Effect of drugs on ciliary motility on frog's buccal cavity

The experiment titled "Effect of Drugs on Ciliary Motility in Frog's Buccal Cavity" is a fascinating study that explores the impact of various drugs on the ciliary movement within the buccal cavity of a frog. The buccal cavity, also known as the oral cavity, is lined with ciliated epithelium. These cilia play a crucial role in the frog's respiratory system, helping to move mucus and trapped particles.

In this experiment, different drugs are introduced to observe their effects on the ciliary movement. The results of this experiment can provide valuable insights into how these drugs might affect ciliary function, which is not only important for understanding the drug's potential respiratory effects, but also its broader physiological implications.

This experiment is a significant contribution to the field of pharmacology and physiology, offering a unique perspective on the intricate interactions between drugs and the ciliary system. It underscores the importance of understanding the systemic effects of drugs, beyond their primary therapeutic targets.

- Equipment Required

1. Apparatus: Frog Board, poppy seeds, stop watch, surgical instruments.
2. Subject: Frog
3. Drugs:
    - normal saline
    - Riger
    - acetylcholine (2µg/ml)
    - physostigmine (2µg/ml)
    - Atropine (2µg/ml)

- Principle

The principle of this experiment is based on the understanding that cilia, tiny hair-like structures lining the buccal cavity of a frog, play a crucial role in the frog's respiratory system. They move in coordinated waves, pushing mucus and trapped particles towards the throat, thereby keeping the airways clear.

Drugs can influence the functioning of these cilia. They can either stimulate or inhibit ciliary movement, depending on their nature and concentration. This experiment is designed to observe and measure these effects.

When a drug is introduced into the frog's buccal cavity, it comes into contact with the cilia. If the drug has a stimulatory effect, it will increase the speed and coordination of ciliary movement. Conversely, if the drug has an inhibitory effect, it will slow down or even stop ciliary movement.

By observing these changes, researchers can gain insights into the drug's potential effects on the respiratory system. This is particularly important for drugs that are inhaled or ingested, as they would come into direct contact with the cilia in the human respiratory and digestive tracts.

This principle underscores the importance of understanding not just the intended effects of a drug, but also its potential side effects and interactions with various physiological systems. It is a testament to the complexity and interconnectedness of biological systems, and the care that must be taken when introducing foreign substances into these systems.

- Ideal observation

Drug	Frog 1	Frog 2	Frog 3	mean time
normal saline	42 sec	42 sec	42 sec	42 sec
Riger	40 sec	40 sec	40 sec	40 sec
Acetylcholine	23 sec	23 sec	23 sec	23 sec
physostigmine	18 sec	18 sec	18 sec	18 sec
Atropine	40 sec	40 sec	40 sec	40 sec

- procedure

1. Decapitate the frog and pin the frog to the frog board on its back.
2. Pin the lower jaw to the abdomen cutting sufficiently buccal cavity and exposing the oesophagus. Keep the buccal cavity and the opening of the oesophagus wet by irrigating it with normal saline.
3. To assess the distance travelled by the particle, fix two points ie. one at start of tire lower jaw and other at the beginning of the esophagus. Keep this distance constant to measure the time taken by the particle to move from a fixed point in the lower jaw to the beginning of the esophagus.

4. Place a poppy seed or a small piece of cork at the pre-marked spot in the jaw. Turn on the stop-watch and note the time taken by the object to reach the beginning of the oesophagus. Repeat this several times.
5. Put a few drops of riger on the buccal cavity and after 3 min repeat step 4. Note the time.
6. Wash the buccal cavity with normal saline. Put a 1 drops of Acetylcholine on the buccal cavity. After 3 min repeat the step 4. Note the time.
7. Wash the buccal cavity with normal saline. Put a 1 drops of physostigmine on the buccal cavity. After 3 min repeat the step 4. Note the time.
8. Wash the buccal cavity with normal saline. Put a 1 drops of atropine on the buccal cavity. After 3 min repeat the step 4. Note the time.
9. Find out the difference in the time taken by the object to move between the pre-marked distance in the buccal cavity in presence of saline, riger, Acetylcholine, physostigmine and atropine.

- Results:

1. **Saline**: As a control, saline should have no significant effect on the speed of ciliary movement. The time taken by the particle to move from the lower jaw to the oesophagus should remain consistent with the baseline measurements.
2. **Riger**: Depending on its properties, riger might either stimulate or inhibit ciliary movement. This would be reflected in a decrease or increase in the time taken by the particle to reach the oesophagus, respectively.
3. **Acetylcholine**: As a neurotransmitter known to stimulate muscle contraction, acetylcholine might increase the speed of ciliary movement. This could result in a decrease in the time taken by the particle to reach the oesophagus.
4. **Physostigmine**: This drug is a reversible inhibitor of acetylcholinesterase, an enzyme that breaks down acetylcholine. By increasing the availability of acetylcholine, physostigmine might also increase the speed of ciliary movement, leading to a decrease in the time taken by the particle to reach the oesophagus.
5. **Atropine**: This drug is a competitive antagonist for the muscarinic acetylcholine receptors. It might slow down ciliary movement, resulting in an increase in the time taken by the particle to reach the oesophagus.