VELOX MCS
MICROCRYSTALLINE STARCH EXCIPIENT
FOR PHARMACEUTICAL PELLETS
VELOX MCS (microcrystalline starch) is a new proprietary excipient for the preparation of pharmaceutical pellets, which enables rapid and complete release of poorly soluble drugs. VELOX MCS disintegrates rapidly in the gastro-intestinal tract in contrast to microcrystalline cellulose (MCC). It has the requisite physical properties to produce smooth, uniform spheres via the extrusion-spheronization process.¹ The spheres can be produced in high yield with low friability and are suitable for enteric coating.² VELOX MCS also possesses mucoadhesive characteristics, which show promise for intravaginal delivery. The pellets may be sealed in a capsule, compressed into a soft tablet³, or delivered via a custom device.

¹ ² ³ Please refer to corresponding footnotes on page 5.
ADVANTAGES OF VELOX MCS PELLETS

Therapeutic:
• Rapid pellet disintegration and release of poorly soluble drugs in the gastro-intestinal tract
• Bioadhesive properties for intra-vaginal delivery
• Reduced risk of dose dumping (versus a single-unit-controlled release dosage form)
• Less irritation of the gastro-intestinal tract
• Reproducible transit time through the stomach resulting in consistent in-vivo drug levels

Technological:
• Excellent flow properties
• Easy to coat
• Narrow particle-size distribution
• Low friability

COMPOSITION
VELOX MCS is a short chain amylase crystalline polymer produced by enzyme debranching a high amylose starch in a proprietary process.

REGULATORY INFORMATION
VELOX MCS meets the specifications in the Food Chemicals Codex and the FDA requirements for maltodextrin under 21 CFR 184.1444.

FORMULATION
VELOX MCS can replace MCC as the major excipient in pellet formulations. A small amount of a binder, such as HPMC, is needed to obtain a high yield of uniform pellets. In addition, a minor amount of a polyol, such as sorbitol, is recommended to improve the mechanical strength of the extrudate and the pellet surface properties.

PROCESS TO MANUFACTURE PELLETS
In a typical process, the active ingredient and dry excipients are mixed and granulated with water to produce a wet mass. This is extruded onto a rotating friction plate to produce uniform pellets, which are then dried. The resulting free-flowing pellets can be produced with uniform size, ranging from about 500 to 1500 μm, depending upon conditions. Optionally, pellets may be coated and used to fill capsules or compressed into soft tablets. The following figure provides a process overview:

[Diagram of process flow: VELOX MCS + Drug + Binder → Powder Mix → Wet Plastic Mass → Extrudate → Wet Pellets → Dry Pellets → Granulation → Extruion → Spheronization → Drying → Free-flowing pellets size range 500 to 1500 μm → Rotating friction plate → Optional Coating → TABLETS → CAPSULES]
ORAL DELIVERY OF A POORLY SOLUBLE DRUG

Rapid release of hydrochlorothiazide (HCT) in vitro using a USP paddle dissolution apparatus is demonstrated in Figure 2. Here the pellets contained 50% HCT, 39% VELOX MCS, 7% HPMC and 4% Sorbitol w/w dry. Comparison was made with the same formulation substituting MCC for the starch. The water required for wet massing and granulation was optimized for each.4

The significant difference in release profiles is due to disintegration of VELOX MCS-based pellets which ensures fast exposure of the poorly soluble drug to the dissolution medium.

The absorption of HCT is limited to the duodenum, thus rapid release is required to achieve maximum bioavailability. An in vivo study in six dogs was performed to compare the bioavailability of two hydrochlorothiazide formulations with fast disintegrating, immediate release Eudex tablets (Novartis). Figure 3 compares the mean HCT plasma-concentration-time profiles obtained with VELOX MCS pellets containing 7% HPMC, 10% or 50% HCT w/w and the immediate release tablets.

No statistically significant differences in AUC 0-24h, Cmax and tmax were detected between pellet and reference formulations (p>0.05) indicating that similar drug concentrations were available at the absorption site.4

INTRAVAGINAL DELIVERY FROM PELLETS

VELOX MCS is a promising excipient for intravaginal delivery via pellets, overcoming many of the disadvantages of semisolid formulations and other solid dosage forms. Studies were conducted in healthy human volunteers using qualitative evaluation by colposcopy and magnetic resonance imaging.3,4,5,6 Quantitative studies were performed in sheep (n=6) using gamma scintigraphy.7 In both cases the VELOX MCS-based delivery system resulted in complete coverage of the vaginal mucosa and long retention time. Figure 4 shows the retention of activity and spread in the vaginal area of the pellets compared to a reference cream in the sheep trial.

Note that the pellets were administered in a hard, gelatine capsule, which took about 4 hours to disintegrate before spreading could occur. Preferably the pellets may be introduced directly via a suitable applicator allowing immediate spreading to cover the mucosal tissue.

REFERENCES

Development of starch-based pellets via extrusion/spheronisation.
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A pilot study evaluating the safety of vaginal administration of a multi-particulate pellet formulation.
7. Samata Mehta et al., Int J Pharm 426 (2009) 44-53
Vaginal distribution and retention of a multiparticulate drug delivery system, assessed by gamma scintigraphy and magnetic resonance imaging.
8. Samata Mehta et al., Drug Dev Ind Pharm (2012) Early Online: 1-7
Vaginal distribution and retention of tablets comprising starch-based multiparticulates: evaluation by colposcopy.

CONTACT US

To learn more about Henkel drug delivery polymers, please contact us at drugdeliverypolymers@henkel.com

Note: Publications up until 2009 used the trademark UNIPURE EX to describe the microcrystalline starch. UNIPURE was a trademark of National Starch and Chemical Company and now of Ingredion Incorporated. The starch is now supplied by Henkel Corporation under the name VELOX MCS.