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A Review Paper on Pharmaceutical Analysis

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ABSTRACT: ***A change in human health was brought about by the invention of pharmaceuticals. These pharmaceuticals can fulfil their function only if they are free of impurities and are given in a sufficient quantity. Various chemical and instrumental methods that are involved in drug estimation have been developed at regular intervals to make drugs fulfil their purpose. These pharmaceuticals can develop impurities that make the pharmaceutical risky to be administered at different stages of their growth, transportation and storage, so they must be identified and quantitated. Instruments and methods play an important role in this analytical instrumentation. The role of analytical instrumentation and analytical methods in evaluating the quality of drugs is highlighted by this study. The examination highlights the different analytical techniques used in the study of pharmaceuticals, such as titrimetric, chromatographic, spectroscopic, electrophoretic, and electrochemical, and their corresponding processes.***

KEYWORDS: Chemical, Drugs, Disease, Pharmaceuticals, Research, Impurities, Healthcare.

INTRODUCTION

In the past, pharmaceutical research, led by pharmacology and clinical sciences and powered by chemistry, played a crucial role in the advancement of pharmaceutical production. In the discovery of drugs, the contribution of chemistry, pharmacology, microbiology and biochemistry has set a standard where new drugs are no longer only produced by the imagination of chemists, but these new drugs are the result of the exchange of ideas between biologists and chemists [1].

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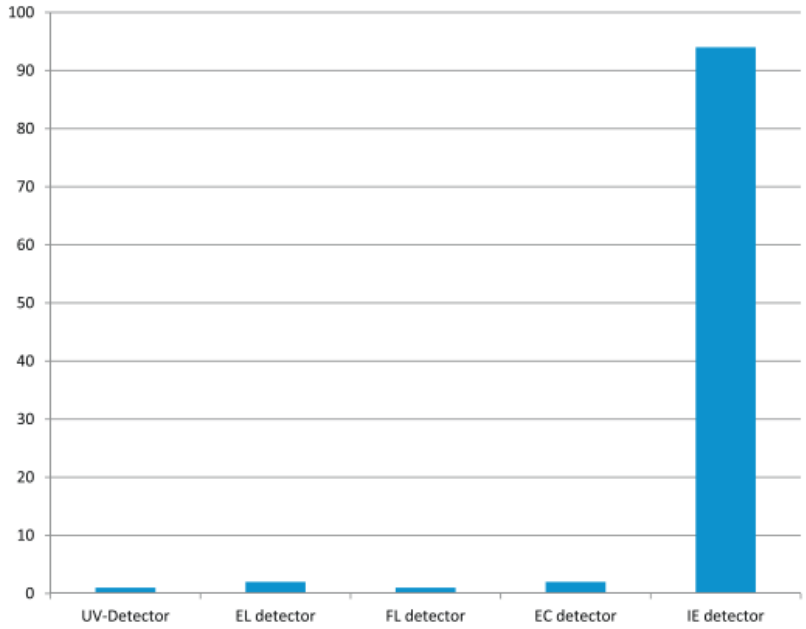

Figure 1: Illustrates the usage of diverse detectors for HPLC analysis of drugs [2]

Table 1: Illustrates proportion of various analytical methods prescribed for the assay of bulk drug materials in Ph. Eur. 4 and USP XXVII [3]

Method	Ph. Eur. 4 (%)	USP 27 (%)
HPLC	15.5	44
GC	2	2.5
Titration	69.5	40.5
Acid–base	57.5	29.5
Aqueous mixtures	21	5.5
Indicator	6.5	4.5
Potentiometric	14.5	1
Non-aqueous	36.5	24
Indicator	9.5	14
Potentiometric	27	10
Redox (Iodometry, Nitritometry, etc.)	6.5	5.5
Other (complexometry, argentometry, etc.)	5.5	5.5
UV–vis spectrophotometry	9.5	8.5
Microbiological assay (antibiotics)	3	2.5
Other (IR, NMR, polarimetry, fluorimetry, atomic absorption spectroscopy, polarography, gravimetry etc.)	0.5	2

Table 2: Illustrates determination of drug by numerous electrochemical methods [4]

Technique	Drugs determined	Remark
Voltammetry	β-blocker drugs	Nafion-coated glassy carbon electrode
	Rosiglitazone	Square wave adsorptive stripping voltammetry
	Leucovorin	Silver solid amalgam electrode
	Secnidazole	Cathodic adsorptive stripping voltammetry
	Acetaminophen and tramadol	At glassy carbon paste electrode
	Dopamine	Differential pulse stripping voltammetry
	Atenolol	Using nanogold modified indium tin oxide electrode
Polarography	Nifedipine	
	Anti cancer drug, Vitamin K3	
	Ciclopirox olamine	
Amperometry	Diclofenac	
	Verapamil	
Potentiometry	N-acetyl-L-cysteine	
	Pentoxifylline	

The drug creation process begins with the innovation of a drug molecule that has proven therapeutic potential for disease prevention, control or cure. The synthesis and characterization of such molecules, also referred to as active pharmaceutical ingredients (APIs), and their study to produce preliminary safety and therapeutic efficacy data are prerequisites for the identification of drug candidates for further comprehensive research [5].

PHARMACEUTICAL ANALYSIS

Pre-drug development experiments are focused on knowledge of the underlying cause of the disease to be handled, information about how the disease-causing genes are changed, protein and affected cell interactions, and changes brought about by these affected cells, and how they influence these cells. A compound is formed based on these facts that interacts with the affected cells and could eventually become the drug molecule or active pharmaceutical ingredient (A.P.I) Drug Discovery and Production [6].

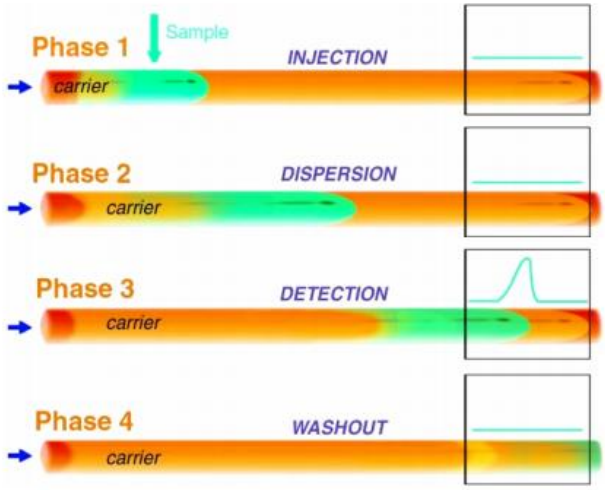

Figure 2: Illustrates the phases of flow injection analysis [7]

Analytical investigation of bulk drug materials, intermediates, drug ingredients, drug formulations, impurities and degradation products, and biological samples containing the drugs and their metabolites is very relevant in the field of pharmaceutical research [3]. Analytical assay methods were used in the compendial monographs from the beginning of the official pharmaceutical research in order to characterize the consistency of bulk drug materials by setting limits on their active ingredient content [8]. The assay techniques in the monographs have included titrimetric, spectrometry, chromatography, and capillary electrophoresis in recent years. Since the 1950s, the Kinetic method of research has been evolving and yet a significant revival of activity is taking place in modern days. Repetitive interest in kinetic approaches can be due to developments in concepts, in automatic instrumentation, in chemical and instrumentation knowledge, in methods of data processing and in the application of analytics [9].

Derivative spectroscopy uses the first or upper absorbance derivatives for qualitative investigation and calculation with respect to wavelength. In the 1950s, when it was seen to have several benefits, the notion of derivatizing spectral data was first offered. However, largely due to the difficulty of producing derivative spectra with early UV-Visible spectrophotometers, the technique received little consideration. In the late 1970s, the invention of microcomputers generally made it convincing to use mathematical techniques to create derivative spectra rapidly, easily and reproducibly [10].

CONCLUSION

The primary goal of prescription drugs is to help people free themselves from future infection or disease prevention. They should be free of impurity or other interference that could affect humans in order for the drug to fulfil its intended function. The aim of this review is to concentrate on the role of different analytical instruments in pharmaceutical assays and to provide a detailed literature survey of the instrumentation involved in pharmaceutical analysis. The research also highlights

the development of techniques starting from the older titrimetric approach and approaching the stages of the advanced hyphenated technique.

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