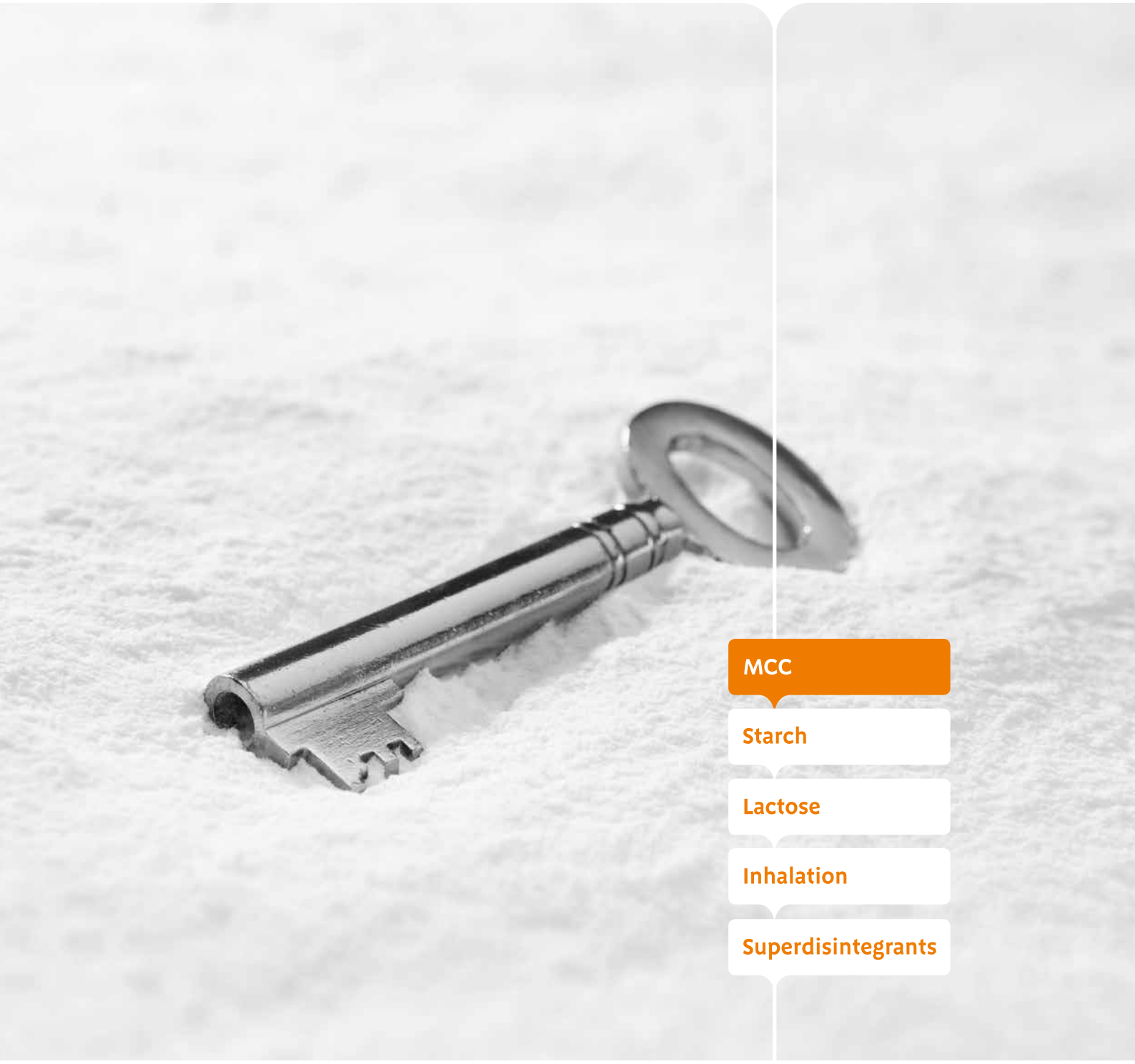
DFE pharma

The unlocked synergy
of DFE Pharma MCC



- MCC
- Starch
- Lactose
- Inhalation
- Superdisintegrants

The pursuit of excipient excellence

We are DFE Pharma

We are the global leader in excipient solutions. We develop, produce and market excipients for oral solid dose and dry powder inhalation formulations. Our customers are pharmaceutical companies, operating globally, regionally and locally.

The pursuit of excipient excellence
Excipient excellence is a pursuit that will never be fully achieved. What is excellent today will be outdated tomorrow. That's why to us the pursuit of excipient excellence is a way of life. A source of inspiration. Excipient excellence is what guides us on our way to developing and producing the best possible excipient solutions for our customers. Today, tomorrow, always.

- ***Leading in expertise***
  We are here to help you create pharmaceutical products that set the new standard.
- ***Leading in supply***
  We are here to ensure you can always produce your products. No matter what happens.
- ***Leading in time to market***
  We are here to help you grow by minimising the time to market.

We invite you to join us in our pursuit of excipient excellence.

Pursuit *'the act of striving towards an ideal with strong determination.'*

MCC

Your MCC
by DFE Pharma

Microcrystalline Cellulose (MCC) has a long history in the pharmaceutical industry and has demonstrated its success as a reliable excipient in a wide variety of formulations. By incorporating another excipient category, we have achieved greater synergies and further increased the power of our product portfolio.

We offer our MCC-based products to customers with the same high and consistent DFE Pharma quality you have come to expect from your global leader in pharmaceutical excipients. Microcrystalline cellulose is extensively used as an excipient in the pharmaceutical industry, and is especially important for oral solid dosage forms. Assured continuity and exceptional quality is of paramount importance to us. Your future requirements may differ significantly from today's norms, but DFE Pharma is ready to evolve with you by continuously investing in improved quality standards and production technologies. Along with this, we make sure that our people are trained and committed to provide you with the technical and commercial support you need. We care for your challenges, now and in the future.

DFE Pharma offers a high-quality range of microcrystalline cellulose:

- Pharmacel® 101
- Pharmacel® 102

Pharmacel® 101 & 102

Microcrystalline Cellulose

Microcrystalline Cellulose is used in a wide variety of oral solid dosage forms, including tablets, capsules, pellets and others. It is one of the most commonly used diluents in drug formulations, and it is made by controlled partial hydrolysis of high purity wood pulp, followed by purification and drying.

Pharmacel® 101 & 102

DFE Pharma produces two grades of microcrystalline cellulose: Pharmacel® 101 and Pharmacel® 102, which are ideally suited to the majority of tablet and capsule formulations processed by direct compression or filling, wet granulation, dry granulation or extrusion-spheronisation. Both Pharmacel® 101 and Pharmacel® 102 possess excellent properties that make them suitable for use in a wide range of formulations.

Pharmacel in tableting

Pharmacel MCC is an ideal excipient for tableting by wet granulation, dry granulation or direct compression. It is very high compactability means that strong tablets can be made at low forces, thus minimizing tablet tooling wear, even when the proportion of active ingredient within the tablet is high. Additionally, tablets made using Pharmacel MCC can be made to disintegrate readily when a superdisintegrant is used, thus maximizing the potential for drug bioavailability.

Wet Granulation

When used as a component for wet granulation formulations, Pharmacel 101 promotes excellent distribution of the granulating fluid, thus ensuring even distribution of the granules. Wet granulation with Pharmacel is therefore a robust and reproducible process, and the resulting tablets show excellent properties. Granule density and compactability can be controlled by the extent of granulation as shown in Figure 1: increasing the granulating fluid increases the granule density and decreases compactability.

Wet granulated formulations containing Pharmatose and Pharmacel in combination with a superdintegratant such as Primojel, are easily optimised to give strong tablets with excellent drug dissolution profiles.

In the example below, tablets were made by conventional wet granulation and drying, followed by compaction with 9mm punches at a force of 10kN.

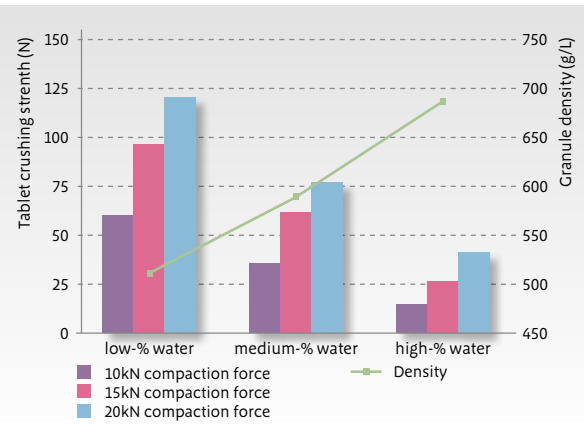


Figure 1: *250mg tablet formulation containing 30% Pharmacel 101 with Pharmatose 200M: high shear granulation.*

Formulation Example using Pharmacel® 101

Diclofenac sodium 25mg

Components	mg / tablet	
Diclofenac sodium	25.0	Intragranular
Pharmacel 101	25.0	Intragranular
Pharmatose 200M	187.5	Intragranular
Povidone (K25 grade)	5.0	Intragranular
Primojel	5.0	Intragranular (2.5mg) Extragranular (2.5 mg)
Magnesium stearate	2.5	Extragranular
Total	**250.0**	

Tablet properties	
Tablet strength	62N
Tablet disintegration time	2.5 minutes
Diclofenac dissolution rate	>95% after 10 minutes

Dry Granulation
Pharmacel is an ideal excipient for use in dry granulated formulations. It does not stick to the rollers or ribbons during roller compaction and it can be used in formulations with a high drug dosage. When used in combination with a brittle excipient such as SuperTab 21AN anhydrous lactose, the benefits of high tablet strength and insensitivity to recompaction are combined to give robust dry granulation formulations. A recommended starting point, especially for low dose formulations, is to use approximately 40% Pharmacel 101 and 60% SuperTab 21AN as the basis for tablets to be made by roller compaction.

Direct Compression
No other excipient compacts as well as MCC, making Pharmacel 102 the ideal choice for direct compression formulations. Its versatility in direct compression extends even to very high dose actives, where compactability is at a premium.

When used in combination with DFE Pharma's other direct compression excipients, the formulator has unrivalled possibilities to optimize the joint benefits of excellent flow and compaction together with enhanced disintegration. Robust, rapidly disintegrating DC formulations can be developed with ease.

In the example below, Ibuprofen had a median particle size of approximately 85 micron and was suitable for direct compression. Materials were blended and compressed using 9mm tooling with a compaction force of 10kN.

Formulation Example using Pharmacel® 102

Ibuprofen 200mg tablets

Components	mg / tablet
Ibuprofen	200.0
Pharmacel 102	64.0
Primojel	8.3
Magnesium stearate	2.7
Total	**275.0**

Tablet properties	
Mean weight	275mg
Weight Uniformity (RSD)	1.1%
Tablet strength	61N
Tablet thickness	4.71mm
Tablet disintegration time	< 1 minute

Pharmacel in Encapsulation
Pharmacel is an inert diluent for hard gelatin capsules. Based on considerations of powder flow, Professor Larry Augsburger concluded a Carr's Index of 20 – 30% is optimal. Carr's Index values of Pharmacel 101 and Pharmacel 102 are typically in the range of 22% to 28% making them both very suitable for capsule filling of dry blended formulation.

Reference: Comparison of the Formulation Requirements of Dosator and Dosing Disc Automatic Capsule Filling Machines, Pavan K. Heda, Kapiamba Muteba and Larry L. Augsburger, AAPS Pharm. Sci. 2002; 4 (3) article 17.

Pharmacel in Modified Release formulations
Multiparticulate formulations for extended and delayed release products are the ideal means of consistent drug delivery. The regular gastric emptying profile of multiparticulates means that enteric coated formulations are not susceptible to gastric hold up, while the presence of many small units in the drug delivery system means that the possibility of dose dumping is minimized when compared to single unit systems. Pharmacel is the perfect excipient for multiparticulates made by extrusion – spheronisation. It can yield hard round robust spheres that are ideal for subsequent coating operations.
We recommend inclusion of at least 20% Pharmacel in formulations made by extrusion-spheronisation.

Pharmacopoeia
Pharmacel® 101 complies with the latest editions of the USP-NF, Ph.Eur. and IP.
Pharmacel® 102 complies with the latest editions of the USP-NF, Ph.Eur. and IP.

Packaging
Pharmacel® is available in 25kg multi-layer polyethylene bags with a polyethylene inner liner.

Storage
Keep in original, unopened packing in ambient conditions, protected from humidity and away from strongly odorous materials.

DFE pharma

Head Office
Klever Strasse 187
P.O. Box 20 21 20
47568 Goch
Germany
T. +49 2823 9288 770
F. +49 2823 9288 7799
pharma@dfepharma.com

North America
902, Carnegie Center
Suite 440
Princeton, NJ 08540
USA
T. +1 609 858 2111
F. +1 609 858 2118

Japan
Kudan Vigas Bldg 3F
1-10-9 Kudan-Kita
Chiyoda-Ku
Tokyo 102-0073, Japan
T. +81 3 5276 7585
F. +81 3 5276 0445

Singapore
3 Temasek Avenue
#11-01 Centennial Tower
Singapore 039190
T. +65 6580 8100
F. +65 6580 8191

India
Plot No. 148,
Prestige Featherlite Tech Park
2nd Phase, EPIP Zone
Whitefield, Bangalore 560066
India
T. +91 80 4925 6100
F. +91 80 4925 6150

www.dfepharma.com

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