

GSR

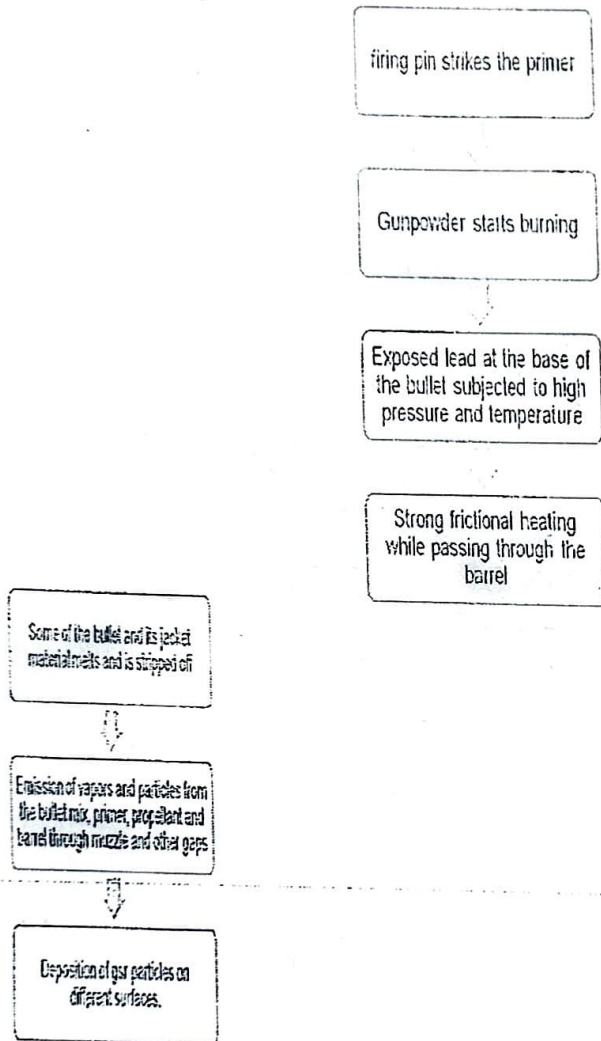
• GUNSHOT RESIDUES

A mixture of gases, vapors and particulate matter formed by the discharge of ammunition in a firearm.

Anything present in the ammunition and the firearm may also contribute to form gsr.

Thus, also known as firearm discharge residues or powder residues.

• MECHANISM AND FORMATION OF GSR



• COMPOSITION OF GSR

It is mainly comprised of gases and particulate matter:

- ⊙ Gunpowder-unburnt and partially burnt gunpowder particles and carbonaceous soot.
- ⊙ Ignition primer-Ca, Pb, Sb, Ba complexes

- ⊙ Residue material of Cartridge case, projectile and bullet jacket-brass, lead, cupronickel, etc.
- ⊙ Barrel-iron and other corrosive material if present.
- ⊙ Gases-carbon dioxide, carbon monoxide, nitrogen, oxygen and water vapors.

⊙ GUNSHOT RESIDUE PATTERNS

The diameter of the circle and the density of the residue depend on the distance between the muzzle and the target.

⊙ NEED FOR ANALYSIS OF GSR

- ⊙ To confirm that the wound is a firearm injury
- ⊙ To identify the shooter
- ⊙ To determine the type of ammunition used.
- ⊙ To identify the entry wound and the exit wound.
- ⊙ To determine the range of fire.

⊙ DEPOSITION OF GSR

Areas that yield the greatest potential for GSR deposition are:

- ⊙ Barrel of the firearm
- ⊙ Shooter's hand, face, clothing, etc.
- ⊙ Soil around the shoot.
- ⊙ Intermediate target or any object in the vicinity.
- ⊙ Target.

COLLECTION OF GSR EVIDENCE

⊙ WET METHODS

- swabbing of the area using dilute hydrochloric acid, or nitric acid(5%).
- barrel washings with the help of warm distilled water
- filter paper moistened with dilute acetic acid.

⊙ DRY METHODS

- Molten paraffin wax poured over the area and the cast is used for further analysis.
- A solution of cellulose acetate may be used in the same way.
- adhesive tape or adhesive aluminium foil
- a cellophane sheet impregnated with acetic acid.

EXAMINATION OF GSR

⊙ PRIMARY EXAMINATION

- visual examination of the residues, its shape and appearance using hand magnifiers or low power stereomicroscope.
- it may reveal blackening, tattooing, scorching, etc if the firearm is discharged from a close range.

◎ SECONDARY EXAMINATION- SPOT DETECTION TEST

1) Modified Griess test or Walker's test

- Detects the presence of nitrite residues.
- Densitized paper treated with mixture of sulphanilic acid and alpha naphthol.
- The exhibit is pressed under the paper and steam ironed with acetic acid
- The acetic acid vapors will penetrate the exhibit and orange spots would appear.

2) Dermal nitrate test

- Detects the presence of nitrates and nitrites.
- The exhibit is treated with diphenylamine/ sulphuric acid reagent.
- Blue coloration of individual particles confirms the presence of nitrates or nitrites.

3) Harrison and Gilroy's test

- Detects the presence of Pb, Sb and Ba.
- Exhibit is treated triphenyl methyl arsonium iodide alcohol solution. orange ring in 2mins indicates presence of antimony
- Further it is dried and treated with sodium rhodizonate solution. Red coloration inside the ring indicates presence of lead or barium or both.
- Further it is dried and treated with dilute HCl. if color changes to blue, lead is present.

❖ INSTRUMENTAL ANALYSIS OF GSR

- ◎ Traditional methods have been well replaced by never sophisticated instrumental techniques like:

◎ Scanning Electron Microscope

-it is a particle analysis method which combines details of the morphology and elemental composition of GSR particles.

-it photographs the particle's size and shape, provides elemental analysis, and gives the number of particle per unit area.

◎ Flameless Atomic Absorption Spectrophotometry

-Suitable for determination of lead.

-extremely sensitive, convenient, less costly, and consumes less time.

-it is not capable of simultaneous multielement analysis

◎ Neutron Activation Analysis

-sensitive technique and a bulk method of analysis inorganic primer components

-although accurate, it is not widely used due to cost, lack of availability of reactors and time required.

◎ Other techniques which may be used are:

- X-ray Fluorescence
- Inductively Coupled Plasma-Mass Spectroscopy
- Infra-red Photography
- Gas chromatography

❖ **SHOOTER'S IDENTIFICATION**

- Positive face or hand or clothing sample –the person either fired a firearm or was in close proximity with a recently fired firearm.
- Negative hand or clothing sample-it is not possible to determine whether the person fired the firearm or was in proximity.