Sustainable Pharmacology

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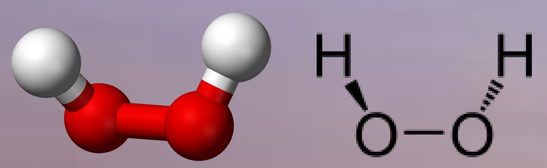
Figure 1

Abstract

There has been an increase in awareness of the effects of APIs (active pharmaceutical ingredients). Seventy-five crayfish were used to test the effects of hydrogen peroxide. The results show that the death ratio is directly proportional to the chemical concentration.



Hydrogen Peroxide (H_2O_2)

Introduction

Hydrogen Peroxide, H_2O_2, is an API that is widely used in a variety of commercial products. Such as: toothpaste, bleach, hair dye products, cleaning supplies, and acne medication (Household Products, 2010). The chemical, H_2O_2, was tested on crayfish to determine if it induced any adverse affects. The experiment was designed to test the hypothesis that H_2O_2 becomes lethal to aquatic organisms at a certain level. Due to a lack of substantial research, a predetermined concentration level could not be established.

Materials and Methods

75 crayfish were caught from the same cell in the Lake Waco Wetlands. Each was weighed, and five of similar sizes were placed into one of fifteen containers (Figure 1). Four concentration levels (.0001%, .001%, .01%, and .1%) plus a control were used. Each level had three duplicates. The hydrogen peroxide was diluted to make three liters of solution. The animals were fed with fish food every two days; the containers were cleaned weekly.

Results

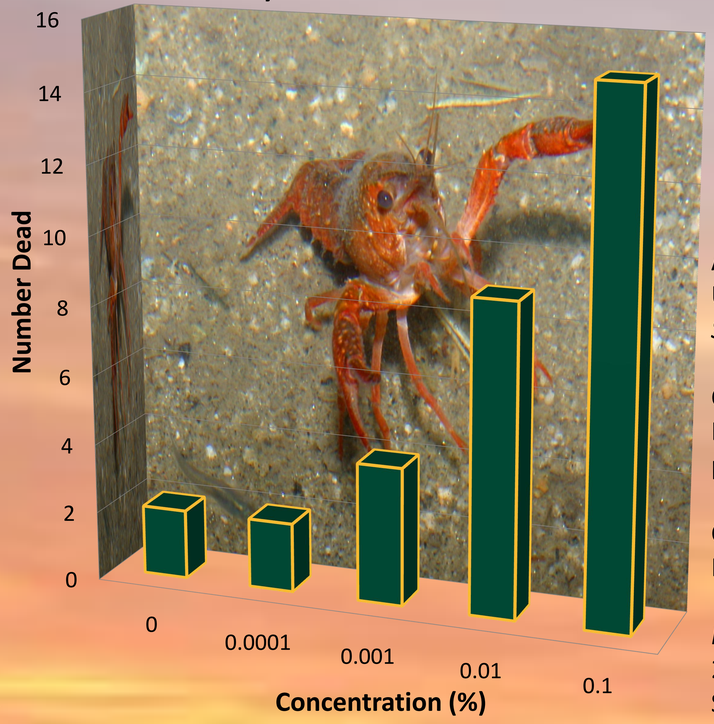
Estimated Mortality Rate for Chemicals and Containers

Size	Chemical	Dead	n	PoD*
1 Small	Control	1	5	0.10938
2 Small	0.0001%	0	5	0.10938
3 Small	0.001%	0	5	0.22697
4 Small	0.01%	4	5	0.55427
5 Small	0.1%	5	5	1.00000
6 Medium	Control	0	5	0.10938
7 Medium	0.0001%	1	5	0.10938
8 Medium	0.001%	1	5	0.22697
9 Medium	0.01%	3	5	0.55427
10 Medium	0.1%	5	5	1.00000
11 Large	Control	1	5	0.18124
12 Large	0.0001%	1	5	0.18124
13 Large	0.001%	3	5	0.34606
14 Large	0.01%	2	5	0.69147
15 Large	0.1%	5	5	1.00000

P-Value (size)=.6738
P-Value (H_2O_2)= .0519

**PoD= Probability of a death occurring*

Number of Crayfish Dead Per Concentration Level



Conclusions

A chi-square test comparing organism size and death ratio yielded a p-value of.6738, indicating the chemical affects the organisms equally, regardless of size. The only thing gained by blocking on size was a smaller p-value when comparing the death ratio to the chemical level, allowing a more definite decision to be made. A second chi-square test comparing the death ratio and chemical level yielded a p-value of .0519. While this isn't statistically significant, it is small. Due to small sample sizes, not enough power was obtained to yield highly accurate results. This contributes to obtaining a small, but statistically insignificant p-value.*

The results indicate a mere .01% increase in the level of H_2O_2 would be potentially lethal to the crayfish population. More research on different API's with different organisms needs to be done, but it has been shown that more effective means of filtering out pharmaceutical ingredients need to be explored and implemented. *α=.05

Literature Cited

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Acknowledgements

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