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Prior Exposure to Carbon Dioxide Causes Halothane Resistance in Drosophila melanogaster

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COLUMN ARTICLE

Inhaled anesthetics have been used for almost 170 years, yet their mechanism of action is still unknown. *Drosophila melanogaster*, the fruit fly, is an excellent model system in which to study the mechanism of action of inhaled anesthetics through genetics [1]. To quantitatively measure the physiological response of *Drosophila* to anesthetics we utilize a unique device known as the inebriometer, which quantitatively measures the anesthetic response in the fly [2]. Using this method, we determined that after flies have been exposed to carbon dioxide (CO_2), they exhibit a subsequent resistance to isoflurane [2]. CO_2 is commonly used in *Drosophila* laboratories as an anesthetic to allow researchers to manipulate flies. Consequently, understanding this CO_2 effect on subsequent anesthesia is critical for a wide range of researchers. Therefore, we set out to determine if this subsequent anesthetic resistance is specific to isoflurane, or a more general phenomenon.

We exposed flies to 100% CO_2 in our exposure apparatus [3] for 10 minutes and allowed them to recover for one hour prior to placing them in the inebriometer with 2% halothane. We found that prior exposure to CO_2 resulted in a resistance to halothane anesthesia (Figure 1), similar to our isoflurane results [2]. Therefore, we conclude that this CO_2 effect is likely a general occurrence with inhaled anesthetics. This reinforces our prior suggestion to *Drosophila* researchers to thoughtfully consider their use of CO_2 anesthesia prior to performing pharmacological, physiological or behavioral research [3].

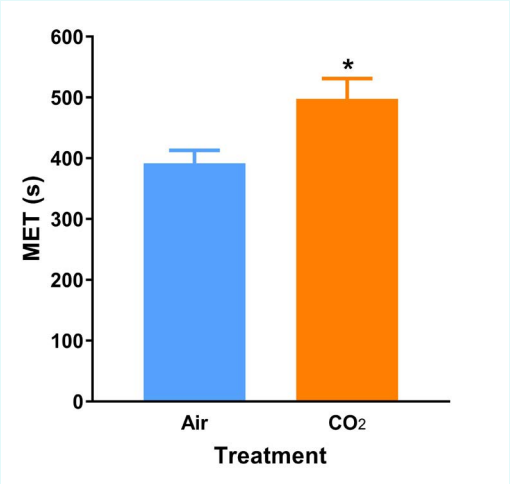

Figure 1: Flies exposed to CO_2 have a subsequent resistance to halothane. Flies are anesthetized slower by halothane, as measured by the mean elution time (MET, [1]) from the inebriometer.
* = $P < 0.05$, Student's T-test.

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