



### D75 Alternate Testing Procedures for the Modified Griess Test

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After attending this presentation, attendees will understand: (1) the procedure for conducting a modified Griess test for enhancing gun shot residue (GSR) powder patterns; understand the results of altering five testing procedures on three types of fabric; and understand the advantages and disadvantages of the altered procedures to enhance visualization of powder patterns. The purpose of this presentation is to present the results of an experiment that evaluated the modified Griess test procedure and five changes in the testing procedure on three types of fabric for GSR powder patterns at specific distances.

This presentation will impact the forensic community and/or humanity by aiding the forensic community in understanding GSR pattern testing procedures and alternatives for conducting the modified Griess test.

A model 686 .357 S&W revolver, with a 4-inch barrel was used to produce GSR patterns by firing .38 caliber Winchester ammunition with 150 grain lead round nose bullets into samples of 100% cotton, a blend of 65% cotton and 35% polyester and 100% polyester. All of the samples were white in color to enhance the comparison of the size of the pattern on the cloth to the modified Griess pattern on photographic paper. All samples were shot at a distance of 6 inches from muzzle to target.

The materials prepared for the modified Griess test included 12 sheets of 203 x 254 mm (8 x 10 in) Agfa multi-contrast double weight fiber base paper and 6 sheets of Kodak polycontrast RC (resin coated), type F photographic paper. Both papers were fixed with Kodak fixer for 10 minutes at 20°C (68°F). After fixing, it was washed in 20°C (68°F) water for 10 minutes and dried. The fiber base paper was air-dried and the RC paper was dried in an RC dryer. The desensitized photographic paper was then immersed in a chemical mixture. The mixture was prepared in two parts. Part one was prepared by adding 0.5 grams of sulfanilic acid in 100 milliliters of distilled water. Part two was prepared by adding 0.28 grams of alpha-naphtol in 100 milliliters of methanol. The two parts were mixed and the desensitized paper was immersed for 1 minute and dried at 20°C (68°F).

Eighteen pieces of 203 x 254 mm (8 x 10 in) cotton cheesecloth were soaked in 15% acetic acid for 1 minute. Each sample of fabric was then covered with a piece of treated photographic paper with the surface of the GSR pattern adjacent to the paper's emulsion. Controlled test conditions included using 100% cotton fabric and ironing the cheesecloth for 1 minute on medium steam heat with the weight of the iron on the cheesecloth using fiber base paper. An orange color developed on the photographic paper in the presence of nitrites. The photographic paper was then washed in 26°C (80°F) water for 1 minute and then rinsed with methyl alcohol.

Controlled testing procedures included using steam heat at 154°C (309° F) with the weight of the iron on the cheesecloth and ironing for one minute on fiber base paper. Five variables in the procedure were altered. They included: use of no steam heat, ironing for 2 minutes, increasing the weight of the iron by 1500 grams, use of RC paper, and increased iron weight also using RC paper.

In conclusion, the GSR pattern diameters on fabric ranged from 8.26 cm (3.25 in) to 12.07 cm (4.75 in) with the average diameter of 10.16 cm (4.00 in). The GSR pattern diameters on photographic paper ranged from 5.08 cm (2.00 in) to 8.89 cm (3.50 in) with an average diameter of 7.19 cm (2.83in). The modified Griess patterns were approximately 30% smaller than the patterns on the fabric. The 100% cotton, 65% cotton and 35% polyester blend, and the 100% polyester fabrics yielded darker colors and larger patterns on RC paper than on fiber based paper. The blended and polyester fabric revealed an outline of the bullet hole in the GSR pattern on RC paper. All fabrics had a tendency to stick to the photographic emulsion when ironed for 2 minutes. Therefore, the recommended alternative method for conducting the modified Griess for 100% cotton, 65-35 blend and 100% polyester is to set the iron on steam heat at 154°C (309° F), add 1500 grams of weight to the iron and iron for 2 minutes on RC paper.

#### Gunshot Residue, Modified Griess Test, Powder Patterns