Quality Control Issues in the Pharmaceutical Industry

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The quality in the pharmaceutical industry has become a major concern and there has been a growing awareness for the significance of the quality of the pharmaceutical products. The current concept of Good Manufacturing Practices (GMP) emphasizes that the quality of pharmaceutical products must be constructed during the overall process cycle. Quality control department plays an important role since it demands the acquisition of reliable analytical data. Many important decisions are based on the analytical data of quality control department and it is important to have indication of the quality of these results. The current Pharmaceutical Industry is facing challenges for the manufacture of Chemical and Biological drugs for human and veterinary consumption as well as medical devices, traditional herbal products and cosmetics. Stringent GMPs are being followed for blood and its derivative as well as controlled manufacturing for Traditional Herbal Medicines, Cosmetics, Food and Dietary products which was otherwise differently a century before. Each regulatory system had faced certain circumstances which led to current well-defined controlled regulatory framework. This has resulted into improvisation of systematic manufacturing and marketing of safe, efficacious and qualitative drugs. With the growth of industry, the legislations from each region have become more and more complex and created a demand for the need for regulatory professionals to understand and solve the critical quality control issues in the Pharmaceutical Industries around the globe. The present study examines the current status of quality related issues in the pharmaceutical industry with the objectives of assessing the nature and intensity of such challenges, identifying gaps and design of policies.

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1. Pharmaceutical Innovation
Global progress in focusing on people’s health needs over the past century has been nothing short of spectacular. Many factors have contributed to this improvement, but one has been particularly critical ie; advances in medical technologies from the private sector. New medicines, vaccines and medical tools have revolutionized medical practice, making many fatal ailments curable or treatable and significantly improving the quality of life among patients suffering from chronic diseases. Pharmaceutical innovation\(^1\) is at the heart of this progress for sustaining better health worldwide to have an in-depth investigation of the complex nature of the process of medical innovation. Critical resources, know-how and skills must be mobilized and managed efficiently in a high risk environment over a long period of time to yield a new, innovative medicine. New medicines are needed dramatically to address the increasing health needs and expectations of patients in every country of the world. The continuous research helps to identify various important challenges facing pharmaceutical innovation today. The research based pharmaceutical industry has a proven track record of bringing innovative products to patients like most drugs and vaccines in the history of modern medicine which have revolutionized public health worldwide and has ultimately emerged from the creative and persistent efforts of this industry. Yet, the success of pharmaceutical innovation is determined largely by a mix of various public policies and regulations. The pharmaceutical companies operate to know how it has a significant influence on their ability to respond to public health needs and bring new medicines to patients around the world. An informed understanding of the Pharmaceutical Innovation Platform among policy makers and public health stakeholders will help in formulating appropriate policies that will support and sustain pharmaceutical innovation thus ensuring its continuing contribution to improving people’s health worldwide.
2. Quality Concerns
Hence, quality has been given the utmost importance by all regulatory bodies for pharmaceutical products. Quality means patient satisfaction in terms of service and product. Many of these quality related activities reflect need for companies to excel in global competition. The patient demands perfection in quality, reliability, low cost and timely performance. The features like trustworthiness, robustness and ease of use have to be built in the product and such product should be free from deficiencies. Quality, productivity, cost, cycle time and value are interrelated terms. Quality activities must try to detect quality problems early enough to permit actions without requiring compromise in cost, schedule or quality. The emphasis must be on precaution rather than on just correction of quality problems. Quality can be the driving force to empower results in other parameters. Hence the quality has to be built in the product as well as services through proper planning, so that the forth coming failure can be avoided. Mere analysis of final product will not work but the quality should be designed in the product.

The principles of quality by design have been used to advance the product and process quality in every industry. Because of need of potent drug with safety profile, pharmaceutical industries are investing billions of money in the drug discovery and development process with an endeavor to design quality product and that to with consistency in manufacturing process to deliver the intended performance of product. The information and knowledge gained from pharmaceutical studies and manufacturing provide a base for scientific understanding to support establishment of design space, specification and manufacturing control. Information from pharmaceutical development studies can be a root for quality risk management. Lifecycle management allows making changes in formulation and manufacturing processes during development and providing additional opportunities to gain added knowledge and it further supports establishment of the design space. Design space is planned by the applicant and will undergo regulatory assessment and approval. Working within the design space is not considered as a change. But an operation out of the design space is considered to be a change and has to face a regulatory post approval change process. During the drug development process, the aspects like drug substances, excipients, container closure systems, manufacturing processes and quality control tests are critical to product quality. Critical formulation attributes and process parameters are generally identified and controlled to the extent of assurance of quality which is also an important task. This scientific and knowledge rich understanding will help industry to manufacture quality products and ultimately flourish industry by means of fame as well as financial assets.

The Indian pharmaceutical companies expanded drastically in the last two decades. The Pharmaceutical and Chemical industry in India is an extremely fragmented market with severe price competition and government price control. The Pharmaceutical industry in India meets around 70% of the country's demand for bulk drugs, drug intermediates, pharmaceutical formulations, chemicals, tablets, capsules, orals and injectibles. There are approximately 250 large units and more than 1000 Small Scale Units, which form the core of the pharmaceutical industry in India. The Indian pharmaceutical industry, which had little technological capabilities to manufacture modern drugs locally in the 1950s, has emerged technologically as the most dynamic manufacturing segment in the Indian economy in the 1990s. When the product patents on Pharmaceutical products were abolished in India in 1972, the Indian industry was not a significant player either in the domestic or the overseas market. It was largely confining its activities to reverse engineering and thriving on developing new processes for the existing products and catered mostly to the domestic market.

3. Pharmaceutical Industrial Scenario
In the last two decades, the Pharmaceutical companies have gained a firm footing in the market where their share of the domestic market has risen from 10 per cent in the early 1970s to over 80 percent now. India has also emerged as a major supplier of drugs to the international markets, particularly over the
past decade. A major factor that contributed to the rapid growth of the Pharmaceutical industry is that through skilful innovations in production processes, the Indian companies could make cheap copies of patented drugs and sell them at very low prices compared to anywhere else in the world. However, this favorable business environment will now undergo a change to favor drug multinational companies because of their size and heavy R&D budgets. At the start of the nineteenth century, new legislations for medicines control started coming into effect due to multiple tragedies worldwide. This was the era when ancient traditions of manufacturing and distribution of drugs evolved into the modern highly organized pharmaceutical industry and controlled system of Drug Regulatory Affairs. Almost five decades after issuance of Import Drugs Act of 1848, vaccines tragedy happened in 1901. During this era, City and State Health Departments use to maintain stables and vaccine preparation facilities unlike the private industry today. Legislations mandating exclusive manufacturing facility for vaccines enacted post two events of death due to immunization failure. The diphtheria antitoxin developed by City Health Department of St. Louis was contaminated by tetanus causing bacteria. This was ended up with the death of 14 children in November 1901. Simultaneously, smallpox vaccine administered was found contaminated and resulted into nine more deaths in Camden, New Jersey. Drug regulations evolved rampantly in last five decades and many laws came into effect which resulted into organized regulatory structure of FDA. This agency grew from single chemist from United Stated Agriculture Department to approximately 9100 employees of varied category i.e. physicians, pharmacologists, chemists, microbiologists, pharmacists, veterinarian and lawyers. Currently, agency is responsible for protecting the public health by assuring the safety, effectiveness and security of human and veterinary drugs. It regulates over 1 trillion dollars worth of products in New Human Drugs, Biologics, Biologics, Complex Medical Devices, Food and Color Additives, Infant formulas and Animal Drugs.

Thus, the pharmaceutical innovation is manifold and falls on a continuum. At one end, it focuses on developing drugs about which relatively little is known at the time of their discovery. At the other end, innovation consists of enhancing drugs that have been on the market for some time by making minor changes to them. Between these extremes, manufacturers find numerous ways to increase the safety, effectiveness, and convenience of their products. Despite the variety of innovation, the FDA’s classification system provides a way to assign all new drug approvals to categories representing distinct levels of innovation. This is possible because the FDA’s Center for Drug Evaluation and Research characterizes all the new drug applications it approves on two dimensions like chemical type and therapeutic potential.

4. Good Manufacturing Practices
The GMP\(^3\) guidelines for biological products have been approved by both the WHO Expert Committee on Biological Standardization and the WHO Expert Committee on Specifications for Pharmaceutical Preparations. Unlike conventional pharmaceutical products which are normally produced and controlled by means of reproducible chemical and physical techniques, bio-products are manufactured with biological materials and processes, such as the cultivation of cells or the extraction of materials from living organisms. Since the materials and processes display inherent variability, the range and nature of manufacturing by-products in biological products are likewise variable. For such products, including allergens, antigens, vaccines, hormones, cytokines, enzymes, human whole-blood and plasma derivatives, immune sera, immunoglobulins, products of fermentation and diagnostic agents for in vitro use, full adherence to GMP guidelines for biological products is recommended for all production steps, including those from which active ingredients are produced. The GMP guidelines for the manufacture of investigational pharmaceutical products for clinical trials in humans supplement both the core GMP guidelines for pharmaceutical products and Guidelines for good clinical practice for trials on pharmaceutical products. These specialized GMP guidelines specifically address those manufacturing practices that may be different for investigational products which are not usually manufactured in
accordance with a set routine and which may be incompletely characterized during the initial stages of clinical development. The specialized GMP guidelines for the manufacture of herbal medicinal products deals with the manufacture of products from material of plant origin, which may be subject to contamination and deterioration and vary in its composition and properties. Furthermore, in the manufacture and quality control of herbal medicinal products, procedures and techniques are often used that are substantially different from those employed for conventional pharmaceutical products. Thus, the findings of numerous studies prove that globalization for GMP requirements for pharmaceutical excipients is fundamental to counteract a negative impact of globalization of the medicines’ supply, enhance GMP compliance, minimize pharmaceutical excipient cost, maximize the degree of safety and quality and elevate standards to meet health care providers and patient expectations.

References


Biography

Gannu Praveen Kumar graduated from H.K.E’s society college of Pharmacy, Gulbarga University in 1997, post graduation from BITS, Pilani in 1999 and PhD from Kakatiya University in 2009. He worked as assistant professor for Vaagdevi college of Pharmacy, Kakatiya University from 1999 - 2005, as Associate professor for SR college of Pharmacy from 2008-2010, as Professor and HOD for Talla Padmavathi college of Pharmacy from 2010-2011, as Professor & HOD for St. Peter’s Institute of Pharmaceutical Sciences from 2011 to 2014 and currently as Principal in Sahasra Institute of Pharmaceutical Sciences, Warangal. Since 2009, he was appointed as an examiner for post graduation and has guided 24 M. Pharm students. He has published in both National and International journals and compiled few chapters for text books. He received Gem of India award in the year 1999 and visited Dubai and London as invited speaker. He was selected as a best academician of Vaagdevi college of Pharmacy in 2002 and of Talla Padmavathi college of Pharmacy in 2011. Recently, he was appointed as an Inspector by Pharmacy council of India for the inspection of Pharmacy colleges.

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