Review Of 12 Principal And Pharmaceutical Application Of Green Chemistry

Akshada Darekar[1], Sanishwar Darekar[2], Bhakti Thorat[3]
Santosh Waghmare[4], Dr. H.V.Kambale[5]
[1, 2, 3, 4] Dept of pharmaceutical chemistry
[5]Dept of pharmacology
[1, 2, 3, 4, 5]Loknete Shri Dadapatil Pharate College of Pharmacy , Mandavgan pharata.

Abstract- *The green chemistry revolution is providing an enormous number of challenges to those who practice chemistry in industry, education and research. The beginning of green chemistry is considered as a response to the need to reduce the damage of the environment by man-made materials and the processes used to produce them. A need for GC practice is highly demanding and the adherence to the 12 principles of GC concept is growing rapidly. A need for great change in policy, rules and regulations which will force industry, research institute, academia, and other is still highly demanding. Moreover the better is encouragements, awareness and make an individual person responsible to adapt to a GC concept in a real practical way. Green action always acts louder than the green words.*

Keywords- Green Chemistry, Twelve principal, Atom economy, catalyst, pharmaceutical application

I. INTRODUCTION

In 1990 the Pollution Prevention Act was passed in the United States. This act helped create a modus operandi for dealing with pollution in an original and innovative way. This paved the way to the green chemistry concept. Paul Anastas and John Warner coined the two letter word "green chemistry" and developed the twelveprinciples ofgreen chemistry. In 2005Ryoji Noyori identified three key developments in green chemistry: use of supercritical carbon dioxide as green solvent, aqueous hydrogen peroxide for clean oxidations and the use of hydrogen in asymmetric synthesis.

CONCEPTS OF GREEN CHEMISTRY

The concept of green chemistry incorporates a new approach to the synthesis, processing and application of chemical substances in such manner as to reduce threats to health and environment. This new approach is also known as:

- Environmentally benign chemistry
- Clean chemistry
- Atom economy
- Benign-by-design chemistry

Green Chemistry or environmentally benign chemistry is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances. Green chemistry wasdeveloped byvirtue ofthe needto overcomethis hazardouseffect that toxic compounds exert on the body. This relatively new area of chemistry uses water as the medium of chemical reactionsthat are donein the laboratory. Chemical reactionsare usuallydone in a medium that is called solvent. An exception is reactions that take place in the gas phase where there is no need for medium there. Sometimes chemical reactions are done in a neat fashion. Namely, the reacting compounds are mixed and reacted together with the need for a solvent. This is one of the methods that are used in green chemistry to avoid pollution and the hazardous effect of the volatile solvent. As a chemical philosophy, green chemistry applies to organic chemistry, inorganic chemistry, biochemistry, analytical chemistry and physical chemistry to minimize west, utilize renewable resources.

II. THE TWELVE PRINCIPAL OF GREEN CHEMISTRY

Fig no. 1 Twelve principal of green chemistry

1. Prevention

It Is better to prevent waste than to treat or clean up waste after itformed. The ability of chemists to redesign chemical transformations to minimize the generation of hazardous waste is an important first step in pollution prevention. It goes back to the old saying "prevention is better than cure". It is better to prevent waste than clean it up after the fact.

2. Atom Economy

Atom Economy Synthetic methods should be designed to maximize the incorporation of all materials used in the process into the final product.

3. Less hazardous chemical synthesis

The goal is to reduce the hazard of the chemicals that are used to make a product. Chemists have traditionally usedwhatever means necessary. Today we are finding that less hazardous reagents and chemicals can be used in a process to make products.

4. Designing safer chemicals

Everyone wants safe products. This principle is aimed at designing products that are safe and non-toxic. Pharmaceutical products often consist of chiral molecules and the difference between the two forms can be a matter of life and death- for example, racemic Thalidomide when administered during pregnancy, leads to horrible birth defects in many new borns. Evidence indicates that only one of the enantiomers has the curing effect while the other isomer is the cause of severe defects. Formation of hazardous substances.

5. Safersolvents

We use solvents regularly in our daily lives (cleaning products, nail polish, cosmetics, etc.) and in the chemistry laboratory. Many chemical reactions are done in a solvent. And, traditionally organic solvents have beenused that pose hazards and many are highly toxic. Solvents are extensively used in most of the syntheses.

6. Design for energy efficiency

Today there is a focus on renewable energy and energy conservation. We use energy for transportation purposes and to provide electricity to our homes and businesses. Traditional methods for generating energy have been found to contribute to global environmental problems such as Global Warming and the energy used can also be a significant cost. This principle focuses on creating products and materials in a highly efficient manner and reducing associated pollution and cost.

7. Use of Renewable Feedstocks

A raw material or feedstock should be renewable rather than depleting whenever technically and practicable.

8. Reduce derivatives

Unnecessary derivatization (blocking group, protection/DE protection) should be avoided whenever possible, because such steps require additional reagents and can generate more waste.

9. Catalysis

Catalysis Catalytic reagents (as selective as possible) are superior stoichiometric reagents.

10. Design for degradation

Not only do we want materials and products to come from renewable resources, but we would also like them not to persist in the environment. There is no question that many products we use in our daily lives are persistent. Plastics do not degrade in our landfills and pharmaceutical drugs such as antibiotics build up in our water streams.

11. Real time analysis for pollution Prevention

Real time analysis for pollution methodologies need to be further developed to allow for real-time, in process monitoring and control prior to the formation of hazardous substances.

12. Safer Chemistry for Accident Prevention

This principle focuses on safety for the worker and the surrounding community where an industry resides. It is better to use materials and chemicals that will not explode, light on fire, ignite in air, etc. When making a product. There are many examples where safe chemicals were not used and the result was disaster. When explosions and fires happen in industry, the result is oftendevastating.

III. PHARMACEUTICAL APLLICATION

Pharmaceutical companies have the capacity to improve the environmental performance by using the

knowledge related to green chemistry. Green chemistry is engaged in developing innovative drug deliverance methods which are less toxic and more useful, efficient and could help millions of patients.

Examples:

1. Phosphoramidite: solid-phase which is blend of antisense oligonucleotides has been altered to entrain the concepts of green chemistry by discarding the usage and formation of toxic or hazardous materials and recycling the important materials like protecting groups amidites and solid support, thus upgrading the cost-efficiency and atom economy
2. The formation of Naproxen with chiral metal catalyst containing 2,2'-bis[diphenylphosphino]-1,1'-binaphthyl ligand with fine quantity of product and this was described by Anastas et al .
3. The green chemistry used in the manufacturing of a key intermediate of atorvastatin and the processes take place in two steps :-

a) In first step, bio catalytic reduction of Ethyl-4-chloro-3-oxobutanoate occurs with combination of keto-reductase and glucose for regeneration of the useful substance which is essential for activity of enzyme forming a product [S]ethyl-4-chloro-3-hydroxybutyrate with high yield.

b) In next step, a halohydrinde halogenase is used to accelerate the substitution of the chloro with cyano group, and this reaction takes place at neutral pH and atmospheric temperatures in presence of natural catalyst.

c) Few workers have invented clean, quick and inexpensive way for the preparation ofamines withhuge portion of drug molecules. Presently, industries manufacture amines in a two-step process at high cost and it results in grand amounts of by-products as a waste material. On the other hand, concepts of Green chemistry don't produce any waste product, and reaction is also a quick one-step process in presence of little amount of catalyst. Steps for Aspirin synthesis with microwave irradiation using catalysts such as H2SO4, MgBr3.OEt2, AlCl3, CaCO3, NaOAc, Et3N and solvent-free approach have been designed.

IV. CONCLUSION

Green chemistry is not a new branch of science. It is a newphilosophical approach thatthrough application and extension of the principles of green chemistry can contribute to sustainable development. Great efforts are still undertakento design an ideal process that starts from non-polluting materials. It is clear that the challenge for the future chemical industry is based on production of safer products and processes designed by utilizing new ideas in fundamental research. Furthermore, the success of green chemistry depends on the training and education of a new generation of chemists. Student at all levels have to be introduced to the practice of green chemistry.

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