



B124 Exposure to Gunshot Residue (GSR) in High-GSR Environments: Can GSR be Transferred to Non-Shooters in an Environment With a High Background of GSR?

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After attending this presentation, attendees will learn about current research into the prevalence of gunshot residue particles on the hands of subjects who have not fired a gun but have been exposed to high levels of gunshot residue in the workplace.

This presentation will impact the forensic community and/or humanity by providing information on the prevalence of gunshot residue on non-shooters will assist in the interpretation of gunshot residue findings to courts of law.

Gunshot residue (GSR), which is produced upon the discharge of a firearm, consists primarily of micron-sized particles that contain the elements lead (Pb), barium (Ba) and antimony (Sb). These particles can escape from a firearm via the muzzle, breech, and other surfaces that do not form a gas-tight seal around the cartridge case, and can then be deposited onto nearby surfaces. It is known that GSR particles can be easily transferred from one surface to another by contact. The purpose of this study was to determine whether or not GSR particles could be identified on the hands of non-shooters in environments with a high background of GSR particles.

During a tour of two firearms factories in which over 200,000 rounds of ammunition are test-fired annually, the author collected samples from the hands of a number of staff members, including those who do not come into contact with the completed firearms as part of their job. The back and web area of each person's hand were sampled using an aluminum stub covered with double-sided tape and these were analyzed for GSR using a scanning electron microscope coupled with an energy dispersive x-ray spectrometer (SEM/EDS).

Of the hands of the five staff members who were sampled in factory #1, a facility that produces handguns, two of the staff (a machinist and a receptionist) did not have GSR present. Of the remaining three staff, two GSR particles were identified on the hands of an accountant, 13 GSR particles were identified on the hands of a machinist (neither of whom handle firearms) and 420 GSR particles were present on the hands of the person responsible for inventory control and shipping of the firearms. The high number of GSR particles on the latter individual is not unexpected, as this person handles completed handguns following the test firings that are done for each firearm following its manufacture.

Of the hands of the nine staff members sampled in factory #2, a facility that produces machine guns, three of the staff (a receptionist, an engineer, and a product sheet designer) did not have GSR present on their hands. One GSR particle was identified on the hands of each of three machinists, one who has never handled a firearm and two who had not handled a firearm on the day of sampling; nine GSR particles were identified on the hands of the tour guide, who had picked up two firearms in the firing range earlier in the day, but had subsequently washed his hands; 121 GSR particles were identified on the hands of the weapons technician (assembler). The gloves worn by one of the staff members while test firing each firearm were also examined to determine the number of particles present on the shooter. More than one thousand GSR particles were present on the samples from these gloves.

The above results demonstrate that as expected, activities that involve test firing or handling recently fired firearms result in the transfer of a large number of GSR particles to a person's hands. However, it is possible for those who work in an area with a high background concentration of GSR particles, but whose workstation is separate from the test firing area, to accumulate only a small number of GSR particles or no GSR particles on their hands. This indicates that the possibility of "chance" contact with GSR particles, even in an environment with high background levels of GSR, is low. These small particle numbers are similar to those commonly seen in casework; however, the background levels of GSR in an environment other than a firearms manufacturing facility is expected to be much lower, thereby making the likelihood of "chance" contact with GSR particles very small in an everyday environment.

Gunshot Residue, Background, Exposure