

Validation of an Alternative Method for Creating the Positive Control Swabs for the Modified Griess Test

By: J. Clayton Jeffress, Texas Department of Public Safety Crime Lab, Garland, TX

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ABSTRACT

Examiners frequently found that the dried nitrite swabs used as the positive control in the Modified Griess Test were time consuming to prepare and gave a weak response. This study indicates that, rather than dry the swabs and rehydrate in acid, the nitrite can be directly dissolved in the acid and the swabs can be used fresh for each day of testing. In all cases, swabs prepared via the fresh method had a stronger and more rapid response than swabs prepared by the dried method.

Introduction

Historically, GSR examinations and muzzle to garment distance determinations within the Texas Department of Public Safety (DPS) Crime Lab System were divided with firearms examiners conducting the exams in the field labs and the Trace Evidence Section conducting the exams at the central lab in Austin. Approximately 12 years ago, these exams in the central lab shifted to the Austin Firearms Section as part of a laboratory realignment. At the same time, many of the specific chemical techniques used by the trace chemists were transferred as well. Rather than use the two step process for creating the positive control nitrite swabs as described by Dillon (22), they used an alternative method called either the "fresh" or "one-step" method. For simplicity, the method will be referred to as the fresh method. It is important to note that the other labs continued to use the nitrite swab preparation described by Dillon [1].

Rather than soak the swabs in a nitrite solution, dry them, and rehydrate them in a 15% acetic acid solution, the fresh method involves dissolving the sodium nitrite (NaNO_2) directly in the acetic acid. Using this method, one positive control swab must be prepared for each separate day of testing as the swabs have been shown to degrade after 24 hours. Many examiners felt that the fresh method had a stronger response than the dried method and was more convenient as many times, an examiner would be ready to start the Modified Griess Test, but find that all of the swabs had been used. While some trace evidence and firearms examiners in the DPS system have had great success with this method, and the fact that the methods

were chemically equivalent, it became necessary to conduct a formal validation study.

Materials and Methods

Three separate batches of dried swabs, eight swabs per batch, were prepared by dissolving .60g of NaNO_2 in 100mL distilled H_2O . The swabs were left to sit in the solution for approximately 20 minutes and then dried by placing them in a polystyrene block in a fume hood. The swabs were dried overnight and subsequently rehydrated in a small amount (approx 25mL) of 15% acetic acid, with each batch of swabs separated and using a different batch of acetic acid.

Three batches of fresh swabs, eight swabs per batch, were prepared by dissolving .60g of NaNO_2 in 100mL 15% acetic acid. The swabs were left to sit in the solution for approximately 20 minutes and then used for testing.

Each of the batches (dried and fresh), were tested multiple times on desensitized photographic paper prepared according to Dillon [1]. Each batch was tested from the left side of the paper to the right in a manner to replicate a gradual dilution. Each piece of desensitized photo paper was tested with eight swabs per batch, alternating between fresh and dried. The swabs were used once, were not re-moistened, and were discarded after testing. The first trial involved conducting consecutive spot testing along the page while the second and third tests involved a single, continuous streak.

Results and Discussion

In all cases the fresh swabs gave a significantly stronger response than the dried swabs. The fresh swabs gave a more

vibrant color and would react within 10 seconds compared to the weaker, 30-45 second response from the dried swabs. Figures 1-3 depict the results of the testing. The main disadvantage of the fresh method is using a larger amount of sodium nitrite in comparison to the Dillon method and the need to prepare a nitrite solution each time an examiner performs the Modified Griess Test.

Conclusion

While not offering a significant benefit over the historical method of preparing nitrite swabs, the fresh method is a

viable and easy alternative that gives a consistently strong nitrite response. It might be worthwhile to test rehydrating the dried swabs in a smaller amount of acetic acid so as to avoid diluting it further. It is possible that 2-3 drops of acetic acid on a dried swab would provide a stronger reaction.

References

[1] Dillon, J.H. "The Modified Griess Test: A Chemically Specific Chromophoric Test for Nitrite Compounds in Gunshot Residues." AFTE Journal, Volume 22, Number 3, page 18-25.

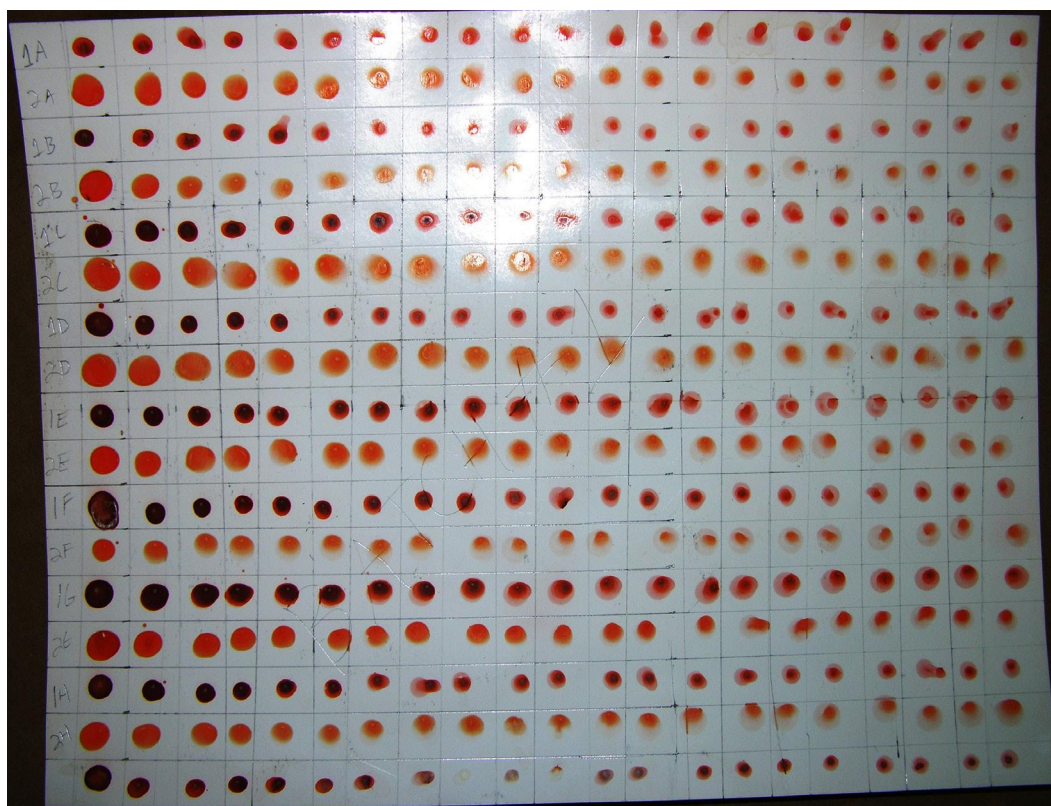


Figure 1: Batch One, rows depict from top to bottom alternating fresh (top) and dried (bottom) swabs with spots made by consecutive spotting.



Figure 2: Batch Two, rows depict from top to bottom alternating fresh (top) and dried (bottom) swabs with spots made by drawing in a continual line.



Figure 3: Batch Three, rows depict from top to bottom alternating fresh (top) and dried (bottom) swabs with spots made by drawing in a continual line.