

## A GLIMPSE OF PRINCIPLES OF CHEMISTRY IN AYURVEDA

\*<sup>1</sup>Dr. Varuni S. J., <sup>2</sup>Dr. Jalindar Dhamale and <sup>3</sup>Dr. Kalpana Sathe<sup>1</sup>PhD Scholar, Tilak Maharashtra Vidyapeeth, Pune. Maharashtra, India.<sup>2</sup>Professor, Department of Kriya Shareera, Sri Sri College of Ayurvedic Science and Research, Bangalore, Karnataka, India.<sup>3</sup>Professor, Department of Kriya Shareera, All India Institute of Ayurveda, New Delhi, India.

\*Corresponding Author: Dr. Varuni. S. J.

PhD scholar, Tilak Maharashtra Vidyapeeth, Pune. Maharashtra, India.

Article Received on 17/01/2022

Article Revised on 07/02/2022

Article Accepted on 27/02/2022

## ABSTRACT

Ayurveda is an age old science that encompasses several branches of science. Rasashastra is a branch which deals with metals, minerals gems its purification, and conversion of them into bhasma forms so that it can be administered internally. Ayurveda uses herbal, herbo-mineral, and animal items to treat a variety of illnesses. These substances act due to their chemical properties, and chemistry is the study of these principles itself.

## INTRODUCTION

Ayurveda is a vast ancient knowledge involving varied branches of science. It has in it a treasure of knowledge hidden in the form of *shlokas* said by great Acharya's (authors of Ayurvedic texts).

Chemistry is a branch of the natural sciences dealing with the composition of substances and their properties and reactions.<sup>[1]</sup>

In Ayurveda, treatment of various disorders is done by using herbal, herbo –mineral and animal products. These substances act due to their chemical properties and study of these principles is nothing but chemistry.

## Basic Principles of Ayurveda and Chemistry

There are mainly few basic principles which are the foundations, on which Ayurveda has been explained. One such principle is the theory of *PanchaMahabhuta*,<sup>[2]</sup> the five basic essential elements – *Akasha* (ether), *Vayu* (air), *Agni* (fire), *Jala* (water) and *Prithvi* (earth).

The *Panchamahabhuta* is a Sanskrit word composed of three words i.e. *Pancha*, *Maha* and *Bhuta*. *Pancha* means five elements, *Maha* means that which is enormous and *Bhuta* means that having their own existence. It is enormous and yet so minute. It is said that there is no existence of any substance in this universe which is devoid of *Panchamahabhuta*. According to modern chemistry atoms are the smallest particles of every substance. This theory of *Panchamahabhuta* holds good at the atomic level too.

In an atom there is presence of protons and neutrons within the nucleus at the center. Electrons are revolving around the nucleus in its definite orbit.<sup>[3]</sup>

- The protons and electrons carry a charge and this energy is responsible for the function of the atom which can be said as the inherent character of *Agni Mahabhuta*.
- Protons and electrons are having a definite bonding between them. This property is because of the presence of *Jala Mahabhuta* which is having the capacity of bonding as its inherent character.
- Every atom has got a definite mass which is depicted in the form of atomic mass number.<sup>[4]</sup> This can be compared to the *Pruthvi Mahabhuta* which is having the property of heaviness.
- Electrons which are continuously moving around the nucleus in definite orbits can be compared to the property of *Vayu Mahabhuta* which is moving continuously.
- Irrespective of its size every atom occupies some space in universe. This is nothing but the innate property of *Akasha Mahabhuta* (ether element).

All substances are made up of atoms and atoms are made up of *Panchamahabutas*. So for every creation of a substance, these *Panchamahabutas* are most essential.

Another basic principle in Ayurveda is "*loka purusha samya vada*"<sup>[5]</sup> which means there is similarity between universe and the human body. This same principle can be viewed through chemistry as, -

- Approximately 75% of earth's surface area is covered by water (hydrosphere)<sup>[6]</sup> Similarly we can find 60 – 70 % of water in the human body also in

the form of ICF (Intra cellular fluid) and ECF (Extra cellular fluid).<sup>[7]</sup>

- In the universe we find nitrogen as the most abundantly available element. Similarly in human body it is present in almost same proportion, in the form of proteins (amino acids).
- Iron and calcium are also present more or less in same percentage in the universe and also in our body.

### Chemistry in Ayurvedic pharmacology

In the preparation of medicines in the form of *asava* and *arishta*, (syrup based fermented preparations) a drug, *Dhataki pushpa* (*Woodfordia fruticosa*) is added which acts as catalyst and also helps to fasten the process of fermentation,<sup>[8]</sup> as it contains yeast colony. In the preparation of these *asava* and *arishta*, the yeast colony acts over the sugars which are one of the ingredients added in various forms (jaggery, honey, sugar, sugar candy) and convert it into different forms of alcohol. This process of converting sugar into alcohol is based upon the principles of organic chemistry. In this process of fermentation, alcohol is being self-liberated and this itself is acting as the best preservative and enhances the shelf life and potency of the medicines.

In other forms of medicines like *kashaya*, (decoctions) the active principle of the drug is extracted by boiling the drug with water. This aqueous extract is also useful, not only as internal medication but also used externally for wound cleaning and other processes. This process of extraction of medicine is based on the principle of diffusion of modern chemistry.

These are done by two ways

1. Extraction of medicine in the self-liberated alcohol and
2. The aqueous extraction of medicine

These are based on the principles of organic chemistry. Extraction of active principles using different types of solvents (alcohol, water, fats etc) facilitates the drug to reach its target organs.

The preparation of certain medicines (*gomutra arka*, *ajamoda arka* etc) in Ayurvedic pharmacy is based on the distillation and condensation techniques of modern chemistry. Such preparations are called as *Arka* which are concentrated aqueous extracts of drugs having volatile active principles.<sup>[9]</sup>

### Ayurveda and Nano Technology

*Rasashastra* is a part of Ayurveda in which the explanation regarding processing of various metals including mercury and its combination with herbs to treat illness is described. Metals are processed and purified using various herbs and then converted into *bhasma* (ash form) which are the smallest organic particles of the same metal, and used as herbo mineral medicines. In the light of recent advancement in the treatment of

cancer, modern science uses nano therapy (smallest particle which easily enters cells). In this therapy they use a whole metal in the form of nano particle which is the basic idea behind *Bhasmas*. Today's latest technology of modern science was known and practiced by Ayurveda scholars thousands of years before.

Certain metals like platinum which are not mentioned in the texts of Ayurveda, were later found and used for various purposes. Ayurveda *vaidyas* today have started using these metals by following the purification process and converted them into *bhasma* form, and have succeeded in treating diseases like leukemia.

In the process of medicine preparation few drugs needs to be purified before its usage internally. This process is based more or less on modern chemistry.

For example – *Sudha Varga*<sup>10</sup> (substances made up of various forms of salts of calcium such as conch shell oyster, coral etc.) which is predominantly alkaline in nature is purified with the help of *amla varga dravyas* (drugs having sour taste) because they are acidic in nature.

We know that acid neutralizes alkalis and thereby render it purified and neutralized so as to administer in the form of *bhasmas* (ash form) in treating various disorders.

In GIT (gastro intestinal tract) disorders such as hyperacidity due to gastric mucosal irritation, these *bhasmas* of *sudha varga* are the drug of choice in treating them.<sup>[11]</sup>

### Alchemy in Ayurveda

*Rasashastra* during its development produced various byproducts in the process of converting inferior metals into gold. Then in those days, *Rasavaidyas* even knew "*Dhatuvada*"<sup>[12]</sup> the art of transmuting the inferior metals into gold. For this purpose mercury (Hg) which is the only metal in liquid state with the atomic number 80<sup>[13]</sup> was chosen. Gold (Aurum - Au) is having the atomic number as 79 as mentioned in the periodic table.<sup>[14]</sup> By removing one electron through various processes mercury was converted to gold. But since gold was one of the costliest metals then and now, for which humans are constantly aspiring for it, this was kept as hidden secret in the books of *Rasashastra*.

Earlier the natural resources of inorganic compounds were easily available. With the advancement of time and extensive usage of these resources by man, it has become difficult to procure. Providing artificially prepared inorganic compounds to fulfill the requirement of current demands of these inorganic compounds, is the greatest contribution of chemistry to Ayurvedic Pharmacology. For example – artificial preparation of *tuttha* (copper sulphate), *kankshi* (alum potash), *tankana* (borax) etc.

Metals are not available in its purest forms and are mixed with impurities. To get rid of these impurities certain purificatory procedures are mentioned in Ayurvedic texts. Modern chemistry has made available the purest forms of metals, wherein these purificatory procedures mentioned in Ayurvedic texts are no longer essential. This is a significant contribution of modern chemistry in Ayurvedic fraternity.

## CONCLUSION

*“Ekam shastram adheeyano na vidyaat shaastra nishchayam”<sup>[15]</sup>*

Thus Ayurveda emphasizes on the fact that knowledge of only one science is not sufficient. Multidisciplinary knowledge is most essential to be competent in today's world. Both chemistry and Ayurveda are having well established interdependent relationship with one another. With the development of newer technology in modern chemistry, it would be helpful to put forth Ayurveda as anticipated by modern fraternity.

## REFERENCES

1. <https://www.wordwebonline.com/en/CHEMISTRY>
2. Sushruta Samhita, Ayurveda Tattva Sandipika, Hindi Commentary, 11<sup>th</sup> edition. Editor, Kaviraja Ambikadutta Shastri, Chaukhamba Sanskrit Bhavana Varanasi, 1997; 338.
3. <https://courses.lumenlearning.com/introchem/chapter/the-bohr-model>
4. [https://en.wikipedia.org/wiki/Mass\\_number](https://en.wikipedia.org/wiki/Mass_number)
5. Acharya. J.T., Charaka samhita of Charaka, Chakrapani commentary, chaukhamba surbharati prakashan, Varanasi, Reprint ed., 2008; 32.
6. <https://gpm.nasa.gov/education/articles/earth-observatory-water-cycle-overview>.
7. K. Sembulingam, Prema Sembulingam, Essentials of Medical Physiology, New Delhi, Jaypee Brothers Medical Publishers, 8<sup>th</sup> edition, 51.
8. Ayurveda sara sangraha, Nagpur, Shri Baidyanath Ayurveda Bhavana private limited, 2004; 617.
9. Ayurveda sara sangraha, Nagpur, Shri Baidyanath Ayurveda Bhavana private limited, 2004; 557.
10. Dr. P Sekhar Reddy, A Text Book of Rasashastra, Varanasi, chaukhambha orientalia, 1<sup>st</sup> edition, 376.
11. Dr. P Sekhar Reddy, A Text Book of Rasashastra, Varanasi, chaukhambha orientalia, 1<sup>st</sup> edition, 381.
12. Dr. Nishchita, Dr. Dharshini Yadav & Dr. Kashyap Kasmin, A critical review on concept and relevance of Dehavada and Dhatuvada, WJPPS, 2020 May 24; 9(6):
13. <https://pubchem.ncbi.nlm.nih.gov/periodic-table/>
14. <https://pubchem.ncbi.nlm.nih.gov/periodic-table/>
15. Sushruta Samhita, Ayurveda Tattva Sandipika, Hindi Commentary, 11<sup>th</sup> edition. Editor, Kaviraja Ambikadutta Shastri, Chaukhamba Sanskrit Bhavana Varanasi, 1997; 18.