TOXICOLOGY - II

ROLE OF ANALYTICAL TOXICOLOGY IN THE MANAGEMENT OF POISONING

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Abstract: *Earliest milestones in the identification of a poison in body tissues and fluids centred around arsenic as it was commonly used as a homicidal poison in the Middle Ages. In the presence of altered mental status without any obvious cause, a clinician must consider investigations to identify toxicants such as CNS depressants or drugs of abuse. For a potentially suicidal patient, paracetamol, lithium, theophylline, iron, salicylates and digoxin tests can be requested as suggested by history, physical signs or bedside tests. Toxicological assays may be qualitative or quantitative. Radio-immunoassay is a slow and expensive method of detecting drugs in the blood, but is highly accurate, which is useful in the detection of drugs in extremely low blood concentrations such as cannabis, digoxin, LSD, paraquat, etc. Enzyme mediated immuno assay technique is preferred over other immuno assay methods in the emergency situation because of its simplicity and speed in providing information on toxic drug concentrations. In a majority of cases, non-toxicological routine metabolic tests such as urea, glucose, electrolytes, and arterial or venous blood gases may be more useful than toxicologic assays. But toxicological assays are useful in suspected poisoning to confirm or exclude such a suspicion. They are particularly useful with regard to digoxin, ethylene glycol, lithium, methanol, paracetamol, salicylates or theophylline where toxicity correlates with serum levels, and specific drug therapy can be instituted. They are also useful in chronic poisoning involving heavy metals and other chemicals or drugs.*

Keywords: *Analytical toxicology, Toxicology assay, Bedside toxicology.*

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Points to Remember

- ***Sophisticated analytical techniques are available, which can detect even micrograms of any poison in almost any kind of biological specimen.***
- ***Analytical methods include qualitative tests and quantitave analysis.***
- ***Qualitaive tests include bedside color tests and thin layer chromatography which take a few minutes to hours, but may require training to interpret them.***
- ***Quantitative tests include ultraviolet spectrophotometry, gas chromatography, high performance liquid chromatography, mass spectrometry, atomic absorption spectrophotometry, radio immunoassay and enzyme mediated immunoassay technique.***
- ***Inductively coupled plasma atomic emission spectroscopy (ICP-AES) is a new method that allows simultaneous multi-element analysis and several elements (mostly heavy metals) can be measured from a single sample.***

References

1. Pillay VV. Analytical Toxicology. In: Modern Medical Toxicology. 5th edn, 2022. New Delhi: Jaypee Brothers Medical Publishers.
2. Cridland JS. How effective are pharmacologic laboratories in big hospitals? Clin Pharmacol Ther 1994 ; 56:117-121.
3. Flanagan RJ, Braithwaite RA, Brown SS, Widdop B, de Wolff FA. Basic Analytical Toxicology 1995. WHO publication. Geneva, Switzerland. p16.
4. Mahoney JD, Gross PL, Stern TA, Browne BJ, Pollack MH, Reder V ,et al. Quantitative serum toxic screening in the management of suspected drug overdose. Am J Emerg Med 1990; 8:16-22.
5. Rajinder Singh, Rajvinder Singh, Sunita Suman, Thakar MK. Thin layer chromatographic analysis of some commonly used poisonous seeds. J Indian Soc Toxicol 2006; 2(2):33-35.
6. Jojo VV, Rajesh RR, Pillay VV. Identification of active principles of Manihot esculenta and Cerbera odallum by thin layer chromatography: The potential for

misinterpretation in forensic cases. J Indian Soc Toxicol 2007; 3(1):22-26.

7. Vale JA, Meredith TJ. Poisoning : Diagnosis and Treatment. Update Books, London. 1981; pp 16.
8. Sharma VK, Satpathy DK. Artefacts in alcohol estimation by conventional spectrophotometric method. J Indian Acad Forensic Med 2001; 23: 40-41.
9. Khanna R, Sharma RS, Arora BB, Verma PS, Sharma IK. Detection of endosulfan isomers and metabolites by GC-MS in the exhumed body of an infant. J Indian Soc Toxicol 2007; 3(2):15-18.
10. Carlo Patrono, Bernhard A. Peskar. Radioimmunoassay in Basic and Clinical Pharmacology. Springer Science and Business Media, 2012.
11. David Wild (editor). The Immunoassay Handbook. 4th edn, 2013. Elsevier.
12. Douglas Skoog. Principles of Instrumental Analysis 6th edn, 2007. Canada: Thomson Brooks/Cole.