

# Urinary excretion of morphine and codeine following the administration of single and multiple doses of opium preparations prescribed in Taiwan as “Brown Mixture”,

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## Abstract

Parallel to the "poppy-seed defense" strategy commonly reported in the United States, donors of urine samples tested positive for opiates in Taiwan often claimed the consumption of Brown Mixture (BM) as the source of the observed morphine and codeine. Because BM contains opium powder (10.0-10.5% morphine), opium tincture (0.9-1.1% morphine), or camphorated opium tincture (0.045-0.055% morphine) and is a popular remedy, and heroin use is considered a serious criminal act, the claim of BM use has to be adequately addressed. In this study, BM from seven different manufacturers (5 tablets and 2 solutions) and urine samples from alleged heroin users and volunteers with various ingestion patterns and were analyzed for their morphine and codeine contents. The analytical procedure included hydrolysis, trimethylsilylation, and gas chromatography-mass spectrometry analysis. The contents of morphine and codeine in the tablets were found to be very consistent, but with significant differences in the two BM solutions. Morphine concentrations found in urine specimens collected from volunteers ingesting BM tablets (or solutions) were always < 4000 ng/mL. The following morphine-to-codeine ([M]/[C]) ratios were observed for urine specimens with morphine concentration > or = 300 ng/mL: (A) < 3.0 for volunteers ingesting BM solution and (B) > 3.0 (mostly > 5.0) for volunteers ingesting BM tablets and alleged heroin users. It appeared that (A) BM ingestion (tablet or solution) was unlikely to result in a morphine concentration > 4000 ng/mL; and (B) [M]/[C] ratio might not be an effective parameter to differentiate heroin use from BM tablet ingestion.