Effect of Particle Size of Hydroxypropyl Cellulose as Dry-Mixing Binder on Properties and Drug Release of Tablet Prepared by High Shear Mixer Granulation Method

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Purpose
High shear mixer granulation method is widely used for pharmaceutical formulation and binder dry-mixing method has advantages such as; 1) preparation of binder solution is not required, 2) less water than binder solution addition method is required, 3) granulation is not affected by viscosity of binder solution. In this study, we evaluated effect of particle size of Hydroxypropyl Cellulose (HPC) on properties and drug release of tablet prepared by high shear mixer granulation (binder dry-mixing) method using Acetaminophen as a model drug.

Methods
Tablet formulation for evaluation was composed of Acetaminophen (30%), Lactose (49%), Corn Starch (21%), HPC (3%) and Magnesium Stearate (0.5%). For evaluation, three particle size (D50: 170micron, 90micron and 40micron) of HPC-L (Viscosity: 6-10mPa*s) were used as dry-mixing binder. Granulation was carried out with four amount of D.I. water (10%, 12.5%, 15% and 17.5% of weight of material powder). For evaluation, tablet hardness, friability, disintegration time and drug release were measured.

Results
In any case of particle size, tablet hardness showed highest value when addition of water was 12.5%. Harder tablet hardness was obtained when particle size of HPC was finer and its value increased as 7.56kgf, 7.98kgf and 9.52kgf respectively. The similar tendency was observed in comparison of friability, and it was 0.1% when HPC-L with particle size of 40micron was used while it was 0.16-0.23% in the case of HPC with particle size of 170micron. In any case of particle size, no much difference was seen in comparison of disintegration time and drug release. However, tendency to slightly hinder disintegration time and drug release was observed when addition of water increased.

Conclusion
In the case of high shear mixer granulation (binder dry-mixing) method, particle size of HPC was found to be a factor to impact tablet properties. The results indicate better tablet properties can be obtained by choosing finer particle size of HPC.