E40 Novel Azo Dye Presumptive Test for the Detection of Nitrites in Gunshot Residue (GSR): An Expansion of the Modified Griess Test

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After attending this presentation, attendees will better understand how the current modified Griess test can be altered to give greater contrast and improved detection of nitrites in GSR.

This presentation will impact the forensic science community by providing a more efficient and safer presumptive test for nitrites in GSR.

The current method detects the nitrites present in GSR by reacting them with sulfanilic acid, an aromatic amine, to form a diazonium ion. This then reacts with alpha-naphthol, an activated aromatic compound, to form an azo dye on the paper substrate. The paper substrate is prepared by soaking it in a solution of the reagents that are combined in equal parts and allowed to air dry. The item suspected of having GSR on it is processed by laying it over the dried paper substrate. Cheesecloth soaked in acetic acid is then laid over the top of the item and the stack is ironed without steam. If nitrites are present, an orange color dye will be visible on the paper substrate.[1]

Alpha naphthol was once thought to be carcinogenic, but now is listed as having unknown effects after chronic exposure and is considered toxic if inhaled. The new method presented uses reagents which are not suspected of causing cancer. Several reagents such as resorcinol and m-nitroaniline were tested in place of alpha-naphthol, and 1,3-metanilic acid and aminoanthracene were tested in place of sulfanilic acid. These changes resulted in a purple dye when reacted with nitrites.2 The limit of detection for Griess is 2.5µM.[3] The results show that using m-nitroaniline and aminoanthracene as the reagents detected nitrites at a concentration comparable to Griess, but was easier to discern due to its darker purple color. If the item being tested has blood on it, such as a suspected gunshot victim's shirt, a purple dye may be more visible through the blood, which would also be transferred during the reaction.

Traditionally, photographic paper that was desensitized was used as the reagent substrate, but due to decreased availability, laboratories are using photo paper, copy paper, both laser and inkjet paper, and standard laboratory filter paper more commonly. There is no standard from laboratory to laboratory.[4] This study conducted a survey of several paper types and found that high gloss photographic paper is the most durable after spraying with reagents and shows the most visual detail after being processed. Filter paper showed the greatest diffusion of the dye due to its porosity. The photo paper gave the best detail for the GSR pattern. Additionally, the reagent solution is generally applied by soaking the paper; by spraying the solution onto the paper with an aerosol sprayer, the solution is added uniformly and requires a lower volume. It also prevents warping of the paper caused by saturation.

Refrence(s):

1. Dillon J. Modified Griess Test: A ChemicallySpecific Chromophoric Test for Nitrite Compounds in Gunshot Residue. *ATFE* 22(3)243-250.
2. Resorcinol, 2,6 diaminopyridine, 1,3 metanilic acid and aminoanthracene. *MSDS*.
3. *Griess Reagent System*. Promega. June 2009.
4. Malikowski S. Alternative Modified Griess Test Paper. *AFTE Journal.* 2003. 35(2):243.

Griess Test, Nitrites, Azo Dye

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