Carbon dioxide induced quiescence as a possible tool for investigating lethargus in *C. elegans*
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Sleep is an evolutionarily conserved, chemically regulated and biologically important process that remains, nonetheless, poorly understood. Its near universality in animals from higher order vertebrates to the nematode, *Ceanorhabditis elegans* is proof of its basic evolutionary importance. The nematode, with its relatively simple neuroanatomy, tractability to various modes of genetic manipulation, and, most importantly for our discussion and investigation, its sleep-like state—termed lethargus—serves as an ideal platform from which to begin characterizing this complex process. Lethargus bears a distinct resemblance to sleeping states in other animals, such as a depressed arousal threshold, prolonged quiescence, homeostatic mechanisms, as well as a species-specific posture. In addition, several molecular pathways and their associated genes in *C. elegans* have been identified as being involved in the tight regulation of sleeping behavior, such as the cAMP and cGMP pathways which suppress and promote lethargus in nematodes, respectively.

This project is based first on the observation that carbon dioxide gas has an immobilization effect on *C. elegans* and that furthermore, this immobilized state is similar to lethargus on a behavioral level. The question that we seek to investigate is one of if there are any underlying mechanistic similarities between CO_2 immobilization and lethargus, and if present, examine the genetic basis for these similarities. To this end, I designed and machined a specialized chamber for creating a controlled environment of carbon dioxide gas. I then went on to test and calibrate the device and its sensor as well as doing various proof-of-concept tests to roughly replicate previous studies on CO_2 as a nematode anesthetic, as well as to determine a rough threshold concentration of carbon dioxide required for worm immobilization.