Formulating Veterinary Tablets to Improve Palatability and Acceptance

For veterinary medicinal products (VMP), compliance and convenience are critical to ensure the success of prevention, control, and treatment programs. Animal health companies strive to develop highly palatable dosage forms that are voluntarily accepted to improve compliance and convenience, this is especially true for medications administered for chronic conditions.[1]

There is a recognized need for highly palatable solid oral dosage forms for companion animals that are freely accepted from their feeding bowl or via the hand of the pet owner. In many cases, pills for companion animals are given via a 'poke down' method or hidden in a favorite food. Ideally, pills would be voluntarily consumed by pets which means veterinary medicine providers strive to develop products with high palatability.[2,3]

Colorcon's proven and trusted Starch 1500®, partially pregelatinized maize starch, has been successfully used as a key excipient in veterinary oral dosage forms. Excipients for use in animal health dosages should have a neutral taste and good palatability. In a recent study, a formulation strategy using Starch 1500 in a chewable veterinary supplement was investigated.

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The Challenge

According to the European Medicines Agency (EMA) to facilitate successful administration of VMP for oral use, voluntary uptake and hence palatability is beneficial.

A product is not considered palatable if it is consumed only when mixed with food or by forced intake.[4]

Palatability involves taste, smell, and mouthfeel such as texture or chewiness. Commercially manufactured VMP are often designed using 'human' formulation strategies. Although in many instances this works well; it doesn't address the specific need for a chewable type of veterinary dosage form and excipient selection is important for palatability and voluntary acceptance.

Formulating for Animal Health

Many chewable tablet formulations for veterinary administration use a similar formulation approach with commonly used excipients such as diluents, flavor, compressible sugars, flow aid, and lubricant. Other ingredients may include binders, disintegrants, pigments, etc.

To develop a chewable glucosamine tablet with good hardness, low friability, and fast disintegration, as well as low ejection force, Starch 1500 was evaluated as the key excipient and in combination with microcrystalline cellulose (MCC) and lactose.

Table 1. Glucosamine tablet formulation

Ingredient	Formula 1 (%)	Formula 2 (%)	Formula 3 (%)
Glucosamine HCL	30	30	30
Starch 1500	56	36	26
MCC	0	20	20
Lactose	0	0	10
Flavor	12	12	12
Mag Stearate	1	1	1
SiO2	1	1	1
Total	100	100	100

To demonstrate the flexibility of this formulation strategy, processing methods commonly used in the VMP industry were studied: top spray fluid bed granulation (FB), high shear granulation (HS), direct compression (DC), and roller compaction (RC).

Direct compression (DC) is the simplest process, while wet granulation (FB and HS) are more complex multi-step methods.

For each trial, a 3 kg batch of the formulation was prepared, keeping the amount of water added, and spray rate consistent across the granulation processes.

For consistency, Starch 1500 was added to the dry blend. Excipients not critical to the granulation process (such as the flavor and lubricants) were added post-granulation. Each blend was compressed using 17 mm round concave D-tooling. Tablets were compressed to a target weight of 1000 mg with compression forces ranging from 25 to 45 kN to generate a compression profile. Tablet samples were collected at each compression force and resulting tablets were tested for hardness, tensile strength, friability, disintegration, assay, and dissolution.

Tableting Success

The formulation had a large influence on the resulting hardness of the tablets, with those produced using a blend of Starch 1500: MCC resulting in the ideal range of 6-8 KP, across the manufacturing technologies. Although the highest ejection forces were seen with formulations containing lactose, this excipient is not ideal as it is animal-derived. All tablets exhibited low friability when compressed at moderate to high compression forces; making them suitable for subsequent film coating, packaging, and handling. The tablets with Starch 1500 and MCC demonstrated fast disintegration times of <5 minutes facilitating good dissolution of the active.

Dissolution testing was performed in 900 mL of DI water at 37°C using USP Apparatus II (paddles) at 75 rpm for 60 minutes, with samples taken at several intervals between 5 to 60 minutes.

Glucosamine assay and dissolution samples were analyzed, with >90% of the glucosamine HCl detected in <5 minutes. This was similar for all formulas and processing technologies.

Figure 1.

Comparison of tablet manufacturing methodsinders.

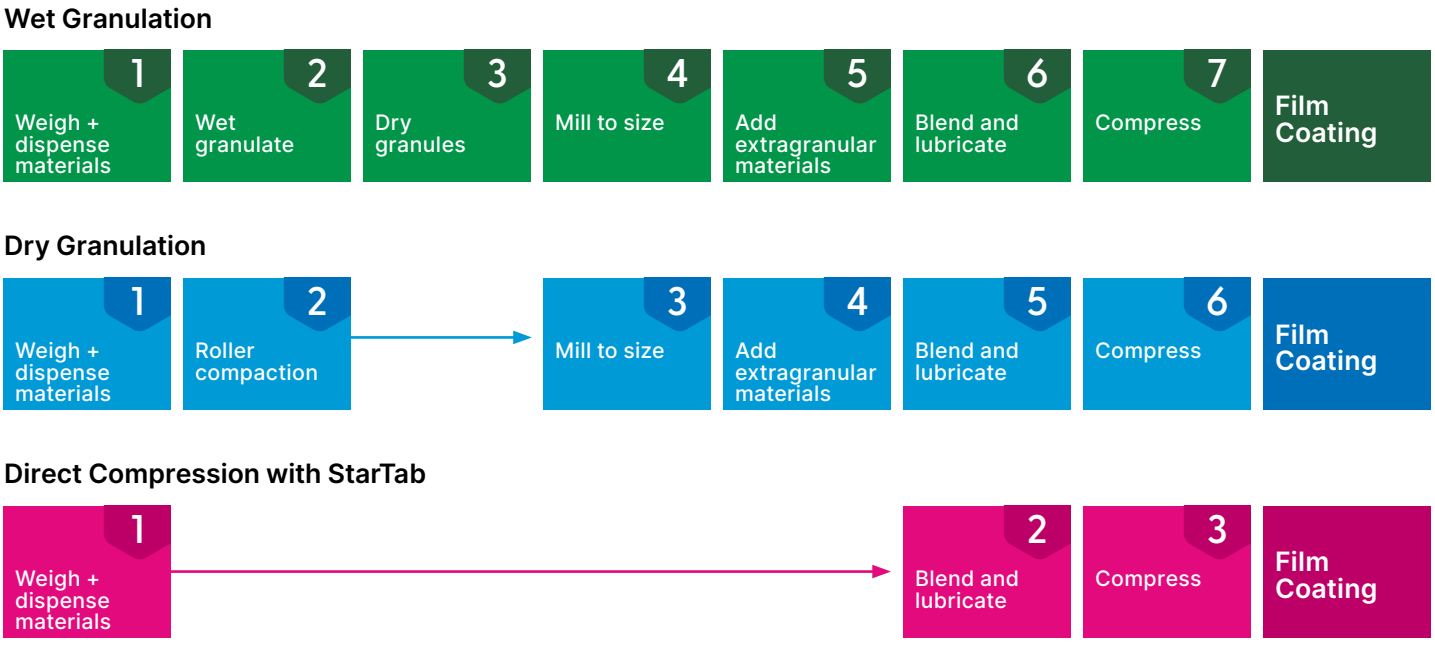
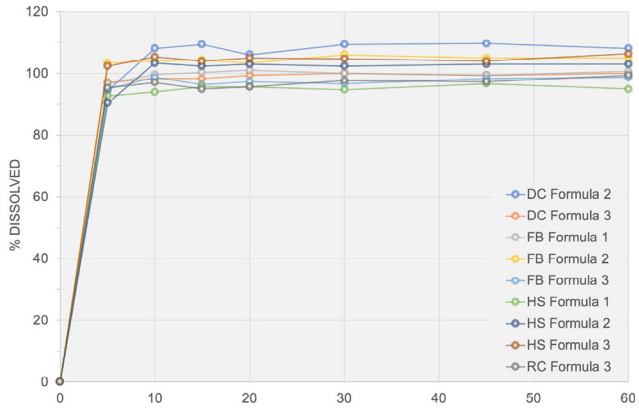


Figure 2

Comparison of particle size and bulk density for the formulations using fluid bed (FB) and high shear (HS)



Think Simplicity

Direct compression offers the simplest and most cost-effective manufacturing process, with robust tablets produced using all the technologies. Combining Starch 1500 with MCC in the formulation resulted in tablets with good hardness, low ejection force and friability, along with excellent disintegration properties and dissolution performance.

When DC is not viable and wet granulation is required, specifically for active ingredients with low density and poor flow, the binding properties of Starch 1500 provide a distinct advantage in terms of quality, flowable granulations without the use of any polymer binders.

Deliver a Superior Product

The use of Starch 1500 provides formulation and process flexibility by enabling changes without the addition of new excipients, avoiding costly delays in late-stage development and flexibility for manufacturing processes.

Colorcon Improves Health and Wellness through Convenience, Compliance, and Safety

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As a naturally sourced excipient from identity-preserved non-GM corn, manufactured in dedicated GMP facilities, the use of Starch 1500 in veterinary dosage forms like chewable tablets and soft chews provides unique benefits for animal health companies:

- No animal products or chemical additives are used in the manufacture of Starch 1500
- Neutral taste with good palatability
- Exhibits good thermal stability to about 121° C, ideal for veterinary soft chew manufacture
- Imparts and maintains plasticity (ductility) to the dosage form

References

1 Thombre, A.G. (2004) Oral Delivery of Medications to Companion Animals: Palatability Considerations. Advanced Drug Delivery Reviews, 56, 1399-413.

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4 Committee for Medicinal Products for Veterinary Use (CVMP) (2014) Guideline on the Demonstration of Palatability of Veterinary Medicinal Products. European Medicines Agency, London, 1-7.

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