

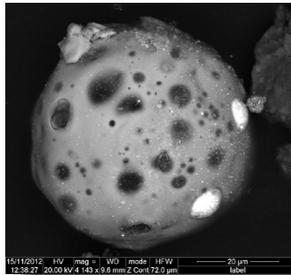
## The Value of GSR Evidence

There are a limited number of primer formulations that are used in a wide range of ammunition types. Consequently, GSR is not specific to a particular type of ammunition or firearm and cannot be linked conclusively to a specific cartridge case or gun.

In general, five primer types are routinely encountered in casework. They can be distinguished from each other by their elemental composition. Other variations exist, but are more rarely encountered.

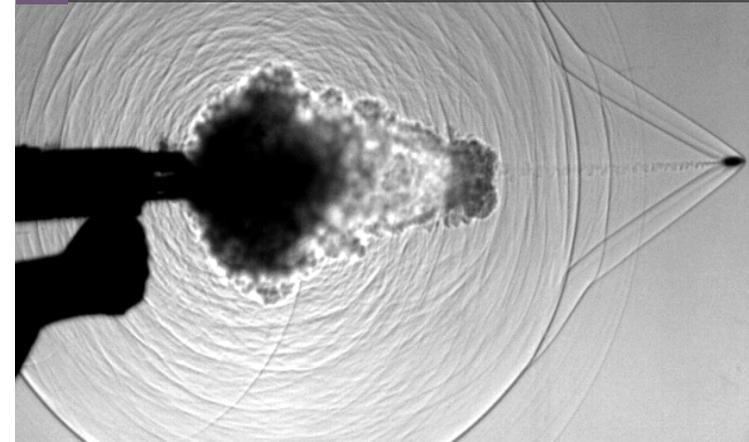
GSR can provide supporting evidence for an investigation and can help address the following:

- Whether a person has been exposed to the discharge of a firearm, (either by discharging a gun or being in close proximity to a discharging gun).
- Whether a gun was fired from or towards a particular location
- Whether a particular person has been in possession of, or handled a gun
- Whether firearms have been carried or stored in vehicles
- Whether vehicles have been used as getaway vehicles
- Assist in identifying clothing worn by firer
- Assist the ballistic scientist in addressing range and type of projectile used



IDENTIFICATION  
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## GUNSHOT RESIDUE - explained



Specialist expertise  
in recovery & analysis

IDENTIFICATION  
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## Introduction

Gunshot residue (GSR) is the collective term for the cloud of fine debris that is expelled from a firearm when a round of ammunition is discharged.

It is also known as FDR (firearms discharge residue) or CDR (cartridge discharge residue).

The cloud may contain a mixture of metallic and nonmetallic particles.

Metallic particles originate from the primer charge (initiating explosive in cap of base of ammunition), bullet, cartridge case and barrel.

Nonmetallic particles originate from the propellant (main powder charge), deposited as unburnt or partially burnt particles.

Only particles from the primer are considered to be characteristic of GSR. Particles from the bullet, cartridge case and barrel are either indicative or commonly associated with, but on their own, not exclusive to, GSR.

# G U N S H O T R E S I D U E - e x p l a i n e d

## Sampling

GSR can be recovered by:

- Adhesive lifting (using stubs or tape samples)
- Swabs/wipes

The preferred methods of recovery at Cellmark are stubbing for fabric surfaces and by wipes for smooth surfaces.

Cellmark stub kits are available for sampling people and vehicles and addresses of interest. This should always be carried out to a case-specific strategy.

## Analysis

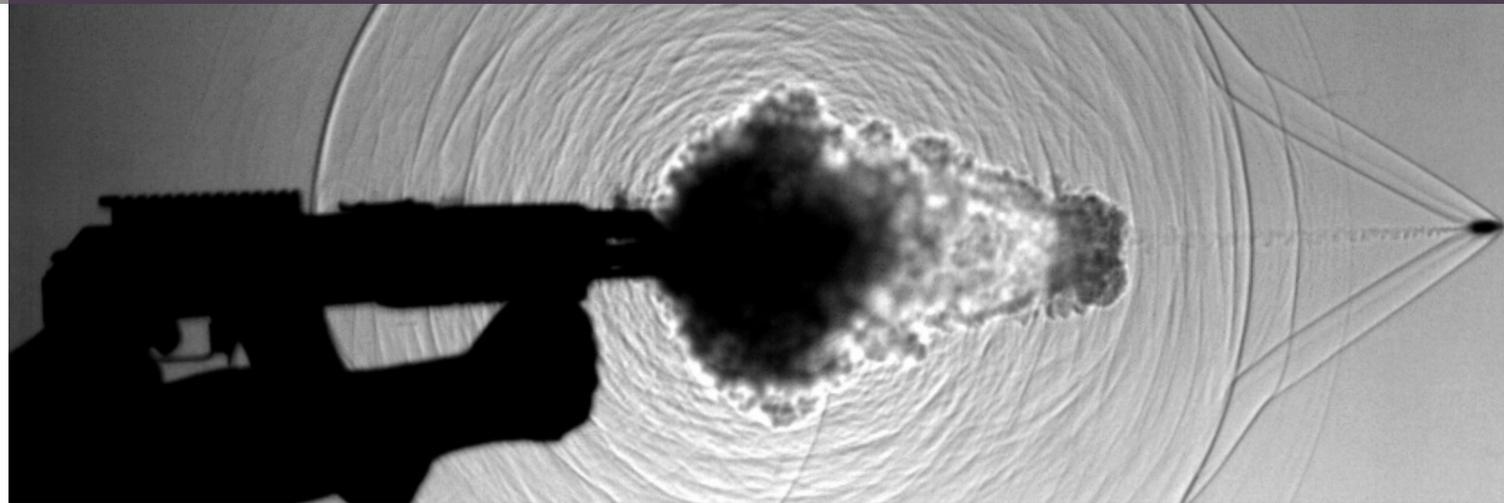
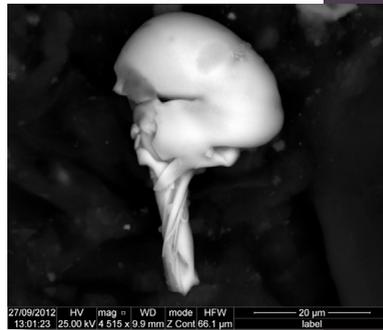
The current standard method adopted throughout the world for the detection of GSR, is to look for primer residue, bullet debris and other firearms-related metallic particles using a scanning electron microscope (SEM). This instrument provides highly magnified images of the recovered particles and the ability to carry out elemental analysis in a nondestructive manner.

During SEM analysis, the surface of each sample is scanned in microscopic detail using an automated procedure that takes several hours.

Out of thousands of background environmental particles that may be present on a sample, the SEM produces a list of potential GSR particles. The elemental composition and morphology (shape and appearance) of these potential particles are checked and confirmed manually by the analyst.

The scientist will confirm the presence of any GSR, determine the level and the type of GSR and then evaluate the significance of the findings within the circumstances of the case.

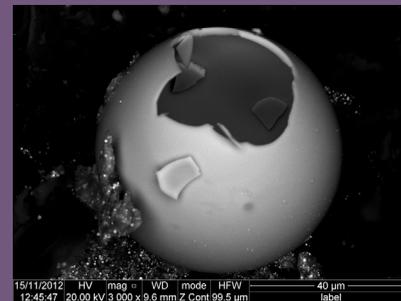
Cellmark does not currently analyse samples for propellant debris, as not all ammunition produces detectable debris and there is less variation than for primer GSR.



## Points to consider

- Type of firearm and details of any spent ammunition
- Number of shots fired
- Location (indoors/outdoors/in vehicles)
- Distance
- Environmental conditions (wind/rain)
- Time interval between incident and recovery of items
- Activity level of subject between incident & seizure of items
- Details of CCTV evidence identifying any potential clothing worn during an incident
- Details of any armed officer involvement

All of these points will be considered when assessing each individual case and taken into account when interpreting the evidence.



## Contamination Advice

- Individuals should not be handled or sampled by personnel who are in regular contact with firearms and tasers. (Armed officers will bear high levels of GSR and may contaminate the subject)
- Individuals should not be transported in vehicles used by firearms officers, nor sampled at police stations with firing ranges or where armed officers are based
- Clothing should be seized and samples taken from individuals as soon as practicable
- Personnel seizing clothing from vehicles and addresses should wear fresh appropriate PPE and place items in clean bags that are stored appropriately to avoid inadvertent contamination
- Firearms, cartridge cases and clothing bearing ballistic damage should be kept separate from samples and clothing from individuals suspected of being involved in a firearms-related incident

GSR can be acquired by:

- Firing a gun
- Being in close proximity to a discharging gun
- Handling a recently fired gun or spent ammunition
- Contact with persons, surfaces and or items bearing GSR

GSR can be deposited onto the following surfaces:

- Hands, face, head/hair
- Clothing (outer surfaces, pockets, waistbands)
- Gloves, balaclava and hats
- Shoes (only if shots fired downwards)
- Bags and items used to conceal firearms
- Other surfaces or items in the close vicinity of a discharging gun
- Vehicles surfaces and storage areas

Persistence:

GSR will be lost through physical disturbance and washing.

GSR acquired by firing may persist for:

- 2 to 4 hours on the hands
- Up to 12 hours on the face, head/hair
- Up to 24 hours wear on outer surfaces of clothing

Particles of GSR can remain indefinitely on surfaces left undisturbed such as discarded clothing, pockets and inside bags.

Note: This is a general guide and timings maybe affected by factors in the "points to consider" section of this leaflet.

For further information and pre-submission advice about GSR, contact a member of the GSR team on 01235 528609.

