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Medical Science Advancement in Analytical and Bio analytical Techniques

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Description

The most important objectives frequently found in analytical and bio analytical chemistry involve advancement of analytical techniques and its application to relevant medical/clinical problems. Keeping in view to these aspects, the present chapter is primarily focused on the development of advanced analytical techniques applied in the medical field. For example, N-acetyl-beta-D-glucosaminidase (NAG) enzyme is a specific biomarker of acute kidney injury. A biomarker is an entity that's purposely measured and estimated as an indicator of normal organic process, pathogenic process, or pharmacological responses to a therapeutic intervention. Hence, successive measurements of urinary NAG may enhance its clinical use as an indicator of ongoing tubular injury. Hence, in order to obtain information for selective monitoring of biomarker, the development of a practical and valid analytical method is important. Experimentation is driven by the need to know more about the medical effects and safety features of the biologically active analytic. It is therefore more important to evaluate the information that is already available for that particular analytic and to quantify the level of uncertainty for the proposed technique [1].

This chapter represents a collective attempt to present a wide range of analytical techniques applied for the clinical development process. Analytical chemistry is concerned with the chemical characterization of matter and refining the qualitative and quantitative problem about that matter. It plays a vital role in almost all the aspects of scientific research and development, for example, clinical, forensic, environmental, and pharmaceutical sciences. In medicine, analytical chemistry is that the key for clinical laboratory tests which imparts basis of disease diagnosis and chart progress for recovery to the physicians. The scheme through which physicians ruled out or analyze the disease prognosis and therapeutic drug monitoring in patients. In accord with this, an analytical chemist also explores the thought of developing advanced technique for betterment of human healthcare and in checking out the issues associated with the disease diagnosis. Implementation of an analytical technique mainly depends on the varying degree of selectivity, sensitivity, accuracy, precision, cost, and rapidity of that specific technique. The techniques employed may be based either on physical property or chemical property of an analytic. An analytic is defined as a constituent which has to be determined in a given sample type. The classical analytical techniques include gravimetric, volumetric, and titrimetric methods; on the opposite hand, instrumental techniques involve ultraviolet-visible (UV-Vis), infrared (IR), and near-infrared (NIR) spectrophotometry fluorimetry, atomic spectroscopy (absorption/emission), electro analytical chromatography, and radioimmunoassay. Instrumental techniques are usually more sensitive and selective than classical techniques but are less precise. Precision of techniques means the repeatability of a result and is expressed as variance. Selectivity of an analytical method defines the measurement of a particular analytic from sample solution to a certain degree, in the presence of other analyses, without any interference. However, sensitivity of a way describes the power to acknowledge two different concentrations.

Biological samples have the potential to deliver important biomarkers within the clinic thanks to accessibility of those biological materials. In clinical development, the most important benefit offered by biomarkers is to limit investigational drugs to critical care patients who would gain the therapies to observe the effectiveness of those drugs. The role of a biomarker is to offer information about the biological mechanism involved within a disease or treatment of disease having the potential to correlate with the clinical findings. One of the foremost tangible problems that research scientists face in recent years is finding disease biomarkers that are translated well from animal or simulation to humans. For example, increase in enzyme activity in computer or animal model may have a big impact in theoretical computer or animal model, whereas same enzyme activity enhancement may have a very limited or no clinical impact [2,3].

There is no denying that "analytical and bio analytical technique" may be a broad topic, incorporating technologies from classical chromatography to point-of-care instrumentation. But unifying and doing those as quickly, accurately, and inexpensively as possible are drives to form chemical or biochemical measurements. Over the preceding sections, we might study the technological improvements along those lines across the broad field of analytical methods. Every subsection of analytical techniques applied in medical field has experienced improvement and advancement also.

Researchers are interested in mapping the neural connectivity of the brain through scanning electron microscopy (SEM). This could be now employed with more powerful microscopes, such as focused ion beam and multi-beam SEM, to collect serial images of ultrathin brain slices. They can now build surface Plasmon resonance substrates out of silver rather than the more typical gold and an SPR microscope to image and quantify 1296 binding events in parallel. Those scientists who have an interest in surface properties can now scan those surfaces faster than ever, because of high-speed atomic force microscopy

Biological samples involve plasma, serum, CSF, bile, urine, tissue homogenates, saliva, semen, and regularly blood. Quantitative analysis of drugs and metabolites containing huge amounts of proteins and large numbers of endogenous compounds within these samples is very complicated. Direct injection of drug containing biological sample into a chromatographic column leads to the precipitation or absorption of proteins on the column packing, leading to an instantaneous loss of column performance. A number of advances have made to convert sample preparation techniques, used for the cleanup of medicine in biological samples into formats that are acceptable for high-volume

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processing with or without automation [4,5].

The spectrophotometric technique is employed to review interactions between electromagnetic radiations and analyte. The concentration of an analyte is decided by employing a graph which is named standard analytical curve. An example is determination of iron in serum. The iron content of serum is decided after deprotonating (by precipitating protein) with trichloracetic acid and reduction with hydroxyl ammonium sulfate. Iron (II) ions are reacted within the medium buffered with ammonium acetate and with diphenyl-1, 10-phenanthroline-disulfonic acid disodium salt (bathophenanthroline disulfonate–Na), and therefore the absorbance of the complex formed is measured at 535 nanometer. The concentration belonging to the absorbance data of the test solution is read from the quality analytical curve and multiplied by three for threefold dilution [6].

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Conflicts of Interest

The author has no known conflicts of interested associated with this paper.

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