

# اهمیت سم‌شناسی قانونی

دکتر مصطفی جعفرزاده

متخصص پزشکی قانونی و مسمومیت‌ها

اداره کل پزشکی قانونی استان قزوین

# Introduction

Forensic toxicology is the science of applying the principles of analytical chemistry and toxicology for medico-legal purposes.

# Definition

Forensic toxicology is the analysis of **biological samples** for the presence of toxins, including drugs.

The toxicology report can **provide key information as to the type of substances present in an individual and if the amount of those substances is consistent with a therapeutic dosage or is above a harmful level.**

# Importance:

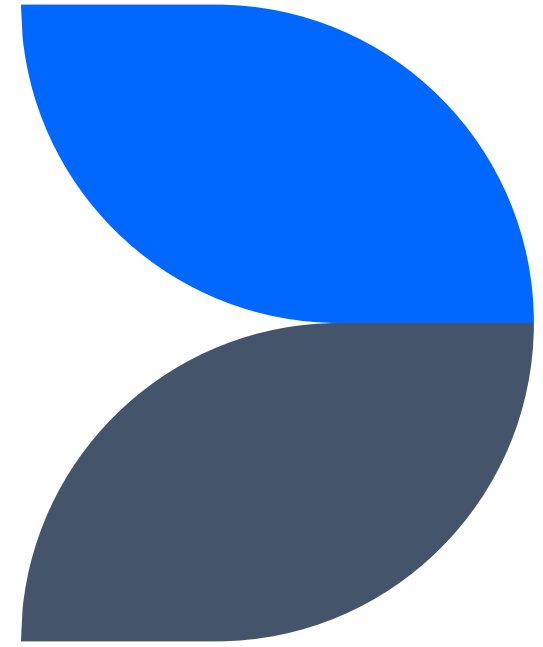
Forensic toxicology deals with the study of the adverse effects of drugs and chemicals on biological systems, and the interpretation of those results for legal purposes.

# Types:

In general, forensic toxicology can be divided in two areas:

1. Death Investigation Toxicology (or Post-mortem Toxicology)
2. Behavioural or Human Performance Toxicology.

Without **supportive evidence**, such as the victim's symptoms, a postmortem pathological examination, or an examination of the victim's personal effects, the toxicologist is forced to use general screening procedures with the hope of narrowing thousands of possibilities to one



# The Analytical Scheme

The strategy used for identifying abused drugs entails a two-step approach: screening and confirmation.

# The Screening Step

A screening test is normally employed to provide the analyst with quick insight into the likelihood that a specimen contains a drug substance.

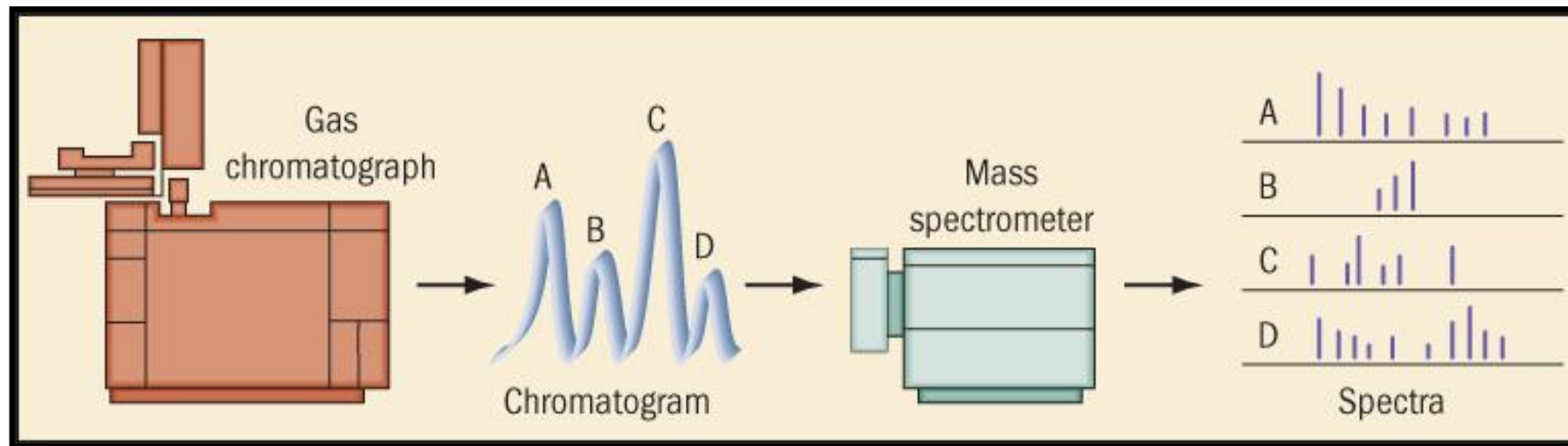
Positive results arising from a screening test are considered to be tentative at best and must be verified with a confirmation test.

The most widely used screening tests are **thin-layer chromatography, gas chromatography, and immunoassay.**



# The Confirmation Step

Gas chromatography/mass spectrometry is generally accepted as the confirmation test of choice.

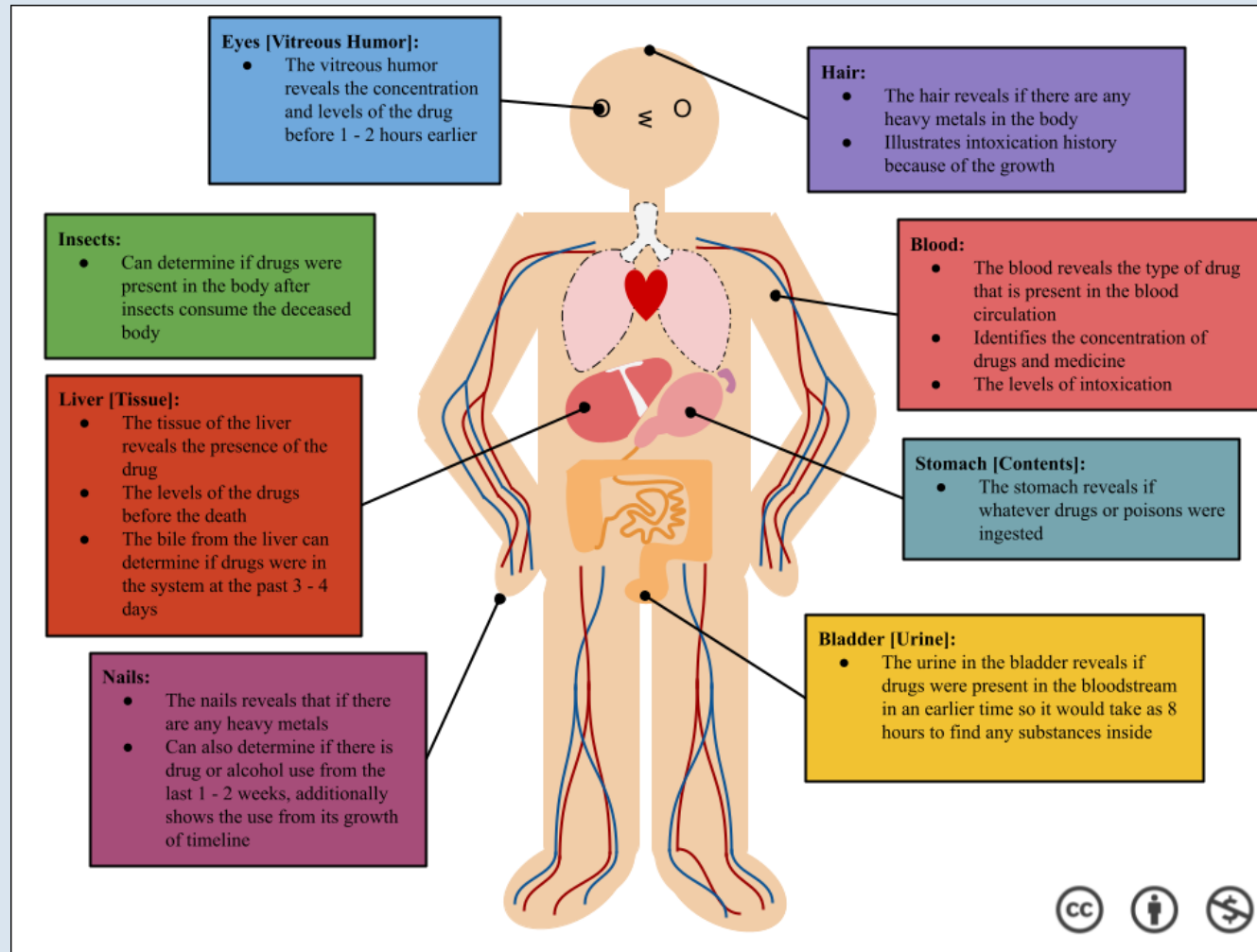


# The Confirmation Step

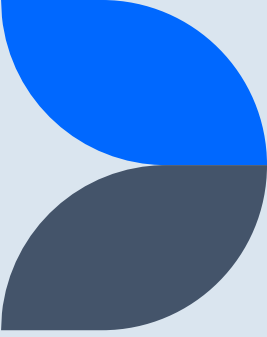
The GC separates the sample into its components, while the MS represents a unique “fingerprint” pattern that can be used for identification.

Once the drug is extracted and identified, the toxicologist may be required to provide an opinion on the drug’s effect on an individual’s natural performance or physical state.

# Samples of Forensic Interest



# Samples of Forensic Interest



Selection sites:

- Multiple, varied sites of collection

Collection

- Appropriate method of collection

- Adequate volumes for analysis

Storage and handling

Important to ensure results are accurate and interpretations are sound

# Typical autopsy specimens

- ◎ Blood
- ◎ Urine
- ◎ Stomach contents
- ◎ Bile
- ◎ Liver
- ◎ Hair
- ◎ Vitreous humor: the transparent jellylike tissue filling the eyeball behind the lens.

# Pitfalls in Postmortem Forensic Toxicology

## Decomposition:

Fewer samples available for collection

Quality of samples is diminished

Putrefaction produces alcohols

Ethanol

Isopropanol

Acetaldehyde

*n*-propanol

# Pitfalls in Postmortem Forensic Toxicology

## **Volume of distribution:**

Volume of distribution is the amount of drug in the whole body (compared to the amount of drug in the blood)

If a drug has a large volume of distribution, it is stored in other fluids and tissues in the body



# Pitfalls in Postmortem Forensic Toxicology

## Postmortem redistribution:

Coping with the problem of postmortem redistribution:

Analysis of both central blood and peripheral blood in cases where postmortem redistribution may be a factor

Compilation of tables to determine average and range of postmortem redistribution factors for drugs





# Pitfalls in Postmortem Forensic Toxicology

## Incomplete Distribution:

Site dependent differences in drug levels due to differential distribution of drugs at death

Has been noted in rapid iv drug deaths

Example:

Intravenous injection of morphine between the toes

Fatal amount of drug reaches the brain

Full distribution of the morphine throughout the body has not occurred

Femoral concentration > Heart concentration

**Thanks for your attention**