# The compaction effects of different disintegrants in a formulation of oral mefenamic tablets.

Charlotte Cartwright & Elaine H.Stone
Merlin Powder Characterisation Ltd, Brierley Hill, UK.

## Introduction

Super disintegrants are chemically modified version of traditional disintegrants used within tablets to improve the speed of release.[1] The investigation looked at taking three commonly used super disintegrants (SSG, CCS and PVP) and incorporating into an Immediate release formulation. Two concentrations were used to evaluate the compositional effect on tablet strength. Mefenamic acid is a commonly used non-steroidal anti-inflammatory drug (NSAID) widely used for mild and moderate pain relief. However, mefenamic acid provides problems with tabletting due to its poor solubility, high hydrophobicity and tendency to stick to surfaces which negatively impacts the tablet dissolution properties.

## Materials and methods

Six direct compression blends were prepared to the composition in *Table 1.* The three super disintegrants compared were: **sodium starch glycolate** (SSG), **croscarmellose sodium** (CCS) and **cross linked polyvinyl pyrrolidone** (CPVP). The blends were assessed by using a compaction simulator with a profile designed to simulate a Korsch XL100 press at a speed of 40 rpm. 10 mm flat faced tooling was used with a target weight of 375 mg. The compression force and in die measurement and ejected tablet parameters were measured.

Table 1: Formulation composition

| Material | Low super disintegrant formulation (%) | High super disintegrant formulation (%) |
|---|---|---|
| Mefenamic acid | 33.3 | 33.3 |
| Avicel PH102® | 46.6 | 43.6 |
| Lactose fast flo 316 | 15.5 | 14.5 |
| Kollidon 30® | 3.0 | 3.0 |
| Super disintegrant (SSG, CCS, CPVP) | 1.0 | 5.0 |
| Magnesium stearate | 0.5 | 0.5 |

## Results- Tabletability

The tensile strength of the 6 formulations were calculated and shown compared to punch pressure in Fig.1.

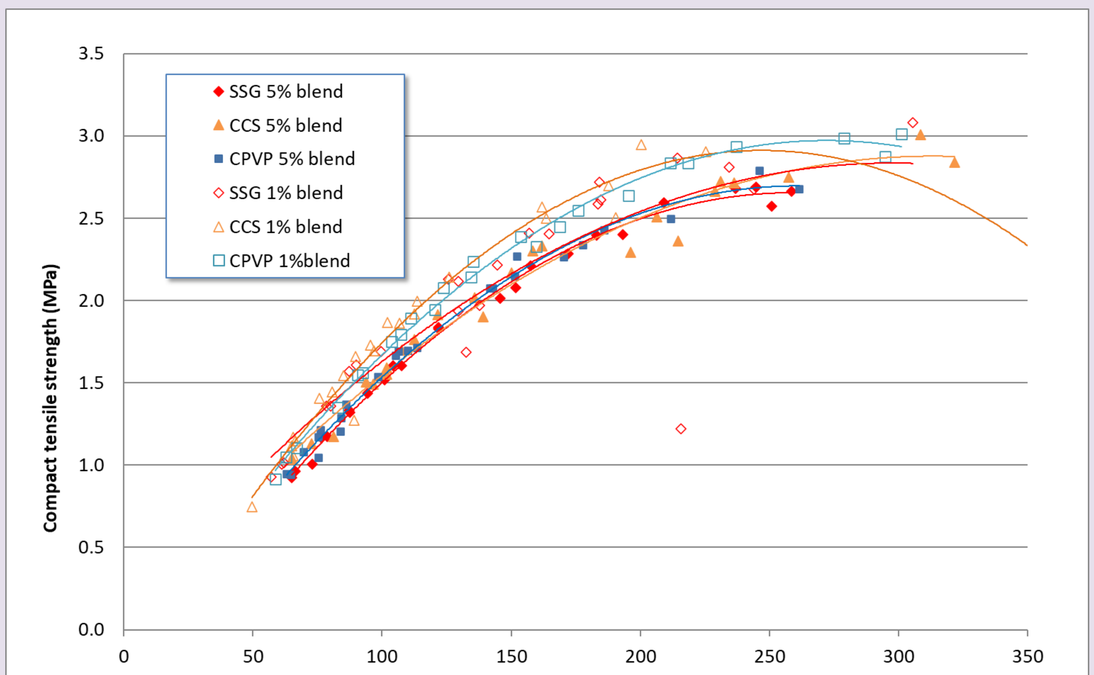


Fig. 1: Tabletability plot for 6 formulations with differing levels and type of disintegrant.

A formulations needs a minimum strength of 1.7 MPa to be considered suitable for scale up to commercial production.[2] All formulations achieve above the required tensile strength for the tabletability to be considered acceptable for commercial manufacturing. Above 200 MPa a plateau can start to be seen for the batches where over compression is being reached. The 1% concentration blends gave a higher tensile strength compared to the 5% concentration blends overall however, the 1% SSG blend showed more variability than the other 1% blends. The 5% CCS showed more variability than the other 5% concentration blends while the CPVP blends showed the smallest variability giving a greater repeatability when used as a super disintegrant within the formulation.
The choice and quantity of super disintegrant added to the formulation affects the tabletability of the DC blend.

## Results- Compactability and Compressibility

Compactability and compressibility plot are shown in Fig.2 and Fig.3 which can be used to aid tablet manufacture by determining tablet sizes based on the solid fraction and predicting punch pressure required in production.

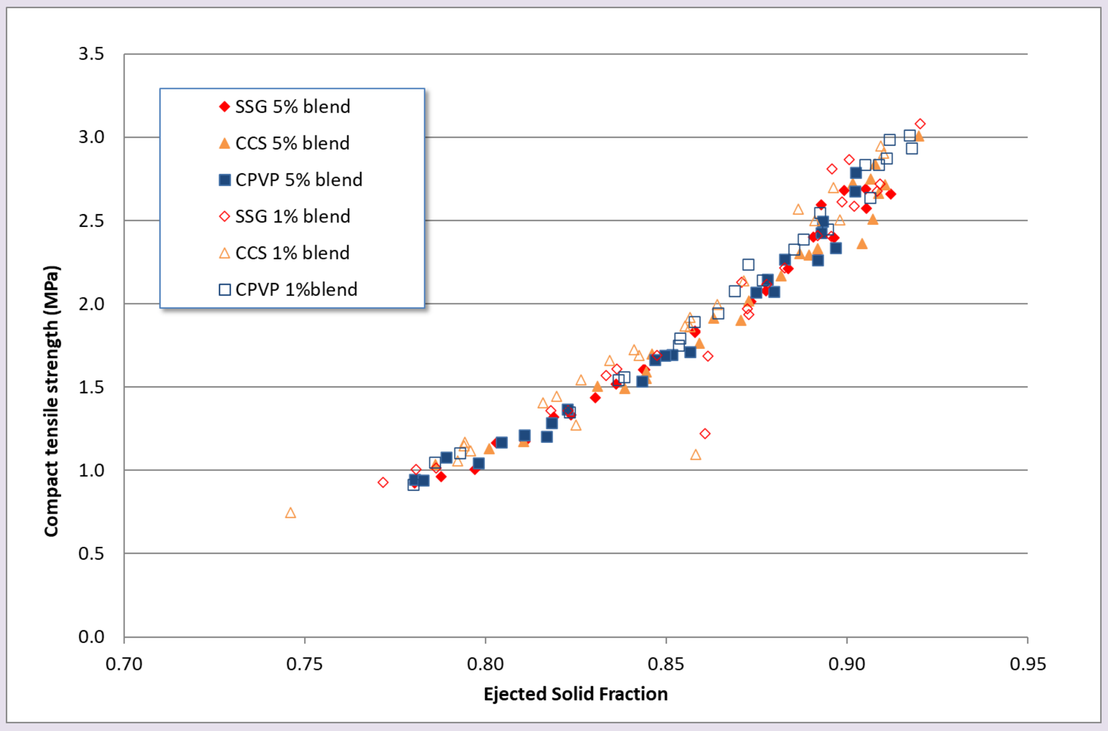


Fig. 2: Compactability plot for 6 formulations with differing levels and type of disintegrant.


Fig. 3: Compressibility plot for all 6 formulations with differing levels and type of disintegrant.

The compactability plot shows as the ejected solid fraction increases so does the tensile strength until a plateau is reached above 0.9 solid fraction. The different disintegrants showed similar properties. 1% levels produce stronger tablets compared to 5% levels.

The compressibility plot shows that as average punch pressure increases so does the ejected solid fraction until ~200 MPa. The risk of over-compression therefore increases above this pressure. Similar compressibility is found for the different disintegrants. 1% levels compress at a lower force compared to the 5% levels.

## Conclusions

Generally, the compactability and compressibility were similar across the different disintegrants used. The 1% levels produce stronger tablets and compress at lower forces compared to the 5% levels.
Tabletability however, is affected by the quantity and choice of disintegrant. The 1% levels give a higher tensile strength than the 5% levels. At the 5% level CCS shows more variability and at the 1% level SSG shows more variability. CPVP gives the greatest repeatability regardless of the level used in the DC blend.

## References

1. Alberto Berardi, Lorina Bisharat, Julian Quodbach, Safwan Abdel Rahim, Diego R. Perinelli, Marco Cespi, International Journal of Pharmaceutics, 2021, 598, 1-11.
2. Michael Leane, Kendal Pitt, Gavin Reynolds et al, Pharm Dev Technol, 2015, 20, 12-21.

info@merlin-pc.com