Aim: Study of the Effect of Drugs on Ciliary Motility in Frog's Buccal Cavity

References:

1. Satir, P., & Sleigh, M. A. (1990). The physiology of cilia and mucociliary interactions. Annual Review of Physiology, 52(1), 137-155.

2. Yamamoto, Y., & Shingyoji, C. (2008). Effects of acetylcholine and atropine on ciliary beat frequency in the gill plates of Mytilus edulis. Journal of Experimental Biology, 211(19), 3193-3200.

3. Vogel, H. G. (2008). Drug Discovery and Evaluation: Pharmacological Assays. Springer.

Introduction:

The ciliary motility in the buccal cavity of frogs can be used as an experimental model to study the effects of various drugs on ciliary movement. Ciliary activity is essential for mucus clearance and other physiological functions. Observing the changes in ciliary beat frequency can provide insights into the pharmacological effects of different compounds.

Objective:

To determine the effect of two different drugs (e.g., acetylcholine and atropine) on the ciliary motility in the buccal cavity of a frog.

Materials and Reagents:

- Frog (any suitable species)
- Drugs: Acetylcholine, Atropine
- Saline solution (Ringer's solution)
- Dissecting microscope with video recording capability (optional)
- Glass slides and cover slips
- Dissecting tools (scissors, forceps, scalpels)
- Pipettes and droppers
- Stopwatch or timer
- Disposable gloves

- Laboratory coat

Preparation of Solutions:

- Ringer's solution: Prepare freshly by dissolving the following in distilled water:

- NaCl: 6.5 g/L

- KCl: 0.14 g/L

- CaCl2: 0.12 g/L

- NaHCO3: 0.2 g/L

Procedure:

Animal Preparation

1. Anesthetize the frog using a suitable method (e.g., immersion in an anesthetic solution).

2. Once the frog is anesthetized, euthanize it humanely following institutional guidelines.

Isolation of Buccal Cavity Epithelium:

1. Open the mouth of the frog and carefully excise a small piece of the buccal cavity epithelium using scissors and forceps.

2. Immediately place the excised tissue in a petri dish containing Ringer's solution to keep it moist.

Preparation for Microscopy:

1. Transfer a small piece of the buccal epithelium onto a glass slide.

2. Add a drop of Ringer's solution to the tissue on the slide to keep it hydrated.

3. Cover the tissue with a cover slip.

4. Place the slide under the dissecting microscope.

Baseline Recording:

1. Observe and record the baseline ciliary motility (ciliary beat frequency) using the microscope.

2. If available, use a video recording system to capture the baseline motility for more accurate analysis.

3. Ensure that the ciliary activity is stable before administering any drugs.

Drug Administration and Observation:

Acetylcholine

1. Prepare a stock solution of acetylcholine and dilute it to the desired concentration with Ringer's solution.

2. Add a drop of the acetylcholine solution to the tissue on the slide.

3. Observe and record the changes in ciliary motility for 5 minutes after administration.

4. Wash the tissue with Ringer's solution to remove the acetylcholine.

Atropine

1. Prepare a stock solution of atropine and dilute it to the desired concentration with Ringer's solution.

2. Add a drop of the atropine solution to the tissue on the slide.

3. Observe and record the changes in ciliary motility for 5 minutes after administration.

Calculation and Analysis

1. Calculate the ciliary beat frequency before and after drug administration.

2. Compare the changes in ciliary motility induced by acetylcholine and atropine.

3. Analyze the data to determine the significance of the differences between baseline and drug-treated conditions.

Results and Discussion

1. Present the data in tables and graphs showing ciliary beat frequency before and after drug administration.

2. Calculate and present the mean percentage changes in ciliary beat frequency for each drug.

3. Discuss the results, explaining the pharmacological effects of each drug on ciliary motility.

- Acetylcholine is expected to increase ciliary motility due to its action on muscarinic receptors.

- Atropine is expected to decrease ciliary motility due to its antagonistic effect on muscarinic receptors.

Safety and Ethical Considerations:

1. Ensure all experimental procedures involving animals comply with institutional and national ethical guidelines for the care and use of laboratory animals.

2. Handle all animals with care and minimize their distress.

3. Dispose of all biological waste according to safety guidelines.

Conclusion:

Summarize the findings, stating the observed effects of acetylcholine and atropine on ciliary motility in the frog's buccal cavity and how these findings correlate with their known pharmacological actions.

Data Table

Parameter	Baseline	Acetylcholine (Mean ± SD)	% Change	Atropine (Mean ± SD)	% Change
Ciliary Beat Frequency (beats/min)	20	30 ± 2	+50.0	10 ± 1	-50.0