GASTRIC EMPTYING OF IBUPROFEN SOLUTION AND SUSPENSION FORMULATIONS: A SCINTIGRAPHIC ASSESSMENT

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INTRODUCTION

Solutions are a more pharmaceutically elegant presentation than either suspensions or emulsions but are difficult to achieve with poorly soluble drugs.

A novel solution of ibuprofen was developed at the University of Strathclyde and the purpose of this study was to compare the gastric emptying profiles of a commercially available ibuprofen suspension with this novel ibuprofen solution. The novel ibuprofen solution was formulated on the premise that ibuprofen, in its solubilised form, would have a similar gastric emptying profile but a superior absorption rate and therefore provide a more rapid onset of pain relief.

EXPERIMENTAL METHODS

A single-centre, randomised two-way crossover study in 10 healthy male volunteers (age 26 ± 8.2 years; weight 72.5 ± 7.8 kg) was conducted.

Subjects were dosed with either the novel ibuprofen solution (A) or the commercially available ibuprofen suspension (B) 30 min after a light breakfast of one scrambled egg, one slice of lightly buttered toast and decaffeinated coffee or tea.

The liquid formulations, radiolabelled with approximately 4 MBq ^{99m}Tc-DTPA, were syringed into the subjects' mouths and then swallowed without water.

Anterior and posterior scintigraphic images of the torso were taken at regular intervals starting immediately after dosing until complete gastric emptying (GE) was noted.

Onset of GE was determined visually, and quantification of radioactive counts within the stomach provided gastric emptying profiles and time to 50% and 90% gastric emptying ($t_{50\%}$ and $t_{90\%}$ respectively).

RESULTS AND DISCUSSION

Scintigraphy showed that, as predicted, the ibuprofen solution and suspension exhibited similar GE times (Table 1, Figure 1 and Figure 2).

Table 1 - Gastric emptying parameters of test ibuprofen solution and comparator ibuprofen suspension.

	Solution			Suspension		
	Onset of GE (min)	$t_{50\%}$ (min)	$t_{90\%}$ (min)	Onset of GE (min)	$t_{50\%}$ (min)	$t_{90\%}$ (min)
Mean	8.8	49.9	109.9	8.9	36.0	95.6
Median	7.5	50.4	108.0	8.8	33.6	90.6
Min	2.5	28.2	68.4	2.5	23.4	64.2
Max	27.5	72.6	167.4	12.5	61.8	148.8
St Dev	8.0	13.5	35.6	3.3	10.5	27.3
n	9	9	9	10	10	10

Increased gastric residence of ibuprofen may lead to an increased incidence of gastric-related side effects; none were reported in this pilot study.

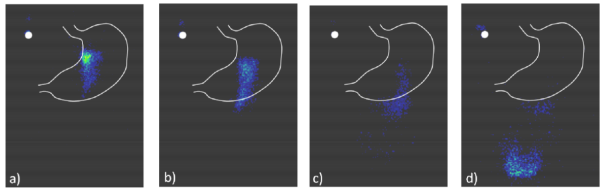

Figure 1 Anterior scintigraphic images of key events in the gastrointestinal (GI) transit of the ibuprofen suspension in subject 002 at various times post-dose. a) t = 0 min; b) t = 10 min (onset of GE 7.5 min); c) t = 50 min ($t_{50\%}$ = 46.8 min) and d) t = 120 min ($t_{90\%}$ = 120 min).

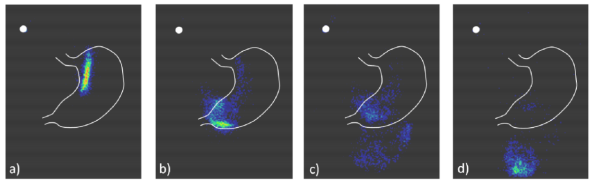

Figure 2 Anterior scintigraphic images of key events in the GI transit of the ibuprofen solution in subject 002 at various times post-dose. a) t = 0 min; b) t = 10 min (onset of GE 7.7 min); c) t = 30 min ($t_{50\%}$ = 28.8 min) and d) t = 90 min ($t_{90\%}$ = 87.6 min).

CONCLUSION

Scintigraphy was successfully utilised in this study to evaluate the differences in gastric emptying of two liquid ibuprofen formulations. Conducting this simple study at the early developmental stages of this novel formulation enabled detection of a physiological effect which may not have been predicted using *in vitro* methods. Strategic reformulation of this ibuprofen solution may now be possible using this data.

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