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From palm to hair: transmissibility of methadone and its metabolite EDDP

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Abstract

Background and Aim: Methadone/EDDP and other drugs are frequently found in the hair of children living with parents on methadone maintenance therapy. Physical parent/child intimacy (caressing) was discussed as a possible source for this finding. Scientific information in this context is scarce[1–4] and focussed on sweat patches to supervise maintenance therapy with methadone of heroin abusers. One study employed liquid chromatography-coupled tandem mass spectrometry (LC/MS/MS) however, analysed methadone but not EDDP [4]. Here, we evaluated (1) detectability of methadone and EDDP in skin wipes from patients on methadone maintenance therapy with LC/MS/MS and (2) the potential transmissibility of methadone and EDDP via palms to human hair.

Method: (1) Skin wipes from palms and armpits from ten patients on long-term methadone were collected in a maintenance facility and prepared for quantitative LC/MS/MS analysis. (2) A human lace wig was exposed intermittently for 18 days at the methadone maintenance facility, resulting in a total number of 900 intensive palm/wig contacts (rubbing). Samples were collected intermittently and analysed after routine washing procedure (methanol).

Result: (1) Beneath methadone EDDP was found on skin wipes however, in trace amounts. The contents varied over a wide range. A constant methadone/EDDP ratio was not found. (2) After intensive exposure of hair strands to palms of patients on methadone maintenance therapy, methadone was detected in trace amounts (< 0.05 ng/mg hair, LOD 0.0059 ng/mg). EDDP was not detected in any sample (LOD 0.0063 ng/mg).

Conclusion: The low content of EDDP in the skin wipes and its absence in the hair suggests that detection of EDDP in human hair indicates body passage rather than external contamination by physical parent/child intimacy.

1. Introduction

Understanding methadone and its main metabolite EDDP excretion in sweat is important for interpreting sweat and hair test results in forensic settings. In the recent past, findings in hair samples from children living with parents on methadone maintenance therapy showed a high burden of methadone and other drugs. Besides known incorporation routes of drugs into the hair via bloodstream (body passage) or external contamination (e.g. spilling) physical parent/child intimacy (caressing) was discussed as a possible source of such findings, since extensive sweating is a known side effect of opioide maintenance therapy. To date there are four publications [1-4] on the use of sweat patches to supervise methadone therapy of heroin abusers enrolled in a long term maintenance program, focussing on methadone. One of these publications is a double publication [2,3]. In two trials GC/MS was used for analytical examination [1-3]. Only one trial employed LC/MS/MS technique. However, only methadone

was analyzed, but not EDDP [4]. So far, there is no clinical trial testing the hypothesis if a transmission of methadone and EDDP via palm to hair is even possible.

2. Material and Methods

(1) Sample collection took place in a physician`s maintenance facility. Ten patients receiving long-term methadone maintenance therapy (oral dose 20-90 mg/day) were asked to voluntarily participate. Anonymity was conserved completely: Except for doses, frequency of washing and last washing of hands and body, no information was documented. Skin wipes from palms and armpits were collected twice from the same area using standard alcohol soaked wipes and stored separately in small plastic bags. The procedure was performed before medication. The samples were shipped to the FTC for analytical evaluation.

(2) A human lace wig was kindly provided by Erich Adelmann KG, Driedorf. Toxicological drug screening showed that the wig was negative. The wig was exposed intermittently for 18 days at the methadone maintenance facility. The patients were asked to rub the hair intensely with their hands. About 50 patients treated in this facility participated in the experiment repeatedly, resulting in a total number of 900 palm/wig contacts. Samples were collected in continuous intervals. Routine washing procedure (methanol) was applied.

Quantitative analysis using LC/MS/MS was performed on (1) extracts of skin wipes, (2) hair strands and hair washes. To test the suitability of the wig hair, i.e. to prove intact texture in comparison to untreated hair, the samples were imaged by scanning electron microscope at Fraunhofer-Institut für Fertigungstechnik und Angewandte Materialforschung, Bremen.

3. Results and Discussion

(1) The experiments could verify the presence of EDDP in skin wipes of patients on methadone maintenance. The methadone and EDDP contents were scattered over a wide range. A constant methadone/EDDP ratio was not found.

Tab. 1 Amounts (ng) of methadone (M) and EDDP (E) per skin wipe and methadone / EDDP ratio (R) for first (1) and second (2) collection from the same area of palms and armpits.

Patient	Palm						Armpit					
	M(1)	E(1)	R(1)	M(2)	E(2)	R(2)	M(1)	E(1)	R(1)	M(2)	E(2)	R(2)
1	8.7	1.2	7.0	3.6	0.35	10	4.9	0.41	12	3.4	0.25	14
2	0.02	-	-	0.04	0.01	7.8	5.9	0.25	24	5.7	0.26	22
3	2.2	0.05	45	2.3	0.06	38	17	0.62	27	2.4	0.02	110
4	5.5	0.09	60	1.9	0.04	44	0.45	0.01	41	0.85	0.02	37
5	1.1	0.09	12	0.35	0.04	9.7	0.01	-	-	0.01	-	-
6	1.3	0.07	19	4.8	0.25	19	1.5	0.05	30	1.5	0.03	50
7	4.6	0.97	4.8	4.3	1.0	4.2	2.4	0.15	16	3.1	0.28	11
8	3.7	0.42	8.7	4.0	0.55	7.2	1.9	0.05	41	2.0	0.07	30
9	3.9	0.08	48	4.6	0.09	49	3.6	0.22	16	1.9	0.10	20
10	3.3	0.71	4.7	2.6	0.43	6.0	9.9	1.7	5.9	7.6	1.5	5.2

(2) After intensive exposure of hair strands to palms of patients on methadone maintenance therapy, methadone was detected in trace amounts (<0.05 ng/mg hair, limit of detection 0.0059 ng/mg). EDDP, in contrast, was not detected in any sample (limit of detection 0.0063ng/mg).

4. Conclusions

The low content of EDDP in the skin wipes and its absence in the hair suggest that detection of EDDP in human hair of children of parents on methadone maintenance therapy indicates body passage of methadone rather than external contamination by parent/child intimacy.

5. References

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