



## The Effect of Anti-Inflammatory Medicines and Antihistamines on the Heart Rate of Daphnia.

Adrienne Serafin



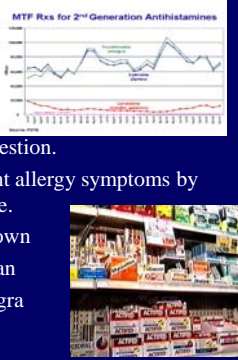
## Anti-inflammatories

- Pain and allergy medications are widely used by Americans.
- Anti-inflammatory medicines are usually non-steroidal anti-inflammatory drugs (NSAIDs).
- Examples include Cox-2 Inhibitors, Vioxx, and Celebrex, which are used regularly by 33 million Americans.
- Patients who take Vioxx have three times the risk of heart attack and sudden cardiac death.



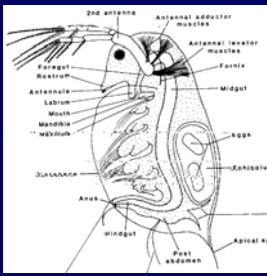
## Antihistamines

- Twenty percent of Americans suffer from allergies.
- Symptoms include: headaches, aches and pains, feverishness, runny nose, and nasal or sinus congestion.
- Antihistamines relieve and prevent allergy symptoms by preventing the effects of histamine.
- Antiquated antihistamines are known to have more serious side effects than newer versions which include: Allegra and Claritin.




## Daphnia

- Daphnia, otherwise known as water flea, are small, aquatic crustaceans who are found in freshwater ponds and feed off algae and detritus.
- The daphnia heart is easily visible through its transparent shell making heart beat easy to monitor through a microscope.
- The normal heart rate of daphnia is between 285 and 315 bpm.



## Hypothesis

- Anti-inflammatory medicines and antihistamines will both cause an increase in the heart rate, however, the strongest dilution of anti-inflammatory medicines will produce the greatest increase heart rate.
- Because the strongest dilutions of the two anti-inflammatories will cause the greatest change, it will also create the most irregularities in the heart rate.




VIOXX PILL
CLARITIN PILL
ALLEGRA PILLS
Peroxicam

## Methods

- Received daphnia magna from the Carolina Biological Supply Company.
- Took two anti-inflammatory medicines: Vioxx (12.5mg) and Peroxicam (20mg), and two antihistamines: Claritin D and Allegra D.
- Created three dilutions of each medicine; 100x, 1000x, 10000x.
- Eight daphnia were used for the experiment and the normal heart rate of each daphnia was calculated by counting the beats for a minute (these heart rates were then averaged).

## Methods

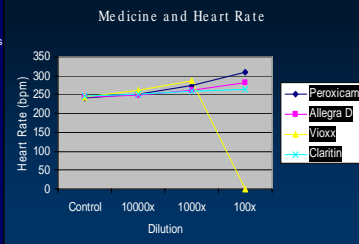
- A daphnia was placed in a scoop slide with one drop of each of the dilutions of one substance and was allowed to absorb the substance for one minute.



- The substance was then sucked out using a pipettor to make the heart visible.
- The heart rate was measured using a microscope. Irregularities were also monitored at this time.
- This was repeated with each of the concentrations of the three other substances and a second trial was performed.
- The results of the two trials were averaged for the results.

## Results

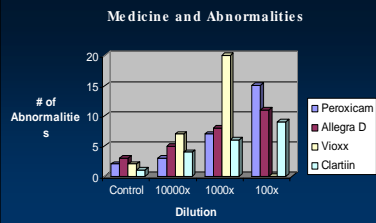
Medicine	Control	10000x	1000x	100x
Cox-2 Inhibitor	242	251	274	310
Allegra D	244	249	262	292
Vioxx*	244	262	287	0*
Clartin	246	251	259	265



This graph illustrates the effects of the various dilutions of the four substances tested. Each number plotted is the average of the two daphnia tested. The 100x dilution of Vioxx caused both daphnia to die causing the heart rate to drop to zero at that point.

## Results

Medicine	Control	10000x	1000x	100x
Cox-2 Inhibitor	2	3	7	15
Allegra D	3	5	8	11
Vioxx*	2	7	20	0
Clartin	1	4	6	9



This graph illustrates the number of abnormalities recorded for each dilution of the four substances tested (after one minute). Even before the substances were administered there were abnormalities, but they were minimal. The 100x dilution of Vioxx caused both daphnia to die so there are no abnormalities recorded for at that point.

## Conclusions

- The Vioxx produced the greatest change in the heart rate of both daphnia tested.
- I can also conclude that the strongest dilution of each substance (100x) created the greatest change in heart beat.
- There was also a direct relationship between the number of abnormalities and the strength of the concentration.
- The 100x dilution of Vioxx caused both daphnia tested to die.
- Although there were some initial irregularities in the daphnia heart rate, this number increased greatly after administering the concentrations.
- It turn under a minute for each of the substances tested to have an impact on the heart rate of daphnia.

## Future Studies

- My future studies would include:**
- Testing different types of daphnia using the same medicines to see how effects vary.
- Using different types of allergy medicines and pain medications to compare results.
- Testing the effect of the temperature of the substances on the heart rate.
- Testing how long the change in heart rate lasts before each daphnia returns to normal heart rate.