

The Effects of Ibuprofen Exposure on the Reproduction of Brown Planarians

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Abstract

Planarians have been used as simple research organisms to help measure the effects of exposure to NSAIDs. Reproduction of Planarians can switch between asexual and sexual reproduction to fit their environment. Recent studies have examined the potential adverse effects of popular NSAIDs, and this experiment focused on the effects of Ibuprofen. By exposing the worms to prolonged periods of time in Ibuprofen, the goal was to see if there would be a harmful effect to the reproductive ability of the Planaria. By creating varying dilutions, 8 worms were put into each concentration and observed every 24-hours over a 96-hour period. We observed that prolonged exposure to high concentrations of Ibuprofen resulted in inhibited reproduction in the 60 and 80mg/L dilutions as well as physical alterations to the worms.

Introduction

- Planarians are small, affordable, and easy to maintain as model systems of regeneration and make wonderful research organisms for molecular and cellular biology (1).
- Non-steroidal anti-inflammatory drugs (NSAIDs) are one of the most commonly used medicines and studies have shown that NSAIDs can cause gastrointestinal, cardiovascular, and other complications. The exact cause of these adverse effects by NSAIDs is still unknown, but the use of planarians in a regenerative pharmacology experiment allows for exploration on the effects of these drugs (2,3).
- When exposed, Planaria show sensitivity to Ibuprofen. Exposure to Ibuprofen leads to puckering of the organism's edges, slowed movement, paralysis, loss of rear parts, lack of definition in anatomy, and/or posterior part coiling upwards (4).
- The purpose of this experiment was to support the notion that exposure to NSAIDs (this experiment looked at Ibuprofen) caused negative side effects that hurt the Planarians ability to regenerate/reproduce.

References

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High concentrations of Ibuprofen limit reproduction

- A Petri dish with eight worms was made up for each dilution of Ibuprofen: 0 (control), 10,20,40,60 and 80 mg/L.
- Each dish was observed every 24-hours for a 96-hour period and each day the number of worms in the dish (reproduction) was documented and the worms were observed under a microscope to determine any morphological changes. The amount of reproduction was documented and is shown below in figures 1. and 2.

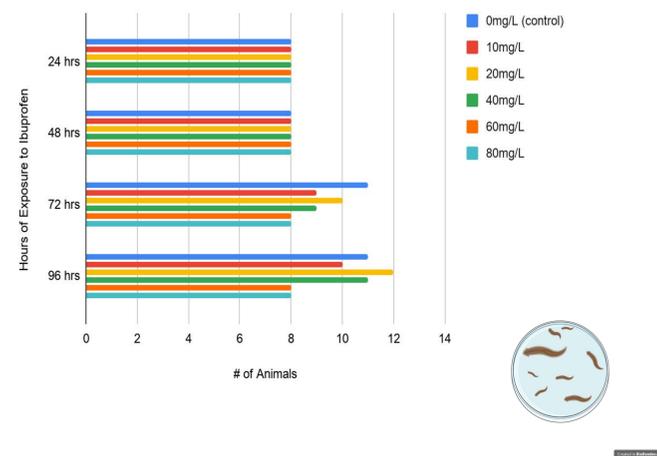


Figure 1. The amount of reproduction in each dish after varying lengths of Ibuprofen exposure: First Experiment. This bar graph shows reproduction occurring at 72 hours and 96 hours in concentrations 0, 10, 20, and 40. However, the stronger dilutions of 60, and 80 are shown to have had an adverse effect on reproduction that stopped it [reproduction] from occurring.

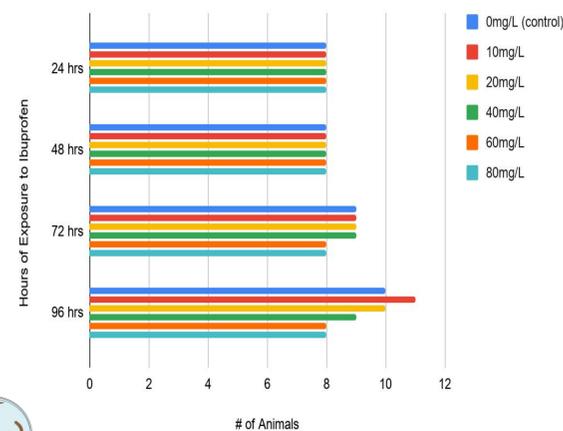


Figure 2. The amount of reproduction in each dish after varying lengths of Ibuprofen exposure: Second Experiment. In a second run, of the same experiment depicted in the first graph, the results were similar. Reproduction was stopped in the 60 and 80 mg/L dilutions and the dishes had the original 8 worms in the dish at the end of the 96 hours. Dishes 0,10,20, and 40 mg/L all had additional worms in their dishes at the end of the 96 hours.

Planaria exhibit morphological changes in response to high doses of Ibuprofen

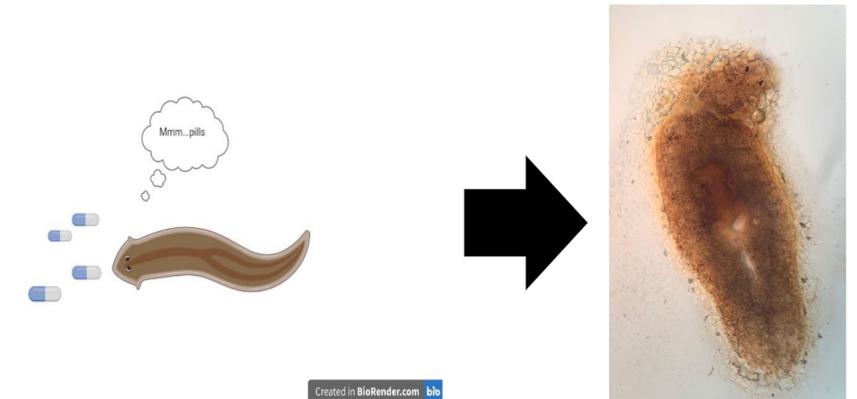


Figure 3. The deterioration of a planarian after 96 hours of Ibuprofen exposure. In this photo, the loss of rear parts, undefined eye spots, and ear flukes show the harmful effects of Ibuprofen on the worm after 96 hours of continuous exposure in the 80mg/L dilution. Similar effects were seen in the worms kept in the 60mg/L dilution as well.



Figure 4. A Fully-grown control planarian, no introduction to NSAIDs. In this picture a healthy Planaria is shown with clearly defined eye spots, flukes, and edges that are observable. *Picture credit: Pagán Laboratory (3).*

Conclusions and future directions

- Planaria submerged in a higher dilution of ibuprofen (60 and 80mg/L) did indeed show a lack of reproduction over the course of the study compared to worms in lower concentrations.
- Planaria exposed to the 0,10,20, and 40 mg/L dilutions reproduced normally.
- Planaria displayed morphological changes following Ibuprofen exposure. Changes included loss of rear parts, lack of defined eye spots and flukes and deterioration of edges.

Future experiments- The current experiment was a simplified effort of measuring the adverse effects of an NSAID. Since there was an observable negative effect of the Ibuprofen on the Planaria, more detailed studies on how Hox genes and others are affected by NSAIDs could prove useful at understanding more of the topic of regenerative pharmacology. Using these simple research organisms, mimicking minute tissue damage via transection along with exposure to varying NSAIDs would help to further understand the potential side effects of anti-inflammatory drugs.