AIM: Anticonvulsant activity assessment using Pentylenetetrazol (PTZ) in rats

INTRODUCTION:

Epilepsy is a chronic neurological disorder characterized by recurrent, unprovoked seizures resulting from abnormal electrical activity in the brain. The development of effective anticonvulsant drugs is crucial for managing this condition. Animal models play a vital role in screening and evaluating potential antiepileptic agents. One commonly used model is the Pentylenetetrazol (PTZ)-induced seizure test in rats. PTZ acts as a central nervous system stimulant by blocking GABA-A receptors, leading to convulsions. By assessing the ability of test drugs to prevent or reduce PTZ-induced seizures, researchers can identify compounds with potential anticonvulsant properties and better understand their mechanisms of action.

REQUIREMENTS:

Animals: Mice (20–25 g body weight)

Drugs: Pentylenetetrazol (PTZ): Dose at 80 mg/kg in mice, prepared as a stock solution containing 8 mg/mL (1 mL/100 g of body weight).

Diazepam: Dose at 4 mg/kg, prepared as a suspension in 1% gum acacia at a concentration of 0.4 mg/mL, with a dose of 1 mL/100 g of body weight.

PRINCIPLE:

Pentylenetetrazol (PTZ) is a central nervous system stimulant known to induce convulsions in rats and mice. This experimental model is commonly used to simulate convulsive episodes for evaluating the efficacy of anticonvulsant drugs. PTZ acts by modulating GABAergic pathways, producing Clonic convulsions that mimic seizure activity in humans. The anticonvulsant drug, diazepam, works through GABA receptor modulation and is used here to assess its effect in preventing PTZ-induced seizure

PROCEDURE:

1) **Grouping and Preparation:**

- Weigh and number the mice.
- Divide the animals into two groups, each consisting of 5 mice.
    - **Group 1 (Control):** Receives PTZ only.

- **Group 2 (Test with Diazepam):** Receives diazepam followed by PTZ.

2) **Drug Administration:**

- **Control Group:** Inject pentylenetetrazol at 80 mg/kg.
- **Test Group (Diazepam):** Inject diazepam at 4 mg/kg, then administer PTZ at 80 mg/kg after 30 minutes.

OBSERVATION:

- Record the following parameters:
- **Onset of Convulsions:** Record the time from PTZ administration to the onset of convulsions, including jerky movements and Clonic seizures.
- **Duration of Convulsions:** Record the duration of Clonic and extensor convulsions.
- **Recovery or Death:** Note whether the animal recovers or succumbs to the convulsions.
- **Data Collection:** Record each parameter (onset, duration, recovery, or death) for all animals in both groups.

OBSERVATION TABLE:

Control group

Sr No.	Body weight (g)	Treatment	Convulsion		
			On set (sec)	Nature and Severity	Death/recovery (min)
1		PTZ			
2					
3					
4					
5					
6					
Mean					

Test group

Sr No.	Body weight (g)	Treatment	Convulsion		
			On set (sec)	Nature and Severity	Death/recovery (min)
1		Diazepam + PTZ			
2					
3					
4					
5					
6					
Mean					

INFERENCE: Control group

Sr No.	Body weight (g)	Treatment	Convulsion		
			On set (sec)	Nature and Severity	Death/recovery (min)
1	20	PTZ	55	Jerky Movement & Straub's Tail	3
2	22		72	Clonic Convulsions	5
3	20		62	Clonic Convulsions	4
4	20		75	Jerky Movement & Straub's Tail	3
5	21		60	Jerky Movement & Straub's Tail	5
6	22		67	Clonic Convulsions	3
Mean					

Test group

Sr No.	Body weight (g)	Treatment	Convulsion		
			On set (sec)	Nature and Severity	Death/recovery (min)
1	20	Diazepam + PTZ	-	No Convulsions	-
2	22		-	No Convulsions	-
3	22		-	No Convulsions	-
4	21		-	No Convulsions	-
5	23		120	Clonic Convulsions	2
6	20		120	Clonic Convulsions	2
Mean					

*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."

RESULTS:

Mean ± SEM Calculation:

- Calculate the mean and standard error of the mean (SEM) for each parameter in both groups.

Data Analysis:

- Compare the latency to onset, duration of convulsions, and recovery rate between the control and diazepam-treated groups.
- A significant increase in latency, reduction in duration, or increased survival rate in the diazepam group suggests anticonvulsant efficacy.

CONCLUSION:

This experiment helps to evaluate the anticonvulsant activity of diazepam in PTZ-induced convulsions in mice. Diazepam, as a GABAergic drug, is expected to prolong the latency to convulsions and decrease their severity, providing evidence of its potential use as an anticonvulsant in clinical settings.