

# The disposition into hair of a new designer drug, methylone and its related compounds

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RURI KIKURA-HANAJIRI

National Institute of Health Sciences, 1-18-1, Kamiyoga, Setagaya, 158-8501, Tokyo, Japan

**AIMS:** Methylone (2-amino-1-(3,4-methylenedioxyphenyl)propan-1-one) is a new ecstasy-like designer drug that recently appeared in the Japanese drug market. Although only a little is known about the harmfulness of this drug, risks common to 3,4-methylenedioxyamphetamine (MDMA) cannot be excluded because of similarities between these drugs. In this study, the disposition into hair of methylone and its related compounds was studied with an animal model, in order to investigate the incorporation tendency of these compounds into hair and to evaluate the usefulness of a hair specimen for the confirmation of the retrospective use of methylone.

**METHODS:** Methylone and its related compounds, amphetamine (AP), methamphetamine (MA), N-ethylamphetamine (EAP), cathinone, methcathinone, 3,4-methylenedioxyamphetamine (MDA), MDMA, N-methyl-1-(3,4-methylenedioxyphenyl)-2-butanamine (MBDB), 3,4-methylenedioxyethylamphetamine (MDEA) and 3-methoxy-4,5-methylenedioxyamphetamine (MMDA) were studied. After the intraperitoneal administration of these respective compounds to pigmented hairy rats (5 mg/kg/day, 10 days, n = 3), the parent compounds in the rat plasma (5, 15, 30, 60, 120, 360 min after administration) and in the newly grown rat hair (after 4 weeks) were determined by GC-MS-SIM. After washing with 0.1 % sodium dodecyl sulfate, the hair samples (10 mg) were spiked with internal standards, extracted by 1-h sonication and over-night soaking in 2 mL of 5 M HCl-methanol (1:20) at room temperature. Following evaporation of the liquid phase, the residue was dissolved in a phosphate buffer solution (pH 6.0). The hair extracts and plasma samples were purified using a solid-phase extraction procedure (Bond Elut Certify, Varian) and derivatized with pentafluoropropionic anhydride before the GC-MS analysis.

**RESULTS AND CONCLUSIONS:** The concentration of methylone in the rat hair was  $79.8 \pm 22.3$  ng/mg, while the area under the concentration versus time curve (AUC) in the rat plasma was  $147.0 \pm 12.0$   $\mu\text{g min/mL}$ . When the ratio of hair concentration to AUC in plasma ([Hair]/AUC) was represented as an index of the incorporation rate of drugs into hair, the order of the [Hair]/AUC was cathinone < methcathinone < AP < MA < EAP < MDA < methylone < MDMA < MDEA < MBDB < MMDA. The [Hair]/AUC of MDA, MDMA and methylone were 3 - 40 times higher than those of AP, MA and methcathinone, suggesting that the methylenedioxy group on the benzene ring raises their incorporation rates very positively. However, the [Hair]/AUC of beta-ketoamphetamines, cathinone, methcathinone and methylone, were 1/2 – 1/10 times lower in comparison with those of their corresponding amphetamines, AP, MA and MDMA, respectively. The [Hair]/AUC of methylone was lower than that of MDMA, but higher than MA. Although methylone has both groups in its structure, the positive effect of the methylenedioxy group may be stronger than the negative effect of the beta-carbonyl group. In conclusion; as with MA and MDMA, the incorporation tendency of methylone into hair is relatively high and a hair sample would be a good specimen for the confirmation of retrospective use of methylone.

**KEYWORDS:** *Hair analysis, Methylone*

**Corresponding author:** [kikura@nihs.go.jp](mailto:kikura@nihs.go.jp)