

Perception of oral grittiness: Influence of formulation variables

Felipe L. Lopez¹, Alexandra Bowles¹, David Clapham², Terry B. Ernest², Joanna Lewis³, Mine Orlu-Gul¹ and Catherine Tuleu¹.

¹UCL School of Pharmacy, University College London, 29 - 39 Brunswick Square, London WC1N 1AX, UK.

²GlaxoSmithKline, New Frontiers Science Park, Third Avenue, Harlow, Essex CM19 5AW, UK.

³UCL CoMPLEX, University College London, Gower Street, London WC1E 6BT, UK.



ABSTRACT



Oral grittiness negatively affects palatability of oral formulations such as suspensions, reducing acceptability of medicines and compliance to a therapeutic regime. In this work, oral perception of grittiness was studied by human panels through direct scaling on a visual analogue scale. Formulation factors such as particle size, particle concentration and viscosity all affected the perception of grittiness. Particle concentration appeared to be the most significant. Less gritty samples were regarded as more pleasant by the subject of the study.



INTRODUCTION

Oral grittiness is an undesired sensation that limits the palatability of oral medicines such as suspensions. This is particularly important in the case of paediatric medicines, where the palatability of the product is critical to ensure acceptability and thus compliance [1]. The study of the formulation factors that affect oral grittiness is therefore important. However, limited data is available on this topic.

AIM

To study the effect of formulations variables (particle size, particles concentration and viscosity) on the perception of grittiness of oral suspensions assessed by human panels.

MATERIALS AND METHODS



Cellulose pellets (Cellelets®) in HPMC aqueous suspension.

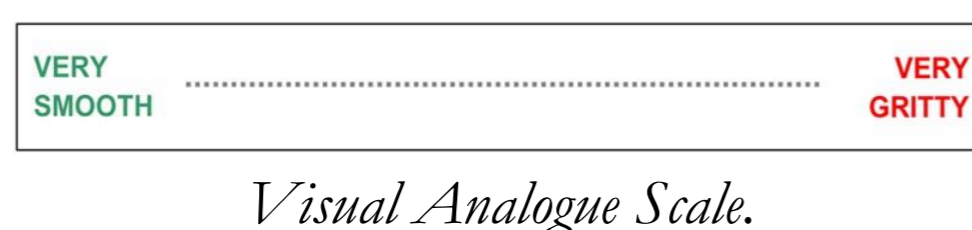
Table 1. Formulation variables.

	Pellet size (microns)	[Pellets] (mg/5ml)	[HPMC] (%w/w)
Low	90	125	0.5
Med	127	250	1.0
High	263	500	2.0
- Ctrl	n/a	n/a	0.5
+ Ctrl	500	500	0.5



N = 30, 18-28 y/o.

The panel members rinsed 10 ml of each sample in the mouth (ca. 10 seconds) and rated the grittiness on a 100 mm scale:



Visual Analogue Scale.

Positive and negative non-blinded controls were tested first. Then, samples were given in a randomised order.

Statistical analysis was conducted by means of mixed-effects modelling using R-Studio software (Free Software).

After the test subjects selected the "two most pleasant" samples.

RESULTS AND DISCUSSION

Graphical evaluation. The three variables tested (particle size, particle concentration and HPMC content) had an impact on the grittiness perception. As depicted in Figure 1:

- The grittiness perception increased with an increase of the particle size.
- Similarly, grittiness perception increased with increasing particle concentration.
- Contrary, grittiness perception decreased with increasing viscosity (i.e. HPMC content).
- Samples selected as 'most pleasant' were usually correlated with a low grittiness score.
- Highly viscous samples were less ranked as 'most pleasant' despite of being 'less gritty'.

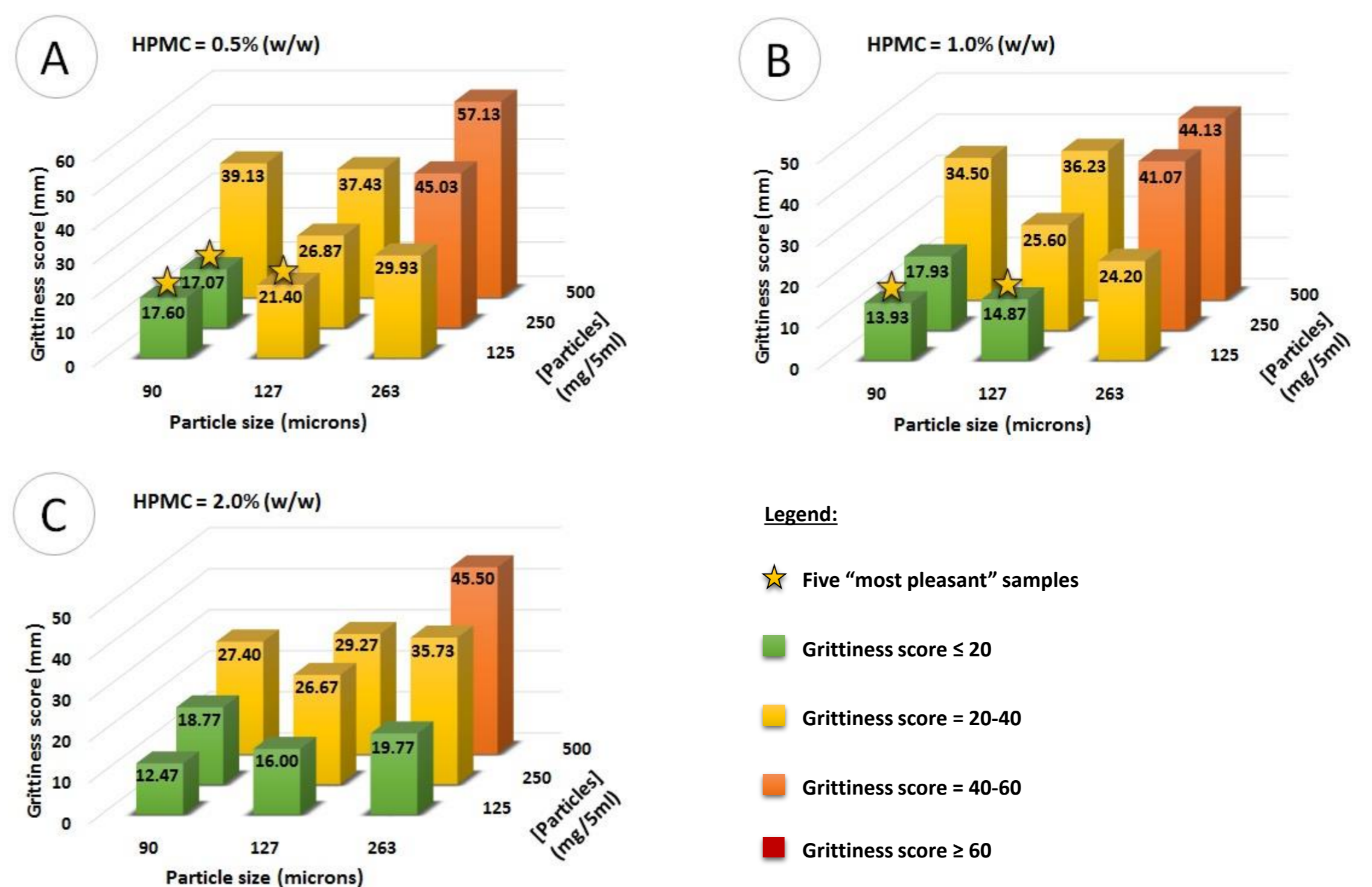


Figure 1. 3D plots showing the effect of particle size, particle concentration and HPMC concentration on the average grittiness score of oral suspensions assessed by human panels on a visual analogue scale.

Mixed-effects model. On average, subjects rated particle size 90 μ m, concentration 125 mg/5ml and HPMC 0.5% w/w (i.e. Low level of all factors) at 15.9 ± 8.7 mm on the scale. An increase of any of the factors altered the response as indicated in Table 2:

Table 2. Deviation of the response (grittiness) produced by an increase of each factor (formulation variable).

	Particle size	Particle concentration	Viscosity, i.e. [HPMC]
From Low to Medium level	3.9 ± 5.9 mm	9.4 ± 4.5 mm	$- 4.3 \pm 5.5$ mm
From Low to High level	16.0 ± 9.4 mm	20.1 ± 9.6 mm	$- 6.7 \pm 16.8$ mm

The model including all three formulation variables was better than a model without any one of the three ($p < 0.0001$ in each case), so all three factors are significant.

CONCLUSIONS AND FUTURE WORK

Formulation factors such as particle size, particle concentration and viscosity affect the grittiness of suspensions, as supported by previous studies [2-3]. In the ranges tested, particle concentration appears to be the most significant factor affecting grittiness. This is also in line with a previous study [3]. An increase of viscosity may be beneficial to reduce oral grittiness. However, highly viscous suspensions may result less pleasant formulations. The order of administration of the samples may affect the way that subjects perceived grittiness. This will be taken into consideration in future studies.

ACKNOWLEDGEMENTS



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