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Does the carrier type affect the CQAs of liquisolid tablets with atorvastatin calcium?

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Liquisolid technique is a simple and cost-effective method to enhance the dissolution of poorly soluble drugs. Porous carriers are crucial in these formulations, as their physicochemical properties and compaction behaviour determine the amount of liquid phase, and therefore drug, that can be incorporated, as well as the overall processability and characteristics of liquisolid systems. In this study, liquisolid tablets were prepared using three different porous carriers (Neusilin®US2, Syloid®XDP3050, and Fujicalin®) to investigate the effect of carrier type on compaction behaviour and dissolution. Compaction properties (tensile strength, work of compression, elastic recovery, and detachment and ejection stresses) were measured, alongside contact angle and dissolution testing. All three carriers produced tablets with acceptable mechanical strength (>1.7MPa) and moderate elastic recovery (21–31%). Tablets with Syloid® required the highest net work of compression, reflecting carrier's rigid, brittle structure. Tablets with Fujicalin® showed the highest ejection stress, likely due to lower liquid-loading capacity. In contrast, the formulation with Neusilin®, which had the highest liquid load, demonstrated the lowest detachment and ejection stresses, and the lowest net work of compression and elastic recovery, indicating efficient plastic deformation and effective liquid distribution. Dissolution testing showed that formulations with Neusilin® and Syloid® achieved rapid and complete drug release, with Syloid® being faster (80% in 5 min), consistent with its high wettability (contact angle 17°). In comparison, tablets with Fujicalin® released the drug more slowly and incompletely, likely due to poor wettability (contact angle 52°) and fragmentation as dominant compression mechanism leading to higher tensile strength. These results demonstrate that choice of porous carrier strongly affects compaction behaviour, which, together with wettability, governs drug dissolution from liquisolid tablets.