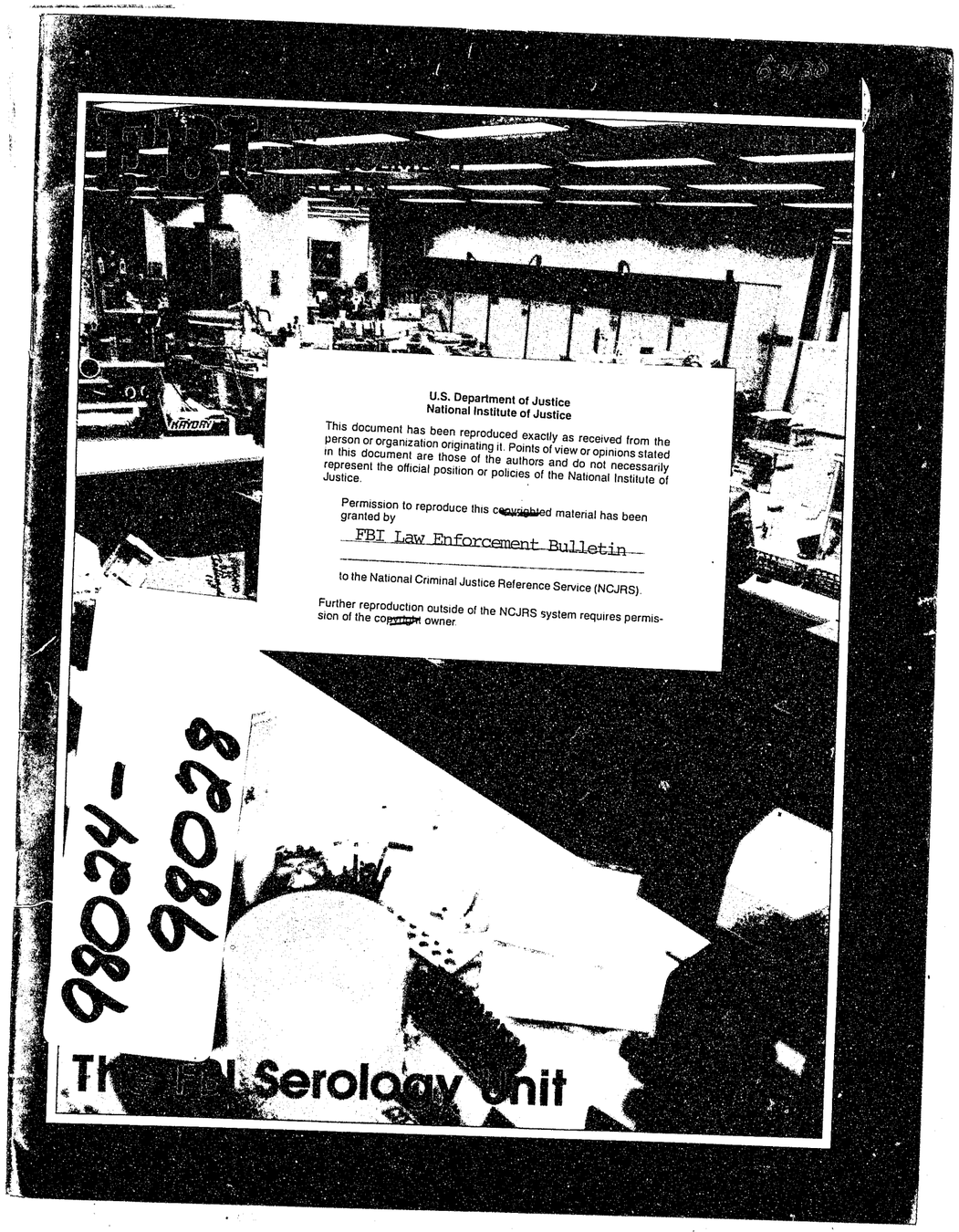
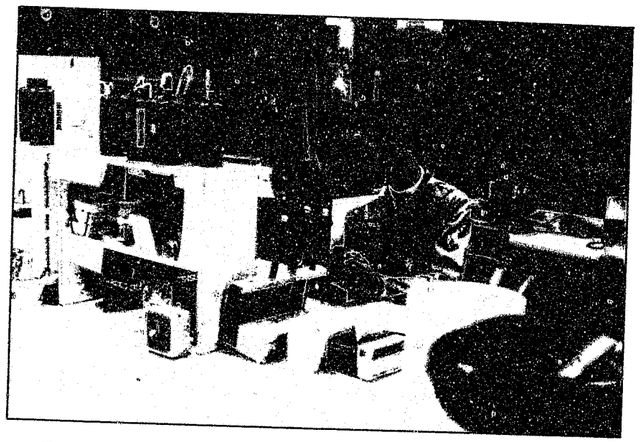


# The FBI Serology Unit
## Services, Policies, and Procedures



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The Serology Unit of the Scientific Analysis Section, FBI Laboratory, is one of the largest and most productive applied forensic serology laboratories in the United States. Special Agent examiners in this unit annually receive requests to conduct serological examinations in more than 2,300 cases involving approximately 25,000 items. These requests come from all 50 States and several U.S. territorial governments and often coincide with requests for examinations by the FBI forensic experts from such disciplines as microscopic analysis, chemistry-toxicology, firearms, and elemental analysis.

This article will briefly explain the types of examinations conducted by the Serology Unit, the policies related to the submission, examination, and reexamination of evidence in the FBI Laboratory, the availability of FBI examiners for testimony in criminal trials related to evidence they have examined, and the collection and packaging of evidence for serological examination by the FBI Laboratory.

### Services

The Serology Unit is staffed and equipped to perform biochemical analyses on blood and other body fluids, such as semen and saliva, that have been deposited on items of evidence. These analyses are usually related to investigations of crimes of violence, such as homicide, sexual assault, assault and battery, kidnaping, and bank robbery. Occasionally, cases related

*Special Agent Murch*

to other nonviolent criminal activities, such as bank burglary and extortion, are received.

**Blood**

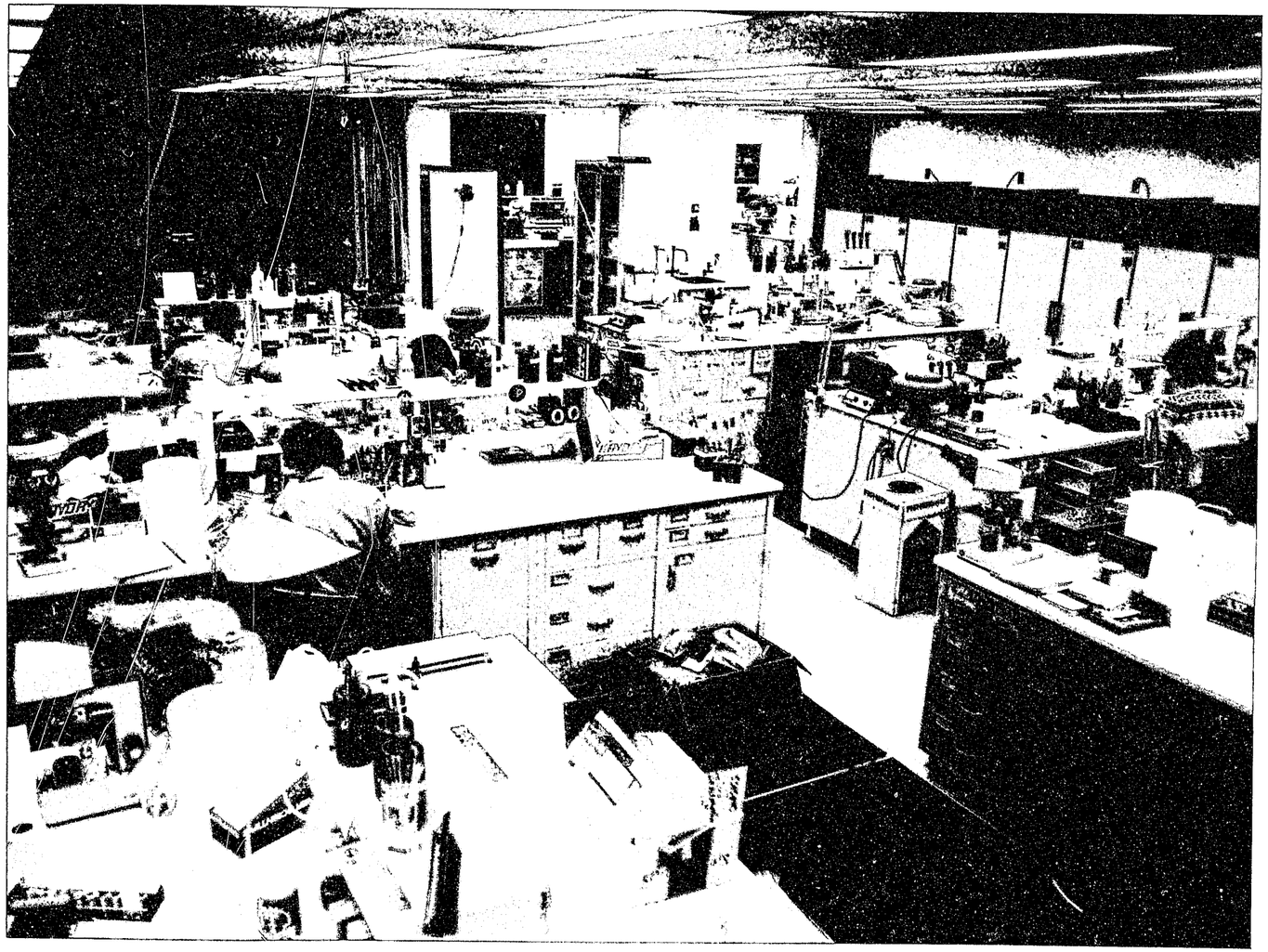
The biochemical analyses that are performed on blood and bloodstains include those for the presumptive presence of blood, the confirmed presence of blood, the origin of bloodstains (either human or animal family), and the identification and discrimination of genetically determined substances (markers) which usually appear in a limited number of forms (phenotypes).

The use of genetic markers by the serologist allows for the separation of the population into distinct groups based upon the particular phenotypes possessed by its members. For blood and bloodstains, the markers used in the Serology Unit include ABO, Rhesus (Rh), Lewis (Le), phosphoglucomutase (PGM), esterase D (EsD), glyoxylase I (GLO I), erythrocyte acid phosphatase (EAP), adenosine deaminase (ADA), adenylate kinase (AK), haptoglobin (Hp), transferrin (Tf), group-specific component (Gc) carbanic anhydrase (CA II), peptidase A (Pep A), and glucose-6-phosphate dehydrogenase (G6PD).

**Semen**

Examinations of sexual assault evidence most often involve the identification of semen, the male reproductive fluid. In the FBI Serology Unit, examinations for the presence of semen can include presumptive tests for acid phosphatase and choline, two chemical compounds found in high concentrations in semen; the microscopic search for spermatozoa, the male reproductive cells; the identification of prostate antigen, a semen-specific protein; and the identification of

*FBI Serology Unit*



*Phosphoglucomutase, a blood and semen protein, as seen by isoelectric focusing.*

biochemical marker phenotypes of the ABH (ABO), PGM, GLO I, Pep A, and G6PD systems.

**Saliva**

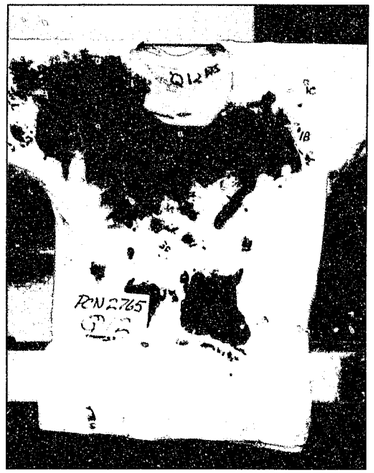
Saliva examinations are usually performed on items such as cigarette butts, envelopes, stamps, items related to oral sodomy cases, and on known saliva specimens. The latter are often essential to confirm one's "secretor" status. A secretor is an individual who is capable of releasing ABH blood group substances into body fluids such as semen, saliva, and vaginal secretions. These substances reflect the donor's ABO blood type. Approximately 80 percent of the U.S. population are secretors. Secretor status can usually be determined in liquid blood samples using the Lewis blood group system.

The test for the presence of saliva relies upon the detection of alpha-amylase, a starch-degrading enzyme. This enzyme is found in very high proportions in saliva relative to other commonly encountered body fluids or substances. When sufficient amylase is located on an item, the ABH grouping tests are performed to attempt to locate any blood group substances that may be present.

**Other Examinations**

Occasionally, the Serology Unit is asked to examine items for the presence of urine, fecal material, or human protein. The test for the presence of urine relies upon the detection of urea, a chemical compound found in high concentrations in urine. Fecal examinations involve a chemical test for the presence of alpha-amylase, microscopic examinations for partially digested plant fragments, and visual and olfactory inspections of questioned stains. The presence of human protein is detected immunologically. No examinations are performed to identify the presence of tears, perspiration, vitreous and aqueous humor (eye fluid), body tissues, or on cultures of veneral disease microorganisms. The unit also does not conduct ABO tissue examinations.

It is the goal of the FBI serologist to identify specifically the body fluid or mixture of body fluids present on submitted items and to indicate whether those body fluids could have originated from a particular individual or individuals. At present, no serologist, including those in the FBI Laboratory, can state unequivocally that a stain was deposited by one individual to the exclusion of all others.

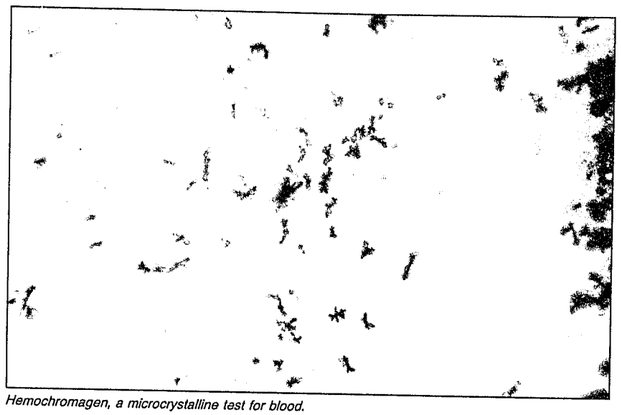


*Homicide evidence following initial processing.*

**Policies**

The FBI Laboratory is authorized to accept and examine evidence submitted in criminal cases from any duly authorized law enforcement or prosecutive agency in the United States and its territories, as well as other agencies of the Federal Government. The FBI does, however, encourage the use of State and local crime laboratories in one's own jurisdiction if the required services are available. Services of the FBI Laboratory are available free of charge to any requesting agency. The services include all examinations conducted, the reporting of results, the travel and court-





*Hemochromagen, a microcrystalline test for blood.*

room testimony of the examiners who have been directly involved with the items submitted, and the handling of evidence while under the FBI Laboratory's control.

Examiners are also available free of charge to provide exculpatory testimony on behalf of the defense, provided the FBI Laboratory originally examined the items in question and the defense attorney provides in advance a subpoena for the examiner's testimony, a letter stating the facts of the case and why the testimony is needed, and an affidavit in support of the request stating specifically what will be asked of the examiner. Negative testimony on behalf of the defense is not provided free of charge and the same documentation requirements exist as for exculpatory testimony.

The FBI Laboratory reserves the right to authorize the travel and testimony of its examiners for trials in which testimony on behalf of the defense will be given. FBI examiners are not available as rebuttal witnesses in cases in which they did not participate, nor do FBI examiners testify at preliminary hearings or grand jury proceedings.

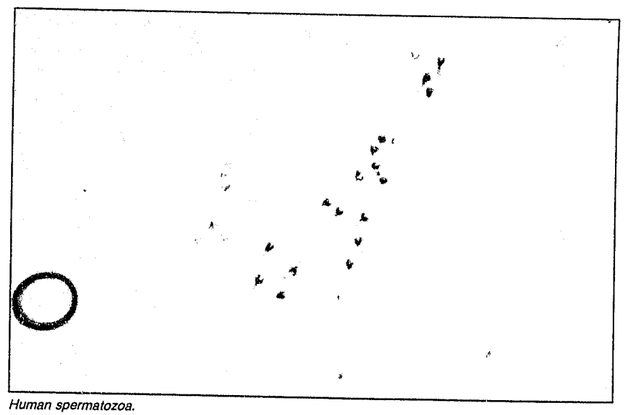
No examination of physical evidence will be conducted on any item that has previously been subjected to the same type of technical examination by another crime laboratory. This requirement is designed to eliminate duplication of effort and ensure that the integrity of the evidence is maintained. An exception may be granted by the Laboratory when there exists compelling reasons for reexamination. These reasons should be set forth in individual letters from the director of the laboratory that conducted the original examination, the prosecuting attorney, and the investigating agency that collected and submitted the evidence for laboratory analysis. No requests for examination will be accepted by the FBI from other crime laboratories that have the capability of conducting the requested examinations unless extenuating circumstances exist and the request is approved by the Laboratory.

The FBI will not examine evidence in civil cases or criminal matters if it is indicated that a civil case may evolve because it is necessary to destroy the evidence during the course of the examination.

**Collection and Submission of Evidence**

When a crime occurs and evidence for serological (or other) analyses at the FBI Laboratory is collected, careful consideration should be given to:

1) The importance and relevance of each item to the investigation and eventual prosecution of the perpetrators;
2) What examinations are to be performed on each item;
3) The collection of each item so as to best preserve the deposited biological fluid;



*Human spermatozoa.*

4) Packaging and marking the item properly; and
5) The acquisition of all appropriate available known specimens for comparison and elimination purposes.

The investigator should be selective in collecting physical evidence for serological examination and should submit only those items that may provide information about the nature of the crime and link the victim to those responsible. If not already apparent, he should inform the FBI serologist as to the particular importance of the various items. Any peculiarities of the case that may influence the outcome or the direction of the investigation should also be included in the letter accompanying the submitted items. The letter should also include a concise but informative description of the facts of the case and the type of examination desired on each item. Valuable time and information may be lost if the contributor fails to make his intentions clear and the serologist first conducts unwanted examinations and then must go back and perform those desired by the requesting agency.

The collection of evidence should be undertaken to allow laboratory examiners the best possible access to the biological fluids of interest and to maximize the information retrieved from them. Again, this responsibility falls upon the investigating or crime scene search officer. In most cases, the entire item should be submitted, with care being taken to preserve the position and integrity of the stain. The item should also be submitted without the prior removal of any portion of the specimen or stain for prior testing. Any alteration may allow for only limited testing during subsequent FBI examinations, reducing the amount of information obtained. If large or unwieldy items are encountered, representative samples of sufficient quantity may be submitted.

All items submitted to the FBI Laboratory should be clearly identified as to the donor or origin, preferably on the packaging material or on an attached evidence tag. The identity of an item or its origin is of particular importance when the contributor or prosecutor telephones the Laboratory to request additional examinations, discuss the progress of the examinations, or desires an explanation of the results contained in the Laboratory report.

The forensic information contained in biological fluids does not remain unaltered indefinitely. In fact, the molecules and cells that carry this information can be destroyed by chemical processes with time. These degradative processes are accelerated when appropriate preservation and packaging methods are not employed. Generally, this means that in order to preserve the biological and biochemical information, one should expect to maintain body fluid stain evidence under either air-dried and frozen, air-dried and refrigerated, or air-dried (nonhumid) conditions until submission. Liquid blood samples should be refrigerated and submitted as quickly as possible, even if the remaining items cannot be sent at the same time. Refrigeration of the submitted items while in transit is not required.

Stained items should be contained in paper envelopes, paper bags, or other containers that allow for the exchange of air but prevent the buildup of moisture. Liquid blood samples should be submitted in sealed blood test tubes without chemical preservatives (anticoagulants acceptable), and wrapped to prevent breakage in transit. Sexual assault evidence, such as vaginal, oral, or anal swabs, should be thoroughly air dried and placed in envelopes or other containers that allow air to pass. Sealed test tubes and test tubes containing water are unsuitable. Items with hard, nonporous surfaces should be collected and packaged to prevent the removal of the questioned stains by friction with other items or the packing material.

Further information concerning the requirements for submitting specific item types can be obtained by referring to the FBI Laboratory's *Handbook of Forensic Science* or "Examination of Biological Fluids," *FBI Law Enforcement Bulletin*, June 1972, (revised March 1980). Each item should be packaged separately.

The collection and submission of known body fluid specimens are important aspects of the process of investigating a crime where body fluids have been deposited. These specimens are used to determine whether a suspect or a victim could have deposited body fluid stains on questioned items. If known specimens are not collected and submitted, the serologist, and perhaps the jury, cannot determine whether the parties involved can be included or excluded from the stains of interest.

When it is suspected that bloodstains are present, liquid blood samples from all parties involved should be submitted on a *timely* basis. If a victim (or suspect) is deceased, blood samples should be collected during the autopsy and submitted immediately. In sexual assault matters, liquid blood and saliva samples should be collected from those involved or suspected of being involved. In cases where the deposition of saliva alone is of interest, both liquid blood and saliva specimens should be included with the other submitted items. Saliva specimens should be collected on clean, sterile filter paper discs, air dried, and placed in paper envelopes prior to submission. Each specimen should be packaged separately. The individual from whom the specimen is being collected should not be allowed to eat, drink, smoke, or place any object in his mouth for 30 minutes prior to the sample being taken.

All evidence submitted to the FBI Laboratory for either laboratory or laboratory and latent fingerprint examinations should be addressed to the Director, Federal Bureau of Investigation, Washington, DC 20535, marked to the attention of the FBI Laboratory. Evidence submitted only for latent fingerprint examinations should be addressed similarly but marked to the attention of the Identification Division.

**FBI**

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