# Uptake of model drugs in dentin – An *in situ* pilot study

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## Background & Objectives

Dental hard tissue can be used as an alternative matrix in post mortem toxicology. Previously, the incorporation of medicinal and illicit drugs into dental hard tissues was shown by *in vitro* studies[1] and post mortem samples[2]. Aims of this *in situ* study were to quantitate stimulant model drugs in dentin samples after simulated single or repeated drug consumption and to assess the windows of detection.

## Methods

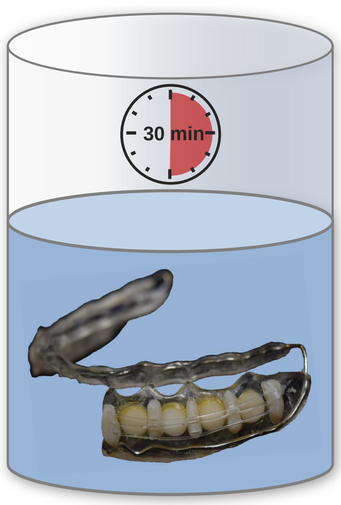
### Study design

- Five volunteers
- Plastic braces with 3 or 4 demineralized bovine dentin samples
- Braces worn for > 21 h per day in the lower jaw
- Plaque not removed
- Incubation in drug solution

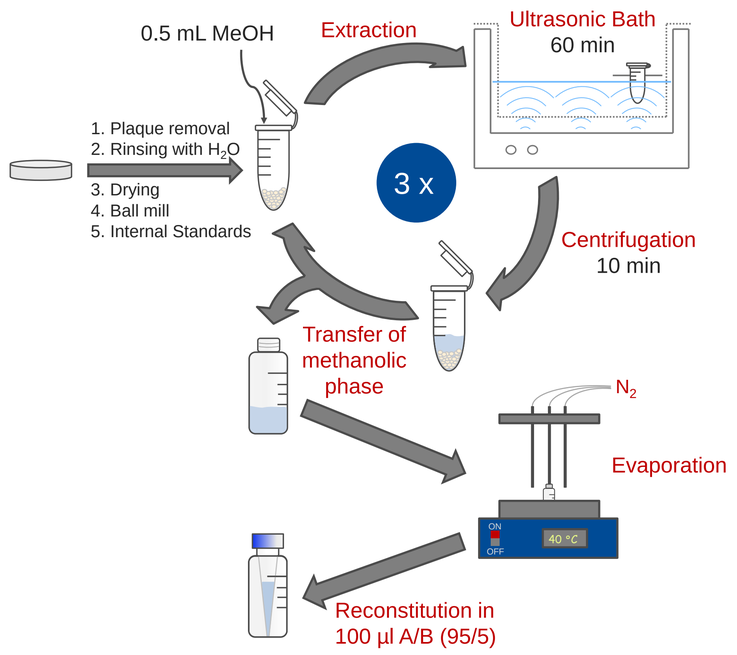
| | Incubation | Sample removal |
|---|---|---|
| A | 3/d x 7 d | after 16 hours |
| B | 3/d x 7 d | after 40 hours |
| C | 1 x 1 d | after 16 hours |

Drug solution (10 µg/mL):

- cocaine, benzoylecgonine
- MDMA, MDA, MDEA
- methamphetamine




### Sample preparation



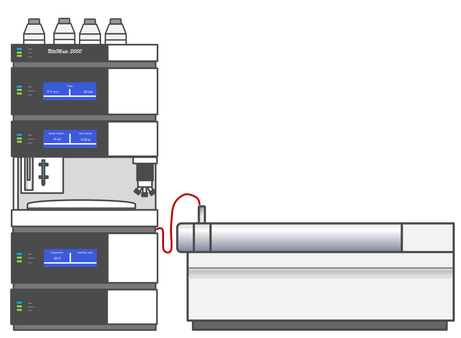

### Analytical method

Instruments: AB SCIEX API 5000™ + Dionex UltiMate 3000 RS

Column: Phenomenex Luna® PFP (150 x 2 mm, 5 µm)

Solvent A: 0.1% HCOOH (*v/v*) + 1 mM $NH_4^+HCOO^-$ in $H_2O$

Solvent B: 0.1% HCOOH (*v/v*) in MeOH



## Results

Almost all model drugs could be detected in dentin after repeated (Fig. 1 + 2 ) as well as after single drug exposure (Fig. 3). After three times incubation over seven days (Fig. 1) the concentrations of one volunteer were 10 to 20 times higher than the other concentrations (approx. 30 to 89 pg/mg) and can be assumed as outliers. The concentrations of all studies, given as average of the respective 3 or 4 dentin samples, ranged from approx. 0.12 to 11 pg/mg (without outliers). MDA showed the highest and benzoylecgonine the lowest incorporation rates. One volunteer usually showed the highest concentrations in dentin (depicted in yellow). Despite different total incubation times (30 min compared to 630 min) the concentrations after single and repeated drug exposure showed only small differences (Fig. 4).

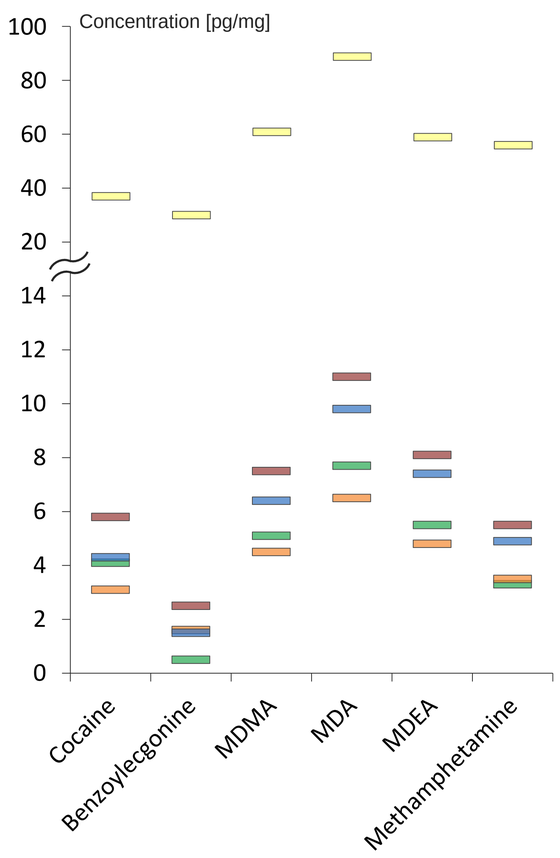



Fig. 1: Results for part **A** (3/d x 7 d, sample removal after 16 h)

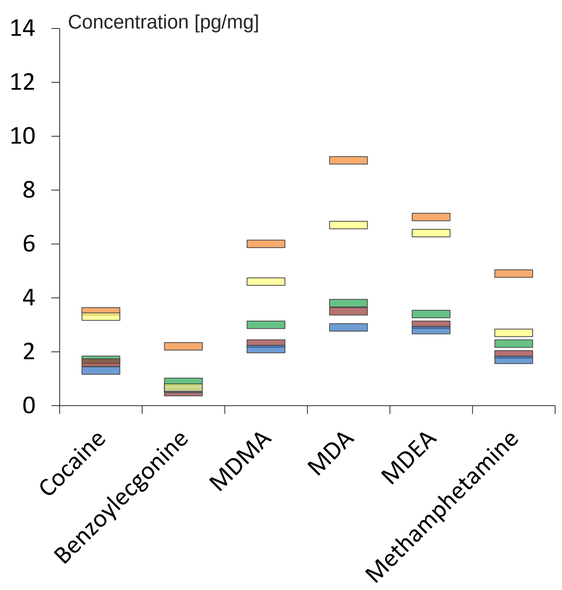



Fig. 2: Results for part **B** (3/d x 7 d, sample removal after 40 h)

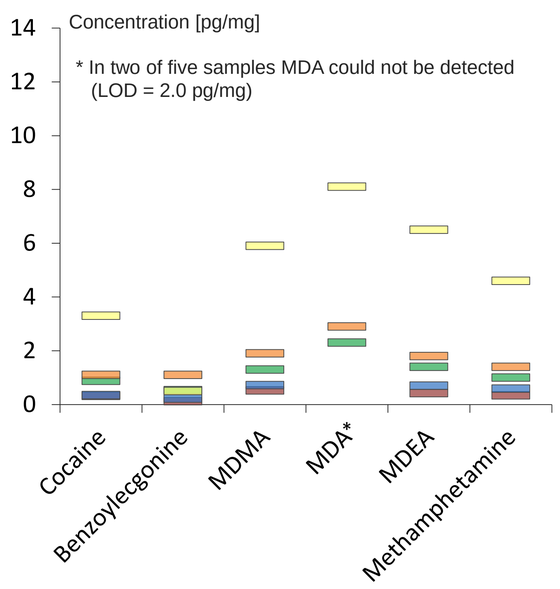



Fig. 3: Results for part **C** (1 x 1 d, sample removal after 16 h)

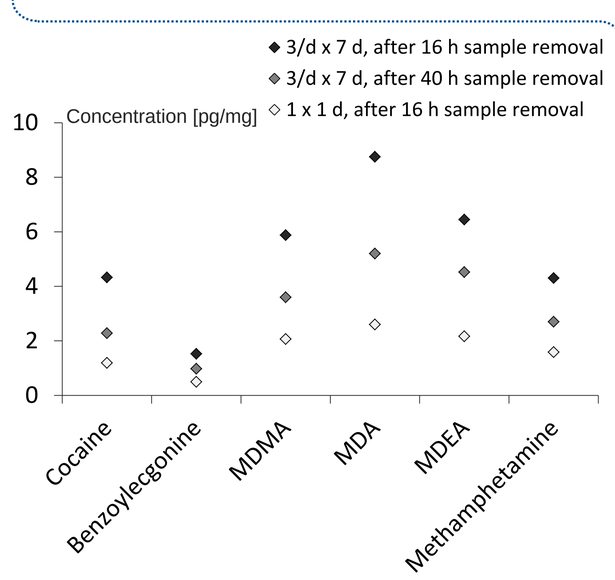



Fig. 4: **Mean values** of five volunteers (without outliers)

## Discussion

Because the braces were not cleaned during the study, the formed plaque was not removed. This could be a factor influencing the incorporation rates of drugs into dentin. In addition, the intraindividual bacteria and fatty acid composition in the oral cavity appear to play an important role (→ Poster P005).

## Conclusions

The investigated model drugs can be detected in dentin for at least 16 hours after a single simulated drug uptake. Furthermore, after simulation of repeated drug uptake over seven days the drugs were detected for at least 40 hours. The concentrations after single and repeated drug exposure showed only small differences indicating a finite individual binding capacity of dentin for drugs.

## References

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[2] Klima, M., Altenburger, M. J., Kempf, J., Auwärter, V., Neukamm, M. A., Determination of medicinal and illicit drugs in post mortem dental hard tissues and comparison with analytical results for body fluids and hair samples, *Forensic Sci. Int.* 2016, 265, 166-171

## Acknowledgement

This publication has been produced with the financial support of the Deutsche Forschungsgemeinschaft (DFG) (NE 1879/2-1, AL 1665/3-1).

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