New Drug Delivery Technology Partnership Opportunity

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ABSTRACT SUMMARY

Piedmont Pharmaceuticals LLC is a specialty pharmaceutical company focused on human and animal health therapeutics with expertise in parasitology and drug delivery systems. Piedmont has developed a soft chew technology that is covered by 3 US Patents1 and a number of International Patents. All of which have been issued in the last two years. Piedmont is now open to partnering with human pharmaceutical companies to bring this novel formulation to patients.

INTRODUCTION

In June, the US Food and Drug Administration’s Center for Veterinary Medicine approved the first application of Piedmont Pharmaceuticals’ invention of a soft chew formulation containing a veterinary medicine. This flavored soft chew formulation contains carprofen and is labeled for the relief of pain and inflammation from osteoarthritis and the control of post-operative pain in dogs. It is the first and only flavored, soft and chewable medicine in the pain category.

Beyond the Animal Health sector, this soft chew formulation is patented for use in delivering human pharmaceutical medications orally. Piedmont has demonstrated positive data supporting the use of Ibuprofen, a common OTC medication, in a creamy citrus flavored soft chew.

The market for this product is estimated to be approximately 5% to 10% of all solid dose formats. Inability or reluctance to swallow solid pills is common in adults and children, whether due to dysphagia, psychological or other reasons. A study by Harris Research in 2003 suggested that 40% of US adults have difficulty-swallowing tablets2.

Difficulty in swallowing – dysphagia – has been diagnosed in 35% of people aged over 50 and frequently appears after stroke and in older people with dementia, Parkinson’s disease and many other conditions. Some 60% of People with dysphagia have trouble swallowing solid tablets and more than half had residue remaining in the throat after swallowing, 17% had material that sat above the airway while 11% aspirated the medication3.

EXPERIMENTAL METHODS

Soft chews were handmade in lab using a mixing/blending method with no heat and no water process. Ibuprofen was coated at roughly 10% with a taste masking agent and chews were formulated to a strength of 200-mg with a targeted 2-g chew weight. They were allowed to cure exposed to air at room temperature. After a 3 day period the chews were foil pouched.

All analytical results herein where conducted at EN-CAS Analytical Laboratories (see author contact T. Ballard). The analytical procedure described in USP35, Ibuprofen Monograph p. 3470, and USP35, Ibuprofen Tablets Monograph p. 3472 were the basis for the analysis of the samples. Stability of flavored Ibuprofen human soft chews was demonstrated after 1, 3, and 6 months of ambient temperature and after 1, 2, 3, and 6 months of accelerated storage at 40°C.

The stock standards used were Ibuprofen ca. 4000 µg/mL in Internal Standard (IS) solution and 4-Isobutylacetophenone (Ibuprofen Related Compound C) ca. 215 µg/mL in ACN. HPLC standards were 4 µg/mL Ibuprofen Related Compound C and Ibuprofen stock standard. The IS consisted of Valerophenone 117 µg/mL in mobile phase. The mobile phase was 40:60 H2O:ACN with 0.4% chloroacetic acid and adjusted to pH 3 with ammonium hydroxide.
The soft chew weight was recorded and then chopped into 8 pieces. The pieces were added to a 100-mL volumetric flask with 50-mL of IS solution. Mixing occurred via stir bar for 2 hours. A ca. 2-mL aliquot was transferred to a disposable plastic centrifuge tube and was centrifuged at high speed for 5 min. The clear layer was transferred to a liquid chromatography vial and then analyzed by HPLC.

HPLC conditions for 0 day, 1 month, and 2 month samples were as follows. Column phase YMC C18 was used with a diameter of 4.6 mm and length of 250 mm (particle size 5 μm, mobile phase 40:60 H2O:ACN with 0.4% chloroacetic acid pH 3.0). A variable wavelength detector (Waters 996 PDA) was used at 254 nm with an injection volume of 15-μL. The column oven (Timberline Instruments) was set at 40°C.

RESULTS AND DISCUSSION

Initial assay on handmade soft chews yielded an average value of 105±4.50% of label claim 200-mg Ibuprofen (results not shown). Dissolution exhibited release of 90.9% of label claim at 60 min (Figure 1). Preliminary stability was conducted through a 6 month duration. This included time points of 1, 3, and 6 months for ambient temperature as well as 1, 2, 3, and 6 months under accelerated 40°C conditions (Figure 2). Ibuprofen exhibits stability in this soft chew formulation based on said preliminary studies. Future analytical work will be done on soft chews that are scaled-up and manufactured via patented process for a more accurate representation of AI behavior under the sort of treatment seen in a production environment.

![Figure 1. Human soft chew Ibuprofen dissolution results.](image1)

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![Figure 2. Human soft chew Ibuprofen 6 month stability results under ambient and accelerated 40°C conditions.](image2)

Figure 2. Human soft chew Ibuprofen 6 month stability results under ambient and accelerated 40°C conditions.

However, these initial results do indicate that Ibuprofen is compatible with this soft chew technology under storage of ambient and accelerated conditions as described.

CONCLUSION

Piedmont’s soft, easily chewable format is presumed to allow fast and effective swallowing of a range of actives. Production process takes place at ambient temperatures, which gives excellent API stability. Formulation maintains a soft like texture throughout shelf life.

REFERENCES


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