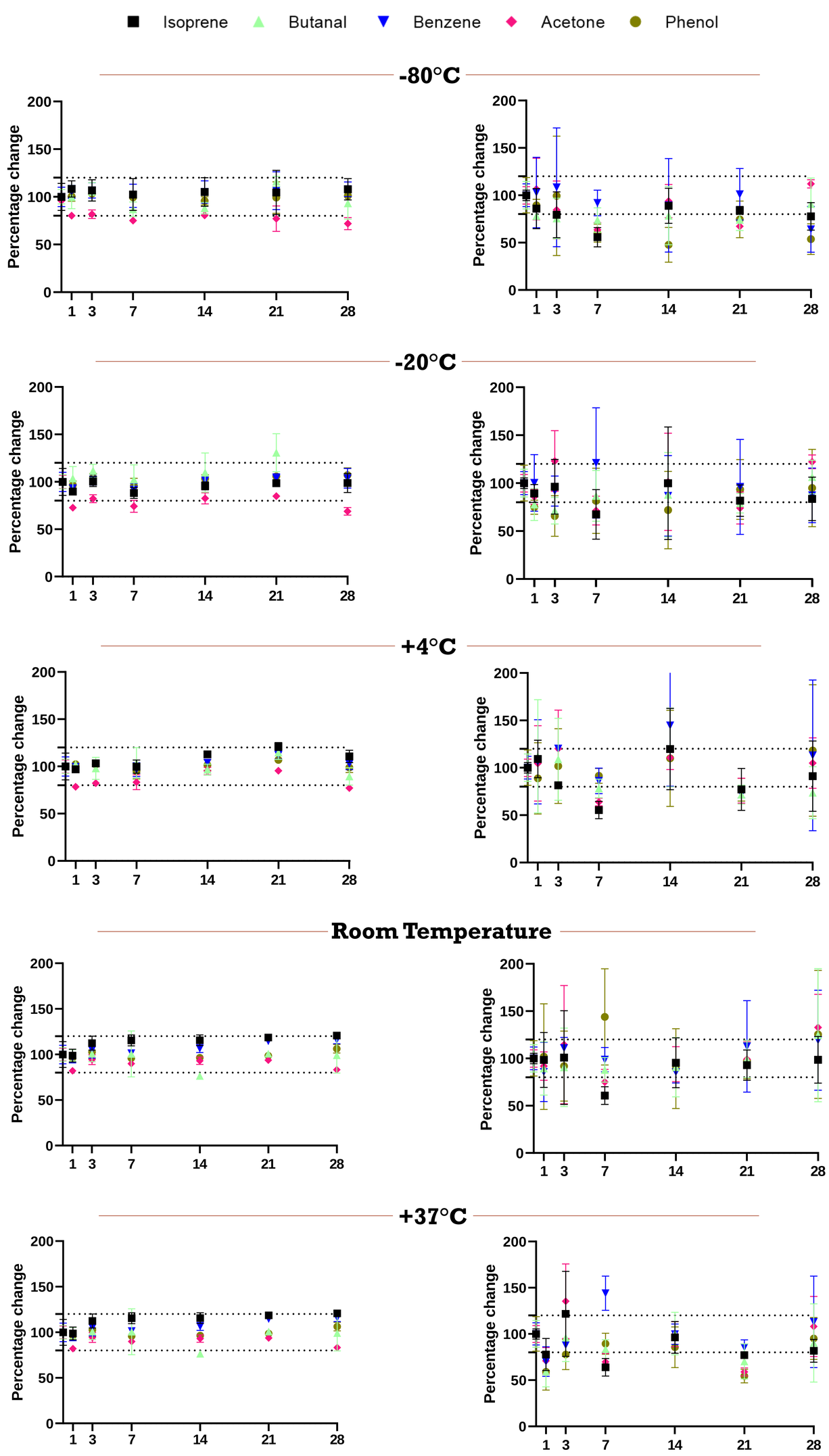


- Thermal desorption tubes were analysed by a thermal desorption unit coupled to a PTR-ToF-MS in NO^+ ionisation mode:

Results

Standards

Blanks



Discussion and Further Work

- Standards show a consistent response with almost all points at all temperatures being between 80 and 120% of the initial value.
- Acetone had the least reproducible results, it is the most volatile of the standards so it is be the first to be lost.
- Blanks showed more variation as the values were much lower, giving a larger uncertainty.
- No obvious trends, therefore the tubes are not gaining VOC whilst in storage.
- Results indicate there is neither a loss nor gain of VOC at all temperatures over the course of 28 days.

- Breath samples need to be analysed as moisture could impact on storage
- Analysis with H_3O^+ ionisation needs to be carried out to examine other compounds, as different classes of compound react with .