CHAPTER 1

INTRODUCTION
A poison is a substance which when introduced into living organisms in sufficient amounts, may have an injurious or deadly effect, chemically producing a morbid or noxious condition (23). A drug is any substance or mixture of substances destined for administration to man for use in the diagnosis, treatment, investigation, prevention of diseases or for modification of physiological function (113). A drug in excess may become poisonous in nature and produce fatal results. People often take the advantage of the above fact and use or misuse drugs for suicide or homicide.

There is a constant increase in the incidence of poisoning in all civilized societies. It is a sign of our times that suicides using the more pleasant methods of poisons and drugs like sedatives, pesticides and other psychotropic drugs have replaced the older methods of hanging or shooting. The methods used for murder or suicide vary greatly from country to country on national character and tradition.

In India there is an alarming increase in problems associated with dowry, social and domestic situations, failure in social affairs, examination and procurement of employment, often leading people in desperation to use poisons and drugs for suicide or homicide. Nowadays most of the poisonous household agents, pesticides, other industrial chemicals and drugs, prescribed or not, are easily available over the counter. In urban areas few household medical cabinets are without an assortment of analgesics, tricyclics and other sedatives and drugs. Furthermore the determined suicide or homicide will hoard the prescribed drug until sufficient for a successful attempt.

Drugs may also be the cause of accidental deaths and medical mishaps when the death of a patient occurs due to the negligence of clinical staff or when death is attributal to a therapeutic or diagnostic hazard. Recently many such cases of poisoning due to antimalarial drugs have come into the scene.

All such cases are of medico-legal significance. Post-mortem viscera specimen (blood, tissues etc) are referred to Forensic Science Laboratories for chemical analysis. Heavy responsibility falls on the shoulders of forensic toxicologists. They are to provide analysis of blood, urine and other biological samples for the poisons and drugs suspected and interpret the results to physicians, police and courts. Hundreds of such cases are received every month at forensic laboratories. The toxicology division of the Gujarat State Forensic Science Laboratory alone handles an average of 250 exhibits every month.

In addition, Forensic Science Laboratories also receive samples from living patients of
poisoning cases from various hospitals, when the physicians have difficulty in diagnosing the compound involved from the symptoms. In such cases of clinical or diagnostic toxicology, the forensic toxicologist has to identify the compound from its metabolites in urine or blood and sometimes hair and nails, when metallic poisons are involved. These results will not only help the physician in correct diagnosis but will also provide a means of biochemical monitoring of treatment, by revealing the qualitative and quantitative status of the compound in circulation.

As analysis involves a variety of chemical classes, there can be no single method. The analysis of a biological sample for a poison basically involves isolation, detection, identification and quantitation. Firstly, the physical properties of the poison are used to classify it into groups, like volatile, organic and inorganic. General screening methods, then classify the organic poison as an acidic, basic, neutral or water soluble compound. Later the poison is isolated using spot tests and thin layer chromatography. Finally the compound is quantitatively estimated using modern analytical techniques like ultraviolet spectroscopy, Gas chromatography, High performance liquid chromatography and mass spectroscopy.

Although in most cases, Forensic Science Laboratories receive sufficient quantity of viscera samples as prescribed, there are some cases, especially of clinical or diagnostic toxicology when very limited amounts of blood or urine samples are received. In such cases it is no longer possible to apply the traditional methods used by the forensic toxicologist for the isolation and identification of drugs as very low quantities are present. Therefore the toxicologist has to utilize specific techniques to isolate and identify the particular drug involved.

In cases of clinical toxicology and accidental poisonings, more than one drug or poison may be involved, for example during multi-drug therapy. This creates problems during analysis using ultraviolet spectroscopy. Due to the presence of many compounds, errors are caused by overlap of the analyte spectral band with interfering bands of unknown or variable intensity. Application of derivative spectroscopy in such samples helped in resolving problems of band overlap and improved the determination of poisons and drugs by ultraviolet spectroscopy.

Some common drug mixtures encountered in Forensic toxicological analysis in India are:

- Strychnine and Brucine (Nuxvomica)
- Aspirin, Paracetamol and Caffeine (in analgesic mixtures)
- Diazepam and Methaqualone in Heroin

There are not much reports on the improved methods of the determination of these drugs by derivative ultraviolet spectroscopy using first, second and fourth order derivatives in literature so far.
In forensic laboratories there is a long interval between specimen acquisition and drug quantitation. During this time, the drug or the poison in tissues undergoes changes and degradation, owing to inadequate preservation and storage facilities. This leads to instability of the drug. If a drug or poison degrades to a point when it is no longer detected, the forensic report may not be justified. As the results of the analysis may be involved in criminal or civil litigation, it is important that they accurately reflect the quantity of drug present at the time of acquisition. Therefore it is necessary to study the stability of poisons and drugs in stored biological tissue over a period of time. Such studies have not been reported in India so far, where the environmental conditions vary compared to other countries.

The present study was therefore undertaken with the following aims and objectives:

1. To improve the determination of some of the poisons and drugs encountered in forensic cases in India using the modern technique of derivative ultraviolet spectroscopy (first, second and fourth order).

2. To find out the stability of some poisons and drugs in post-mortem human blood and liver tissues, stored at room temperature and measured at different intervals over a period of four months.

3. To determine the stability of some poisons and drugs in blood, liver, spleen and kidney tissues of experimental animal (rat) stored at room temperature and measured at different intervals over a period of four months.

4. To develop regression equations (predictive formulae) for estimating the percentage recovery of poisons and drugs from biological tissue at different intervals of time.

5. To suggest the use of the present findings to improve the determination of the studied poisons and drugs in Analytical and Forensic Toxicology.