



## CHEMISTRY AID TO THE DISCOVERY OF DRUGS USED TO TREAT DISEASES AND PEOPLE'S HEALTH

Dr. A. Vijayalakshmi<sup>1\*</sup>, Sarita S Mane<sup>2</sup>, Dr. Sandhya A M<sup>3</sup>, Dr Merin Mathew<sup>4</sup>, Sanjay Kumar<sup>5</sup>,  
Vijay Kumar Sharma<sup>6</sup>

### Abstract

Your thoughts, words, and actions are all the product of a chemical process. Understanding physiologic (health and well-being) and pathophysiologic (disease) circumstances requires first and foremost the elucidation of the basic mechanisms behind these chemical interactions. The study of the biochemistry underlying these interactions is the focus of the scientific discipline of clinical chemistry, which aims to assist a healthy lifestyle while also identifying disease states, monitoring treatment, and better-predicting survival. By testing, we hope to attain these aims. It is easy to see that clinically relevant chemical connections are complicated, which is why test designs, test techniques, and test systems need to undergo constant improvement. It is of the utmost importance to discover new biochemical markers that can precisely represent the illness condition. When they have been discovered, specific chemical processes and very complex testing equipment may be necessary in order to quantify them. The foundation for medical treatment is provided by these several diagnostic instruments. To be of widespread use to the public as a whole, then, they need to have a high degree of reliability while also being easily available and reasonably priced.

**Keywords:** Health and Well-being, Pathophysiologic, Clinical Chemistry, Biochemistry

<sup>1\*</sup>Associate Professor, Department of Chemistry, Institute of R. M. K. Engineering College, Thiruvallur, City of Chennai, State of Tamil Nadu, Mail id: avl.sh@rmkec.ac.in, Mobile: 9952892832.

<sup>2</sup>Assistant professor, Department of Physiology and Biochemistry, Institute of Bharati Vidyapeeth (deemed to be university) Dental college and Hospital, Navi Mumbai, District of Thane, City of Navi Mumbai, State of Maharashtra

<sup>3</sup>Associate Professor, Department of Physiology and Biochemistry, Institute of Bharati Vidyapeeth (Deemed to be University) Dental College and Hospital, Navi Mumbai, Thane, of Navi Mumbai, State of Maharashtra

<sup>4</sup>Assistant Professor, Department of Prosthetic Dental Science, Institute of College of Dentistry, Jof University, Saudi Arabia, E-mail: mmulahannan@ju.edu.sa, dr.merin.mathew@jodent.org

<sup>5</sup>Associate professor, Department of chemistry, Institute of Shyam Lal College, University of Delhi, Delhi

<sup>6</sup>Designation Professor, Department of Physics, Shyam lal College, University of Delhi, Nationality Indian Shahdara Delhi 110032, India, State Delhi, District of East Delhi, Delhi, Pin Code 110032, E-Mail id nonuvijay@rediffmail.com

**\*Corresponding Author:** Dr. A. Vijayalakshmi

\*Associate Professor, Department of Chemistry, Institute of R. M. K. Engineering College, Thiruvallur, City of Chennai, State of Tamil Nadu, Mail id: avl.sh@rmkec.ac.in, Mobile: 9952892832.

**DOI:** - 10.31838/ecb/2023.12.si5.016

## I. INTRODUCTION

Chronic illnesses such as diabetes, cardiovascular ailments, obesity, and cancer grow increasingly frequent as our population ages and consume a disproportionate part of the funds spent yearly on healthcare throughout the globe. Several diseases are becoming less irreversible and more treatable as medical research advances and a clearer understanding of these complicated biochemical relationships is achieved. Clinical chemistry studies these health concerns from every angle, from prevention (diet and nutrition) through early diagnosis (genomics, proteomics, and mass spectrometry), to treatment (circulating tumour cells and cell-free DNA). Prevention of disease begins with what we eat and how we nourish our bodies. Recent studies have shown the value of nutrients like folic acid and B12 in preventing and treating cancer, as well as in other areas including hypertension, lipid metabolism, gastroprotection, vitamin D, testosterone, liver disease, homocysteine, and iron deficiency. (Guanche et al., 2023)

## II. OBJECTIVE

The research aimed to fulfill the following objectives:

- What role does chemistry play in the human health?
- To study Why is it vital for humans to understand chemistry?
- What applications of chemistry may be found in everyday life?

## III. METHODOLOGY

Early diagnosis is crucial for successful treatment and management of the illness. Finding new biomarkers is a key focus of cancer research, including studies of breast, colorectal, prostate, and lung cancer; cardiac disease (troponins, BNP, heat shock proteins); allergy and asthma; Alzheimer's disease; autoimmune diseases; etc. Newer technologies, such as tandem mass spectrometry, microarrays, and next-generation sequencing, may be required to facilitate the creation and testing of novel disease indicators. An effective monitoring system is crucial for clinically ill patients as it allows for rapid evaluation of patient progress and feedback on therapeutic strategy. Colorectal cancer tumour staging, mass spectrometry for thyroid illness, circulating tumour cell quantification and characterization in breast cancer, and the discovery of specific bone markers in cancer patients are all covered in related articles. Colorectal cancer tumour staging, mass spectrometry for the treatment of thyroid illness,

circulating tumour cell analysis in breast cancer, and the discovery of osteoporosis-specific bone markers are only few of the topics covered in the articles included here.

## IV. WHAT ROLE DOES CHEMISTRY PLAY IN THE HUMAN HEALTH?

In order to handle these three topics, which are nutrition for the prevention of illness, diagnostics for the detection of disease, and medicine for the treatment of disease, chemistry is taught and learnt on a need-to-know basis in schools and universities. People know about more than 1.2 billion different chemicals. About 40,000 to 60,000 of them are used in business, and 6,000 of them make up upwards of 99% of all the chemicals used in business around the world. In 2017, this same chemical industry has been the second largest mass production industry in the world, and that number is going up. From 2017 to 2030, sales of chemicals are expected too almost double. (2018)

Chemicals are a part of our environment, whether they come from nature or are made by people. Chemicals that are made in factories include pesticides, petroleum products, and metals that have been worked on. Some chemicals are made for specific uses, whereas others are unwelcome by-products, like wastes, as well as products of combustion, like toxic particles and gases from industrial pollution and burning fuel.

As part of everyday life, everyone comes into contact with chemicals. This can happen through the food and water they eat and drink, the products they use or are around at home or at work, their contact with the environment (for example, when they breathe the air, touch the soil, or swim in recreational waters), or a chemical accident. People use and are exposed to a lot of chemicals. Some of them are harmless or even helpful, but others are dangerous to people's health and the environment. Both social and biological factors affect the amount of exposure and the health effects that come from it. Men, women, and children are exposed to chemicals in different ways, at different levels, and at different times. Also, men, women, and children react differently to the health effects of dangerous chemicals because of how their bodies work. (2018)

### *contributions do chemistry provide to the fields of health and medicine*

Chemistry has produced significant advancements in the field of medical care via its contributions. In order to produce novel medications, a combination

of chemical research and the creation of new molecules is required. There have been a lot of recent broadcasts on television that tout the vast number of new pharmaceuticals that have been invented by chemists. The process of creating a brand-new medication is time-consuming and difficult. (2023)

### **"Chemistry health" mean**

Tagline. A scientific education pamphlet titled "The Chemistry of Health" that examines the job that chemists conduct may be found here. A significant number of chemists work in the medical field as researchers, seeking for novel approaches to health care and methods to make people healthier. Others are contributing to the protection of our world by discovering methods that are secure, economical, and effective for the production of the resources that we use on a daily basis. (Burch & Eisenhut, 2016)

### **Why is it vital for humans to understand chemistry?**

For us to be able to satisfy our fundamental need for food, clothes, housing, health, energy, and the maintenance of clean air, water, and soil, chemistry is absolutely necessary. Chemical technologies provide novel answers to issues relating to human health, the production of materials, and the use of energy, all of which contribute to an improvement in the general quality of life. (2023)

In what ways may one see instances of chemistry in daily life?

Instances When Chemistry Is Used in Everyday Life

- ◆leaves that have developed a discoloration.
- ◆Food Digestion.
- ◆Common salt.
- ◆Ice floated on top of the lake.
- ◆The slicing of onions brings on the tears.
- ◆Sunscreen.
- ◆Medicines.
- ◆Hygiene.

Your daily activities include a significant amount of chemistry. Chemistry is present in many aspects of everyday life, including the meals you consume,

the air you breathe, the soap you use, your feelings, and virtually anything else that can be seen or touched. Chemicals are used in the production of food. Chemical reactions are the source of many of the changes that occur in the environment around you, which you can witness. Chemistry may be found in many aspects of everyday life, including the meals we consume, the air we breathe, the chemicals used for cleaning, our feelings, and virtually anything else that can be seen or touched. Certain aspects of ordinary chemistry could be rather intuitive, while others might take us by surprise. Chemical compounds, which are just combinations of elements, are what give our body its structure and function. (2014)

### **What kinds of contributions have chemists made to the field of medicine?**

As a result, chemistry has a significant amount to give to various professions, like medicine and materials engineering, amongst others. Chemistry plays an important role in the diagnosis and treatment of medical conditions. Chemists are able to develop a variety of treatments by experimenting with various ingredients and mixes. The composition of matter is the primary factor that contributes to the connection between chemistry and medicine. In order to prevent, treat, or alleviate the symptoms of illness, the medical profession studies the chemical processes that occur inside the body. The study of the components of matter, which is done in chemistry, contributes to an improved knowledge of the workings of the human body. In a nutshell, chemistry continues to be the most beneficial science, and it continues to play the most important role in the process of developing new drugs. It plays the role of the skeleton to support the overall framework of drug development and contributes to the expansion of the pharmaceutical sector. The vast majority of illnesses, injuries, and therapies in medicine involve chemicals or chemical reactions, making chemistry an essential subject. Because of our knowledge of chemistry, we are able to create medications that combat illness, improve nutrition, and create healthier surroundings in which to live in order to prevent sickness. (Eckhardt, 2016)

## Chemistry in Medicines & Healthcare

The chemical substances used for treatment of diseases and for reducing sufferings from pain are called medicines or drugs.

Some of the medicinal compounds are discussed below:

Type of Drug	Its Use	Example
Antipyretics	Lower the temperature of body	Aspirin, paracetamol, phenacetin.
Analgesics	used to relieve pain	naproxen, diclofenac sodium.
Antiseptics	used to kill or prevent the growth of micro-organisms.	furacin, soframycin
Anticancer drugs	to treat cancerous growths.	cisplatin
Tranquilizers	treatment of stress, mild and severe mental diseases	mebutal, veronal, luminal
Antihistamines	diminish the actions of histamine released in the body and hence prevent allergy.	Benadryl, Avil, foristal
Antacids	neutralize acid in the gastric juice and relief from acidity, heat burns	Baking soda in water, cimetidine, rantidine.
Anesthetics	produce general or local insensibility to pain and other sensations.	Chloroform, vinyl ethers

**Figure 1.** Chemistry In Medicines And Healthcare

### V. WHAT APPLICATIONS OF CHEMISTRY MAY BE FOUND IN EVERYDAY LIFE?

You will see that the label on the package of tablets or other medicines lists a few more chemicals besides the part of the drug that is really effective. If the medical staff knows a little bit about chemistry, they can better understand what a certain composition is for, how the medicine should be given, and how it works. If you look closely at the label on the medicine in the picture on the right, you'll see the word "ibuprofen," which is a painkiller, and the number "200 milligrams" next to it. Also, it talks about "coated tablets."

There are many different chemicals in the medicines we take.

They could be acidic or alkaline, soluble in oil or water, polar, or many other things.

The prescription label is an example of how chemistry is used in medicine. In the example given above, the medicine is called an NSAID, which means that it is non-polar and acidic by nature. The doctor will be able to make better guesses about how the medicine will work if he or she knows something about chemistry. For example, the stomach is a better place to absorb medications that are acidic, while the intestines are a better place to absorb medications that are

alkaline. Also, a lipophilic medicine gets into the brain and deeper tissues much more quickly than a hydrophilic medicine. So, a doctor will be able to get an idea of how the medicine will work in the body by looking at how its chemicals are put together. In the event that too much medicine was given, he would be able to get rid of the acid part of the medicine. (Douc, 2017)

While trying to figure out what the effects of the drug interactions will be.

Most of the time, someone in therapy takes more than one drug at the same time.

If the pharmacist knew how the drug worked chemically, they would be better able to tell if it might cause any drug interactions or not.

For people with stomach ulcers, for example, a doctor might suggest that they take an antacid like calcium hydroxide and an antibiotic like tetracycline. In this case, the tetracycline will combine with the calcium to make a chemical complex that will let the calcium get into the bloodstream. Since this is the case, taking the antibiotic in question would have no effect on the body at all. (2021)

About how to sterilize and clean something. For sterilization and disinfection, many different chemicals are used, such as alcohol, phenol, acids,

and aldehydes. To understand how the material might kill the germs, it helps to know something about chemistry. So, the user can choose what kind of sterilizing agent to use for each function. Find out more about the many ways alcohol can be used here.

In the process of figuring out what's wrong.

- ◆ The chemical tests were made by using what was learned by studying the chemistry of biomolecules and how they interact with each other.
- ◆ Simple biochemical tests can be used to find out about a wide range of diseases and conditions.
- ◆ With the help of these chemical assays, for example, it is easy to find out how much glucose and cholesterol are in the blood.
- ◆ Also, the costs are less than what other methods would be.
- ◆ For instance, the glucose oxidase method is one way to figure out how much glucose is in the blood.
- ◆ So, the results of these chemical tests help the doctor figure out what's wrong.
- ◆ to make rules for how medical supplies should be given out.
- ◆ By changing the way, the body works chemically, it is possible to control how the medicine is taken in, distributed, and gotten rid of.
- ◆ Poisoning can happen, for example, if a person eats or drinks a lot of salicylates or other acidic medicines.
- ◆ Since sodium bicarbonate is an alkaline substance, it may make the blood more alkaline, which will speed up the rate at which they are passed out of the body.

Some drugs can't get into the brain because they don't dissolve in water. Medication like local and general anesthetics can make a drug less likely to hurt people while also making it more acceptable. As part of the field of medicinal chemistry, researchers look into how medicines are put together. By going through this process, the main groups of functions that are responsible for therapeutic benefits and harmful effects can be

found. By changing the functional groups in question, it is possible to lessen the drug's potentially harmful effects. (Cue, 2022)

To come up with more new medicines or to make the ones we already have work better.

Penicillin was found when Alexander Fleming took it from a fungus.

Amoxicillin and carboxy penicillin are two examples of alternatives to penicillin that were made possible by studying its chemical structure. In the past, penicillin was often used to make people go into anaphylactic shock or even kill them. But since the update, this problem is no longer a problem. Another benefit is that these new compounds work well against gram-negative bacteria as well.

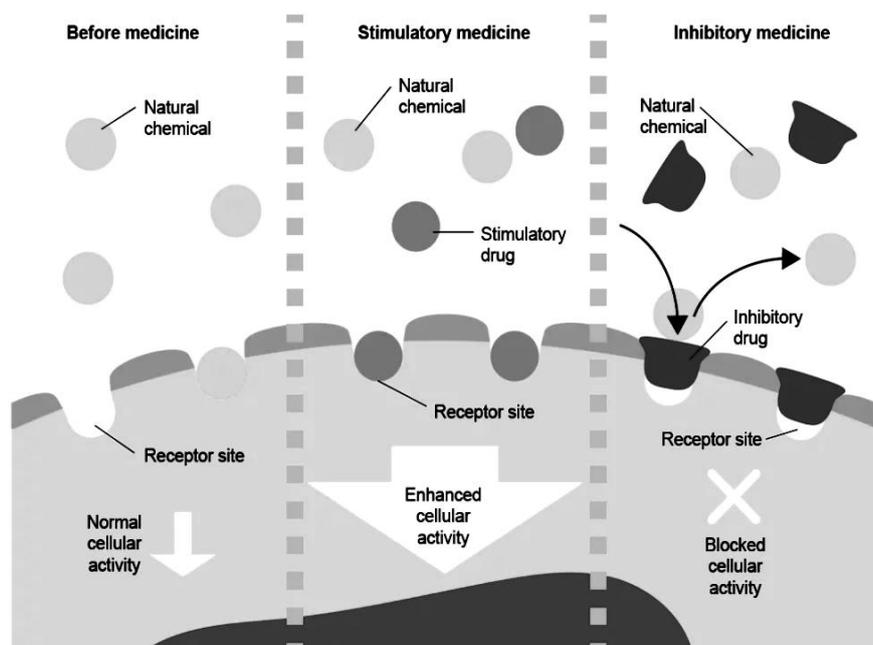
To look into how illness affects the body.

- ◆ Most illnesses are caused by changes in the body's chemicals.
- ◆ Osteoporosis, for instance, happens when the amount of calcium in the body goes down.

Also, when the stomach makes more hydrochloric acid, the stomach gets more acidic. Anemia happens when there isn't enough iron in the body. So, scientists may be able to use chemistry to figure out what makes a person sick and how to treat it. (Nautical et al., 2023)

To figure out how the medicine works,

- ◆ A certain process is used to make pharmaceuticals work as medicine.
- ◆ Chemistry is a good way to study this process and to explain how it works.
- ◆ For example, when someone has depression, the normal amounts of neurotransmitters in their brain are thrown off.
- ◆ Neurotransmitters like serotonin, norepinephrine, and dopamine are affected most by this.
- ◆ These neurotransmitters are made to work better by the medicines that are used now.



**Figure 2.** How The Medicine Works?

## CONCLUSION

It is now possible, as a result of the development of innovative technology for conducting genetic testing (next generation sequencing), to identify certain mutations in cancer patients to whom the three are therapeutic options that are specifically tailored to their condition. In conjunction to this, the field of clinical chemistry addresses environmental issues that are relevant to the general populace and are crucial to consider. They include diseases that are brought on by asbestos, the possibility of outsourcing an infection, this same difficulties of envenomation in nations of the third world, and exposed to carcinogens including

such polycyclic aromatic hydrocarbons, which also are commonly used in industrial settings. All of these things can occur simultaneously.

## REFERENCES

1. A bio adhesive nanoplatform enhances the permeation of drugs used to treat diabetic macular edema. (n.d.). <https://doi.org/10.1021/acsabm.0c00080.s001>
2. Burch, J., & Eisenhut, M. (2016). How do different antimicrobial drugs compare when used to treat people with cholera? *Cochrane Clinical Answers*. <https://doi.org/10.1002/cca.1103>
3. A controversial dam unites indigenous people and scientists, and transplanting mitochondria to treat rare diseases. (2023). *AAAS Podcast DO Group*. <https://doi.org/10.1126/science.adg5434>
4. Cue, B. W. (2022). Green Chemistry approaches to drugs that treat epidemic and pandemic diseases. *Contemporary Chemical Approaches for Green and Sustainable Drugs*, 307–331. <https://doi.org/10.1016/b978-0-12-822248-5.00003-6>
5. Douc, E. (2017). Orphan Drugs (drugs used in rare diseases) situations in Turkey and in the world. *Health Care Academician Journal*, 4(3), 196. <https://doi.org/10.5455/sad.13-1502288229>
6. Eckhardt, B. (2016). Hepatitis C treatment in people who inject drugs. *Current Treatment Options in Infectious Diseases*, 8(4), 416–425. <https://doi.org/10.1007/s40506-016-0091-7>
7. Effects of drugs used to treat infertility on periodontium and periodontal disease. (2018). *International Journal of Women's Health Care*, 3(1). <https://doi.org/10.33140/ijwhc.03.01.07>
8. In patients receiving end-of-life care, medications used to treat co-morbid diseases should be discontinued when appropriate. (2014). *Drugs & Therapy Perspectives*, 30(12), 432–434. <https://doi.org/10.1007/s40267-014-0153-1>
9. The interaction of drugs to treat cardiovascular diseases and testosterone therapy, their effects and characteristics. (2021). *Journal of Men's Health*. <https://doi.org/10.31083/jomh.2021.005>
10. Nautical, H., Kazmi, I., Kaleem, M., Afzal, M., Ahmad, M. M., Zafar, A., & Kaur, R. (2023). Mechanism of action of drugs used in gastrointestinal diseases. *How Synthetic Drugs*

Work, 391–419. <https://doi.org/10.1016/b978-0-323-99855-0.00017-8>

11. Guancho, V., Bals lev, H., Sad grove, N. J., & Phum hum, M. (2023). Medicinal plants used by rural Thai people to treat non-communicable diseases and related symptoms. *Helion*, 9(1). <https://doi.org/10.1016/j.heliyon.2022.e12758>