Ergonomics within an *in vivo* facility

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Abstract

Maximising the use of MBSCs

Microbiological Safety Cabinets (MBSC) primary function is to provide the operator with protection from exposure to Laboratory Animal Allergens (LAAs) whilst performing a variety of *in vivo* tasks. Lone working use of MBSCs can impact both efficiency and morale. Our aim was to assess whether two individuals working concomitantly per MBSC would be compatible with our health and safety programme.

Despite the implementation of standard ergonomic principles in the facilities, musculoskeletal issues are being increasingly reported i.e. upper and lower back pain, wrist pain, shoulder and neck pain. Over the last 12 months we have been working to find solutions to various ergonomic challenges that have presented themselves within our *in vivo* laboratories.

Some of the issues may be attributed to the working height of the MBSC, the shape and size of the sash height, the duration of the working periods in the MBSCs as well as the operating height which is restricted somewhat by the facility ceiling height as MBSCs to have double HEPA filtration as requested by our Safety, Health and Environment (SHE) team.

Working with SHE specialists we have reviewed how we conduct common tasks using the HSE Assessment of Repetitive Tasks (ART) tool and made recommendations for staff to adjust ways of working. The goal of this project was to determine measures that could be utilised to reduce the musculoskeletal risk to an acceptable level when working at a MBSC. (Figure 1)

To provide an assessment of musculoskeletal risks, biological and chemical hazards for tasks, alongside existing controls and possible further or amended controls which could be considered. To group those risks according to impact and to provide several solutions and next steps which can be considered by those managing the risk. Work on the challenge of finding solutions to enable all individuals to work comfortably within a MBSC for *in vivo* tasks.

Method

- Manual handling assessment charts tool.
- Ergonomic Method of Analysis.
- Assessment of Repetitive Tasks tool.
- Rapid Entire Body Assessment (REBA) – Ergonomic assessment method rationale.
- Laboratory Animal Allergen assessment for Occupational Exposure Limits under Control of Substances Hazardous to Health (COSHH).
- Manual handling assessment charts (MAC). **Note:** Using the MAC may not comprise a suitable and sufficient risk assessment. You may need to do a full risk assessment when certain conditions apply.
- Ergonomic Tools (ART & REBA).

Remember: The purpose of the assessment is to identify and then reduce the overall level of risk of the task and put measures in place to control the risks that have been identified.

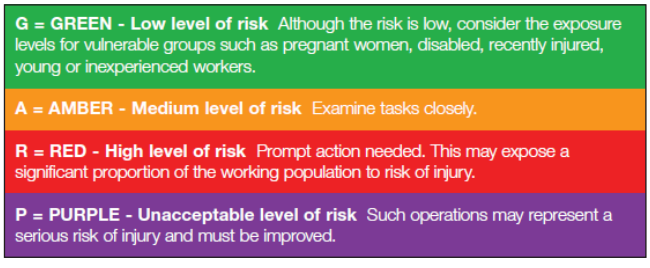


Figure 1.

Consultation with line managers for MBSC users who highlighted Muscular Skeletal disorders.

Independent specialist from outside of AZ: Industrial Hygienist for measuring potential exposure to LAA.

Ergonomic methods and practices

Provide theory training to the *in vivo* team, involving a classroom training session:

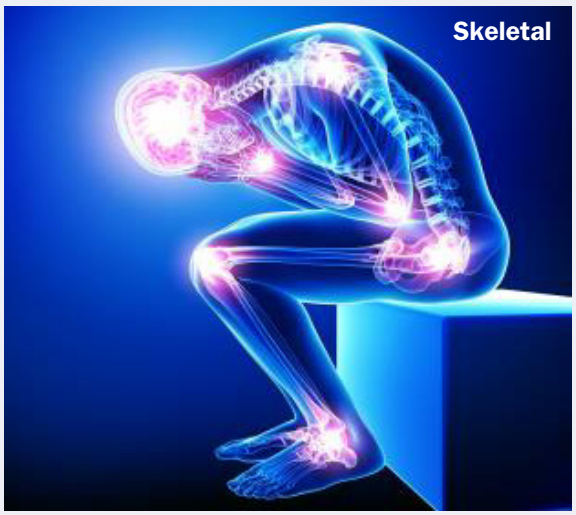


Figure 2.

Engagement with our ergonomic specialist and enable individuals to have specific one assessment of posture whilst in the working environment. (Figure 2)

Replacement of lab chairs with ones of ergonomic design following feedback from individuals working within the *in vivo* facilities.

Evaluation of the use of anti-fatigue mats for individuals standing at a MBSC, (however the initial trial was unsuccessful due to the facility barrier entry process but we are investigating other potential types).

Complete a holistic assessment combining ergonomics, biological and chemical risks associated with *in vivo* tasks conducted in a MBSC to understand at risk postures and measure to minimise any risks.

Introduce footwear insoles (see Figure 3) that have provided relief for some individuals who spend a lot of time on their feet.

Figure 3. Insoles.

Ergonomic assessment method rationale for REBA

Due to the posture, frequency and working range in the MBSCs for both standing and seated, we chose three core tasks for REBA as below in Figure 4. These were then rated using ART Figure 5 and REBA scoring systems Figure 6.

REBA scoring

Core Task	Zone of work
1. Reaching to the back of cage.	Long range – full reach into Tech60
2. Oral dosing	Mid/closer range
3. Measuring	Close range – close proximity to Tech60 sash.

Figure 4. Chosen core tasks.

1	Negligible Risk
2 or 3	Low risk, change may be needed
4 to 7	Medium risk, further investigation, change soon
8 to 10	High risk, investigate and implement change
11+	Very high risk, implement change

Figure 5. REBA assessment scoring system.

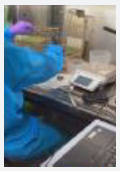
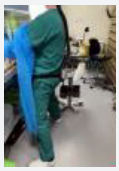
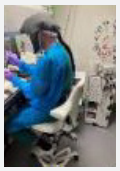
Task	Taller user	Taller user – seated	Taller user – change station mode
Reaching to the back of cage	 High – 10	 Medium – 6	 Medium – 4
Measuring mice	 High – 8	 Medium – 6	 Medium – 4
Oral Dosing	 Medium – 7	 Medium – 4	 Medium – 4

Figure 6. Chosen core tasks results.

ART assessments scoring low/medium/high risk depending on duration, however showed similar risk areas as REBA:

High risk scores for head/neck and arms for all users, higher risk for back/trunk/neck for taller users.

Results

We have designed a bespoke monitoring protocol and evaluated LAA exposure when two individuals operate concomitantly per MBSC. Static and operator sample were collected to determine exposure of the operators at the MBSC and in the wider room and when analysed the results of the LAA monitoring: increasing the number of operators to two did not cause greater LAA exposure to the operators. There was no detectable impact on the exposure to anyone in the room.

Following a user consultation and review of all the LAA data we were able to update our risk assessment to reflect this change for the tasks evaluated. (Tables 1 and 2)

Results of monitoring

Key – HSL Guidance Values (Mouse mus m1):	
Low Risk: <5 ngm^{-3}	
Medium Risk: 5 ngm^{-3} to 50 ngm^{-3}	
High Risk: >50 ngm^{-3}	

Table 1. Guidance values.

Sample Ref	Sample Location	Sample Period (mins)	Sample Volume (l)	Amount Detected ng	Conc^{n} ngm^{-3}
AZ16	**Alice Pemberton** Hood 2 – Dosing	10.28 – 11.01 11.09 – 11.35 (59)	118	<0.04	<0.34
AZ17	**Chelsea Cavanagh** Hood 2 – Dosing	10.33 – 11.01 11.09 – 11.35 (54)	108	0.13	1.20
AZ26	**Positive Control** Hood 2	10.25 – 11.03 11.09 – 11.35 (64)	128	0.51	3.98
AZ18	**Julia Bieluczyk** Hood 1 – Randomisation	10.20 – 11.07 (47)	94	<0.04	<0.43
AZ27	**Positive Control** Hood 1	10.18 – 11.03 11.06 (48)	96	0.04	0.42
AZ19	**John Peverill** Hood 3 – Dosing	10.56 – 11.36 (40)	80	<0.04	<0.50
AZ28	**Positive Control** Hood 3	10.53 – 11.36 (43)	86	0.04	0.47
AZ20	**Chelsea Cavanagh** Hood 4 – Dosing	11.12 – 12.31 (79)	158	<0.04	<0.25
AZ21	**Adam Holberry-Brown** Hood 4 – Dosing	11.12 – 12.39 (87)	174	<0.04	<0.23
AZ29	**Positive Control** Hood 4	11.13 – 12.39 (86)	172	<0.04	<0.23

Table 2. Results of LAA monitoring.

Next – we want to:

- Monitor the impact of this refined way of working.
- Assess whether a similar approach could be applied to a MBSC in cage change mode.
- We have collected information (task risk assessments work timelines) to complete a holistic risk assessment by combining the ergonomic, biological and chemical risks associated with common tasks conducted using the MBSC.
- Looking into perching stools to allow flexibility in movement that sitting in a chair does not, allowing users to stand more easily if required to move away from the MBSC and allow an ergo friendly stretching movement.

Conclusion

- Using the ergonomic processes and tools available we have reduced the impact on staff by validating the ability to safely use our MBSC with two users at once.
- Improved postures and ability to work whilst seated

to give relief to musculoskeletal issues.
- The improvement in staff wellbeing is also reflected in improved scores in this category in our company-wide employee engagement survey conducted twice a year.
- Investment in staff wellbeing for this project has multiple benefits including improved morale, reduced risk of musculoskeletal injury and better workflows in procedure space utilisation.

Acknowledgements

AST UK CPSS: Karen Balch, Emma Flynn, AST UK Team. AZ Safety, Health and Environment: Laurence Jones, Chris Harris, Abhishek Upadhyay.

AZ Cambridge Operations: Darren Kenyon, Stuart Macdonald, AZ Cambridge Early Oncology *In Vivo* Teams.