

AIM: - To study introduction to in-vitro pharmacology and physiological salt solutions.

THEORY:-

IN-VITRO PHARMACOLOGY

What Is In Vitro Pharmacology?

- ❖ In In-vitro pharmacology is, **in vitro** means studies or experiments conducted on microorganisms and cells outside of their normal biological environment; and **pharmacology** is the study of the effects of drugs and pharmaceutical products on living organisms.
- ❖ In pharmacology means research of the biological effects of drugs and pharmaceutical products, conducted outside of living organisms.
- ❖ In vitro studies are conducted using components of an organism that have been isolated from their usual biological surroundings, such as microorganisms, cells, or biological molecules. For example, microorganisms or cells can be studied in artificial culture media, and proteins can be examined in solutions.
- ❖ Colloquially called "test-tube experiments", these studies in biology, medicine, and their sub disciplines are traditionally done in test tubes, flasks, Petri dishes, etc.

In Vitro Pharmacology in Drug Discovery

- ❖ Before drug development comes drug discovery, the process by which new candidate drugs are identified.
- ❖ Modern science helps researchers to understand how disease and infections are controlled at the molecular and physiological levels and to use that knowledge to create compounds that will be effective against the chosen targets.
- ❖ The purpose of drug discovery is to identify a drug candidate: a molecule that targets the chosen disease selectively and effectively, and has favorable medicine-like properties.
- ❖ To find such a drug candidate, pharmaceutical researchers screen large libraries of chemicals for molecules with the necessary properties. Usually, a pool of potentially useful compounds ("**hits**") is identified and narrowed down to identify more promising compounds ("**leads**").

- ❖ The next stage is called **lead optimization**, where the most promising molecules undergo further screening.
- ❖ At this stage, **in vitro pharmacology** assays are used to extensively optimize the biological activity and properties of the leads.
- ❖ In vitro pharmacology at the **lead optimization** stage of drug discovery generates high-quality data in a precise and timely manner, allowing researchers to identify the best compound for their chosen purpose.
- ❖ That compound will be the drug candidate that will go on to **pre-clinical trials**.

In Vitro Pharmacology in Pre-Clinical Trials

- ❖ When a drug candidate enters the pre-clinical trials phase, researchers already know it is effective against a certain disease or infection. However, At the pre-clinical trial stage, all these parameters must be assessed, and the dose for the first use in a human clinical trial must be determined. On average, only one in 5,000 compounds that enter pre-clinical trials becomes an approved drug.
- ❖ Its purpose is to assess any potential undesirable effects of the drug on the body's major systems.

At the pre-clinical trial stage, in vitro pharmacology can be used to:

- ✓ Obtain high-quality data on the safety and toxicity of your drug candidate;
- ✓ Identify potential adverse effects early in the drug development process;
- ✓ Assess the potency and efficacy of your drug candidate against the targeted disease;
- ✓ Gather data on pharmacokinetics and pharmacodynamics;
- ✓ Evaluate the activity of biosimilar compounds.

Advantages:

- ❖ In vitro pharmacological investigations are significant, in that they permit increasingly quick advancement of new medicines - numerous medications can be learned at once and just those that seem, by all accounts, to be strong go on to human examinations.

Disadvantage:

- ❖ A non-attendance of pharmacokinetics, in medicinal phrasing, is one of the critical downsides of in vitro pharmacological investigations.
- ❖ An absence of pharmacokinetics, just as a few different variables, can make it hard to extrapolate the outcomes to what may be normal when the medication is utilized in vivo.

PHYSIOLOGICAL SALT SOLUTION (PSS)

- The ionic requirements and nutritional supply can be provided by using the suitable solutions, commonly known as PSS.
- Its composition is such that it provide artificial media resembling the inorganic composition of blood plasma together with buffer mechanism to maintain the optimum pH about 7.0 to 7.2 and glucose to facilitate tissue metabolism.
- Commonly used PSS are frog ringer, Tyrode, De Jalon and Kreb's solution.

List and Purpose of each ingredient of various types of PSS :

Sr. no.	Ingredients	Concentration in gms/l				Functions of the ingredient
		Frog Ringer	Tyrode	Kreb's	De Jalon	
1.	Sodium Chloride (NaCl)	6.5	8.0	5.9	9.0	To maintain isotonicity, isomolarity, contractility and excitability
2.	Potassium Chloride (KCl)	0.14	0.2	0.35	0.350	To provide ionic balance
3.	Calcium Chloride (CaCl ₂)	0.12	0.18	0.28	0.003	To provide contractility
4.	Sodium Dihydrogen phosphate (NaH ₂ PO ₄)	0.05	0.1	-	-	Act as buffer
5.	Potassium dihydrogen phosphate (KH ₂ PO ₄)	-	-	0.11	-	Act as buffer
6.	Magnesium Chloride (MgCl ₂)	-	0.1	-	-	To stabilize the preparation
7.	Glucose	1.5	1.0	2.0	0.5	To provide energy
8.	Sodium Bicarbonate NaHCO ₃	0.4	1.0	2.1	0.5	To provide alkaline medium

QUESTIONS:

1. What Is In Vitro Pharmacology?
2. Describe used of In Vitro Pharmacology in pre-clinical studies.
3. What is PSS? Enlist the types PSS solutions.
4. Why sodium bicarbonate is added at the time of setting up of the experiment? Give reason.
5. Which physiological salt solution used for rat/ chicken ileum preparation?
6. What is the function of each composition in Tyrode solution?
7. What is contractility?
8. What is Isotonicity? Why there is need to providing isotonic solution?
9. What is the need to provide buffer in PSS?

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