



The Reproductive Consequences of Sevoflurane in Male *Drosophila melanogaster*

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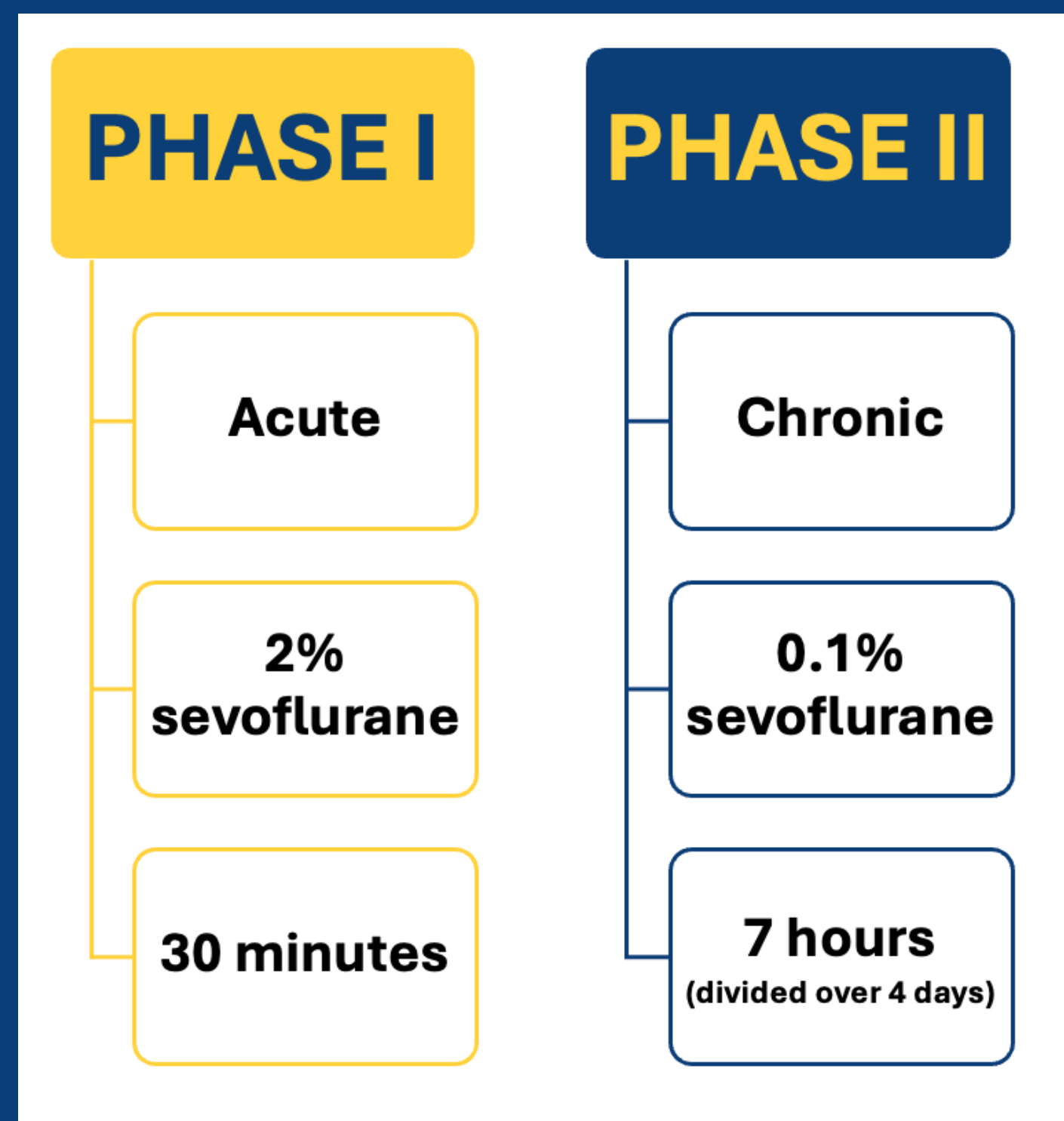


Introduction

- Sevoflurane (sevo), a widely used inhaled anesthetic, is known for its safety in clinical settings. However, its long-term effects on the reproductive health of anesthesia providers remain underexplored.
- Previous studies have suggested that chronic exposure to anesthetic gases, like sevo, might lead to adverse reproductive outcomes, such as altered offspring sex ratios (OSR) and increased spontaneous abortions.
- This study investigates these potential effects using male *Drosophila melanogaster* to simulate occupational exposure scenarios.
- The research question is:** Does exposure to sevoflurane affect the gender ratio and number of offspring in male *Drosophila melanogaster*?
 - Our findings revealed that while acute exposure had no significant impact, chronic exposure significantly skewed the OSR toward females and increased male mortality. This suggests that prolonged exposure to sevo may pose reproductive risks, highlighting the need for enhanced safety protocols in healthcare settings.
- This study fills a critical knowledge gap by experimentally demonstrating the reproductive consequences of chronic sevo exposure, underscoring the importance of further research and improved occupational safety measures for anesthesia providers.

Methods

- Study Population:** Oregon R Wildtype *Drosophila melanogaster*
 - Anesthesia naïve
 - Only virgin females utilized for mating
- Two Experimental Phases:** to simulate acute, one-time exposure to sevo and chronic occupational exposure to sevo
 - Male *Drosophila* were randomly allocated into an untreated, control group or sevo-treated experimental group
 - Sevo administered via Kent Scientific Somnosuite
 - Control group concurrently exposed to ambient room air
 - Treatment group allowed to fully reawaken from anesthesia
 - Male *Drosophila* from both groups transferred into individual fresh food vials and randomly paired with 1 virgin female
 - Mating pairs isolated in vials in incubator for 1 week
 - Daily inspections to assess mating pair vitality and presence of pupae/larvae
 - Mating pairs extracted from vials after 1 week mating period
 - Following initial emergence of offspring, counting and sexing of offspring conducted daily for a period of 7 days
 - Total number of offspring analyzed via unpaired, two-tailed T test
 - OSR analyzed via Fischer's Exact and Mann Whitney U testing
 - RNA analysis of progeny performed to assess for potential variance in expression of slowpoke (slo) gene
 - PCR testing analyzed with ANOVA testing



Results

Major Findings

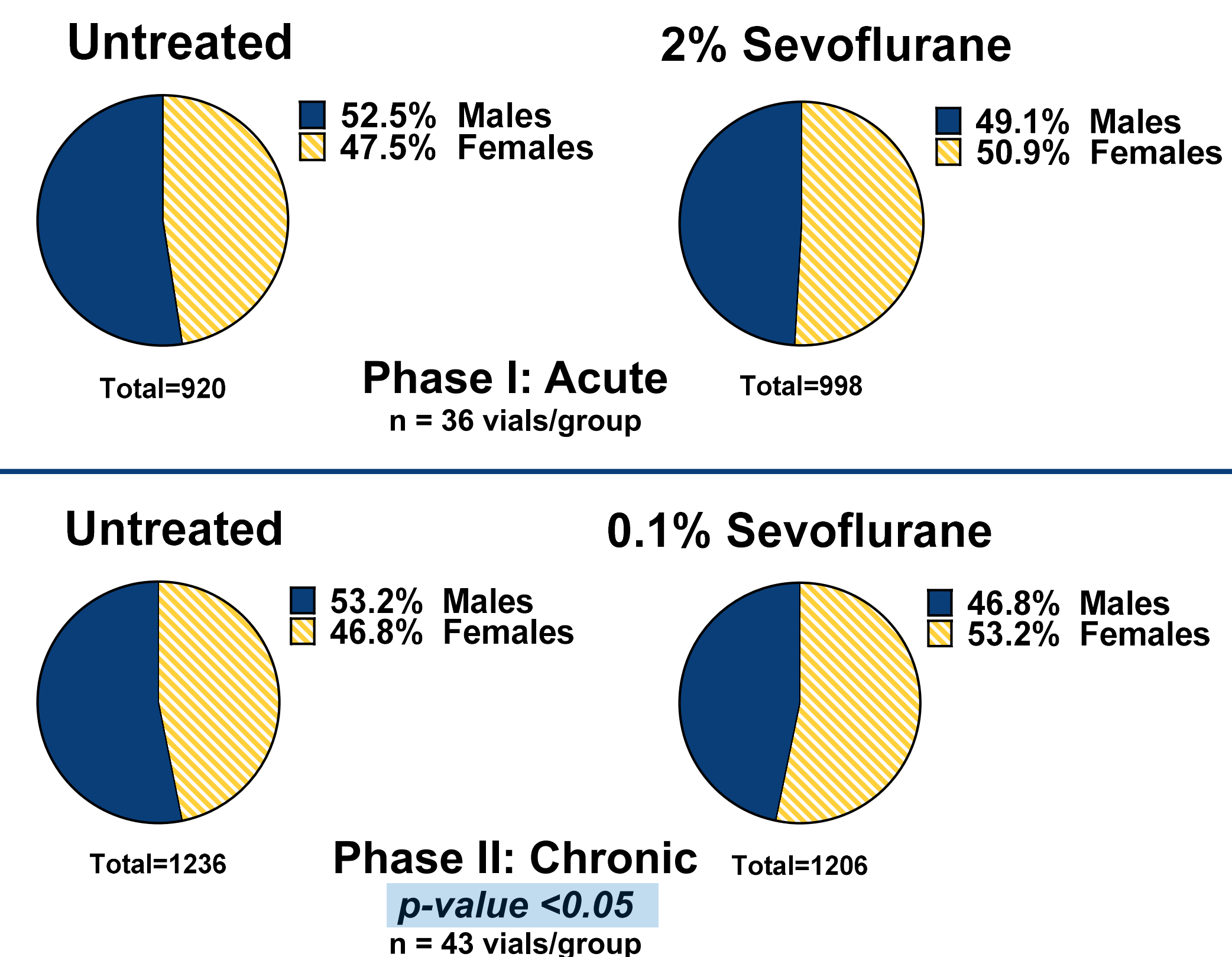
- No significant difference in total number of offspring between groups in Phase I or Phase II
- No significant difference in OSR between groups in Phase I

Statistically significant difference in OSR between groups in Phase II favoring female offspring

OFFSPRING SEX RATIO

- PHASE II
- Untreated → 1.13 M:F
 - 53.2% Male
 - 46.8% Female
 - 0.1% Sevoflurane → 0.88 M:F
 - 46.8% Male
 - 53.2% Female
 - Statistically significant difference in OSR between the untreated and 0.1% sevoflurane groups
 - Fisher's Exact: $p = 0.0018^*$
 - Mann Whitney U: $p = 0.017^*$

Male:Female Ratio



Minor Findings

- 4.5x increased relative risk of premature mortality in male *Drosophila* chronically treated with 0.1% sevo in Phase II ($p=0.048$)
- Statistically significant decrease in slo gene expression in progeny of sevo-treated groups ($p<0.0001$)

Conclusions

- This study explored whether sevoflurane exposure affects the gender ratio and number of offspring in male *Drosophila melanogaster*. Acute exposure did not significantly impact offspring count or sex ratio. However, chronic exposure led to a significant skew in the offspring sex ratio towards females and increased male mortality, aligning with previous findings suggesting reproductive risks from anesthetic gases. Additionally, chronic exposure resulted in reduced expression of the slo gene in progeny, indicating potential genetic alterations.
- These findings highlight the need for improved safety protocols for anesthesia providers and underscore the importance of further research to understand the long-term occupational health implications of sevoflurane exposure. Future studies should explore the mechanisms underlying these effects and evaluate the potential impacts on human reproductive health.
- Significance**
 - Our results contribute to the growing body of evidence on the reproductive risks associated with chronic anesthetic exposure, emphasizing the critical need for continued research in this area.

References



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