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Effect of tampering methods on particle size reduction of poly (ethylene oxide)-based tablets

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Opioid analgesics have high potential for abuse, and oral formulations are frequently tampered to produce greater effects. General methods of opioid tampering include crushing and solution extraction for abuse via snorting and injection, respectively. To deter crushing, poly (ethylene oxide) (PEO) is commonly incorporated into abuse-deterrent medications with further processing to improve mechanical strength. Evaluating the ease by which such tablets can resist crushing is challenging since no compendial or universally-accepted methods exist. Furthermore, the choice of tool used is likely to result in different particle sizes. Therefore, the purpose of this study was to evaluate the ability of different crushing methods (manual and mechanical) and devices to reduce the particle size of a standard PEO-based tablet. Using a Carver press, tablets consisting of 80 mg acetaminophen and 320 mg high molecular weight PEO (Polyox® WSR coagulant) were made under 2000 pounds of compression. Tablets were then manipulated by manual (pill crusher and pestle-mortar) and mechanical (ball mill and high shear grinder) methods for one minute (n=3). The resultant mass was separated by particle size above and below 500 microns using sieve analysis. It was found that ball mill and pestle-mortar respectively generated 18.1 ± 0.7 and 16.3 ± 2.0 % of particles larger than 500 microns, whereas pill crusher and high shear grinder generated about three times as much such particles, 57.5 ± 1.3 and 54.5 ± 0.6 %, respectively. Further analysis of particle size showed tablets crushed using a pill crusher or high shear grinder displayed wide size distributions compared to narrower distributions obtained using a pestle-mortar or ball mill. It was concluded that the type of tool (manual or mechanical) used to perform crush resistance studies is important to show the level of resistance to particle size reduction.

Biography

Srinath Muppalaneni earned a BS in Pharmacy from Andhra University and a MS in Pharmaceutical Sciences from Campbell University. He is currently a Doctoral candidate in Pharmaceutics at Nova Southeastern University (NSU) with dissertation research focusing on abuse-deterrent formulations. He has so far participated in 6 inventions, 3 publications, 26 presentations, 1 grant, and 2 book chapters. He also won the best poster award at the 2013 OMICS 3rd International Conference and Exhibition on Pharmaceutics & Novel Drug Delivery Systems.

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