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A COMPARATIVE REVIEW OF DRY CHEMISTRY ANALYZERS AND WET CHEMISTRY ANALYZERS IN CLINICAL LABORATORY: A SHORT COMMUNICATION

Biochemistry

Dr. Uma Maheshwari. K*

Professor & Hod, Department Of Biochemistry, Bhaarath Medical College & Hospital, No.173, Agaram Main Road, Selaiyur, Chennai, Tamil Nadu 600073 *Corresponding Author

ABSTRACT

The advancements made in analytical chemistry has led to the development of automated dry chemistry and wet chemistry analyzers in clinical laboratory. It includes liquid based wet chemistry and film based dry chemistry systems. Reflectance spectrophotometry used in dry chemistry analyzers offers a viable alternative to wet chemistry systems in terms of precision and accuracy. The dry chemistry analyzers offers several advantages including the improved stability of calibrators and reagents lots used. It incorporates dry film technology wherein the reagents are made into dry film cartridges with multiple layers performing specialized functions. The sample which is liquid mixes with the reagent and after dissolving it, aids in analytical determination of the analyte. It depends on the laboratory to take a suitable decision to opt for the most compatible type of analyzer based on the resources available. This review compares the pros and cons of both dry and wet chemistry analyzers.

KEYWORDS

Dry chemistry analyzer, Reflectance spectrophotometry, Clinical laboratory

INTRODUCTION:

In the new era of modern technology, the clinical chemistry laboratories have a high workload of processing the patient samples accurately with shorter turn around time. This leads to the adoption of different methods for efficient management of the workload with the available manpower and resources to improve the quality of the results. Automated systems are used in the laboratory which includes liquid based wet chemistry analyzers and film based dry chemistry analyzers. Reflectance spectrophotometry employed in dry chemistry analyzers is a suitable alternative available to the existing wet chemistry analyzers. [1,2]

Merits Of Dry Chemistry Analyzer:

Initially the dry chemistry analyzers were used as point of care testing devices with limitations such as limited test parameters, result reliability and test cost.[3] However, with the advancement in the available technologies, the dry chemistry analyzers have been reported to produce accurate and reliable results. They also have high precision, stability of the calibrator and reagent lots with absence of carry over effects faced with wet chemistry analyzers. They contribute to consistent and reproducible results. It can also be used for analysis of samples from pediatric or geriatric patients with very small dead volume. Microslide assays are available for a range of routine chemistry parameters providing a convenient testing option on dry chemistry analyzers.[4]

Merits Of Wet Chemistry Analyzer:

Most of the biochemical analyzers used so far are based on wet chemistry analysis. These tests have lower cost compared to the dry chemistry analyzers. It uses liquid reagents which is mixed with the sample in a reaction vessel. It employs colorimetric reactions for sample analysis.[5] It is equipped with a piping system for aspiration of the sample, sample dilution, reagent distribution and other functions. Pipeline cleaning and drainage of waste liquids should also be done. They play a crucial and indispensable role in laboratory.

Both the systems provide reliable results shown by the high level of correlation and agreement between the comparison of test parameters in both the systems. It depends on the laboratory to select the most appropriate system suitable to cater to their needs with the available resources. Dry chemistry analyzers use dry reagent strips as solid phase reagents.

Though the dry chemistry analyzers offer advantages such as reduced external interventions and improved precision and accuracy, enhanced performance in external quality assurance scheme, it does not offer much difference in the clinical interpretation of the patient results. [6]

Multilayer dry film technology used in dry chemistry analyzer:

It uses solid phase reagent technique with a multilayer film. The liquid sample is added to the reagent carrier that has been solidified into a solid structure. The water in the sample is use to dissolve the reagents in the carrier and it is used for analytical determination. The multilayer film has several layers to perform unique functions.

1. The first layer is the distribution diffusion layer. It ensures uniform distribution of the sample and minimizes interference from hemolysis, hyperlipidemia and hyperbilirubinemia.
2. The scavenger layer which allows selected components to penetrate to the reagent layer and filters the interfering substances from entering the reagent layer.
3. The third layer is the reagent layer which contains the dry reagents.
4. The fourth layer is the indicator layer which contains the dye for colour development.
5. The support layer which supports the reagent sheet and allows the light to pass through it.[7]

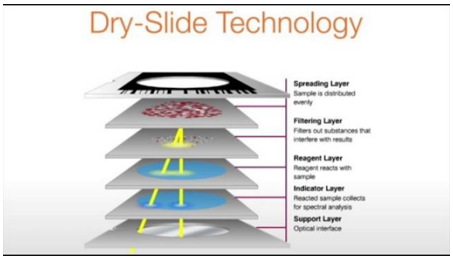

Fig.1 Schematic diagram of dry slide technology used in dry chemistry analyzers

The reaction between the sample and the reagents produces a signal which can be a colour change and it is proportional to the concentration of the analyte in the sample. Measurement of this analyte is done by photometric or fluorometric analysis. Some dry chemistry analyzers can do random access testing which can process multiple samples at the same time instead of batch processing. It enables faster turn around times for test results.[7]

Uses Of Dry Chemistry Analyzers:

Dry chemistry analyzers can be used for routine chemistry testing such as glucose, electrolytes such as sodium, potassium, chloride, liver function tests, renal function tests and lipid profile. It can be used for immunoassay testing such as hormones, tumour markers such as TSH, Prostate specific antigen (PSA), human chorionic gonadotrophin (β hcg) etc.

It is used for cardiac marker testing like Troponin, creatine kinase, myoglobin. It is used for therapeutic drug monitoring to measure the drug levels in the blood to ensure drug efficacy and monitor drug toxicity levels. It offers a broad testing options, has a user friendly interface, efficient work flow process with faster turn around times.[8]

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