CAPSULE FRAGMENT ENUMERATION COMPARISON BETWEEN
APTAR PHARMA TWISTER® DPI DEVICE AND OTHER MARKETED DEVICES
WITH VARIOUS TYPES OF CAPSULES

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INTRODUCTION

It is known that some DPI capsules, e.g., gelatin, can become more brittle when they lose some of their moisture content and can therefore potentially generate more fragments during capsule opening [1,2]. It is important to take into consideration “foreign particulates” [3] when developing a new device, to ensure that the patient does not inhale large fragments that may cause discomfort to the patient and hence, affect the inhalation and the distribution of the API to the lungs. Two methods are currently used in marketed devices to enable the powder to exit the capsule: either puncturing the capsule with a pin system or by rotating the device to remove totally or partially the top of the capsule.

The current study focuses on the capsule fragment identification and enumeration when using Aptar Pharma Twister® DPI device (Figure 1), which is a rotating system, in comparison to other marketed devices with either rotating or puncturing capsule opening systems, used with various capsule types.

METHODS AND MATERIALS

Aptar Pharma Twister® DPI device, marketed rotating and puncturing devices
Size 3 hard gelatin & hydroxyl-propyl-methyl-cellulose (HPMC) capsules
Dose unit sampling apparatus (DUSA) with filter membrane, TMTP 5 μm
Test conditions, 4 kPa, 4L (USP [4]), 20+/-2°C, 40-60%RH
Purified water (filtered at 0.22 μm)
3 samples measured per series, one capsule per measurement
Microscopic identification and enumeration, Zeiss KL1500, x10
Size ranges, 50-100 μm and >100 μm, see Figures 2, 3 and 4

RESULTS AND DISCUSSION

Figure 2: Capsule fragment enumeration of Twister® with Gelatin and HPMC capsules (n=3, ± StDev)

Figure 2 illustrates that only a few fragments are generated when using Twister® with both Hard Gelatin and HPMC capsules. However, it seems that more fragments are generated with HPMC capsules in the range 50-100 μm, which impacts on the overall result.

Figure 3: Hard Gelatin capsule fragment enumeration comparison between Aptar Pharma Twister® device and one rotating opening device and two different puncturing devices (n=3, ± StDev)

Figure 3 illustrates that only a few fragments are generated when using the Hard Gelatin capsules for all the 4 different devices, for fragment between 50-100 μm. However, fewer capsule fragments are generated with Twister® when considering fragments larger than 100 μm.

Figure 4: HPMC capsule fragment enumeration comparison between Aptar Pharma Twister® device and one rotating opening device and two different puncturing devices

Figure 4 results indicate that HPMC capsules lead to similar levels of fragments generated by all 4 devices tested, with slightly higher readings in the 50-100 μm range compared to gelatin capsules.

CONCLUSION

Based on the test results generated to date, only a few capsule fragments in the range of 50-100 μm and larger than 100 μm are generated when using gelatin or HPMC capsules with Twister® (which is a rotating system DPI device) or with puncturing system DPI devices and another rotating opening system device, under controlled room conditions.

However, fewer capsule fragments are generated with Twister® in these specific size ranges, when using gelatin capsules. In addition, Twister® DPI device has other advantages including a transparent dosing chamber allowing easy visual feedback for the patient and furthermore, the patient can avoid direct handling of the empty capsule and thus drug contact during capsule removal.

REFERENCES