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Carbamazepine Co-crystal Screening with Dicarboxylic Acids Co-Crystal Formers

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Abstract : Co-crystal is believed to improve the solubility and dissolution rates and thus, enhanced the bioavailability of poor water soluble drugs particularly during the oral route of administration. With the existing of poorly soluble drugs in pharmaceutical industry, the screening of co-crystal formation using carbamazepine (CBZ) as a model drug compound with dicarboxylic acids co-crystal formers (CCF) namely fumaric (FA) and succinic (SA) acids in ethanol has been studied. The co-crystal formations were studied by varying the mol ratio values of CCF to CBZ to access the effect of CCF concentration on the formation of the co-crystal. Solvent evaporation, slurry, and cooling crystallisations which representing the solution based method co-crystal screening were used. The product crystal from the screening was characterized using X-ray powder diffraction (XRPD). The XRPD pattern profile analysis has shown that the CBZ co-crystals with FA and SA were successfully formed for all ratios studied. The findings revealed that CBZ-FA co-crystal were formed in two different polymorphs. It was found that CBZ-FA form A and form B were formed from evaporation and slurry crystallisation methods respectively. On the other hand, in cooling crystallisation method, CBZ-FA form A was formed at lower mol ratio of CCF to CBZ and vice versa. This study disclosed that different methods and mol ratios during the co-crystal screening can affect the outcome of co-crystal produced such as polymorphic forms of co-crystal and thereof. Thus, it was suggested that careful attentions is needed during the screening since the co-crystal formation is currently one of the promising approach to be considered in research and development for pharmaceutical industry to improve the poorly soluble drugs.

Keywords : co-crystal, dicarboxylic acid, carbamazepine, industry
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