

An accelerated aging experiment on gum-chloral slide mounting media

Zoe Adams

Curator for the Simuliidae & Psychodidae
The Natural History Museum
London, UK

Z.Adams@nhm.ac.uk









Background

- Murray Upton (CSIRO) gives an excellent historical review of these mounting media (*Bull Ent Res* 1993: **83**, 267-274).
- First recorded use – Prof H.F. Hoyer (Warsaw) in 1882, no accurate recipe given.
- Widely recommended for the slide mounting of small arthropods since the early 1900s.
- Reported advantages:
 - Aqueous nature dispenses with the need to dehydrate the specimen, dehydration can collapse very delicate structures & takes up considerable time.
 - Chemicals involved are less hazardous (c.f. xylene needed to thin Canada Balsam).
 - Good refractive index enabling visualisation of very fine structures with standard bright field light microscopy.
- They were frequently prepared by the user following a published recipe.
- The literature contains a confusion of different recipes, with frequent errors, and misattributions.
- Lots of variation in the instructions for how the various ingredients should be treated and mixed.

Composition of gum-chloral mounting media

- Taken from Upton 1993



	Faure	Hoyer's	Puri	Womersley	Davidson
Gum Arabic	15-22	8-19	8-15	14-16	7-14
Distilled Water	22-37	16-19	10-21	38-48	9-18
Chloral Hydrate	22-32	47-67	52-72	23-26	54-76
Glycerine	14-28	6-15	6-7	absent	absent
Glucose Syrup	4-5 (optional)	absent	absent	7-9	4-9
Acetic Acid	absent	absent	3-6	6-14	2-5

- Upton has distilled things down to 5 basic recipes
- These are named after the author who first published a recipe
- Published recipe modifications are reflected in the ranges shown
- Figures are % weights
- Can be categorised as:
 - Glycerine & non-glycerine
 - Low chloral hydrate & high chloral hydrate

Problems

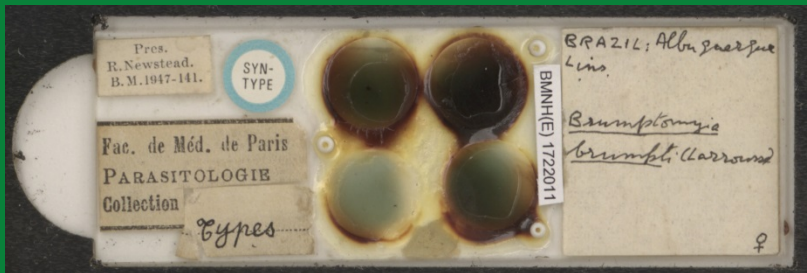
Discoloration

– blackening of the media



Crystallisation

– media becomes opaque



Problems at the Natural History Museum, London.

- Gum-chloral media have been used extensively in a number of collections at the Natural History museum, London (BMNH) e.g. mites, aphids, sandflies, blackflies.
- Sandfly slide collection (Diptera: Psychodidae)
 - 33,000 slides of which 62% are gum-chloral (over 19,000 slides)
 - Some 2,900 slide types of which around 1,100 are gum-chloral
- Aphid slide collection (Hemiptera: Aphididae)
 - Some 220,000 slides of which around 50% are gum-chloral
 - Estimated that the majority of these gum-chloral slides are now discoloured
 - 10,000 specimens (mainly types) have been remounted into Canada Balsam, at a cost of 10 person years!

NHM case study

- Dr David J. Lewis, employed by the UK Medical Research Council, and based at the NHM between 1945 and 1986.
- Worked medical diptera, principally Psychodidae, and Simuliidae
- Generated large slide holdings (perhaps as many as 30,000 slides)
- His preferred choice of mounting media and methods varied over time:
 - **1951** recommends Puri's recipe, ringed with more Puri's.
 - “avoid ringing with Canada Balsam as this penetrates under the cover slip”.
 - **1967** still using Puri's recipe, but now ringing with Euparal.
 - **1973** switched to a low chloral hydrate 'Berlese' type recipe, ringed with Euparal.
 - **1982** low chloral hydrate 'Berlese' recipe ringed with Glyceel.
 - **1985** abandoned Glyceel for ringing slides and returned to Euparal because of large numbers of “failed slides”.

Accelerated ageing experiment - Design

- “Accelerated aging is testing that uses aggravated conditions of heat, oxygen, sunlight, vibration, etc. to speed up the normal aging processes of items”
- Test slides were housed in a slide oven set at 60°C
- For each unique combination of parameters 5 replicate slides were made (a total of 1200 slides).
- Parameters explored were, presence/absence of specimen, media recipe, ringing agent, and clearing agent.

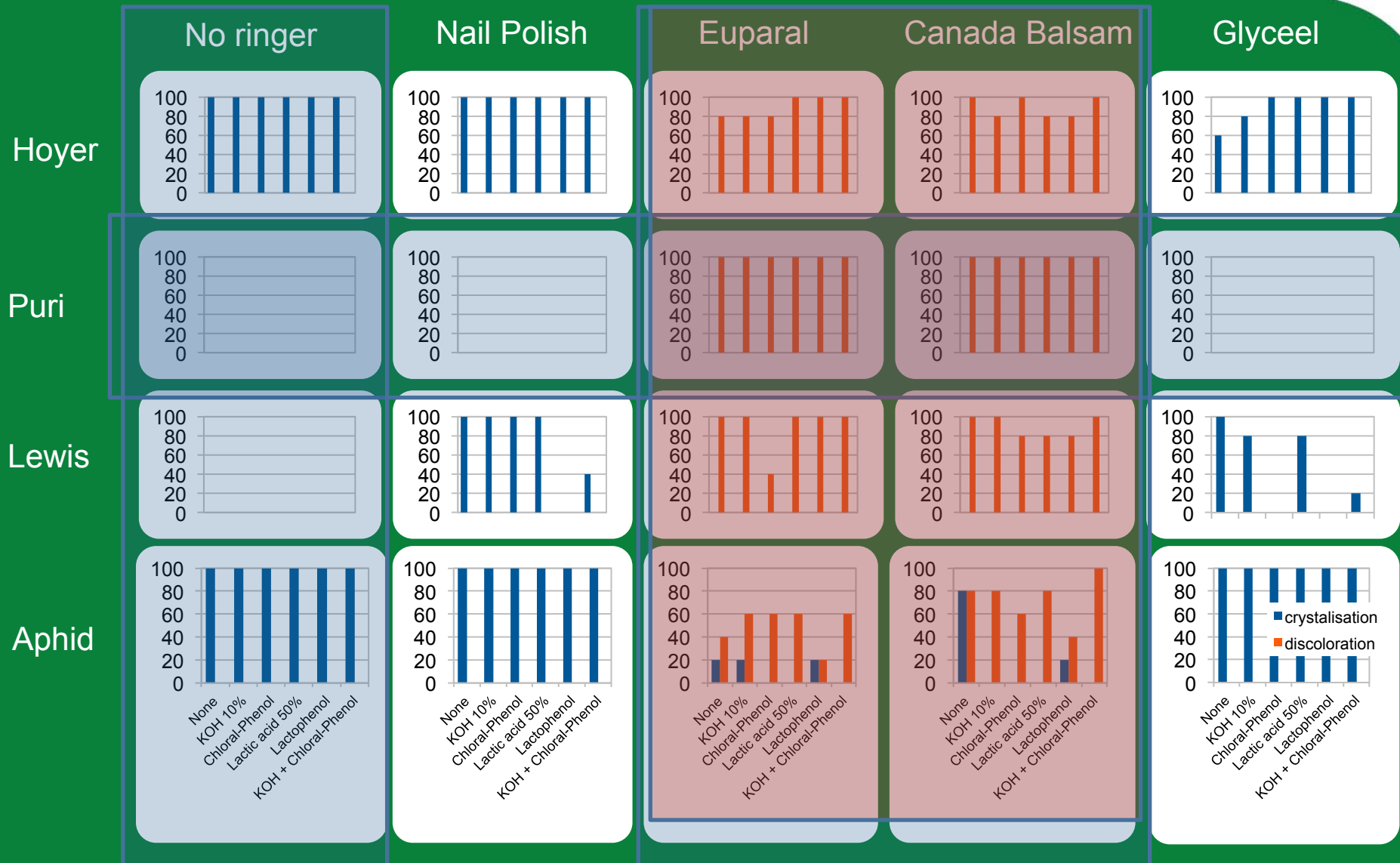
Specimen	Recipe	Ringing Agent	Clearing Agent
			<i>(0.1% solution)</i>
A Present	C Aphid	G None	M None
B Absence	D Hoyer's	H Nail Polish	N 10% KOH
	E Puri's	J Euparal	P Chloral-Phenol
	F Lewis	K Canada Balsam	Q 50% Lactic Acid
		L Glyceel	R Lactophenol
			S KOH + Chloral-Phenol

Monitoring

- Slides were examined over a 20 week period, weekly to start with, and then reducing to bi-weekly.
- Every slide was examined on at least 10 occasions
- Because of the volume of material to be examined , and the length of the experiment , it was impossible to have all the inspection events precisely matching for all the groups of slides
- Inevitably with such a long experiment we ended up with more than 1 recorder taking part
- Each slide was scored for:
 - Crystallisation – presence/absence
 - Discoloration –

1	0-25% of area under coverslip discoloured
2	26-50%
3	51-75%
4	76-100%

Results



Conclusions

- Scope of this experiment is limited to recipes and protocols used at the NHM
- Discolouration is probably not inevitable
- Crystallisation maybe inevitable – more data needed, clearly some recipes are much better than others
- Should you allow people to use Gum-Chloral media?
 - These media do have real advantages in certain contexts
 - Not for types
 - Not for important reference material
- Should you accept slide collections made with these media into your care?
 - Use your judgement

Thanks

- Phil Ackery
- Paul Brown
- Sidrah Ahmad

Questions

