Application Related Properties of a New Fast Dispersible Excipient

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Abstract Summary
The new excipient Ludiflash®, which is a formulation based on mannitol, polyvinyl acetate and crospovidone, was tested regarding its suitability for orally dispersible tablets. Compression studies revealed that rapidly dispersing tablets of sufficient hardness and friability could be manufactured via an easy direct compression step. The optimum compression pressure ranges from 50 – 80 MPa. The tablet properties are not influenced by changes in tabletting speed. During and after disintegration the tablets develop a smooth and pleasant taste.

Introduction
Orally disintegrating tablets are becoming more and more popular since they offer a convenient method of application and also promote a quick onset of action (1). Furthermore, people who have problems in swallowing tablets, such as children or elderly people, can easily take this dosage form. However, the prerequisites for such a dosage form and for the necessary excipients are extremely high. Suitable excipients must have an excellent compressibility together with outstanding disintegration properties and must also provide a good taste and feeling in the mouth. Currently, there are no materials available which fulfill all these requirements. A new rapidly dispersible excipient formulation has been developed based on monographed ingredients. This new material is tested for its physico-chemical properties and how it acts in orally disintegrating tablets.

Experimental Materials
• Materials:
  Fast dispersible excipient based on mannitol, polyvinyl acetate and crospovidone (Ludiflash®, BASF Aktiengesellschaft, Germany), magnesium stearate (Bärlocher, Germany)

• Methods:
  Particle size distribution
  Laser diffraction (Malvern Mastersizer X) was used
  Manufacture of tablets
  5.0 kg Ludiflash® and 0.1 kg magnesium stearate were blended in a Turbulad blender (Bachofen, Switzerland) for 10 min. and tabletted on a Korsch XL single punch press and a Korsch XL 100 rotary press into flat tablets of 10 mm diameter with bevelled edge. The tablets were compression molded from 20 to 60 rm and compression force from 3 to 25 kN.

Results and Discussion
Ludiflash® consists of agglomerated particles of a relatively fine particle size 192 µm (D 4,3 value) and a uniform distribution with a span value of 3.7. The particle size in combination with the surface characteristics results in an angle of repose of 38.4°. Due to the fact that the main component is mannitol sorption isotherm is very low and water is significantly taken up initially at > 90 % r.h. All these properties should allow a direct compression step as the best method of tablet production.

Tabletting speed was varied from 20 to 60 rpm and magnesium stearate (Ludiflash®, BASF Aktiengesellschaft, Germany), magnesium stearate was used. Lowering the lubricant level will probably further improve disintegration and dissolution (3).

The second tabletting study with increasing tabletting speed (20 – 60 rpm) revealed that there was almost no impact of speed on tablet properties, even hardness remained at a constant level. At all speeds, uniformity of tablet mass met the requirements of the Ph. Eur., which specifies a 5 % deviation from the mean value.

Conclusion
• The new excipient Ludiflash® is highly suitable for orally dispersible tablets made by direct compression.
• Tablets should be compressed at 50 – 90 MPa since this pressure results in rapidly disintegrating, mechanically stable tablets.
• Tablet characteristics are not influenced by compression speed.

References

Figure 1
Hardness and friability as a function of compression force

Figure 2
Disintegration time as a function of compression force

Figure 3
Uniformity of mass at increasing compression forces

Figure 4
Hardness and disintegration time as a function of tablettting speed

Figure 5
Uniformity of mass related to the specification of the Ph. Eur. (20 single values)

Table 1
Powder characteristics

Table 2
Tabletting speed study at 5 kN – Compression and tablet data

Table 3
Tabletting speed study at 5 kN – Compression and tablet data

Table 4
Testing of tablets in the mouth revealed an even faster disintegration process with 15 – 25 s and a very smooth and pleasant feeling in the mouth. At higher compression forces disintegration determined with the usual tester as well as in the mouth was prolonged. This is mainly caused by a reduction of the tablet porosity (C). Despite the relatively fine particles and a medium flowability of the powder, standard deviation of compression force (2.98 – 3.60 %) and uniformity of hardness (0.67 – 0.70 %) remained excellent. This result shows that the dies are filled in a very reliable way.

The extremely low ejection forces of approx. 30 – 50 N are a result of the large amount of lubricant used. Lowering the lubricant level will probably further improve disintegration and dissolution (3).

Figure 6
Disintegration time as a function of tablet hardness

Figure 7
Uniformity of mass related to the specification of the Ph. Eur. (20 single values)