

## **Pseudoephedrine to Methamphetamine: Comparison of Percent Conversion between Abuse-Deterrent and Non Abuse-Deterrent Formulations**

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**Background:** Clandestine chemists ("cooks") have demonstrated the ability to convert commercially available pseudoephedrine (PSE) to methamphetamine. Some PSE formulations have abuse-deterrent properties that manufacturers claim limit or prevent conversion to methamphetamine. These studies evaluated commercially available PSE products for ease of extraction and conversion to methamphetamine using fundamental, "kitchen chemistry" techniques.

**Methods:** These experimental methodology studies compared 2 marketed PSE products with abuse-deterrent properties (PSE-A and PSE-B) to a comparator product without abuse-deterrent properties (PSE-C). Extractability was evaluated using 8 readily available tools, 2 common solvents, 2 extraction temperatures, and unstirred versus stirred reaction conditions. Eight solvents were compared for their ability to extract PSE from manipulated, solubilized tablets. The one-pot conversion method commonly used in clandestine settings was slightly modified to determine impact on methamphetamine yield. Quantities and addition times of the chemicals used were varied; reaction duration was varied; the procedure was scaled down and conducted in a controlled environment to reduce risk. Chemicals and equipment were purchased from local retail stores. PSE and methamphetamine were quantified using High Performance Liquid Chromatography-Tandem Mass Spectrometry (HPLC-MS/MS). Standard calculations determined quantities of PSE and methamphetamine recovered and converted, respectively. Raw data including the calculated means and percentages are reported.

**Results:** A rotating blade coffee grinder effectively reduced particle size. Dissolution rates of ground tablets and physical characteristics varied by product; PSE-A was most resistant to dissolution while PSE-B and PSE-C were comparable and able to be dissolved completely, demonstrating no dissolution-deterrent properties. Conditions of the one-pot conversion method were modified to increase the yield of methamphetamine. The modified process resulted in 43% - 47% conversion of extracted PSE-A, 46% - 60% of extracted PSE-B, and 49% - 66% of extracted PSE-C.

**Discussion:** Experimental conditions resulting in conversion of approximately 50% of abuse-deterrent and non-abuse deterrent PSE products to methamphetamine were identified using a slightly modified standard clandestine process.

**Conclusion:** This series of methodological evaluations confirmed that "cooks" can produce methamphetamine readily and with a yield that is similar from PSE products with and without abuse-deterrent technology.