Response to Sunshine Request Questions from Joyful Heart Foundation

Prepared by:
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1. Any documentation regarding the number of sexual assault forensic evidence kits that have been collected and booked into police evidence by the St. Louis Metropolitan Police Department in the last ten years, broken down by year.

There were 2,088 total evidence submissions that we classified as a sexual assault kit that were submitted to our lab between 1/1/2004 and 12/21/2014. The break down for each year can be seen in the attached document.

2. Any documentation regarding the number of sexual assault forensic evidence kits that have been collected and booked into police evidence by the St. Louis Metropolitan Police Department in the last ten years that have been processed by a public or private crime or forensic laboratory, broken down by year;

Of these sexual assault kits, 2,073 were screened or otherwise processed by a crime laboratory. The bulk of this work was conducted by the St. Louis Metropolitan Police Department Crime Lab, but some work may have been conducted by other crime labs such as the Missouri State Highway Patrol.

3. Any documentation regarding the number of unprocessed sexual assault forensic kits in any storage facilities currently under St. Louis's jurisdiction and control; and

The remaining 15 sexual assault kits were not processed at all as they were related to non-criminal incidents or the investigating officer requested that the evidence not be worked. There is also DNA evidence waiting to be processed from 173 cases that are related to sexual offenses from this time frame. This evidence may or may not be related to sexual assault kits.

4. Any written policies or procedures regarding department practices on the handling of sexual assault forensic evidence kit evidence, including testing protocols.

Attached are excerpts from the Biology Screening Procedure Manual that pertain to the screening of sexual assaults as well as the tests performed most commonly during that screening process.

Sexual Assault Kits Submitted to the SLMPD Crime Lab between 1/1/2004 and 12/31/2014

004	184
005	203
006	257
007	257
008	194
009	192
010	146
011	160
012	161
013	179
014	155
2,088	

If a stain(s) is located, sample(s) may be taken at the analyst's discretion for future DNA testing. The specific location and number of samples taken will be left to analyst's discretion, based on available case information. All apparent blood samples taken may be photographed prior to removal from the evidence. (Refer to photography of evidence section).

If bloodstain patterns are noted on the item or garment, care should be taken to ensure the patterns are preserved. The bloodstain patterns can be preserved by photography with a scale and if necessary a bloodstain pattern analyst can conduct a more comprehensive examination at a later date.

Sexual Assault Screening

Items in a sexual assault kit will be itemized and processed based on available case information (i.e. police reports, physician's reports, etc).

Swabs present in a sexual assault kit will be processed for seminal fluid using the STMP presumptive test (See STMP procedure) based on the circumstances of the case. If swabs test positive with STMP, a corresponding slide is made for sperm searching (see slide preparation procedure). If swabs are negative with STMP, but police reports/physician reports indicate penetration of that particular orifice or appear to have been collected for the presence of seminal fluid, prepare a slide from those swabs for sperm searching.

Stain any slides made for sperm searching. (See staining procedures for sperm slides).

If sperm are located on a slide, a photograph will be taken as notes and will be stored in LIMS under the corresponding item. If there are no sperm located on a slide which corresponding swab(s) were positive with STMP, an ABAcard P30 test will be performed on an extract from the swab(s) (See ABAcard P30 procedure). If no sperm are located on a slide which was negative with STMP, no further testing is necessary, and the swabs will be kept in the sexual assault

kit unless digital penetration and/or oral contact is noted in that particular orifice.

Any swabs which are positive for STMP, sperm, and/or P30 will be saved.

In cases where there is no bloodstain card or buccal swabs of the victim, oral swabs will be retained as a victim reference. If there are no oral swabs present or they are positive for STMP, sperm, or P30, the vaginal swabs (if negative for STMP and sperm) will be retained as a victim reference. If oral and/or vaginal swabs are positive for STMP, sperm and/or P30, an email should be sent to the investigating officer requesting buccal swabs of the victim.

Any swabs which contain possible saliva and/or touch DNA evidence will be saved for DNA analysis. These swabs do not need to be processed for any biological fluids unless specifically requested.

Check any clothing or bedding for stains as needed using the Polilight/Alternate Light Source at the optimal wavelength for the material being examined (415, 450, 470, 490 nm). In most cases, a wavelength of 450 with a corresponding pair of orange goggles provides the greatest visibility of stains. Check all appropriate stains for seminal fluid using the STMP procedure. Any item with a crotch (i.e. underwear, pants) will always be tested using the STMP procedure. Prepare slides for positive stains using the following guidelines:

- If there is a single perpetrator, prepare one slide per piece of clothing from the most intimate cutting. If that cutting is negative for sperm, the P30 test will be used. If the P30 test produces a positive result, no further testing is necessary on other cuttings. If the P30 test is negative, then a slide will be made from another positive cutting, if available. This procedure will continue until all cuttings are exhausted and/or a positive for sperm or P30 is achieved.

- If there are multiple perpetrators, the number of slides prepared is left to the analyst's discretion. The same procedures for P30 and negative sperm slides will be applied from above.

All items processed should be visually checked for possible bloodstains and chemically tested for possible blood if applicable.

Check for the presence of hair or other relevant evidence (i.e. saliva, urine – see Procedures for saliva and urine) as circumstances of the case dictate.

If fingernail clippings/scrapings are present in a sexual assault case, the included items will be swabbed for DNA evidence. The fingernail clippings/scrapings will be retained in the sexual assault kit and the swabs of these items will be retained in the [redacted] freezer[redacted].

Condoms will be tested for seminal fluid and sperm. Separate swabs will be taken of the inside of the condom and the outside of the condom as the condom is presented in the evidence envelope. These swabs will then be tested using STMP and a slide will be made from each of the swabs for sperm searching, regardless of the result of the STMP test. The condom and swabs will be stored in the [redacted], regardless of the results obtained.

All slides made will be kept with the sexual assault kit and/or corresponding evidence bag for storage.

Sexual assault kits from the Medical Examiners Office should be processed using the Morgue Sexual Assault Kit Procedure.

If a physicians report is available, scan a copy of the report into the imaging module in LIMS under the actual item. Ex. If physicians report is item 1-5, attach the copy of the physicians report to item 1-5 in the imaging module.

Other cases

As cases dictate, the analyst may choose to swab and/or cut areas for potential DNA evidence in which there is no screening test available (i.e. skin cells on

Appendix B - Phenolphthalein Presumptive Test for the Presence of Blood

Procedure:

Check the reagents each day prior to use using a positive control (known bloodstain or a known hemoglobin standard) and a negative control (filter paper) and the procedure below to ensure that the test is functioning properly. Reagents are only used on casework after a positive reaction is observed on the positive control and after no reaction is observed on the negative control. The date of these control tests will be recorded on the analyst's notes page(s).

1.) Wipe a piece of dry or dampened filter paper or swab over suspected stain.

2.) Add drop of phenolphthalin (reduced phenolphthalein) solution to the filter paper or the swab. (A pink color change at this point does not indicate the presence of blood. Oxidizing agents can convert the phenolphthalin without the interaction of heme.)

3.) Add one drop of 3% H_2O_2 to the filter paper or swab.

4.) An immediate **pink color** at this point indicates the presence of blood.

If the test is negative and the possible bloodstain is very weak, repeat the above procedure using dampened filter paper or swab, if dry filter paper or swab was used initially.

Preparation of Reduced Phenolphthalein Solution

Dissolve 2.0 grams of phenolphthalin and 25 grams of potassium hydroxide in100 ml of H_2O. Add 400 ml of absolute ethanol and mix. Add 20 grams of zinc metal and store in a dark bottle in the refrigerator.

Preparation of Hemoglobin Standard

Add 100 ml of H_2O directly to a fresh bottle of 1gram of hemoglobin and gently vortex. Add the solution to 900 ml of H_2O. Store concentrated solution frozen. Create a 1/20 dilution (10 ml stock in 190 ml H_2O) and soak swabs to saturation. Dry the swabs and store frozen.

Reaction

The (colorless) phenolphthalin is oxidized to phenolphthalein (reddish-pink color) by the hemoglobin's peroxidase reaction with hydrogen peroxide.

References

1.) Miller, L.S./Brown, A.M./Carimi, N.J., Criminal Evidence Laboratory Manual an Introduction to the Crime Laboratory, 1990, Anderson Publishing Co., p. 58.
2.) Cox, M., "A Study of the Sensitivity and Specificity of Four Presumptive Tests for Blood", Journal of Forensic Sciences, JFSCA, vol. 36, No. 5, Sept. 1991, pp. 1503-1511.

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Appendix C - Forensic Identification of Human Blood using ABAcard® HemaTrace®

The ABAcard® HemaTrace® control will be tested once per lot number using a positive control (known bloodstain extract or hemoglobin standard) and a negative control (distilled water). The analyst who completes the control checks will indicate on the box and in the reagent log book: the date checked, if the controls passed, and the analyst initials and DSN. The date of the positive and negative tests which worked correctly, lot number, expiration date, and initials/DSN of analyst who checked the lot will be recorded in the analyst's note page(s). If the reagent fails to produce the proper response with the standard or the negative control gives a positive result, new kits will be ordered and the kits which failed will not be used on casework.

1. The sample should be at room temperature.

2. Extract the specimen from swab or stain by immersing in 200µL-300µL distilled water or buffer provided with Hematrace kit.

3. Remove the test device and the dropper from the sealed pouch.

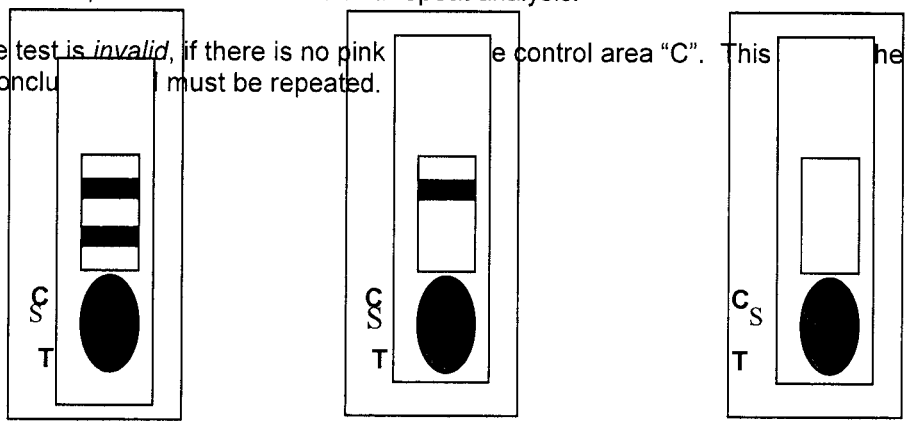
4. Add 150µL (or 4-5 drops with dropper) of the extracted specimen to the sample well "S" of the test device.

5. Read results at 10 minutes. Positive results are normally seen much sooner than 10 minutes. To declare a negative result, one must wait the full 10 minutes.

6. The test is *positive* if there are two pink lines, one each in the test area "T" and in the control area "C". This indicates that the human hemoglobin level is at or above 0.05 µg/mL

7. One pink line in the control area "C" indicates a *negative* result. If High Dose Hook Effect[1] is of concern, dilute 10 to 100 fold and repeat analysis.

8. The test is *invalid*, if there is no pink e control area "C". This he test is inconclu l must be repeated.



[1] The High Dose Hook Effect may give a false negative result due to the presence of high concentration of human hemoglobin in the sample, as for example in undiluted blood.

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Positive **Negative** **Invalid**

Reaction:

The test device contains a mobile monoclonal antihuman Hb antibody with conjugated pink dye. When an antigen-antibody complex is formed with Hb, the complex is captured by the immobile anti-Hb antibody in the "T" area, forming an antibody-antigen-antibody sandwich.

The Hb antibody-dye conjugates are captured by an immobilized anti-immunoglobulin antibody in the "C" region.

References

Abacus Diagnostics, Inc., ABAcard® HemaTrace® for the Forensic Identification of Human Blood, Technical Information Sheet, 2005.

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Appendix D - Hemastix Presumptive Test for the Presence of Blood

Quality Check: Each new bottle of the Hemastix strips will be quality tested by a member of the biology section prior to use in the field. A positive control (hemoglobin standard) and a negative control (filter paper) will be tested to ensure the test is working properly. The initials, DSN, and date of the testing will be recorded on the bottle and in the reagent log book as well as if the positive and negative worked correctly. The strips will be considered valid per manufacturer specifications until the expiration date is reached. At that time, the strips should no longer be utilized in the field for casework.

Procedure for the use of Hemastix should be as follows:

1. Ensure that bottle has been quality checked and that the expiration date has not passed (if quality controls are not listed and/or expiration date has passed, do not use for casework and return to the biology section for further investigation.)
2. DO NOT APPLY HEMASTIX DIRECTLY TO EVIDENCE ITEM AND-DO NOT APPLY HEMASTIX DIRECTLY TO THE SWAB BEING SUBMITTED FOR DNA ANALYSIS.
3. Using filter paper, test suspected stain by taking a swab of the suspected area of blood, touch swab to the clean filter paper, and apply the Hemastix strip directly to the filter paper **or** take a dry piece of filter paper, rub stain gently, and place a wet Hemastix strip to the filter paper
4. Apply strip to suspected stain/filter paper for approximately 1-2 seconds
5. Remove strip and read within 1-2 seconds.
6. A positive/weak positive result is indicated if there is any green/green-blue/blue color present on the strip within 1-2 seconds.
7. If no color change has occurred after a couple of seconds the test should be read as negative or inconclusive.
8. If unsure if a proper reading has been obtained, either bring the sample to the laboratory for further testing or use the phenolphthalein reagent testing procedure.

Reaction: The test is based on the peroxidase-like activity of hemoglobin that catalyzes the reaction of diisopropylbenzene dihydroperoxide and 3,3',5,5'-tetramethylbenzidine. The resulting color ranges from orange through green; very high levels of blood may cause the color development to continue to blue. (taken from instruction sheet included in box from manufacturer – Siemens)

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Appendix E - Sodium Thymolphthalein Monophosphate (STMP) Spray

(Presumptive test for Seminal Acid Phosphatase)

Check the STMP reagent each day prior to use using a positive control (known seminal stain or a potato acid phosphatase standard) and a negative control (filter paper) and the below procedure to ensure that the test is functioning properly. Reagents will only be used on casework after a positive reaction is observed for the positive control and no reaction is observed for the negative control. The date of these control tests will be recorded on the analyst's notes page(s).

1. Press wetted filter paper against stain, swab the stain with a wetted swab, or take a tiny cutting of the stained substrate and place on wetted filter paper.
2. Spray STMP reagent onto filter paper, swab, or cutting.
3. Let stand 5 minutes.
4. Spray with NaOH (1 gram in 5 mL H_2O).
5. Read immediately. A blue color change denotes a positive result.

REAGENT PREPARATION:

A. Citrate Buffer
   1. 29.4g trisodium citrate·$2H_2O$ in 1 liter H_2O
   2. 2.1g citric acid·H_2O in 100 mL H_2O

      Add enough of #2 to #1 to bring the pH to 5.95 (normally all of the #2 solution will be used)

      Note: This solution is stable for 6 months at 4°C

B. STMP Reagent
   1. 0.185g STMP
   2. 100mL of the citrate buffer

      Adjust with NaOH solution (1g NaOH in 5 mL H_2O) to pH 6.0 and filter the solution (filtering is optional)

STANDARD PREPARATION:

B. Acid phosphatase from potato
   1. Add 600 µl H_2O to new 50 unit bottle
   2. Add solution evenly to an approximately 4 cm X 5cm piece of Whatman #3 paper Cut the paper into 3mm x 3mm squares, label container with date and initials and store in freezer

REACTION:

The enzyme activity of the seminal acid phosphatase hydrolyzes the sodium thymolphthalein monophosphate. The resulting chromophore turns blue when sprayed with the sodium hydroxide.

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REFERENCES:

Roy, A.V., M.E. Brower and J.E. Hayden. Sodium Thymolphthalein Monophosphate: A New Acid Phosphatase Substrate with Greater Specificity for the Prostatic Enzyme in Serum. *Clin. Chem.* 17, 11 (1971).

Seiden, H., and Duncan, G., Presumptive Screening Test for Seminal Acid Phosphatase Using Sodium Thymolphthalein Monophosphate. Assoc. Off. Anal. Chem. Vol. 66, #1, 1983.

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Appendix F - Staining Procedure for Spermatozoa Slides

1. Cover slide with Nuclear Fast Red solution and incubate at room temperature for approximately 10 to15 minutes.
2. Wash gently with Milli-Q water.
3. Cover slide with Picroindigocarmine solution and incubate at room temperature for approximately 30 seconds.
4. Wash gently with absolute ethanol or with water.

Spermatozoa will be stained:
Heads, anterior = light red
Heads, posterior = dark red
Tail = dark green line

Search for stained material using 200X or 400X magnification for an overall cell search. Use 400X magnification to photograph spermatozoa.

Use the Mideo LIMS connect program or the SPOT program to photograph and save any spermatozoa located. Save the photograph under the correct laboratory number and item/submission number and title each photograph with a description (ie. vaginal). Export from the Mideo LIMS connect program and the image will automatically transfer into the LIMS imaging module for the respective piece of evidence.

STAIN PREPARATION:

1. **Nuclear Fast Red:**
   Purchased premade from Seri
2. **Picroindigocarmine:**
   Purchased premade from Seri.

The reagents will be tested prior to their first use to ensure that the staining reagents are functioning properly. A positive slide is made using known seminal fluid and a negative slide is made using distilled water. Reagents are used on casework only after proper staining has been observed. If a reagent fails, a new reagent is ordered and the reagent that fails is disposed of properly.

REFERENCE

Stone, I.C. 1972. Staining of spermatozoa with Kernechtrot and picroindigocarmine for microscopical identification. Document CIL No. 2, Southwestern Inst. Forensic Sci., Criminal Investigation Laboratory (USA).

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Appendix G – Preparation of Slide from Seminal Stain in Cloth

1.) Cut out a small portion of the stain and place in a 2 ml centrifuge tube or take a swab of the material and roll the swab onto a clean slide. The swab is then saved for future DNA analysis, if necessary. If taking a cutting proceed to step 2. If rolling the swab(s), skip to step 6.

2.) Soak with Milli-Q H_2O. Take a sterile swab and use stick end to mash the material or vortex material.

3.) Remove the material from the liquid or remove material, place in a spin basket and continue to step 4 (optional)

4.) Centrifuge at 10,000 rpm for 5 minutes (optional)

5.) Remove approximately 10 µl from the pellet (bottom of the liquid) and place on a glass slide.

6.) Dry the slide, stain and visualize

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Appendix H - Forensic Identification of p30 using the ABAcard® p30

The ABAcard® p30 control will be tested once per lot number using a positive control (known [redacted] and a negative control (distilled water [redacted]
The analyst who completes the control checks will indicate on the box and in the reagent log book: the date checked, if the controls passed, and the analyst initials and DSN. The date of the positive and negative tests which worked correctly, lot number, expiration date, and initials/DSN of analyst who checked the lot will be recorded in the analyst's note page(s). If the reagent fails to produce the proper response with the standard and or produces a positive with the negative control, new kits will be ordered and the kits which failed will not be used on casework.

1. Sample should be at room temperature.

2. Extract the specimen from swab or stain by immersing in 200µL-300µL of the buffer provided in the ABAcard P30 kit or distilled water.

3. Remove the test device and the dropper from the sealed pouch.

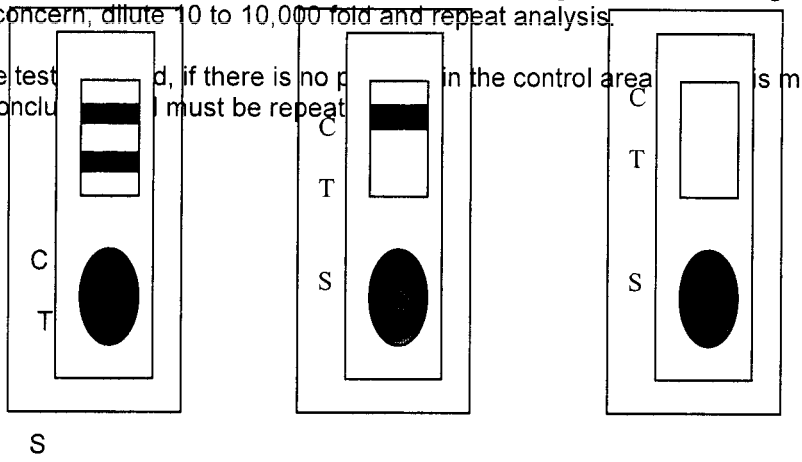
4. Add approximately 200µL (or 8 drops with dropper) of the extracted specimen to the sample well "S" of the test device.

5. Read results at 10 minutes. Positive results are normally seen much sooner than 10 minutes. To declare a negative result, one must wait the full 10 minutes.

6. The test is positive if there are two pink lines, one each in the test area "T" and in the control area "C". This indicates that the p30 level is at or above 4ng/mL

7. One pink line in the control area "C" indicates a negative result. If High Dose Hook Effect[2] is of concern, dilute 10 to 10,000 fold and repeat analysis.

8. The test [illegible]d, if there is no p[illegible] in the control area [illegible]s means the test is inconclu[illegible] must be repeat[illegible]



[2] The High Dose Hook Effect may give a false negative result due to the presence of high concentration of p30 in the sample, as for example in undiluted seminal fluid.

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Positive Negative Invalid

Reaction

The test device contains a mobile monoclonal antihuman p30 antibody with conjugated pink dye. When an antigen-antibody complex is formed with p30, the complex is captured by the immobile anti-p30 antibody in the "T" area, forming an antibody-antigen-antibody sandwich.

The p30 antibody-dye conjugates are captured by an immobilized anti-immunoglobulin antibody in the "C" region.

References

Hochmeister, M.N., Budowle, B., Rudin, O., Gehrig, C., Borer, U., Thali, M., and Dirnhofer R. Evaluation of Prostate-Specific Antigen (PSA) Membrane Test Assays for the Forensic Identification of Seminal Fluid. J Forensic Sci 1999;44;1057-1060.

Abacus Diagnostics, Inc., OneStep ABAcard® p30 Test for the Forensic Identification of Semen, Technical Information Sheet, 1999.

Appendix I - Detection of Saliva

1.) Place approximately ½ cm^2 cutting of substrate in test tube and add 1 ml dH_2O. [Run with positive (known saliva sample) and negative controls (distilled water).] The results of the controls will be recorded on the analyst's notes sheet(s). If one of the controls fails to produce the correct results, the test will be halted until a determination is made as to what caused the incorrect results.
2.) Add three drops of slurry made by suspending one Phadebas tablet in 5 ml dH_2O.
3.) Incubate for 30 minutes at 37°C.
4.) Centrifuge and observe. A blue color in the supernatant is positive for amylase. Sample results are invalid if positive and/or negative controls fail.

Reaction

The Phadebas tablet contains a water-insoluble cross-linked blue starch polymer which acts as a substrate for alpha-amylase. The alpha-amylase hydrolyzes the polymer into water-soluble blue starch fragments.

Reference

Phadebas Amylase Test: Clinical and Technical Information, Pharmacia Laboratories, Inc.

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Appendix J - Presumptive Test for Saliva - (Saliva Press Test)

Use a positive control (known saliva stain) and a negative control (small portion of the starch paper removed and not applied to the evidence in question, just wet with distilled water) and the below procedure to ensure that the test is functioning properly. Casework results are reported only when a positive reaction is observed from the positive control and a negative reaction is observed from the negative control. The date of the control tests will be recorded on the analyst's notes page(s).

Try to pinpoint the location of saliva stains using the Polilight starting at 350 nm. If no stain is apparent, the relevant portion of the garment may be processed.

To test a stain for the presence of amylase:

a. Moisten a piece of substrate-saturated filter paper (note: for best results, use paper at room temperature)
b. Place substrate-saturated filter paper over suspected saliva stain. Record the position and orientation of the filter paper should it be necessary to later recover the actual stain.
c. Press down paper with flat surface for 10-15 seconds.
d. Remove paper and place it on a clean paper in the hood. Apply a known sample of saliva to a corner of the paper as well to act as a control/known.
e. Incubate the paper for 10 minutes at room temperature.
f. *In a fume hood while wearing safety goggles and gloves*, make up a 1:100 dilution of iodine solution and pour it into a spray bottle. Spray the diluted iodine solution directly onto the paper. Read instantly. (The diluted solution may be stored in the refrigerator, protected from light.)

Interpretation of results:

Positive result (+) = white area surrounded by purple background

REAGENT PREPARATION:

A. **Starch Solution / Substrate-Saturated Filter Paper**
   1. Phosphate Buffered Saline (purchased commercially)
      a. Add 10 grams of purchased PBS to 1 Liter of water to create a 1X working solution.
   2. Add 1 g of **soluble starch** to the liter of PBS solution.
   3. Bring solution to a boil in a flask to dissolve the starch.
   4. Cool the solution to room temperature.
   5. Cut pieces of Whatman **filter paper # 3** to desired size (larger or smaller depending on size of area to be tested).
   6. Saturate the pieces of filter paper with the starch solution (substrate). For larger pieces of filter paper, pour starch solution into a tray
   7. Place the pieces of substrate-saturated filter paper on a sheet of aluminum foil and allow them to dry in a fume hood.
   8. Store excess pieces of substrate-saturated filter paper in the freezer, wrapped in aluminum foil.

B. **Lugol's Iodine** (prepare as below or purchase commercially)

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Prepare **Lugol's Iodine solution** (*in a fume hood while wearing safety goggles and gloves!*) as follows:

1. Dissolve 1.7 g KI in 30 mL distilled water.
2. Add 2.5 g I_2 and stir for approximately 5 minutes.
3. Filter the solution.
4. Store refrigerated in a foil-wrapped bottle or in a dark bottle.

REACTION

The starch– iodine reaction yields a purple color. Amylase, an enzyme that is present in saliva, hydrolyzes starch. The starch–iodine reaction cannot take place where amylase has hydrolyzed the starch. Therefore, the areas that have not been hydrolyzed by amylase will appear purple and the areas where the starch has been hydrolyzed will appear white.

REFERENCE

Wurster, JW and Laux, DL. 1990. A Rapid Amylase Mapping Procedure. MAFS Newsletter 19: 48-49.
www.mafs.net/pdf/wl.jpg

Gaensslen, R.E., *Sourcebook in Forensic Serology, Immunology, and Biochemistry*, National Institute of Justice, Washington, D.C., 1983, pp. 183-189.

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Appendix K - Urine Detection

Use a positive control (known urine stain) and negative control (distilled water) and the below procedure to ensure that the test is functioning properly. Casework results are reported only when a positive reaction is observed from the positive control and no reaction is observed with the negative control. The date of the control tests will be recorded on the analyst's notes page(s).

1. Cut approximately ½ cm^2 section of stain, place in a test tube, and cover with three drops Milli-Q H_2O. Run with a positive and a negative control.

2. Add one drop urease solution (1 mg urease/1ml Milli-Q H_2O) to each test tube.

3. Using a bent staple, attach a 1" piece of red litmus to a cork, and cork each test tube. Adjust so that the litmus paper does not touch the side of the test tube.

4. Incubate at 37°C for 30 minutes.

5. Read. A change to a blue color on the litmus paper indicates a positive result. Sample results are invalid if the positive and/or negative controls fail.

Reaction

Urease catalyzes the following reaction: urea + $H_2O \rightarrow CO_2 + 2NH_3$
The resulting ammonia is detected by the litmus paper.

Reference:

Spalding, R. P. and Cronin, W. F., Technical and Legal Aspects of Forensic Serology: A Laboratory Manual, Vol. 1, F.B.I. Laboratory.

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