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Exploring the Intersection of Neuroscience and Pharmacology: A Gateway to Novel Therapeutics

Dear Esteemed Colleagues,

It is with great pleasure that I extend my warmest welcome to you all to this esteemed journal. As we embark on another journey of discovery and innovation, it is crucial to reflect on the profound impact of our collective efforts in advancing the fields of neuroscience and pharmacology.

The intersection of neuroscience and pharmacology represents a gateway to understanding the intricacies of the human brain and developing novel therapeutic interventions. This synergy between the two disciplines has propelled groundbreaking research, leading to the development of treatments for neurological disorders that were once deemed insurmountable.

In recent years, we have witnessed remarkable advancements in neuropharmacology, ranging from the elucidation of molecular mechanisms underlying neurological diseases to the identification of novel drug targets and the development of innovative therapeutic strategies. Moreover, the advent of cutting-edge technologies, such as optogenetics, CRISPR-Cas9, and single-cell sequencing, has revolutionized our approach to studying the brain and identifying potential drug candidates with unprecedented precision.

However, despite these remarkable achievements, significant challenges remain on the horizon. The complexity of the human brain, with its intricate neural circuits and diverse cell populations, presents formidable obstacles in our quest for effective treatments. Furthermore, the translation of preclinical findings into clinically viable therapies requires meticulous attention to detail and rigorous validation in human trials.

As we navigate these challenges, it is imperative to foster interdisciplinary collaboration and embrace innovative approaches to drug discovery and development. By leveraging the collective expertise of neuroscientists, pharmacologists, clinicians, and industry partners, we can accelerate the pace of discovery and bring much-needed therapies to patients suffering from neurological disorders.

In this spirit of collaboration and innovation, I invite researchers from around the globe to contribute their cutting-edge research to this journal. Whether it be elucidating the molecular mechanisms of neurodegeneration, identifying novel drug targets, or conducting clinical trials of promising therapeutics, your contributions play a vital role in advancing the field of neuropharmacology.

Together, let us embark on this journey of exploration and discovery, united in our commitment to unravelling the mysteries of the brain and alleviating the burden of neurological disease. I am confident that through our collective efforts, we will continue to push the boundaries of scientific knowledge and pave the way for a brighter future for all.

Warm regards,

Dr. Hanumanthachar Joshi
Editor-in-Chief
International Journal of Community Pharmacy

Review Article

NOVEL HERBAL DRUG DELIVERY SYSTEM: A REVIEW

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Abstract:
A Novel Drug Delivery System [NDDS] can be defined as new approach that combines innovative development, formulations, novel methodologies for delivering pharmaceutical compounds in the body as needed to safety achieve its desired pharmacological effects. Drug delivery is the method or process of administering pharmaceutical compound to achieve a therapeutic effect in humans or animals. Most common methods of delivery include the preferred non-invasive peroral (through the mouth), topical (skin), transmucosal (nasal, buccal, sublingual, vaginal, ocular and rectal) and inhalation routes. Many medications such as peptide and protein, antibody, vaccine and gene-based drugs, in general may not be administered using these routes because they might be susceptible to enzymatic degradation or cannot be absorbed into the systemic circulation efficiently due to molecular size and charge issues to be therapeutically effective. NDDS is advanced drug delivery system which improves drug potency, control drug release to give a sustained therapeutic effect, provide greater safety; finally, it is to target a drug specifically to a desired tissue. NDDS is a system for delivery of drug other than conventional drug delivery system. NDDS is a combination of advance technique and new dosage forms which are far better than conventional dosage forms.

Keywords: Drug delivery system, liposomes, noisome, herbal excipients, applications.

Introduction:
A Novel Drug Delivery System [NDDS] can be defined as new approach that combines innovative development, formulations, novel methodologies for delivering pharmaceutical compounds in the body as needed to safety achieve its desired pharmacological effects. drug delivery system is advanced drug delivery system rather than the conventional drug delivery system. A novel drug delivery system [NDDS] is an expression mainly associated with the formulation of new pharmaceutical forms, which have as smaller particle size, high permeability parameters, and selective site targeting permeability parameters.

Need of study:
95% of all experimental drugs have low pharmacokinetic and biopharmaceutical properties at present. Consequently, suitable medication distribution schemes must only be established at the site without harming healthy bodies and tissues, which will disperse the therapeutically activated drug molecules, lower the efficacy doses as well as improve therapeutic indices and safety profiles in new therapists. Various explanations are,

1) Pharmaceutical
   - Confusion in traditional dosing
   – Solubility
2) Biotechnology
   - Poor uptake.
   - High diaphragm borders
   - Instability of the organism
3) Pharmaceuticals/pharmacodynamic
   - Short half of a lifespan
   - Wide distribution volumes
   - Limited pace
4) Clinical Clinical
   - Poor Index of Therapy

Objective:
In order to achieve site specific action at the therapeutically optimized rate and dosage scheme, the main goals when developing the nano parts as an input device are to monitor particle size, surface properties or release of pharmacologically active agents. The medication is therefore explicitly engineered with minimum side effects & enhanced therapeutic index to achieve a desired pharmacological response in a selected site without adverse interactions in other sites.
Ex: replacement therapy with cancer chemotherapy and enzyme

Recent developments in novel drug delivery system of herbals
- ✓ Liposome
- ✓ Nanoparticles
- ✓ Emulsions
- ✓ Microsphere
- ✓ Ethosome
- ✓ Solid lipid nanoparticle
- ✓ Controlled Drug Delivery System
- ✓ Other novel vesicular herbal formulations

- ✓ Proprietary novel drug delivery system of plant actives and extracts
- ✓ Noisome
- ✓ Proniosomes
- ✓ Transdermal Drug Delivery System
- ✓ Dendrimers
- ✓ Liquid Crystals
- ✓ Hydrogels
- ✓ Phytosome

- **ADVANTAGES OF NOVEL DRUG DELIVERY**

1. Maintenance of drug levels within a desired range.
2. Less dosing and increased patient compliance.

- **DISADVANTAGES OF NOVEL DURG DELIVER SYSTEM:**

1. Poor in-vivo and in-vitro correlations.
2. Difficult to optimize the accurate dose and dosing interval.

Liposomes:

The name liposome is derived from two Greek words: Lipos "fat" and Soma ="body". Liposomes are simply vesicles or 'bags in which an aqueous volume is entirely encloses by a membrane composed of lipid (fat) molecules, usually natural or synthetic phospholipids. It is used as vehicle for administration of nutrients as well as pharmaceutical drugs. It shows both characteristics-

- ✓ Hydrophilic head
- ✓ Lipophilic tail

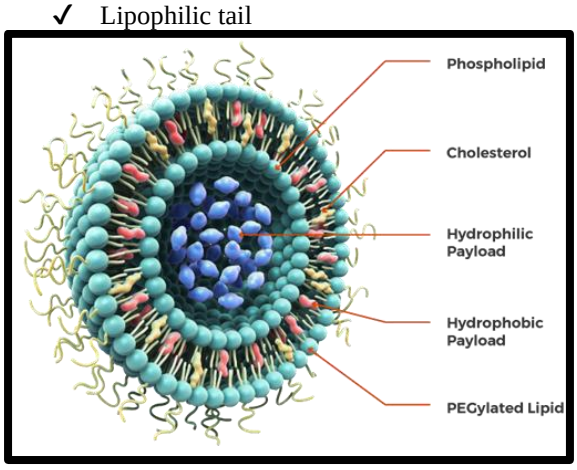

Figure 01: structure of liposome

Mechanism of liposome formation:

The liposomes are formed by hydrated phospholipids. So, the physicochemical properties of phospholipids play a significant role in the liposome formation. Phospholipids are amphiphilic molecules (having affinity for both aqueous and polar moieties) as they have a hydrophobic tail is composed of two fatty acids containing 10-24 carbon atoms and 0-6 double bonds in each chain. In aqueous medium the phospholipids molecules are oriented in such a way that the polar portion of the molecule remains in contact with the polar environment and at the same shields the non- polar part.

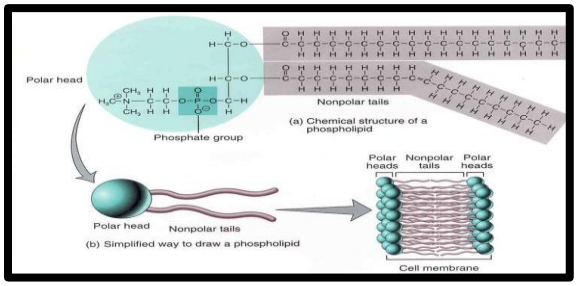

Figure 02: Structure of phospholipids

Types of liposomes:

Vesicle type	Diameter Size	No. of Lipid Layer
Multi lamellar large vesicles (MLV)	More than 0.5 µm	5-25 Oligo
lamellar vesicles (OLV)	0.1-1.0 µm	Approx 0.5
Uni lamellar vesicles (UV)	All size ranges	1
Small Uni lamellar vesicles (SUV)	20-100 nm	1
Medium sized uni lamellar vesicles (MUV	More than 100nm	1
Large Uni lamellar vesicles (LUV)	More than 100nm	1
Giant Uni lamellar vesicles (GUV)	More than 1.0 µm	1
Multi Vesicular vesicles (MVV	More than 1.0 µm	1

Table 01: types of liposomes

Marketed production of liposome:

Sl. NO	PRODUCT NAME	DRUG	COMPANY
1	Ambisome	Amphotericin B	NeXstar pharmaceuticals

2	Abelcet	Amphotericin B	The Liposome company N.J
3	Amphocil	Amphotericin B	Sequus pharmaceuticals
4	Doxil	Doxorubicin	Sequus pharmaceuticals
5	DaunoXome	Daunorubicin	NeXstar pharmaceuticals
6	Mikasome	Amikacin	NeXstar pharmaceuticals
7	DC99	Doxorubicin	Liposome CO.,NJ,USA
8	Epaxel	Hepatitis A vaccine	Swiss Serum Institue,Switzerland
9	ELA	Lidocaine	Biozone Labs,CA,USA

Table 02 : Marketed production of liposome

NIOSOMES:

Noisome are a novel drug delivery system, which entrapped the hydrophilic drug in the core cavity and hydrophobic drugs in the non-polar region present within the bilayer hence both hydrophilic and hydrophobic drugs can be incorporated into noisome.

Salient features of noisome:

• Niosome can entrap solutes.
• Niosome are osmotically active and stable

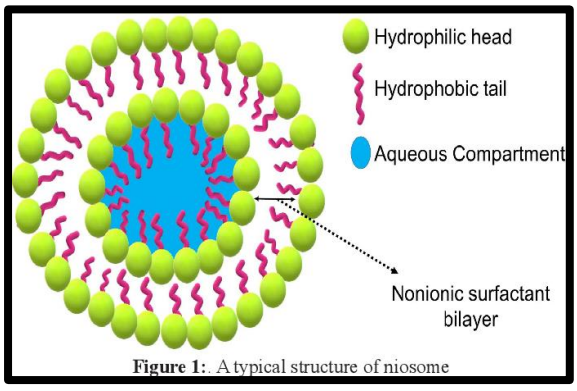

Figure 03: Structure of niosome

COMPOSITION OF NIOSOMES:

There are various components used for the preparation of niosomes they are as follows.

1. Cholesterol
2 Non-ionic surface acting agents

Formulation of Niosome:

Ingredient	Role/Use
Non-ionic surfactant	Form the basic structure of noisome, Provide stability
Cholesterol	Enhances rigidity and stability of noisome membrane
Phospholipids	Aids in membrane formation, contributes to drug encapsulation
Drug	Active pharmaceutical ingredient to be delivered

Table 03: formulation of noisome

TYPES OF NIOSOME:

Parameter	Multi lamellar vesicle	Small Unilamelar vesicle	Large unilamrelar vesicle
Vehicle size	Greater than 0.05micro meter	0.025-0.05micro meter	Greater than 0.10micro meter
Method of preparation	Hand shaking method	Sonication Extrusion method,Solvent evaporation method	Reserve phase evaporation method

Table 04: Type of Niosome

METHOD OF PREPARATION:

- ❖ Hand Shaking Method
- ❖ Ether Injection Method
- ❖ Sonication Method:
- ❖ Reverse Phase Evaporation Method

Evaluation parameter of niosome:

1. Size and vesicle charge
2. Zeta potential
3. Measurement of angle of repose
4. Entrapment efficiency
5. Invitro release study

MARKETED FORMULATION OF NIOSOMES:

Sr.no	Brand	Name of the product
1	Lancôme foundation and complexation	Flash Retouch Brush on Concealer
2	Britney Spears-Curious	Curious Coffret: Edp Spray 100ml +Dualended Parfum & Pink Lip-gloss + Body soufflé 100 ml
3	Loris Azzaro-Chrome	Chrome Eau De Toilette Spray 200 ml
4	Orlane –Lip color and Lipsticks	Lip Gloss

Table 05: Marketed formulation of noisome

HERBAL EXCIPIENTS:

The word Excipient was coming from Latin word, "excipients" which mean to receive, to gather and to take out. The standard of any formulation depends on active pharmaceutical ingredient (API), manufacturing processes and the excipients used. Excipient plays a great role in performance of the API and to support the safety & efficacy.

Classification of Excipients:

Sr. No	TYPES OF EXCIPIENTS	HERBAL EXCIPIENTS
01	Fillers	Plant cellulose, gelatin, lactose, sucrose
02	Binder	Acacia,AlginateAcid,Corn Starch
03	Lubricants	Castor Oil, Mineral Oil, Paraffin Oil
04	Glidants	Vitamin D, Talc
05	Disintegrants	Silicon, Allen gum, Agar
06	Preservatives	Clove Oil, Neem Oil, Cumin Seed

Table06: Herbal Excipient

Application of herbal excipient:

1. Binder: Herbal excipients can act as binders, helping to hold the ingredients of a tablet or capsule together
2. Coating Agent: They can be employed in coating tablets or capsules, providing a protective layer or modifying the release characteristics of the active ingredient.
3. Flavoring Agent: Herbal excipients can contribute to the taste and overall palatability of pharmaceutical formulations

Targeted Drug Delivery for cancer:

➤Targeted drug delivery system is achieved with the advantage of morphology and physiological differences between normal cells and tumor cells.

➤An ideal anticancer drug delivery system should fulfill the following requirements:-

• Effectively kill tumor cells.
• Be non-toxic for healthy organs, tissues and cells.
• Not induce multidrug resistance.

➤Drug targeting to tumor is based on:-

• EPR effect (Enhanced Permeability and Retention).
• Nanoparticle properties and design.

Approaches to Tumor Targeting:

1. Passive Targeting
2. Active Targeting
3. Triggered drug delivery

PASSIVE TARGETING:

Passive targeting is based upon the drug accumulation in the areas around the tumors with leaky vasculature, commonly referred to Enhanced Permeation and Retention (EPR) effect.

Passive tartegeting involves therapeutic exploitation of the natural distribution pattern of a drug-carrier construct in-vivo. Active targeting is used to describe specific interactions between drug/drug-carrier and the target cells, usually through specific ligand-receptor interactions.

CONCLUSION:

Novel drug delivery is novel approach to drug delivery that addresses the limitation of the traditional drug delivery System. NDDS is to provide a therapeutic amount of dreg to the appropriate site in the body. They have various types of Drug delivery system like targeted Release DDS, Controlled release DDS, Trans- dermal release DDS etc. It aids in enhancing therapeutic benefit, increases bioavailability and reducing medication toxicity. NDDS have new approaches like. Liposome, phytosome, Niosome, Ethosome Nano technology. They have less side and use in treatment & diagnosis of various diseases.

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Review Article

RECENT DEVELOPMENT ON COSMETIC SCIENCE

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ABSTRACT:

Cosmetics are constituted mixture of chemical compound. Obtain either natural sources or created synthetically. Cosmetics are used to different type of purposes. Those mainly prepared for personal care and skin care or also used to the purpose of protection of the body or skin.
The main aim of the presence study is to prepare and evaluate the herbal shampoo to determine the physicochemical, efficiency and quality. Different natural sources are used as mixture of cosmetic preparation.
Cosmetic preparation is prepared by using different type of instrument such as spray dryer, freeze dryer etc. on the large scale or small-scale basis the main advantage of herbal cosmetic preparation produces less side effect and safe.

INTRODUCTION

COSMETIC SCIENCE

"Cosmetic means any article intended to be rubbed, pour, sprinkled, or sprayed on, or introduce into, or otherwise applied to, the human body or any part thereof for cleansing, beautifying, promoting attractiveness, or altering the appearance and includes any article intended for use as a component of cosmetic.
Cosmetic are the constitute mixture of chemical compound derive from either natural source "Cosmetic" means any article intended to be rubbed, poured, sprinkled or sprayed on, or introduced or synthetically created ones
Cosmetics have various purpose Those designed for personal care and skin care can be used to cleanse or protect the body or skin.

Figure 01: Cosmetics Preparation

ICH guidelines for stability study:
A stability study should include the following considerations,
• Identify tests that will "accelerate and predict" the effects of normal conditions of
Storage and use. Where relevant, consider stresses, including temperature, that will enable
assessment of product integrity under anticipated product exposure conditions.
• Consider evaluation of critical aesthetic properties such as color, fragrance, texture,
And flow, particularly after exposure to conditions designed to stress each specific Property.
• Consider variation in process conditions.
• Consider the impact of packaging on the contained product, as well as any effects Which the product might have on the packaging.

TYPE OF HERBAL COSMETIC

Skin care	Hair care	Other
Skin cleansers	Detergents	Colours
Moisturizers	Conditioners	Perfumes
Nourishers	Nourishers	Talcum powders
Antiseptics	Hair colorants	Oral care product
Soothing agent	Hair growth promoters	
Sunscreens	Antidandruff	
Antiwrinkle		

Table 01: Types of Herbal Cosmetics

INSTRUMENTS USED IN COSMETIC SCIENCE

1) Brookfield viscometer
2) Tablet punching machine
3) Capsule filling machine

4) Spray dryer

5) Freeze dryer

6) Homogenizer

7) Ultrasonicator

8) Colony counter

SPRAY DRYER

PRINCIPLE:
The spray dryer provided large surface for the heat and mass transfer by automizing the liquid into small droplets. These are sprayed in a stream of hot air that each drop dries to get a solid particle.

CONSTRUCTIONS:
It consists of drying chamber having conical base. It is made of stainless steel. The inlet for hot air is also provided at bottom and another inlet for spray disk automizer at the top. Atomization may be achieved by means of single fluid or two fluid nozzles. The drying chamber is connected to cyclone separator. The dry product is collected from the bottom cyclone separator.

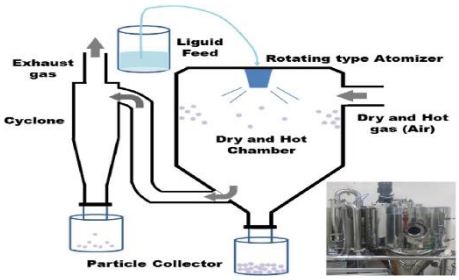

Figure 02: Spray dryer

WORKING:
Spray drying process can divided into 4 sections

1.Atomization of the fluid

2.Mixing of the droplets.

3.Drying

4.Removel and collection of the dry particle.

ADVANTAGES:
1.The process of drying complete within the 3 to 30 sec.
2.Less labour cost.
3.Solution or suspension dried easily.

DISADVANTAGES:
1.Difficult to operate.
2.Expensive.
3.Thermal efficiency is low.

APPLICATIONS:

1.Spray dryer can be used for drying both solution or suspension.
2.Spray drier are very useful for the drying of heat sensitive substance.
3.Milk, Soap, Detergants are also dried by a spray dryer.

FORMULATION AND EVALUATION

HERBAL SHAMPOO

FUNCTION OF HEARBAL SHAMPOO:

1. Conditioning
2. Hair Growth
3. Maintenance of Hair Colour
4. Medication

ADVANTAGES:

1. Cleansing properties
2.Improving hair hygiene.
3. Treating scalp conditions
4. Treatment for dry scalp
5. Treatment for hair loss

DISADVANTAGES:

1. less stable, so preservative should be added
2. seasonal variation of plant constituent
3. vary in consistency from batch to batch.

FORMULATION OF HERBAL SHAMPOO

Formulation of the herbal shampoo was done as per the formula. To the gelatin solution 10%, added the herbal extract and mixed by the shaking continuously at the time interval of 20 min. 1 ml of lemon juice was also added with constant stirring. To improve aroma in the formulation, sufficient quantity of essential oil (rose oil) was added and made up the volume to 100 ml with gelatin.

Ingredient	Medicinal use
Neem	Antibacterial agent
Soap nut extract	Foaming agent
Amla extract	Antidandruff agent
Shikakai extract	Detergent

Hibiscus	Conditioning agent
Bhringraj extract	Hair growth
Aloe vera	Moisturizing agent
Gelatin	Gelling agent
Lemon juice	Antimicrobial agent

Table 02: Uses of plant

EVALUATION OF HERBAL SHAMPOO

1.physical appearance
2.PH
3.Solid content
4.Surface tension
5.Wetting time
6.Foaming ability and foaming stability
7.Dirt dispersion test
8.Conditioning performance

Some Marketed Preparation of Herbal shampoo

1.HIMALAYA ANTI HAIR FALL SHAMPOO

Features and review
• Lathers less as it clarifies
• reduce hair fall
• shampoo has soft floral fragrance that is nice and mild

2.INDULEKHA BHRINGHA ANTI HAIR FALL SHAMPOO

Review and feature
• Gives deep conditioning and anti-breakage benefits to your hair
• Good for everyday use
• Leaves your hair stronger

CONCLUSION

We understand the concept of cosmetic, cosmetic science, drug industry, drug and cosmetic act 1940 and 1945, licening and documentation, After completion of this cosmetic science report. We also gain the knowledge about different type of instrument their working, construction and their handling that commonly used in different type of cosmetic preparation. Herbal cream is the viscous preparation that purely obtain from the natural sources and provide most effective safe result to the hair and minimize the chances of side effect.

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Review Article

A REVIEW ON MICROBIOLOGY AND MOLECULAR BIOLOGY

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ABSTRACT

Forensic microbiology is an old science in a new application. Its introduction to the forensic sciences has been a necessary response to terrorist threats. The benefits that microbiology brings to criminal investigations extend well outside those required for the investigation of terrorism. In return, microbiology has benefited from the enormous advances imposed by the need to develop tools for forensic investigation.

The purpose of this article is to describe how microbiology is applied in the investigation of bioterrorism, highlighting the modern advances in technology, particularly the DNA technologies, which have assisted this discipline as a forensic practice.

Predictive microbiology is based on the premise that the responses of populations of microorganisms to environmental factors are reproducible and that by characterizing foods in terms of those factors, it is possible, from past observations, to predict the responses of those microorganisms in other analogous environments. This knowledge is summarized in mathematical models to enable prediction of the behavior of microbial populations in foods over time. Predictive microbiology is a powerful tool to aid microbial food safety and quality assurance, both in its own right and to complement hazard analysis and critical control points programs, hurdle technology, and quantitative microbial risk assessment.

This article considers the history, philosophy, and impetus of predictive microbiology; principles of mathematical modelling; types of predictive microbiology models; uses, strategies, and resources for ‘predictive microbiology’; and assessment of the performance of ‘predictive microbiology’ models.

Keywords :- Molecular biology , bacteriology , cell biology.

I. INTRODUCTION

- Microbiology is the study of all living organisms that are too small to be visible with the naked eye. This includes bacteria, archaea, viruses, fungi, prions, protozoa and algae, collectively known as 'microbes'.
- microbes play key roles in nutrient cycling, biodegradation/biodeterioration, climate change, food spoilage, the cause and control of disease, and biotechnology.
- Thanks to their versatility, microbes can be put to work in many ways: making life-saving drugs, the manufacture of biofuels, cleaning up pollution, and producing/processing food and drink.

II. METHODOLOGY

- Understanding the principles of microbiology and human cell mechanisms allows pharmacists to discover antimicrobial drugs that would prevent an escalating number of communicable diseases.
- Pharmacists and microbiologists work synergistically to ensure that drug therapies target the opportunistic microbes without harming its human host. Another important role in pharmaceuticals is the use of microbes for the medically important studies.

OSMATIC MICROBIOLOY

- According to International Microbiology, microbial contamination of cosmetic products is a matter of great importance to the industry and it can become a major cause of both product and economic losses.
- Moreover, the contamination of cosmetics can result in them being converted into products hazardous for consumers.
- The water and nutrients present in cosmetics make them susceptible to microbial growth, although only a few cases of human injury due to contaminated cosmetics have been reported.
- More often, microorganisms are the cause of organoleptic alterations, such as offensive odours, and changes in viscosity and colour.

STERILIZATION

- Sterilization can be defined as any process that effectively kills or eliminates transmissible agents (such as fungi, bacteria, viruses and prions) from a surface, equipment, foods, medications, or biological culture medium.
- In practice sterility is achieved by exposure of the object to be sterilized to chemical or physical agent for a specified time.
- Various agents used as sterilant elevated temperature, ionizing radiation, chemical liquids or gases etc. The success of the process depends upon the choice of the method adopted for sterilization.

III. MODELING AND ANALYSIS

Dry heat Sterilization

- It is well known fact that microorganisms get kill by dry heat due to oxidation effect. Direct flaming direct flaming designer one of the simplest methods of dry heat sterilization in reality the dry heat sterilization is mostly used in microbiology laboratory for the sterilization of the inoculating loops which is Delhi accomplice by heating the loop wire to a red glow and this is 100% effective in actual practice likewise the same principle is even extended to the process of incretion to Sterling as well as dispose of heavy contaminated paper bags cups and dressings.

Hot air sterilization

- It may be regarded as another kind of right sterilization in this particular process of various items need to the Steris are do Lake kept in electric oven prepare lovely with stainless steel chamber inside and Dolly maintain at 170degree Celsius for duration of approximately 2 hours to ensure complete sterilization.
- It has been adequately observed that the longer the period + higher temperature are needed proposedly due to the fact that the heat in water is more rapidly pass on to a cool body in comparisons is the heat in air.
- Disinfectants are substances that are applied to non-living objects to destroy microorganisms that are living on the objects. Disinfectants are substances that are applied to non-living objects to destroy microorganisms that are living on the objects.

AOAC Method:-

- The AOAC dilution method is a standard currently being employed for the evaluation of disinfectant methodology three strains of microorganisms are usually employed in the AOAC method such as salmonella cholerae Suis Staphylococcus aureus and Pseudomonas aeruginosa the various steps in all as the follows:

  - To carry outer use dilution, taste the metal carrier rings are doula deep into the standard culture of the test organism adequately grown in a liquid media removed carefully write at 37 degrees Celsius for a short duration.

Filter Paper Method

- The filter paper method is commonly used in the effects evaluation of a chemical agent as a disinfectant in teaching practice in Laboratories a small dicks of filter paper preferably what man grade is Duly soak in a solution of a chemical agent and place expectedly on the surface of other plate which has been previously encultured and incubator do you live with a pure text organism the effect to is of the chemical agent under investigation will be exhibited by a clear zone as the zone of any vision designating preciously the initiation of growth just around the disk.
-

Disinfectants Variant:-

1) Alcohol
2) Aldehyde
3) Halogen
4) Oxidating agent
5) Surface Active agent

DNA

✓ DNA is a polymer compose of two polynucleotide chains that coil around each other a form of double helix the polymer carrier genetic instruction for the development function in growth and Reproduction of all non-organisms and viruses DNA and Ribonucleic acid nucleic acid alongside proteins lipids and complex carbohydrates polysaccharide nucleic acid one of the four major types of micro molecules that are essential for all known forms of life.

✓ The two DNA stands are known as polynucleotides as they are composed of simpler monomeric unit called nucleotides is nucleotide is composed of one of four nitrogen containing nucleotide basis Cytosine Guanine Adenine Thymine a sugar called as the deoxyribose phosphate group. then nucleotides are joined to one another in a change by covalent bonds are also known as phosphodiester linkage.

✓ The nitrogenous base of the two separate poly nucleotides stands are bound together according to base pairing rules A with T and C with G hydrogen

bonds to make double standard DNA the complement nitrogenous bases are divided into two groups the single ring pyrimidines and the double rings purines the pyrimidine is the thymineand cytosineare adenine and guanine.

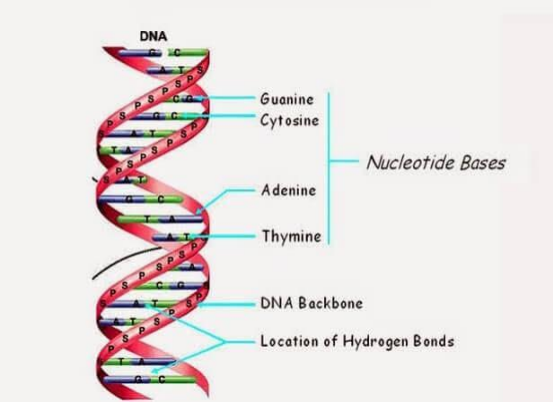

Figure 1:- Structure of DNA

RNA

- Ribonuclic acid RNA is a polymeric molecule that is social for most biological functions either by performing the function itself non coding rna forming a template for the production of proteins messenger RNA.

- RNA and deoxyribonucleic acid and nucleic acid . the nucleic acid constitutes one of the four major macro molecules essential for all known forms of life RNA.is a assembled as a chain of nucleotide cellular organism messengers RNA. to convey genetic information using the nitrogenous bases of the letter Guanine Uracil Adenine Cytosine that directs synthesis of specific proteins many viruses in court their genetic information using RNA genome.

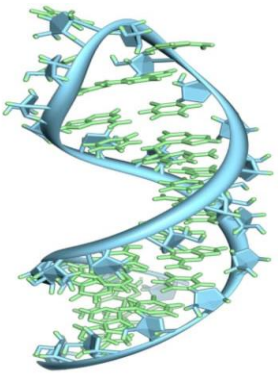

Figure2:Structure of RNA

Proteins

- Proteins are the end products of the decoding process that starts with the information in cellular DNA. as work horses of the cell protein compose structural and motor element in the cell and they serve as the catalyst for Virtually every biochemical reaction that occurs in living things incredible array of function derives from a strolling simple code that specifies a hugely diversity of structure.

- In fact, itching in cellular DNA conduct the code for unique protein structure not only are these proteins assemble with different amino acid 6 phase but they also are l Together by different bonds and folded into variety of three-dimensional structure the folded shape or confirmation depends directly on the linear Ammonia acid sequence of the protein.

- The building blocks of protest around us in which are small organic molecules that consist of Alpha Central carbonate am into an amino group A carboxyl group hydrogen atom and horrible component call side chain within a protein multiple hour acids are linked Together by peptide Wars there by forming a long chain bonds are formed by chemical reaction that extract water molecules acid joints the amino group of one acid to the carboxyl group of neighbouring our linear equation a protest president of the proteins.

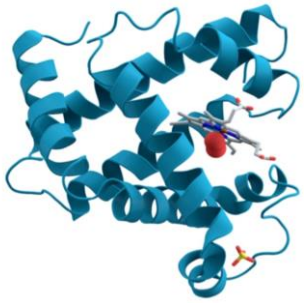

Figure3:-Structure of Protein

Insulin

- The role of insulin in the body is to allowed glucose in the blood to enter the sales providing them with the energy to function a lack of effect to insulin play the key role in the development of diabetes insulin is a type of hormone hormones are chemical messengers that instruction sales or tissue to act in a certain way that supports a particular function in the body insulin essential for staying alive insulin is a chemical messenger that all of sales to abs of glucose a sugar from the blood the pancreas is an organ behind the stomach that is the main source of insulin in the body cluster of sales in the pancreas called isolate produce the hormone and determine the amount base on blood glucose levels in the body the higher the level of glucose the more insulin goes into production to balance sugar levels in the body insulin also assist in Breaking Down fats or proteins

for energy the delicate balance of insulin regulated blood sugar and many process in the body if insulin levels are to lower high excessively high or low blood Sugars start to cause symptoms.

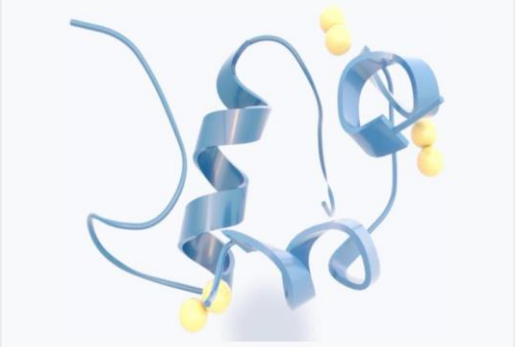

Figure 4:- Structure of Insulin

1. Entry

1)Enter the quality control department through the staircase
2) remove the street footwear and keep them in the designated place.
3) cross over the bench and were dedicated QC slippers
4) open the garment cubical pick and wear dedicated by white apron
5) open the entry door and reach the microbiology selection through QC corridor
6) press interlocking but open the airlock door
7) open the entry door and enter into the air lock of microbiology section remove the dedicated QC slippers and keep them in designated place.
8) cross over the bench and wear the dedicated microbiology lab slippers
9) press the interlocking button and open the door and enter into microbiology lab general coriander.

2.Exit:-

1) Press interlocking button to open the air lock door.
2) open the exit door of main entry airlock and enter into the air lock keep the dedicated microbiology lab slippers in the designated place in the case of shoes covers remove the covers and put them into the dustbin
3)cross over the bench and wear dedicated QC slippers .
4) press the interlocking button and open the door leading to exit from the QC
5) cross over the bench and wear street footwear
6) open the exit door and reach the stair case to department for the QC department
7) in the case of dedicated factory dress in the change room and wear the street garments.

Figure 5:-Microbiology Laboratory

SOME LABORATORY INSTRUMENTS ARE USED IN LABORATORY

1) Petri Dish
2) Spatula
3) Wire Brush
4) Hot plate
5) Pipette
6) Agar Slant
7) Measuring Jar
8) Measuring Cylinder
9) Funnel
10) Incubator
11) Micro Pipette
12) Lab Coat
13) Burner
14) Forceps
15) Tripod

IV. RESULT AND DISCUSSION

List of media:

- Differential media
- The differential media usually request to the incorporation of certain specific Chemicals into medium that may even showily give rise to diagnostically useful growth or Apparent change in the membrane after the proper incubation a few typical examples are discuss under following
-

1) Eosin Methylene Blue Agar (EMB Agar)

- The EMB Agar media is employed exclusively to differentiate between the lactose fermentation and the non-lactose fermenters.

- inside the EMB Agar media essentially comprise of the Lactose Salts and two dye eosin and methylene blue. from the observation the interfere following.

  1) E coli will produce either dark Colony or one of that has media sheen and
  2) S typhi shall appear as an absolute colourless Colony.

Enrichment Media

- It has been Amply demonstrated and established the critical and judicious incorporation of blood or extract to the particular tryptic soy Agar or broth shale enormously argument the desired growth of a large number of most fastidious microbes.
- In actual practice however largely employed to isolate Primarily the microorganisms from host of biological such as cerebrospinal fluid pleural fluid wound abscesses and sputum.

1) Blood Agar

- The critical addition citrated blood to the prevailing tryptic soya gardeners it is the variable haemolysis that in turn all of the precious differentiation of certain species of microorganisms it is how your pertinent to state here that one May observe this thing haemolytic patterns of the Other a few searches typical variations are stated under.

Figure 6: Blood Agar

a) Alpha Haemolysis: -

- It may be observed due to the formation of greenish to brownish around the colony example streptococcus gardenia and streptococcus pneumoniae.

b) Beta Haemolysis: -

- It represents the virtual complete haemolysis of blood cells there by giving rise to a distinct clearing effect around growth in the colony example staphylococcus aureus and staphylococcus pyrogens.

c) Nonhemolytic:

- Pattern in this particular instance participatively no change ours in the medium example Staphylococcus epidermidis and Staphylococcus saprophyticus.

Figure 7: Different types of culture media

TESTS

BACTERIAL ENDOTOXIN TEST

Endotoxin:

- Endotoxin alkyl polysaccharide is a pyrogenic substance that is found in the cell wall
- Gram-negative bacteria.
- Pyrogenic substance (or pyrogen) can induce fever when injected into the blood or cerebrospinal fluid
- It is associated with injectable products
- Sterile production procedures are needed
- Sterilization does not remove the endotoxin

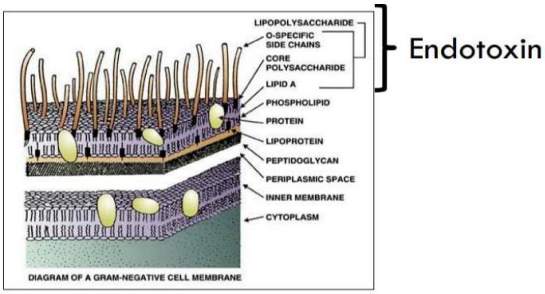

Figure8: Endotoxin Test

Bacteria endotoxin test

- Bacterial endotoxin test (aka LAL test): -

- To detect or quantify endotoxin of gram-negative bacterial origin using amoebocyte lysate from horseshoe crab

Types of Lal test:

Methods: -

- ✓ Gel clot
- ✓ Gel clot (Limit test)
- ✓ Gel clot (Semi-quantitative test)
- ✓ Photometric
- ✓ Chromogenic (Kinetic)
- ✓ Turbidimetric (Kinetic)

ELISA TEST INFORMATION

- It is commonly used analytical biochemistry assay, first described by Eva Engvall and Peter Pearlman in 1971. The assay uses a solid-phase type of enzyme immunoassay (EIA) to detect the presence of a ligand (commonly a protein) in a liquid sample using antibodies directed against the protein to be measured. ELISA has been used as a diagnostic tool in medicine, plant pathology, and biotechnology, as well as a quality control check in various industries.
- In the simplest form of an ELISA, antigens from the sample to be tested are attached to a surface. Then, a matching antibody is applied over the surface so it can bind the antigen. This antibody is linked to an enzyme and then any unbound antibodies are removed. In the final step, a substance containing the enzyme's substrate is added.
- A buffered solution of the antigen to be tested for is added to each well (usually 96-well plates) of a microtiter plate, where it is given time to adhere to the plastic through charge interactions.
- A solution of nonreacting protein, such as bovine serum albumin or casein, is added to each well in order to cover any plastic surface in the well which remains uncoated by the antigen.
- The primary antibody with an attached (conjugated) enzyme is added, which binds specifically to the test antigen coating the well.
- A substrate for this enzyme is then added. Often, this substrate changes colour upon reaction with the enzyme.
- The higher the concentration of the primary antibody present in the serum, the stronger the colour change. Often, a spectrometer is used to give quantitative values for colour strength.

Enzyme Immobilization:-

- Immobilization of enzymes (or cells) refers to the technique of confining/anchoring the enzymes (or cells) in or on an inert support for their stability and functional reuse. By employing this technique, enzymes are made more efficient and cost-effective for their industrial use. Some workers regard immobilization as a goose with a golden egg in enzyme technology.
- Immobilized enzymes retain their structural conformation necessary for catalysis.

Methods of Immobilization:

1) Adsorption:

- Adsorption involves the physical binding of enzymes (or cells) on the surface of an inert support.
- The support materials may be inorganic (e.g. alumina, silica gel, calcium phosphate gel, glass) or organic (starch, carboxymethyl cellulose, DEAE-cellulose, DEAE-Sephadex).
- Adsorption of enzyme molecules (on the inert support) involves weak forces such as van der Waals forces and hydrogen bonds. Therefore, the adsorbed enzymes can be easily removed by minor changes in pH, ionic strength or temperature.

2) Entrapment:

- Enzymes can be immobilized by physical entrapment inside a polymer or gel matrix.
- The size of the matrix pores is such that the enzyme is retained while the substrate and product molecules pass through
- In this technique, commonly referred to as lattice entrapment, the enzyme (or cell) is not subjected to strong binding forces and structural distortions.
- Some deactivation may however, occur during immobilization process due to changes in pH or temperature or addition of solvents. The matrices used for entrapping of enzymes include polyacrylamide gel, collagen, gelatin, starch, cellulose, silicone and rubber. Enzymes can be entrapped by several ways.

3) Microencapsulation:

- Microencapsulation is a type of entrapment. It refers to the process of spherical particle formation wherein a liquid or suspension is enclosed in a semipermeable membrane. The membrane may be polymeric, lipoidal, lipoprotein-based or non-ionic in nature.

There are three distinct ways of microencapsulation.

1. Building of special membrane reactors.

2. Formation of emulsions.

3. Stabilization of emulsions to form microcapsules.

- Microencapsulation is recently being used for immobilization of enzymes and mammalian cells. For instance, pancreatic cells grown in cultures can be immobilized by microencapsulation. Hybridoma cells have also been immobilized successfully by this technique.

4)Covalent Binding:

- Immobilization of the enzymes can be achieved by creation of covalent bonds between the chemical groups of enzymes and the chemical groups of the support.
- This technique is widely used. However, covalent binding is often associated with loss of some enzyme activity.
- The inert support usually requires pretreatment (to form pre-activated support) before it binds to enzyme. The following are the common methods of covalent binding.

5) Cross linking:

- The absence of a solid support is a characteristic feature of immobilization of enzymes by cross-linking.
- These reagents in fact react with the enzyme molecules and create bridges which form the backbone to hold enzyme molecules.
- There are several reagents in use for cross-linking.
- These include glutaraldehyde, diazo benzidine, hexamethylene diisocyanate and toluene.

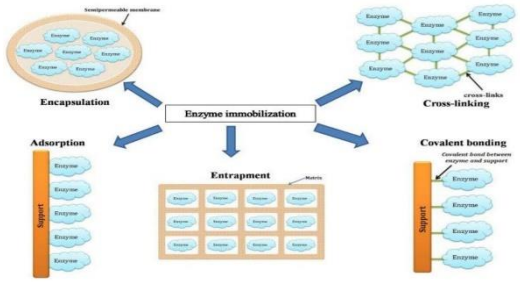

Figure 8: Enzyme immobilization

V. Conclusion:

Microbiology plays a crucial role in terms of preventing some kind of infection and bacteria from the living being. Thus, it can be concluded that microbiology plays a crucial role in terms of preventing some kind of infection and bacteria from the living being and that can be helpful for the future biological perspective. Microbiology plays a crucial role in medical microbiology and why mental microbiology and the Food Industry can be significantly helpful for preventing bacteria and viruses from foods and human beings. It helps to identify the treating diseases of the human body and agricultural perspective that can be applied to find the specific cells in a Complex biological system. There is a high scope in the field of microbiology which can be helpful in the induction of modern life. Molecular microbiology deals with molecular mechanisms and physiological processes of microbes and their utilisation in production of biotechnology products and medicines such as vaccines, antibodies.

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Research Article

IN VITRO ANTHELMINTHIC ACTIVITY OF HERBAL FORMULATION AGAINST *EISENIA FETIDA*

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ABSTRACT:

The present study was undertaken to evaluate anthelmintic activity of Herbal formulation of leaves of *Platyclatus orientalis*, *Momordica charantia* and *Punica granatum* against *Eisenia fetida.* For this study used various concentrations (25-100 mg/ml) herbal formulation were evaluated in the bioassay involving determination of time of paralysis (P) and time of death (D) of the worms. Albendazole was used as standard anthelmintic drug and distilled water was used as control. The results of present study indicated that the herbal formulation significantly exhibited paralysis (P<0.01) in worms in higher dose 100 mg/ml and also caused death of worms especially at higher concentration of 100 mg/ml, as compared to standard drug.

Key Words: Albendazole, Anthelmintic activity, Herbal formulation, *Eudrilids eugenia.*

1. INTRODUCTION:

Helminthic infections are among the most widespread infections in humans, distressing a huge population of the world. Although the majority of infections due to helminths are generally restricted to tropical regions and cause enormous hazard to health and contribute to the prevalence of undernourishment, anaemia, eosinophilia and pneumonia Parasitic diseases cause ruthless morbidity affecting principally population in endemic areas. The gastro-intestinal helminths become resistant to currently available anthelmintic drugs therefore there is a foremost problem in treatment of helminths diseases. Hence there is an increasing demand towards natural anthelmintics[1-3].

Platycladus orientalis Linn. (Synonymous: *Thuja orientalis*) is belong to family Cupressaceae, it is a coniferous shrub with evergreen and scale-like leaves; It is used in traditional medicine in the treatment of bronchitis, cystitis, enuresis, psoriasis, amenorrhea, uterine carcinomas and rheumatism[4]. The essential oils obtained from *Platycladus orientalis* contains β-thujone and β-thujone which showed toxic effects on ruminant animals[5]. However, the ethanol extract of *Platycladus orientalis* is nontoxic at low concentration (≤ 0.6 mg/ml) and it suppressed the growth of human lung cancer cell line [6].

Momordica charantia locally called as 'Karela' is famous for its fruit and eaten as vegetable. The fruits are considered as tonic, stomachic, carminative agents and have been used for diabetes. The fruits are also used in rheumatism, gout and diseases of liver and spleen and are febrifuge. The seeds and leaves are used as anthelmintic. The leaves are also reported to be useful in piles, leprosy and jaundice[7] .The leaves, fruits and roots have been used as laxative and antipyretic agents[8] . It has been used to treat anaemia, cholera, bronchitis and ulcers. The fruit juice is used for the treatment of colic, wounds, sores and worms. The seeds have been reported to have antiviral, antiulcer and anti-leukemia properties[9] . MAP 30, a protein from *Momordica charantia* has been reported to have anti-HIV and antitumor properties [10] . Keeping in view the medicinal importance of *L. cylindrica* and *M. charantia*, the current study was carried out to find the antibacterial, antifungal and phytotoxic activities of these two plants.

Punica granatum L. known as 'Annar' in Urdu and 'Pomegranate' in English is the famous

edible fruit. In traditional medicine it has been used for the treatment of various diseases in America, Europe, Africa and Asia. In addition to past uses, P. granatum is used in several medicines for a variety of ailments [11]. Different parts of P. granatum contain a variety of chemicals. Tannin and alkaloid are present in both bark and roots. Antimicrobial activity of tannins, flavonoids and polyphenols is well studied [12-14]. Tannin-containing beverages consumption such as tea could be helpful in curing or prevention of several illnesses (Cowan, 1999). Different parts of P. granatum such as roots, peels and fruits have been used generally in herbal therapies by local therapists in many states. Peels of P. granatum have been used traditionally for treatment of dysentery and diarrhea [15-18]. The crude extracts of P. granatum peels were successfully used against Agrobacterium tumefaciens, causative agent of plant tumor [18]. One of the known pharmacological property of tannins is astringency (Cowan, 1999). The seed consist of steroids while, fruit pulp contains vitamins, minerals and macromolecules like fats, proteins and carbohydrates [19].

Punica granatum L. is a shrub belonging to the unigeneric family Punicaceae, a native of semitropical Asia. The different parts commonly used are leaf, flower, fruit,fruit rind, seed, dried bark of stem, and root[20]. The root bark shows activity against tapeworms. Astringent properties of the fruit rind and fruit juice explain the antidiarrheal activity. The bark and seeds are useful in bronchitis. The flowers are used in epistaxis. The unripe fruit is a good appetizer, and it is useful in nausea and vomiting. The ripe fruit is tonic, astringent to the bowels, and relieves burning sensation of the body. The rind of the fruit is very useful in diarrhea and dysentery.The fresh juice is used in cooling and refrigerant mixtures of some medicines for dyspepsia. The root bark has been used as an anthelmintic.

2. MATERIALS AND METHODS:

2.1: Plant Collection and authentication:

The plant leaves of *Platyclatus orientalis*, *Momordica charantia* and *Punica granatum* were collected from Latur, Dist-Latur (Maharashtra); and authenticated by Dr.Wadkar G.S, Dept. of Pharmacognosy, Kasegaon, (Maharashtra).

2.2: Preparation of Herbal Formulation:

The fresh leaves of *Platyclatus orientalis*, *Momordica charantia* and *Punica granatum* collected from local area and obtained fresh juice with the help of an electric grinder. After that filter with muslin cloth and collected the filtrate of fresh juice.

2.3: Worms Collection and authentication:

The African species of earthworms *Eudrilus eugeniae* were collected from the water-logged areas of soil worms were obtained from freshly slaughtered fowls.

2.4: Preparation of test sample:

The samples for in-vitro study were prepared by dissolving and suspending 2.5 g of each herbal formulation in 25 ml of distilled water to obtain a stock solution of 100 mg/ml. From this stock solution, different working dilutions were prepared to get concentration range of 125, 250 and 500 mg/ml.

2.5: Anthelmintic assay:

The anthelmintic assay was carried out as per the method of Ajayieoba et al with minor modifications[21]. The assay was performed on adult African species of earthworm *Eudrilus eugeniae*, due to its anatomical and physiological resemblance with the intestinal roundworm parasites of human beings[22]. *Eudrilus eugeniae* worms are easily available and used as a suitable model for screening of anthelmintic drug [23-25]. The 50 ml formulations containing four different concentrations of each herbal formulation (125,250 and 500 mg/ml in distilled water) were prepared and six worms (same type) were placed in it. Time for paralysis was noted when no movement of any sort could be observed except the worms were shaken vigorously. Time for death of worms were recorded after ascertaining that the worms neither moved when shaken vigorously nor when dipped in warm water at 50 ^{o}c [26,27]. Albendazole (50,75 and 100 mg/ml) was used as reference standard while distilled water as the control.

3. RESULTS AND DISCUSSION:

As shown in Table.1 & Graph.1 & 2 showed aqueous and ethanolic extract of whole plant of *Ficus glomerata* exhibited anthelmintic activity using *Eudrilus eugeniae* worms in dose-dependent manner giving shortest time of paralysis (P) and death (D) with 500 mg/ml concentration. The herbal formulation caused paralysis at 9.23 ± 0.1050 min. and time of death of 16.07 ± 0.2823 min. respectively against the earthworm *Eudrilus eugeniae*. The standard drug Albendazole showed the same paralysis at 5.23± 0.1020 and time of death of 9.03 ± 0.2751 minutes.

Herbal Formulation

Albendazole by increasing chloride ion conductance of worm muscle membrane produced hyperpolarization and reduced excitability that led to muscle relaxation and flaccid paralysis[28]. The herbal formulation not only demonstrated paralysis, but also caused death of worms especially at higher concentration of 500 mg/ml, in shorter time as

compared to standard drug Albendazole. Phytochemical analysis of the crude extract revealed the presence of tannins among other chemical constituents. Due the presence of tannins the anthelmintic activity has been shown singnificantaly. It is possible that tannins contained in the herbal formulations produced similar effects. The anthelmintic effect shown because of tannins is that they can bind to free proteins in the gastrointestinal tract of host animal or glycoprotein on the cuticle of the parasite and may cause death[29,30].

Tables:

Drug	Concentration in mg/ml	Paralysis Time (min)	Death Time (min)
Albendazole (Standard Drug)	50	8.35± 0.1056	13.20± 0.1275
	75	7.25± 0.1140	12.26± 0.1033
	100	5.23± 0.1020	9.03 ± 0.2751
Herbal Formulation	125	17.27± 0.1506	51.38 ± 0.3228
	250	13.25± 0.0875*	36.29 ± 0.1105*
	500	9.23 ± 0.1050**	16.07 ± 0.2823**

Table 1: Anthelmintic activity of Herbal Formulation.

Figures:

Fig.1: Anthelmintic assay of Herbal formulation

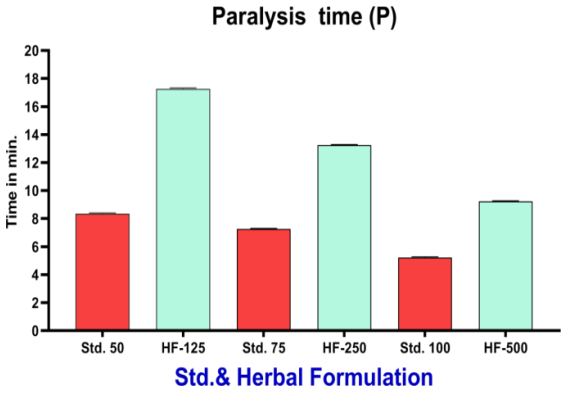
Fig.2: Anthelmintic assay of Std.Drug

Values are expressed as MEAN±SEM

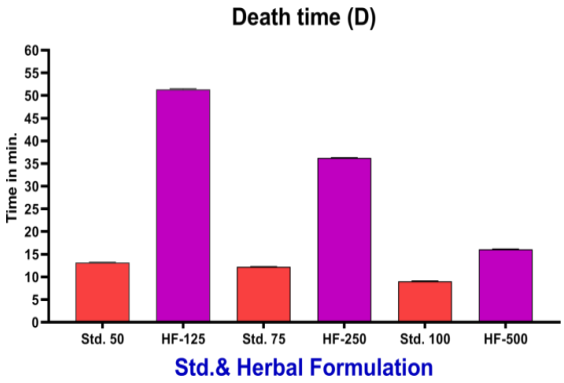
One way ANOVA followed by Dunnett's 't' test.

Note: n=6 in each group. *P<0.05, **P<0.01, ***P<0.001

Graphs:



Graph.1. Paralysis time of Std. & Herbal Formulation



Graph.2. Death time of Std. & Herbal Formulation

4. CONCLUSION:

The results of this study indicate that the herbal formulation of *Platyclatus orientalis*, *Momordica charantia* and *Punica granatum* exhibited a significant anthelmintic activity. The herbal formulation was the same as albendazole in terms of good paralysis time and death time at concentrations of 500 mg/mL. The herbal formulation showed good activity.

ACKNOWLEDGEMENT:

We are thankful to President and Principal of VDF School of Pharmacy, Latur for providing the facilities to carry out the research work.

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Review Article

AN OVERVIEW FOR DETERMINING CYTOTOXIC ACTIVITY OF SOME INDIAN MEDICINAL PLANTS

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ABSTRACT
The aim of this review is to provide cell-based assays for the assessment of the cytotoxicity potential of some Indian medicinal plants against different cancer cell lines on Humans. The cytotoxicity of various cell lines such as HepG2, Hs578T, MCF-7, A549, SKOV3 were evaluated by performing various invitro anticancer assays such as MTT assay, MTS assay, SRB assay, HPLC method. All these plants have the potential for invitro studies and possess anticancer activity. The result of this present study confirmed that plant extracts have bioactive constituents with cytotoxic properties and which are useful for developing new anticancer drugs.

KEY WORDS
Cytotoxicity, Cancer cell lines (HepG2, MCF-7, SKOV3), Assays (MTT, MTS, SRB)

INTRODUCTION
Cancer is defined as the abnormal growth of cells in any part of the body that results in an organ bulge or a tumor of cells that is not beneficial to the body [Dorababu; 2016]. Due to the absence of widely available, comprehensive early detection techniques, the poor prognosis associated with late-stage diagnosis, and the diseases rising global occurrence [Sumitra; 2013].Cancer is a major global health cancer. Worldwide, cancer is a leading cause of both morbidity and mortality. The World Health Organization recently estimated that the annual cancer incidence and mortality rate in sub-Saharan Africa is 5,51,200 and 4,21,000 respectively per year. Approximately 70% of cancer- related deaths took place in low and middle income nations [Salwa; 2015]. Currently, the two biggest barriers to using chemotherapeutic drugs in the treatment of cancer are toxicity and tumor resistance [Ahmed; 2020].
Numerous pure chemicals have been investigated for their ability to combat cancer [Merajuddin; 2022]. Metabolites found in medicinal plants may be able to prevent the severe and often unbearable adverse effects associated with manufactured medications. While there are some novel methods in drug discovery, like combinatorial chemistry and computer based molecular modeling design, natural products remain crucial in the process of finding and developing new drugs[Salwa; 2015]. Since most known cancer medicines have side effects and different cancers respond differently to treatment, new approaches or substances must be found [Deniz; 2017]. Finding novel, safe therapy alternatives is seen as a difficult task [Ahmed; 2020]. Over the past century, technological advancements have allowed for the pure isolation of diverse plants active components for a variety of therapeutic uses [Merajuddin; 2022].

Since ancient times, Ayurveda, a traditional Indian medicinal system based on plant-based medicines, has effectively prevented or suppressed a variety of cancers using a variety of therapeutic modalities' [Sumitra; 2013]. The 1950s saw the initial recognition of the vital role that natural products played as anticancer agents, which paved the way for the development of several significant plant based anticancer therapies [Merajuddin; 2022]. In the majority of third world nations, herbal products continue to be the mainstay of healthcare [Deniz; 2017]. The importance of the synergistic action of composites, or mixtures of chemicals contained in the whole plant extract, is being highlighted by a growing number of researches [Merajuddin; 2022].
Based on the diversity of their chemical elements, including flavonoids, polyphenols, and alkaloids, plant extracts are rich in bioactive compounds that are important to the process of finding and developing new drugs [Ahmed; 2020]. Certain compounds found in plants, known as secondary metabolites, resemble toxins and have the potential to be hazardous to humans [Ahmed; 2020]. Typical commodities, particularly plants, have been utilized in the therapy for a range of illnesses for thousands of decades People from different ethnic groups live

in different parts of India, each with their own unique culture, customs, and medical expertise from ancient procedures. They use herbal medicine to treat a range of illnesses [Sumitra; 2013].

MATERIALS AND METHODS

A. Invitro methods

Many biological assays require the measurement of surviving and proliferating mammalian cells.

MTT (tetrazolium) Assay

MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide; was dissolved in PBS at 5 mg/ml and filtered to sterilize and remove a small amount of insoluble residue present in some batches of MTT. At the times indicated below, stock MTT solution (10µl per 100µl medium) was added to all wells of an assay, and plates were incubated at 37° C for 4hours. Acid-isopropanol (100µlof 0.04 N HCl in isopropanol) was added to all wells and mixed thoroughly to dissolve the dark blue crystals. After a few minutes at room temperature to ensure that all crystals were dissolved, the plates were read on Dyntech MR580 Microelisa reader, using a test wavelength of 570 nm, a reference wavelength of 630nm, and a calibration setting of 1.99 (or 1.00 if the samples were strongly coloured). Plates were normally read within 1 hour of adding the isopropanol.

LDH Assay

LDH assay is one of the colorimetric assays. Lactic Dehydrogenase activity is spectrophotometrically measured in the culture medium and in the cellular lysed with 50mM Tris-HCl buffer, pH 7.4 + 20 mM EDTA + 0.5% Sodium Dodecyl Sulfate (SDS), further disrupted by sonication and centrifuged at 13,000 X grams for 15 minutes. The assay mixture (1ml final volume) for the enzymatic analysis consists of 33 µl of sample I 48 mM PBS, pH 7.5 + 1 mM pyruvate and 0.2 mM NADH. The percentage of LDH released is calculated as percentage of the total amount, considered as the sum of the enzymatic activity present in the cellular lysate and that in the culture medium.

SRB Assay

Sulforhodamine B assay is a bright pink aminoxanthene dye that binds to basic amino acids in mild acidic conditions and dissociates under basic conditions. Cells are plated in 96-well flat bottom plates at 5000-10000 cell/well. The difference in cell numbers plated adjusts for differences in the growth rates of the various cell lines. Cells are allowed to adhere to the lwells overnight, then the samples are added to triplicate wells in serials 3-fold dilutions. Water is added to the control wells at 1:10 dilution in medium. These plates are incubated at 37° C, 5% CO_2 for 3 days, then assayed for growth inhibition using sulforhodmine B (SRB) assay. The cells are fixed by the addition of cold 50% trichloroacetic acid to a final concentration of 10%. After 1 hour incubation at 4°C, the wells are washed for five times with deionized water. The cells are then stained with 0.4% SRB dissolved in 1% acetic acid for 15-30 min and subsequently washed five times with 1% acetic acid to remove unbound stain. After the plates are air dried at room temperature, the bound dye is solubilized with 10 mm Tris base and the plates are analysed on a microplate reader (Molecular Devices) at 595 nm.

TLC Assay

Phytochemical screening by means of TLC was carried out for selected plants following the method of Wagner and Bladt. For this, dried extracts were reconstituted in ethanol to a concentration of 10mg/ml. 20µl of the extracts were spotted, in triplicate, on aluminium backed TLC plates chemical constituents were separated using any one of the three different eluent systems. For polar system, solvents used were ethyl acetate; for intermediate elution, solvents ethyl acetic acid/formic acid/glacial acetic acid were used; and for non-polar solvents were used. The TLC plates were dried under a stream of cold air until there was no solvent smell remaining to ensure complete removal of the eluting solvents. The plates were examined under UV light to detect coumarins that appear as blue, violet or yellow fluorescent spots. The specific groups present in the extracts were identified using specific developers. Vanillin sulphuric acid spray reagent were then sprayed on the dried plates and heated at 110°C for colour development for detecting the presence of monoterpene alcohol, bitter principle and saponin. Sprinkling the plates with 5% ethanolic solution of $AlCl_3$ resulting in the appearance of yellow or greenish fluorescent spot under UV light at 365 nm indicated the presence of flavonoids. A brown colorization reveals the presence of triterpenes and steroids. A 10% vanillin ethanol solution was used for detecting saponins, the presence of which results in blue, violet and yellow spots.

MTS Assay

MTS, a colorimetric assay, is very simple and widely used in response to compounds and agents from various sources to evaluate cell cytotoxicity and viability. Reduction of MTS tetrazolium compound or 3-(4,5-dimethylthiazol-2-yl)-5-(3-carboxymeth-oxyphenyl)-2-(4-sulfophenyl)2H-tetraolium to soluble purple formazin dye in the presence of phenazine methosulfate, is done by NAD(P)H-dependent oxidoreductase enzymes in mitochondria of viable cells. In this assay, a group of tetrazolium reagents which include PMS have been lused to eliminate solubilization steps. These compounds can penetrate through the cell

membrane and convert tetrazolium to formazan product. To prepare MTS solution,dd 2 mg/ml of MTS powder to DPBS and dissolve it to have a clear yellow solution, then dissolve the 0.21mg/ml of polyethersulfone in MTS solution and add 1NHCl to adjust pH on 6.0-6.5 in the next step, filter the solution by filter of 0.2µm filter and transfer them into a sterile and light resistant container, the store MTS solution in light-protected place at -20℃ until analysis for immediate use store it at 4℃. To perform this assay, use seeded cell suspensions into 96 well plates in different tested groups which are incubated in a humidified atmosphere with 5% CO_2 at 37℃ in next step, add 20µl prepared MTS solution to each well and incubate for 1-4 hours at 37℃, and measure the absorbance by microplate reader at 570 nm.

BRINE SHRIMP Assay

Dried cysts of Artemisia salina were collected from an aquarium shop and hatched in artificial sea water for 48 hours to mature shrimp called nauplii. After hatching, active nauplii free from egg shells were collected from brighter portion of the hatching chamber and used for the assay. The test sample were prepared by dissolving them in DMSO plus sea water to attain concentrations of 10, 25,50,100,200,300,500 and 800 µg/ml. A vial containing 50µl DMSO diluted to 5ml was used as a control. Vincristine was used as positive control. After 24hours the number of survival of nauplii was counted and percentage of mortality was determined.

B. Cell Lines

PC-3 cell line was established in 1979 from bone metastasis of grade IV of prostate cancer in a 62 year old Caucasian male and these cells are influenced by epidermal growth factors. P53 is the most frequently mutated gene in cancer; it is mutated in some of aggressive cancers as small cell lung cancer, breast cancer. MCF-7 is a human breast cancer cell line with estrogen, progesterone receptors; it is derived from pleural effusion of 69 year old Caucasian. K562 cell line was the first human immortlised myelogenous leukemia cell line; it is a type of erythroleukemia and derived from 53 year old female chronic leukemia patient. HEK293 is derived from human embryonic kidney cells and these possess expression of membrane proteins. THP1 cell line is a human leukemia monocytic cell line used to study monocyte functions, nutrient and drug transport and it is isolated from peripheral blood of an acute monocytic leukemia patient.

MCF10 cell line is a non-tumorigenic epithelial cell line and it is a milk fat globule antigen and it is isolated from benign proliferative breast tissue. HepG2 cell line possess high proliferation rates and used in hepatotoxic studies and isolated from 15 year old liver tissue of causcasian male. HeLa cell line was first immortal human cell line; oldest and commonly used cervical cancer cell line. CHO-K1 cell line was derived from subclone from parenteral CHO cell line; an ovary of adult, female Chinese hamster. 3T3 cell line is a fibroblast cell line that was isolated from mouse embryo. EAC cell line is a udifferentiated carcinoma and one of the type of liver cancer. SK MEL2 cell line is commonly used human melanoma cancer cell line it induce mutations in BRAF and NRAS genes.SKOV3 cell line is a human ovarian cancer cell line with epithelial like morphology and are resistant to tumor necrosis factor. A549 cancer cell lines are lung carcinoma epithelial cells and used to model the alveolar type II pulmonary epithelium.

SW-620 cells were isolated from large intestine of 51 year old male colorectal cancer patient and used in cancer research. HGF-1 cell line was isolated from gingiva of 28 year old male patient. LNCaP cell line was isolated from left supraclavicular lymph node of 50 year old male metastatic prostate carcinoma patient. SW-48 cell lines were isolated from large intestine of 82 year old female colorectal cancer patient.EV-71 is a viral strain isolated from adult female oral cancer patient. Hs-578T cell line was isolated from 74 year old female breast cancer patient. HCT-116 cell line was isolated from colon of adult male with colon cancer and used to control PCR assay mutation in codon. AsPC-1 cell line was isolated from 62 year old female pancreatic cancer patient. CLL cell line is a type of B cells and it slowly affects the adults. 3T3L-1 cell line used to study cellular mechanisms of diabetes, obesity. T-47D cell line was isolated from 54 year old female breast cancer patient. HT-29 cell line was isolated from 44 year old colorectal adenocarcinoma patient.

Table1: A summary of Indian Medicinal plants having cytotoxicity against different cancer cell lines[10-49]

S. NO	PLANT NAME	SCIENTIFIC NAME	PLANT PART	MEDICINAL USES	CELL LINE	TYPE OF CANCER	TYPE OF ASSAY
1.	Neem	Azadirachta indica	Leaf	Leprosy, eye problems, skin diseases, septic sores	PC-3	Prostate cancer	MTT assay

				and infected burns			
2.	Tamarind	Tamarindus indica	Seed	constipation, liver and gallbladder problems and stomach disorders	RD Human lymphoma	Lymphomas	Brine shrimp assay
3.	Aloe Vera	Aloe vera	Leaf	Anti-inflammatory, antimicrobial Anti-aging and Heal wounds	P53	Liver cancer	Brine shrimp assay
4.	Henna	Lawsonia inermis	Leaf	Anti-inflammatory, anticancer, Analgesic and Reduces spams	MCF-7	Breast cancer	TLC assay
5.	Hibiscus	Hibiscus	Leaf, Stem	Antioxidant, antidiabetic, anticancer, antibacterial and Anti-inflammatory	K-562	Leukaemia	MTS, MTT assay
6.	Teak	Tectona grandis	Leaf, Bark	Used as laxative, sedative, treatment of piles, dysentery, leukoderma and anti-inflammatory	HEK-293	Kidney cancer	ABTS assay
7.	Curry leaves	Murraya koenigii	Leaf	Treatment of dysentery, antidiarrheal, antidiabetic, Treatment of morning sickness and nausea	Thp-1	Leukaemia	Colorimetric, MTT assay
8.	Sandal wood	Santalum album	Leaf	Anti-inflammatory, antiseptic, treatment of headache, stomachache, and urinary and genital disorders	MCF-7, MCF-10	Breast cancer	MTT assay
9.	Bael	Aegle marmelos	Leaf	Antidiarrheal, antidiabetic, treatment of dysentery and peptic ulcers	HepG2	Carcinoma	MTT assay
10.	Ant plant	Myrmecodia tubercosa	Leaf	Anticancer, antimicrobial,	HeLa	Cervical cancer	Brine shrimp assay

				anti-inflammatory, treatment of asthma and arthritis			
11.	Basil	Ocimum basilicum	Leaf	Used to treat stomach spasms, anti-inflammatory	CHO K1	Carcinoma	MTT assay
12.	Ivy gourd	Coccinia grandis	Roots	Antidiabetic, treatment of gonorrhoea	3T3 L1	B cell cancer	Brine shrimp
13.	Water lily	Water lillies	Leaf	Antidiabetic, anti-inflammatory, and used to treat liver disorders	MCF-7	Breast cancer	MTT assay
14.	Moringa	Moring oleifera	Leaf	Antioxidant, anti-inflammatory, anti-cholesterol	HeLa cell	Cervical cancer	MTT assay
15.	Amaranth	Amaranthus	Leaf	Antiseptic, anti-inflammatory, antifungal, anti-atherosclerotic	EAC	Breast cancer	DPPH assay
16.	Calotropis	Calotropis gigantean	Flowers	Anticancer, anti-inflammatory, antidiarrhoeal,	SK-MEL2	Melanoma	MTT assay
17.	Custard apple	Annona squamosal	Leaves	Anticancer, anti-inflammatory, antioxidant	MCF-7	Breast cancer	MTT & LDH assay
18.	Giloy	Tinospora cordifolia	Roots & Leaves	Anticancer, antiallergic, antidiabetic	AW13516	Oral cancer	MTT assay
19.	Peepal	Ficus religiosa	Bark, latex	Antidiabetic, antibacterial, anticancer, antioxidant	MCF-7, HCT-116	Breast cancer, colorectal cancer	MTT assay
20.	Betel	Piper betel	Leaves	Anticancer, antimicrobial, antidiabetic	HeLa	Cervical cancer	MTT assay
21.	Mango	Mangifera indica	Peel	Anti-ageing, anticancer, antidiabetic	HepG2, SW-620	Hepatic cancer, Colorectalcancer	MTT assay
22.	Periwinkle	Cantharanthus roseus	Stem	Antidiarrheal, anti-inflammatory, anticancer	THP-1	Human monocytic leukemia	Colorimetric XTT assay
23.	Vajradanti	Barleria prionitis	Leaves	Anti-rheumatic, anti-inflammatory	HGF	Human gingival fibroblast	MTT assay

24.	Sweet basil	Ocimum basilicum	Leaves	Used to treat stomach spasm and kidney diseases	HeLa, SKOV3	Cervical cancer, Ovarian cancer	MTT assay
25.	Guava	Psidium guajava	Leaf	Antidiarrheal, antidiabetic, and used to treat gastro intestinal infections	LNCaP	Prostate adenocarcinoma	MTT, SRB assay
26.	Touch me not	Mimosa pudica	Leaves, Roots	Antibacterial, antifertility, anticonvulsant, antidepressants	MCF-7, HepG-2	Breast cancer, Hepatoma	Brine shrimp assay
27.	Eucalyptus	Eucalyptus teriticornis	Leaves	Used to treat cough cold and bronchitis	SW48, HepG2	Colon cancer, Hepatic cancer	MTT assay
28.	Red silk cotton	Bombax ceiba	Flowers	Antidiarrheal, and used to treat male sexual disorders	A549, HepG2	Lung cancer, Hepatic cancer	MTT assay
29.	Banana	Musa acuminata	Leaves, Corms	Used to treat High Blood pressure	EV71, CHIKV	Enterovirus, Chickungunya virus	MTT assay
30.	Indian gooseberry	Phyllanthus Emblica	Fruit	Used to treat heartburn, antiaging, weight loss	HepG2, Hs578T	Hepatosarcoma, breast cancer	HPLC
31.	Indian Kudzu	Pueraria Tuberosa	Roots	Treat alcoholism, menopausal symptoms, fever	MCF-7, HepG-2, A-549, SKOV-3	Breast cancer, Hepatosrcoma, Ovarian cancer	HPLC
32.	Tridax Daisy	Tridax Procumbens	Leaves	Treat bronchial catarrh, diarrhea, dysentry	A-549, MCF-7	Lung cancer, Breast cancer	MTT assay
33.	Ajwan	Trachyspermum Ammi	Seeds	Relieve indigestion, bloating, treat ulcers	MCF-7, AsPC-1	Breast cancer, Pancreatic cancer	MTT assay
34.	Devil Trumpet	Datura Stramoium	Leaves	Treat stomach pain, fever, worm infestation	HepG-2	Liver cancer	MTT assay
35.	Night Jasmine	Nyctanthes Arbor	Flowers	Antioxidant, antbacterial, antfungal, anticancer, antiHIV	MCF-7, CLL	Breast cancer, Chronic Lymphocytic leukemia	Brine shrimp assay
36.	Rose	Rosa rubiginosa	Rose oil	Antidepressant, antispasmodic,	A-549	Liver cancer	MTT assay

				aphrodisiac,astringent			
37.	Banyan	Ficus Benghalensis	Powder	Burning sensation, ulcers, painful skin diseases, toothache	CHO, A-549	Ovary cell, Liver cancer	MTT assay
38.	Quail grass	Celosia Argentea	Flowers	Treat skin sore, eruption, heal burns, parasiticide	3T3L-1	Murine Preadipocyte cell line	MTT assay
39.	Sarsapari la	Smilax Ornata	Rhizome	Reduce joint pain, skin itching, reduce inflammation	T-470, HT-29	Breast cancer, Colon cancer	MTT assay
40.	Punarnav a	Boerhavia Diffusa	Root	Revitalize liver, rheumatoid arthiritis, antiangiogenic	MCF-7	Breast cancer	MTT assay

CONCLUSION

A few Indian origin medicinal plants with anticancer properties have been included in this review. These Indian plants possess anticancer activity due to their strong antioxidant properties. This study's objective is to provide an overview of the developments in India's research on medicinal plants that have anticancer properties. We have made an effort to investigate the newly found plants that have anticancer properties using invitro techniques. India is among the most promising regions in the world for finding new compounds in its flora that are physiologically active. To protect the humans from cancer, more research is required to identify powerful anticancer plants found on Mother Earth.

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Review Article

ENVIRONMENTAL TOXICOLOGY

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ABSTRACT

Medicines are prescribed for a range of illnesses and occasionally used for a variety of nonmedical purposes. There are countless documented cases where medications have caused more harm than good. Concerns over the environmental effects of medication manufacture are also becoming more widespread among scientists and environmentalists. Low concentrations of medications have been found in drinking water, ground water, surface water, sea water, and sewage treatment plant (STP) effluents in numerous nations. Acute toxicity tests have been used to examine the effects of certain medications on aquatic species. However, little is known about the long-term toxicity and possible mild consequences.[1]

KEYWORDS

Toxicology, agriculture, environment, heavy metals, ecotoxicology.

INTRODUCTION

These days, thousands of contaminants enter aquatic habitats, straining aquatic life in a number of ways that often result in harmful changes to the quality of the water. The aquatic life is still one of the ecosystem's most important components. The detrimental impacts of chemical pollution are becoming better understood as more studies are conducted on these contaminants and as analytical detection techniques develop. The aquatic environment, an essential component of the biosphere, has been called “the ultimate sink” for both naturally occurring and man-made toxins. With the limited amount of water available, ongoing chemical pollution of the aquatic ecosystem could pose a major harm to the environment's health. [2] The environment is defined as the place where microorganisms exist or operate. It is composed of Earth's atmosphere, land, and water. The four zones that make up the Earth's system are the environment (air), ecosystem (living things), water layer (water), and crust (land). All of these regions work together. More substances than in any other area of our surroundings are contaminants and environmental pollutants.

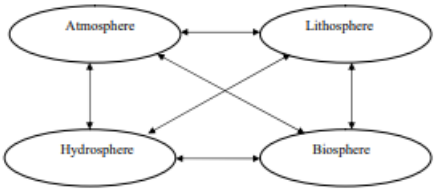

Fig. No. 1: Relationship of all the spheres

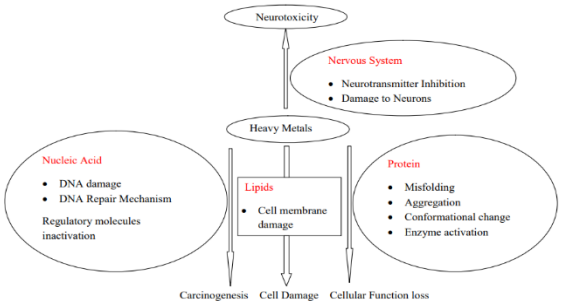

Table No. 1: List of heavy metals that are more prevalent in daily life and have densities greater than 5 g/cm3.

Fig. No. 2: Effects of heavy metal contamination

The interdependence of people, animals, and plants in our habitat is recognized by several cross-disciplinary medical practices, such as eco-health and healthcare of the Earth. Regrettably, anthropogenic production and consumption habits have created global change agents that have altered the health-related relationship by resulting in unparalleled biodiversity losses. For example, the current decrease rate is 10–100 times higher than it was during the previous 10,000 years, putting over a million species at risk of going extinct in the next few decades. [4]

ENVIRONMENTAL CONTAMINANTS

Tributyltin (TBT), an environmental pollutant with potent biocidal qualities, is found on every continent except Antarctica. Organotin compounds are tin compounds based on hydrocarbons. These materials are used as antifungals, molluscicides, and acaricides in agriculture and industry, as well as repellent paints and wood preservatives. Tributyltin (TBT) is a general word for a class of compounds that are characterized by their poor water solubility and involvement in the (C4H9)3Sn category. Tributyltin oxide is a well-known method for preparing TBT. TBT's low cost and potent antifouling paint-preventing properties made it a popular additive for ship hulls and underwater marine equipment by the middle of the 1960s.

TBT started to harm aquatic species in the marine environment after years of extensive use, and its

detrimental effects were subsequently documented. For example, populations of the invertebrate Nucelli lapillus along the UK coast have demonstrated that imposex, or the emergence of masculine sexual features in women, can be caused by a low dosage of 1 ng/L.

Vertebrates have also been reported to exhibit the Imposex effect. According to initial documentation of imposex with mammals, females might be masculinized by consuming amounts of TBT in their food of 0.1 µg/g, which is what Paralichthys olivaceus ate. More than 260 species of marine gastropods have been reported to exhibit the imposex effect of TBT as of 2011.

Heavy Metals	Occurrence of Source	Effects on human health
Nickel	Air, water, soil, food	Lung fibrosis, kidney & cardiovascular diseases, Cancer of respiratory tract.
Cadmium	Electroplating, pesticides, fertilizers	Renal dysfunction, bone defects, kidney damage, bone marrow.
Lead	Burning of coal, Automobile emissions, smoking	Mental retardation in children, chronic damage to nervous system
Arsenic	Pesticides, fungicides, mental smelters	Bronchitis, dermatitis, poisoning
Zinc	Mental plating, Refineries	Damage to nervous system, dermatitis

Furthermore, economic losses and environmental harm had already extended to other continents by this point. Several restrictions against the use of TBT in antifouling paints were first put into place in France, the UK, and other nations. Two factors that can increase the half-life of TBT compounds in the surrounding environment are their ability to dissolve in lipids and their preferential absorption through sludge or biological material with environments, which makes them suitable for placement in ocean sediments, and their ability to be distributed up to a century into the atmosphere, as predicted by computational frameworks.

Furthermore, TBT bioaccumulates in a variety of marine creatures those are at the base of the food chain. Due to their lipid solubility, TBT remains in these organisms even 20 years after the initial contamination. Marine life, fish, and seabirds because of the biomagnification of the contamination that occurs inside the nutritional connection, mammals may carry TBT residues. The World Health Organization (WHO) set a daily threshold of 250 ng/Kg of TBT due to the possible harm that consuming polluted food or water (such shellfish) can cause to human health. A 100-fold extrapolation was used to determine its significance based on tests for toxicity, mobility, and individual variation in mice. According to these experiments, the animals' thymus weight and function were reduced when TBT was added to their diet. The main way that drinking contaminated water or other beverages exposes people to TBT. However, eating seafood in particular has been demonstrated to be a significant human exposure pathway. The highest TBT concentration (1510 ng g^3 dry weight) was found in oysters from the coastal region of Hsiangshan, which accounted for 86–91 percent of all butyltin compounds in developed countries in the 1980s. A few years later, the International Maritime Organization (IMO) forbade the use of TBT-containing antifouling paints worldwide on January 1, 2003, and on January 1, 2008, it outlawed their use on board ships. However, given the financial benefits, it was projected in 2004 that 70–80% of the world's naval fleet was made up of a combination of TBT.

Two factors that can increase the half-life of TBT compounds in the environment are their ability to fall into sediments from the ocean (due to their notable solubility in lipids and preferential absorption by sand or biological material in environments) and the fact that they can be allowed to linger in the environment for up to a century, as predicted by mathematical methods. Moreover, an abundance of studies has shown that TBT disrupts estrogen signaling, affecting several tissues. [5]

APPLICATIONS

1)Use of Pharmaceutical Concept in Environment Dosage:

Environmental exposure to pesticides every year, a lot of chemicals (primarily herbicides, insecticides, and fungicides) are applied to arable areas. Initially, a seed coating is sprayed to protect freshly sprouting crops against target pest A. A significant amount of pesticide seeps into the soil, exposing it to helpful soil organisms including mycorhhizal fungus and earthworms. Within field boundaries (wildflower/hedgerow), where native plant species and other organisms may be at risk, pesticides disperse by water, mud, or breeze. Through nectar

and pollen, a contaminated crop may also expose pollinators to pesticides over an extended period of time.
This seeming conflict could be explained by three factors:
1)There is no harm to biodiversity by pesticides
2)The problem is pesticides, but they've started an irreversible chain reaction.
3)The total number of pesticides used

Considering an ecosystem to be a single living thing black arrows represent therapeutic actions, while red arrows suggest possible unintentional actions.
1)The person: While an individual arrives with a health concern, issue, the clinician is guided by fundamental pharmacological principles to administer the least amount of treatment that will be both minimally effective and safe for the patient. According to environmental pharmacology, regional ecology must view since one of them system of life that is comparable for a sufferer.
2)Handling: The analogy starts via a warning, which could be an agricultural pest within an ecosystem or a disease that affects humans. In both situations, a suitable dosage schedule (Chemical burden while dosage frequency) must deliver a bioactive steady-state dose in order for the drug to be used effectively (To individual) or pesticide (Regarding an agricultural product).
3)Side effects: treatment should only be administered in proportion to acceptable side effects arising from off-target bioactivity (e.g., human organ function or the activity of beneficial species in the ecosystem, like bees).
4)Long-term adaptations: In cases where chronic exposure arises (due to extended treatment or long-term persistence), human and ecological adaptations (such as pursuing choices/sensitization in harvest insects' ability to resist pesticides along with pollinators) must be taken into account. Examples of these adaptations include physiological consequences like addiction or sensitization, or multidrug resistance in pathogens.
5)Cocktail effects: a growing number of elderly patients are being treated for complex contraindications as a result of accumulating prescription medications, a condition known as polypharmacy.[6]

2)**When Used Pesticide Bioactivity Is A More Reliable Measurement of Possible Damage Compared To Weight:**

Refocusing regarding pesticide Bioavailability would allow pharmacology's full quantitative power to be applied, leading to a significant improvement in our comprehension of the danger posed by ecological pollutants and better environmental dosage for combating agricultural pests. For instance, the "therapeutic window," or the dosage range where a drug is present to provide a positive outcome, yet not one that side impacts exceed advantages, is a key idea in medical pharmacology. Low selectivity between related species is a common feature of pesticides. As a result, an insecticide might not be able to tell the difference between a pest like aphids and a beneficial insect like bumblebees, or during their a "weed" and an untamed, or between a fungicide and beneficial soil mycorrhizal fungus that cause fungal diseases in crops.
Therefore, the effects of pesticides on numerous organisms that observe without acting, whether toxicological or pharmacological (i.e., Dosage below dangerous threshold), are not regularly evaluated, despite the fact that the effects on the intended organisms could be well-researched.
When considering effectiveness of pesticides upon different pest species and the environmental impact of their use, the quantity of pesticides used appears to be a meaningless metric. It has been suggested that a more accurate way to gauge toxicity would be to use an agent's lethal dose (LDso), which is the dose at which 50% of treated subjects die. When measuring honeybee vulnerability using this metric, UK pesticide use increased sixfold between 1990 and 2015 instead of decreasing. Even though using LD5o as a metric is likely more beneficial than using pesticides in large quantities, it still misses sub lethal effects like behavioural changes that may have an impact on a species' long-term health.

FACTORS TO BE TAKEN INTO ACCOUNT REGARDING THE MEDICINAL PROPERTIES OF CHEMICALS IN NATURE INCLUDE:

1.Quantity & regularity.
2.The application of a varying makeup of chemicals cocktails. Each chemical's and its metabolite's unique environmental half-life.
3.The fluctuating effects regarding the numerous organisms that observe without acting, alternatively Pharmacological or toxicological (i.e., in dosages below lethal).
4.Variations in sensitivity at various phases of development.
5.The fluctuating impact of confusing surroundings regarding observer organisms: climate, soil type, ecosystems calibre, runoff, and prevalence of disease and parasites. [7]

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Review Article

SAFE USE OF HYDROGEN PEROXIDE AS A NASAL SPRAY - A REVIEW

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ABSTRACT

The present review aims to find out the possibility of using a H_2O_2 nasal spray by studying the available hydrogen peroxide sprays for human use for various purposes. Normally 3-6% solutions of H_2O_2 are used in medical applications. The reported NOEL and LOAEL studies indicated that up to 14.6mg/m^3 was found to be safe in human trials. Hence the available safety reports recommend that, a single exposure of 0.3% H_2O_2 in the external nostrils as a nasal wash with a subsequent blowing of nose can be helpful in relieving decongestion.

Keywords: Hydrogen peroxide, nasal wash. 0.3% H_2O_2

1.INTRODUCTION

Hydrogen Peroxide is a colourless liquid at room temperature possess powerful oxidizing activity[17]. Aqueous solutions of 3%-6% are used for cosmetic & medical applications. Hydrogen Peroxide and water do not form an azeotropic mixture (two or more liquids whose proportions cannot be altered or changed by simple distillation), and are completely separable[18].

Hydrogen peroxide is physiologically produced by oral bacteria and plays a significant role in the balance of oral microecology due to its important antimicrobial activity [(1)]. In the epithelial cells, the enzyme superoxide dismutase catalyses a reaction leading from hydrogen peroxide to superoxide. The oxidative stress stimulates a local innate response through activation of the toll-like receptors and the NF-κB[2]. Viral infections also activate these kinds of reactions [(3)]. Virus-induced oxidative stress plays an important role in the regulation of the host immune system and the specific oxidant-sensitive pathway is one of the effective strategies against viral infections [4-6]. Many viruses have been found to be sensitive to hydrogen peroxide, such as swine flu, rubella, rabies etc[7-12].

Hydrogen Peroxide is used in cosmetic sprays and could possibly be inhaled; for example, it is reported to be used up to 4% in aerosol hair sprays. In practice, 95% to 99% of the droplets/particles released from cosmetic sprays have aerodynamic equivalent diameters > 10 µm, with propellant sprays yielding a greater fraction of droplets/particles < 10 µm compared with pump sprays [(13,14)]. Thus, most droplets or particles incidentally inhaled from cosmetics would be deposited in the nasopharyngeal and thoracic respiratory tract regions and would not be inspired (i.e., they would not enter the lungs) to any appreciable amount [(15,16)].

This study aims at determining the possibility of usage of Hydrogen Peroxide as a nasal wash at safe concentrations.

Pharmacokinetics of H_2O_2

Hydrogen Peroxide is a normal metabolite in aerobic cells[19]. Hydrogen Peroxide passes readily across biological membranes. Under normal, physiological conditions, the concentration of Hydrogen Peroxide in tissues is 1 to 100 nM/L (0.034 to 3.4 µg/L) depending upon the organ, cell type, oxygen pressure, and cell metabolic activity [(20)]. In biological systems, Hydrogen Peroxide is metabolized by catalase and glutathione peroxidases [(20)].

The highest activities are found in highly vascularized tissues such as the duodenum, liver, kidney, and mucous membrane [(21)]. In the metabolism of Hydrogen Peroxide to water and oxygen, the decomposition rate in human plasma is approximately 0.01 to 0.05 M/L/min. Catalase is more efficient at the decomposition of higher concentrations of Hydrogen Peroxide; glutathione peroxidase is more efficient at decomposing lower Hydrogen Peroxide concentrations [(22)]. Glutathione peroxidase is present in cytosol and mitochondria but not in peroxisomes. A high glutathione peroxidase reduction activity of Hydrogen Peroxide is found in liver and erythrocytes; moderate levels are found in the heart and lungs, and a low activity is present in muscle. In the presence of transition metals in cells, Hydrogen Peroxide can be reduced via the Haber-Weiss reaction [(23)]. This reaction produces hydroxyl radicals (free radicals) which are highly reactive and can result in lipid peroxidation. At high uptake rates, Hydrogen Peroxide can pass the absorption surface and enter the adjacent tissues and blood vessels, where it is rapidly degraded by catalases and molecular oxygen is liberated [(19,20)]. As a consequence of this, mechanical pressure injury and oxygen embolism may be observed. In the view of the high degradation capacity for Hydrogen Peroxide in blood, it is unlikely that it is systemically distributed; therefore, the endogenous steady state levels of the substance in tissues are unlikely to be affected. On 1000-time dilution of the rat blood, the half-life of Hydrogen Peroxide was less than 5 min at both 5 and 10 mg/L. 6 For 20

mg/ml, the half-life was more than 4 h. In the study, concentrations of Hydrogen Peroxide were much greater than the range of aqueous solutions in products or in-use concentrations. Furthermore, this supports the view of rapid decomposition of Hydrogen Peroxide entering the blood circulation which will not be systemically available. For this reason, the distribution of Hydrogen Peroxide in the body is expected to be very limited after exposure to Hydrogen Peroxide solutions. Due to the rapid endogenous transformation into water and oxygen, there is no specific excretion of Hydrogen Peroxide or a determinable degradation product [20].

2. METHODOLOGY

2.1. Mucolytic Action of H_2O_2

In 1941, William et al. [33] demonstrated the mucolytic properties of hydrogen peroxide and ascorbic acid on purified gastrointestinal mucin [30]. They showed that hydrogen peroxide as a single agent is capable of degrading mucin and that the speed of the reaction can be increased 250-fold by the addition of ascorbic acid (equimolar quantities). Hydrogen peroxide is an oxidizing agent that may target the disulphide bonds and hence disrupt the cross linkage between adjacent molecules [33]. It may also attack the glycosidic linkages [35].

A study by Pillai et al in 2012 compared both ascorbic acid (0%–0.2%) and hydrogen peroxide (0%–3.0%), as single agent which showed mucolytic action on Peritoneal mucin. A linear increase in mucolysis has demonstrated with increasing concentration of each agent [36].

2.2. Inhalation

Anesthetized rabbits (number and strain not specified) were administered aerosolized 1% to 6% aq. Hydrogen Peroxide by inhalation. The left atrial blood was found to be supersaturated with oxygen up to levels that corresponded to oxygen administration at 3 atm. When the amount of Hydrogen Peroxide was increased, small bubbles began to appear in the blood samples. The amount of arterial oxygen was the same with both 1% and 6% Hydrogen Peroxide. No further details were provided [19].

2.3. Toxicokinetic Studies in human trials

A study by Ernst Gard et al depicts that Subjects (n = 11) were exposed to Hydrogen Peroxide (30% aq.; 0, 0.5, and 2.2 ppm; calculated as 0, 0.7, and 3.08 mg/m3) vapours for 2 h at rest in an exposure chamber (20 m3). Symptoms related to irritation and central nervous system (CNS) effects were rated with Visual Analog Scales. The ratings varied considerably but were generally low and with no significant differences between exposure conditions, although the ratings of smell, nasal irritation, and throat irritation showed borderline tendencies to increase at 3.08 mg/m3 , but not at 0.7 mg/m3 . Nasal airway resistance increased after exposure to 3.08 mg/m3 , but not at 0.7 mg/m3 . No effects in relation to the exposure on pulmonary function, nasal swelling, breathing frequency, and blinking frequency were detected. No clear effects were seen on markers of inflammation and coagulation (e.g., interleukin-6, C-reactive protein, serum amyloid A, fibrinogen, factor VIII, von Willebrand factor, and Clara cell protein in plasma). The authors concluded that Hydrogen Peroxide was slightly irritating at 3.08 mg/m3 , but not at 0.7 mg/m3 [24].

Another study by National Industrial Chemicals Notification and Assessment Scheme (NICNAS) towards Human health, Tier II assessment for hydrogen peroxide (H2O2) in 32 subjects indicates the threshold of detection for irritation through inhalation exposure was 10 mg/m3 (independent of the exposure time, which was from 5 minutes to 4 h) when Hydrogen Peroxide (concentration not provided) vapor was inhaled through the nose using a face mask [25].

2.4. Short Term Inhalation Toxicity Study

Mice exposed to Hydrogen Peroxide (90% aq.; 79 or 107 mg/m3) for 6 h per day for 2 to 3 days per week, for up to 4 weeks had nasal discharge, oedematous feet, and irritation of the skin at week 2 and hair loss around the nose (probably due to scratching due to irritation) at week 5; seven of nine mice died after eight exposures in the low-dose group, and in the high dose group, five of 10 mice died after eight exposures and eight of 10 died after 18 exposures[26].

Rats exposed to Hydrogen Peroxide (50% aq.) 5 days per week, 6 h per day, for 28 days showed clinical signs at 14.6 mg/m3 (including reddened nose, salivation, irregular breathing), but not at 2.88 mg/m^3; the no-observed-effects-level (NOEL) was 2.9 mg/m^3 and the Lowest Observed Adverse Effect Level (LOAEL)[2] was14.6mg/m^3. Rats exposed to 93 mg/m3 Hydrogen Peroxide (90% aq.) for 6 h per day for 2 to 5 days per week for 7 weeks (30 exposures) showed signs of nasal irritation and profuse discharge at 2 weeks, lung congestion and hair loss (probably due to scratching due to irritation) at 5 weeks [26]. In black rabbits exposed to 90% Hydrogen Peroxide (30 mg/m3) vapor for 6 h per day, 5 days per week for 12 weeks, there were no effects observed except for the bleaching of the fur and some irritation around the nose[26].

2.5. Sub-Chronic Inhalation Toxicity Studies

In rats exposed to Hydrogen Peroxide (concentration not specified) in whole body chambers for 5 h per day, 5 days per week for up to 4 months, the threshold for lung effects was 10 mg/m3 ; the NOEL was 1 mg/m3 and the LOEL was 10 mg/m3 . 2,32 There were no mortalities when rats were exposed to Hydrogen Peroxide (50% aq.) up to 10.3 mg/m3 for 6 h per day, 5 days per week, for 13 weeks; the NOAEL was 3.6 mg/m3 for male and female rats for decreased liver and thymus weights.2

Irritation was noted around the nose of rabbits exposed to 90% aq. Hydrogen Peroxide at 22 ppm (calculated as 30.77 mg/m3) for 3 months[27].

2.6. Chronic Toxicity Inhalation Studies:
In two dogs exposed to aerosolized 90% Hydrogen Peroxide (10 mg/m^3) for 6 h per day, 4 to 5 days per week for 26 weeks, the only observed effects were fur bleaching and loss at 14 weeks, and sporadic sneezing and lacrimation at 23 weeks [26]. At necropsy at 26 weeks, the lungs had areas of atelectasis and emphysema, and there was some hyperplasia in bronchial musculature [26].

2.7. Carcinogenicity Studies:
International Agency for Research on Cancer (IARC) determined that there is inadequate evidence in humans to come to a conclusion on the carcinogenicity of Hydrogen Peroxide and that there is limited evidence in experimental animals on the carcinogenicity of Hydrogen Peroxide. IARC concluded that Hydrogen Peroxide is not classifiable as to its carcinogenicity to humans (Group 3)[28].

2.8. Other Occupational Exposure Studies on H_2O_2:
The Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for inhalation of Hydrogen Peroxide is 0.0001% (1.4 mg/m3) averaged over an 8-h work shift. The National Institute for Occupational Safety and Health (NIOSH) immediately dangerous to life or health (IDLH) level for Hydrogen Peroxide is 0.0075% and the recommended exposure limit (REL) is 0.0001% (1.4 mg/m^3) [29,30]. According to the American Industrial Hygiene Association (AIHA) emergency response planning guideline (ERPG-2), the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 h without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action is 50 ppm (0.0050%). The Scientific Committee on Occupational Exposure Limits (SCOEL) concluded that an occupational exposure limit (OEL) of 0.0001% (1.4 mg/m^3) for Hydrogen Peroxide, as 8-h time-weight average (TWA), is recommended [31]. NICNAS conducted a Tier II assessment on Hydrogen Peroxide under IMAP (see Non-Cosmetic Use section for more related information) [32]. It is advised that industries should use measures to minimize the risk of oral, dermal, ocular, and inhalation exposure to Hydrogen Peroxide by workers.

3. DISCUSSION

The study by William et al shows the mucolytic effect of the H_2O_2 which is increased by 250-fold in addition of ascorbic acid. This is supported by the findings of Pillai et al showing the mucolysis in peritoneal mucin. Table 1 shows the published safe concentrations of the hydrogen peroxide administered through inhalation and other modes in various animal and human studies.
On observing the inhalation effects of the H_2O_2, it is observed that up to 90% aqueous aerosol exposure of 107mg/m^3 administered in frequencies in mice for 2 weeks produces oedematous, nasal discharge and skin irritation. 50%aqueous concentration of 14.6mg/m^3 in rats for a period of 28 days produced irregular breathing and redness in nose. 1-6% aerosolized concentration administered in rabbits produced supersaturation of atria with oxygen and at concentrations of 30mg/m^3 in black rabbits, bleaching of fur and irritation of nose were reported. On human studies, 30% aqueous concentration of 3.08mg/m^3 increased nasal airway resistance was reported.
Table 1: safe concentrations of hydrogen peroxide in animal and human studies.

Figure 1: Concentration of Hydrogen Peroxide in mg/m3 vs Physiological Effect

S.NO.	PUBLISHED CONCENTRATION	EFFECTS
1.	0.2-3% in Peritoneal mucin	Mucolytic effect
2.	90% aqueous 107mg/m^3 in mice for 2 weeks	Oedematous feet, nasal discharge and skin irritation
3.	50% aqueous 14.6mg/m^3 in rats for 28 days	Irregular breathing, reddened nose.
4.	1-6% aerosolized in anesthetized rabbits	Supersaturation of atria with oxygen
5.	90% aqueous 30mg/m^3 in black rabbits	Bleaching of fur and irritation of nose.
6.	30% aqueous 3.08mg/m^3 to 10mg/m^3 in humans	Increase in Nasal Airway resistance

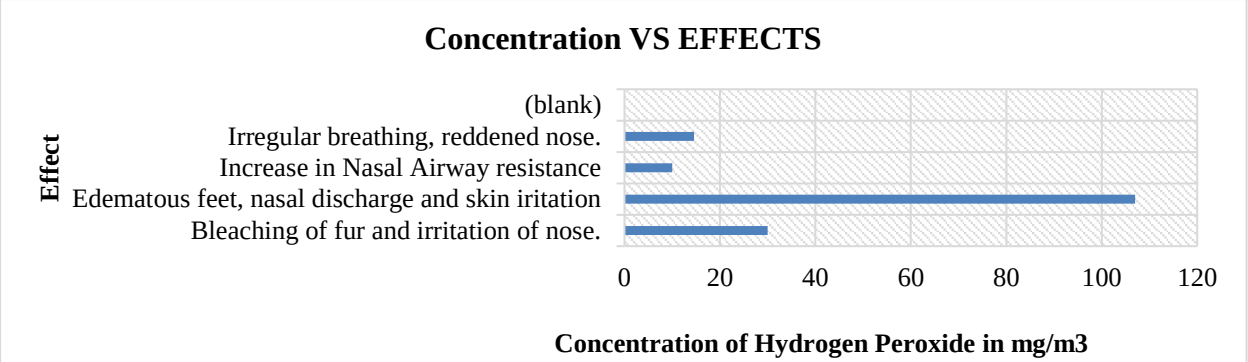

Table 2: conversion table for making various concentrations of H_2O_2

Quantity of Hydrogen Peroxide	*Quantity of water*	*% concentration of H_2O_2*
1 part 6% H2O2	1 part	3
	2 parts	2
	3 parts	1.5
	4 parts	1.2
	5 parts	1

The Study noted the issue of incidental inhalation exposure in aerosol hair sprays is about 4%. The available inhalation data suggest little potential for respiratory effects at relevant doses.

It should also be highlighted that inhalation toxicity studies on test animals are often conducted using high concentrations of droplets/particles with size distributions well within the respirable range and long exposure durations to ensure that the potential for pulmonary or systemic toxicity will be detected. In contrast, however, the concentrations of respirable droplets/particles and the inhalation exposure durations from the use of cosmetic products will be much less than those of the animal studies. A randomized, double-blind, parallel, placebo-controlled clinical trial by Di Domenico MB et al to assess the effectiveness of (1.0 %) gargling and (0.5%) nasal wash with H_2O_2 shows that H_2O_2 as a mouthwash and nasal spray is safe to use [37].

4. CONCLUSION

Thus, with the available toxicological data and safety reports, we can suggest that, a single exposure of 0.3% H_2O_2 in the external nostrils as a nasal wash with a subsequent blowing of nose can be helpful in decongestion and also in maintaining a sterile environment in the external nostrils. Still further studies are still required to provide accurate efficacy of the formulations developed.

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Review Article

AN OVERVIEW ON ENVIRONMENTAL TOXICOLOGY

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ABSTRACT

Medicines are prescribed for a range of illnesses and occasionally used for a variety of nonmedical purposes. There are countless documented cases where medications have caused more harm than good. Concerns over the environmental effects of medication manufacture are also becoming more widespread among scientists and environmentalists. Low concentrations of medications have been found in drinking water, ground water, surface water, sea water, and sewage treatment plant (STP) effluents in numerous nations. Acute toxicity tests have been used to examine the effects of certain medications on aquatic species. However, little is known about the long-term toxicity and possible mild consequences.[1]

KEYWORDS

Toxicology, agriculture, environment, heavy metals, ecotoxicology.

INTRODUCTION

These days, thousands of contaminants enter aquatic habitats, straining aquatic life in a number of ways that often result in harmful changes to the quality of the water. The aquatic life is still one of the ecosystem's most important components. The detrimental impacts of chemical pollution are becoming better understood as more studies are conducted on these contaminants and as analytical detection techniques develop. The aquatic environment, an essential component of the biosphere, has been called “the ultimate sink” for both naturally occurring and man-made toxins. With the limited amount of water available, ongoing chemical pollution of the aquatic ecosystem could pose a major harm to the environment's health. [2] The environment is defined as the place where microorganisms exist or operate. It is composed of Earth's atmosphere, land, and water. The four zones that make up the Earth's system are the environment (air), ecosystem (living things), water layer (water), and crust (land). All of these regions work together. More substances than in any other area of our surroundings are contaminants and environmental pollutants.

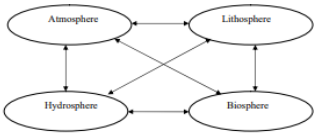

Fig. No. 1: Relationship of all the spheres

Table No. 1: List of heavy metals that are more prevalent in daily life and have densities greater than 5 g/cm3.

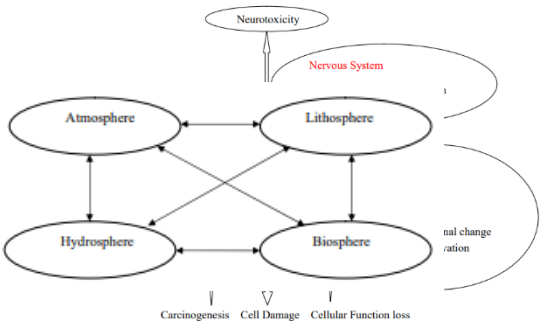

Fig. No. 2: Effects of heavy metal contamination

The interdependence of people, animals, and plants in our habitat is recognized by several cross-disciplinary medical practices, such as eco-health and healthcare of the Earth. Regrettably, anthropogenic production and consumption habits have created global change agents that have altered the health-related relationship by resulting in unparalleled biodiversity losses. For example, the current decrease rate is 10–100 times higher than it was during the previous 10,000 years, putting over a million species at risk of going extinct in the next few decades. [4]

ENVIRONMENTAL CONTAMINANTS

Tributyltin (TBT), an environmental pollutant with potent biocidal qualities, is found on every continent except Antarctica. Organotin compounds are tin compounds based on hydrocarbons. These materials are used as antifungals, molluscicides, and acaricides in agriculture and industry, as well as repellant paints and wood preservatives. Tributyltin (TBT) is a general word for a class of compounds that are characterized by their poor water solubility and involvement in the (C4H9)3Sn category. Tributyltin oxide is a well-known method for preparing TBT. TBT's low cost and potent antifouling paint-preventing properties made it a

popular additive for ship hulls and underwater marine equipment by the middle of the 1960s.
TBT started to harm aquatic species in the marine environment after years of extensive use, and its detrimental effects were subsequently documented. For example, populations of the invertebrate Nucella lapillus along the UK coast have demonstrated that imposex, or the emergence of masculine sexual features in women, can be caused by a low dosage of 1 ng/L.
Vertebrates have also been reported to exhibit the Imposex effect. According to initial documentation of imposex with mammals, females might be masculinized by consuming amounts of TBT in their food of 0.1 µg/g, which is what Paralichthys olivaceus ate. More than 260 species of marine gastropods have been reported to exhibit the imposex effect of TBT as of 2011.

Heavy Metals	Occurrence of Source	Effects on human health
Nickel	Air, water, soil, food	Lung fibrosis, kidney & cardiovascular diseases, Cancer of respiratory tract.
Cadmium	Electroplating, pesticides, fertilizers	Renal dysfunction, bone defects, kidney damage, bone marrow.
Lead	Burning of coal, Automobile emissions, smoking	Mental retardation in children, chronic damage to nervous system
Arsenic	Pesticides, fungicides, mental smelters	Bronchitis, dermatitis, poisoning
Zinc	Mental plating, Refineries	Damage to nervous system, dermatitis

Furthermore, economic losses and environmental harm had already extended to other continents by this point. Several restrictions against the use of TBT in antifouling paints were first put into place in France, the UK, and other nations. Two factors that can increase the half-life of TBT compounds in the surrounding environment are their ability to dissolve in lipids and their preferential absorption through sludge or biological material with environments, which makes them suitable for placement in ocean sediments, and their ability to be distributed up to a century into the atmosphere, as predicted by computational frameworks.
Furthermore, TBT bioaccumulates in a variety of marine creatures those are at the base of the food chain. Due to their lipid solubility, TBT remains in these organisms even 20 years after the initial contamination. Marine life, fish, and seabirds because of the biomagnification of the contamination that occurs inside the nutritional connection, mammals may carry TBT residues. The World Health Organization (WHO) set a daily threshold of 250 ng/Kg of TBT due to the possible harm that consuming polluted food or water (such shellfish) can cause to human health. A 100-fold extrapolation was used to determine its significance based on tests for toxicity, mobility, and individual variation in mice. According to these experiments, the animals' thymus weight and function were reduced when TBT was added to their diet. The main way that drinking contaminated water or other beverages exposes people to TBT. However, eating seafood in particular has been demonstrated to be a significant human exposure pathway. The highest TBT concentration (1510 ng g^3 dry weight) was found in oysters from the coastal region of Hsiangshan, which accounted for 86–91 percent of all butyltin compounds in developed countries in the 1980s. A few years later, the International Maritime Organization (IMO) forbade the use of TBT-containing antifouling paints worldwide on January 1, 2003, and on January 1, 2008, it outlawed their use on board ships. However, given the financial benefits, it was projected in 2004 that 70–80% of the world's naval fleet was made up of a combination of TBT.
Two factors that can increase the half-life of TBT compounds in the environment are their ability to fall into sediments from the ocean (due to their notable solubility in lipids and preferential absorption by sand or biological material in environments) and the fact that they can be allowed to linger in the environment for up to a century, as predicted by mathematical methods. Moreover, an abundance of studies has shown that TBT disrupts estrogen signaling, affecting several tissues. [5]

APPLICATIONS

1)Use of Pharmaceutical Concept in Environment Dosage:

Environmental exposure to pesticides every year, a lot of chemicals (primarily herbicides, insecticides, and fungicides) are applied to arable areas. Initially, a seed coating is sprayed to protect freshly sprouting crops against target pest A. A significant amount of pesticide seeps into the soil, exposing it to helpful

soil organisms including mycorhhizal fungus and earthworms. Within field boundaries (wildflower/hedgerow), where native plant species and other organisms may be at risk, pesticides disperse by water, mud, or breeze. Through nectar and pollen, a contaminated crop may also expose pollinators to pesticides over an extended period of time.

This seeming conflict could be explained by three factors:

1)There is no harm to biodiversity by pesticides

2)The problem is pesticides, but they've started an irreversible chain reaction.

3)The total number of pesticides used

Considering an ecosystem to be a single living thing black arrows represent therapeutic actions, while red arrows suggest possible unintentional actions.

1)The person: While an individual arrives with a health concern, issue, the clinician is guided by fundamental pharmacological principles to administer the least amount of treatment that will be both minimally effective and safe for the patient. According to environmental pharmacology, regional ecology must view since one of them system of life that is comparable for a sufferer.

2)Handling: The analogy starts via a warning, which could be an agricultural pest within an ecosystem or a disease that affects humans. In both situations, a suitable dosage schedule (Chemical burden while dosage frequency) must deliver a bioactive steady-state dose in order for the drug to be used effectively (To individual) or pesticide (Regarding an agricultural product).

3)Side effects: treatment should only be administered in proportion to acceptable side effects arising from off-target bioactivity (e.g., human organ function or the activity of beneficial species in the ecosystem, like bees).

4)Long-term adaptations: In cases where chronic exposure arises (due to extended treatment or long-term persistence), human and ecological adaptations (such as pursuing choices/sensitization in harvest insects' ability to resist pesticides along with pollinators) must be taken into account. Examples of these adaptations include physiological consequences like addiction or sensitization, or multidrug resistance in pathogens.

5)Cocktail effects: a growing number of elderly patients are being treated for complex contraindications as a result of accumulating prescription medications, a condition known as polypharmacy.[6]

2)**When Used Pesticide Bioactivity Is A More Reliable Measurement of Possible Damage Compared To Weight:**

Refocusing regarding pesticide Bioavailability would allow pharmacology's full quantitative power to be applied, leading to a significant improvement in our comprehension of the danger posed by ecological pollutants and better environmental dosage for combating agricultural pests. For instance, the "therapeutic window," or the dosage range where a drug is present to provide a positive outcome, yet not one that side impacts exceed advantages, is a key idea in medical pharmacology. Low selectivity between related species is a common feature of pesticides. As a result, an insecticide might not be able to tell the difference between a pest like aphids and a beneficial insect like bumblebees, or during their a "weed" and an untamed, or between a fungicide and beneficial soil mycorrhizal fungus that cause fungal diseases in crops.

Therefore, the effects of pesticides on numerous organisms that observe without acting, whether toxicological or pharmacological (i.e., Dosage below dangerous threshold), are not regularly evaluated, despite the fact that the effects on the intended organisms could be well-researched.

When considering effectiveness of pesticides upon different pest species and the environmental impact of their use, the quantity of pesticides used appears to be a meaningless metric. It has been suggested that a more accurate way to gauge toxicity would be to use an agent's lethal dose (LDso), which is the dose at which 50% of treated subjects die. When measuring honeybee vulnerability using this metric, UK pesticide use increased sixfold between 1990 and 2015 instead of decreasing. Even though using LD5o as a metric is likely more beneficial than using pesticides in large quantities, it still misses sub lethal effects like behavioural changes that may have an impact on a species' long-term health.

FACTORS TO BE TAKEN INTO ACCOUNT REGARDING THE MEDICINAL PROPERTIES OF CHEMICALS IN NATURE INCLUDE:

1.Quantity & regularity.

2.The application of a varying makeup of chemicals cocktails. Each chemical's and its metabolite's unique environmental half-life.

3.The fluctuating effects regarding the numerous organisms that observe without acting, alternatively Pharmacological or toxicological (i.e., in dosages below lethal).

4.Variations in sensitivity at various phases of development.

5.The fluctuating impact of confusing surroundings regarding observer organisms: climate, soil type, ecosystems calibre, runoff, and prevalence of disease and parasites. [7]

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- To elevate and establish a standard of competence for community pharmacy.
- To develop and promote standards of education and training for community pharmacy.
- To develop and promote short term informal training programs for individuals interested in community pharmacy.
- To educate hospital trustees, Board of Directors, Board of Visitors and the public to understand that the practice of community pharmacy calls for special training and experience.
- To serve as a forum for exchange of ideas and experiences, and collection and dissemination of information in general community pharmacy.
- To spread the knowledge on the principles, practices, techniques and methods concerning community pharmacy.
- To promote and safeguard the status and the interest of community pharmacy and the interests of those engaged in it.
- To promote sponsor, submit, memorandums, petitions and representations to local, state, union and other authorities for better laws, and influence legislation which affect hospitals and other community pharmacy organizations.
- To organize conferences, seminars, meetings and discussions for the promotion and furtherance of the aims and objects of the ACPI.
- To undertake and bring out, publish, sell, distribute free or otherwise, edit, print and exhibit for sale, magazines publication, bulletins, books pamphlets and the like, in furtherance of the objects of the ACPI and in any event not for the purpose of carrying a trade there from but only for the purposes of furthering the objects of the ACPI.
- To raise any monies for the purpose of the ACPI by way of special subscriptions, membership or entrance fees, donations, special fees, loans or in any other manner on such terms and conditions as may be determined.
- To purchase, take on lease or in exchange, or otherwise acquire, any movable or immovable property, rights or privileges, which may be deemed necessary, expedient or desirable for any of the objects, of the ACPI.
- To accept from the Government, organizations, institutions and individuals, grants, donations, subscriptions, gifts bequests, endowments, special fees, etc, for the furtherance of the objects of the ACPI.
- To make from time to time, regulation and bye-laws for the control, conduct and regulation of the affairs of the ACPI.
- To confer Fellowships in community pharmacy on those who have done or are doing noteworthy service in the field of community pharmacy.
- To generally do all such other things as are incidental or conducive to the attainment of any or all of the above-mentioned objects.

EDITORIAL OFFICE

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