



An Ontological Study on Pharmaceutical Chemistry (Academics) in India

Dibyajyoti Saha*¹ and Swati Paul ¹

Department of Pharmacy, BGC Trust University Bangladesh Chittagong.

COMMENTARY

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Corresponding Author:

Dr. Dibyajyoti Saha

Department of Pharmacy,
BGC Trust University Bangladesh,
Chittagong.
E-mail:saha.dibyajyoti@gmail.com
Telephone No: +88 01752560434

Abstract

The current philosophy or approach to professional practice in pharmacy is designated as pharmaceutical chemistry which deals with design, development, synthesis of pharmaceutical drugs. In India, the syllabus structure, branches and courses may be varied due to various universities academic system. But, University Grant Commission (UGC) & All India Council for Technical Education (AICTE) framed standard format for pharmaceutical chemistry syllabus. This monography may be delivered vast knowledges about pharmaceutical chemistry & its present academic scenario in India.

Keywords: *Pharmaceutical; Chemistry; Academic; Syllabus.*

Introduction

In our pharmaceutical curriculum, pharmaceutical chemistry takes a challenging role now a day. Pharmaceutical chemistry is the science dealing with the composition and preparation of chemical compounds used in medical diagnosis and therapies ^[1]. Medicinal chemistry is a main branch of pharmaceutical chemistry which deals with the design, development and synthesis of pharmaceutical drugs ^[2]. The discipline combines expertise from chemistry and pharmacology to identify, develop and synthesize chemical agents that have a therapeutic use and to evaluate the properties of existing drugs where as, phytochemistry is the branch of chemistry dealing with the chemical processes associated with plant life and the chemical compounds produced by plants ^[3]. The pharmaceutical analysis (analytical chemistry) may be defined

as that branch of practical chemistry which deals with resolution, separation, identification, determination and purification of a given sample of a medicine or a pharmaceutical ^[4]; the detection and estimation of impurities that may be present there is also included ^[5].

BRANCHES OF PHARMACEUTICAL CHEMISTRY:

Generally, pharmaceutical chemistry classifies as follows according to various Indian Universities Syllabus:

- Pharmaceutical Inorganic Chemistry
- Pharmaceutical Physical Chemistry
- Pharmaceutical Organic Chemistry
- Pharmaceutical Biochemistry
- Medicinal Chemistry
- Pharmaceutical Analysis (Analytical Chemistry)
- Phytochemistry/ Chemistry of Natural Products

SYLLABUS STRUCTURE:

The branches are classified theory and practical aspects as per norms:

- The inorganic chemistry deals with acid, base, buffer, water, GI agents, electrolytes, essentials and trace elements, cationic and anionic components, radio pharmaceuticals, topical agents, gases and vapors, dental products, complexing and chelating agents, miscellaneous agents etc.
- The physical chemistry deals with behavior of gases, the liquid state, solutions, thermodynamics, adsorption, photochemistry, chemical kinetics, quantum mechanics etc.
- The organic chemistry deals with nucleophilic aromatic substitution, heterocyclic compounds, stereochemistry, structures and properties etc.
- The biochemistry deals with enzymes, coenzymes, carbohydrate metabolism, citric acid cycle, lipid metabolism, biological oxidations, nitrogen and sulphur cycle, metabolism of ammonia and nitrogen containing monomers, biosynthesis of nucleic acids, genetic code and protein synthesis. regulation of gene expression etc.
- The medicinal chemistry deals with the synthesis procedures of selected drugs, drug design,



drug acting on CNS, studies on diuretics, cardiovascular drugs, anticoagulant and ant platelet drugs, steroid and related drugs, chemotherapeutic agents, antineoplastic agents, antimetabolites, antiviral agents, immunosuppressive and immunostimulants, amino acids, peptides, nucleotides and related drugs, drug metabolism.

➤ The pharmaceutical analysis deals with basic titrations (such as acid- base, precipitation, oxidation –reduction), quantitative analysis, gravimetric analysis, non aqueous titrations, complexometric titrations, potentiometry, conductometry, coulometry, polarography, amperometry, diazotization titrations, kjeldahl method, Karl Fischer. gasometry, oxygen flask combustion, chromatography, (such as TLC, HPLC, GC, PC, HPTLC, CC etc), UV- spectrophotometry, fluorometry, IR- spectrophotometry, NMR spectroscopy including ¹³C NMR, mass spectrometry, flame photometry etc.

➤ The phytochemistry deals with the study of biogenesis, general method of isolation and separation of plant constituents, alkaloids, steroids, glycosides, antibiotics, vitamins, flavonoids, terpenes, concept of stereoisomerism taking examples of natural products etc.

SCOPE:

- Research and Development
- Formulation and Development
- Chemist and Druggist
- Product Management Team
- Inspector of Drugs
- Health care system
- Bulk drugs department
- Quality Control Officer/ Manager
- Quality Assurance Officer/ Manager
- Production Officer/ Manager
- Phytochemistry & herbal division
- Chemistry of medicinal & pharmaceutical drugs study
- Cancer research division (including cancer chemoprevention, cancer chemotherapy, environmental carcinogenesis, oncogene regulation, signal transduction and biogenic amine etc)
- Drug design and development
- School/ Institute/ University faculty members.
- Process and chemical technology
- Food technology

THE TWO YEARS PHARMACEUTICAL CHEMISTRY PROGRAMMS OFFERED IN INDIA ARE AS FOLLOWS:

- M.Sc (Pharmaceutical Chemistry): Banasthali Vidyapith, Rajasthan.
- M.Sc (Pharmacognosy & Pytochemistry): Rashtrasamt Tukadoji Maharaj Nagpur University, Nagpur.
- M.Tech (Pharmaceutical Chemistry): Vellore Institute of Technology, Vellore.
- M.Tech (Pharm) in Pharmaceutical Technology (Process Chemistry): National Institute of Pharmaceutical Education and Research, Punjab.

➤ M.S (Pharm) in Pharmaceutical analysis: National Institute of Pharmaceutical Education and Research, Punjab.

➤ M.S (Pharm) in medicinal chemistry: National Institute of Pharmaceutical Education and Research, Punjab.

➤ M.Pharm (Pharmaceutical Analysis & Quality Assurance): Biju Patnaik University of Technology, Rourkela.

➤ M.Pharm (Phytochemistry): Kurukshetra University, Institute of Pharmaceutical Sciences, Kurukshetra.

➤ M.Pharm (Pharmaceutical Chemistry): Biju Patnaik University of Technology, Rourkela.

➤ M.Pharm (Medicinal Chemistry): Jadavpur University, Kolkata.

➤ M.Pharm (Biochemistry): Jadavpur University, Kolkata.

The M.Phil/ Ph.D/ D.Sc programmes also available all above mentioned courses.

Conclusion

The monography may be focused vast knowledges about pharmaceutical chemistry including its branches, syllabus curriculum, and specialized programmes according to various Indian Universities. The review must be useful for students and as well as academicians, teachers for basic needs, proper selection of courses, upgradation of syllabus etc.

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AUTHORS' CONTRIBUTIONS

Authors contributed equally to all aspects of the study.

PEER REVIEW

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests