Effect of Viscosity of Hydroxypropyl Cellulose (HPC) on Wettability and Drug Dissolution
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Purpose
Hydroxypropyl cellulose (HPC) is a well-known solid dosage form excipient and one of the excipient approved worldwide. HPC has various grades which attributed from viscosity (molecular weight), and the most suitable grade to the drug designing can be selected. Especially, low viscosity HPC are often selected as a tablet binder, owing to its high binding ability and low viscosity of binder solution. In this study, evaluation on effect of HPC viscosity on tablet wettability and drug dissolution as well as tablet properties were carried out. Ethenzamide (ETA) was used as a model drug.

Methods
A mixture of ETA (30%), lactose (49%) and corn starch (21%) was granulated by fluidized bed granulator, adding 3% of HPC as binder by spraying HPC aqueous solution. Tablets were prepared by compressing mixture of granules and magnesium stearate (0.5%) using laboratory scale rotary tablet press machine (VELAS, KIKUSUI SEISAKUSHO Ltd.). The tablet wettability was determined using contact angle gauge (DropMaster DM-700, Kyowa Interface Science Co., Ltd.). Tablet hardness was measured by tablet hardness tester (Portable checker PC-30, Okada Seiko Co., Ltd.). Friability, disintegration time and drug dissolution were measured according to JP16 method.

Results
The wettability of prepared tablets were determined by contact angle observation; the contact angle of the surface of the tablet prepared decreased along with the decrease in viscosity of HPC (HPC-H (3630 mPa·s): 65.6°, HPC-L (7.3 mPa·s): 57.2°, HPC-SSL (2.5 mPa·s): 44.8°). As a result of the dissolution test, tablets prepared using lower grade HPC showed increase in dissolution rate (HPC-H: 7.0%, HPC-L: 34.9%, HPC-SSL: 45.4% in 5 minutes). Also, tablets prepared using lower grade HPC showed faster disintegration time (HPC-H: 13.1 min, HPC-L: 7.3 min, HPC-SSL: 6.2 min). Hardness and friability of tablet prepared with HPC-H, HPC-L and HPC-SSL were 13.2kgf/0.03%, 12.4kgf/0.12% and 13.2kgf/0.15% respectively. There was not much difference in both tablet hardness and friability, which inclines that these properties does not depend on the using HPC grade.

Conclusion
When HPC was used as a tablet binder, its viscosity, wettability, disintegration time and drug dissolution rate was found to be correlated each other. On the other hand, tablet hardness and friability did not show relation to the viscosity of HPC. Tablet wettability was found to be improved when lower viscosity grade of HPC was used as a binder, and it is considered that faster drug dissolution rate could be obtained owing to the improvement of wettability. Investigations concentrated on lower viscosity HPC, wettability and tablet properties are now ongoing.

![Figure](image.png)

**Figure.** Contact angle observation of prepared tablets
(a) HPC-H (3630 mPa·s), (b) HPC-L (7.3 mPa·s), (c) HPC-SSL (2.5 mPa·s)