

PRO'S AND PRO'S OF SELECTIVE CLEANING

Mark White, University College London, Biological Services,
Kathleen Lonsdale Building, 5 Gower Place, London WC1E 6BS



Corresponding author - m.white@ucl.ac.uk | Based on a presentation at the 8th LAT West Middlesex Branch Technician Symposium 2019

Introduction

The Kathleen Lonsdale Building (KLB), is a high specification, high health status animal facility that opened in 2011. It is a full IVC facility with an integral quarantine section. It houses transgenic (TG) mice, inbred, outbred and immuno-suppressed mice and occasionally rats and hamsters.

The reasons we decided to investigate included improving animal welfare with less disturbance to the cage through reduced cleaning and with a 60% increase in bedding, the ability for the mice to show some natural behaviours such as tunnelling, foraging and digging. We also wanted to work 'leanly', save the College money in product and labour time and create time for our technicians to do other things and provide much needed planned preventative maintenance on IVC racks and cages. Time did not allow this with the current system of cleaning. Of course, we were aware that reduced cleaning may increase ammonia levels in the cage so we assessed the environment of the IVC during the study with ammonia detectors to ensure cleaning took place at >25ppm but never exceeded >50ppm which could damage the nasopharynx regions of our mice.

Aims of study

- Increased animal well-being.
- Mice do not enjoy a pristine environment.
- Cleaning out male cages often causes aggression.
- Disturbing new litters can increase pre weaning mortality.

Creating time for new challenges.

- New more detailed cost-recovery software.
- Routine PPM of Total Cage Change.
- IVC Rack PPM (spigots, plenums, etc.).
- More forums, meetings and symposia.
- Increasing workload.
- Create time = less chance of mistakes.
- Creating a 'Leaner' facility.

Cleaning regime prior to October 2015

- First week – FULL CLEAN WEEK (100%).
- Second Week – PART-CLEAN WEEK (approximately 40%).
- Averaging 70% weekly.

Pre-study

Trialed 4 different bedding products from 3 different companies. Product of choice IPS Lignocel Select.** This was the best product and after a visit to the bedding plant in Germany I was assured of good QA.

** Important! Please note the findings of this study are on Lignocel Select only. You will need to perform your own study if using a different bedding.

Cleaning regime after October 2015

- Monday – Thursday or Tuesday – Friday.
- 3 day gap: 4 day gap. Technicians ask the question "Will the Cage go until then?".

Increase in amount of bedding

We wanted to encourage natural behaviours in our mice and decided to explore using more bedding to encourage this. We hypothesised that an increase in bedding would also improve absorbency of urine/faeces/ammonia. With bedding levels at 2.5cm this was now possible.

- OLD : 152.5g with a depth of 1.5cm.
- NEW : 244g WITH A DEPTH OF 2.5cm.
- = an increase of 60%.

Initial concerns

Would the cage flood? – No increase in cage floods. If they do occur, more of the water is absorbed ensuring animals/litters are not on soaked bedding.

Study – November 2015 to January 2016

- Room 302 – 17% cleaned, Breeding/Stock, Technician MT.
- Room 303 – 18% cleaned, Breeding/Stock, Technician MT.
- Room 308 – 16% cleaned, Breeding /Stock /Experimental, Technician MT.
- Room 309 – 29% cleaned, Breeding /Stock /Experimental, Technician PW.
- Room 310 – 31% cleaned, Breeding/Stock, Technician MW.
- Room 316 – 26% cleaned, Breeding/Stock/ Experimental, Technician TJ.
- Room 317 – 12% cleaned, Breeding /Stock/Experimental, Technician TC.

Result assessment

Big percentage differences. A subjective decision as everyone's assessment of a dirty cage was different. It was decided with the proof of the ammonia detectors that a cage is cleaned when:

- Latrine areas that have reached the top up to the area of two 10p pieces (still <10% of overall floor dimensions).



Figure 1.

Latrine area has reached top of the bedding. Remember! Area of 2 x 10p pieces consistently showed ammonia levels just as it is changing from medium (light green) to high (dark green) between 25ppm - 50ppm

- Latrine areas have changed to a dark colour before reaching the very top.
- Some strains move bedding around with no definitive latrine area. After time produced "yellowing" of bedding; Whereby once again it is changed.

Ammonia levels

Animals cleaned out once ammonia level exceeds medium:

- Low – 0-1ppm = Low Medium = 1-25ppm
- High = 26-50ppm Danger = 50+

Exercise 1 – clean cage challenge

Technicians shown 12 pictures of cages in varying stages of dirtiness! Assume average stocking density (4) or breeder with small litter. Asked: How many would you change? Told to remember "Will this cage go to the next clean in 3 or 4 days?".

To clean or not to clean?



Figures 2-3. This cage would not be cleaned



Figures 4-5. This cage would be cleaned

Exercise 2 – Clean cage challenge

How many would you change now after the tutorial? Assume average stocking density (4) or breeder with small litter. 12 pictures of cages in varying stages of dirtiness! Remember "Will this cage go to the next clean in 3 or 4 days?".



Figures 6-7. Examples of cage pictures shown during challenge.

Animal welfare result assessment

Ammonia

Concerns of excess ammonia in cage due to less frequent cleaning.

Sample(s) from:	Default Location	Collection Date	Animal Care	Approval Date
		27-Apr-2015	27-Apr-2015	04-May-2015

Notes

On Site Necropsy:

Laboratory: Results approved by Moin Anne 21/04/16

Necropsy

	1	2	3	4	5	6	7	8	9
	Rm 310	Rm 309	Rm 309	Rm 309	Rm 309				
Cross Necropsy Exam	-	-	-	-	-	-	-	-	-

Remarks

- = No significant findings.

Customer Notes:

The KLB has conducted selective 'spot' cleaning in its facility for the past 18 months. Ammonia detectors have been used in random cages and are cleaned-out at 25-26 ppm max latrine area the size of 2x10p pieces at the surface! Upon post-mortem we have found no clinical signs of illness or any abnormality (including the nasopharynx region, during these tests).

Did we see a rise in ammonia? No, in fact we found a reduction due to the increased bedding in all cages.

Ringtail

Concerns regarding Ringtail? Only 1 cage of ringtail in 20 months. We do not feel this is related to our study.



Figure 8.

Small animal ammonia sensor.
(Courtesy Vet-Tech Solutions FM023)

The level of ammonia can increase for a short time in male cages after cleaning out due to males marking their new territory. The cage, fun tunnel and diet can be a reservoir for ammonia, this can result in ammonia levels taking longer to reduce in a cage than if the whole cage was replaced. Males predominantly urinating on the cardboard tunnel will increase ammonia levels. **Cardboard tunnels have been replaced with plastic handling tubes.**



Figure 9

Heavily soiled cardboard tunnel showing danger levels of ammonia.

Depth of bedding and sex of animals appear to affect ammonia levels. We found with a bedding depth of 1.5cm ammonia levels can reach 25ppm in as little as 5 days. **The same cage averaged 12 days on 2.5cm of bedding.**

Dispensing 152.5g with a depth of 1.5cm in a cage base.

- Cage of 5 female adult mice averaged 5 days until ammonia level reached 25ppm.
- **The same cage averaged 12 days on 2.5cm**

Dispensing 152.5g with a depth of 1.5cm in a cage base.

- Cage of 4 male adult mice averaged Only 6 days until ammonia level reached 25ppm.
- **The same cage averaged 10 days on 2.5cm.**

Dispensing 152.5g with a depth of 1.5cm in a cage base.

- Cage of 2 male adult mice averaged 20 days until ammonia level reached 25ppm.
- **The same cage averaged 30 days on 2.5cm.**

Welfare benefits

- Natural behaviour increased. Tunnelling and foraging.
- Less cage changes = less stress = happy mice.
- Reduced need to disturb females with new litters due to soiled cages.

Financial benefit

Although the move to less frequent cleaning was not motivated by financial gains, there were significant financial benefits.

Bedding saving over 1 year of 2 = 26% despite an increase in the cage depth by 60%!

Further savings

Reduced contract labour by 3 days a week leading to a saving of approximately £30,000 a year.

Conclusions

- New regime has allowed
- cleaning out reduced by approximately 66%
- increased technician time
- reduced bedding use by 26%
- reduced capital equipment use by 40%
- reduced ammonia levels

Time for new challenges

- New more detailed software: LAMIS – Laboratory Animal Management Information System more data input required than previous less detailed system.
- Routine Planned Preventative Maintenance (PPM).
- IVC PPM – spigots, plenums, full-cage, etc.
- Time to attend more forums, meetings and symposiums.
- Ability to cope with units increasing workload.
- Create time = less chance of mistakes.
- Created a more 'Lean' facility.
- **Technicians making a more intelligent and closer assessment of the cage environment results in less time spent in actual cleaning (lean!).**
- Technicians more alert. No routine cleaning.
- Lessens boredom on full-clean weeks. Creates more time (lean!).
- Better for the mice: Less home cage changes.
- Reduction in cross contamination – Increase in Biosecurity!
- Complete PPM on racks/cages. All rack components including cages completely changed every 3-4 months
- 26% Less bedding used: 40% less chemicals used (lean!)
- More storage space created (lean!) – Decreased labour time (lean!)
- Reduction in use of equipment i.e. autoclaves, cagewash (lean!)
- Reduction in cleaning of up to 66% based on a full clean/part clean.

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