

Evaluating methods of gas euthanasia for laboratory mice

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Background

- Laboratory mice are commonly euthanized with CO₂, but evidence suggests that this method is aversive;
- Argon-induced hypoxia and carbon monoxide are also aversive to mice;
- Little is known about aversion to inhalant anaesthetics.

Aim

- To use approach-avoidance testing to determine mouse aversion to CO₂ and the inhalant anaesthetics halothane and isoflurane.

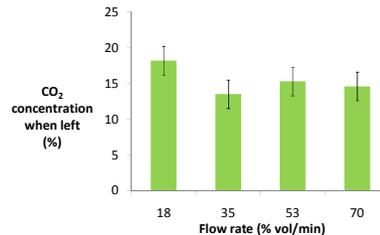
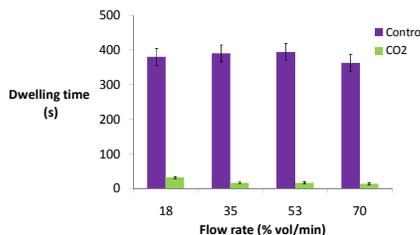
Methods



- Seven male CD-1 mice were trained to enter the bottom cage for a reward of ¼ tsp of sweetened shredded coconut;
- Treatment gases were turned on as soon as mice started eating;
- We tested four CO₂ flow rates: 18% - 70% of the test cage volume per min;
- We tested two concentrations of each anaesthetic – low and high concentrations were matched for the time they took to induce recumbency;
- Treatment order was balanced using a Latin square design;
- We recorded:
 - Dwelling time
 - Gas concentration when left (CO₂).

Results

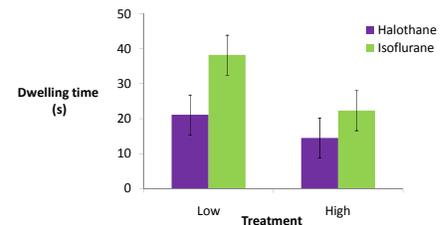
CO₂ experiment



- All mice left before recumbency;
- Dwelling time was not affected by changes in control (air) flow rate;
- Dwelling time decreased with increasing CO₂ flow rates ($P = 0.0001$).

- Mice always left the test cage when CO₂ reached 14-18%, regardless of flow rate.

Inhalant anaesthetics experiment



- Two mice remained until recumbency with isoflurane;
- Dwelling time was longer with isoflurane than with halothane ($P < 0.05$).

Discussion

- Motivation to avoid CO₂ and halothane was always strong enough for mice to abandon a preferred food reward;
- Motivation to avoid isoflurane was sometimes weaker than motivation to access this reward;
- Inhalant anaesthetics have sedative properties, so forced exposure beyond the point of aversion may cause less distress than forced exposure to other agents.

Conclusion

- Exposure to CO₂ is aversive to laboratory mice;
- Although still aversive, the inhalant anaesthetic isoflurane is a more humane alternative.

