Cambridge Polymer Group

Sniffing Out Biomarkers Using Chromatography

HS-GC-MS in Medical Device Development

Summary

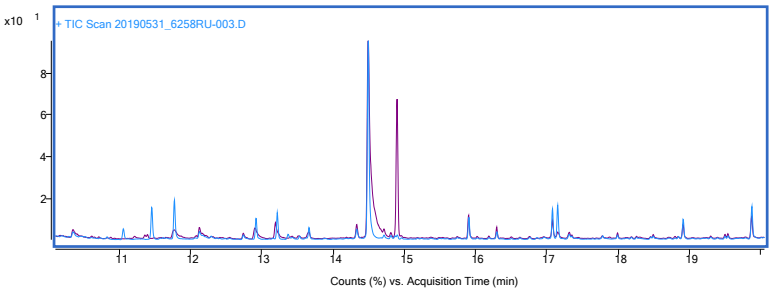
Researchers from MIT and John Hopkins were developing an electronic "nose" with a greater sensitivity to prostate cancer than that of a dog's nose. CPG used headspace solid-phase microextraction gas chromatography-mass spectrometry (HS SPME GC-MS) to generate unique, chromatographic fingerprints from the urine of cancer patients relative to biopsy-negative controls.[1] This information was used in combination with data from trained cancer detection dogs to train an artificial neural network (ANN) to emulate canine olfactory diagnostics.

Description

Frozen urine samples from cancer patients and biopsy-negative controls were provided to CPG for GCMS analysis. Data was analyzed with Agilent MSD ChemStation software and Mzmine 3.6.0 open-source software.

Analysis

2-D and 3-D total ion chromatograms for patients with cancer and for biopsy negative controls were generated for comparison with prostate cancer detection by Medical Detection Dogs and training of the ANN after application of statistical methods.



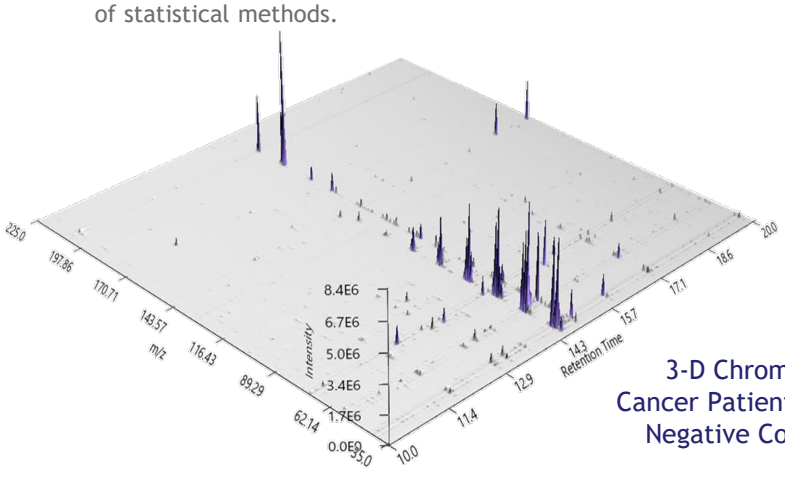
2-D Overlay of Cancer vs. Biopsy Negative Profiles

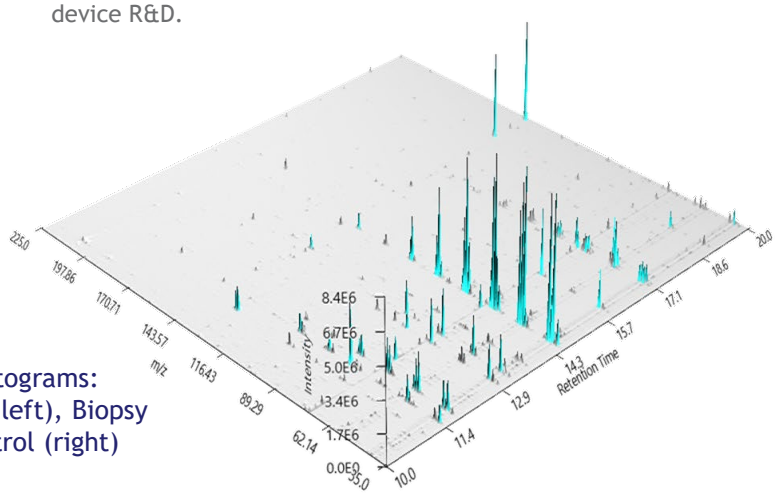
Applications

The trained ANN generated from the GCMS data and canine cancer diagnostics paves the pathway for further development of methods for non-invasive, early detection of cancer.

Key Points

- CPG works with cross-disciplinary teams to analyze complex chromatographic datasets.
- CPG provides analytical results critical to medical device R&D.





3-D Chromatograms:
Cancer Patient (left), Biopsy Negative Control (right)

[1]Guest C, Harris R, Sfanos KS, Shrestha E, Partin AW, Trock B, Mangold L, Bader RA, Kozak A et al. (2021). PLoS ONE 16(2): e0245530.

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- Validate and verify manufacturing processes
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