Potential of Sodium Hypochlorite Solution for Seminal Stain Laboratory Examination

Rony L. Villaflores, PhD
Department of Physical Sciences
College of Science
University of Eastern Philippines
6400 Catarman, Northern Samar
Philippines

Abstract

An experimental study on the potential of sodium hypochlorite (NaOCI) solution for seminal stain laboratory examination was conducted at University of Eastern Philippines, College of Science, Physical Sciences Department, Chemistry Laboratory. It sought to augment a dearth of laboratory materials for seminal stain analysis at the crime scene; determine the potential of sodium hypochlorite (NaOCI) solution for seminal stain laboratory examination. The analysis of semen includes dry and wet samples, n=45. Results showed that both dry and wet semen samples discolored to yellow. The suspected seminal stain samples were treated with 10%, 20% and 30% sodium hypochlorite solutions. For 30% sodium hypochlorite revealed a very yellow color. This means positive. The 20%, yellow, and light yellow for 10% respectively. The semen samples were used with increasing volume. For 30% solution was dropped onto the white cloth with 30 mL semen, for 20 % to 20 mL and 10% to 10 mL, it revealed that as the volume of the sample of semen increases, it showed a yellow color. This study was positively controlled using a compound microscope and Florence reagent, and negatively controlled using the distilled water. This would help the crime investigators and the communities better understand the corroborating of physical evidences for justice of rape victims, innocent suspects, and perpetrators. Based on the findings of the study, it is recommended to include the quantity of semen to test the change in yellowing with different percentages of the reagent.

Keywords: seminal stain, sodium hypochlorite solution, cost and time innovation

Introduction

The legal proof of rape is spermatozoa. It is present in the semen. The identity of the given specimen as semen may provide objective evidence strongly indicative and corroborating changes of rape, seduction, and unnatural practices such as sodomy.

The seminal vesicles produce a yellowish viscous fluid rich in fructose and other substances that make up about 70% of human **semen**. The prostatic secretion, influenced by dihydrotestoterone, is a whitish (sometimes clear), thin fluid containing proteolytic enzymes, citric acid, acid phosphatase and lipids. (Wikipedia Retrieved June 27, 2017).

Sodium Hypochlorite is used as an oxidizing and bleaching agent and as a disinfectant. (From Grant and Hackh's Chemical dictionary, 5thed.) Sodium Hypochlorite id a chlorine compound often used as a disinfectant or a bleaching agent. Sodium Hypochlorite in 0.5% w/v solution is called Dakin's solution, and is used as an antiseptic to kill infected topical wounds. Sodium Hypochlorite is a colorless or slightly yellow watery liquid with an odor of household bleach. Mixes with water.

In a variety of sexual offences, the seminal stain is sexually encountered in a dried form on the body of the victim. It is usually in the lower abdomen of the victim. Or on the clothing, like underwear.

The acid phosphates reaction is now become an indispensable chemical test in the hands of a forensic scientist to identify the present of semen which is an abundant source of enzyme acid of phosphatase. This enzymes acts optimally on monoesters of phosphoric acid at pH values around 5 to 6.

The presence of spermatozoa reacts chemically to produce a purple color which eventually turns to yellow color. (P.S. Raju and N. K. Iyengar, Journal of Criminal Law and Criminology, Retrieved June 28, 2017.)

The seminal stains maybe found on the underwear, bed sheet, carpet, towel, and or pillow cover.

Handling of articles having stains should be done very carefully to avoid damage to spermatozoa. Vaginal/anal/penile swabs should be sent along with their smears on slide. Swabs should be taken on the sterile slides. These should be dried in air at room temperature (37 ^{o}C) and swabs dispatched in sterile feat tubes and slides in clean wrappers.

The raked eye seminal stains generally appear translucent or opaque spots, at times yellowish tint and darker border depending of color and thickness or substrates, which is stiff due to dried semen. On good substrata seminal stains may appear to be fluorescent under ultraviolet light.

Review of Relted Literature

The seminal vesicles produce a yellowish viscous fluid rich in fructose and other substances that makes up about 70% of human semen (Dr. Derek H. Owen, 2005).

In every crime against people, as in sexual assault, the contact between the perpetrator and victim, or his/her environment, or both always leaves evidence which is transferred from the perpetrator to the victim, to the scene, vice versa (M. L. Acosta, 2002, J. Horswell, 2004).

Forensic evidence, in the broadest sense, is any item or information about a suspected crime, which is considered to be relevant to an investigation in order to find truth of the facts. It may be useful to (1) orient police investigation; (2) provide a reliable identification of the perpetrator; (3) exonerate a suspect or an accused form the crime; (4) support or contradict a victim's witness', or suspect's statement and, consequently, promote police to conduct further investigations; (5) provide information about the crime scene; and (6) provide proof that attests to the occurrence of the alleged event.

Typically crime scene evidence could be found on any place where a criminal offence was committed, on anything worn or carried by the victim during the time the offence or within or on the body of any person associated with the offence.

Evidence may be found at the victim's body or clothes, in condoms or bed clothes, or at the crime scene (S. A. Connery, 2013, W. R. Bozzo, A. G. Colussi, M. I. Ortiz and M. M. Lojo, 2009, T. J. Verdon, R. J. Mitchell, and R. A. H. van Oorschot, 2013, J. E. Allard, A. Baird, G. Davidson, 2007, A. J. Loeve, R. A. C. Farmen, I. Haukeli, P. Ruoff, and E. S. Froyland, 2012). Therefore, the examiner should rapidly inform police to isolate and protect the crime scene and should collect first the more urgent samples (J. A. Adams, 2008). Nevertheless, professionals must be aware that in ASA cases the victim's body may be the most important part of the crime scene (D. Johnson, J. Peterson, I. Sommers, and D. Baskin 2012).

Two types of evidence can be considered: (a) Direct evidence: it establishes the fact without needing without needing further investigations. The most important one is the eyewitness or victim statement; nevertheless, their statement can be prone to many inaccuracies and may be contradicted or supported by other types of evidence (e.g., biological for DNA testing) (T. Magalhaes and D. N. Vieira, 2013). (b) Circumstantial evidence (or indirect evidence): it needs to be identified and matched with a control or reference sample collected from the victim, suspect, and/or the crime scene or database, Although it is more objective than direct evidence, it must be handled carefully aiming to avoid risk of destruction, contamination, or loss. It is the majority of the evidence analyzed in the forensic laboratories and can be divided into two basic classes. (1) Physical evidence: it includes items of nonbiological origin, such as finger, and foot prints, shoe/tire impressions, fibers, paint, soil, dirt, glass, headlamps or arson debris, explosives and gunshot residues, and figured injuries (e.g., bite marks, scratches) (T. Magalhaes and D. N. Vieira, 2013. A. Tandon, K. Sircar, A. Chowdhry, and D. Babiani, 2013). They are very useful to identify the crime scene and should be collected when available (M. L. Acosta, 2002, J. Horswell, 2004, J. Lavelle, 2005). (2) Biological evidence: it includes items from a biological origin, usually from the victim of perpetrator (e.g., semen, vaginal fluid, oral fluid, sweat, blood, and other body fluids, hair, cells of the alleged perpetrator under a victim's finger nails, or epithelial cells of the alleged victim present on the penis of the perpetrator) (R. K. B. Farmen, I. Haukeli, P. Ruoff, and E. S. Froyland 2012, D. Sweet, M. Lorente, J. A. Lorente, A. Valenzuela, and E. Villanueva, 1997), and botanical elements (e.g., pollen, plants, and wood).

It is considered the most important type of evidence (especially semen) since it is very useful to prove that physical/sexual contact occurred and to identify a perpetrator through DNA studies (D. Johnson, J. Peterson, and D. Baskin, 2012, H. C. Lee and C. Ladd, 2001, J. J. Raymond, R. A. H. van Oorschot, P. R. Gunn, S. J. Walsh and C. Roux, 2009, W. R. Brozzo, A. G. Colussi, M. I. Ortiz, and M. M. Lojo, 2009, N. Khaldi, A. Miras, K. Botti, L. Benali, and S. Gromb, 2004).

Methodology

The dry and wet seminal stains were treated experimentally using 10%, 20%, and 30% Sodium Hypochlorite Solutions. Both the dry and wet seminal stains were tested and replicated seven (7) times for each percentage solution.

To test with positive control the Peltzer test was adopted. It is a modification of the Florence Test. The suspected parts were moistened with hydrogen peroxide. If semen is present extensive foaming occurs. The sample is centrifuged, placed on a slide, and stained with two percent aqueous eosin. These crystals may disappear but can be recrystallized by the addition of more iodine-potassium solution. In this study, it was further confirmed whether the sample contains the presence of semen through microscopic test. It revealed the presence of spermatozoa as positive result.

To test with negative control, the distilled water was used. Each sample of both the dry and wet seminal stains were applied with a drop of distilled water.For preparing seminal stains samples: acquire the needed seminal stains; prepare the 7 pieces of white cloth for every percentage diluted Sodium Hypochlorite solution.Note: Prepare for two sets for dry and wet; Put the semen sample using a dropper onto the pieces pf cloth; the set A is dry seminal stain and the set B is for wet seminal stain.

For the application of the diluted Sodium Hypochlorite solutions for dry seminal stains: Dry air the pieces of cloth with seminal stain; put a small amount of 10% diluted Sodium Hypochlorite Solution in each of the seven pieces of cloth with seminal stain; repeat procedure 2 for 20% and 30% Sodium Hypochlorite Solution respectively.For the application of the diluted Sodium Hypochlorite solutions for wet seminal stain: Follow procedures 2 and 3 from (Dry seminal stain). A yellow color appears for positive.

Results and Discussion

The following data were the actual results of the experiment conducted to test the potential of sodium hypochlorite solutions in seminal stain laboratory examination. The information were consolidated out from three groups of forensic Chemistry students of University of Eastern Philippines.The Florence reagent was used as positive control. It was counterchecked through microscopic method. A brown elongated choline periodide crystals were observed and confirmed microscopically with the presence of spermatozoa. For 30% sodium hypochlorite revealed a very yellow color. This means positive. The 20%, yellow, and light yellow for 10% respectively.

Table 1. Chemical Analysis of Wet And Dry Seminal Stainsgroups

1,2 and 3 n=45

TESTS	Trial 1 Observation	Trial 2 Observation	Trial 3 Observation
Microscopic(+)	Presence of spermatozoa	Presence of spermatozoa	Presence of spermatozoa
Florence Reagent(+)	brown elongated choline periodide crystal	brown elongated choline periodide crystal	brown elongated choline periodide crystal
Distilled H2O (-)	no color . Remained white	no change of color	no change of color
10% Sodium Hypochlorite	light yellow	light yellow	light yellow
20% Sodium Hypochlorite	yellow	yellow	yellow
30% Sodium Hypochlorite	Very yellow	Very yellow	Very yellow

Fig. 1. Microscopic test of semen

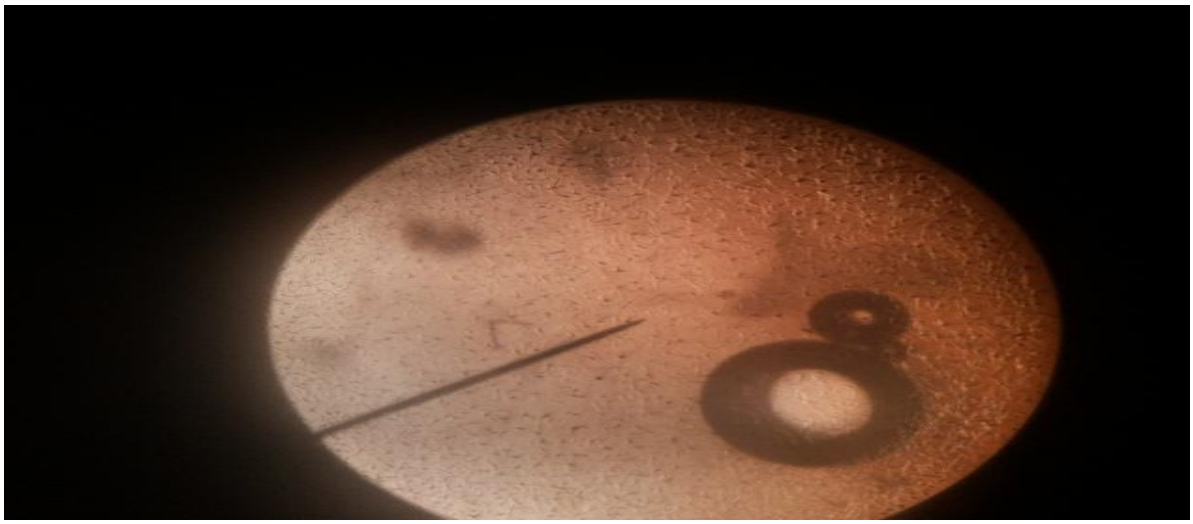
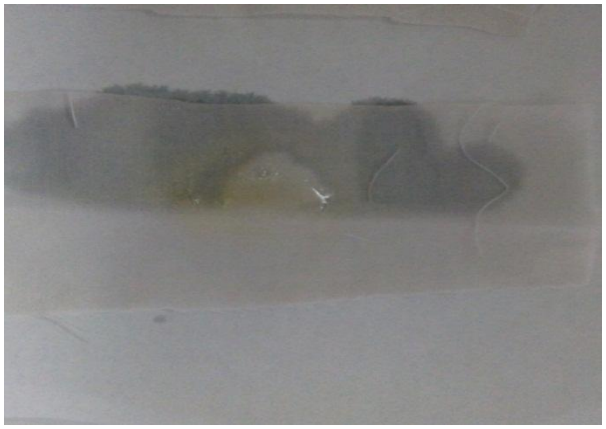


Photo evidence of 30% Sodium Photo



evidence of 20% Sodium
Hypochlorite Solution Hypochlorite Solution

Photo evidence of 10% Sodium Hypochlorite Solution

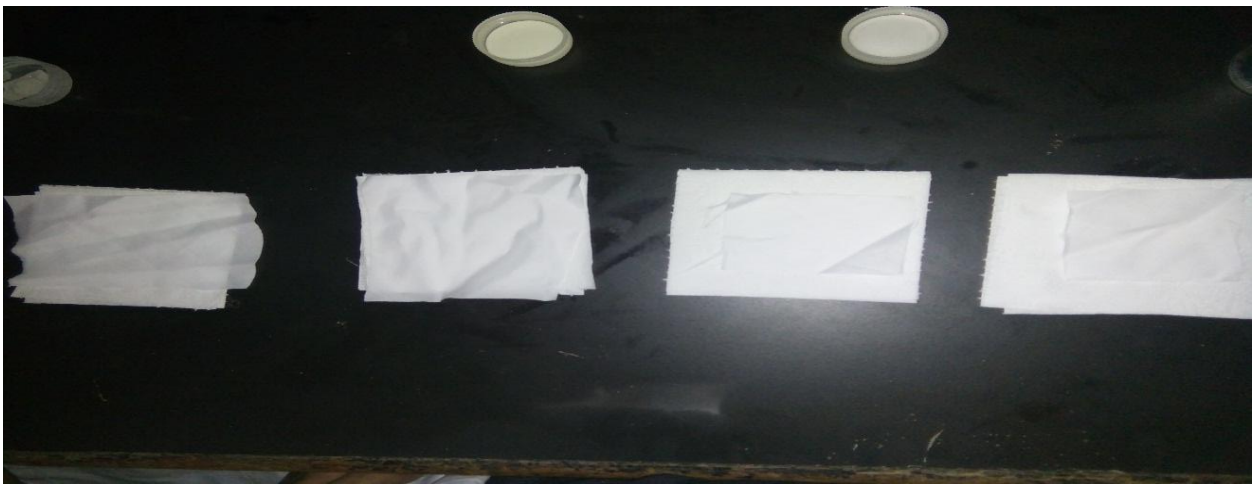


Table 2Comparison of Results of Sodium Hypochlorite Solutions and Phosphatase acid test on Seminal Stain

Sodium Hypochlorite Solutions	• A yellow color was observed and confirmed positive with the presence of spermatozoa.
Phosphatase Acid Test	• A purple color is observed due to the presence of spermtozoa and changes to yellow after sometime.

Conclusions

Based on the findings in this study,the sodium hypochlorite solution is potential for seminal stain laboratory examination. It is a cost and time saving to the part of criminal investigators. This study presents idea about the use of sodium hypochlorite in retrieving a seminal stain. The analyzed samples contain useful scientific information that will corroborate the other physical evidence at the crime scene. Based on the results obtained, the presence of seminal stain is confirmed through microscopic test; and compared with the result in Phosphatase acid test which shown a purple color for positive result that confirmed to change within a few seconds to yellow color.

Recommendations

It is further recommended that researchers will conduct experiments on the chemical analysis of semen to include the quantity of semen to test the change in the yellowing with the Sodium Hypochlorite solution.

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