

**ATTACKING THE STATE'S SCIENCE**  
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**USER (of the forensic lab) BEWARE**

**I. AGGRESSIVE LITIGATION FOR DISCOVERY OF THE BASIS FOR WHAT THE STATE CLAIMS IS SCIENCE.**

An area of investigation that is sadly neglected is the investigation into the bases and validity of what the State claims to be the results of tests and experiments conducted in its crime laboratories. What is generally provided as pretrial discovery is an SBI laboratory report that reports only the conclusion of the State's laboratory analyst about certain evidence, e.g. positive for cocaine; positive for heroin. This kind of laboratory report is USELESS.

1. It merely tells you what conclusion the State intends to offer at trial.
2. It does not tell you the basis for that conclusion.
3. It does not tell you anything about the procedures that the chemist/technician used to reach the conclusion.
4. It does not tell you what tests were performed or what data was obtained from those tests.
5. It does not tell you the procedures that the chemist/technician should have used to reach valid conclusions, generally denoted "protocols."
6. It does not tell you how the evidence was collected or handled.
7. It does not tell you if the chain of custody and all transfers of evidence was complete.
8. It does not talk about laboratory receiving records (records documenting the date, time and condition of receipt of the evidence in question; laboratory-assigned identifiers; storage location).
9. It does not talk about procedures for subsampling (collection of analytical aliquots) and contamination control.
10. It does not give you copies of technical procedures in effect at the time the test was performed during sample screening and confirmation, including sample preparation, sample analysis, data reporting and instrument operation.
11. It does not tell you about controlled proficiency results for each analyst and technician responsible for preparation or analysis of subject specimens, including: raw data and reported results, target values and acceptance ranges, performance scores, and all related correspondence.
12. It does not give you copies of traceability documentation for standards and reference materials used during analysis, including unique identifications, origins, dates of preparation and use, composition and

- concentration of prepared materials, certification or traceability records from suppliers, assigned shelf lives and storage conditions.
13. It does not give you sample preparation records, including dates and conditions of preparation, responsible analyst, procedural reference, purity, concentration and origins of solvents, reagents, and control materials prepared and used, samples processed concurrently, and extract volume.
  14. It does not give you copies of bench notes, log books, and any other records pertaining to case samples or instruments; records documenting observations, notations, or measurements regarding case testing.
  15. It does not give you instrument run logs with identification of all standards, reference materials, sample blanks, rinses, and controls analyzed during the day/shift with subject samples (as appropriate: run sequence, origins, times of analysis and aborted run sequences).
  16. It does not give you records of instrument operating conditions and criteria for variables, including as appropriate: GC column, instrument file identification, tuning criteria, instrument performance check, initial calibration, continuing calibration checks, calibration verification.
  17. It does not give you records of instrument maintenance status and activities for instruments used in subject testing, documenting routine as-needed maintenance activities in the weeks surrounding subject testing.
  18. It does not give you raw data for the complete measurement sequence (opening and closing quality control included) that includes the subject samples. For GC-MS analysis, this would include: areas and retention times, injection volumes, dilution factors, chromatograms and mass spectra - As prepared and as determined values for all quality control samples.
  19. It does not give you a description of the library used for spectral matches for the purpose of qualitative identification of controlled substances, including source(s) and number of reference spectra.
  20. It does not give you a copy of records documenting computation of the laboratory's theoretical production yield, including the basis for the computation and the algorithm used, as appropriate.
  21. It does not give you procedure(s) for operation and calibration checks of analytical balance used to weigh controlled substances.
  22. It does not give you results of calibration checks and documentation of mass traceability for gravimetric determinations.
  23. It does not give you results of contamination control surveys for trace level analytes relevant to test methods at the time of analysis, including sampling design and analytical procedures.
  24. It does not give you records and results of internal review of subject data.

25. It does not give you method validation records documenting the laboratory's performance characteristics for qualitative identification and quantitative determinations of the controlled substances, to include data documenting specificity, accuracy, precision, linearity, and method detection limits.
26. You do not get a copy of the laboratory's Quality Manual in effect at the time the subject samples were tested as well as the laboratory's most recent Quality Manual (however named; the document that describes the laboratory's quality objects and policies).
27. You do not get a copy of the laboratory's technical or operational procedures in effect at the time the subject samples were tested (often termed Standard Operating Procedures, for analytical laboratory operations) as well as the laboratory's most recent technical or operational procedures for analytes detected in subject samples.
28. You do not get a copy of the laboratory's ASCLD-LAB application for accreditation, and most recent Annual Accreditation Review Report, as appropriate.
29. You do not get a statement of qualifications of each analyst and/or technician responsible for processing case samples to include all names, locations and jurisdictions of cases in which these personnel testified concerning the same substances found in the present case.
30. You do not get a copy of the laboratory's ASCLD-LAB on-site inspection report, as appropriate, as well as any reports of on-site inspections by any other testing laboratory audit organization.
31. You do not get a copy of internal audit reports generated during the period subject samples were tested.
32. You do not get a list of capital instrumentation in the laboratory at the time subject testing was performed, including manufacturer, model number, and major accessories.
33. You do not get data for the drug testing section: numbers of tests performed per month or per year, and the number of full time equivalent personnel in the drug testing section of the laboratory.
34. You do not get the Drug Chemistry Section Procedures Manual.
35. You do not get the Drug Chemistry Section Training Manual.

(some of these questions were suggested by a Laboratory Testing Auditor because of the problems that affected the usability of data).

You must insist that all these "raw" materials be provided to you in pretrial discovery.

Most defense attorneys do not have science backgrounds, and thus do not know what to ask for. Now you know. You can certainly learn this. It is not that hard. Besides, there is a wealth of information waiting to be discovered and digested, all for the asking. Keep in mind that all laboratories have testing problems, and

all tests have problems. They can include anything from contamination to incompetence.

Therefore, all attorneys should be proficient in cross-examining laboratory personnel and/or scientific experts in their education, training and experience, bias, lab problems, handling of specimens, use of standards and controls, integrity of samples, and recording methods, just to name a few. Use this paper to craft as many questions as you can come up with. That will give you a good start. Ask for help if you need it.

All attorneys must understand the importance of validation in a laboratory setting. The laboratory should engage in Validation Studies to determine if they are having general contamination problems, and/or to show that the techniques they are using are valid, and to validate that the lab itself can perform the tests properly. The lab should also engage in Proficiency Studies, in order to validate their methods for ascertaining false positive rates, and to make sure their chemists/technicians are proficient in performing the tests. Ideally, laboratories should have external blind proficiency tests. It is basic scientific method that all laboratory records must be kept in a way to permit valid independent scientific review of the test(s) performed. Further, protocols, validation and proficiency studies must be maintained by the laboratory for certification by the National Association of Crime Lab Directors. Since the SBI laboratory in North Carolina is so certified, they must retain this information.

When the State supplies you with a lab report, you must aggressively seek and litigate your right to the rest of the information you will need, and are entitled to, in order to deal with the State's claim that their evidence is based on science.

## **A. LAW**

### **1. N.C. Gen Stat. Sect. 15A-903(e)**

#### **a) Reports of Examination and Tests**

Upon motion of a defendant, the court must order the prosecutor to provide a copy of or to permit the defendant to inspect and copy or photograph results or reports of physical or mental examination or of tests, measurements or experiments made in connection with the case, or copies thereof, within the possession, custody, or control of the State, the existence of which is known or by the exercise of due diligence may become known to the prosecutor.

## 2. **State v. Cunningham**

In *State v. Cunningham*, 108 N.C. App. 185, 195, 423 S.E. 2d 802 (1992), the Court of Appeals construed Section 903(e) as “entitling a criminal defendant to pretrial discovery of not only conclusory laboratory reports, but also of any tests performed or procedures utilized.....to reach such conclusion.” That court looked to the cases and commentary construing Federal Rule 16 for guidance regarding its construction of Section 15A-903(e). The court noted that Federal Rule 16 had been construed to provide a criminal defendant with broad pretrial access to a wide array of medical, scientific and other materials obtained by or prepared for the prosecution:

[b]ecause of the extraordinarily high probative value generally assigned by jurors to expert testimony, of the need for intensive trial preparation due to the difficulty involved in the cross-examination of expert witnesses, and of the inequality of investigative resources between prosecution and defense regarding evidence which must be analyzed in a laboratory....

*Id.*, 108 N.C.App. at 194, 423 S.E.2d at 807-808. Referring to the ABA Standards for Criminal Justice, the Court of Appeals delineated the scope of discovery under section 15A-903(e) to encompass the materials necessary to enable a defendant to determine that “the tests performed were appropriate and to become familiar with the test procedures.” *Id.* (citing 2 A.B.A. Standards for Criminal Justice, Commentary to Standard 11-2.1(a)(iv)2d.ed.1980 & Supp. 1986).

## 3. **State v. Robert Earl Dunn (case in its entirety at the end of these materials)**

After *State v. Cunningham*, there were few cases in North Carolina addressing the scope of material the State must provide under 15A-903(e) beyond the bare results of laboratory tests until *State of North Carolina v. Robert Earl Dunn*, 154 N.C. App. 1, 2003. In that case, an officer testified that he tested the suspected drug substance bought from the defendant with a “Marquis test system.” When the substance tested negative for heroin, he sent the remaining portion to the State Bureau of Investigation lab for further testing. He then took the remaining substance to Lab Corp. in Burlington, North Carolina, to be tested at the defendant’s request. The forensic drug analyst for the SBI, testified that the substance from defendant tested negative for heroin twice, and positive for heroin twice. The chemist from Lab Corp. testified that her analysis “showed it to be at least 90 percent or greater match for heroin.” At the Court of Appeals, the defendant contended that the trial court erred “in failing to require the State to provide defendant discovery information pertaining to laboratory protocols, incidences of false positive results, quality control and quality assurance, and proficiency tests of the State Bureau of Investigation laboratory.....” Pre- trial, the Defendant had filed a Motion for Discovery requesting documents from SBI agents who tested the substance from the defendant. He requested “access to and a copy of all case notes...describing, without limitation, the details of the samples received, and the condition thereof, as well as the full experimental records of the test(s) performed.” The Defendant also asked for laboratory protocol documents, any reports documenting “false positives” in SBI laboratory results, and information about the

credentials of the individuals who tested the substance on behalf of the State. The Court said they were entitled and the Defendant received a new trial.

Practice Tip: An argument the State tries to use to avoid turning over the materials sought is that the materials fall within “reports, memoranda, or internal documents” specifically barred from discovery by N.C. Gen. Stat. Sec. 1A-904. Such argument obviously fails. The plain language of the leading phrase of Section 15A-904 exempts materials that the State must produce under Section 903(e) from application thereof. “except as provided in G.S. 15a-903(a),(b),(c), and (e), this Article does not require the production of reports, memoranda, or other internal documents made by the prosecutor, law enforcement officers, or other persons acting on behalf of the State in connection with the investigation or prosecution of the case...” N.C. Gen Stat. Sec. 15A-904(a) 1997).

## **B. Science**

### **I. Forensic Drug Chemistry**

Forensic drug chemistry involves the examination and identification of evidence (samples), suspected to contain suspected controlled substances, and identifying and quantifying the results.

A. In Strategic Use of Scientific Evidence, John Tarantino points out correctly in Chapter 8 that the forensic scientist must:

1. isolate and identify the chemical substance using the appropriate scientific technique;
2. determine the presence or absence of other potentially related chemical substances in the specimens taken;
3. quantitatively measure any identifiable chemical substance found in the specimen;
4. use appropriate corroborative tests to confirm the identity and amount of any chemical substance found in the specimen;
5. maintain appropriate measures to secure the collection, storage, and analysis of the specimen to guarantee that no contamination, spoilage, interference, or loss occurs; and
6. issue a report that details:
  - a) the specificity of each test;
  - b) the sensitivity of each test; and
  - c) the reproducibility of each test.

(Fn.1)

## II. Suspected Drugs Commonly Tested

### A. Cocaine

Cocaine – Benzoylmethylecgonine  
Molecular Weight, 303 - - C17 H21 N 04  
Melting Point – 98 degrees Centigrade

- a) Cocaine hydrochloride (salt version) is commonly known as “powered” cocaine, but can appear lumpy if it is pressed.
- b) Cocaine base (crack) is manufactured by mixing cocaine hydrochloride, water and bicarbonate of soda (baking soda), and heating the mixture. Crack is often seen in chunks or lumps, but can be milled to a powder.

### B. Heroin

Heroin – diacetylated morphine

Heroin has a more rapid onset and shorter duration of action than morphine. It has an analgesic potency greater than that of morphine: 3 mg. of heroin is equivalent to 10 mg. of morphine.

### C. Dilaudid

Dilaudid – Hydromophone

Hydromophone is 10 times more potent than morphine in producing analgesia, with correspondingly more respiratory depressant activity. It is highly physically addicting.

### D. Marijuana:

Cannabis sativa L., is a plant with an odd number of leaves, from about five to thirteen. The leaves are long, slender, pointed at both ends, and saw-toothed at the edge. The female of the species has an abundance of cannabis, the high-inducing resin. The tops and leaves are dried to prepare marijuana.

## III. Equivalent Weights And Conversion Measures

1 g.	=	1000 mg.	g. = abbreviation for grams
0.653	=	653 mg.	mg.= abbreviation for milligrams
14.7 g.	=	14,700 mg.	l. = abbreviation for liter
1 Liter	=	1,000 ml.	ml.- abbreviation for milliliter

Simple Hint: Multiplying grams by 1000 converts that weight to milligrams.  
Dividing milligrams by 1000 converts that weight to grams.

#### **IV. Day To Day Management Of Laboratory And Drug Testing**

1. Insure that there are enough personnel with adequate training and experience to conduct the work in the lab.
2. Assure the continued competency of the laboratory personnel through in-service training, review of work and verification of their skills.
3. Prepare a current operations/procedures manual.
4. Review, sign and date changes in the procedure manual in a timely fashion.
5. Establish a quality assurance program.
6. Establish acceptable performance limits for each of the controls, standards, and for internal blind performance testing.
7. Assure and document the validity, reliability, accuracy, precision, and performance characteristics of each test and test system.
8. Take all remedial actions necessary to maintain satisfactory operation and performance of the lab in response to quality control systems not within performance specification. Correct errors in result reporting or analysis of performance testing results. (Fn.2)
9. Make sure all lab licenses and accreditations are current.

#### **V. Commonly Used Laboratory Tests And Equipment**

Note: Attorneys should always find out if a chemist has relied on books, journals, lab protocols etc., for guidance in performing tests and identifying the results. If the chemist has relied on particular books etc., make sure that the chemist is able to give the title, author's name, degree etc. Attorneys should also question the chemist about the drawbacks of each test performed, since every test and procedure has some. Finally, ask the chemist what he/she did to counter the drawbacks of the tests performed.

Practice tip: Always review the SBI Drug Chemistry Section – Drug Chemistry Procedure Manual for a comprehensive review of how the tests are conducted by the SBI. The following tests are just a small sampling to help you get started.

##### **1. Color Tests**

Laboratories routinely use color tests to “identify” drugs. A small amount of a test sample is placed on a plate, then a reagent is added to the sample. Observation of color results is noted. Color tests are generally non-specific. Thousands of other compounds can give the same color reaction. Thus, this test is considered “presumptive” and preliminary only. Some labs screen suspected cocaine with the Scotts Test or Modified Scotts Test to determine if the suspected cocaine is base (crack) or hydrochloride (powder).

Then the technician performs additional tests accordingly.

## 2. Modified Duquenois-Levine Test

Twenty five to sixty mg. of dry crushed marijuana is shaken in a test tube with 2 ml. of Duquenois reagent for one minute. An equal volume of concentrated hydrochloric acid is added. The color changes to a final violet shade. The mixture is then shaken with 1 to 2 ml. of chloroform. If marijuana is present, the violet shade will be transferred to the chloroform layer. The Duquenois test can not absolutely prove the presence of marijuana. It gives a good indication of marijuana.

### NOTE:

Some common vegetable substances could produce the positive test reaction even when cannabis is not present. Carophyllene and thymol, taken from everyday vegetable, will cause this inaccurate result, even if only minute amounts of it are present. Not every substance has been subjected to the Duquenois, or other tests for marijuana.

Thus, it cannot be certain that a substance other than cannabis is causing a positive reaction. Since we do know that there are some substances other than cannabis which do cause the positive reaction, the tests are even more questionable.

With color tests, improper recognition is possible, especially when the sample is small and shows only a hint of color. Age and concentration of reagents are very important at this stage, since old reagents can ruin results as can incorrect concentrations.

## 3. Gas Liquid Chromatography (GLC)

GLC is a method of separating the components of a mixture. Only a highly trained and skilled technician should attempt use of a gas chromatograph. GLC uses different temperatures, columns, and detectors to determine the presence of compounds.

A GLC system includes the sample, the carrier gas, tubing, a solid support and the liquid phase. Components of the sample mixture have a varying affinities for the liquid phase. Thus, components will emerge from the column at different times. When the component emerges from the column, it enters a detector. The detector registers the presence of the component and measures its quantity. The recorder translates the data into a graph.

One major problem with gas chromatography is that its qualitative analysis is nonspecific since different chemicals have identical retention times. The possible duplication of retention times can lead to erroneous identification. Since GLC requires only a small sample, measurement of the sample is critical.

Separations of many mixtures may, however, be achieved by the proper choice of column packing and other experimental conditions. Thus, gas chromatography is

a good method for separating or isolating components – non specifically.  
Remember, however, post isolation identification of drugs is limited. (Fn.1)

Practice Hint: This procedure can be analogized to traffic being routed through a forest, where motorcycles speed right through, zigzagging around trees and coming out of the forest first, small cars are next, big cars next, and the trucks last. Since the columns in a gas chromatograph are like the forest, and the traffic like the unknown mixtures that are injected into the columns, adjusting the spacing of the “trees” by choosing the correct chemicals for separating the compounds and carefully controlling the temperature and carrier flow so that each type of traffic comes out in a neat, readily identifiable group are critical.

#### 4. Thin Layer Chromatography (TLC)

TLC separates and isolates different compounds within a sample. It is not intended as a method for identifying compounds. It does, however, aid in the identification of a particular compound. It is not proof that a specific “drug” is present. It can only be consistent with the known sample.

TLC involves applying a sample to a glass plate coated with silica gel. Once a sample is “spotted” on a plate, the sample must be allowed to dry. It is then placed into a container with developing agent (solvent). The level of solvent must be below the spot on the plate. By capillary action, the solvent travels up the plate (like ink on a blotter), carrying the spotted material. The sample distributes itself on the plate. After drying, the TLC plate is examined under ultra-violet light or developed by stain.

NOTE: Variations in experimental conditions can affect the migration of compounds on TLC plates. There are numerous positions on a thin layer plate that can be differentiated by a color spot, thus making it possible that two different compounds can have about the same position on the plate. Problems with this test also arise when TLC plates are old, moist, or contaminated. If the solvent is old and/or contaminated, the results will be unreliable. Ambient humidity can also contribute to poor results. Therefore, a known standard (reference compound) and a “blank” must be run simultaneously on the same plate as close as possible to the sample examined.

The only way to memorialize the TLC plate is to photograph it, since the spots disappear over time. Without a picture, there is no way of knowing from memory what the spots looked like in every case. Hand drawings are insufficient. Nevertheless, if the technician did not take a picture, the attorney should ask the chemist to describe the pattern of spots which formed without conceding that the picture was unnecessary.

#### 5. Mass Spectrometry (MS), Infrared Spectrophotometry (IR) and Gas Chromatography/Mass Spectrometry (GC/MS)

Mass spectrometry is said to be a very good method of identifying organic substances. The technique is even more respected when combined with gas chromatography (GC/MS). Yet, the following problems have been cited:

- a) the analyst does not have all the information needed for testing;
- b) overlapping peaks showing an impure compound;
- c) the spectrum is incorrectly marked by the analyst;
- d) peaks in the spectrum are unaccounted for;
- e) the parent peak is misidentified. (Fn.2)

The combination of GC/MS/IR is purported to have the highest confidence identification of drugs. (Fn.3)

Remember, THERE IS NO INFALLIBLE SYSTEM IN A LABORATORY.

#### **CHECK LIST: GENERAL**

1. For what type of substance is the test being conducted?
2. What method was used:
  - a) color or other spot test
  - b) neutron activation analysis (NAA)
  - c) gas chromatography (GC)
  - d) gas chromatography/mass spectrometry (GC/MS)
  - e) infrared spectrophotometry (IR)
  - f) ultraviolet spectrophotometry (UV)
  - g) nuclear magnetic resonance (NMR)
  - h) thin layer chromatography (TLC)
  - i) high pressure liquid chromatography (HLC)
3. Are the tests specific or nonspecific for the substance used

#### **CHECK LIST: COLOR TESTS**

1. A reagent control or blank must be available
2. A positive control (known pure substance) must be available
3. The known substance must be compared to the suspected sample (particularly if the analyst has poor color vision)
4. The unknown sample must be purified in order to compare spot test results with standard chart results, since the standard charts reflect only color changes of pure compounds
5. False negatives must be carefully avoided

## **CHECK LIST OF ARGUMENTS TO ATTACK FINDINGS**

1. There is no infallible system. Lab errors generally fall into the following categories;
  - a) human and technical errors
  - b) mislabeling
  - c) misrecordings
  - d) misrepresentations
  - e) case mix-ups
  - f) contaminations – bacterial contamination, and/or residue material in instruments and on glassware
  - g) various interpretive errors
  - h) false positives and false negatives
  - i) use of nonspecific test
  - j) inadequate qualifications of chemist
  - k) problems with instruments
  - l) problems with methods of analysis
  - m) faulty conclusions

### **VI. Selected Areas For Defense Voir Dire And Cross Examination**

1. Education
  - a) Determine the extent of the education of each chemist. Be very specific. Does the chemist have a background in analytical chemistry, organic chemistry, physical chemistry, pharmaceutical chemistry or biochemistry. Find out if the chemist has an advanced degree in science, or if he/she took special courses relevant to drug analysis. Some chemists have not been educated in identifying controlled substances. Many learn only a few techniques on the job. Weed out education and courses that are not relevant to the issue at hand. Examine the chemist regarding his/her teaching experience, academic ranking, honor programs, etc. Inquire as to whether the chemist has authored relevant books, journals, written articles or lectured on the subject at hand.
2. Training and Experience
  - a) Determine how long the chemist has worked on the job.
  - b) Determine whether the chemist has had in-service training, review of work, or any verification of the particular skills involved in the specific techniques.
  - c) Determine if the chemist has had any other training related to the identification of controlled substances.

- d) Weed out irrelevant experience and do not allow the chemist to testify in areas outside the scope of the questioning.
  - e) Find out how many suspected drug substances the chemist has analyzed.
  - f) Show that the chemist does not analyze all possible ways to identify controlled substances.
  - g) Show that the chemist will testify about certain instrumental techniques, yet is not an expert in the instrumental techniques he/she is testifying about.
3. Bias
- a) Determine how many times the chemist has testified in court proceedings, or has prepared for court proceedings on behalf of the State.
  - b) Determine if the chemist refused to speak with the defense attorney prior to the trial, or would only speak to the defense attorney in the presence of the prosecutor.
  - c) Determine when and how often the chemist has received training on “how to testify” for the State. Ascertain if the training was given by police or other biased resources.
4. Lab Problems
- a) Establish that laboratory testing does not always run smoothly. Establish that false positives and false negatives are not unusual and that there are drawbacks to every test. For example, poppy seeds or codeine can sometimes test positive for heroin. Ibuprofen can sometimes test positive for marijuana. (Fn.2) Wind, air conditioning, fluctuating temperatures in the lab, or within the machines, among many other things, can all lead to lab errors. Misrepresentations, or misinterpretation of the test results by the operator resulting from carelessness or lack of experience can also cause major problems. Standards and reagents that are used more than one technician have a high incidence of contamination.
5. Handling of Specimens
- a) Each sample must be collected separately into a chemically clean container (sterile is best), sealed and labeled with a name and ID number, date, place of collection, name of person who has collected the sample, and some indication of the examination required. (Fn.4)
  - b) Laboratory counter tops must be maintained by frequent and thorough cleaning. Disposable paper can be used to cover counter tops for the particular tests, but cleaning is nevertheless essential.
  - c) Gloves should be worn at all times and changed frequently.

6. Standards and Controls
  - a) Technicians/chemists should carefully prepare standards and controls for all lab procedures. Labels should include content, concentration, and date prepared. Mislabeled or contaminated standards are useless.
  - b) If standards are purchased from a manufacturer, the lab should verify the concentration and quality of materials.
  - c) Find out how many technicians/chemists use the same standards.
  - d) When appropriate, blanks should be used in order to determine a baseline, or if contamination is present.
  
7. Integrity of Samples
  - a) Under no circumstances should the technician use a portion of a sample and then return the portion (aliquot) to the original specimen.
  - b) Care should be taken to label samples appropriately.
  - c) Dates and times of assays should be recorded.
  - d) Unusual conditions during a testing procedure should be reported.
  
8. Quantity and Diversity of Sample Information
  - a) Determine the amount of the original sample, the amount analyzed, the amount remaining, and the amount of “other” materials mixed with the sample, e.g., the cutting agents.
  - b) Determine the number of tests run on each sample and whether or not the tests were performed in duplicate. Duplicates serve to back up the reported result.
  
9. Record the Details
  - a) Each analyst should record the details of the samples received, their condition, and keep a full experimental record of the analyses. Attorneys should look at all original data, lab protocols, lab notes, and test results before attempting to examine or cross examine the chemist or toxicologist.
  - b) Question extensively on where and how the samples were stored and who had access to the samples.
  - c) Find out information regarding the internal chain of custody in order to determine if samples were co-mingled. Review chain of custody documentation.
  - d) The lab should have available quality control and quality assurance records.
  - e) The lab should have procedure manuals and lab protocols. The principle of each assay should be recorded, and directions for equipment calibration should be available.
  - f) The lab should maintain manuals for all lab equipment.
  - g) Records should be kept when chemicals/reagents are received or made in the lab, and the expiration dates should be carefully documented and observed.

## **ALL LABORATORY RECORDS SHOULD BE KEPT IN A WAY TO PERMIT A VALID SCIENTIFIC REVIEW OF THE DATA**

### 10. General Laboratory Information

- a) The lab should engage in Validation Studies i.e. to determine if they are having general contamination problems, and/or to show that the techniques they are using are valid, and to validate that the lab itself can perform the tests properly.
- b) The lab should engage in Proficiency Studies, in order to validate their methods for ascertaining false positive rates. Ideally, labs should have external blind proficiency tests.

### 11. Glassware

- a) If a lab is not using disposable glassware, the glassware must either be cleaned in acid or autoclaved, and checked periodically for contamination. If disposable glassware is used, packaging must be carefully checked for breaks in the seal. Contamination is common when residue material is left behind on glassware. Some proteins stick to glassware, thus making the cleaning process more difficult. Minute amounts of residue can change results dramatically.
- b) Damaged glassware must always be discarded.

### 12. Equipment

- a) All lab equipment must be properly maintained. Find out who sets up laboratory equipment/machines. Find out who specifically calibrates the individual equipment/machines, who prepares the columns etc., and who is responsible for troubleshooting. Find out if all technicians/chemists are responsible for reading the equipment manuals. Find out when and who services the laboratory equipment.
- b) Temperatures of dependent equipment should be checked and recorded daily.
- c) Balances (scales) should be serviced regularly, and cleaned and zeroed after each use.
- d) Laboratory equipment should be calibrated and cleaned on a regular basis.

## WHAT TO EXPECT FROM THE SBI CHEMISTS

(FROM: Drug Chemistry Sections in Training Manual  
State Bureau of Investigation)

### I. Structure of Substance

A basic operating principle for any drug chemist considering the identification, separation, obtaining analytical data, or performing a procedure involving a drug is to know the structure of the substance in question. Thus,

- a) Be able to draw drug structures when given the name and give the name when presented with a structure.
- b) Be able to list several examples of drugs and draw structures when given a general drug class.
- c) Be familiar with the North Carolina Controlled Substances Act and be able to use it to determine if a particular structure is controlled, using both the listings of the various schedules as well as the definitions.
- d) Complete a comprehensive exam.

### II. Color Testing

Chemists will be required to demonstrate knowledge in areas of color testing.

- a) Make color test reagents.
- b) Review the Drug Chemistry Technical Procedure Manual (Section A: Preliminary Tests)
- c) Test a wide variety of controlled and non controlled drugs in each type of color test reagent.
- d) Practice techniques and consistency with drugs and reagents.
- e) Complete a set of 12 unknowns.
- f) Complete a comprehensive exam based on structure and reactivity of compounds.

### III. Ultraviolet Spectroscopy

Chemists are required to demonstrate knowledge in the following areas of ultraviolet spectroscopy:

- a) Become familiar with the UV spectrophotometer and obtain UV spectra of representative samples from various drug classes.
- b) Recognize certain structural groups in drug compounds.
- c) Understand and be able to explain solvent and pH effects on the UV spectrum of compounds.

- d) Understand the relationship between transmittance, sample thickness, and concentration.
- e) Review the Drug Chemistry Technical Procedures Manual on Spectrophotometer.
- f) Complete the laboratory and general exercises.
- g) Complete a comprehensive exam.

#### IV. Thin Layer Chromatography

Chemists are required to demonstrate knowledge in the following areas of thin layer chromatography:

- a) Explain the principles of:  
Absorption; solubility; stationary phase; mobile phase; sample; Equipment required; development of chromatogram; detection of separated sample; evaluation of chromatogram.
- b) Become familiar with the systems used for particular drugs, and work to develop good techniques in sample application.
- c) Review the Drug Chemistry Technical Procedures Manual on Thin Layer Chromatography.
- d) Run samples from various classes of compounds utilizing at least three solvent systems.
- e) Complete laboratory exercises.
- f) Complete a comprehensive exam.

#### V. Infrared Spectroscopy

Chemists are required to demonstrate knowledge in the following areas of infrared spectroscopy:

- a) Review the theory of IR spectrophotometry.
- b) Become familiar with instrument operation and obtain IR spectra of representative samples from various drug classes.
- c) Be able to explain the basic working principles of a grating spectrophotometer and a Fourier transform spectrophotometer.
- d) Review the Drug Chemistry Technical Procedures Manual on Infrared Spectrophotometry.
- e) Complete general exercises.
- f) Complete a comprehensive exam.

#### VI. Separation Method

Chemists are required to demonstrate knowledge in the following areas of separation methods:

- a) Read background material and review acid-base theory.  
Recognize acids, bases, and neutral compounds from structure.  
Understand acid-base theory for aqueous and nonaqueous media.

- Know relative strength for various structure types for acids and bases.  
Be able to explain why acids are acidic and bases are basic.
- b) Review Drug Chemistry Technical Procedures Manual.
  - c) Complete Exercises in Training Manual.
  - d) Prepare separation schemes for common drug preparation
  - e) Successfully extract 12 drug samples including mixes, time release, and low dose preparations.
  - f) Complete a comprehensive exam.

## VII. Marijuana Analysis & Microscopic Techniques

Chemist are required to demonstrate knowledge in the following areas of marijuana analysis and microscopic techniques:

- a) Describe the morphological characteristics of marijuana.
- b) Be familiar with the legal definition of marijuana and hash, including which parts are controlled substances.
- c) Review of the library of spices to compare their characteristics with those of marijuana.
- d) Perform thin layer chromatography on marijuana and hashish.
- e) View a variety of diluent materials under the polarizing microscope and complete a proficiency exam.
- f) Review the Drug Chemistry Technical Procedures Manual re: polarized light microscopy. Use the reagents listed with a variety of commonly encountered controlled substances.
- g) Perform optical isomer determination techniques on propoxphene and complete a proficiency exam.
- h) Complete a comprehensive exam on marijuana analysis and a proficiency exam using microcrystalline techniques.

## VIII. Gas Chromatography

Chemists are required to demonstrate knowledge in the following areas of gas chromatography:

- a) Basic concepts of gas chromatography.
- b) Basic instrumentation, column, detectors, and injectors.
- c) Review the Drug Chemistry Technical Procedures Manual re: gas chromatography.
- d) The effect of temperature and flow rate on retention times and resolution.
- e) Sample preparation and injection techniques.
- f) Perform qualitative and quantitative procedures, including data handling and programming integrators or using Windows based software.
- g) General maintenance procedures, including gas cylinders, septum, and column replacement.

- h) Proper selection of liquid phases and columns appropriate for sample analysis.
- i) Complete 4 laboratory exercises dealing with qualitative and quantitative procedures utilizing normalization and internal standard techniques.
- j) Complete a comprehensive exam.

IX. Mass Spectrometry

Chemists are required to demonstrate knowledge in the following area of mass spectrometry.

- a) Become familiar with the quadrupole mass spectrometer and be able to explain how a mass spectrum is obtained using the GC/MS system.
- b) Review the Drug Chemistry Technical Procedures Manual re: Gas Chromatograph/Mass Spectrometer.
- c) Be able to use the index of hydrogen deficiency rules.
- d) Recognize spectra that contain chlorine or bromine atoms.
- e) Explain the concept of resolution in mass spectrometry.
- f) Explain the use of isotope ratio data to determine molecular formulas.
- g) Explain the McLafferty rearrangement.
- h) Demonstrate proficiency by running samples on a mass spectrometer in the Drug Chemistry Section.
- i) Complete the general exercises in the Training Manual.
- j) Complete a proficiency exam.
- k) Complete a comprehensive exam.

X. Policy Review, Report Writing, and General Unknowns.

Chemists are required to demonstrate knowledge in the following areas:

- a) Special case assignments; disposition of evidence; monitoring of court testimony; inventory of controlled substance standards.
- b) Documentation; control of equipment...reagents, chemicals, and scientific supplies; evidence handling procedures; internal quality control; data analysis and statistics.
- c) SBI Manual re: evident control; drug chemistry section.
- d) SBI Crime Laboratory Policy and procedure Manual re: case prioritization; court appearances; evidence handling; laboratory records/case files; laboratory facility protocol; safety issue.
- e) SBI Crime Laboratory re: lab case file.
- f) SBI Technical Procedures Manual re: random sampling.
- g) Review correct note taking and report writing procedures.
- h) Obtain a user ID and become familiar with the Crime Lab Information Management System.
- i) Be able to demonstrate the procedures for evidence transfer, report writing, scheduling and case information management.
- j) Successfully analyze a set of unknowns and document the analysis according to proper SBI Drug Chemistry Section Policy and Procedure.

## XI. Some Abbreviations for Analysis Notes/Report Writing

- a) Evidence Description
  - ME = manila envelope
  - PB = plastic bag
  - PBC = plastic bag corner
  - Packet = any small paper, plastic, or foil package (bundle).
  - Glassine Packet = as above, a special waxed paper
  - Vial = any number of cylindrical, plastic or glass containers such as prescription vials, candy, containers, etc.
  - Injection Vial = glass container with rubber stopper, usually contains liquid or residue
  - Injection ampule = another container for injection liquids, contains scored neck to be opened by breaking. May also contain powder for making solutions
  - C = containing
- b) Items not analyzed
  - SME reported to contain off-white hard material. (Used when chemist cannot see the actual evidence)
- c) Seals and Identification
  - Abbreviations for seals and identification may be placed in parenthesis and do not appear on the typed report
  - S or SID = sealed, initialed, dated
  - U = not sealed, no identification marks
  - SmZpl = small zip-locked plastic bag(s)
- d) Results of Analysis
  - NCS = No controlled substance
  - NE = Not examined
- e) Disposition of Evidence
  - FCM = First Class Mail
  - Retain = evidence to be retained by the evidence technician for pickup by officer
  - UPS = evidence to be returned by UPS, total weights two pounds or more
- f) Unusual Dispositions
  - When items are worked in the presence of the officer and returned the same day, both sign for transfer of evidence on SBI-5. The report then reads: Evidence was returned to submitting office on (date). For transfers within the lab, the report will read: The packaging from items #2 and #4 were transferred to S/A J. Doe of the ....section on (date). The unconsumed portion of the evidence was returned via FCM.

## XII. Training Notes on Case Analysis and Report Writing

- a) The chemist's initials or name, date (case started), and the lab file number should appear on the cover sheet and at the heading of each page. In addition, the date finished should also appear in the notes and on the cover sheet if different from the starting date.
- b) Initials, date, lab number, and item number should also appear on each piece of date (ir, uv. Etc.) and each item of packaging materials. (item numbers are required on the inner piece of packaging, even if it is a one item case.)
- c) A standard is required for the identification of a controlled substance. FTIR standards or GC/MS library spectra are required when controlled substances are identified using these techniques. Standards of non specific techniques (i.e.UV) are not required, only the specific technique used. Infrared standards are required in each case file when a substance (controlled or noncontrolled) has been identified using IR data and the substance is stated on the report. (This includes cocaine base standards when GC/MS data is present for crack samples.) Standards are not required for noncontrolled substances when the lab report reads "NCS".
- d) GC/MS data must be initialed for chain of custody and be labeled with header information/page numbers.
- e) The base form of cocaine should be identified and reported, when possible. There are different sentencing guidelines for cocaine base in Federal Court.
- f) When greater than 1 gram of a controlled substance is received, the returned weight should appear in the lab case notes. For items less than 1 gram, no returned weight is required.
- g) Any differences in the number of discrete units (ten tablets, six paper squares etc.) or major differences in packaging should be noted and documented.
- h) A logbook depicting the case number, dates received, worked, and returned, origin (who submitted) and results will be maintained by each chemist.
- i) The Reagent Log should list the dates made/expiration dates of reagents. Each reagent bottle should bear the appropriate ASCLD required information.
- j) Any information received or released about a case will appear on a Telephone Log (or stapled to one if it comes in written form via email or fax) and will bear the case file number.
- k) Release of Case Information is LIMITED to the requesting officer or his supervisor and the DA or US Attorney assigned to prosecute the case. SBI field agents whose case number appear on the lab report can

also receive case information. This does NOT include partners of requesting officer, defense attorneys (unless authorized by DA/US Atty), or DEA, AFT, or other law enforcement agencies who may be involved in the case.

- l) Each chemist is responsible for maintaining a log of the monthly verification of their balance calibration.
- m) Weekly case statistics are to be included on the Activity Summary turned in each Friday. This includes the number of cases received during the week, number completed, total number on hand and the date the oldest case was submitted to the laboratory.
- n) Monthly case statistics should be submitted to the section supervisor and should include the following information for each county:
  - number and total amount of all cocaine cases weighing over one gram
  - Number and total weight of all heroin cases
  - Number and total dosage units for all LSD cases with a description of any blotter paper
  - Number and total weight of all methamphetamine/amphetamine cases
  - Any unusual cases analyzed for the month

### XIII. Expert Testimony and Mock Trial

Chemists are required to demonstrate knowledge in the following areas:

- a) Successfully analyze a representative drug case and present results in a mock trial
- b) Explain qualifications in a clear and concise manner
- c) Explain techniques used in non-technical terms
- d) Answer questions about the validity of standards
- e) Adequately explain opinion based on a series of nonspecific tests
- f) Understand the advantage of using general terms to describe evidence and procedures
- g) Understand the advantage of not volunteering extraneous information
- h) Recognize the importance of remaining calm under intense cross-examination.

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## SOME QUESTIONS TO GET YOU STARTED

### **Re: color tests**

You used a color test for screening purposes, correct?

Color tests are not definitive, right?

Many compounds give the same color reaction, isn't that true?

That's why the color tests are considered presumptive and preliminary only, right?

In fact, this initial test alone is insufficient as far as both the scientific and legal community are concerned, isn't that right?

That is because they are not reliable since you can get false positives, isn't that true?

Nevertheless, you screened with a color test and said that the sample turned blue, but there is no picture taken so someone can look at it in the future or now and see the color you say was there, correct?

Although you mentioned some chemicals that you used in performing the test, one e.g. was HCL, you didn't write the amounts down anywhere, isn't that true?

So, if someone looking at your notes without you here, that person can't say, this chemist used 2 grams of x and mixed it with y, isn't that right?

And we don't know when the chemicals you used came into the lab, do we?

And we don't know how and when they were mixed?

And if they were mixed properly?

And if they were mixed/used before their expiration date?

### **Same for the GC screen**

In performing gas chromatography, you would agree that only a highly trained and skilled technician should attempt use of a gas chromatograph, isn't that right?

In fact, there is a big difference between a chromatographer vs. an instrument operator, wouldn't you agree?

In looking at your notes, there is no mention of who calibrated the machine, who prepared the columns, and who was responsible for troubleshooting, isn't that right?

You would agree that if the machine isn't calibrated properly, the results would be useless, right?

You would also agree that if the columns weren't prepared right, the results would be useless, right?

It would appear that you didn't make notes about the temperature, isn't that right?

And, you would agree that temperature variation in the machine can mess up the results of the test, isn't that right?

You do agree that laboratory equipment has to be calibrated and cleaned on a regular basis, wouldn't you?

Cause, if the machine was dirty, the sample you are testing would get contaminated, isn't that right?

And, since the gas chromatograph requires only a small sample for testing, measurement of that sample is critical, isn't that right?

Etc. Etc., Etc.

Now, let's talk about standards.

You would agree that the only way to do a proper test is to use a standard, isn't that right?

And so a lay person can understand this, you would agree that a standard is a known amount of, in this case, cocaine, correct?

You need the standard e.g. to calculate the percentages you talked about, right?

And the reason you need a standard is so that you can compare the results you get from the unknown with the known, correct?

Just so the jury understands, one can think of it as dollar bills, right?

For example, if you have a real dollar, and you are trying to see if you can find counterfeit dollars, you would compare the real dollars to the unknown ones that you have – lets say from a sting operation, right?

And you would agree that standards and controls should be carefully prepared for all lab procedures, isn't that right?

They should be labeled with content, concentration and the date prepared, correct?

Mislabeled or contaminated standards are useless, right?

And since you purchase the standard from a manufacturer, the lab should verify the concentration and quality of the materials, right?

And, when appropriate, blanks should be used in order to determine a baseline, or if contamination is present, correct?

And so the jury understands, a blank is something that basically has no sample or standard in it, e.g. plain distilled water, right?

Now with regards to lab equipment and machines, e.g. the gas chromatograph, as we mentioned, the machines must be calibrated, right?

They are like scales, i.e. if you set them low, they'll give you an improper reading, isn't that right?

And when you calibrate a machine, that means that you are sure it has no contamination in it, right?

So, calibration is the key to getting good results when you are in the lab, right?

After all, these are some of the things you learned when you went through your training, right?

You generally don't learn these things in college, do you?

Unless, of course, you specialize in forensic chemistry, you probably didn't even learn about the testing of cocaine in college, right?

You never learned, e.g. what the real name is for cocaine in college, right?

You didn't learn what the molecular weight or formula was for cocaine in college, right?

You can't even write it on the board for us now, can you?

You didn't learn in college that the melting point of cocaine was 98 degrees, did you?

Etc., Etc., Etc.

Now with regards to doing a sample in duplicate, you would agree that doing duplicates assure you that you are getting proper results, isn't that true?

It is like checking a math column twice, right?

You want to make sure the result you got was accurate, isn't that right?

Now with regards to your testing – isn't it true that your results and methods are useless if someone can't repeat what you did?

And in order to repeat what you did, someone has to be able to look at your work sheets and know what you did?

So if they aren't conclusive, then we have to take your word, which down the road may be impossible, right?

Someone wouldn't be able to come into the lab down the road, retest the unknown e.g. see if it was stored properly, not contaminated etc. if your notes and methods weren't complete, right?

Re: chemicals

Isn't it true that most chemicals have expiration dates?

Isn't it true that some chemicals can denature in heat?

So isn't it imperative to write down the names of the chemicals you used and their expiration date to assure us that you didn't use denatured or expired chemicals?

And that's because chemistry is like baking, not like cooking, correct?

What I mean by that is that with cooking you can add a little of this, and a little of that, and your recipe will work, but with baking, if you are off by a bit, your results are no good.

For example, if your yeast is expired, your bread may not rise, right?

And that is why I compare it to chemistry – if you are off in your measurements by a little, or your chemicals are denatured or expired, your results will be wrong, isn't that right?

And you would agree:

1. There is no infallible system
2. There are many laboratory problems
3. Laboratory testing doesn't always run smoothly
4. Wind, air conditioning, fluctuating temperatures in the lab, or within the machines among many other things can all lead to lab errors

5. Standards and reagents that are used by more than one technician have a bigger incidence of contamination
6. Lab errors generally fall into the following categories;
  - a) human and technical errors
  - b) mislabeling
  - c) misrecordings
  - d) misrepresentations
  - e) case mix ups
  - f) contamination – bacterial contamination, and or residue material in instruments and on glassware

You would also agree:

Contamination occurs if a sample is not put into a chemically clean container. Counter tops must be maintained by frequent and thorough cleaning and gloves should be worn, right?

Where does it say you did that?

And you would agree that your own procedures manual at section H6 with regards to the gas chromatograph says that the syringe must be flushed at least 10 times with clean solvent between injections to insure sample integrity between injections and to insure that no sample transfer is made between vials. You did read that, didn't you?

And the reason that is so important is because glassware in the lab is one of the roots of contamination, right?

Contamination is common when residue is left behind on glassware, right?

In fact, some proteins stick to glassware, thus making the cleaning process more difficult, correct?

And, minute amounts of residue can change results dramatically since some of these tests measure micrograms i.e. 1/1000 of a mg.

And so we understand how small that is, a sweet and low packet is one gram.

And to complete the list of possible lab errors, you would agree that some fall into these categories, right?

- g) various interpretive errors
- h) false positives and false negatives
- i) use of nonspecific test
- j) inadequate qualifications of chemist
- k) problems with instruments
- l) problems with methods of analysis
- m) faulty conclusions

Now, have you read a paper called the use of GC, IR, MS for High Confidence Identification of Drugs, published in Clin. Chem. Vol. 35, No7?

Since you haven't read that, you would agree that real forensic experts have taken the position that the only acceptable confirmation test is GC/MS, isn't that right?

In fact, the FDA and the federal government have urged its use, did you know that?

ETC, ETC, ETC.

NOTE: the article below as just another recent example of why we need to examine the "science".

Oct. 31, 2003, 12:04AM

Shutdown at lab called 'nightmare'  
Prosecutor fears toxicology crisis could affect thousands of cases  
By ROMA KHANNA  
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This week's shutdown at the Houston crime lab could have an impact far beyond the division involved, a prosecutor said Thursday, voicing fears that the latest crisis will make the lab's problems with DNA testing "look like a cakewalk."

One day after the Houston Police Department shuttered its toxicology division, Assistant District Attorney Marie Munier said her office is bracing for the possibility that the lab's newest problems could affect thousands of cases. Prosecutors are set to launch a review of Pauline Louie's work as supervisor and lone analyst of the toxicology division, but Munier noted that Louie also supervised the enormous narcotics division.

"This is like a nightmare," Munier said. "If this leads to questions about drug testing, the numbers are going to be astronomical. But if there is the possibility that messed-up lab work put someone in prison, we have to fix it."

HPD shut down the crime lab's toxicology division, which tests blood and urine for drugs and alcohol, and suspended Louie after she failed a competency test administered as part of the process to earn national accreditation for the lab. When the Police Department last year closed the DNA division, it prompted a review of 1,300 cases and retesting of evidence from nearly 400 of those.

Louie, a 28-year HPD veteran, has performed toxicology tests for at least three years and calibrated the machines that test the breath of suspected drunken drivers. One of the crime lab's highest-ranking analysts, Louie also managed the staff of 15 analysts in the narcotics section, which performs the most tests of any of the lab's five analytical divisions.

As of now, District Attorney Chuck Rosenthal said he plans to review only those cases that Louie analyzed and involve the type of test she failed. That would include about 170 tests, though Rosenthal could not say how many of those led to criminal charges. Louie's work could have affected cases involving offenses such as intoxication manslaughter, intoxication assault and driving while intoxicated.

But Munier warned that Louie's role as head of narcotics testing and the possibility that the lab's toxicology procedures were wrong could spell a much larger review.

"You could not pick an area with a larger caseload than narcotics, and she supervised that section," Munier said.

The narcotics section received nearly 16,000 controlled-substance cases in 2002, according to HPD records. Also, Louie has managed several part-time employees in the toxicology division the last few years, and some say these analysts also may have used her problematic protocols.

The district attorney's office had already begun to develop a database of cases that might be affected, Munier said, and will meet with police officials to determine the scope of the review.

HPD has begun its own internal investigation that will include an examination of Louie's other work. It is the second such investigation stemming from problems in the crime lab. The probe initiated because of the DNA problems concluded in June with discipline recommended for nine employees, including Louie and an assistant police chief. (Louie was suspended then for seven days and cited for failing to inspect equipment and failing to complete an inspection checklist.)

Meanwhile Thursday, defense lawyers and other forensic scientists say the toxicology case review must go beyond Louie's work on the type of test she failed.

"If you are incompetent in one area, why would we assume you are competent in other testing, training or even determining whether another analyst is competent?" said Gary Trichter, a Houston lawyer who handles many DWI cases.

Trichter, who has observed HPD's analysts for years, said he is not surprised there are questions about their toxicology work.

"The people they have testifying are technicians, not experts," Trichter said. "(Louie) was certainly more knowledgeable than other people working there, but the fact that one would have those people work for you raised questions."

Louie has worked in forensic sciences for at least 17 years and since 1992 has been one of the crime lab's highest-ranking analysts. She also was one of the early members of the Southwestern Association of Forensic Scientists, serving as president in 1986-87.

After her suspension Tuesday, HPD officials declined to describe her mistakes on the competency test. But Rosenthal said she made errors on three analyses in the lab portion of the test.

In two samples, Louie identified a drug that was not present -- a mistake known as a false-positive -- and she failed to find a drug that was present in a third sample, Rosenthal said. He added that she may have used an instrument meant for large samples of drugs on a small sample of blood or urine.

Bruce Goldberger, an associate professor and director of toxicology at the University of Florida, said such errors are troublesome.

"A false-positive finding is a very egregious finding because, generally, a positive result is used in a punitive way," Goldberger said. "A false-negative doesn't bother me as much."

Goldberger said a false-positive could signal problems with lab controls.

"It is not a good idea for a toxicology lab to analyze samples like pure cocaine at the same time you are analyzing biological samples because of the possibility of contamination," he said.

The district attorney's office will begin its review, Munier said, by attempting to identify which cases -- regardless of analyst -- were processed on the machine in question.

<http://www.chron.com/cs/CDA/printstory.hts/front/2193034>

STATE OF NORTH CAROLINA

v.

**ROBERT EARL DUNN**, Defendant

NO. COA01-487

NORTH CAROLINA COURT OF APPEALS

Filed: November 19, 2002

Appeal by defendant from judgment entered 1 November 2000 by Judge Henry W. Hight, Jr. in Durham County Superior Court. Heard in the Court of Appeals 14 February 2002.

Attorney General Roy Cooper, by Assistant Attorney General John G. Barnwell, for the State.

Lisa Anderson Williams, for defendant-appellant.

HUDSON, Judge.

Defendant was convicted on 25 October 2000 of selling heroin, delivering heroin, and possessing heroin with the intent to sell and deliver it. He was sentenced to a minimum term of 168 months and a maximum term of 211 months. Defendant appeals his convictions.

The pertinent facts are as follows: Officer W.M. Evans, an investigator with the Durham Police Department, testified at defendant's trial that while he was working in the street crimes unit he participated in a drug bust on 30 April 1999. Officer Evans operated an unmarked "white panel van" equipped with audio and visual surveillance equipment on Elm and Hopkins Streets in Durham as part of an ongoing investigation regarding drug activity.

On the evening at issue, Officer Evans pulled up to the corner, rolled down his window, and a man, later identified as the defendant, approached his window. Officer Evans asked defendant for a "bag of boy;" "[b]oy is a street term for heroin." Defendant told Officer Evans "[f]ollow me," then defendant "began to walk west on Hopkins Street." The officer followed him in the van and defendant walked behind the Greater Zion Wall Baptist Church on Hopkins Street. Defendant returned to the van and gave Officer Evans "a glassine bag with a red sun on it;" Officer Evans gave defendant twenty-five dollars in return. Officer Evans drove away, made notes of what happened, put the glassine bag in a plastic evidence bag, and described defendant to other police units in the area. He then returned to headquarters, reviewed the surveillance video, and was contacted by Investigator Mike Berendson, a Durham Police Officer familiar with local drug dealers and users, when defendant was apprehended.

Officer Evans testified that he tested the substance bought from defendant with a "Marquis test system." He explained that the Marquis test system is "an ampule [the police] have to test cocaine, marijuana, heroin, you know, different things. You break the ampule open, it has a little solution in there. You would take a paper clip, stick i[t] into the bag of heroin, get a little bit of residue on there, stick it into the bag, and if it turns purple, it means it's tested positive for heroin." The substance at issue here tested negative and Officer Evans sent the remaining portion to the State Bureau of Investigation (the "SBI") lab for further testing.

Officer Evans explained that one possible reason that the substance tested negative for heroin was that "[h]eroin on the street is only 30 to 35 percent [pure]" and that the other sixty-five to seventy percent of a bag of heroin sold on the street customarily is made up of manitol, a cutting agent. Manitol does not test positive in the Marquis test.

After the SBI lab finished testing the substance in the glassine bag, Officer Evans picked up the remains of the substance and, pursuant to the court's instructions, took it to Lab Corp in Burlington, North Carolina, to be tested at the defendant's request. Officer Evans retrieved the remaining portion of the substance from Lab Corp and returned it to the property room at the police station in Durham, where it stayed until trial.

In response to questions concerning possible identity confusion between defendant and his brother, Officer Berendson testified that he was familiar with both brothers. He confirmed his identification of defendant as the person who sold a substance to Officer Evans. Other

Later Citations

employees of the Durham Police Department also testified to establish the chain of custody for the substance recovered in the drug buy.

Special Agent Wendy Cook, forensic drug analyst for the SBI, testified that the substance purchased from defendant tested negative for heroin twice, and positive for heroin twice. Cook did not conduct all of the tests herself, but read the results as indicating that less than one-tenth of a gram of heroin was present in the sample. She explained that this procedure (reading tests performed by others) was standard procedure at the SBI laboratory. During voir dire, Agent Cook acknowledged that most of the documents requested by defendant as additional discovery existed and were available. The State did not provide these documents to defendant.

Over the objection of defendant, the State called Ms. Gail Ingold and Ms. Mitzi Walker to testify. Both were employed by Lab Corp in Burlington, which had been retained by the defendant to perform independent testing on the substance. Ms. Ingold testified to the chain of custody of the sample she received from Officer Evans. Ms. Walker, a chemist, testified that her analysis "showed it to be at least 90 percent or greater match for heroin."

The jury convicted defendant of selling heroin, delivering heroin, and possession of heroin with intent to sell or deliver it. After the verdict was entered, the same jury heard evidence and convicted defendant of the status of habitual felon pursuant to N.C. Gen. Stat. § 14-7.1 (1999). The court then sentenced defendant to a minimum of 168 months and a maximum of 211 months in prison. Defendant appealed.

In his first assignment of error, defendant contends that the trial court erred "in failing to require the State to provide [defendant] discovery information pertaining to laboratory protocols, incidences of false positive results, quality control and quality assurance, and proficiency tests of the State Bureau of Investigation laboratory when State Bureau of Investigation chemists tested the substance that the State alleged to be heroin four times and only two of those tests returned a positive result for heroin." Defendant filed a Motion for Discovery on 28 March 2000 requesting documents from SBI agents who tested the substance bought from defendant. He requested "access to and a copy of all case notes . . . describing, without limitation, the details of the samples received, and the condition thereof, as well as the full experimental records of the test(s) performed." Defendant also asked for laboratory protocol documents, any reports documenting "false positives" in SBI laboratory results, and information about the credentials of the individuals who tested the substance on behalf of the State. Eleven pages of laboratory notes from the SBI are included in the record. The record contains no reports concerning false positives at the SBI laboratory, laboratory protocol documents, or credentials of the laboratory employees involved in this case, which apparently were not given to defendant.

The defendant's right to discovery of exculpatory information stems from the Constitution. *See Brady v. Maryland*, 373 U.S. 83, 10 L.Ed. 2d 215 (1963). In *Brady*, the Court held that "suppression by the prosecution of evidence favorable to an accused upon request violates due process where the evidence is material either to guilt or to punishment, irrespective of the good faith or bad faith of the prosecution." *Brady v. Maryland*, 373 U.S. at 87, 10 L.Ed. 2d at 218. Therefore, a defendant is entitled to discovery from the prosecutor of all information within the scope of *Brady*. However, our courts have noted that, [w]ith the exception of evidence falling within the realm of the *Brady* rule, . . . there is no general right to discovery in criminal cases under the United States Constitution, thus a state does not violate the Due Process Clause of the Federal Constitution when it fails to grant pretrial disclosure of material relevant to defense preparation but not exculpatory.

*State v. Cunningham*, [108 N.C. App. 185](#), 195, 423 S.E.2d 802, 808 (1992).

In North Carolina, the General Assembly has expanded the defendant's right to discovery through the enactment of N.C. Gen. Stat. § 15A-903. Subsection (e) provides that, "[u]pon motion of the defendant, the court must order the prosecutor to provide a copy of or to permit the defendant to inspect and copy or photograph results or reports of physical or mental examination or of tests, measurements or experiments made in connection with the case . . . ." N.C. Gen. Stat. 15A-903(e) (1999). Defendant contends that the discovery he sought before trial would have given him and his attorney the ability to understand the test results received from the SBI laboratory, would have helped explain why the substance tested negative in two of the four SBI tests, why the SBI laboratory technicians ruled out the negative tests, and how often the SBI laboratory returns false positives on similar substances. The trial court denied defendant's motion for additional discovery, and the State provided defendant with the eleven pages of tests and laboratory results which are included in the record.

Defendant relies upon *Cunningham* as authority for his argument that the trial court erred in refusing his request for the additional documents. In *Cunningham*, the defendant received through discovery only an SBI laboratory report, which was "limited to a statement that the material analyzed contained cocaine, reveals only the ultimate result of the numerous tests performed . . . ." 108 N.C. App. at 196, 423 S.E.2d at 809. Explaining that this did not "enable defendant's counsel to determine what tests were performed and whether the testing was appropriate, or to become familiar with the test procedures," in *Cunningham*, the Court held that this additional information was discoverable under N.C. Gen. Stat. § 15A-903(e), and that the trial court erred. *See id.* There we explained that because of the extraordinarily high probative value generally assigned by jurors to expert testimony, of the need for intensive trial preparation due to the difficulty involved in the cross-examination of expert witnesses, and in the inequality of investigative resources between prosecution and defense regarding evidence which must be analyzed in a laboratory, federal Rule 16 has been construed to provide criminal defendants with broad pretrial access to a wide array of medical, scientific, and other materials obtained by or prepared for the prosecution *which are material to the preparation of the defense* or are intended for use by the government in its case in chief.

*Id.* at 194, 423 S.E.2d 807-8. We concluded that there was no evidence the information sought was exculpatory, and that the error was harmless beyond a reasonable doubt in light of "overwhelming evidence of defendant's guilt."

Since *Cunningham*, there have been few cases in North Carolina addressing the scope of material the State must provide under 15A-903(e) beyond the bare results of laboratory tests. *See State v. Bartlett*, [130 N.C. App. 79](#), 502 S.E.2d 53 (1998). In *Bartlett* we granted defendant a new trial, where the State refused to provide "alco-sensor" test results in response to a discovery request under N.C. Gen. Stat. 15A-903(e). "Admission of the alco-sensor test results was error because they were erroneously admitted as substantive evidence and the State violated the discovery rules." *Id.*, 130 N.C. App. at 84. *Cf. State v. Brewington*, [352 N.C. 489](#), 532 S.E.2d 496 (2000), *cert. denied*, 531 U.S. 1165, 148 L.Ed.2d 992 (2001) (holding that polygraph results, which are subjective and unreliable, do not fall within the scope of statute providing for discovery of results or reports of tests, measurements or experiments made in connection with the case); *State v. East*, [345 N.C. 535](#), 481 S.E.2d 652 (1997), *cert. denied*, 522 U.S. 918, 139 L.Ed.2d 236 (1997) (holding that there is nothing in statute authorizing discovery by the state, N.C. Gen. Stat. 15A-905, which limits results or reports of physical and mental examinations of defendant to production of existing written reports). Because the cases are so sparse, we have expanded our research.

The Official Commentary to N.C. Gen. Stat. 15A-903 indicates that it was patterned after Federal Rule of Criminal Procedure 16. *See* N.C. Gen. Stat. 15A-903, Official Commentary; *see, also, State v. Brown*, [306 N.C. 151](#), 163, 293 S.E.2d 569, 578, *cert. denied*, 459 U.S. 1080, 74 L.Ed. 2d. 642 (1982). Although we are not bound by the lower federal courts, we look to cases interpreting Rule 16 for guidance in our interpretation of N.C. Gen. Stat. 15A-903. *Cf. Brewer v. Harris*, [279 N.C. 288](#), 292, 182 S.E.2d 345, 347 (1971), *affirmed*, [279 N.C. 288](#), 182 S.E.2d 345 (1971) (because federal rules are the source of the North Carolina Rules of Civil Procedure, we look to the decisions of federal jurisdictions for guidance). We

also examine cases from other states interpreting discovery statutes similar to our own. In *United States v. Wilkerson*, the defendant asked for very similar information to what defendant sought here: (a) written records, notes and documentation pertaining to the chain of evidence and testing; (b) complete technical procedures, including description of the testing process, criteria for review of data, quality assurance, and standardization; (c) quality assurance programs; (d) internal quality assurance policies and procedures and (e) information regarding the occurrence or frequency of "false positive" results. See *United States v. Wilkerson*, 189 F.R.D 14, 15 (D.Mass. 1999). The prosecution agreed that it would turn over the materials sought in (c), (d) and (e). The court determined that while the working notes of the lab and some of the procedural data were protected as the internal "working papers of the examiner," a detailed summary of the tests was necessary to reveal the examiner's "opinions, the bases and the reasons for those opinions." *Id.* at 16; see, also, Fed. R. Crim. P. 16(a)(2) and 16(a)(1)(E). The court concluded that such a summary must include a description of the sample received, what the examiner did to ready the sample for the test(s), a description of the test(s) (i.e., how the test(s) work(s) to detect the drugs), what physically was done with the sample during the test(s), what physically occurred to the sample as a result of the test(s), what occurred which led the examiner to his or her conclusion that the substance was cocaine, any steps taken to review the test(s) results to insure accuracy, any other action with respect to the sample or the testing, and what the examiner did with the sample after examination.

*Id.* at 16-17. While the material ordered to be disclosed is very similar to that sought in the case at hand, the *Wilkerson* court based its decision upon Federal Rule of Criminal Procedure 16(a)(1)(E), a provision in the federal discovery rule which goes beyond N.C. Gen. Stat. § 15A-903.

In *United States v. Green*, the court ordered the government to "turn over to the defendants not only all scientific reports but also all findings, scientific or technical data upon which such reports are based." *United States v. Green*, 144 F.R.D. 631, 639 (W.D.N.Y. 1992). Unlike *Wilkerson*, the *Green* court based its holding on Rule 16(a)(1)(C) and 16(a)(1)(D), which are the same as the North Carolina statute. See Fed. R. Crim. P. 16; N.C. Gen. Stat. § 15A-903. Significantly, the court favored more extensive discovery because "it would appear to facilitate trial by enabling defense counsel to assess the correctness or sufficiency of the testing and to prepare to cross examine the government's experts and to present defense experts, if appropriate." *Id.*

The trial court's assertion here that "any further information in regards to that, you can surely extract from them on cross examination," overlooks what the courts noted in both *Green* and *Cunningham*: allowing the discovery would enhance *preparation* for cross examination, and permit both sides to assess the strengths and weaknesses of this aspect of the evidence. In addition, we noted in *Cunningham* that Like federal Rule 16(a)(1)(D), Section 15A-903(e) must be construed as entitling a criminal defendant to pretrial discovery of not only conclusory laboratory reports, but also any tests performed *or procedures utilized by chemists to reach such conclusions*. However, unlike under federal Rule 16(a)(1)(D), no requirement exists that such information be material to the preparation of the defense or intended for use by the State in its case in chief.

*Id.* at 194-95, 423 S.E.2d at 808 (emphasis added).

Thus, it is clear from *Cunningham* and *Bartlett* that this court has viewed the North Carolina rule broadly, an approach we are obligated to follow.

Similarly, courts in other states have held that the State should provide more than the bare test results and reports to the defendant in discovery under similar rules. For example, in

*State v. Paul*, the Missouri Court of Appeals held that the State could not use as evidence the results of a chemical breath analysis when it would not release to the defendant upon request 'full information' concerning the chemical test of defendant's breath. They particularly asked about the type of equipment used, whether and when it had been inspected for accuracy and the result thereof, the names and qualifications of persons making the chemical analysis, the time defendant had been observed by the testing personnel, and a description of the procedure used in testing for alcoholic content of the defendant's blood.

*State v. Paul*, 437 S.W.2d 98, 101 (Mo.App. 1969) (superseded by statute that still required full information be given upon request but required a judicial determination of reasonableness, relevance and materiality before State's evidence could be suppressed. See *State v. Clark*, 723 S.W.2d 17 (Mo. App. E.D. 1986)). The Georgia Supreme Court held that "[t]he cross examiner must be able to examine the material that the expert relied upon to support her direct testimony; otherwise a thorough and sifting cross-examination of the expert's intelligence, memory, accuracy and veracity and of her scientific testing and opinion is not possible." *Eason v. State*, 396 S.E.2d 492, 494 (Ga. 1990) (although later overruled by statute, prior statute, upon which the decision was based, is like North Carolina statute). Thus we conclude that the trial court erred by refusing to require the State to provide the defendant the discovery he sought pursuant to N.C. Gen. Stat. 15A-903(e). However, in light of our resolution of the next issue, we need not determine whether this error alone would entitle defendant to a new trial.

In his second assignment of error, defendant contends that the trial court erred in admitting testimony concerning laboratory tests and results of Lab Corp, a testing facility retained by defendant to independently test the substance at issue. Defendant argues that he never intended to call Lab Corp or its representatives as witnesses at trial, and that pursuant to N.C. Gen. Stat. § 15A-905(b), the State would only have been able to inspect results, reports, or documents made in connection with defendant's case, "if the defendant intends to offer such evidence or tests or experiments made in connection with such evidence, as an exhibit or evidence in the case." Thus, defendant contends that, by calling the Lab Corp employees to testify, the State: (1) circumvented North Carolina's rules of discovery; (2) compelled defendant to supply evidence against himself; (3) violated the defendant's Sixth Amendment right to effective assistance of counsel; and (4) violated the defense attorney's work product privilege. We agree that the State's actions violated the defendant's rights to effective assistance of counsel, and related work product privilege. As this is an issue of first impression in North Carolina, we have analyzed this issue in depth and in light of the decisions of other courts which have confronted the issue, and concluded that this result reflects the better-reasoned approach.

Defendant correctly points out that the report of Lab Corp is protected from discovery by the State under N.C. Gen. Stat. § 15A-906, which states that "[e]xcept as provided in G.S. 15A-905(b) this Article does not authorize the discovery or inspection of reports, memoranda, or other internal defense documents made by the defendant or his attorneys or agents in connection with the investigation or defense of the case . . . ." N.C. Gen. Stat. § 15A-906 (1999). The exception provided in the statute allows the State "to inspect and copy or photograph results or reports of physical or mental examinations or of tests . . . , which were prepared by a witness *whom the defendant intends to call at the trial.*" N.C. Gen. Stat. § 15A-905(b)(1999) (emphasis added). If the defendant does not intend to call the witness at trial, the results and reports of tests performed by the witness are protected from pre-trial discovery.

Here, however, the State did not seek to obtain the report of Lab Corp in pre-trial discovery, but instead to present the testimony of Lab Corp employees at trial. Over the objection of the defendant, the trial court ruled:

I'll allow Ms. Ingold to testify, and the other employees that you have from Lab Corp. However, they may not testify to any communication, conversation, or report generated by them and delivered to counsel for the defendant, any communication between them and counsel for the

defendant, and anything that was said to them by counsel for the defendant. Their testimony will be limited to their procedures and the result of any testing which they did upon the substance which was contained in State's Exhibit 2, which was the % identified as the controlled substance.

The wording of the court's ruling and of the State's brief indicate that both believed that, while the report of Lab Corp's testing of the material was protected by N.C. Gen. Stat. 15A-905, the results of the testing were not. We disagree.

While N.C. Gen. Stat. 15A-905(b) is headed "Reports of Examinations and Tests," the clear wording of the statute itself is that the State may "inspect and copy or photograph *results or reports* of physical or mental examinations or of tests . . . , which the defendant intends to introduce in evidence at the trial or which were prepared *by a witness whom the defendant intends to call at the trial . . .*" N.C. Gen. Stat. 15A-905(b) (1999) (emphasis added).

Defendant did not intend to introduce results of Lab Corp's test, or to call the testers as witnesses; thus the results would not have been discoverable had the State asked for them.

However, the fact that the State could not have obtained the results through pre-trial discovery does not necessarily mean they may not be used at trial. In *State v. Hardy*, the defense sought pre-trial disclosure of a transcribed interview of one of the state's witnesses. See *State v. Hardy*, [293 N.C. 105](#), 125, 235 S.E.2d 828, 840 (1977). The State refused, claiming that the material was protected by N.C. Gen. Stat. 15A-904, which "does not require the production of reports, memoranda, or other internal documents made by the prosecutor . . . or of statements made by witnesses or prospective witnesses of the State to anyone acting on behalf of the State." N.C. Gen. Stat. 15A-904(a) (2001). The *Hardy* Court agreed that the material was protected from pre-trial discovery, but held that "G.S. 15A-904(a) does not bar the discovery of prosecution witnesses' statements *at trial*." *Hardy*, 293 N.C. at 125, 235 S.E.2d at 840 (emphasis added). The Court went on to state:

At trial the major concern is the "search for truth" as it is revealed through the presentation and development of all relevant facts. To insure that truth is ascertained and justice served, the judiciary must have the power to compel the disclosure of relevant facts, *not otherwise privileged*, within the framework of the rules of evidence. *Id.* (emphasis added).

Further, in *State v. Warren*, the North Carolina Supreme Court allowed the State to compel discovery of defendant's non-testifying expert's report for use in cross-examination of a testifying expert, stating "even when the statutes limit the trial court's authority to compel *pretrial* discovery, the court may retain inherent authority to compel discovery of the same documents at a later stage in the proceedings." *State v. Warren*, [347 N.C. 309](#), 325, 492 S.E.2d 609, 618 (1997), *cert. denied*, 523 U.S. 1109, 140 L.Ed.2d 818 (1998). However, this was done in the context of a capital sentencing hearing, "where the Rules of Evidence do not apply" and "the trial court must permit the State 'to present any competent evidence supporting the imposition of the death penalty.'" *Id.* at 325-26, 492 S.E.2d at 618. If the State is prevented from compelling a defense expert to testify at trial, this protection must stem from a different source than the discovery rules.

Here the issue arose because agents of the State, while in the process of delivering evidence to the defense expert for testing, served a subpoena on the expert. Under applicable discovery provisions, neither the State nor the defense are required to release the identities of non-testifying experts. See N.C. Gen. Stat. 15A-904, 905 (1999). Without knowing the expert's identity, the adverse party would obviously be unable to compel his testimony.

However, in a case like this, where the court instructs officers to deliver to a defense expert physical evidence held by law enforcement to maintain its chain of custody, the defense necessarily reveals the identity of its expert. The court could, as an alternative, have ordered the evidence delivered to a neutral third party for delivery to the expert in order to protect both the chain of custody and the identity of defendant's expert.

In a similar case of first impression, the Appellate Court of Illinois held that a scientific report by a non-testifying consulting expert retained by the defendant was protected from disclosure to the state. See *People v. Spiezer*, 735 N.E.2d 1017 (Ill. App.3d 2000). The Court

in *Spiezer* stated:

[M]any jurisdictions have held that the reports prepared by nontestifying, consulting experts are protected from disclosure. What is unclear, however, is the proper framework for the analysis. Four distinct bases for such protection have emerged. . . . the fifth amendment privilege against self-incrimination, the sixth amendment right to effective assistance of counsel, the attorney-client privilege, and the work product doctrine.

*Id.* at 1020. As the defendant neither addressed the attorney-client privilege in his assignments of error nor argued it in his brief, we confine our analysis to the remaining three bases.

We first address the Fifth Amendment privilege against self-incrimination. Defendant argues that by compelling the testimony of experts that he retained, the State required him in effect to supply evidence against himself. We disagree. In *United States v. Nobles*, the United States Supreme Court held that "[t]he Fifth Amendment privilege against compulsory self-incrimination is an intimate and personal one . . . . [I]t adheres basically to the person, not to information that may incriminate him." *United States v. Nobles*, 422 U.S. 225, 233, 45 L.Ed.2d 141, 150-51 (1975). The Court concluded that allowing the disclosure to the prosecution of a report prepared by a defense investigator would not violate the defendant's Fifth Amendment privilege which, "being personal to the defendant, does not extend to the testimony or statements of third parties called as witnesses at trial." *Id.* at 234, 45 L.Ed.2d at 151. Although the *Nobles* Court considered the specific instance of the report of a third party who was also a testifying witness, the Court's ruling implies that the Fifth Amendment privilege would not extend to the statements of non-testifying third party consulting experts. We therefore hold that the defendant's privilege against self-incrimination does not bar the State from compelling testimony from a consulting expert retained by the defendant. We next turn to the work-product doctrine, originally recognized by the United States Supreme Court in *Hickman v. Taylor*, where the Court stated:

[i]t is essential that a lawyer work with a certain degree of privacy, free from unnecessary intrusion by opposing parties and their counsel. Proper preparation of a client's case demands that he assemble information, sift what he considers to be the relevant from the irrelevant facts, prepare his legal theories and plan his strategy without undue and needless interference. That is the historical and the necessary way in which lawyers act within the framework of our system of jurisprudence to promote justice and to protect their clients' interest.

*Hickman v. Taylor*, 329 U.S. 495, 510-11, 91 L.Ed. 451, 462 (1947). The Court went on to establish that certain materials, prepared by the attorney in anticipation of litigation, were protected from discovery by a qualified privilege. *See id.* In *Nobles*, the Court extended the doctrine to "protect material prepared by agents for the attorney as well as those prepared by the attorney himself." *Nobles*, 422 U.S. at 238-39, 35 L.Ed.2d at 154; *see, also, Hardy*, 293 N.C. at 126, 235 S.E.2d at 841. The principles of *Hickman* were embodied in Rule 26(b)(3) of the Federal Rules of Civil Procedure. Similar principles are codified in N.C. Gen. Stat. 15A-904 and N.C. Gen. Stat. 15A-906. Although the work product doctrine was created in the context of civil litigation, it applies in criminal cases as well. *See Hardy*, 293 N.C. at 126, 235 S.E.2d at 841. Moreover, although the statutory work product protections may be limited to pretrial discovery, the *Nobles* Court noted that "the concerns reflected in the work product doctrine do not disappear once trial has begun. Disclosure of an attorney's efforts at trial, as surely as disclosure during pretrial discovery, could disrupt the orderly development and presentation of his case." *Nobles*, 422 U.S. at 239, 45 L.Ed. 2d at 154. The *Nobles* Court did

not define the scope of the work product doctrine's protection at trial, holding that the defendant had waived the doctrine's protection by presenting the defendant's consulting expert as a witness at trial.

In *United States v. Walker*, which is closely analogous, the court held that the government was barred by the work product doctrine from calling as witnesses ballistics experts retained by the defendant, but whom the defendant did not intend to call himself. *See United States v. Walker*, 910 F.Supp. 861 (N.D.N.Y. 1995). The court noted that "exhaustive research has disclosed no criminal case in which a federal court has permitted the government to elicit testimony from a defendant's consultative expert concerning that expert's efforts or opinions undertaken or developed at the request of a defense attorney in preparation for a criminal trial." *Id.* at 864. While the court left open the possibility of the government obtaining the testimony of defense experts given "a showing of substantial need and undue hardship," as a general rule the court opposed the practice. *Id.* at 865. "Absent such an area of qualified privileged [sic] within which to prepare for trial a criminal defendant's preparation can only be crippled by the prospect of creating an unfavorable witness every time he attempts to obtain an unbiased assessment of the government's evidence by consulting an expert." *Id.* at 865. We note that the *Walker* court was concerned not only with the admission of the report of a defense expert, but also with the government's attempt to compel the expert to testify, as occurred here.

Similarly, the court in *Speizer* concluded that the work product doctrine was the proper framework within which to analyze the state's attempt to compel pretrial disclosure of the report of a non-testifying, consultative expert retained by the defendant. *See Speizer*, 735 N.E.2d at 1020. In its analysis, the court attempted to distinguish between the work product doctrine and the Sixth Amendment right to effective assistance of counsel. *See id.* at 1025. The court reasoned that the government "violates the right [to effective assistance of counsel] when it interferes in certain ways with the ability of counsel to make independent decisions about how to conduct the defense." *Id.* The work product doctrine, however, operates not only to "protect the reports and potential testimony of nontestifying, consulting experts" but also "to increase the information available to the trier of fact by encouraging the attorney to seek, on his own, information about the case that he could not obtain from his adversary through the discovery process." *Id.* at 1026-27. The court reasoned that the adversarial process of litigation requires a balance between the need of the defendant for confidentiality in developing trial strategy and the need for the trier of fact to have access to the relevant facts of the case. *See id.* at 1026. Because the work product doctrine is a qualified privilege, not an absolute one, the State may defeat the privilege by showing a special need for the testimony of the defendant's consultative expert. *See id.* at 1026. The *Speizer* court concluded:

It is precisely this need to strike a balance between competing interests at trial that precludes protecting the reports and potential testimony of a nontestifying, consulting expert on sixth amendment grounds. If the protection were embodied in constitutional form, it would not be amenable to change by rule, statute, or further case law development. Courts and legislatures should have reasonable freedom to develop new approaches to issues concerning discovery and testimonial privilege. We believe that such freedom would be unnecessarily impaired were our holding to turn on sixth amendment analysis.

*Id.* at 1027.

Several other courts, by contrast, have held that the Sixth Amendment right to effective assistance of counsel is the proper basis upon which to bar the state from attempting to compel the testimony of a non-testifying, consultative witness retained by the defendant. For example, in *State v. Mingo*, the New Jersey Supreme Court confronted the issue when the state sought to compel the testimony of a handwriting expert retained by the defendant.

*State v. Mingo*, 392 A.2d 590 (N.J. 1978). Initially, the court noted:

The State had no justification for calling defendant's handwriting expert as its witness. If it considered the identity of the disputed note's author to be a critical part of its case, the State was fully capable of retaining its own expert. The better practice would have been for it to have done so, and thus avoid jeopardizing any conviction it might obtain.

*Id.* at 592. The court went on to analyze the defendant's right to effective assistance of counsel, and held that in order for a defense attorney to provide the guaranteed effective assistance:

It is essential that he be permitted full investigative latitude in developing a meritorious defense on his client's behalf. This latitude will be circumscribed if defense counsel must risk a potentially crippling revelation to the State of information discovered in the course of investigation which he chooses not to use at trial.

*Id.* at 592. The court cited *United States v. Alvarez* in support of the theory that "[t]he attorney must be free to make an informed judgment with respect to the best course for the defense without the inhibition of creating a potential government witness." *United States v. Alvarez*, 519 F.2d 1036, 1047 (3rd Cir. 1975). The Sixth Amendment right to effective assistance of counsel, therefore, encompasses the right of the defense attorney to formulate strategy and conduct the defense free from government interference. *See Speizer*, 235 N.E.2d at 1025. The *Mingo* Court went on to hold that even when the defense waives its Sixth Amendment protection of the report of a consultative expert by announcing its intention to use the report at trial, it "does not waive its right to control the testimonial use of the expert; he remains unavailable to the State as a witness." *Mingo*, 392 A.2d at 595. When a defendant intends to present an expert witness at trial, the report of that expert becomes available to the State in pre-trial discovery. If the defense expert actually testifies at trial, the State may cross-examine. "However, should the defense elect not to present the expert as a witness after previously indicating to the contrary, the fact that his otherwise confidential reports have been disclosed to the prosecution does not entitle the State to call the expert as its witness over objection by the defense." *Id.* Similarly, in *State v. Williams*, the North Carolina Supreme Court held that a defendant was required to disclose to the State the report of an expert which it intended to call at trial, even though subsequently the defense did not call the expert or seek to introduce the report itself at trial. *State v. Williams*, [350 N.C. 1](#), 18, 510 S.E.2d 626, 638 (1999), *cert. denied*, 528 U.S. 880, 145 L.Ed.2d 162 (1999). The *Williams* Court did not confront the issue of whether the State could call the expert to testify if the defense did not do so.

The Supreme Court of Colorado has also ruled that a "trial court's decision to permit the prosecution to call the defense-retained expert in its case-in-chief absent waiver or compelling justification denied the defendant his constitutional right to effective assistance of counsel." *Hutchinson v. People*, 742 P.2d 875, 876 (Colo. 1987). The court reasoned that thorough preparation is essential to effective assistance of counsel. "Without knowledgeable trial preparation, defense counsel cannot reliably exercise legal judgment and, therefore, cannot render reasonably effective assistance to his client." *Hutchinson*, 742 P. 2d at 881. As part of that preparation, the defense counsel may need to consult experts to develop strategy for presentation or rebuttal of physical evidence.

In some instances, an expert may be needed as a defense witness to establish a defense or to rebut a case built upon the powerful investigative arsenal of the state. Consequently, it cannot be denied that a defense counsel's access to expert assistance is a crucial element in assuring a defendant's right to effective legal assistance, and ultimately, a fair trial.

*Id.* The *Hutchinson* Court held that if the prosecution were allowed, in effect, to co-opt the defendant's experts, "defense attorneys might be deterred from hiring experts lest they inadvertently create or substantially contribute to the prosecution's case against their clients."

*Id.* at 882. Or they might be motivated to hire only those experts which they have reason to believe will lean their way. Neither outcome advances the search for the truth, and both

impair the defendant's right to "effective" assistance of counsel.

Taking what we believe to be the most reasonable synthesis of these cases and principles, we conclude that the trial court erred when it allowed the State to compel testimony from employees of Lab Corp that defendant did not plan to call as witnesses. We believe that in so doing, the trial court infringed upon the defendant's Sixth Amendment right to effective assistance of counsel, and unnecessarily breached the work-product privilege.

However, where there is an alleged violation of the defendant's constitutional rights, the State has the burden of showing that the error was "harmless beyond a reasonable doubt." *See* N.C. Gen. Stat. § 15A-1443 (2001). Having determined that the trial court's error has constitutional dimensions, under this standard we conclude that it requires a new trial.

In the absence of the defense expert's testimony, the State's evidence was inconclusive. Two of the four tests the State ran on the substance here produced negative results, while two were positive. One test, run twice, returned different results. On cross examination, the SBI witness was unable to account for the discrepancy. The witnesses at issue here, Ingold and Walker, Lab Corp employees, retained by defendant but who testified against him, provided the test results that could very well have tipped the balance in the State's favor. Given that the defense may have been hampered upon cross-examination by the denial of their discovery request, discussed earlier in this opinion, we cannot conclude that the trial court's error was harmless beyond a reasonable doubt. As such, we reverse the defendant's conviction and remand for a new trial.

Because the defendant's remaining issues may not arise in future trial, we decline to address them now.

New trial.

Judges MARTIN and CAMPBELL concur.

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