

Introduction to Instruments used in Pharmacology with its Application

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Abstract: *Pharmacology is a multidisciplinary field that focuses on the study of drug interactions, mechanisms of action, and therapeutic effects. The advancement of pharmacological research and clinical applications is heavily dependent on various specialized instruments that enable precise measurement, analysis, and monitoring of drug properties and their effects on biological systems. Instruments used in pharmacology range from simple laboratory tools, such as spectrophotometers and chromatographs, to more complex systems like high chromatography (HPLC), mass spectrometry (MS), and in vivo imaging devices. These tools are essential for drug discovery, pharmacokinetic studies, dose assessments, and toxicological evaluations. The development and application of these instruments allow researchers to accurately quantify drug concentrations, monitor physiological changes, and identify potential drug targets, thereby facilitating the discovery of safe and effective pharmaceutical agents. This introduction provides an overview of the fundamental instruments commonly used in pharmacology and highlights their critical roles in modern drug development and research..*

Keywords: Pharmacology

I. INTRODUCTION

- In pharmacology, various instruments and techniques are used to study and understand the effects of drugs on biological systems the mechanisms of drug action, and to measure the concentrations and pharmacokinetics of drugs.
- These instruments help researchers and clinicians to evaluate the safety, efficacy, and pharmacodynamics of medications.
- Below is an introduction to some of the key instruments used in pharmacological research and practice Instruments used in pharmacology are essential for conducting experiments in drug development, preclinical testing, and clinical research.
- From the initial discovery phase to post-market surveillance, these tools help to assess how drugs behave in the body, their therapeutic effects, potential toxicity, and any unintended side effects.
- The use of advanced technologies allows for more precise and efficient drug testing, faster development of new treatments, and better monitoring of their use in clinical settings.

LIST OF INSTRUMENTS

- Sherrington roatatingdrum and kymograph
- Organ bath
- Rota red apratus
- Acto-phoyometer • Acto-phoyometer
- Electro -convulsometer
- Analgesiomotor(hot plate,tailflick)
- Pole climbing
- Histamine chamber
- Metabolic cage

- Tele thermometer Aerator

1) ORGAN BATH

The tissue bath used to put the animal tissue for studying the drug action is called student bath



2) SHERRINGTON ROTATING DRUM

- Used to record contraction or relaxation of the isolated tissue preparation
- The recording is done on kymograph papers fixed on circular cylinder and runs at different speed using electrical recording drum.



Application

- To record the effect of drug

3) STUDENT ORGAN BATH

- It is used to studying the effect of drug is isolated animal tissue
- Student organ bath tissue is mounted and provided with its necessary environment



Application

- Used to maintaining the integrity of muscle tissue for several hours ,in a controlled environment
- Quantify the effect of treatment with contractile and relaxing unit
- Affinity and efficacy studies of agonist and antagonist
- Drug discovery and safety pharmacology
- Uses
- Organ bath have been used for decades by pharmacologists to investigate nerve-muscular interaction and the contractility of smooth,cardiac or skeletal muscle

Two types of organ bath

1.single unit organ bath

- This setup was designed and developed by Rudolph magnus
- It has only one inner bath



2.double unit organ bath

- Double unit organ bath is having two holding place for organ tube that's why we can perform two studies at same time



ESSENTIAL PARTS OF ORGAN BATH

- Rotating drum and kymograph
- Kymograph
- Outer bath/outer water jacket
- Inner organ bath
- Tissue holder and oxygen supply
- Fulcrum

- Stirrer
- Heating iron coil and thermostat



Kymograph paper

3) RECORDING LEVERS

Use: used to record the contraction and relaxation of the isolated tissue preparation

List of levers

- Simple lever
- Frontolwriting lever
- Frontolwriting lever
- Starting heart lever
- Brodiesuniversal lever
- Gimblever (GL)
- Isometric lever

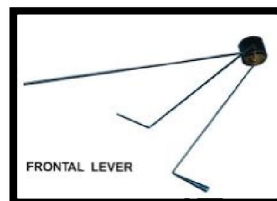
1) Simple lever

- It is simple type of lever
- Made of simple stainless still, aluminium or wood with stylus
- Attachment of simple lever should be targential to the smoke drum



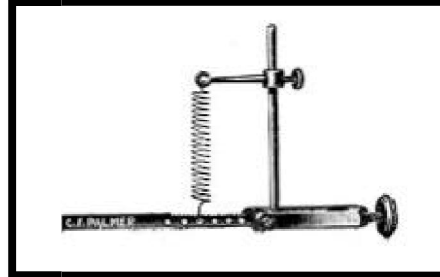
2) Frontol writing lever(FWL)

- Made up of stainless steel with stylus
- Attachement of should be perpendicular to the smoke drum



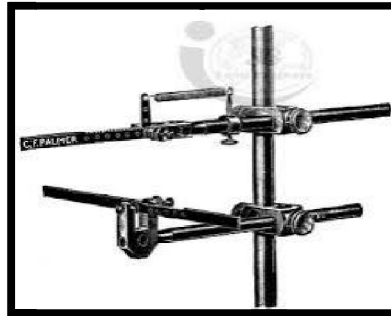
3) Starling heart lever

- Made of stainless steel or aluminium with detachable style
- Attachment of SHL is perpendicular to the smoked drum



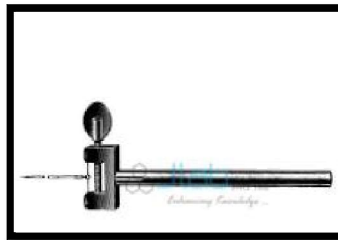
4) BRONDIESUNIVERSAL LEVER

- It is generally utility lever with axis screwed with two nuts



5) ISOMETRIC LEVER

- It consist of heavy brass frame with spring steel wire fixed to each limb and carrying the lever from the centre



6) FORCEPS AND SCISSORS

- Laboratory instruments made uoof stainless steel.
- Forceps are a handheld, hinged instrument used for grasping and holding object.
- Scissors are used for many purpose during a surgical procedures .
- Operating a surgical scissors come in different sizes and are used to cut the tissue.
- Dissecting scissors are used to seprateand difference tissue because they are more precise than operating scissord



7) ROTA ROD more precise than operating scissord



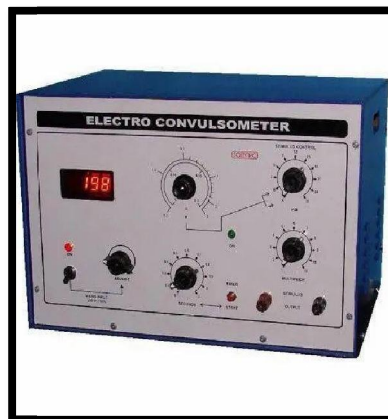
ROTA ROD APPRATUS

Determine the effect of skeletal muscle relaxant drug using Rota rod apparatus

- Drug –Diazepam
- Animal -Rat,mice
- The apparatus consist of a horizontal metal rod(coateswith rubber)of 3cm diameter
- Adjusted speed-2 rotation /min to 6 rotation/min
- The rod is 75 cm in length and is decided into 6 section by plastic disc
- Thereby allowing the simultaneously testing of 6 mice Height of rod-50 cm
- Cut off timr-for the tesis -2min

8) ELECTRO-CONVULSIOMETER

Instruments is used to study the anticonvulsant activity of phenytoin against maximal electro shock induced convulsion in rat



- Animal-rat mice
- The electric applied the corneal shock is through electrode

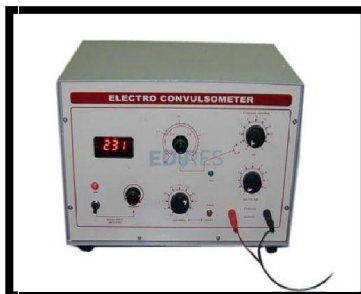
It produce five phases

1. Tonic flexion
2. Tonic extensor
3. Clinic convulsion
4. Stuper
5. Recovery/death

Electro-convulsio meter is used for applying maximal electro shock through corneal electrodes provided

9) ANALGESIOMETER

- Effect of analgesic using analgesiometer • Animal –rat, mice
- The instrument works on the principle of observing the pain threshold in the rodent before the drug administration
- This is perform mainly to identify any pain is stimulus threshold in rodent
- This is perform mainly to identify any pain is stimulus threshold in rodent against a radiant heat and to screen analgesic drug by increasing the pain threshold
- The radiant heat method is being used for evaluation of systemic analgesic activity of drug
- The endpoint of the experiment is considered escape reaction which is considered to be controlled by brain



Two types of Analgesiometer

1. Tail flick analgesiometer
2. Hotplate analgesiometer



10) METABOLIC CAGE

- The metabolic cage is designed to allow measurement of fluid intake and to separate and collect feces and urine for numerous qualitative determination
- It is used to study the metabolic parameter such as faecal and urine for the study of purgative or laxative, animal such as rat and mice are used

II. CONCLUSION

In conclusion, the instruments used in pharmacology are indispensable tools that drive the advancement of drug research, development, and therapeutic applications. From basic analytical techniques to sophisticated imaging and diagnostic systems, these instruments enable the precise measurement, analysis, and interpretation of drug properties and their biological effects. The integration of technologies such as HPLC, mass spectrometry, and in vivo imaging has significantly enhanced our understanding of pharmacokinetics, pharmacodynamics, and toxicology. As the field of pharmacology continues to evolve, the development of more advanced, high-throughput, and precise instruments will likely play a pivotal role in the discovery of new therapeutic agents and the optimization of drug therapies. Ultimately, these instruments not only advance scientific knowledge but also help ensure the safety and efficacy of drugs, thereby improving patient care and outcomes in clinical settings.