Hair analysis for synthetic cannabinoids

a study on the issue of passive contamination by side-stream smoke

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Introduction

As hair analysis is often used for abstinence control it is crucial to consider potential effects of contamination by passive exposure, particularly when drugs are smoked. In this study, the composition of main-stream and side-stream smoke of herbal mixtures containing the synthetic cannabinoids JWH-018, JWH-122 and JWH-210 was investigated and put into the context of head hair concentrations of samples collected from individuals exposed to side-stream smoke of the same mixtures.

Exposure of Hair to Side Stream Smoke

Study Setup

Hair exposed to side-stream smoke

Mask

Air supply (scuba-gear)

Covered clothes and hands

Synthetic cannabinoid cigarette
500 mg tobacco
500 mg herbal mixture

Water jet pump

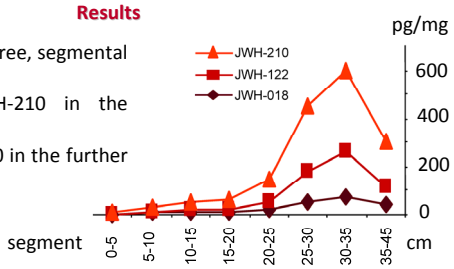
- Three participants
- Room size 2.5 x 2 x 2.5 m³
- Synthetic cannabinoid amount in side-stream smoke:
  10 mg JWH-210, 4 mg JWH-122 and 1 mg JWH-018 per cigarette
- Exposure on five days a week over three consecutive weeks
- Hair sampling over 5-6 weeks, regular washing
- Hair samples were analyzed in 3-5 cm segments

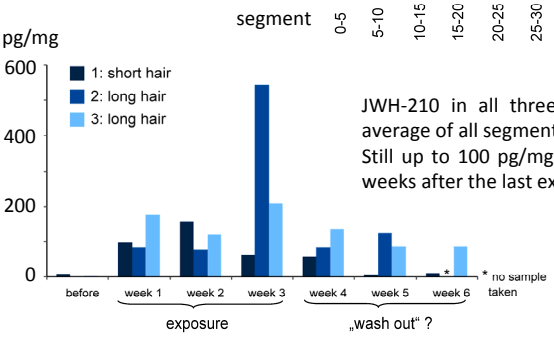
Analytical Method

50 mg hair; Washing: water, acetone, petroleum ether; addition of deuterated standards and 1.5 mL ethanol; Ultrasonication for 3 hours; LC-MS/MS: ABSciex Qtrap 4000, column: Luna Phenyl-Hexyl; Calibration range: 0.5 pg/mg to 75 pg/mg (details see Hutter et al.)

Results

Participant three, week three, segmental hair analysis:
Up to 60 pg/mg JWH-210 in the segments from 0 to 20 cm
Up to 600 pg/mg JWH-210 in the further distal segments



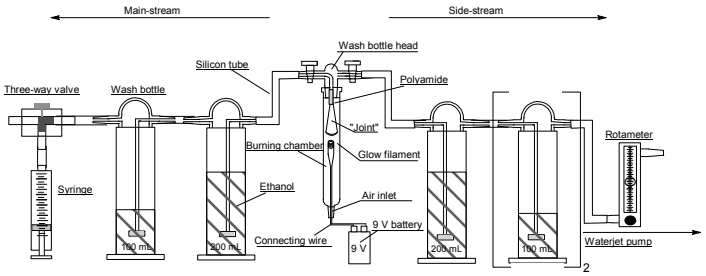


JWH-210 in all three participants, average of all segments:
Still up to 100 pg/mg two to three weeks after the last exposure

Acetone wash solutions: equal or less analyte in comparison to the corresponding hair segment

Smoke Analysis

Smoking Apparatus



Main-stream parameters:
Puff volume: 35 mL
Puff duration: 3 s
Puff intervall: 30 s

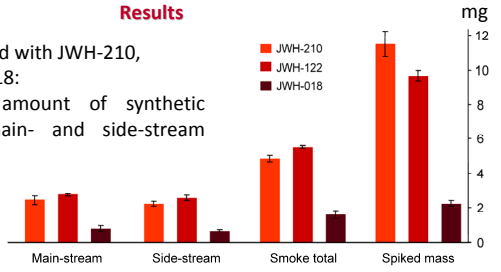
Side-stream:
Flow: 1 L/min

Analytical Method

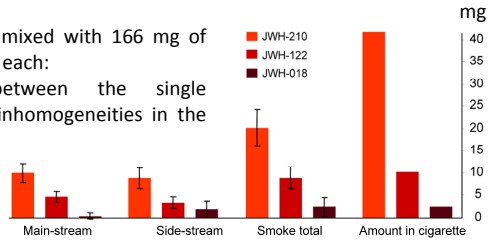
Sample workup: dilution, addition of deuterated standard
GC-MS parameters: Heating rate: 30 °C /min, Start: 100 °C, End: 310 °C;
Run time: 20 min; Injection volume: 1 µL, splitless; Liner without glass wool

Results

1 g dry tobacco spiked with JWH-210, JWH-122 and JWH-018:
About the same amount of synthetic cannabinoids in main- and side-stream smoke condensates



500 mg dry tobacco mixed with 166 mg of three herbal mixtures each:
high variability between the single experiments due to inhomogeneities in the herbal mixture



Conclusion

Amounts of synthetic cannabinoids reaching the side-stream smoke are about as high as the amounts inhaled during smoking. Thus, hair contamination by side-stream smoke is very likely to occur, which was confirmed by the exposure study. The concentrations in hair after exposure are in the middle to high range compared to forensic hair samples, even several weeks after the last exposure. Therefore, when using hair analysis for abstinence control, influence of external contamination and subsequent incorporation into the hair has to be taken into account.

Reference

M. Hutter, S. Kneisel, V. Auwärter, M. A. Neukamm: Determination of 22 synthetic cannabinoids in human hair by liquid chromatography–tandem mass spectrometry, *J. Chrom. B* **2012**, *903*, 95-101

Acknowledgement

This publication has been produced with the financial support of the Drug Prevention and Information Programme of the European Union (JUST/2011/DPIP/AG/3597), the German Federal Ministry of Health and the City of Frankfurt/Main.

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