Aim: Effect of spasmogens and spasmolytics using rabbit jejunum

References

1. Goyal, R. K., & Hirano, I. (1996). "Gut motility and regulatory mechanisms." Journal of Clinical Gastroenterology, 22(4), 293-310.

2. Rang, H. P., Dale, M. M., Ritter, J. M., & Moore, P. K. (2011). "Pharmacology" (7th ed.). Churchill Livingstone.

3. Tripathi, K. D. (2019). "Essentials of Medical Pharmacology" (8th ed.). Jaypee Brothers Medical Publishers.

Principle

The jejunum, a part of the small intestine, exhibits spontaneous rhythmic contractions due to intrinsic myogenic activity modulated by neurotransmitters and drugs. Spasmogens induce contractions, whereas spasmolytics inhibit them. By recording these effects on an isolated tissue preparation, the pharmacological properties of different drugs can be studied.

Materials and reagents

Instruments: Student's organ bath (20–30 mL capacity), Isotonic lever and kymograph (or PowerLab system for digital recording), Aerator, Syringes (1 mL, 5 mL), Stopwatch, Fine scissors, forceps, and thread

Reagents and Solutions: Ringer's solution (composition per liter of distilled water):

NaCl – 9 g

KCl – 0.42 g

$CaCl_2$ – 0.24 g

$NaHCO_3$ – 0.5 g

Glucose – 1 g

Drugs:

Spasmogens: Acetylcholine (ACh), Histamine

Spasmolytics: Atropine, Papaverine

Freshly sacrificed rabbit jejunum

Procedure

Preparation of Isolated Jejunum:

1. Sacrifice a rabbit following ethical guidelines and rapidly excise a segment of the jejunum (~2–3 cm).

2. Place the tissue immediately in cold aerated Ringer's solution.

3. Remove adhering fat and mesentery carefully using fine scissors.

4. Mount the jejunum in the organ bath containing Ringer's solution at 37°C, aerated with 95% O_2 and 5% CO_2.

5. Attach one end of the tissue to the bottom of the organ bath and the other to an isotonic lever connected to a kymograph (or a force transducer).

6. Maintain an initial tension of 1 g and allow the tissue to equilibrate for 30 minutes with regular washing every 10 minutes.

Recording Responses:

1. Spontaneous Activity: Observe the baseline contractions of the jejunum.

2. Effect of Spasmogens: Add increasing concentrations of acetylcholine (10^{-8} to 10^{-4} M) or histamine (10^{-8} to 10^{-4} M) and record the contractile response.

3. Effect of Spasmolytics: Pre-treat the tissue with atropine (10^{-6} M) or papaverine (10^{-6} M) for 5 minutes and then add acetylcholine or histamine to observe inhibition.

4. Record and compare the responses before and after the addition of drugs.

Observations and result

Drug	**Concentration**	**Response (Amplitude of Contraction in mm)**	**Effect**

Acetylcholine	10^{-8} M	↑	Spasmogen
Acetylcholine	10^{-6} M	↑↑	Spasmogen
Histamine	10^{-6} M	↑	Spasmogen
Atropine + ACh	10^{-6} M + 10^{-6} M	↓	Spasmolytic
Papaverine + ACh	10^{-6} M + 10^{-6} M	↓↓	Spasmolytic

Conclusion

- Acetylcholine and histamine increased jejunum contraction, indicating their spasmogenic action.
- Atropine inhibited acetylcholine-induced contraction, confirming its role as a muscarinic antagonist.
- Papaverine reduced contractions, indicating its smooth muscle relaxant (spasmolytic) action.

The study demonstrates how neurotransmitters and drugs modulate intestinal motility.

Precautions

- Ensure proper aeration of the organ bath for tissue viability.
- Maintain a constant bath temperature (37°C).
- Use fresh tissue and minimize handling to avoid mechanical damage.
- Record drug concentrations accurately for reproducibility.