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RESEARCH ARTICLE

BENEFITS OF USE OF POWER LAB IN PRACTICAL AND RESEARCH IN PHARMACOLOGY DEPARTMENT OF MEDICAL UNIVERSITIES.

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Abstract

Power lab is instrument which has essential use in performing pharmacology practical related to cardiovascular, respiratory, gastrointestinal and reproductive organs tissues of frog, rat and rabbit and in-vivo study. It has beneficial effects in pharmacology practical for study of effects of different drugs on gastrointestinal tissue, skeletal muscles, cardiovascular, respiratory and uterus and to store the data safely and effectively. Aim of this study was application of powerlab to plot a graph of effect of drugs on gastrointestinal tract noting the drugs having stimulant and depressant effects (pilocarpine, histamine and barium chloride are all stimulants of intestine while adrenaline and atropine are depressants) and data storage.

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Introduction:-

A manual of pharmacology experiments designed to be performed using the Power lab/410 data recording system. The system is technical accurate and reliable, provide biological and pharmacological laboratory researches quality results. It can be used with force, displacement, pressure and many other types of transducers, which also makes it useful for animal laboratory practicals¹.

Power lab include hardware unit for generation of voltage pulses for electrical stimulation of nerve and muscles. Organ bath which includes tissue holders, transducer holders, micropositiones and tissue chambers. Thermo regulator water pump used to heat and circulate water through the jacketing of organ bath, it includes thermo regulated heater, thermometer, water bath. Bridge amplifiers they are single or multichannel, non-isolated, connects to most DC bridge transducers. Isotonic transducers are suitable for investigating isotonic contractions of isolated organs and tissue.² The basic hardware unit is the Power lab, a multichannel recording instrument for the measurement of electrical signals.

Lab tutor controls the sampling, digitizing and storage of experimental data, and allows researcher to display, manipulate and analyze the data effectively. First, a transducer converts the signal of interest (for example muscle movements or blood pressure) into an analog voltage, whose amplitude can vary . This is monitored by the recording hardware, which can modify the signal by amplification and filtering, processes called 'signal conditioning'. The resulting signal is sampled at regular intervals and converted from analog to digital form before transmission to the attached computer. In the attached computer sampled data is stored and displayed.³

The aim of this study was to signify the benefits of use of powerlab in pharmacology practical to study of effects of different drugs acting on gastrointestinal tissue, skeletal muscles, cardiovascular, respiratory and uterus.

Methodology:-

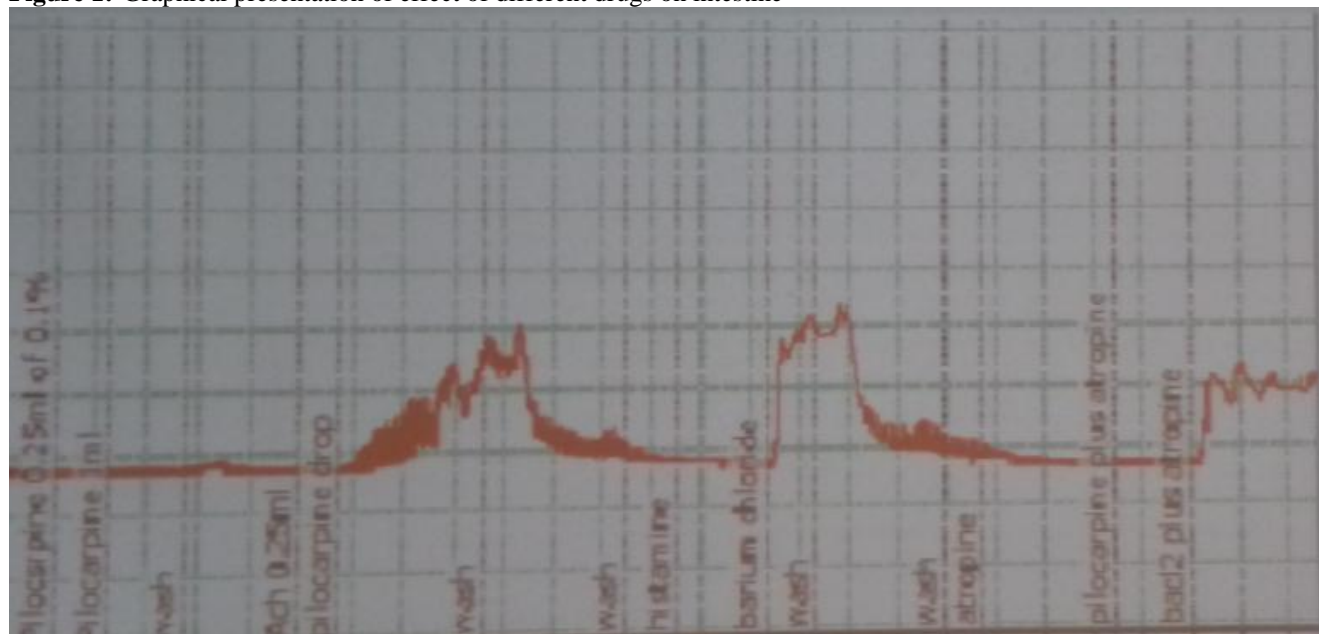
In this animal experiment (isolated piece of rabbit intestine) Prepared isolated segments of ileum after sacrificing the animal were transferred into petri dish containing oxygenated tyrodes solution and maintain the 37° C temperature in the tissue bath. After cutting 2.5cm intestine segment suspend it in the inner bath containing tyrode solution with hook, connect transducer to the hook. Record the activity of intestine on monitor through power lab system. Different drugs were added one by one in the inner bath and record the tracings. Wash the tissue 3-4 times before adding a new drug.

Similar methodology was used in performing for skeletal muscle, cardiovascular and uterus to determine effects of various drugs. Experimental effects of drugs on respiratory system and cardiovascular system on humans can be done using power lab.

Results:-

In the following Figure 1 data taken from the experiments shows that pilocarpine, histamine and barium chloride are all stimulants of intestine while adrenaline and atropine are depressants.

Figure 1:-Graphical presentation of effect of different drugs on intestine



The effects on drugs were seen on different tissues by using power lab, as given in Table-1.

Table-1:-Experiment Conducted on Power Lab

Subjects	System/ Tissues	Drugs and their effects	Receptors/Action
Rabbit	GIT- ileum	<ul style="list-style-type: none"> • Pilocarpine- Contracts • Histamine- Contracts • Epinephrine- Relaxes • Atropine- Relaxes 	<ul style="list-style-type: none"> • μ • H • $\alpha_1\alpha_2\beta_1\beta_2\beta_3$ • μ blocker
Frog	Skeletal Muscle	<ul style="list-style-type: none"> • Acetylcholine- Contract • Atracurium- Relaxes • Ringer's Lactate(Nutrient)- Normal contracts 	<ul style="list-style-type: none"> • μ and nicotinic • Non depolarizing
Rabbit	CVS+ Vascular smooth muscle	<ul style="list-style-type: none"> • Epinephrine- Contract • Propranolol- Relaxes 	<ul style="list-style-type: none"> • $\alpha_1\alpha_2\beta_1\beta_2\beta_3$ • β_2

		<ul style="list-style-type: none"> • Digoxin- Contract • Dobutamine- Contract • Verapamil- Relaxes 	<ul style="list-style-type: none"> • Na/K ATPase • β_1 • Ca channel blocker
Human	Respiratory-lungs	<ul style="list-style-type: none"> • Albuterol- Bronchodilator • Ipratropium- Bronchodilator 	<ul style="list-style-type: none"> • β_2 • μ blocker
Rat	Repro-Uterus	<ul style="list-style-type: none"> • Oxytocin- Contract • Ergotamine- Contract • Terbutaline- Relaxes • Atosiban- Relaxes • Diltiazem- Relaxes 	<ul style="list-style-type: none"> • Oxytocin receptor • 5HT • β_2 • Antagonist • Ca channels blocker

Discussion:-

Powerlab is used in performing various in-vivo, animal and human studies. Previous data can be acquired using the Power lab data acquisition system (AD Instruments, Colorado Springs, CO) and digitized at a sampling rate of 2 kHz. Lab Chart Pro v.7 software with HRV and dose-response plug-ins (AD Instruments, Colorado Springs, CO) can be used for all data analysis. Additional channels were set up for “cyclic measurements” to convert raw ECG data into beat-to-beat HR using default mouse ECG settings and “smoothing” to calculate 10-s moving averages of beat-to-beat HR.^{4,5}

The arterial blood pressure was determined indirectly by the tail-cuff method using the Model 29 pulse amplifier and Model 20NW cuff pump coupled to a computerized data acquisition system (Power Lab © AD Instruments, Sydney, Australia). In this study, an invasive blood pressure measurement was obtained under ketamine and xylocaine anesthesia in surgically prepared animals.⁶ This, led an initiative to produce guidelines for reporting animal research. The guidelines, referred to as ARRIVE (Animals in Research: Reporting In Vivo Experiments), have been developed using the CONSORT Statement as their foundation^{7,8,9,10}.

Conclusion:-

Powerlab has proved extremely effective and useful instrument in carrying out animal experiments for testing action of drugs on GIT and other tissue and organs for conducting pharmacology practices in undergraduate and postgraduate medical students and all data can be safely stored.

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