Challenges of sensory evaluation (palatability/acceptability) of pharmaceutical products for *adults and* children

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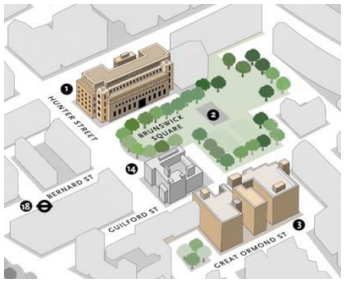


IFST Sensory Science Group Conference June 16 2016

Today's snapshot

- Opportunities for sensory analysis during the development of (paediatric) medicines
- The EU paediatric medicine regulation: 9 years down the line

- Acceptability and Palatability of medicines

-Methodological similarity/differences with food sensory research
a case study: 'to select or not to select'
- *Moving towards non human tools?*

Official (regulatory) definitions

- Acceptability is an **overall ability** of the patient and caregiver (defined as ‘user’) **to use a medicinal product as intended** (or authorised).

vs

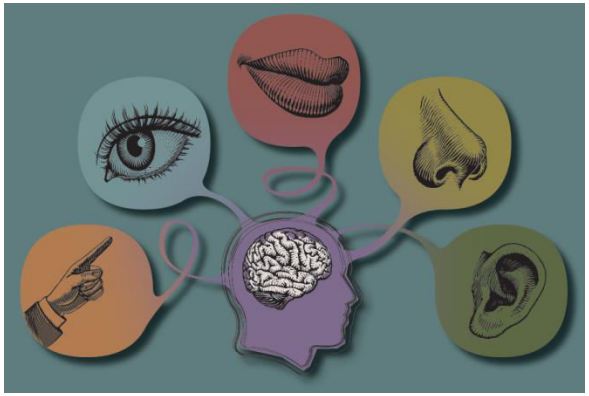
- Acceptability of a medicinal product is likely to have a significant impact on the **patient’s adherence** and consequently is likely to have an **impact on safety and efficacy** of the product.

Characteristics of medicinal product

- **Palatability** *(one of the main but not exclusive elements)*
  - appearance (e.g. colour, shape, embossing, etc.)
  - swallowability (size/shape, integrity of dosage form (e.g. coating)
- Required dose (e.g. dosing volume, number of tablets, break marks, etc.)
- Required dosing frequency and duration of treatment
- Actual mode of administration
  - Complexity of modification prior to administration (if required)
  - Selected administration device (if any)
- Container closure system (primary and secondary)

(physical and behavioural) age appropriate / clinically relevant

- **Palatability** is defined as the **overall appreciation** of a (*often oral*) medicine by organoleptic properties such as vision (**appearance), smell, taste, aftertaste and mouth feel** (e.g. texture, cooling, heating, trigeminal response), and possibly also sound **(auditory clues).**



- It is determined by the characteristics of the components (**Active Substance and Excipients**) and the way the active substance is **formulated into a medicine.**

- *Palatability is also relevant for other routes of administration e.g. buccal, nasal, inhalation use, and whenever the product may contact the taste receptors indirectly e.g. by deposition in the throat, post nasal run off, etc.*

Children DO NOT think that the worse a medication taste, the better it works!

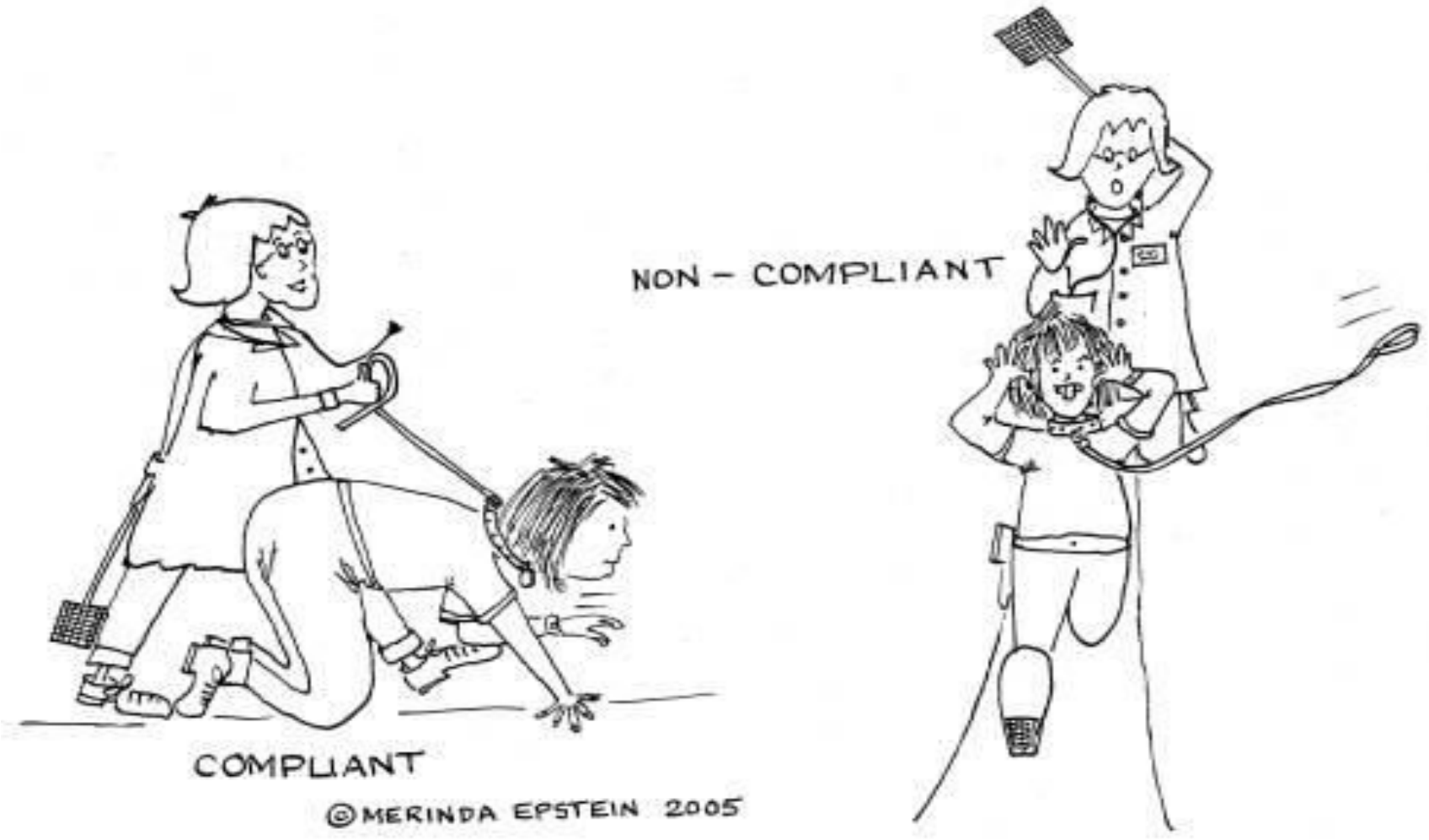
A survey of over 800 paediatricians on barriers to treatment completion for children with acute/chronic illnesses:
Frequency of dosing (96%/91%)
Unpleasant taste (91%/84%)
Side effects of medication (88%/88%)
American Society of Pediatrics; 2000

A survey of 500 parents [Ascent Pediatrics, Inc.] indicated that ~50% of children refuse to take their medication at some time and that, for the **75% of those who were noncompliant, the reason reported was related to a drug's taste**.
C.-P. Milne et al, Clin Ther 2008 30 (11) 2133-2145

Taste was the most commonly reported barrier to medicines administration affecting 35% (188/542) of all prescribed oral formulations, and associated with 64% (54/85) of formulations that were refused.
Venables, R., Int J Pharm, 480 (2015) 55-62.

Palatability remains one of the key reasons for rejection of medication in young children.

Is the future bright?



Since January 2007 the Paediatric Regulation came into force in EU and obliges pharmaceutical companies to develop paediatric medicines

27.12.2006 EN Official Journal of the European Union L 378/1

I

(Acts whose publication is obligatory)

REGULATION (EC) No 1901/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 12 December 2006

on medicinal products for paediatric use and amending Regulation (EEC) No 1768/92, Directive 2001/20/EC, Directive 2001/83/EC and Regulation (EC) No 726/2004

(Text with EEA relevance)

EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

A system of OBLIGATIONS and INCENTIVES

PIP

Early in development (end of phase 1 in adults)

	studied.	
Acceptability or palatability testing	The acceptability, including palatability, of <specify the dosage form, e.g. oral solution, oral suspension, etc.> should be confirmed during the clinical trial with the target population. or (if relevant) Acceptability of <specify the dosage form, e.g. tablets, capsules, etc.> should be tested during the clinical trial with the target population.	Whenever an oral liquid formulation is proposed, it is advisable to include a request for confirmation of acceptability of this formulation during a trial with the target population. In case of liquid formulations, acceptability includes palatability testing (taste, texture, flavour, etc.). In case of tablets, especially when proposed to the younger subsets of paediatric patients (6 – 8 years of age), or when the tablets size is large, their acceptability should be investigated and confirmed. Usually palatability testing for tablets is not needed. Due dates for acceptability (palatability) testing should be aligned with due dates for clinical studies during which the testing takes place. Having different deadlines may result in submission of the data as part of another application (due to compliance check rule).

European Medicines Agency
Pre-authorisation Evaluation of Medicines for Human Use

London, 23 June 2005
EMEA/CHMP/PEG/194810/2005

COMMITTEE FOR MEDICINAL PRODUCTS FOR HUMAN USE (CHMP)

REFLECTION PAPER: FORMULATIONS OF CHOICE FOR THE PAEDIATRIC POPULATION

AGREED BY PAEDIATRIC WORKING PARTY & QUALITY WORKING PARTY	May 2005
ADOPTION BY CHMP FOR RELEASE FOR CONSULTATION	23 June 2005
END OF CONSULTATION (DEADLINE FOR COMMENTS)	31 December 2005

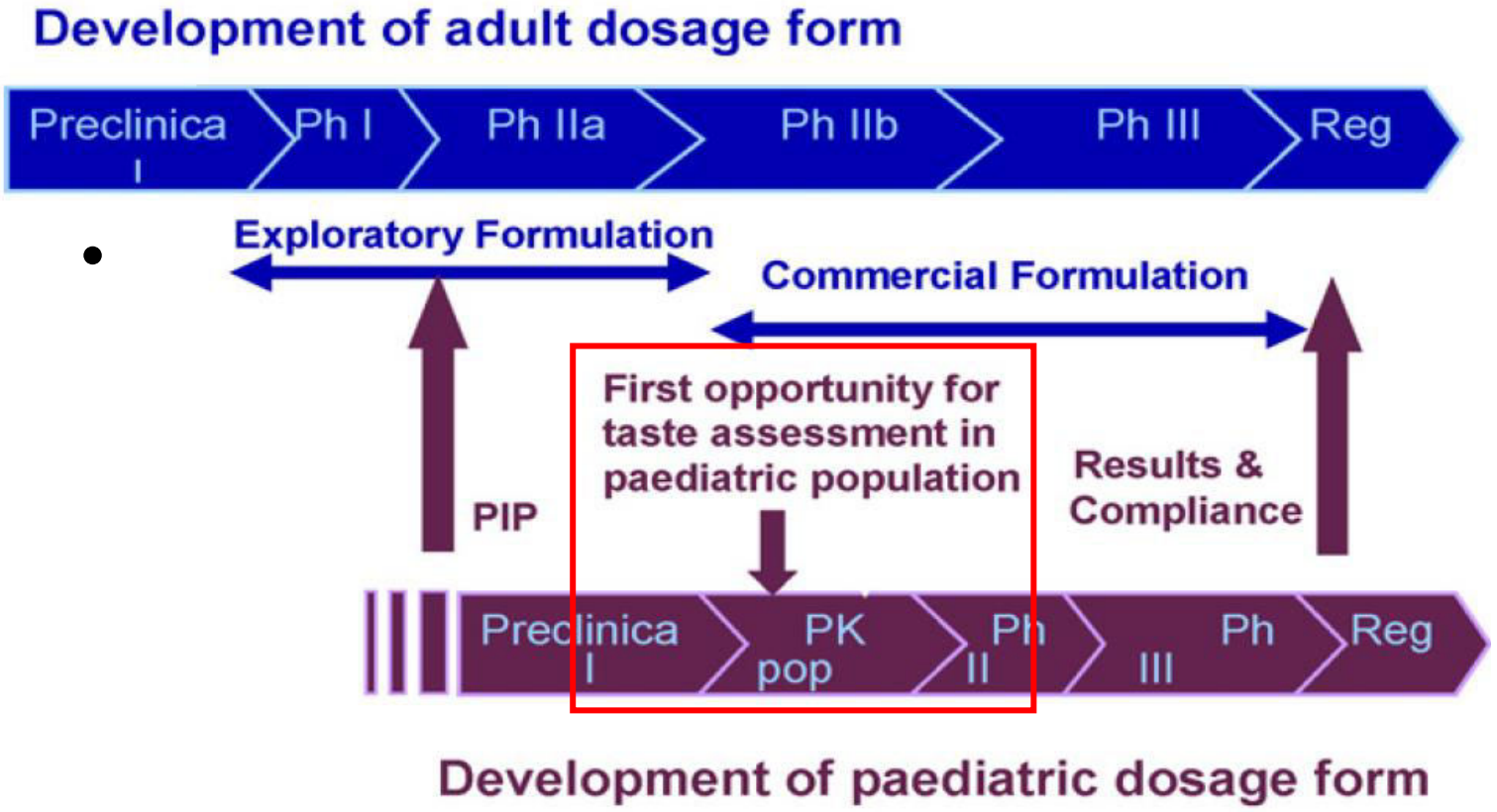
EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

1 August 2013
EMA/CHMP/QWP/805880/2012 Rev. 2
Committee for Medicinal Products for Human Use (CHMP)
Paediatric Committee (PDCO)

Guideline on pharmaceutical development of medicines for paediatric use

Table of contents

"It is recommended that taste assessment is conducted hand-in-hand with formulation development"…catch 22!



Adult Program

- *Taste as criteria for compound selection?*
- Phase I studies – adult.

Paediatric Program

- *In vitro methods?*
- *Adult volunteers?*
- Part of the pediatric clinical studies.
- Other means and confirm post marketing

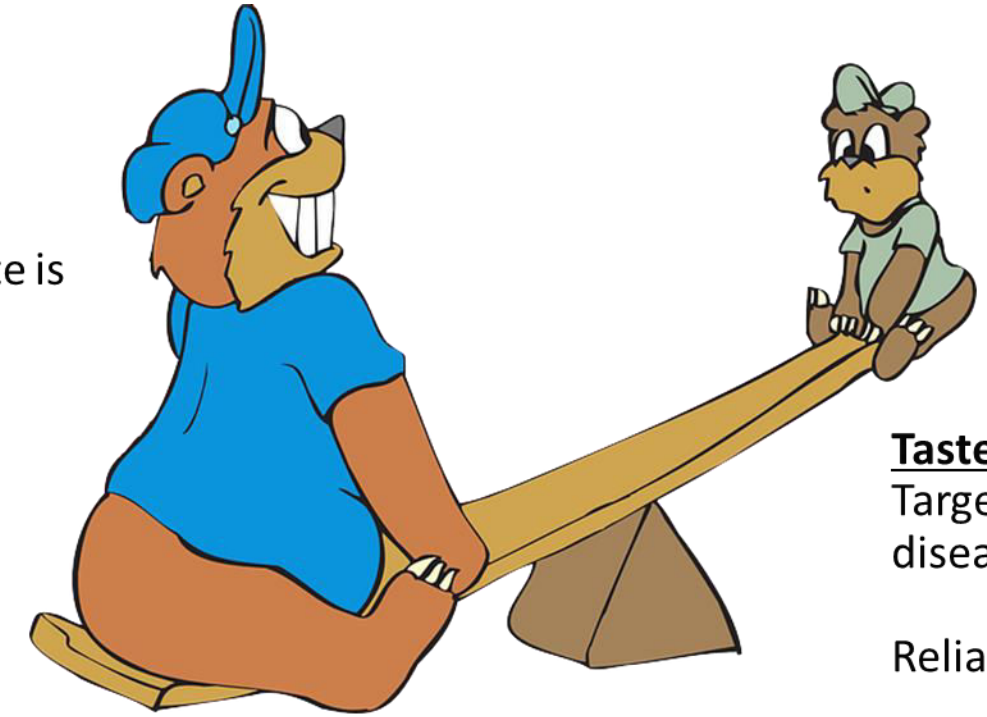
Int J Pharm. 2009 Jan 5;365(1-2):1-3. doi: 10.1016/j.ijpharm.2008.09.015. Epub 2008 Sep 19.

Challenges of developing palatable oral paediatric formulations.

Cram A[1], Breitkreutz J, Desset-Brèthes S, Nunn T, Tuleu C; European Paediatric Formulation Initiative (EuPFI).

Taste Test in Adults
Adult perception of taste is different from children

Data transferable to pediatrics / consider bridging studies



Taste Test in Children
Targeted age group and disease state.

Reliability of method

Ethics

15. Trials with healthy children

In principle, healthy children should not be enrolled as healthy volunteers, because they cannot consent and are vulnerable like children with a disease or condition. Studies should not be performed in children when they can be performed in adults. Exceptions could be where healthy children participate in palatability testing such as swill and spit taste testing for a new flavoured medicine.

EMA, Ethical considerations for clinical trials on medicinal products conducted in pediatric population, 2008.

A. Cram et al, Int J Pharm, 365 (2009) 1-3.; P. Kozarewicz, Int J Pharm, 469 (2014) 245-248.

Later phase 'panels'

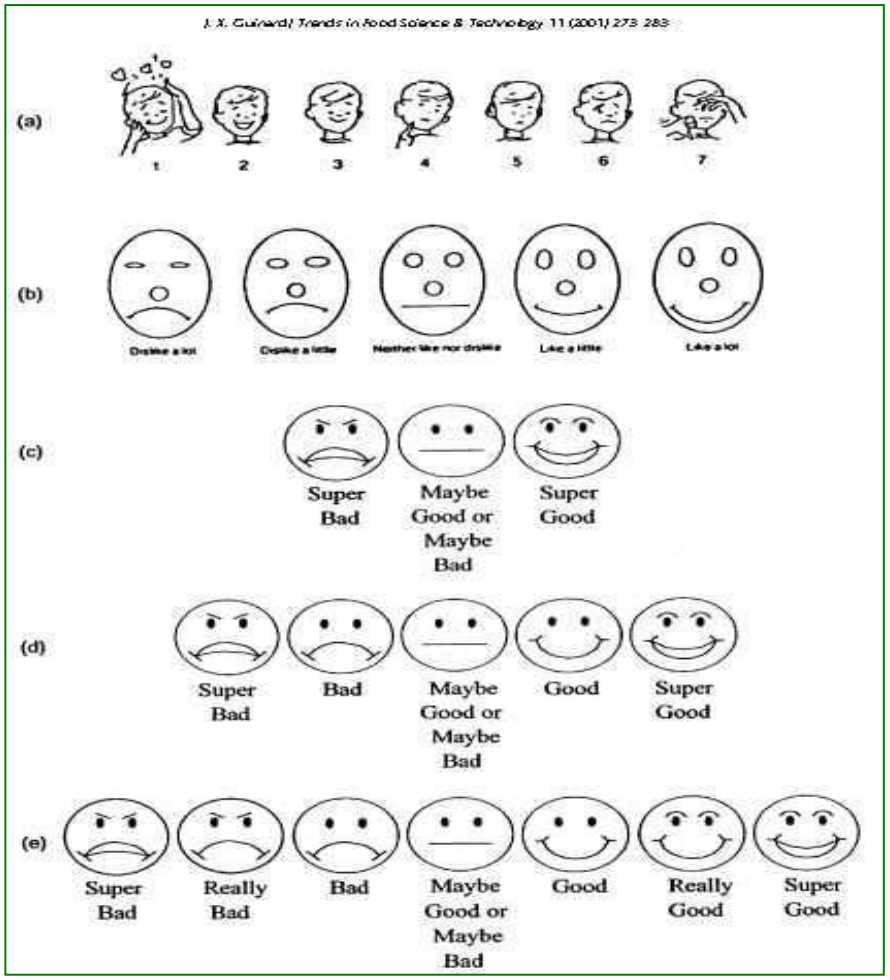


Table III. Measurement scale used with children in relation to cohort age

Measurement tool	Age group (years)
2-point Hedonic scale	3-5[34]
3-point hedonic scale	4-7[45]
4-point Hedonic scale	5-13[34]
5-point Hedonic scale	3-12,[37] 4-9,[40] 5-8,[39] 5-9,[38] 5-10,[21] 5-11,[35] 6-11,[33] 6-12[41]
Sex-specific 5-point Hedonic scale	4-8[18]
Sex-specific 5-point Hedonic scale	4-8[19]
10-point Hedonic scale	3-8[28]
10-cm VAS (very bad to very good)	15-19[24]
10-cm VAS (really good to really bad)	8-17,[28] 5-9,[27] 4.2-11,[29] 4-7,[25]
Rank order in between 2 products	4-8[31]
Rank order in between 3 products	Not specified[17]
Verbal response	
Taste "good," "not good," or "very bad:"	
Converted to 1-3 scores	Old enough for verbal assessment (>1)-7[44]
Converted to 1-5 scores	3-10,[36] 3-12[37]
Converted on scale 1 to 10	8-17[45]
No details	5-10[26]

*Guinard FX. Sensory and **consumer testing** with children Trends in Food Science & Technology 11 (2001) 273–283*

Davies & Tuleu. 2008 Journal of Pediatrics. 153, 599-604.

Regulatory expectations?

"The choice of the **method** and the **acceptance criteria**, as proposed by the applicant, should be described and justified for the **intended aim**. The suitability of the chosen method and the appropriateness of the limits to be applied should be discussed and justified in terms of **benefit-risk considerations**

…including risks at population level (e.g. emergence of resistance), and should take account of the characteristics of the target age group, the condition relevant to the medicine, incidental and multiple use and co-medication"

Int J Pharm. 2014 Aug 5;469(2):245-8. doi: 10.1016/j.ijpharm.2014.03.057. Epub 2014 Apr 1.

Regulatory perspectives on acceptability testing of dosage forms in children.

Kozarewicz P[1].

Author information

[1]Specialised Scientific Disciplines Department, Quality of Medicines, European Medicines Agency (EMA), 7 Westferry Circus, Canary Wharf, London E14 4HB, United Kingdom. Electronic address: piotr.kozarewicz@ema.europa.eu.

Several methods described in the literature

BUT knowledge still fragmented

- an internationally harmonized method has not yet been developed
- iUK

P.R.O. 2016

SPaeDD-UK: *Smart Paediatric Drug Development - UK*

Accelerating paediatric formulation development

An open innovation R&D project

http://www.paediatricscienceuk.com

The ambition of the Consortium is to establish an industry standard framework and suite of tools to develop safe and efficacious paediatric dosage forms:

- Taste evaluation
- Acceptability testing
- Prediction of human exposure in children
- Technology platforms for paediatric medicines

Numerous aspects need to be further explored, including:

- **design of studies** incl. number of subjects involved, questionnaires to patients and/or caregivers, type of scales used etc.
- **acceptance criteria**
  - eg 100% 80%? What % is ‘acceptable’?

Production of Zinc Tablets and Zinc Oral Solutions

Guidelines for Programme Managers and Pharmaceutical Manufacturers

World Health Organization · unicef · USAID FROM THE AMERICAN PEOPLE

USP DQI United States Pharmacopeia Drug Quality and Information Program · JOHNS HOPKINS BLOOMBERG SCHOOL of PUBLIC HEALTH

World Health Organization

Design of the acceptability study

Acceptability tests must be considered as clinical studies performed by qualified personnel with Ethical Committee approval and informed consent from parents or guardians.

This acceptability studies should be conducted in communities, in children with acute diarrhoea, who have been prescribed dispersible zinc tablet (one 20-mg tablet per day for 10 days). Blister packs of zinc tablets are given to selected drug-sellers and healthcare providers in the community. A visit to the home of the children prescribed zinc dispersible tablets is arranged 2 weeks after to assess acceptability of and adherence to the instructions for zinc treatment.

The study population should include children aged 3–59 months with an acute diarrhoea episode, whose caretakers sought assistance from one of the selected drug-sellers or healthcare providers and are provided with the zinc blister pack.

Sample size

To identify a ± 7.5% minimal difference in acceptability between children aged over and below 18 months with an anticipated 70% acceptability (p), setting the level of confidence at 95% ($z = 1.95$), the resulting sample size estimate is 140 children per group. To adjust for potential drop-outs, it is necessary to add 10 children in each group, for a final target sample of 300 children (150 in each age-group).

5.2 Evaluation of acceptability and adherence to treatment

Adherence to the treatment regimen for 10 to 14 days is essential to ensure the full effect of zinc for the prevention and treatment of diarrhoea. However, adherence to treatment can be obtained only if the zinc products promoted for use in the management of diarrhoea are acceptable to infants and young children.

So, it is strongly advised that all zinc products considered for use in the management of diarrhoea be tested for acceptability using a standard methodology. Such a methodology (Annex 8) should allow one to precisely determine the proportion of children receiving zinc for a duration considered satisfactory. As a general guideline, a treatment may be considered to have good acceptability if 80% of the prescribed treatment is taken by at least 70% of the children.

t

ised for acceptability and adherence are:

Acceptability is measured on the basis of a caretaker's report of his/her child's behaviour when given the medicine. The caretakers are asked about their perception of taste of the zinc tablet given to their children compared to other medicines. The response options are better, same, or worse than other medicines.

Adherence is defined in relation to the dose given, frequency of daily administration, duration of treatment, and preparation (dispersion) of the tablets.

EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

10 July 2014
EMA/CVMP/EWP/206024/2011
Committee for Medicinal Products for Veterinary Use (CVMP)

Guideline on the demonstration of palatability of veterinary medicinal products

'…voluntary full consumption within the maximum offering time…'

7.4. Criteria to grant a palatability claim

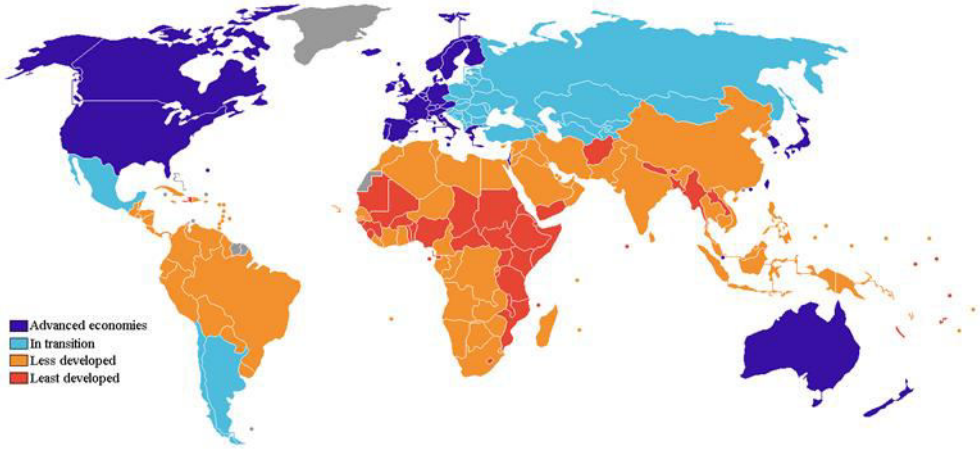
To be granted a palatability claim, the overall voluntary acceptance rates should at least reach the threshold of 80% in dogs and 70% in all other species. The threshold should be reached in a group of at least 50 animals if the product is administered only once. The threshold should be reached in a group of at least 25 animals if the product is for at least two administrations.

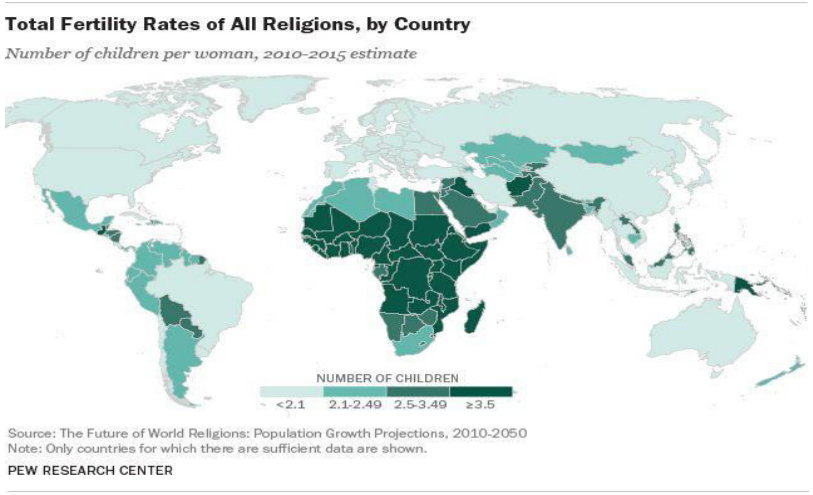
In cases where palatability is evaluated as part of clinical studies with similar testing conditions, none of which have 25 or 50 animals treated with the investigational VMP, the results obtained could be pooled to accumulate the required number of animals in the studies.

Formulation development - earlier phase and panels of healthy adult volunteers

What to learn from the *modern sensory and consumer science of* food industry?

- The market
  - Pharma (small) vs Food (Big)
  - Global
  - Development geared towards more developed countries where there is less kids
  - Rx market not driven by competitive sales (excl. OTC)





- *Soft food to administer medicines (as administration vehicle/taste masking effect)?*
- *Flavouring? Level of sweetness acceptance…*

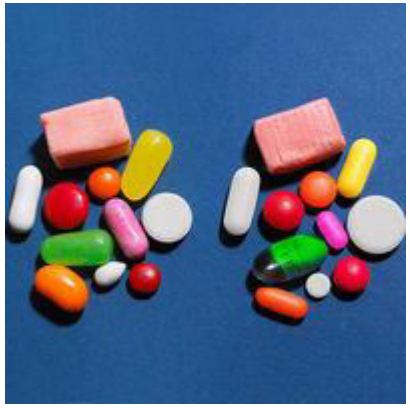
Pharma vs Food

- Start point….Endpoint

BAD (bitter, metallic… AVERSIVE)

→ OK →

- Product attribute
  - limited
  - can't be attractive (Rx)



- Product quality for testing:
  - GMP

Socio-demographics

Age (direct vs proxi measurement)

Environment (*parents*) influence

gender, genetics…

Panel healthy ~~(sick)~~ volunteers)

Methodology

Questionnaires/ Scale used

stats

Setting

is it a CT?

End point

Product development

Benchmarking – generics!

Degree of liking (preference) =many naïve subjects

Vs

Degree of tolerance (acceptability) = few trained subject (patients?)

QC

Methodology

- Swallow /swirl-spit
- 5ml?->15ml?

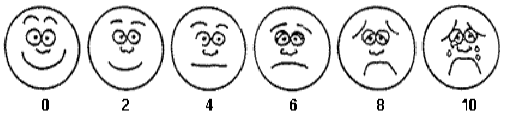
5sec?->15 sec?

- Single vs repeated exposure(compliance)

Pain scale

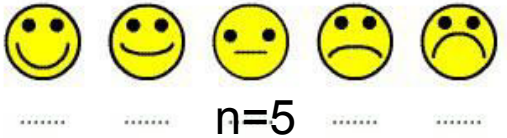
3yo+, self report

Wong & Baker, 1988



n=6

Aversiveness scale



n=5

P.R.O. iUK 2016

MHRA
Regulating Medicines and Medical Devices

IS IT A CLINICAL TRIAL OF A MEDICINAL PRODUCT?

This algorithm and its endnotes will help you answer that question. Please start in column A and follow the instructions. Additional information is provided in the notes at the end of the table. If you have doubts about the answer to any of the questions contact the clinical trials unit of your competent authority.

A	B	C	D	E
A CLINICAL TRIAL OF A MEDICINAL PRODUCT?				A NON-INTERVENTIONAL CLINICAL TRIAL?
Is it a medicinal product (MP)?[i]	**Is it not a medicinal product?**	**What effects of the medicine are you looking for?**	**Why are you looking for those effects?**	**How are you looking for those effects?**
If you answer no to all the questions in column A, the activity is not a clinical trial on a MP. If you answer yes to any of the questions below go to column B.	If you answer yes to the question below in column B the activity is not a clinical trial on a MP. If you answer no to this question below go to column C	If you answer no to all the questions in column C the activity is not a clinical trial under the scope of Directive 2001/20/EC. If you answer yes to any of the questions below go to column D.	If you answer no to all the questions in column D the activity is not a clinical trial under the scope of Directive 2001/20/EC. If you answer yes to any of the questions below go to column E.	If you answer yes to all these questions the activity is a non-interventional trial which is outside the scope of Directive 2001/20/EC. If your answers in columns A,B,C & D brought you to column E and you answer no to any of these questions the activity is a clinical trial within the scope of the Directive.
A.1 Is it a substance[ii] or combination of substances presented as having	B.1		ascertain or fy/compare the cacy[vii] of the	E.1 Is this a study of one or more medicinal products, which have a marketing authorisation in the Member State concerned?
A.2 Does the substance function as a medicine? i.e. can it be administered to human beings either with a view to restoring, correcting or modifying physiological functions by exerting a pharmacological, immunological or metabolic action or to making a medical diagnosis or is otherwise administered for a medicinal purpose?	•  •  • supplements) not presented as a medicine; • A cosmetic product[vi] • A medical device	C.4 To study or verify/compare its absorption, distribution, metabolism or excretion?	ty of the dicine?	2 Are the products prescribed in the usual manner in accordance with the terms of that authorisation? E.3 Does the assignment of any patient involved in the study to a particular therapeutic strategy fall within current practice and is not decided in advance by a clinical trial protocol[viii]?
A.3 Is it an active substance in a pharmaceutical form?		NO		E.4 Is the decision to prescribe a particular medicinal product clearly separated from the decision to include the patient in the study? E.5 Will no diagnostic or monitoring procedures be applied to the patients included in the study, other than those which are applied in the course of current practice? E.6 Will epidemiological methods be used for the analysis of the data arising from the study?

YES (Phase 1 study)

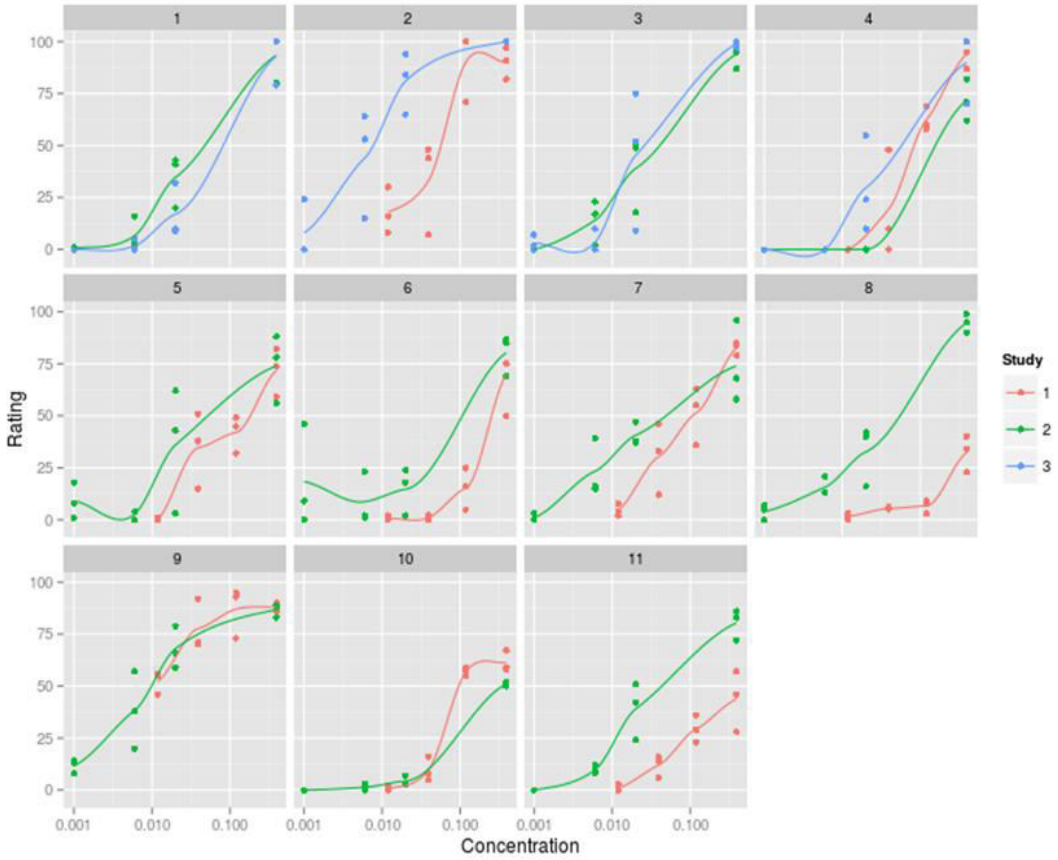
NO

ISO guideline on participant training(/selection?) methodology

Retrospective analysis of 3 studies selection on quinine

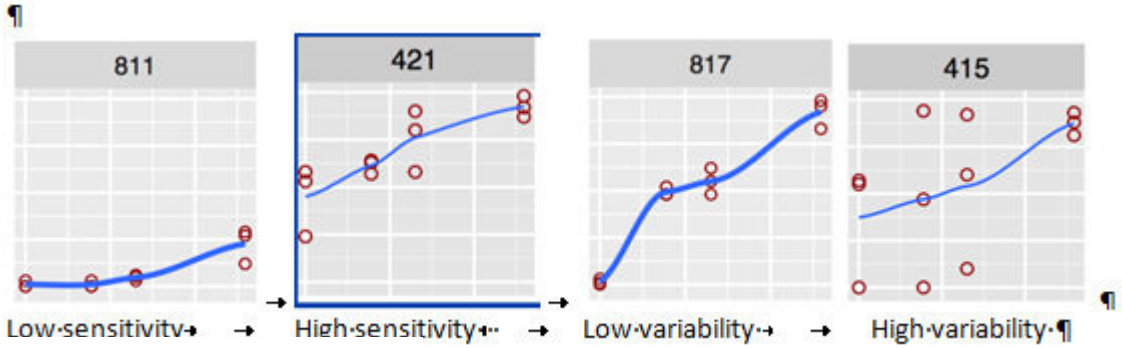
	Sample	APIs
Study 1	N=21 males and females	Quinine hydrochloride Caffeine citrate Diclofenac sodium Sildenafil citrate Paracetamol
Study 2	n=48 males and females	Quinine hydrochloride
Study 3	n=48 males	Quinine hydrochloride

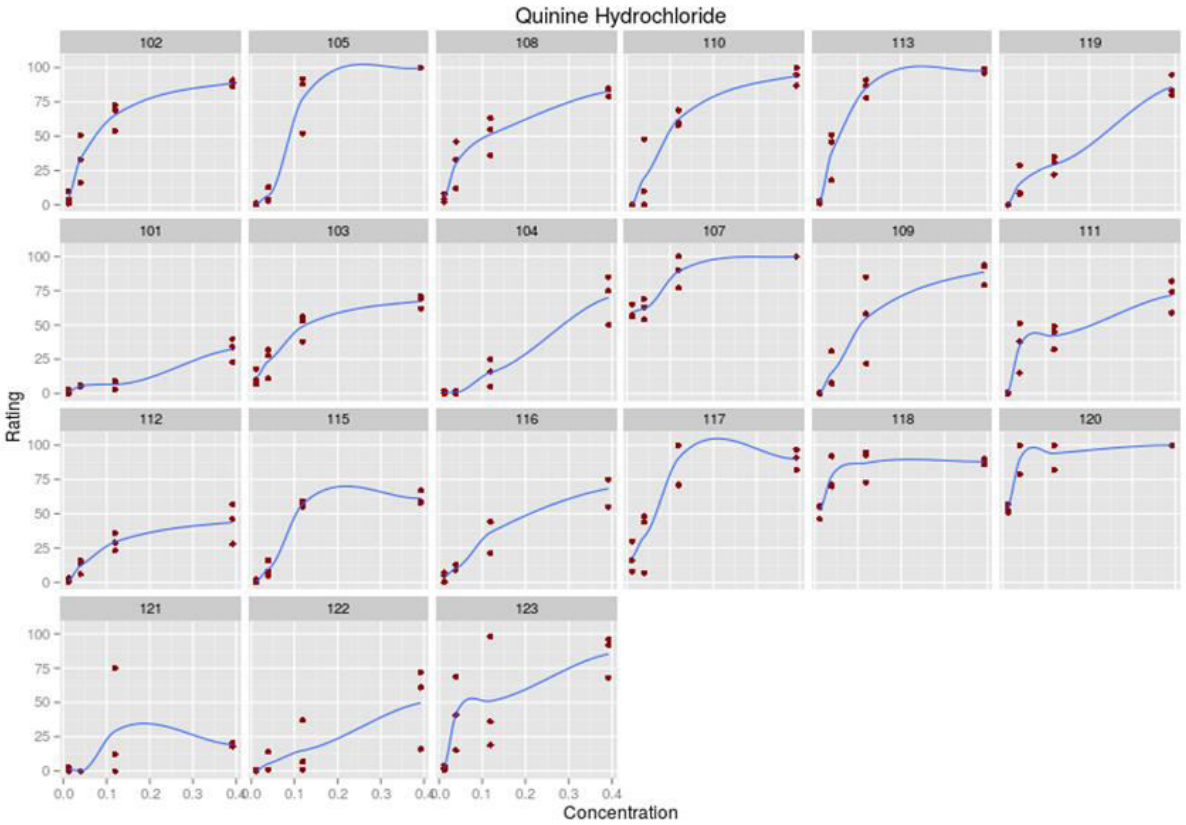
Intra-individual Variability



To select or not to select…

inter-individual variability



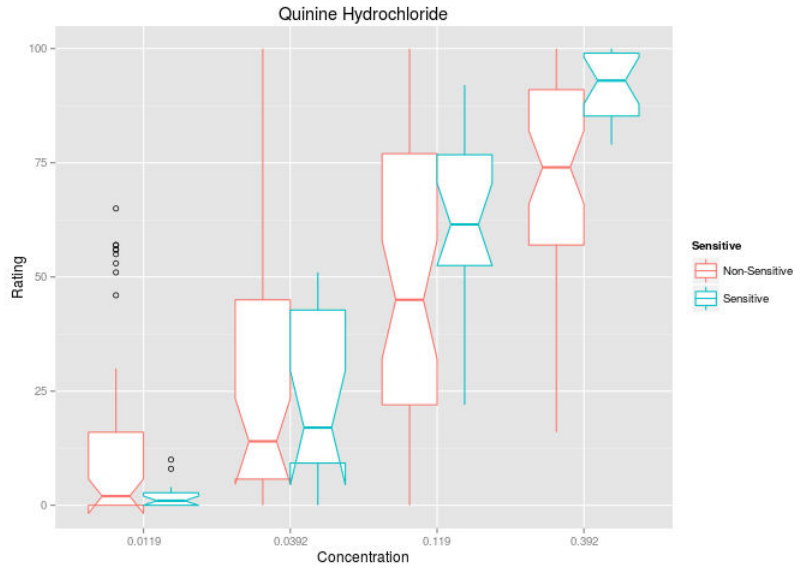


Rationale for selecting participants:

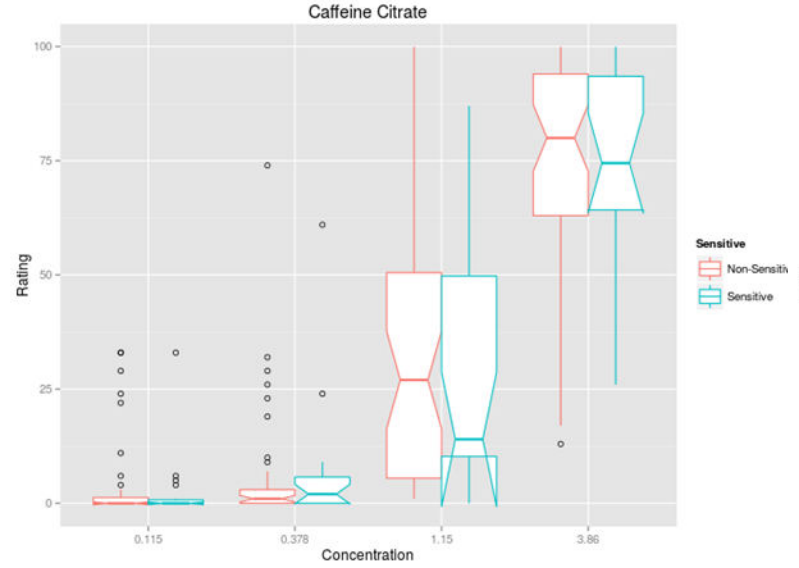
-For lowest [quinine] all ratings <25
-For highest [quinine] all >75
-Range between two ratings of the same concentration no greater than 50

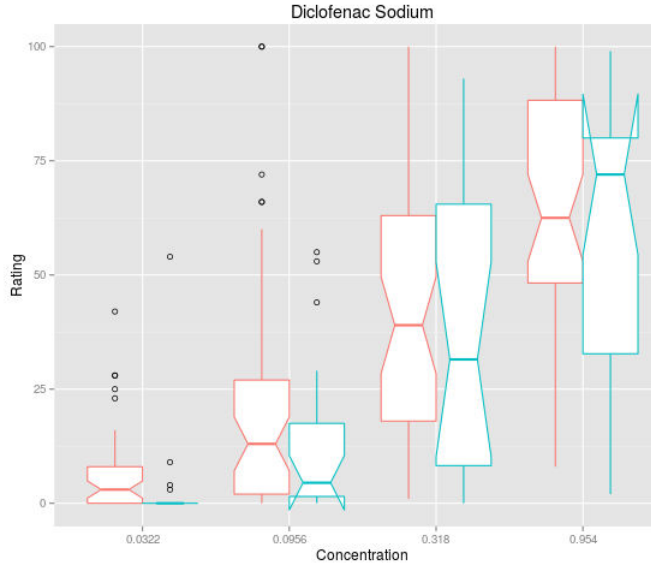
6 participants "sensitive" (the first 6) the remaining 15 as "non-sensitive

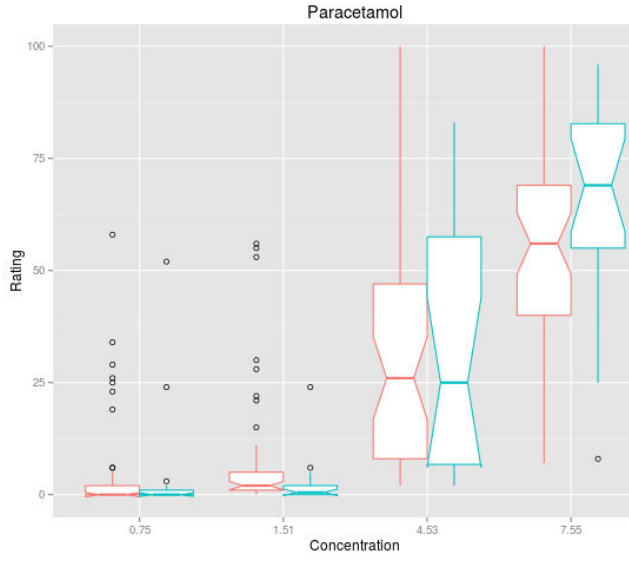
To select or not to select…



"sensitivity selection" to quinine did not necessarily result in participants being significantly more sensitive to other APIs







➢**Need for** screening tools for taste assessment at different stages of the drug development process EARLY PHASE

Pre-candidate stage? → **Selection of salt?** → **Formulation?**

Drug Discovery Today
Volume 21, Issue 7, July 2016, Pages 1170–1180

Review

Non-human tools for the evaluation of bitter taste in the design and development of medicines: a systematic review

Abeer H.A. Mohamed-Ahmed[1], , Jessica Soto[1], Terry Ernest[2], Catherine Tuleu[1]
Show more

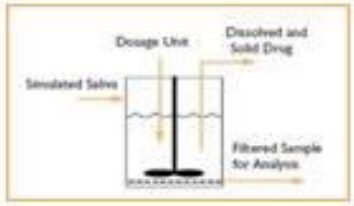
doi:10.1016/j.drudis.2016.05.014

Highlights

- Electronic taste sensing systems give relative taste statement and should be validated with human taste panel tests. Once validated, these sensors can be used for early screening of taste of pure APIs and optimisation of taste masked preclinical formulations in industry.
- Brief access taste aversion model, (mainly rats) have showed good correlation with human taste data. This model can be used for early screening of taste of pure API and formulated products.
- *In vitro* dissolution/release studies can be used to support other tools in early screening of taste of API/coated solid dosage forms where it is not feasible to test non liquid forms.

Taste assessment

Drug release



INSENT electronic tongue

HUMAN taste threshold/profile

Human Panels

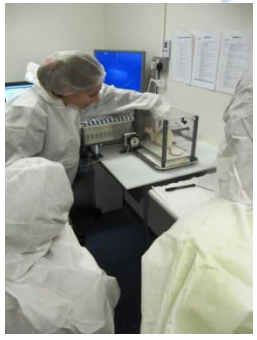
'swirl and spit'

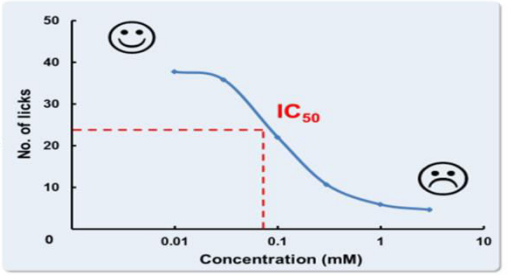
REC

Brief-access taste aversion (BATA) model

lickometer

Home office License

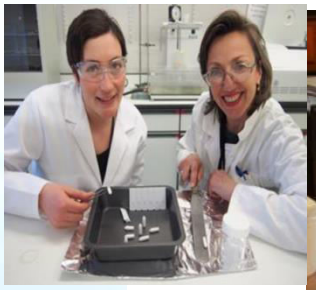




Thanks to my group for their hard work! …And still smiling…





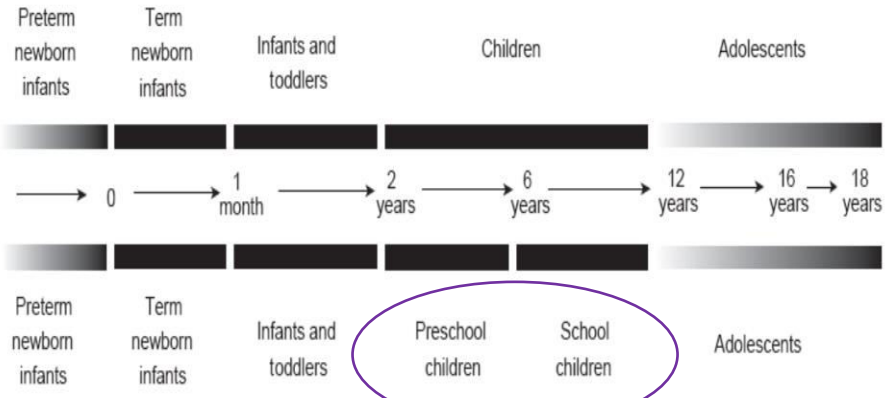

https://www.ucl.ac.uk/pharmacy/people/academic-research-staff-profiles/catherine-tuleu

Back up slides

3 pilars

- **Obligation** : data in children agreed as per binding **Paediatric Investigation Plan (PIP)**
  - End of phase I
  - Or Waiver from the requirement
  - Or Deferral of the timing of the studies
  - Discuss all subsets

A **ICH E11**



B **For formulators**

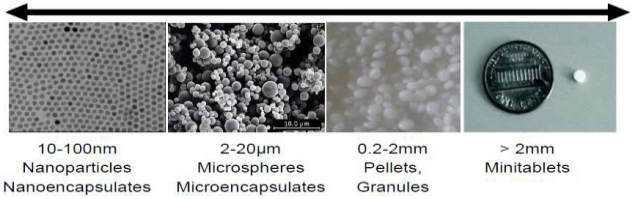
- **Paediatric Committee (PDCO)** at the EMA
  - FORMULATION WORKING GROUP

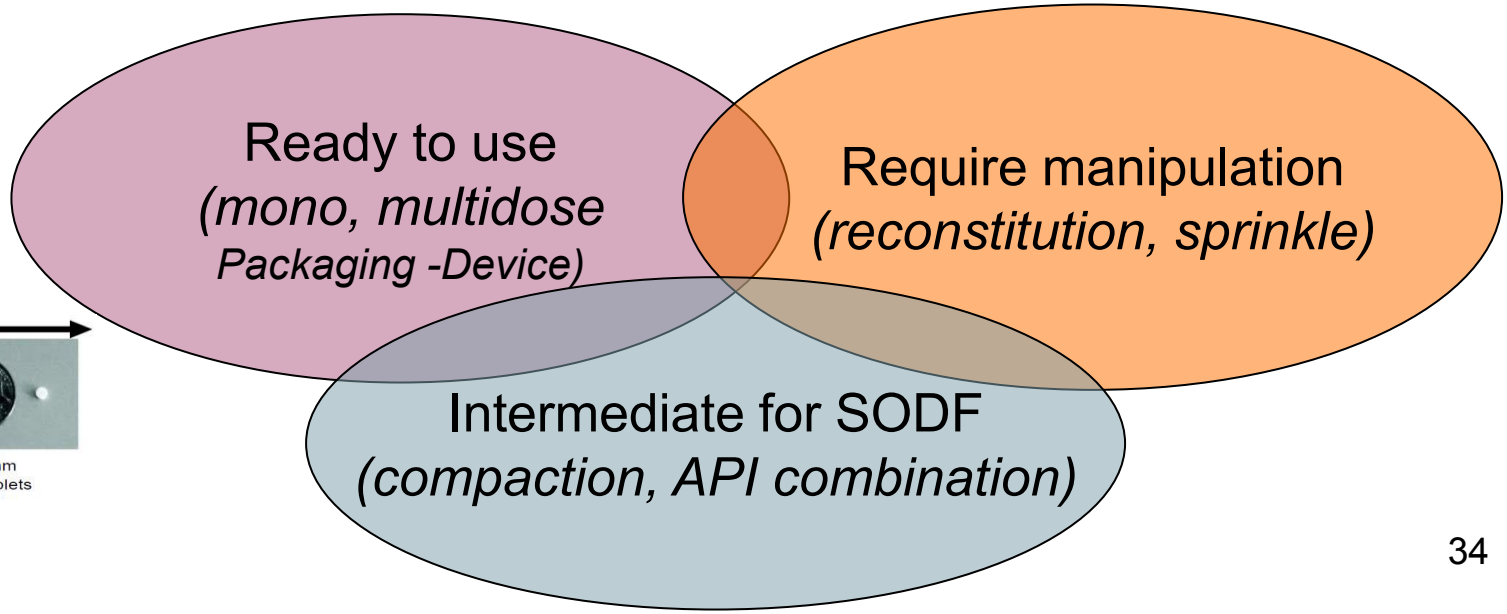
- **Reward** (incentives) for paediatric studies conducted if information included in the product information (SPC)
  - *even if clinical trial do not show efficacy*

Solid dosage forms = smaller is nicer?

Dosage forms	Swallow-ability	Dosing flexibility	Taste masking	Modified release	Chemical stability	Excipients tolerability
Liquids	☑	☑	☒	☒	☒	☒
Solids	☒	☒	☑	☑	☑	☑
Multi-particulates	☑	☑	☑	☑	☑	☑

Powder
Granules
Pellets
Minitablets
1 to <4mm





Evaluation of palatability and acceptability of multiparticulate formulations

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INTRODUCTION

Evaluation of the patient acceptability of paediatric formulations should be an integral part of the pharmaceutical development [1].

Multiparticulates, in the form of pellets or beads, offer benefits over conventional solid and liquid formulations (Figure 1) [2].

Figure 1. Benefits of multiparticulates over conventional formulations.

However, grittiness or rough mouth-feel could be a barrier to the patient acceptability of multiparticulate formulations [3].

AIM

To evaluate overall palatability of multiparticulates and its influence on the willingness to take the formulation by young adults.

EXPERIMENTAL METHODS

Randomised single-blind sensory evaluation (UCL REC:4612/007).

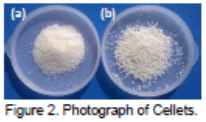

Figure 2. Photograph of Cellets.

Microcrystalline cellulose pellets (**Cellets ®**, Pharmatrans Sanaq, Switzerland) were used as model multiparticulates (Figure 2).

(a) 200-355 µm (b) 500-710 µm

Samples were composed of 250 or 500 mg of Cellets of either of two particle size distributions (Table 1). Dry samples administered **directly in the mouth followed by water** (dry) were compared to samples **pre-dispersed in 10 ml of water** (wet administration).

Table 1. Variables considered [2 levels ^ 3 factors = 8 formulations (F1-F8)].

Factors	Amount (mg)		Particle size (µm)		Administration	
Levels	250	500	200-355	500-710	Dry	Wet

Evaluation tool (Qualtrics.com, Utah, USA):

- Grittiness rated using 5-point hedonic scale (From 1 for "not gritty" to 5 for "very gritty")
- 'Willingness to take sample' in bipolar scale
- Qualitative feedback also recorded

N=24 (21-33 y/o)

RESULTS AND DISCUSSION

Grittiness perception increased with increasing amount and size of the multiparticulates (Figure 3). For the majority of the formulations (6/8) at least 50% of the volunteers scored grittiness 4 and above. Volunteers' comments are provided in Figure 4.

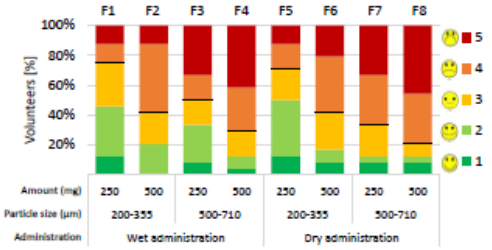

Figure 3. Grittiness perception expressed as percentage of the total number of responses (n=24). Centre lines in black depict grittiness score ≤ 3.

Figure 4. Qualitative feedback about multiparticulates provided by volunteers.

Willingness to take multiparticulates: For 7 out of 8 samples at least half of the volunteers would be willing to take the formulation every day (Figure 5). A correlation was found between grittiness and willingness to take multiparticulates (Tau = - 0.85), i.e. grittier formulations were less often accepted.

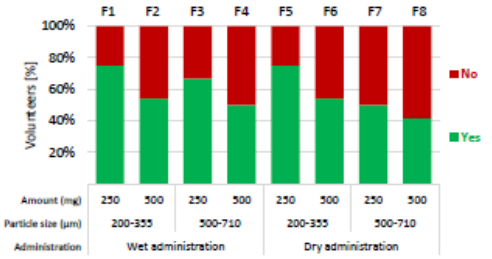

Figure 5. Percentage of volunteers willing to take multiparticulates every day.

CONCLUSIONS AND FUTURE WORK

Oral grittiness is an outcome of multiparticulates which hinders palatability and reduces the willingness of the patient to take the product. Increasing the amount and size of multiparticulates exaggerates the issue, whilst pre-dispersion in water slightly improves acceptance. Future work includes sensory evaluation of multiparticulates in children and investigation of formulation strategies to improve palatability.

ACKNOWLEDGEMENTS

EPSRC grant: EP/I01375X/1

REFERENCES

[1] EMA 2013, Guideline on pharmaceutical development of medicines for paediatric use
[2] FL Lopez, TB Ernest, C Tuleu, M Orlu Gul 2015. Expert Opin Drug Deliv. 12:1727
[3] S Kimura, S Uchida, K Kanada, N Namiki 2015. Int J Pharm 484:156-162

iUK ACCEPT MP mouthfeel Birmingham Thinktank
(P Mistry, Dr H Batchelor)

Mouthfeel of dispersible tablets excipients (coprocessed or not)

- Tribology
- BATA model
- *Texture aids?*
- Swallowability models
- Gastrointestinal transit of non disintegrating MP

Acceptability of mouthfeel of Multiparticulate study

1. Please rate the grittiness of the sample.
   (Grittiness means that you can feel 'bits' in the sample)

Not Gritty *(No bits)* — **Very Gritty** *(Lots of bits)*

2. What did you think of the overall volume of the sample?
   (Volume means the amount you had to take)

3. What did you think of the overall mouthfeel of the sample?
   (Mouthfeel means how the sample felt in your mouth)

4. What did you think of the overall taste of the sample?

5. Can you still feel any of the 'bits' in your mouth?

Yes ◯ **No** ◯

Any other comments about this sample: