new art laboratories

Hairtubes – a contactless hair decontamination

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Rapid Tests

Laboratory Diagnostics

Laboratory Service

Consulting & Service

Introduction

Introduction

- Hair as a sample in toxicological research:

- Non-invasive collection;

- Hard to adulterate;

- Detection of large spectrum of drugs of abuse (e.g. opiates, cocaine, cannabinoids);

- Large detection window (until years after consumption).
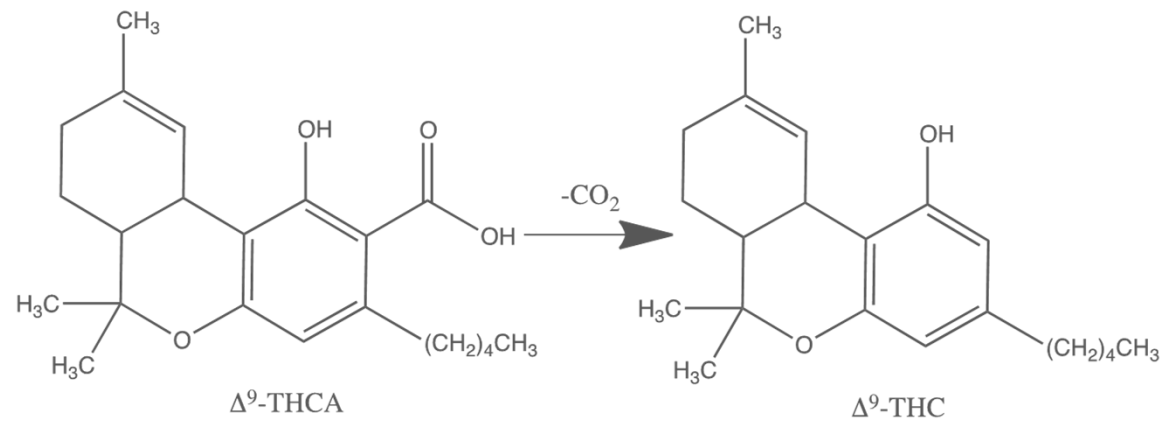
Introduction

- Pre-cleaning step (decontamination) needed;

- Several methods available, but several challenges remain:

  - Uncertainties concerning sample integrity;
  - Avoiding migration of contaminants towards the hair interior due to swelling.

Introduction

- THC-COOH
  - According to SoHT, positive for THC if [THC-COOH] > 0,02 pg/mg;

  - Requires hyphenated techniques: GC-MS-MS with chemical ionization;

  - Recent study by V. Hills proved that THC-COOH can be formed by pyrolysis (SoHT meeting 2015)

Introduction

- THCA conversion at GC injcetor:

Aims

Aims

- Development of decontamination method:

  - Contacless;

  - Artifact-free;

  - High sample throughput.

Experimental

Experimental

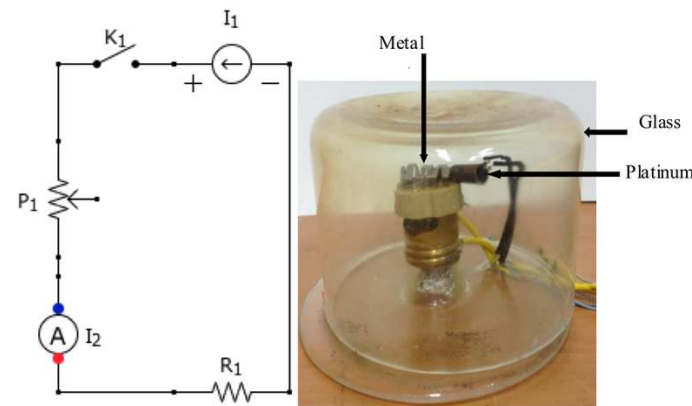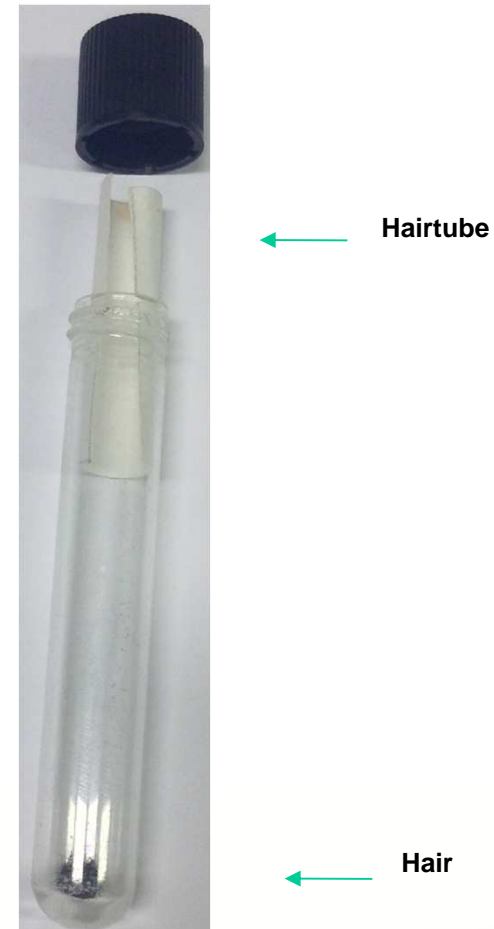- Contamination of hair samples for opiates: soaking in 1 µg/mL solution of both morphine and 6-MAM for 1 h;

- Contamination of hair samples for cannabinoids: smoke flushing for 7h in the case of THC.

Experimental

- Decontamination process:
  - Rinsing with dichloromethane;

  - Rinsing with water;

  - Heated in the presence of the Hairtube for 16h (overnight).

Hairtube

Hair

Experimental

- Extraction and sample cleanup

  - Incubation in NaOH at 50ºC for 45 min;

  - Neutralization with HCl;

  - 5 mL of PBS + 25 µL of internal standard;

  - SPE column Oasis® MCX:

    - 2 mL of 1 M NaOH, deionized water and n-hexane;

    - Elution with 2 mL of dichloromethane: isopropanol (75:25, v/v).

Results & Discussion

In vitro contamination of hair samples

- Contamination of negative hair samples.

Contamination results
for opiates (ng/mg):

Sample #	Morphine	6-MAM
1	0.04	0.65
2	0.17	0.16
3	0.25	**19.20**
4	1.69	**16.44**
5	0.70	**8.65**
6	1.78	**11.95**
7	0.21	2.91
8	0.05	0.60
9	0.17	0.78
10	0.48	7.89
11	1.57	**22.95**
12	0.07	0.90

Contamination results
for THC (ng/mg):

Sample #	THC
1	105,10
2	335,08
3	4,15
4	180,14
5	60,60
6	12,41
7	35,43
8	56,71
9	47,51
10	684,67
11	311,48
12	230,37
13	95,57
14	77,58
15	570,37

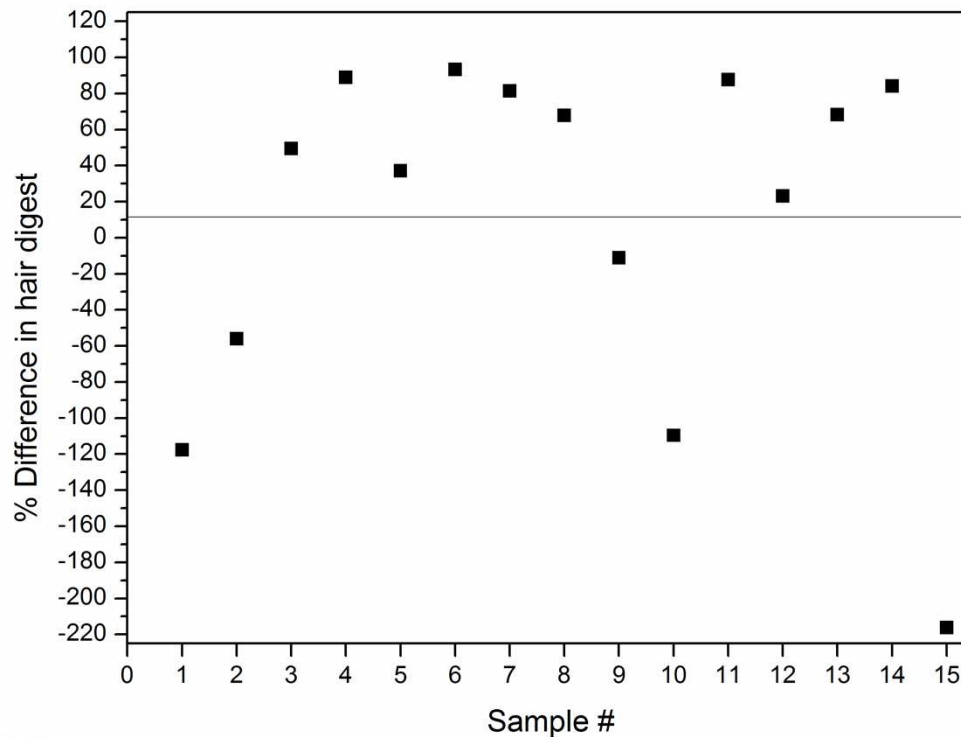**Hairtubes – a contactless hair decontamination**

Method validation – Opiates
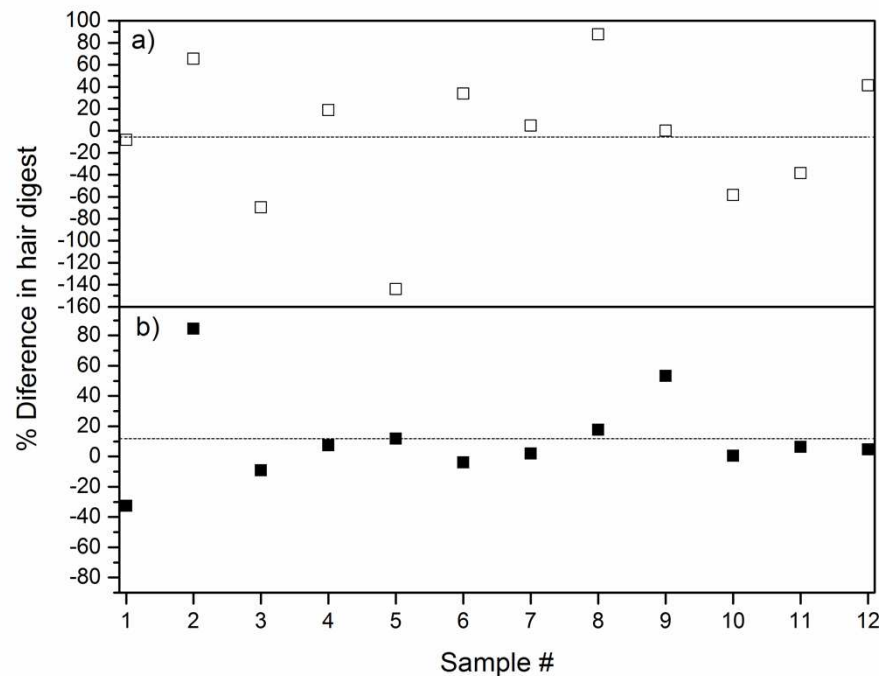
- Comparison between the developed method and T. Cairns method[*];

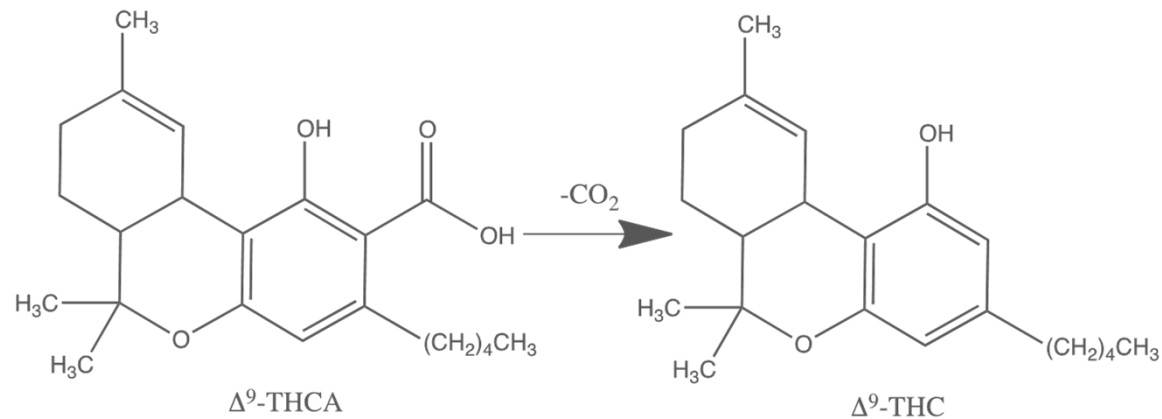- Our method is so efficient as Cairns' method (5 %) .

Method validation - THC

- Comparison between the developed method and T. Cairns method[*];

- Our method is almost always more efficient (> 20 %) than Cairns' method.

THCA vs THC

- According to Perrotin-Brunel[*] at 100 ºC we have full conversion of THCA to THC after **60 min.**

Δ⁹-THCA → Δ⁹-THC (−CO_2)

Conclusions

Conclusions

- Contactless method: sample integrity is preserved and no drug from the matrix is extracted.

- Achieve results as good as the ones obtained by Cairns et al. method (in average).

- Although it takes 16 h, it allows the simultaneous decontamination of many samples (possibly more than 100, depending on the size of the oven) and the process can be carried out overnight without the presence of any technician.

- Overcomes the problem associated to the possible presence of a THCA contamination;

- The present method represents a significant breakthrough towards an easy and efficient procedure for hair decontamination, which is capable of providing greater laboratory throughput.

Thank you for your attention

Make it better,

Make it successful!