animal welfare program

Comparing Rat Aversion to Isoflurane and Carbon Dioxide

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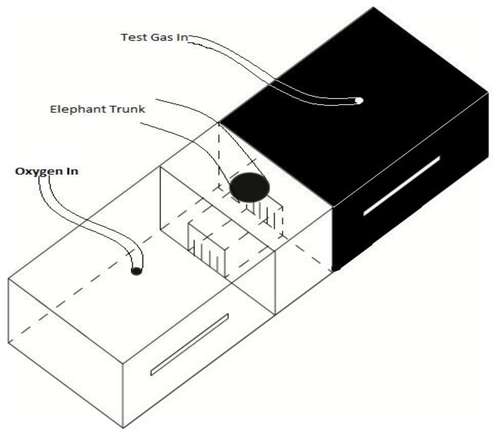
Background

- Laboratory rodents are commonly euthanized with CO_2, but evidence suggests this gas is aversive
- Some evidence suggests that isoflurane is less aversive
- Few studies have directly compared rodent aversion to isoflurane and CO_2

Aim

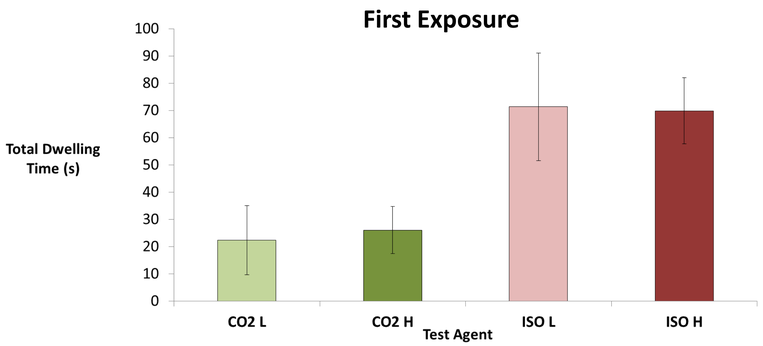
To use aversion-avoidance testing to compare albino rat aversion to isoflurane and CO_2

Methods

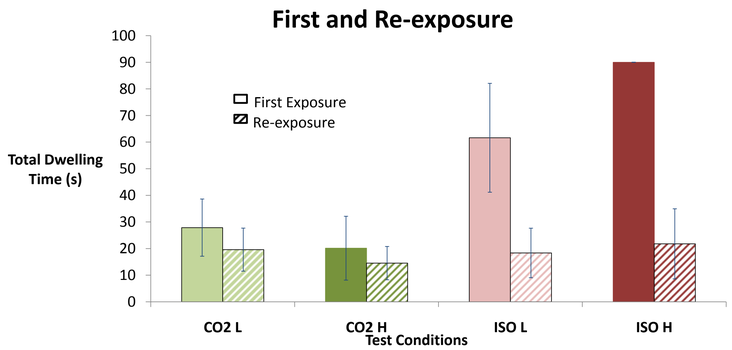


- Male albino rats were habituated to a light-dark box
- Dark compartment filled with either:
  - O_2 (32% vol/min)
  - Isoflurane (5% in O_2 at 32% vol/min)
  - CO_2 (24% vol/min)
- Light compartment was illuminated with either 0, 300, 800, or 1600 lux
- Treatment order was balanced using a Latin square design
- We recorded:
  - Whether rats remained in the dark compartment
  - Total dwelling time in the dark compartment

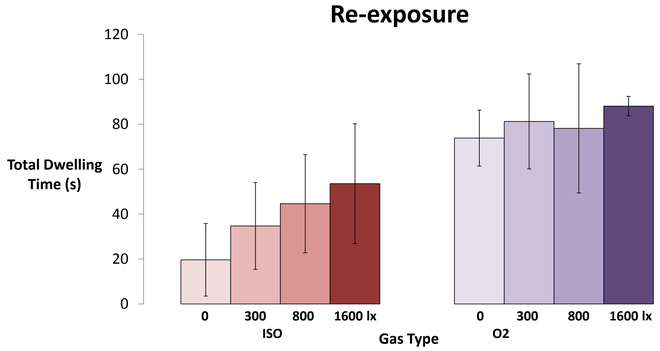
Results



- **9/16 rats stayed until recumbent with isoflurane; 0/16 stayed until recumbent with CO_2 ($P < 0.0005$)**
- Dwelling time was unaffected by different light levels, but was significantly higher with isoflurane than with CO_2 ($P = 0.0001$)



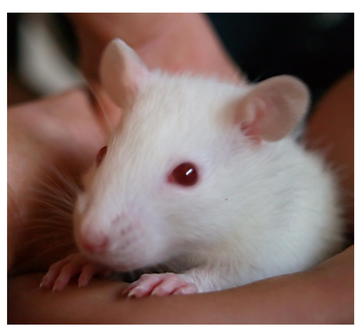
- **During first exposure, 9/15 rats stayed until recumbent with isoflurane; 0/16 rats stayed until recumbent with CO_2 ($P > 0.0003$)**
- During re-exposure, dwelling time did not differ between test agent or light level



- **The brighter the light conditions, the longer rats stayed in the dark ($P = 0.03$)**
- Dwelling time was significantly lower with isoflurane than with O_2 ($P < 0.0001$)

Conclusion

- During first exposure rats showed less aversion to isoflurane than to CO_2; most rats tolerated isoflurane until recumbency, but none tolerated CO_2
- During re-exposure rats showed less tolerance to both test agents
- **We conclude that sedation with isoflurane before euthanasia with CO_2 is a humane alternative, particularly with rats that have no previous isoflurane exposure**



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