AIM: Investigating Morphine's Pain-Relieving Properties in Mice with Acetic Acid-Induced Writhing

REFERENCE:

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b. Medhi Band Prakash A, Introduction to Experimental Pharmacology, Practical Manual of Experimental and Clinical Pharmacology. Jaypee Brothers Medical Publishers (P) Ltd. First Edition, 2010
c. M.N. Gosh Common Laboratory Animals, Fundamentals of Experimental Pharmacology, Fifth Edition, 2011

INTRODUCTION:

Morphine, a powerful opioid analgesic, is commonly employed for pain management. However, its adverse effects and potential for addiction necessitate the exploration of alternative pain-relieving agents. In this study, we delve into the efficacy of morphine in alleviating pain induced by acetic acid in mice.

Acetic acid-induced writhing serves as a well-established model for assessing visceral pain in rodents. By intraperitoneally injecting acetic acid, researchers induce abdominal discomfort and writhing responses. Our hypothesis posits that morphine, as an opioid, will mitigate this pain.

EQUIPMENT REQUIREMENT:

Apparatus: glass chamber, mice cages, stopwatch

Animal: Mice (25-30 gm)

Drugs: Acetic Acid 1% v/v (inject 1ml/100g of body weight of the animal), Morphine sulphate (Dose 5mg/kg, s.c., prepare the stock solution).

PRINCIPLE:

The principle underlying this experiment lies in the assessment of morphine's analgesic efficacy using the acetic acid-induced writhing model in mice.

1. **Acetic Acid-Induced Writhing Model**:
    - Researchers use intraperitoneal injection of acetic acid to induce visceral pain in mice.
    - Acetic acid irritates the peritoneal lining, leading to abdominal discomfort and characteristic writhing movements.

- This model mimics visceral pain experienced by humans and provides a reliable platform for pain assessment.

2. **Morphine as an Opioid Analgesic**:
   - Morphine is a potent opioid with well-known pain-relieving properties.
   - It acts primarily on mu-opioid receptors in the central nervous system.
   - By binding to these receptors, morphine inhibits pain signals and modulates pain perception.
3. **Hypothesis**:
   - We hypothesize that morphine administration will reduce acetic acid-induced writhing in mice.
   - If successful, this would confirm morphine's analgesic effect in this specific pain model.
4. **Mechanism of Action**:
   - Morphine's binding to mu-opioid receptors leads to:
     - Suppression of nociceptive (pain) signaling pathways.
     - Altered perception of pain stimuli.
     - Reduced pain-related behaviors.
5. **Clinical Implications**:
   - Understanding morphine's efficacy in this model informs pain management strategies.
   - It sheds light on potential applications in human medicine.
   - Safety considerations and optimal dosages are crucial for clinical translation.

OBSERVATION:

Sr No.	Body wt. (gm)	Treatment	Number of writhes (10 min)
1		Control (acetic acid)	
2		Control (acetic acid)	
3		Control (acetic acid)	
4		Control (acetic acid)	
5		Control (acetic acid)	
6		Control (acetic acid)	
	MEAN		
1		Morphine + Acetic acid	
2		Morphine + Acetic acid	
3		Morphine + Acetic acid	
4		Morphine + Acetic acid	
5		Morphine + Acetic acid	

6		Morphine + Acetic acid	
	MEAN		

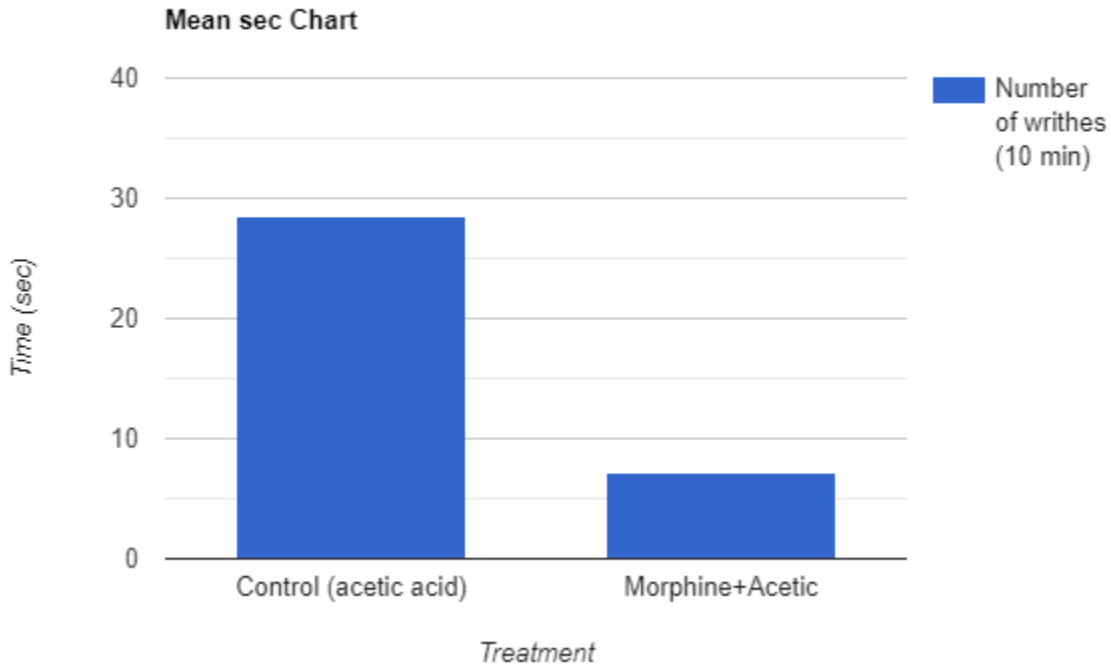
INFERENCE:

Sr No.	Body wt. (gm)	Treatment	Number of writhes (10 min)
1	26	Control (acetic acid)	28
2	25	Control (acetic acid)	26
3	28	Control (acetic acid)	29
4	27	Control (acetic acid)	31
5	26	Control (acetic acid)	30
6	30	Control (acetic acid)	27
	MEAN		28.5
1	26	Morphine + Acetic acid	6
2	30	Morphine + Acetic acid	8
3	28	Morphine + Acetic acid	5
4	25	Morphine + Acetic acid	7
5	27	Morphine + Acetic acid	8
6	30	Morphine + Acetic acid	9
	MEAN		7.17

*Observation table after completion of the experiment can be downloaded by clicking tab (RJPT SimLab)

DISCLAIMER: "The results provided here are only for reference or comparison purposes. Students are expected to perform the experiment and record their actual observations."

GRAPH:



PROCEDURE:

1. **Animal Preparation**:
    a. Weigh and assign identification numbers to the animals.
    b. Divide them into two groups, each containing 6 animals.
2. **Control Group**:
    a. Administer an appropriate volume of acetic acid solution to the first group.
    b. Place each animal individually under a glass jar for observation.
    c. Note the onset of writhing (abdominal contractions, trunk twist response, and hind limb extension) during a 10-minute period.
3. **Morphine Treatment Group**:
    a. Inject morphine into the second group of animals.
    b. After 30 minutes, administer acetic acid solution to these animals.
    c. Observe and record the onset and severity of the writhing response, similar to the control group.

4. **Analysis**:
    a. Calculate the mean writhing scores separately for the control and morphine-treated groups.

b. Take note of how morphine inhibits the pain response.

RESULT:

Study demonstrates that **morphine significantly reduces acetic acid-induced writhing** in mice. The treated group exhibited fewer writhing episodes compared to the control group. This finding supports morphine's efficacy as an analgesic agent in this specific pain model.