Evaluation of Segregation of Pharmaceutical Formulations in Direct Compression Process

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The phenomenon of powder segregation during the direct compression process can pose a significant challenge in controlling of content uniformity in blended powders, particularly when the powder exhibits characteristics of being free-flowing or easily flowing. Evaluating the level of segregation in powders at early formulation stage faces a significant challenge due to the scarcity of available samples. The utilisation of small bench-scale testers for an advanced segregation evaluation can provide valuable insights for making formulation decisions and recommendations for operational parameters in a process that has not been extensively studied previously. This study utilized a total of eight formulations, each consisting of a combination of two co-processed excipients blended with one active pharmaceutical ingredient at varying concentrations. The objective of the study was to investigate the phenomenon of segregation using two different types of bench-scale testers, namely the air-induced segregation tester and the surface rolling segregation tester. Additionally, a pilot simulation process rig was employed to conduct a comparative analysis. The findings indicate that the assessment of segregation on bench-scale testers can effectively serve as an indicator of the level of segregation within a blend for a process, if the segregation intensity does not exceed 20%. The comparison also demonstrates that both the bench-scale testers exhibit a strong correlation with the process rig, indicating that any segregation tester can be utilised autonomously for the purpose of evaluation. The study investigated the use of a linear regression model to predict segregation in the process.

Keywords: Segregation in process; Formulated powders; Bench-scale testers; Harshness factors; Linear regression model