

DEVELOPMENT OF A PORTABLE MARIJUANA BREATHALYZER

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OBJECTIVE

Hound Labs has developed a patented technology¹ capable of rapidly, accurately, and inexpensively measuring recent cannabis use in a person's breath. The challenge with detecting recent cannabis use is that levels in blood, oral fluid, and other body samples can remain elevated for long time periods, well beyond the time during which the user is significantly impaired^{2,3}. Breath testing has the potential to overcome this limitation because it has a detection window that corresponds to the peak impairment window following use (~3 hours)^{4,5}. The Hound® breathalyzer was intentionally designed with a disposable cartridge which can be retained for future analysis via mass spectrometry.

BREATH CAPTURE

Collect Breath

- 5 liters of breath at ~5 Lpm

Saliva Trap

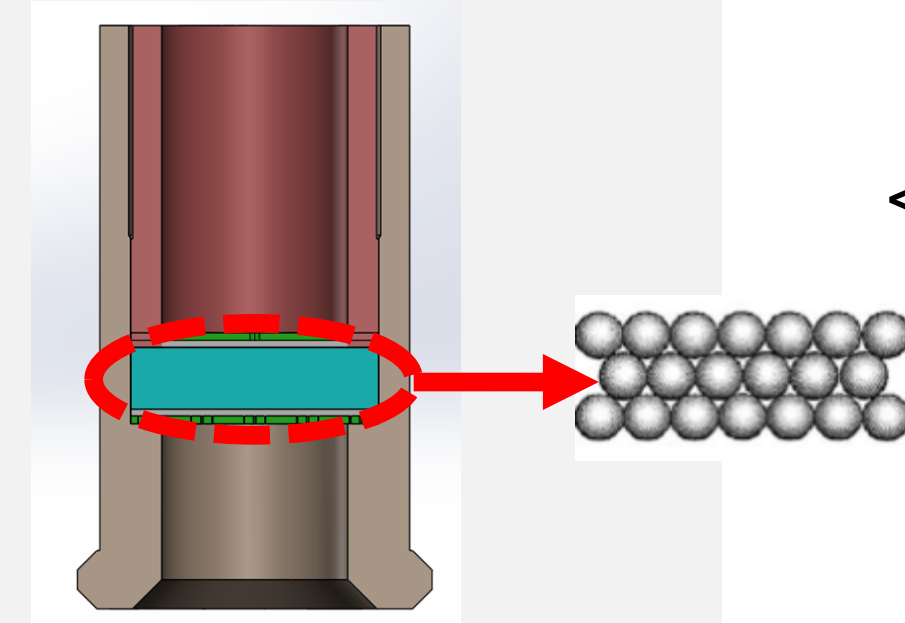
- Placed directly between subject and BCM
- Impaction-based approach to rejecting saliva
- Alpha-amylase testing demonstrates rejection

Breath Capture Module (BCM)

- Packed bed of 800µm silica beads
- Technostat electrostatic filter

Elution of THC into Chemical Assay

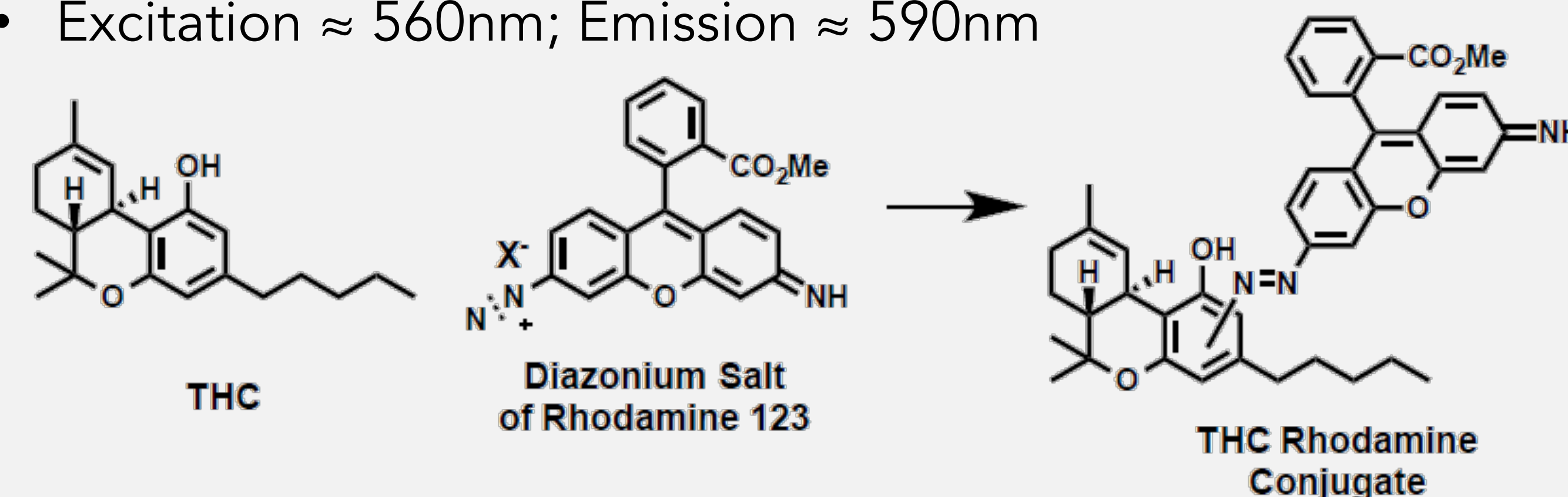
- 200 proof ethanol used to strip THC off of BCM
- Split sample - (1) roadside test, (2) confirmation test



CHEMICAL ASSAY

Fluorescence-based THC Detection

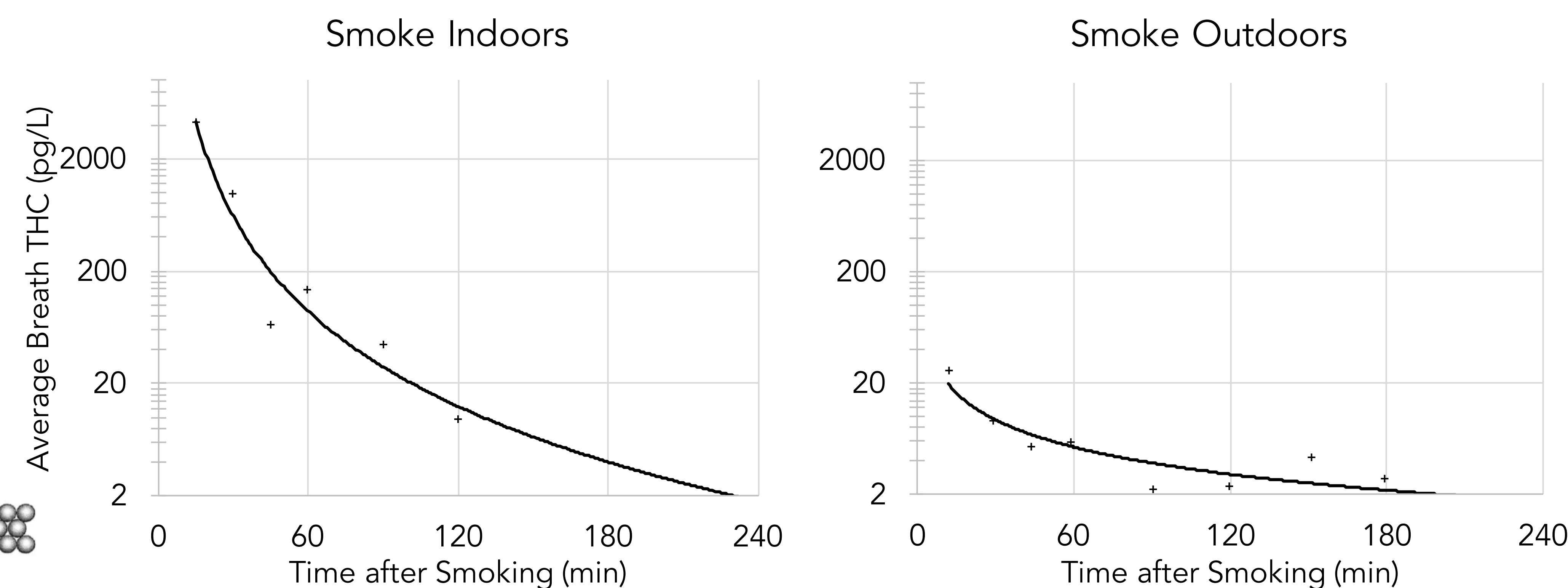
- Diazonium salt made from Rhodamine 123 precursor
- Excitation ≈ 560nm; Emission ≈ 590nm



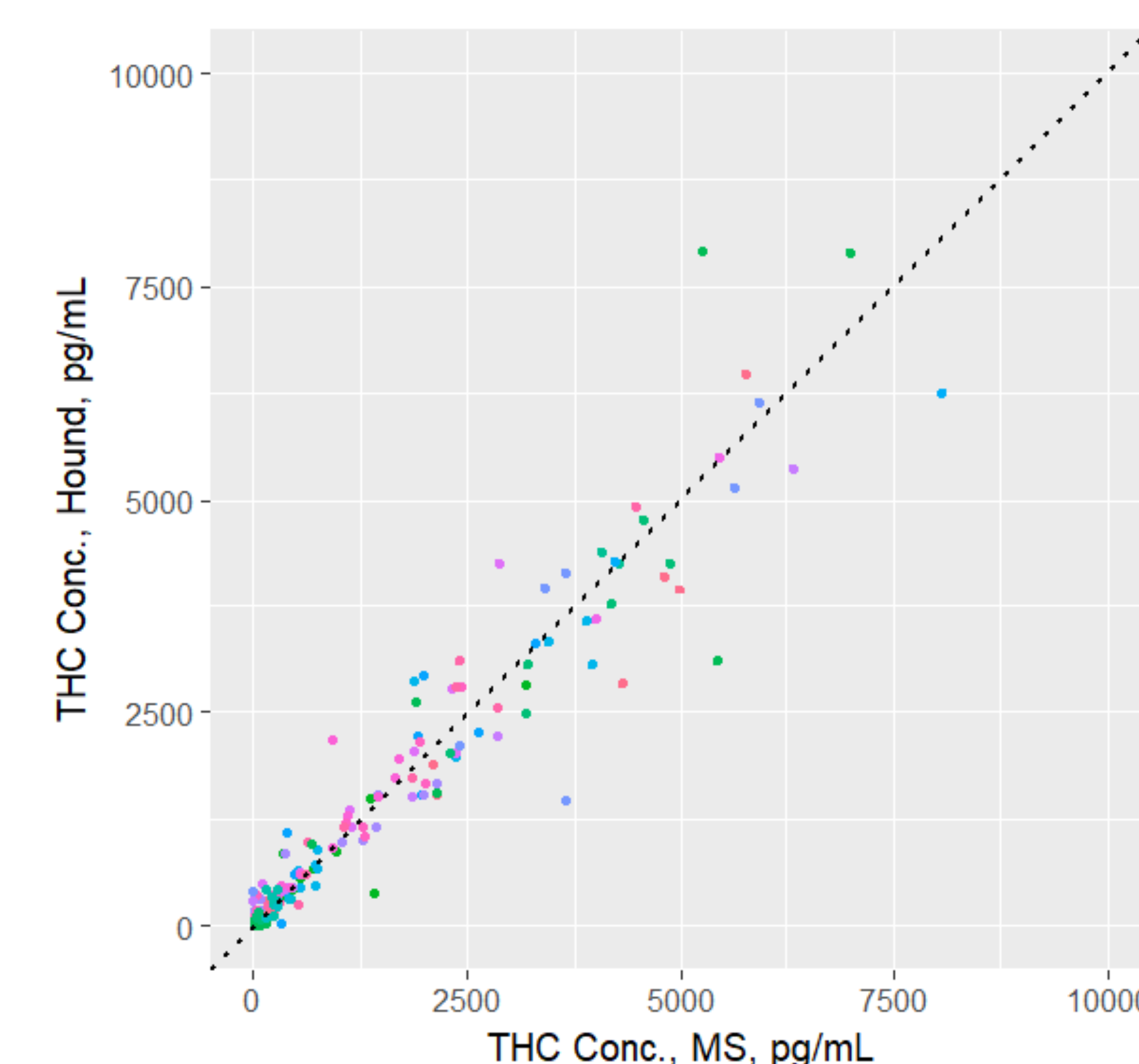
HOUND® BREATHALYZER



CLINICAL TESTING



COMPARISON TO LC/MS-MS



DRIVER TESTING



RESULTS

- Participants were found to have high levels of THC in their breath immediately after smoking but the level of THC in breath samples dropped to near zero after 2-3 hours.
- Breath THC is highly influenced by environment. However, with a sufficiently sensitive breathalyzer THC is measurable for the entire 2-3 hour peak impairment window.
- Occasional and frequent smokers are similar in that they have virtually no THC in their breath within a few hours of smoking.
- Baseline breath measurements of THC in chronic marijuana smokers is 0-3 picograms per liter of breath (pg/L). This means frequent smokers – who have substantial residual THC in oral fluid, blood, and urine long after impairment subsides – do not have appreciable THC in breath.
- Preliminary driver testing showed reduced ability to avoid obstacles (i.e. pedestrians) when positive for THC in breath.

CONCLUSION

The Hound marijuana breathalyzer is the first roadside tool that has the ultra-sensitivity and accuracy to measure the extremely low levels of THC that exist in breath during the 2-3 hour peak impairment window.

REFERENCES

1. US Patent US9709581B1
2. Talpins, S.; E. Holmes, T. Kelley-Baker, H. C. Walls, and T. Kimball, "Breath Testing for Cannabis: An Emerging Tool with Great Potential for Law Enforcement," *Between the Lines*, NTLC, 25(2), 2017.
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5. Grotenhermen, F. et al., "Developing limits for driving under cannabis," *Addiction*, vol. 102, no. 12, pp. 1910-1917, 2007.