Prevalence of synthetic cannabinoid use among persons undergoing drug testing for cannabis

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Introduction and Aims

Synthetic cannabinoids (SCs) are often perceived as a legal alternative to cannabis and an important motive for consumption is the presumptive non-detectability in drug tests. In most cases of abstinence control ordered by court or driving license regranting cases, SCs are not covered in the drug panel analyzed. So far, only little is known about the proportion of participants in abstinence programs switching to consumption of SCs, hereby bypassing the demand for abstinence. The aim of the present study was to assess the frequency of SC consumption among people undergoing abstinence control.

Methods

Anonymized urine samples collected in two German federal states between January and November 2015 for abstinence control were analyzed for SCs applying an LC-MS/MS method comprising metabolites of 57 parent compounds. The samples included had been tested routinely for cannabis but not for SCs.

Liquid chromatography conditions:

- Dionex UltiMate® 3000RS
- Luna® C18(2) column (150 mm × 2 mm, 5 µm)
- Gradient elution: 15 min, 0.25 mL/min (total flow rate)
- Solvent A: 0.2% HCOOH, 2 mmol/L $NH_4^+HCOO^-$ in H_2O
- Solvent B: ACN
- Post column flow: 0.2 mL/min 2-propanol

Mass spectrometry conditions:

- SCIEX API 5000™
- MRM(+) mode
- Metabolites of 57 SCs
- At least 2 transitions per metabolite
- Semi-quantitative for selected analytes (LLOQ = 0.05 - 0.1 ng/mL)

Results and Discussion

Uptake of SCs could be confirmed in 56 of the 809 analyzed urine samples, leading to an overall prevalence of 7% (see Fig. 2 on the right) in the study collective (Tab. 1).

	Baden-Wuerttemberg		Northern Bavaria		Total	
	Samples	Age (Ø, *m*)	Samples	Age (Ø, *m*)	Samples	Age (Ø, *m*)
Total	558	15-62 (26, 21)	251	17-61 (32, 29)	809	15-62 (28, 25)
Male	534	15-62 (26, 21)	216	17-61 (33, 30)	750	15-62 (28, 25)
Female	24	16-45 (24, 21)	35	17-51 (27, 28)	59	17-51 (26, 25)
CSC	457	15-62 (24, 20)	226	17-61 (32, 29)	683	15-62 (27, 22)
DLRC	92	17-54 (33, 31)	23	18-40 (31, 28)	115	17-54 (32, 30)

Tab. 1: Analyzed sample collective and age distribution.
CSC = court sanction cases, DLRC = driving license regranting cases, Ø = mean age, *m* = median age.

Comparison of the prevalence in the two federal states showed a considerably higher prevalence in Northern Bavaria (13%) than in Baden-Wuerttemberg (4%) (see Fig. 1A+B for more details).

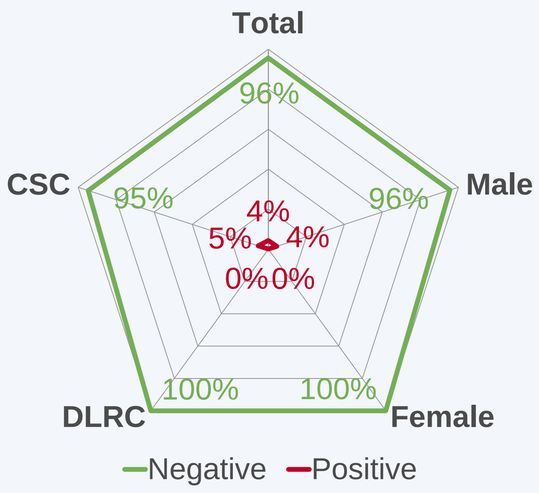


Fig. 1A: Results of the SC screening in the Baden-Wuerttemberg collective as well as in different sub-collectives.
CSC = court sanction cases,
DLRC = driving license regranting cases.

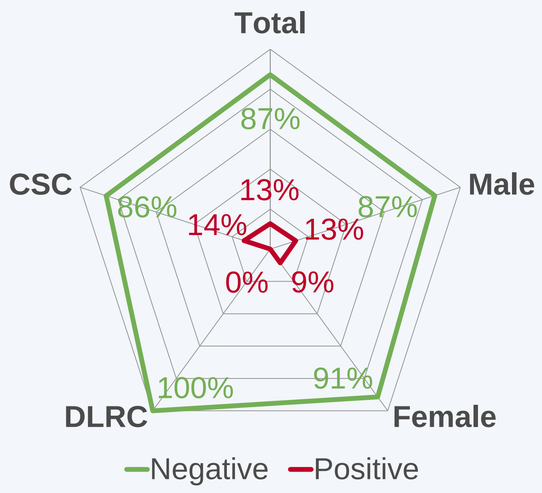
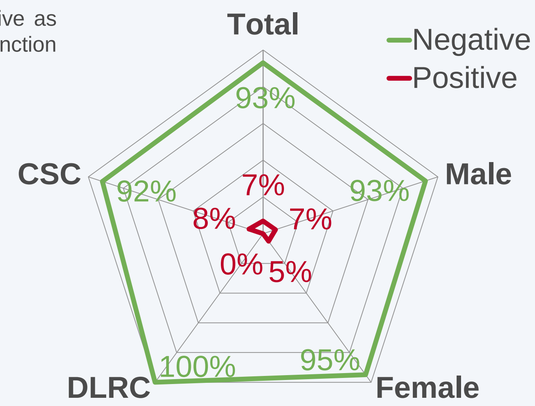


Fig. 1B: Results of the SC screening in the Northern Bavaria collective as well as in different sub-collectives.
CSC = court sanction cases,
DLRC = driving license regranting cases.

All positive samples were obtained in the context of court sanction cases (CSC), whereas all samples from driving license regranting cases (DLRC) were tested negative (Fig. 2 on the right). In 54% of the cases only metabolites of one SC were detected, in 23% metabolites of two, and in 22% metabolites of three or more (up to five) SCs (Fig. 3).

Fig. 2: (right) Results of the SC screening in the overall collective as well as in different sub-collectives. CSC = court sanction cases, DLRC = driving license regranting cases.



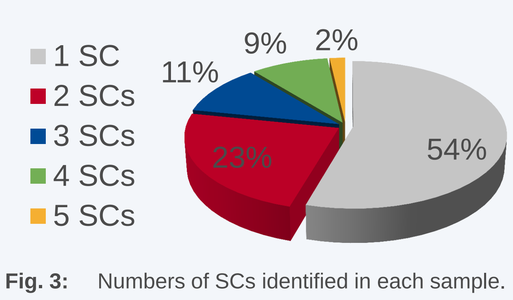


Fig. 3: Numbers of SCs identified in each sample.

Metabolites of at least 13 different SCs were detected, with MDMB-CHMICA, AB-FUBINACA/FUB-AMB and AB-CHMINACA being the three most prevalent substances (Fig. 4).

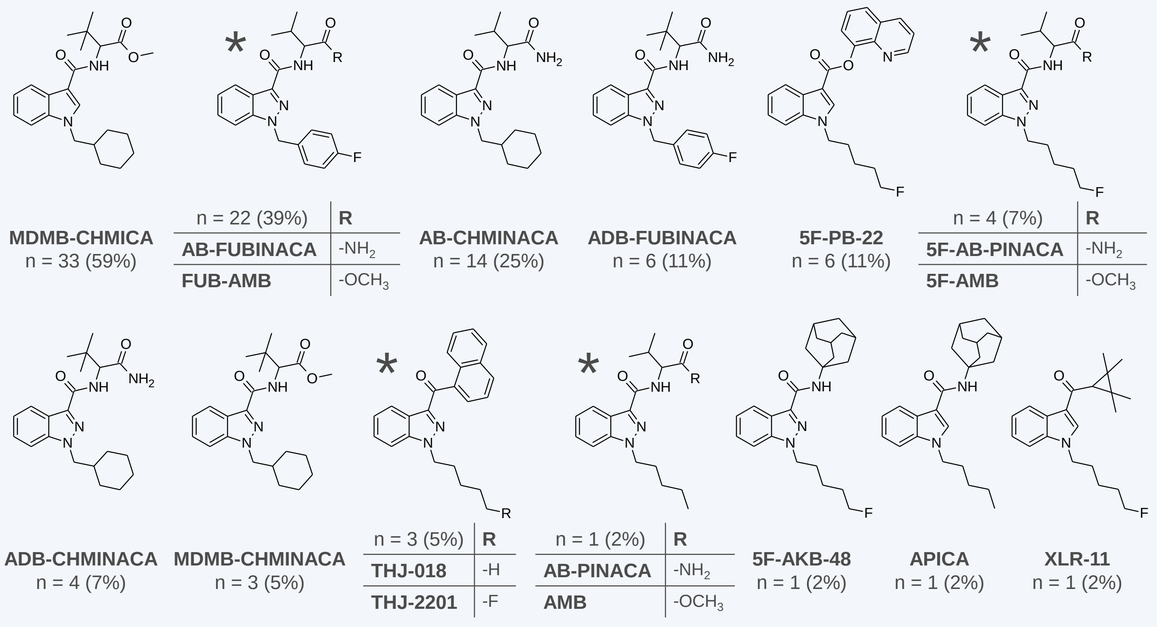


Fig. 4: Consumed SCs detected in the analyzed collective. The prevalence of an SC is shown by the number of its positive samples and in relation to all positive samples (n = 56) in decreasing order. Marked substances (*) showed common main metabolites and were not distinguishable by the applied screening method.

Conclusion

The study data show that consumption of SCs by persons undergoing abstinence control programs is a frequent phenomenon among certain populations, with a higher number of 'THC substituters' among CSC as compared to DLRC and regional disparities. Consequently, analysis for these compounds should not be neglected in drug screening programs. It has to be noted that the majority of the compounds consumed were SCs of the latest generation, and analysis should be carried out applying comprehensive, up-to-date LC-MS/MS analysis rather than immunochemical assays.

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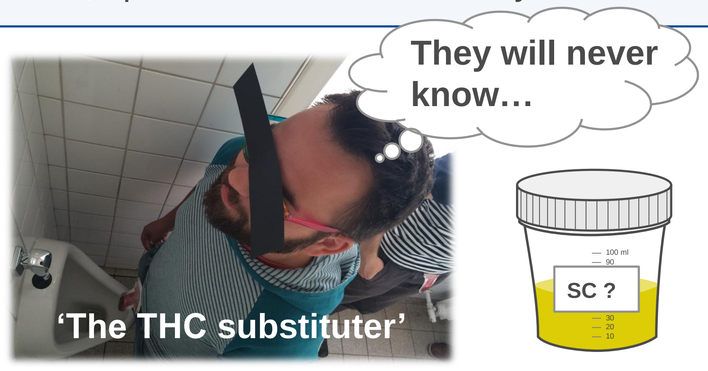

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