Newsletter of the California Association of Criminalists • FALL 1993

The CAC News

The President's Desk

The CAC has been the leader in Forensic Science Associations for the last 40 years. We were the first formalized forensic association, we led in the development of ethical standards, in exchange of information, in certification, we served as the model for several other associations, the list goes on and on. As we approach the next century it is time to ask our selves "Where now?" Can we maintain our leadership? What does the future hold for criminalists? During this recession, it is hard to stimulate interest in the future when the present is so precarious.

There is talk that the public laboratories may be eliminated in the manner of the forensic laboratories of Great Britain. If that happens, will the CAC be able to continue in the same mode it is in now? Will our Code of Ethics still be viable? Are we ready for this? These are not easy questions to answer. This is only one possibility, there are several others. Will technology continue to develop at the ever increasing rate, how will this impact on our field? The CAC had no long range plans to help us enter this computer age, in fact, we are just now beginning to start scratching the surface of the capabilities of this technology.

Paul Kirk, as President in 1968, established a Long Range Planning Committee to develop plans for the future of Criminalistics. That committee developed the plan that allowed California to take advantage of the monies that were suddenly available in the early 70's by developing the statewide laboratory system (DOJ). This caused the rapid growth of criminalistics in California long before the rest of the nation.

What would happen if we now have another "decade of plenty" thrust upon us? Would we all continue to build our own little empires that come under threat with the next cutback? Or could we work together to develop a plan for growth that will ensure a systematic secure job for future generations of criminalists?

I am reestablishing a standing "Long Range Planning Committee" to work on plans for the CAC under the leadership of Dave Hong, LASD. If you have any ideas please communicate with him.

Let's maintain our leadership role in the forensic community.

Lisa M. Brewer
CAC Editorial Secretary
Editor

John Houde
Ventura Sheriff's Lab
Publisher

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Notice to Contributors

This newsletter publishes material of interest to its readers and is pleased to receive manuscripts from potential authors. Meeting announcements, employment opportunities, course announcements, etc. are also solicited.

Advertisements are also accepted, although a fee is charged for their inclusion in The CAC news. The acceptance of any advertisement is at the sole discretion of the Editorial Secretary.

Because of the computerized typesetting employed in The CAC News, the Editorial Secretary requests that where possible, submissions to the News be made in the form of IBM or MS-DOS compatible files on 5.25 or 3.5 inch floppy disks (high or low density). It is preferred that text files from word processors be saved as ASCII files without formatting codes, e.g. bold, italic, etc. An accompanying hardcopy of the file may be submitted along with the disk to illustrate the author's preference for special emphasis. Graphics, sketches, photographs, etc. can also be placed into articles. Please contact the Editorial Secretary for details. FAX submissions are also acceptable. The FAX number for the Editorial Secretary is (408) 298-7501.

The deadlines for submissions to The CAC News are: December 15, March 15, June 15 and September 15.

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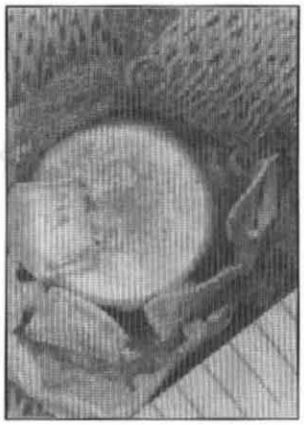

On the cover
Failing to penetrate, a .357 slug dangles from the sweater of a suspect in a CHP-involved shooting. The bullet had ricochet'd off the ground first.

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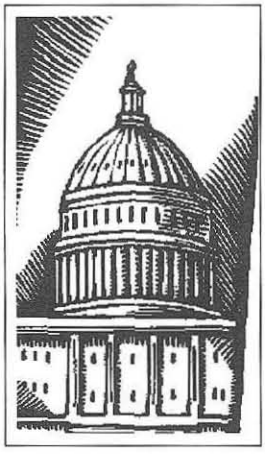

Bye-Bye Frye
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TECHNIQUE: Saliva Mapping

Background:

It is well established that human saliva contains very high amounts of amylase when compared to other body fluids, or animals such as dogs. Amylase is an enzyme which breaks down starch into smaller sugar units. Iodine forms a blue complex with starch, but is colorless when in solution with simpler sugars. A common method of visualizing the action of amylase, and thus demonstrating its presence, takes advantage of the highly colored starch-iodine complex.

Materials:

1 gm starch (Sigma Potato Hydrolyzed)
250 ml distilled water
Lugol's Iodine Solution
Whatman 114 large size (46cm x 57cm) filter paper

Method:

Prepare a solution of starch by dissolving 1 gram of starch powder in 250 ml distilled water and heating to a boil, stirring constantly. When the solution clears, the starch is dissolved.

Prepare indicator paper by dipping the filter paper into the cooled starch solution. Allow to dry, or dry quickly with forced air.

Spread out an article of clothing, bedding, etc. and place the dry filter paper over the area suspected of having a saliva stain. Wet down the paper to saturation with distilled water from a wash bottle. Using gloves, press down on the wet paper achieving good contact between the paper and the cloth. Allow to stand for about 20 minutes.

Mark the orientation of the filter paper "map" on the cloth item, for future reference, should it be necessary to recover the actual stain.

Remove the paper, and place in a moisture chamber, which could simply be a plastic box with a tight-fitting lid. Incubate at 37 deg. C. for one hour.

Remove the paper from the moisture chamber, and allow to dry, of use forced air to dry quickly. If the paper is developed when wet, the iodine may "feather" out, blurring the edges of the stain.

Using a spray device, cover the entire filter paper with a 1% solution of Lugol's iodine in water. The areas which have not been "digested" by amylase will appear blue instantly. If there is no starch in an area, it will appear white.

The coloration on the filter paper will fade over time, but may be sprayed over and over to bring up the details. It may be photographed or even photocopied to preserve its record.

Interpretation:

Saliva stains which have been located on cloth generally appear as irregular, diffuse white areas on the map. If an area develops as a sharply demarcated, white circle, there is some possibility that the filter paper itself was contaminated by saliva inadvertently. It must also be kept in mind that without further testing, it cannot be certain whose saliva is being demonstrated, since even the investigator who packaged the item for examination could have contaminated it.

Notes:

A dilute solution of sodium thiosulfate will remove any accidental iodine spills on lab coats, benches, etc.

Lugol's Iodine can be made in the laboratory by dissolving 10 gm of potassium iodide in 100 ml of water, followed by 5 gm of iodine crystals.

The literature suggests that it is not unusual to find a considerable amount of saliva on the front of garments, due to small amounts ejected during talking, eating, etc.

Reference:

Rushton, Claire, Kipps, Ann, et al, "The Distribution and Significance of Amylase Containing Stains on Clothing", *J. For. Sci. Soc.* (1979), 19, 53.

—John Houde VCSO

SAFS Outstanding Paper 1993

The Identification of Condom Lubricant Traces on Evidence Items From Sexual Assaults

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The Naval Criminal Investigative Service Regional Forensic Laboratory in San Diego has recently been involved in the investigation of two separate rape cases in which the accused allegedly wore a lubricated condom. In both cases, the result of a search for lubricant traces on evidentiary items was vital in verifying or refuting the victim and suspect statements.

With the new fears associated with contracting sexually transmitted diseases, and the publicized potential of positive identifications through DNA profiling, the use of condoms in cases of rape, forcible sodomy, and child sexual abuse is likely to increase.

Latex Condom Types

In the March 1989 issue of *Consumer Reports*, forty different brands of latex condoms commercially available in the United States were rated and categorized. Although information on market share was not provided, 34 of the 40 brands were lubricated. The article categorized the lubricants as either "wet" or "dry." The "wet" lubricant was described as "a water-based surgical jelly." Only five brands from two different manufacturers contained the "wet" lubricant, and two of these (both from the same manufacturer) also contained the spermicide, nonoxynol-9. The "dry" lubricant was described as "typically a silicon-based oil." Twenty-nine brands contained the "dry" lubricant, and eight of these also contained nonoxynol-9.

Case Reports:

Case 1

A female member of the Armed Forces was attending a service school in San Diego and had spent the evening drinking with some classmates. While unconscious, she was raped by a classmate who wore a lubricated condom, saved it, and returned to his barracks where he displayed the condom to his friends and bragged, "I got (her name)."

When the victim regained consciousness she was aware that she had been sexually assaulted because her pants and panties had been removed. She reported the rape and was medically examined at a hospital where the usual samples were collected using a sexual assault evidence collection kit. By the time special agents from the Naval Criminal Investigative Service (NCIS) were able to interview the suspect he had disposed of the used condom, but they collected his clothing. From interviews with other service members who were present that evening, NCIS special agents learned that the suspect had obtained the condom packet from a classmate and that it was the Sheik-Elite Lubricated brand (made in Japan for Schmid Laboratories, Little Falls, New Jersey).

Although NCIS special agents were able to obtain a confession from the suspect as well as corroborating statements from others the finding of condom lubricant traces on evidence items was considered essential for verification.

Case 2

A 17 year old girl was with several friends and acquaintances in a home when she was sexually assaulted by a member of the Armed Forces while she was in the bathroom. She reported the rape to the local police and was medically examined. However, a member of he family advised her not to press charges. Although the suspect was not charged by the local police, jurisdiction in the case was turned over to the Navy to at least consider assault charges. A this point, investigation by NCIS special agents disclosed that the suspect had been previously diagnosed as having active acquired immunological deficiency syndrome (AIDS), and that he had attended the counseling program provided to service members when they diagnosed with this condition.

In an interview with NCIS special agents the suspect admitted that he had had sex with the girl, but claimed that it was consensual. He also said that he had worn a condom, but that it had broken. The victim denied that it was consensual and said that he had not worn a condom. When asked about the condom the suspect said that it was one of those that are made available to shipmate as they depart their ship to go on shore leave. These are Prime Lubricated condoms (Ansell Incorporated, Dothan, Alabama).

Therefore, regardless of the question of consent, the result of a forensic examination for condom lubricant traces on vagina swabs obtained from the victim would be crucial to the prosecution on assault charges. If no traces of the condom lubricant were found, it would then be necessary to show that the extraction an identification methods used were sufficiently sensitive to have found them had such a lubricated condom been used under the conditions claimed by the suspect.

Both the Sheik-Elite *(Case 1)* , and the Prime *(Case 2)* brand condoms use a "dry" lubricant without spermicide. Therefore initial research efforts were directed towards finding a method of first extracting and then categorizing traces of this "dry lubricant from evidence items.

Materials and Methods

Condom lubricants and extracts from cotton swabs and other evidence items were examined at 100X and 400X with a polarizing microscope (both with and without crossed polars) using standard glass microscope slides and coverslips.

Dichloromethane, CH_2Cl_2, Nanograde (Mallinckrodt, Inc., St. Louis, MO) was the only reagent used.

To facilitate extractions a vortex mixer (Vortex Genie™, Fisher scientific, Bohemia, NY) was used with test tubes, and an ultrasonic cleaner (Branson Ultrasonic Corporation, Danbury, CT) was used with beakers.

All infrared spectra were obtained on 3M Disposable IR Cards. These cards are a new mid-range infrared sampling medium introduced at the 1992 Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy. They consist of 5cm x 10cm cardboard with an approximately 1.8cm diameter circle of porous polyethylene which is located so that it is at the center of the infrared beam position when the card is inserted in the sample holder on the optical bench of a standard Fourier transform Infrared spectrophotometer (FTIR). The cards are available in packs of 25 from either Fisher Scientific, Pittsburgh, PA (catalog # 14-385-861), or VWR Scientific, San Francisco, CA (catalog # 22957-400).

Extraction

Using a disposable scalpel (Feather Industries LTD., Tokyo, Japan) the cotton tip was removed from a vaginal swab and placed in a 12 x 75mm disposable test tube. Enough dichloromethane was added to cover the swab and the tube was agitated briefly with a vortex mixer. For extracts from garments the areas where lubricant residues were suspected were cut out (for example — in Case 1 a dark ring was observed in an area of the suspect's left front pants pocket where it was thought that he had placed the used condom after the rape), placed in a beaker, covered with dichloromethane, and then the beaker was briefly placed in the ultrasonic cleaner. Portions of the CH_2Cl_2 extracts were placed on glass slides, a coverslip added, and then the slides were examined under the polarizing microscope (see Results). The remainder of each extract was filtered through a cotton plug in a disposable pipet and then allowed to a evaporate down to a volume of a few drops.

Infrared Spectroscopy

All infrared spectra were recorded on a Nicolet 510P FTIR Spectrophotometer equipped with a DTGS detector. A spectrum of a blank 3M Disposable IR Card was first obtained and stored as the BACKGROUND. The filtered and condensed CH_2Cl_2 extract was then slowly dripped onto the center

of the sampling area of the card, allowing each drop to evaporate before adding another drop. (The drops rapidly spread on the porous polyethylene substrate and the sample would be wicked to the edges of the circular sample area and lost in the cardboard if the drops were added rapidly.) To prevent damaging the substrate, do not use a heat gun (hot air hair dryer) to accelerate the evaporation. Because the porous polyethylene substrate has a very large surface area, volatile solvents (and even water) rapidly evaporate from it. Depending on the solvent used and the temperature and humidity conditions in the laboratory, a solvent may evaporate so rapidly that condensation forms due to cooling. This will be seen in the infrared spectrum in the areas where water absorbs. However, usually in less than an hour the water will have evaporated and then a spectrum can be obtained with little interference from water bands.

Because of the very strong absorption of the porous polyethylene, the area around 3000 to 2800 cm^{-1} is not useful and is normally blanked out. Fig. 1A shows the spectrum typical of "dry" condom lubricants and is plotted between 2000 and 400 cm^{-1}. Fig. 1B shows the spectrum from the extract from a precoital vaginal swab, and Fig. 1C is the spectrum obtained from the extract from a postcoital vaginal swab when a "dry" lubricated condom was used.

Clearly, vaginal secretions do not interfere with the identification of PDMS, nor have additional tests simulating condom failure shown any interferences from seminal fluid. The method is sufficiently sensitive to detect "dry" condom lubricant traces under these conditions, in fact, usually only a part of the CH_2Cl_2 extract is needed. If too much of the extract is applied, the sample layer may be too thick and resolution will suffer.

Results and Discussion

There are only four companies that actually manufacture condoms in the United States. These are Ansell Inc., Dothan, AL; Carter-Wallace, Inc., New York, NY; Schmid Laboratories (a Division of London International U.S. Holdings, Inc.), Little Falls, NJ; and Aladan Corporation, Dothan, AL (Safetex Corp., Lyndhurst, NJ is a division of Aladan).

The "dry" condom lubricant used by these as well as foreign manufacturers is actually a polydimethylsiloxane (PDMS) polymer of around 200 cSt viscosity. Three major U.S. suppliers of PDMS fluids to condom manufacturers are Dow Corning, Union Carbide, and General Electric.

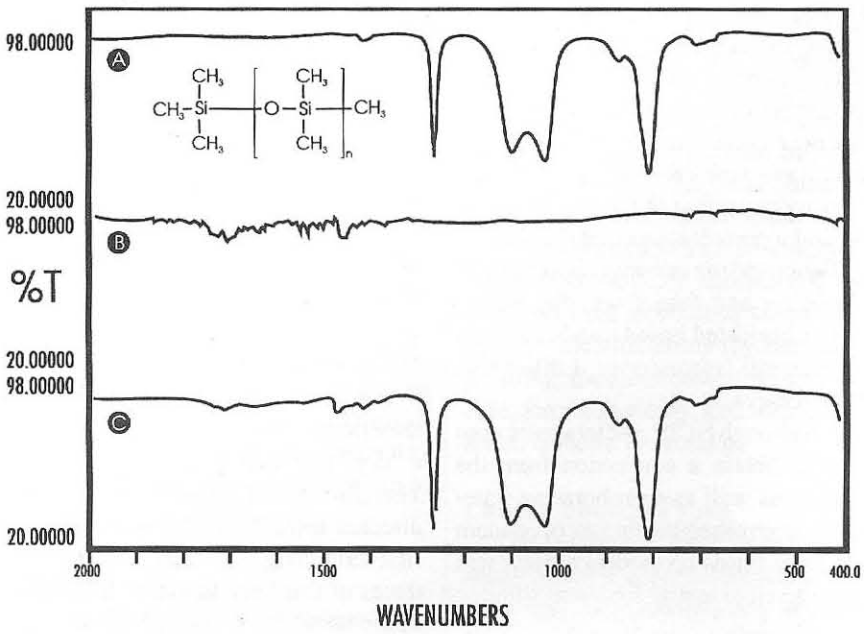
The infrared spectra of the lubricants from twelve different brands of condoms having a "dry"-type lubricant have been obtained. These included condoms manufactured in the U.S.A., Japan, Korea, and Germany. The infrared spectra of PDMS in the region between 2000 cm^{-1} and 400 cm^{-1} is characterized by four major peaks. These may be assigned to symmetric methyl deformation (around 1262 cm^{-1}), antisymmetric SiOSi stretch (approximately 1096 and 1020 cm^{-1}), and methyl rocks and SiC stretches (around 801 cm^{-1}) [5]. Because of the simple repeating structure of PDMS, one would not expect to see much variation in their infrared spectra despite minor differences in average molecular weight (average chain length), molecular weight distribution, or percentage of cyclic oligomers.

Therefore, although CH_2Cl_2 extraction followed by FTIR is suitable for the identification of PDMS, the method is unlikely to be capable of distinguishing between different sources. A method capable of distinguishing PDMS originating from different suppliers, or even different productions, runs would have greater evidential value.

Other PDMS characterization methods

The PDMS used in condoms is not sufficiently volatile to be capable of identification / comparison by capillary column gas chromatography under normal conditions. One manufacturer [4], claims that PDMS liquids may be analyzed using a capillary column coated with their HT5 high-temperature stationary phase. However, high-temperature gas chromatography is only capable of analyzing PDMS oligomers ranging up to around 1200 Da [2]. PDMS is used itself as a phase material for capillary columns, and one must be sure you are not merely detecting column bleed! Raising the injection port temperature in an attempt to volatilize the PDMS will simply result in pyrolysis with the production of cyclic oligomers. Thus, pyrolysis/capillary col-

Fig. 1



umn gas chromatography, pyrolysis/capillary column gas chromatography/mass spectrometry [3], or direct pyrolysis/mass spectrometry [1] may be used to detect PDMS traces, but they are not useful for discrimination between different PDMS samples, Methods such as laser desorption mass spectrometry, time-of-flight secondary ion mass spectrometry [2], desorption chemical ionization mass spectrometry [6], and supercritical fluid chromatography [2] may be capable of some discrimination, but this instrumentation is not normally found in forensic laboratories.

Gel permeation chromatography (GPC) [7] may be able to distinguish between relatively low viscosity PDMS samples having distinctly different molecular weight distributions, but GPC produces just a broad envelope rather that separating individual oligomers and therefore is not likely to be able to distinguish between similar samples, particularly those of higher viscosity.

It is possible to obtain the average chain length of a PDMS sample by Si29 nuclear magnetic resonance spectroscopy (NMR) [2].

The silicon atoms at the chain ends have three methyl groups attached while the silicon atoms along the chain only have two and therefore come into resonance at a different field strength. An excellent general reference is The Analytical Chemistry of silicones [5], edited by A. Lee Smith of the Dow Corning Corporation, Midland, Michigan.

Microscopic Examination

Microscopic examination at 100 and 400X of smears of "dry" condom lubricants directly on standard glass microscope slides disclosed that condom manufacturers add various insoluble lubricants in addition to PDMS. These vied with the manufacturer, or depended upon the requirements of a special order if the condoms were not going to be sold under the manufacturer's brand name. Some of the solid lubricants found were corn starch (or other starches), lycopodium, finely powdered silica, and talc. Thus, some discrimination between different "dry" condom lubricant sources might be possible on this basis plus the presence or absence of the spermicide, nonoxonol-9, even if their PDMS looks the same. However, a word of caution, many of these same solid lubricants may be normally present on various brands of latex examination gloves. Medical personnel examining victims of sexual assault should we non-lubricated latex or plastic gloves to prevent any question as to the source of these solid lubricants on evidence items.

CONCLUSIONS

Using only dichloromethane as an extraction solvent, a method has been presented for the identification of "dry" condom lubricant (i.e., polydimethylsiloxane) traces from vaginal swabs and other evidence items. The method is quick, simple, and utilizes instrumentation (FTIR) routinely found in forensic laboratories. It is sufficiently sensitive to detect PDMS traces when they would be expected to be present, yet is not so sensitive that one is likely to be mislead by adventitious traces from other sources. The presence of vaginal and/or seminal fluids does not interfere, and the 3M Disposable IR Cards may be labeled and saved. The PDMS used for condom lubricants has low volatility and is well retained by the porous polyethylene substrate. Cards being PDMS samples have been saved and after six months still yield the same FTIR spectra.

Although FTIR is capable of identifying PDMS, it is not likely to be capable of distinguishing between PDMS from different manufacturers or production runs. Some discrimination between condom lubricant traces may be realized on the basis of the presence or absence of the spermicide, nonoxonol-9, as well as microscopic examinations for the presence of solid lubricants such as starch grains, lycopodium, finely powdered silica, and talc.

Work on the characterization of condom lubricants is continuing in collaboration with other researchers. The eventual goal will be the creation of a "decision tree" which may be routinely used by forensic laboratories when presented with sexual assault evidence where there are indications or claims that a condom may have been used. The decision tree would be consistent with the needs for serological/DNA examinations and would follow different paths according to whether there were indications that a non-lubricated or lubricated condom had been used; if a lubricated condom, then whether it was a "wet" or "dry" lubricant, and whether the spermicide, nonoxonol-9, was present or absent.

DISCLAIMER.

The opinions or assertions contained herein are the private views of the author and are not to be construed as official. Names of commercial products and manufacturers are provided for identification, and inclusion does not imply endorsement by the Naval Criminal Investigative Service.

REFERENCES

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Southern

On Thursday, June 24, 1993, Lisa Thompson of the Orange County Sheriff-Coroner's Laboratory hosted a dinner meeting at Robbie's Bar and Grill in Santa Ana. My Harrison, an FBI Special Agent with the Los Angeles FBI Office, spoke on psychological profiling. Forty-six people attended the dinner meeting.

DNA STUDY GROUP

Chairs: Rob Keister, Orange Co Sheriff-Coroner; Erin Riley, LAPD

The DNA Study Group met on May 27, 1993 at the Huntington Beach Police Department. There was a discussion of papers/information from the FBI International FBI DNA Symposium. Reviewed DNA papers and the DNA Study Group meeting of the Western Region DNA laboratories held at the Spring 1993 CAC meeting in Berkeley. Discussed portions of the NRC Report and a possible CAC response to the report. SBSD distributed bloodstains from FSA of known HLA DQ alpha genotypes to six laboratories participating in PCR validation studies. LASD distributed a set of autopsy tissues received from LACO to the six laboratories participating in PCR validation studies. LASD distributed handouts on FBI Advanced Aspects of Forensic DNA Analysis and the latest Cellmark list of DNA court cases and expert witness list. OCSD distributed handouts on the FBI DNA Data Network bulletin board and a list of expert witnesses who have testified in OCSD cases.

The DNA Study Group met on June 24, 1993 prior to the dinner meeting. Discussed DNA papers presented at the Spring 1993 CAC Seminar in Berkeley. Discussed issues associated with D1S80 (validation, type of gel system used, etc). A "Back to Basics" lecture on PCR was presented by Eva Steinberger of OCSD. This presentation was videotaped for the Training and Resources Library. Arrangements were made for each participating laboratory in the sample exchange to bring to the next meeting, 10 blood or saliva DNA extracts from laboratory personnel for D1S80 typing by OCSD.

SEROLOGY STUDY GROUP

Chairs: David Hong, LA Co Sheriff; Don Jones, San Bernardino Co Sheriff

The Serology Study Group met on June 24, 1993 prior to the dinner meeting. A "Back to Basics" lecture on presumptive blood screening and human species identification was presented by Lourdes Peterson and Alissa Mayo of the DOJ Riverside Laboratory. This presentation was videotaped for the Training and Resources Library. A protocol exchange was made of PGM methods for review by the group.

TRACE STUDY GROUP

Chairs: Lynne Herold, LA Co Sheriff; Jeff Thompson, Huntington Beach PD and Wayne Moorehead, OCSD

The Trace Study Group met on June 24, 1993 prior to the dinner meeting. A "Back to Basics" lecture and demonstration on the manufacture, identification, dye extraction and microspectrophotometry of fibers was presented by Wayne Moorehead.

TOXICOLOGY STUDY GROUP

Chair: Manuel Munoz, LA Co Coroner

The Toxicology Study Group met on June 24, 1993 prior to the dinner meeting. Attendees participated in a round table discussion of cocaethylene.

DRUG STUDY GROUP

Chairs: Elizabeth Thompson, John Davis, Orange Co Sheriff-Coroner

Paul Sedgwick (OCSD) discussed representative sampling in multiple item drug cases. Discussion included OCSD court experience using extrapolating weight of cocaine seizures and proving enhancements in cocaine cases using representative sampling and statistics.

Northern

The July Dinner Meeting (July 15, 1993) was hosted by Jerry Chisum of DOJ Sacramento at the Lederwolff Culinary Academy. The Academy served a gourmet dinner of Indian cuisine. The Academy staff was introduced and the two chefs gave short speeches. One chef explained how the meal was prepared. This chef was a winner at a recent nationwide contest in the seafood category. The Academy Director discussed how the Academy was started and the fee schedule for classes ($12,000 for a nine month full time course OR a twelve month part-time night course). Jerry put a label on the back of each attendee as they came into the cocktail (wine) hour prior to the dinner. The name was that of an infamous criminal, real or fictional. By asking a series of questions, each person had to deduce the name on their back. Forty-four people were in attendance.

On September 9, 1993, Nancy Marte and Lisa Skinner of the Santa Clara County Crime Lab hosted a dinner meeting at Palermo's in San Jose. The guest speaker was Dr. Brad Stone, an Associate Professor of Chemistry at San Jose State University. Dr. Stone discussed exobiology, which is the study of how life may have originated elsewhere in the universe. The title of his presentation was "The Atmosphere of Titan - Exobiological Implications". Twenty-four people attended the dinner meeting where they enjoyed a traditional Italian gourmet dinner.

SEROLOGY STUDY GROUP

Chairs: Pam Sartori, Oakland PD and Nancy Marte, Santa Clara Co

The Serology Study Group met on July 15, 1993 at CCI prior to the dinner meeting. Jerry Chisum (DOJ Sacramento) lectured on Bloodstain Pattern Reconstruction and Interpretation. A videotape on Blood Dynamics was shown to the group. This presentation was videotaped for the Training and Resources Library.

The Serology Study Group met on September 9, 1993 at the Santa Clara County Lab prior to the dinner meeting. Topics were "Back to Basics" and included viewing two training tapes, EAP/ACP1 lecture by Bernadette Rickard (Kern Co) and Peptidase A lecture by Collin Yamaguchi (LAPD).

INSIDE Information

NEW KIDS ON THE BLOCK

SERI: Laurie Rawlinson and her husband Terry, welcomed their new son, Davis Alexander on June 17, 1993.

Fresno DOJ: Delia Frausto-Heredia and her husband Eddie, welcomed their new son, Eddie Jr. on September 2, 1993.

MARRIAGES

SERI: Kristina Benson married Steve Bolts, a sergeant with San Luis Obispo Sheriff's Department, on August 14, 1993.

ATF: John Murdock married ***Donna Hyde*** (CCCSO) on August 15, 1993.

MOVING ON

Michele Horne (DOJ Salinas and DNA Labs) has left criminalistics to attend USC Medical School. A criminalist turned medical examiner would be ideal for those of us in the labs, but Michele wants to treat the living. We wish her the best of luck in her new career.

Patricia Huck (DOJ Sacramento) has accepted a position with the International Criminal Investigation Training Program (ICITP) of the Justice Department. She starts with two weeks orientation then goes to Bolivia and Columbia to teach Serology and Crime Scene Investigation in Spanish. She does not expect to be back in the US until December. We wish her luck in her new job. We expect her to give papers at upcoming seminars regarding her experiences!

TRANSFERS

Terry Spear from Santa Clara County as Chief Criminalist to DOJ-DNA Lab as Supervising Criminalist.

When News Happens...
Tell your Lab's "Insider",
or call Greg Matheson.

Training & Resources
(CAC Members Only)

SEROLOGY

Back to Basics Series:

TAPE 1:
- Electrophoresis Basics — *Ron Linhart*
- Glycogenated Vaginal Epithelia —*Ed Jones*
- Erythrocyte Acid Phosphatase — *Berni Rickard*
- Phosphoglucomutase —*J. White / M. Hong*
- Haptoglobin — *David Hong*

TAPE 2: · Immunology — *David Stockwell*
TAPE 3: · Gm / Km —*Stockwell / Wraxall*
TAPE 4: · Peptidase A — *Colin Yamaguchi*
TAPE 5: · ABO —*Jeff Thompson*
TAPE 6: · Saliva —*Terry Spear* (incl DNA Kelly-Frye/Howard Decision)
TAPE 7: · Presumptive Tests/Human Determination—*Peterson/Mayo*
TAPE 8: · Gc—*Devine/Navette*

Also available:

Population Genetics & Statistics Course
Dr. Bruce Weir, Instructor
Eight two-hour tapes, PLUS the course notebook.
(from the three day course at SBSD)

Bloodspatter Lecture — Fall 1992 CAC Meeting
Gary Knowles, Instructor, 2 Tapes

Microscopic Exam. of Sex Assault Evidence
Ed Jones, Instructor

DNA Workshop — Spring 1993 CAC Meeting, 4 Tapes

GENERAL INTEREST

TAPE 1:
- ABC News 9/23/91: "Lab Errors"
- CBS News 4/27/92: "Animation Reconstruction"
- Alex Jason / Jim Mitchell: "Trial Animation"

TAPE 2: · 48 Hours 9/25/91: "Clues"

TRACE EVIDENCE

Basic Microscopy Lecture
Ed Rhodes, Instructor, Two tapes

Tire Impressions as Evidence
Lawren Nause, RCMP, Instructor
Five two-hour tapes PLUS the course notebook
(from the three day course at SBSD)

Evaluation of Lamp Filament Evidence
Lowell Bradford, Instructor

FTIR Lecture
Wayne Moorehead, Instructor

Gunshot Residue Lecture
Ray Calloway, Aerospace, Instructor

Footwear
Bodziak, Instructor, Two tapes

Please address requests to:
Carol L. Hunter, T&R Chairperson
Cal Lab of Forensic Science
17842 Irvine Blvd. Suite 224
Tustin, CA 92680

Announcements

NORTHEASTERN ASSOCIATION OF FORENSIC SCIENTISTS

October 14-16, 1993

The 19th Annual Meeting of NEAFS will be held in Springfield, Massachusetts at the Springfield Marriott. The American Board of Criminalistics (ABC) General Knowledge Examination will be offered in conjunction with this meeting at 9:00am on October 14, 1993. For further information, please contact: Karolyn Leclaire, MA DSP Crime Laboratory, 1010 Commonwealth Avenue, Boston, MA 02215, (617) 566-4500 ext. 241.

NORTHWEST ASSOCIATION OF FORENSIC SCIENTISTS

October 18-22, 1993

The Fall 1993 Meeting of the NWAFS will be held at the Owyhee Plaza Hotel in Boise, Idaho. The following workshops are planned for this meeting: GC-MS, Recovery of Buried Bodies and Scattered Surface Skeletons, Bio-Environmental Evidence in Death Investigation, Smith and Wesson Armorer's School, Footwear and Tire Track Evidence Collection and Preservation, and Expert Witness Seminar. For further information, please contact: Donna Shepherdson, Bureau of Forensic Services, 2220 Old Penitentiary Road, Boise, Idaho 83712, (208) 334-2231.

SOUTHWESTERN ASSOCIATION OF FORENSIC SCIENTISTS

October 24-29, 1993

The Fall 1993 Training Meeting of SWAFS will be held at the Woodlands Plaza Hotel in Flagstaff, Arizona. Ten workshops are scheduled as well as a general session and round table discussion. For further information, please contact: Arizona DPS Crime Lab, PO Box 15500, Flagstaff, AZ 86011.

CALIFORNIA ASSOCIATION OF CRIMINALISTS

October 20-23, 1993

The 82nd Semi-Annual Meeting of the CAC will be held at the Bahia Resort Hotel on Mission Bay in San Diego, California. For further information, please contact: Randy Robinson or Marty Fink, San Diego Co Sheriff, 3520 Kurtz Street, San Diego, CA 92110, (619) 692-5630.

CANADIAN SOCIETY OF FORENSIC SCIENCE / NORTHWEST ASSOCIATION OF FORENSIC SCIENTISTS

October 31-November 5, 1994

The CSFS and NWAFS will hold a joint meeting at the Waterfront Hotel in Vancouver, British Columbia. Workshops and original presentations will run from October 31 through November 5, 1994. For info., contact: Jeffrey Caughlin, RCMP Forensic Laboratory, 5201 Heather Street, Vancouver, BC V5Z 3L7, (604) 264-3507.

Jobs Offered

SUPERVISING CRIMINALIST

The Santa Clara County Crime Laboratory is currently recruiting qualified applicants for the position of Supervising Criminalist. Vacancies are in the laboratory's Serology/DNA unit and Comparative Evidence/Chemistry unit. The effective salary range is $56,308 - $68,450 per year and requires a minimum of five years of experience. Applicants who are interested in these positions, please contact: Benny Del Re at (408) 299-2220, Santa Clara County Crime Laboratory, 1557 Berger Drive, Room B-2, San Jose, CA 95112.

FORENSIC SEROLOGIST - LABORATORY AGENT II

The Colorado Bureau of Investigation is accepting applications for the position of Forensic Serologist. The annual salary range is $42,684 - $57,204 with a minimum of two years experience in serological and/or DNA analysis. A masters degree may substitute for one year experience and a doctorate degree may substitute for two years experience. For further information, please contact: Department of Public Safety, Department of Personnel, Carol, Pritchard, Personnel Administrator, 700 Kipling Street, Denver, CO 80215, (303) 239-4427 OR Pete Mang, Agent-in-Charge, (303) 239-4303.

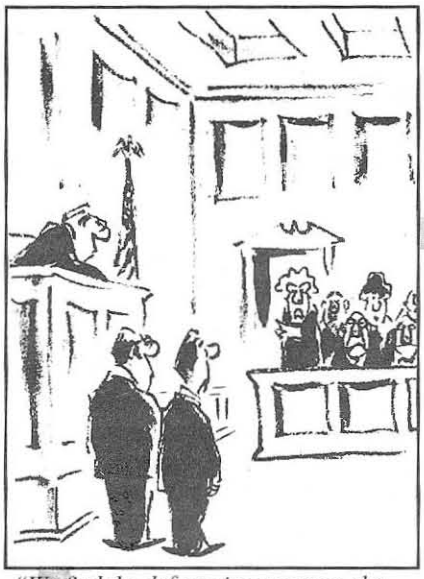
TRACE EVIDENCE EXAMINERS

The Northern Virginia Forensic Laboratory is accepting applications for the position of Senior Forensic Scientist and Forensic Scientist. The annual salary range for Senior Forensic Scientist is $33,568 - $51,253 and Forensic Scientist is $30,707 - $46,884. Minimum qualifications include bachelor's degree in chemistry or related scientific field, experience in a forensic laboratory environment and experience in performing examinations in any two of the following trace evidence areas: glass, paint, explosives, synthetic fibers and accelerant analysis. Expertise in the areas of glass and paint analyses is highly preferred. For further assistance, please contact: DGS JOBLINE (804) 786-3055. Deadline for application submission is no later than 5:00 PM, November 16, 1993.

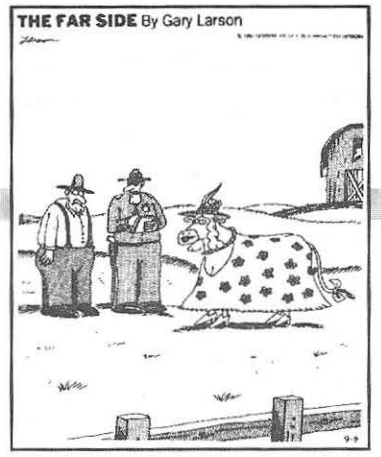
SENIOR CRIMINALIST CRIMINALIST

The Orange County Personnel Department will be accepting applications for Senior Criminalist and Criminalist on a continuous basis until the needs of the County can be met. The monthly salary range for Senior Criminalist is $3524 - 4739 and Criminalist is $2690 - $3628. Minimum qualifications for Senior Criminalist include bachelor's degree in related science field and two years experience in

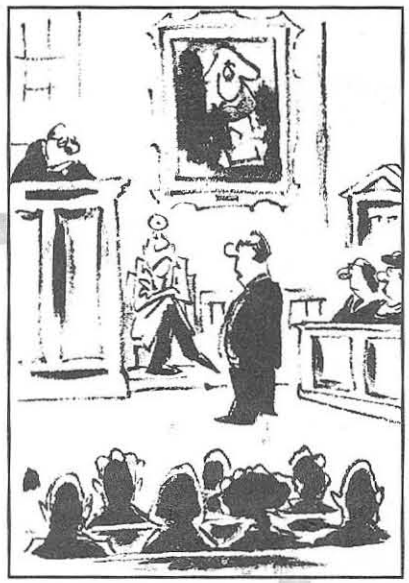
continued on page 12



"We find the defense incompetent, the prosecution arrogant, the food inedible, the accomodations isufferable, and the defendant guilty as Hell."



"You were hit last night by some cult, Mr. Gilbert. . . Not the sickest cult I've ever seen, but a cult nonetheless."



"May I ask you to call for quiet, Your Honor? My witness is about to share his expertise."

If :-) is "Smiley", then who is

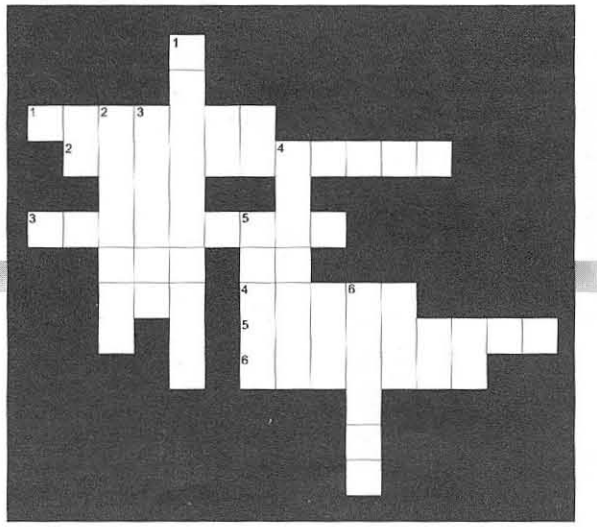
*<:-)	a
=^)	b
[:-)	c
8=:-)	d
-=#:-)	e
8(:-)	f
#-)	g
7:^]	h

Say, who *are* these people anyway?

a-Santa Claus, b-Dagwood Bumstead, c-listening to walkman
d- chef, e-wizard, f-mouseketeer, g-hungover, h-Ronald Reagan

"Objection, Your Honor. The witness is playing hard ball!"

Take 5ive...



ACROSS

1. "Godfather" of microscopy
2. Color depends on vibrational direction
3. "Brings down" your species
4. Mendelyev's offering
5. "Nuke it 'til it glows"
6. Hard to find references

DOWN

1. Sheppard "fell" for one of these
2. Crime labs collect this
3. Tell your story over and over
4. Root of the *Rheum officinale*
5. *This* is to *that*
6. Sour *milk*, not sour grapes

Answers later in this issue.

JOBS

cont'd from page 10

criminalistics (a master's degree may substitute for one year of experience). Minimum qualification for Criminalist is a bachelor's degree in related science field. For further information, please contact: Dianne R. Coe, (714) 647-1889. For applications, please call (714) 834-2844.

SENIOR FORENSIC TOXICOLOGIST
FORENSIC TOXICOLOGIST

The Orange County Personnel Department will be accepting applications for Senior Forensic Toxicologist and Forensic Toxicologist on a continuous basis until the needs of the County can be met. The monthly salary range for Senior Forensic Toxicologist $3524 - $4739 and Forensic Toxicologist is $2690 - $3628. Minimum qualifications for Senior Forensic Toxicologist include bachelor's degree in related science field and two years experience in forensic toxicology within the past five years. Minimum qualifications for Forensic Toxicologist is a bachelor's degree in related science field. For further information, please contact: Ingrid Kutschal, (714) 647-1886. For applications, please call (714) 834-2844.

The following speech was presented by John Murdock at the CAC Spring Seminar Banquet on May 21, 1993 upon receipt of the 1993 Distinguished Member Award.

Mr. President, Members of the Board, fellow CAC Members, and guests:

I appreciate the opportunity to have worked for CAC in the various ways described by Greg (Matheson). But I'm sure that it won't come as any surprise to any of you that my favorite area is Ethics.

One of the main reasons I have always promoted membership in the CAC is because of our Ethics Code and Enforcement Procedure. Having a Code is fairly easy; enforcing it is quite another matter— but we do it and I'm very proud of our overall track record.

We have made mistakes, but we have learned from them and have kept moving forward, and by so doing are held in high esteem by enlightened professionals.

As an example of how relevant our efforts are, I would like to describe a speech I heard last night at the AFTE Seminar banquet in Raleigh, North Carolina. A very well informed North Carolina Supreme Court Judge, who was described as the best friend law enforcement has had in the last ten years, spoke about forensic science.

He first described the beneficial aspects of the use of forensic science by citing specific case examples such as Wayne Williams and Ted Bundy. He cited statistics about how believable we are in the eyes of jurors, lay people in general, as well as Judges and trial lawyers.

> ***"Forensic scientists are, after all, only mortal and as such they make mistakes..."***

Then he paused and said: "Perhaps you are too believable."

He then began a recitation of proficiency test results, citing reported error rates in serology, trace evidence, and of course, firearms and toolmarks.

He then began to talk about what he called "horror stories"; actual cases or instances where "experts" had lied about experience and degree status and instances like the Ricky Ross case where incorrect results had been reported. He said he got his information from court records and law journals and not from the newspaper.

He went on to say that what a lot of people don't realize is that forensic scientists are, after all, only mortal and as such they make mistakes— *but why so many?*

He said that ours is a completely unregulated industry and proceeded to compare and contrast us with clinical chemists who must be licensed and successfully complete proficiency tests, even though the clinical chemist doesn't de-

velop evidence that can mean someone is put to death.

He acknowledged that our voluntary proficiency test efforts as well as certification but went on to say the he favors mandatory proficiency testing (regulated by some outside group) with the results reported publicly. He summed up by admonishing us to do our forensic laboratory work carefully and professionally.

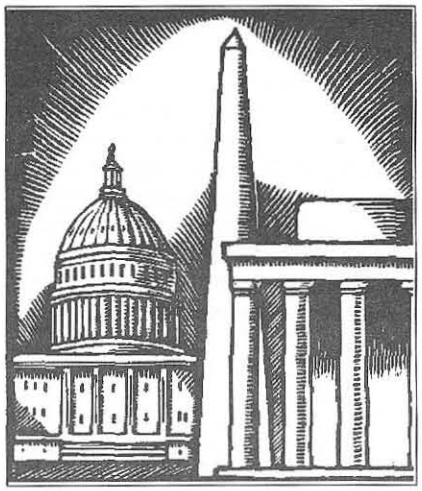
The new AFTE president, Jerry Styers, then spoke about how AFTE was going to work with ASCLD, the national crime lab management group, in the enforcement of ethical standards when mistakes in firearm and toolmark examinations are made in ASCLD member laboratories. I'm not sure how he intends to go about this, but the fact that he said it is significant. He stressed the need to do casework cautiously, to not let the crush of casework cause examiners to take shortcuts, to not condone excuses like "It's not my job", or "I didn't have time to do it right". It's significant that the AFTE ethics code and enforcement procedure closely resembles the CAC's.

Our longstanding and continuing effort to monitor the conduct of our members, while at the same time not being preoccupied with it, as some would have you believe, is helping to create a more professional climate of concern for quality in forensic science casework.

I feel very privileged to have worked closely with some very talented and dedicated professionals within CAC, CACLD, AFTE, as well as ASCLD to help promote standards of conduct.

I'm very proud to belong to the CAC because you continue, in a constructive way, to be concerned with professional conduct.

Finally, I'm glad that there exists a climate in the CAC that allows people who have a special interest in this area of professional conduct to be rewarded for their efforts. I'm honored and pleased that this time it has been me. Thank you so much for the 1993 Distinguished Member Award. ■



"Junk science isn't just a plaintiffs' or defendants' problem; it's an enemy of the system."

—Raoul D. Kennedy, Esq.
California LawyerMagazine
September 1993

Analysis

Dean M. Gialamas

Say 'Bye-Bye' to Frye

On March 30, 1993, the United States Supreme Court was asked to rule on the validity of the 70-year old *Frye* rule, which basically requires a "general acceptance" of scientific methodology as a prerequisite for admission of evidence. In a landmark ruling on June 28, 1993, the Justices voted *unanimously* that the 1923 *Frye*-test has been superceded by the 1975 adoption of the Federal Rules of Evidence, which, in part, basically state that the trial judges, not the scientific community only, have a responsibility to determine whether the scientific evidence is valid and reliable when novel scientific techniques are offered.

Case History:

The petitioners ("plaintiffs") are two minor children and their parents. They allege that the children's serious birth defects are a result of the mothers' prenatal ingestion of Bendectin, an antinausea drug. The case started in California, but the case was moved to Federal court on the grounds of diversity. Extensive discovery was provided. The petitioners provided eight experts who based their conclusion that the drug does cause birth defects on animal studies, chemical structure analysis, and unpublished re-analysis of previously published results. The respondents ("defendants") provided experts with more than 30 published papers showing that in the 130,000 subjects studied, none showed evidence of Bendectin being a teratogen (a substance that causes birth defects). The District Court granted the respondents with a summary judgment stating that the petitioners evidence did not meet the applicable "general acceptance" standard held under *Frye*. The United States Court of Appeals for the Ninth Circuit agreed. The Supreme Court of the United States did NOT agree.

The following are direct quotes from the actual ruling as given in *Daubert, et. al. v. Merrell Dow Pharmaceuticals, Inc.*, 1993 US LEXIS 4408.

Supreme Court Summary Ruling: "The Federal Rules of Evidence, not Frye, provide the standard for admitting expert scientific testimony in a federal trial." (Emphasis added)

Part I

(a) "*Frye's* 'general acceptance' test was superceded by the Rules' adoption." (See addendum containing Frye rule and Federal Rules of Evidence excerpts)

(b) "The Rules — especially Rule 702 — place appropriate limits on the admissibility of purportedly scientific evidence by assigning to the trial judge the task of ensuring that an experts testimony both rests on

a reliable foundation and is relevant to the task at hand."

(c) "... the trial judge... must make a preliminary assessment of whether the testimony's underlying reasoning or methodology is scientifically valid and properly can be applied to the facts at issue."

(d) "Cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof, rather than wholesale exclusion under an uncompromising 'general acceptance' standard, is the appropriate means by which evidence based on valid principles may be challenged."

Excerpts from the Supreme Court Opinion written by Justice J. Blackmun:

Part II-A

"*Frye* made 'general acceptance' the exclusive test for admitting expert scientific testimony. That austere standard, absent from and incompatible with the Federal Rules of Evidence, should not be applied in federal trials."

II-B

"... under the Rules the *trial judge* must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable." (emphasis added)

II-B

"In a case involving scientific evidence, evidenciary reliability will be based upon scientific validity.."

II-C

"... the trial judge must determine at the outset, pursuant to Rule 104(a), whether the expert is proposing to testify to (1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue. This entails a preliminary assessment of whether the reasoning or method-ology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue. ...[W]e do not presume to set out a definitive checklist or test."

II-C General Observations made by the Court:

"Ordinarily a key question to be answered in determining whether a theory or technique is scientific knowledge that will assist the trier of fact will be whether it can be (and has been) tested."

"Another pertinent consideration is whether the theory or technique has been subjected to peer review and publication. Publication... does not necessarily correlate with reliability... and in some instances well-grounded but innovative theories will not have been published..."

"Additionally, in the case of a particular scientific technique, the court ordinarily should consider both the known or potential rate of error..."

"Finally, 'general acceptance' can yet have a bearing on the inquiry. ... [A] 'known technique that has been able to attract only minimal support within the community' may properly be viewed with skepticism."

"The inquiry envision by Rule 702 is, we emphasize, a flexible one. ... *The focus, of course, must be solely on principles and methodology, not on the conclusions that they generate"* (emphasis added).

Part III

"Respondent expresses apprehension that abandonment of 'general acceptance' as the exclusive requirement for admission will result in a 'free-for-all' in which befuddled juries are confounded by absurd and irrational pseudoscientific assertions. In this regard respondent seems to us to be overly pessimistic about the capabilities of the jury, and of the adversary system generally. Vigorous cross-examination, presentation of contrary evidence, and careful instruction of the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence. ... These conventional devices, rather than wholesale exclusion under an uncompromising 'general acceptance' test, are the appropriate safeguards where the basis of scientific testimony meets the standards of Rule 702."

Part IV

"To summarize: 'general acceptance' is not a necessary precondition to the admissibility of scientific evidence under the Federal Rules of Evidence, but the Rules of Evidence — especially Rule 702 — do assign to the trial judge the task of ensuring that an expert's testimony both rests on a reliable foundation and is relevant to the task at hand. Pertinent evidence based on scientifically valid principles will satisfy those demands.

The inquiries of the District Court and the Court of Appeals focused almost exclusively on 'general acceptance,' as gauged by publication and the decisions of other courts. Accordingly, the judgment of the Court of Appeals is vacated and the case is remanded for further proceedings consistent with this opinion.

"It is so ordered."

Chief Justice Rehnquist and Justice Stevens concur with the statements made in Parts I and II-A. Both Justices dissent with respect to parts II-B, II-C, III, and IV. The following are excerpts from Chief Justice Rehnquist's dissent opinion.

"The Court concludes, correctly in my view, that the *Frye* rule did not survive the enactment of the Federal Rules of Evidence ..."

"'General Observations' by this Court customarily carry great weight with lower federal courts, but the ones offered here ... tend to be not only general, but vague and abstract."

Chief Justice Rehnquist goes on to discuss some serious questions about when to use the rule and to whose testimony it pertains.

"I do not doubt that Rule 702 confides to the judges some gatekeeping responsibility in deciding questions of the admissibility of proffered expert testimony. But I do not think it imposes on them [the judges] the obligation or the authority to become amateur scientists in order to perform that role."

Chief Justice Rehnquist thinks that the Court overstated its opinion:

"... our reach can so easily exceed our grasp."

Clearly now there is a lower standard for the admissibility of novel evi-

dence. The grounds upon which this evidence is accepted are now more flexible. The high court has ruled that the precedent setting *Frye*-test is currently not the only appropriate means to rule on the admissibility of evidence. The court states that *Frye* may be used — but it is not to be the sole deciding factor in a case of evidence admissibility in federal courts.

The criteria set by the US Supreme Court, to follow with Chief Justice Rehnquist, are rather vague. Where or how are judges going to get the scientific foundations upon which decisions on novel scientific evidence are made? Some judges may be cautious and seek the aid of an independent, court appointed expert to help in decision making if there is acknowledgement of a lack of scientific background on the judges' part. Hence, a federal judge may still use the *Frye*-test criteria under the new ruling in allowing evidence obtained from a new scientific technique. The Court has not ruled *Frye* to be inappropriate; it is merely stating that *Frye*, as case law, has been overridden by the Federal Rules of Evidence, legislative law. Perhaps the more conservative judges will follow this line of thinking. Other judges may be more liberal in their "persuadability" and allow all relevant evidence. Under the new ruling, the *Frye* test need not be applied. The evidence can be allowed as long as it meets the criteria set forth under the Federal Rules of Evidence.

Well, what is to happen to us Californians? Many of us are familiar with *Kelly/Frye*. In summary, there are three "prongs" to *Kelly/Frye*:

1. **Experts properly qualified**
2. **Correct procedures used**
3. **Reliability established by experts**

The *Kelly* case was concerning results of voiceprint evidence that was offered by the prosecution. The appellate ruling reconfirming *Frye* in California came about from the checks and balances of the judicial system which ensures a defendant's right to a fair trial when expert testimony on scientific evidence is offered:

"...We simply circumscribe, carefully and deliberately, the admission of evidence born of new techniques until the time when there is demonstrated solid scientific approval and support of the new methods. The *Frye* test was not designed to eliminate reliance upon scientific evidence, but to retard its admissibility until the scientific community has had ample opportunity to study, evaluate, and accept its reliability." (*People v. Kelly*, (1976) 17 Cal.3d)

There now is a direct conflict with the Daubert Federal ruling and the *Kelly/Frye* California rulings.

Now that the US Supreme Court has overturned *Frye*, greater judicial discretion has been granted to the Federal courts. But where does this leave us as experts? Opponents of the new ruling feel it is a "crack" in the system. Absurd scientific techniques which are not "generally accepted" by the scientific community may fill federal courtrooms. The fear of "junk science" taking over testimony in the courtroom is of great concern. Of greater concern is judges and juries believing it.

But as we all know, phony evidence and testimony often benefits the "opponent" through careful cross-examination and appropriate counter-testimony. Therefore, greater burden is now put on the attorneys, working together with the scientific community, to discredit these charlatans.

Proponents of the ruling feel it is the break they needed. With technology growing at such a rapid pace, experts now have the potential to use more new techniques. Take, for instance, the rapidly growing field of DNA analysis. With all the new probes being developed, the new ruling will make it easier to apply and admit novel techniques to crime lab DNA cases.

But if there is a fine line between novel science and "junk" science, just how *will* judges get the scientific foundations upon which to rule? Some may take the conservative view and seek independent experts or use the *Frye* criteria for help. Others may be more liberal and apply the old standard of "knowing it when they see it."

Though one must keep in mind (1) novel evidence may or may not be presented. (2) If presented, the evidence must be ruled to be admissible (of course, the admissibility of evidence may vary from judge to judge now because of *Daubert*; another argument of itself!). (3) Upon admission, it must be properly challenged by both parties involved through rigid cross-examination and/or counter-testimony. (4) If the evidence still survives, it must then be given weight by the trier(s) of fact. So even if testimony or evidence still stands once it is offered, accepted, and challenged, there still remains the issue of weight. Note that *Daubert* only affects point (2). The other points, especially (4), remain unchanged. Of course, supporters of the evidence will try to bolster its weight, while the opposing party will try to downplay its significance. Perhaps *Daubert* is just shifting courtroom arguments from admissibility to arguments of weight.

California and other states will certainly be faced with some serious implications for future trials involving new scientific evidence. We will soon see how judges and attorneys decide to handle novel science as well as "junk" science when, and if, it is offered. If challenged properly, the "enemy of the system" that some are concerned about will be easily defeated. So, to which standard will we be held in California? Time will tell.

—D.G.

ADDENDUM

The *Frye* Test:
Frye v. U.S. (1923) 293 F. 1013, 1014

"Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs."

cont'd

Bye-Bye

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Excerpts from the Federal Rules of Evidence: (written in 1975)

Rule 104(a): "Preliminary questions concerning the qualification of a person to be a witness, the existence of a privilege, or the admissibility of evidence shall be determined by the court, subject to the subdivision (b) [pertaining to conditional admissions]."

Rule 402: "All relevant evidence is admissible, except as otherwise provided by the Constitution of the United States, by Act of Congress, by these rules, or other rules prescribed by the Supreme Court pursuant to statutory authority. Evidence which is not relevant is not admissible."

Rule 403: permits the exclusion of relevant evidence "if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury ..."

Rule 702: "If scientific, technical, or other specialized knowledge will assist the triers of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise."

Rule 703: "...[E]xpert opinions based on otherwise inadmissible heresay are to be admitted only if the facts or data are 'of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject.'"

Rule 706: allows the court at its discretion to procure the assistance of an expert of its own choosing.

Dean M. Gialamas is a Criminalist with the California Laboratory of Forensic Science

ReMatch

The OCSD Team They are all smiling because they have yet to find out that they will buy pizza! Great game, guys and gals!

On Saturday, September 25, 1992, the First Annual Southern California Crime Laboratory Softball Tournament was played at Mile Square Park in Fountain Valley. During the tournament, a grueling match was played between the Orange County Sheriff-Coroner (OCSD) team and the Huntington Beach Police /Cal Lab (HB/CL) teams. HB/CL rose to victory. The HB/CL team was challenged to a rematch on a later date.

On July 24, 1993, after being rained out on a previous occasion, the two teams met again for a best-of-three match. The stakes were high: losers had to buy pizza. Pitted with an extra incentive to win, both teams came out to fight and play hard.

The first game was quick and uneventful with a HB/CL winning 7-1.

The second game seemed like a another breezy win for the HB/CL team. The odor of burnt pepperonies, melting mozzarella, and other favorite pizza trimmings were filling the air. At the top of the seventh (we only played 7 innings per game), HB/CL was winning 14-7. Victory was sure.

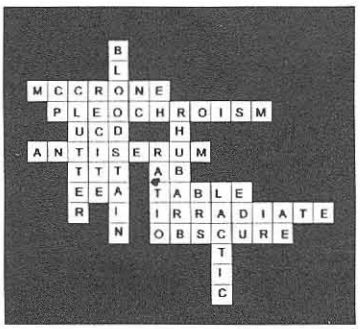
Well, so were the hard hits from OCSD — scoring 8 runs in the top of the seventh (!) to take the lead 15-14. It seemed as though the HB/CL team packed their bags an inning too early.

HB/CL came up to bat to try to chip away at the OCSD lead. With Carolyn Gialamas on second, Rueben Flores hit a double to center bringing Carolyn home to tie the game 15-15. With two outs and Rueben on second base, Rich Eidelhuber hit the winning slug into never-never land and HB/CL wins 16-15.

Boy were we ready for pizza by then! Thanks to all who played, OCSD for the pizza, and special thanks to Monica Moriartiy at OCSD for the great action photos!

—Dean M. Gialamas

Answers to **Take 5ive...**

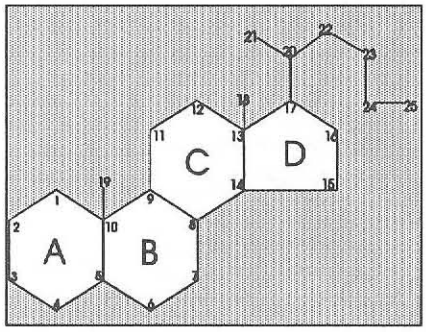


Analysis of Anabolic Steroids

Gary Koverman
Laboratory Agent
Colorado Bureau of Investigation
301 South Nevada Avenue
Montrose, CO 81401

INTRODUCTION

Steroid hormones are lipids which play a major role in the physiology of mammals. Steroid hormones include cholesterol, bile acids, Vitamin D, adrenocorticoids and the sex hormones. Medicinal properties of steroids make them useful as anti-inflammatory agents, oral contraceptives, and male hormones (androgens). All the steroid structures contain the characteristic tetracycyclic nucleus termed the cyclopentanoperhydrophenanthrene ring system, a five-membered cyclopentane ring fused to a fully-reduced phenanthrene ring system. The steroid ring system is numbered by position, and the rings are designated by the letters A, B, C, and D. (See Figure)



Substituents attached to the ring occupy discrete locations in space. The substituents may either project above or below the plane of the ring structure. Substituents which project upward from the plane of the steroid ring are designated as beta-substituents, while substituents which project downward from the plane of the steroid ring are designated as alpha-substituents. Steroid hormones are biosynthesized from cholesterol which is obtained from the diet or by hepatic biosynthesis. Anabolic steroids as defined by *Dorland's* Medical Dictionary (1) are:

Any group of synthetic derivatives of testosterone having pronounced anabolic properties which are used clinically, mainly to promote growth and repair of body tissues in senility, debilitating illness, and convalescence.

Anabolic —A constructive process by which simple substances are converted by living cells into much more complex compounds, especially into living matter.

Androgenic —That quality of a substance possessing masculinizing activities such as testicular hormone (testosterone).

A large number of testosterone derivatives have been developed in an attempt to separate androgenic and anabolic properties. Analogues with a high ratio of anabolic to androgenic activity are collectively referred to as anabolic steroids (2). It is estimated that there are over seventy (70) anabolic/androgenic steroids marketed worldwide.

The anabolic steroids can be subclassified as non-esters or 17-B esters. The non-esters include testosterone, methyltestosterone, nortestosterone, methandrostenolone, fluoxymesterone, methandriol, boldenone, oxymetholone, oxandrolone, and stanozolol. Of these derivatives, nortestosterone fluoxymesterone and stanozolol have greater anabolic than androgenic activity.

The non-esters testosterone, nortestosterone, and boldenone are relatively ineffective when taken orally. These anabolic steroids are generally formulated as suspensions for intramuscular injection. These agents, when taken orally, are absorbed into the "portal" blood flow and are distributed to the liver where they are destroyed by hepatic metabolism. As a result, insufficient amounts of the active steroid survive to reach systemic circulation. The primary pathways of inactivation include oxidation of the C-17 hydroxy group and reduction of the enone moiety at C-3 position.

The other non-ester anabolic steroids including fluoxymesterone, methandriol, methyltestosterone, oxandralone, oxymetholone, and stanozolol are marketed as tablets or capsules for oral administration. The increased oral efficiency of these compounds is a result of the presence of an additional methyl or ethynyl substituent at the C-17 position. The presence of such a substituent protects C-17 from hepatic oxidative metabolism in the liver. The ester anabolic steroids include C-17 ester derivatives of testosterone, nortestosterone, boldenone and methandriol. These compounds are generally marketed as oily solutions for intramuscular injection. After injection these compounds enter the systemic circulation where the C-17 ester position is cleaved by plasma esterases to yield active anabolic steroids.

It has been documented that athletes competing in a variety of sports from high school to professional level have used anabolic steroids to increase muscle development, strength, decrease healing time following injury, diminish fatigue and increase aggressiveness. Furthermore, the growing interest in physical fitness in the United States has been accompanied by an increase in the casual use of anabolic steroids. Probably the most notorious incident of anabolic steroid abuse was the Canadian runner, Ben Johnson, who was disqualified from winning a gold medal in the 1988 Olympics in Seoul, South Korea, for the abuse of the steroid stanozolol.

Adverse reactions associated with anabolic steroid abuse are dependent on the particular agent, its dose, and duration of use. Prolonged abuse can adversely effect the cardiovascular system by causing sodium and fluid retention, increasing LDL cholesterol along with decreasing HDL cholesterol and producing changes in heart muscle.

Probably the most serious adverse effects are disorders of the liver. The abuse of anabolic steroids has been associated with peliosis hepatitis, liver cysts, hepatomas or liver tumors. Extreme abuse has been associated with cholestatic jaundice resulting from obstruction of the outflow of bile from the liver. This condition results in the yellowish discoloration of the skin and eyes due to accumulation of bile salts in the blood.

MATERIALS

Filter Paper—Fischer P-809-790-12G
Centrifuge—Adams Sero-Fuge II
Thin layer plates—Analtech 10 x 20cm coated 250 microns with silica gel GHLF with fluorescent indicator
Ultra Violet Spectrophotometer—Beckman Model 25
GC/MS—Hewlett Packard 5890 Gas Chromatograph/Hewlett Packard Mass Selective Detector/Hewlett Packard 9133 Chem Station
Pharmaceutical anabolic steroids—local pharmaceutical supply
Anabolic steroid standards—Sigma Chemical Company
P. O. Box 14508
St. Louis, MO 63178

Steraloids, Inc.
P. O. Box 310
Wilton, NH 03086

PROCEDURE

An analytical method consisting of extraction, TLC, UV and GC/MS was devised for sixteen commonly abused anabolic steroids.

EXTRACTION

1. Two tablets of the solid dosage are crushed to a fine powder and added to a 10 x 75mm test tube and 1ml of methanol* is added. (4)
2. If the dosage form is a liquid injectable, 1ml is placed in the test tube and 1ml of methanol is added.
3. The mixture is shaken vigorously and vortexed for approximately thirty seconds.
4. The emulsion which may form is broken up by centrifuging the mixture at high speed for two minutes.
5. If the top supernatant layer is not clear, it should be filtered through qualitative filter paper.
6. The clear filtrate or supernatant liquid is now ready for UV, TLC and GC/MS analysis.

* Due to the limited solubility in methanol, stanozolol and oxandrolone are extracted in dimethyl formamide (DMF) and methylene chloride respectively. (3)

ULTRA VIOLET SPECTROPHOTOMETRIC ANALYSIS

1. Approximately one drop of the extracted sample is added to a blanked cuvette of methanol.
2. Due to the high end absorption of methanol, ethanol is substituted for the analysis of stanozolol.
3. The samples are scanned in the ultra violet region from 320 to 200 nm.
4. The results of ultra violet spectrophotometric analysis are summarized in Table I.

TABLE I

Anabolic Steroid	Wavelength
Mesterolone	***
Testosterone	241
Methyltestosterone	242
Methandrostenolone	245
Oxandrolone	***
Testosterone Acetate	241
Oxymetholone	283
Testosterone Propionate	240
Fluoxymesterone	239
Stanozolol	224
Testosterone Isocaproate	240
Testosterone Enanthate	241
Testosterone Cypionate	240
Nortestosterone Decanoate	239
Testosterone Decanoate	240
Testosterone Phenypropionate	240

*** No absorbance in the 200-360nm region

THIN LAYER CHROMATOGRAPHY ANALYSIS

Thin layer plates—Analtec 10x20cm coated with 250um of silica gel GHLF (fluorescent indicator).
Mobile phase solvent — Chloroform:ethyl acetate 80:20
Detection reagent—EtOH:H_2SO_4 4:1

Plates are first visualized with long wave UV (254nm) and the results recorded. Plates are then oversprayed with EtOH:H_2SO_4 (4:1) and heated gently on a hot plate and the results recorded.

A summary of the results of the thin-layer chromatography analysis is included in Table II.

TABLE II

Anabolic Steroid	hRF	UV	EtOH/Acid
Stanzolol	0	-	brown
Fluoxymesterone	5	+	rose
Methandrostenoloe	18	+	gold*
	21	+	tan
Testost. phenylproprion.	28	+	yellow
Oxandrolone	24	-	rose
Testosterone	24	+	purple
Methyltestosterone	28	+	tan
Oxymetholone	26	+	rose
	35	+	rose*
Mesterolone	37	-	purple
Testosterone Isocaproate	41	+	brown
Testosterone Acetate	57	+	purple
Testosterone Proprionate	60	+	purple
Testosterone Enanthate	65	+	purple
Testosterone Cypionate	65	+	purple
Nortestosteron Decanoate	66	+	brown*
	43	+	tan
Testosterone Decanoate	68	+	gold

*Most intense spot

GC/MS CONDITIONS

electron impact
70eV
column—12 m x 0.2mm x .33um film thickness of methyl silicone (Hewlett Packard HP-1)um carrier gaslinear velocity 36 cm/sec split ratio 30:1
solvent delay 1.5min
scan range 40-500 atomic mass units
1 ul of sample introduced in methanol (methylene chloride for oxandrolone and DMF for stanazolol)

Gas Chromatograph Program

Initial temperature:	220 C
Initial time:	4min
Rate 1:	20 C/min
Level 1 Temperature:	250 C
Level 1 Time	5 min
Level 2 Temperature	280 C
Level 2 Time	14 min
Total Time	26 min
Detector Temperature	290 C
Injector Temperature	290 C

The results of gas chromatographic retention times are summarized in Table III.

TABLE III

GAS CHROMATOGRAPHIC RETENTION TIMES

Anabolic Steroid	Retention Time (min)
Mesterolone	7.20
Testosterone	7.37
Methyltestosterone	7.63
Methandrostenolone	8.03
Oxandrolone	8.59
Testosterone Acetate	8.78
Oxymetholone	9.25
Testosterone Propionate	10.28
Fluoxymesterone	11.00
Stanozolol	12.56
Testosterone Isocaproate	14.06
Testosterone Enanthate	15.62
Testosterone Cypionate	19.73
Nortestosterone Decanoate	21.13
Testosterone Decanoate	23.67
Testosterone Phenylpropionate	24.55

Immunoassay for Human Chorionic Gonadotropin (HCG)

Introduction

Human Chorionic Gonadotropin (HCG) is secreted from the placenta and is present in high concentrations in the urine of pregnant females. It is a glycoprotein, and a large macromolecule, quite unlike the basic ring structure of typical anabolic steroids. However, upon introduction into the system of adult males, it stimulates the Leydig tissue of the testis and elicits the production of endogenous testosterone.

For this reason several states, including Colorado, have classified HCG as an anabolic steroid. Since HCG is a large macromolecule, it cannot be analyzed by conventional forensic chemistry techniques; therefore a sensitive and specific technique for the detection of HCG was developed utilizing an ouchterlony double-diffusion immunoassay. HCG is generally manufactured for subcutaneous injection by mixing lyophilized powder with sterile water to produce an HCG solution at 1000 IU/ml. The ouchterlony technique employed has sufficient sensitivity to detect 5ul of such a preparation.

Double-diffusion ouchterlony plates were utilized for the detection of HCG. Antiserum to HCG (anti-HCG) and HCG are utilized along with questioned samples to be identified. The analysis was carried out in phosphate buffered 1% Type I agarose gel in petri dishes. After overnight diffusion at room temperature, the gels are soaked for three hours in 1M saline and rinsed with distilled water. The protein precipitin bands were visualized by staining with Comassie blue.

The working HCG stock solution was prepared by dissolving the lyophilized powder in 10ml of distilled water to produce a concentration of 1000 international units per milliliter (IU/ml) and stored at 0 C-5 C. The working antibody solution was prepared by diluting the stock antibody solution 1:5, as per manufacturers directions, with 0.01M phosphate buffer, pH7.8 containing 0.15M sodium chloride, 0.5% bovine serum albumin (BSA) and 0.1% sodium azide.

The identification of purple precipitin bands between the wells is a positive identification of HCG. The sensitivity of the method is such that 7ul of 500 IU/ml HCG can be detected with 7ul of the 1:5 diluted antibody.

Reagents

Anti HCG - Sigma C8534 rabbit alpha and beta subunits antiserum.
Separated into 100ul aliquots and stored frozen.

HCG - Sigma CG-10 10,000IU per vial diluted with 10ml distilled water to yield 1,000 IU/ml HCG stored refrigerated.

Phosphate Buffer pH 7.8

0.39g monobasic sodium phosphate
1.02g dibasic sodium phosphate
8.77g sodium chloride diluted to 1 liter with distilled water

Agarose

1% agarose Sigma Type I in phosphate buffer

Plate Preparation

7ml of hot agarose solution added to a 95mm x 15mm petri dish (Fisher 08-757-14g) and allowed to cool on a level surface. Plates may be stored upside down in a refrigerated moisture chamber for up to two months.

Ouchterlony Analysis

Holes are punched in the agarose gel with a cylindrical tube having 3mm diameter ("BIC" ink pen inner tube) 7mm apart for antigen and antibody wells (*see diagram at end of article*). 7ul of working antigen, questioned HCG, working antibody solutions, and phosphate buffer are added to respective wells. Plates are incubated overnight at room temperature.

Ouchterlony Staining Procedure

Destaining solution:
250ml methanol
250ml distilled water
50ml glacial acetic acid

Stain:
0.1g Coomassie Blue (Brilliant blue R) (0.1%) in 100ml of destain solution

1M saline 58.44g sodium chloride diluted to one liter with distilled water.

Procedure

After ouchterlony plate has run 24 hours, add 1M saline and let soak for three hours. Rinse gently with distilled water. Stain until precipitate bands become visible and destain to remove excess dye. Precipitate bands will stain purple.

DISCUSSION

Controls placed on anabolic steroids to limit their use by the federal government and many states placing anabolic steroids on their controlled substances list along with increased demand has led to a growth in the clandestine market and smuggling for steroid dosage forms. Due to these activities, it is reasonable to expect more "counterfeit" anabolic steroids and the incidence of mislabeling will be encountered. For these reasons, a rapid and efficient analytical method was developed for the detection of pharmaceutical and clandestine dosage forms.

It is suggested that anabolic steroids be placed on either Schedules III

current legal definition for anabolic steroids in Colorado, placing them in Schedule III of Controlled Substances:

Definition:

"Anabolic Steroid" means: any material, drug, hormonal compound, salt, isomer or salts of isomers of testosterone, or synthetic or natural derivatives of testosterone having pronounced anabolic properties which is used primarily to promote growth of muscle tissue, which includes, but is not limited to, any of the following:

1) boldenone
2) chlorotestosterone
3) clostebol
4) dehydrochlormethyltestosterone
5) dihydrotestosterone
6) drostanolone
7) ethylestrenol
8) fluoxymesterone
9) formebulone
10) human chorionic gondatropin
11) human growth hormone
12) mesterolone
13) methandienone
14)methandranone
15) methandriol
16) methandrostenolone
17) methenolone
18) methyltestosterone
19) mibolerone
20) nandrolone
21) norethandrolone
22) oxandrolone
23) oxymesterone
24) oxymetholone
25) stanolone
26) stanozolol
27) testolactone
28) testosterone
29) trenbolone

30) any salt, ester, or isomer of a drug or substance described or listed in this paragraph, if that salt, ester, or isomer promotes muscle growth.

Except as provided, such term does not include an anabolic steroid which is expressly intended for administration through implants to cattle or other nonhuman species and which has been approved by the Secretary of Health and Human Services for such administration.

CONCLUSIONS

Anabolic steroids were first controlled in Colorado with Senate Bill No. 81 in May, 1987. In June 1992 they were placed under the Uniform Controlled Substances Act with House Bill No. 92-1015. This law placed anabolic steroids in Schedule III of the Controlled Substances. Since these laws were enacted, numerous cases of anabolic steroids have been encountered. This paper is an attempt to present a method to isolate, screen, and definitively analyze 17 commonly encountered anabolic steroids by utilizing analytical equipment and procedures available to most forensic laboratories (i.e. TLC, UV, and GC/MS). In addition, a novel serological technique has been developed for the analysis of Human Chorionic Gonadotropin (HCG).

It is anticipated that a similar serological technique would be feasible for the identification of Human Growth Hormone, another compound included under the anabolic steroid statute in Colorado.

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4. *United States Pharmacopeia*, 20th Revision, USPXX July 1980.
5. *Analytical Profiles of Anabolic Steroids and Related Substances*, Volume II, CND Analytical, Auburn, AL, 1991
6. Coleman, Paul, et al, "Anabolic Steroids - Analysis of Dosage Forms from Selected Studies from the Los Angeles County Sheriff's Scientific Services Bureau", *Journal of Forensic Sciences*, Vol. 36, No. 4, July 1991, pp 1079-1088
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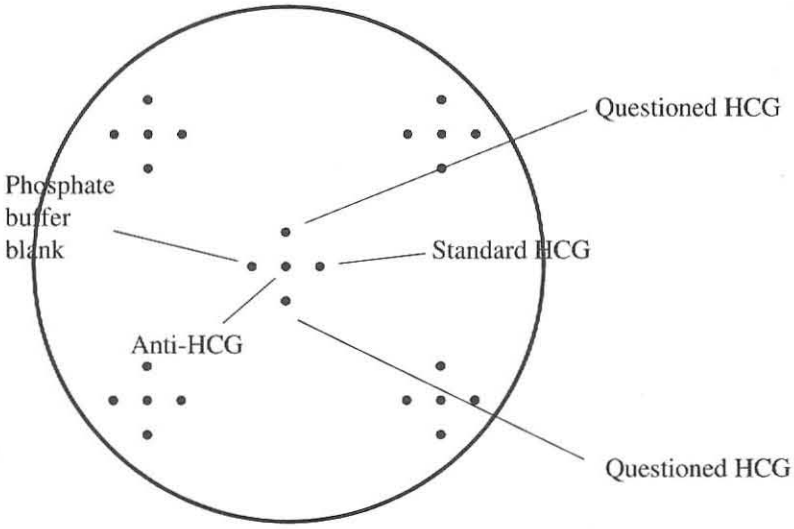
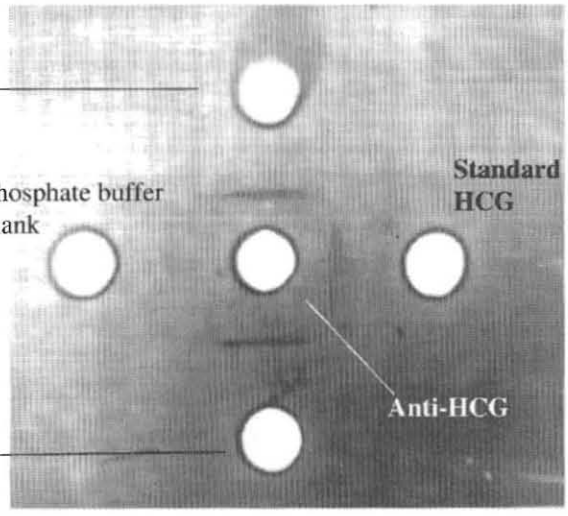
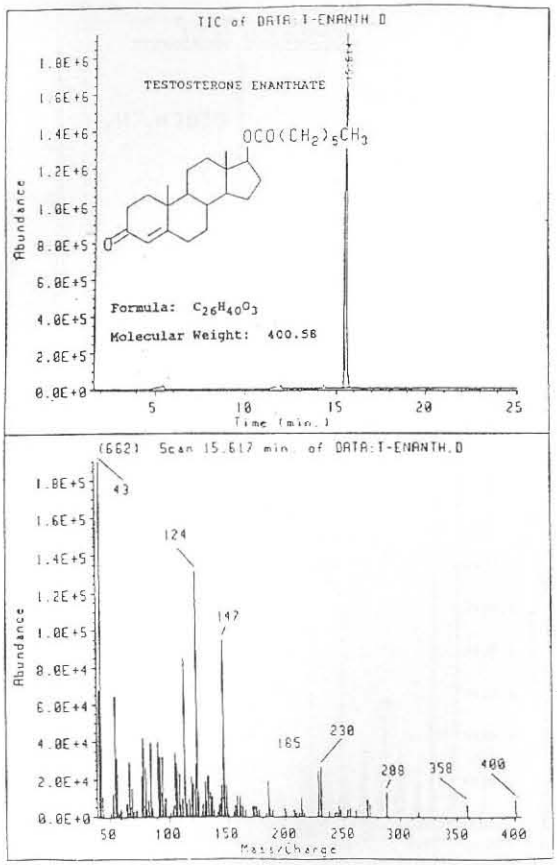
OUCHTERLONY TEMPLATE



7ul of sample is pipetted into each well



A precipitate band between adjoining wells is indiciative as to the presence of HCG.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OCO(CH2)5CH3
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Molecular Weight: 400.58
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Time (min.)
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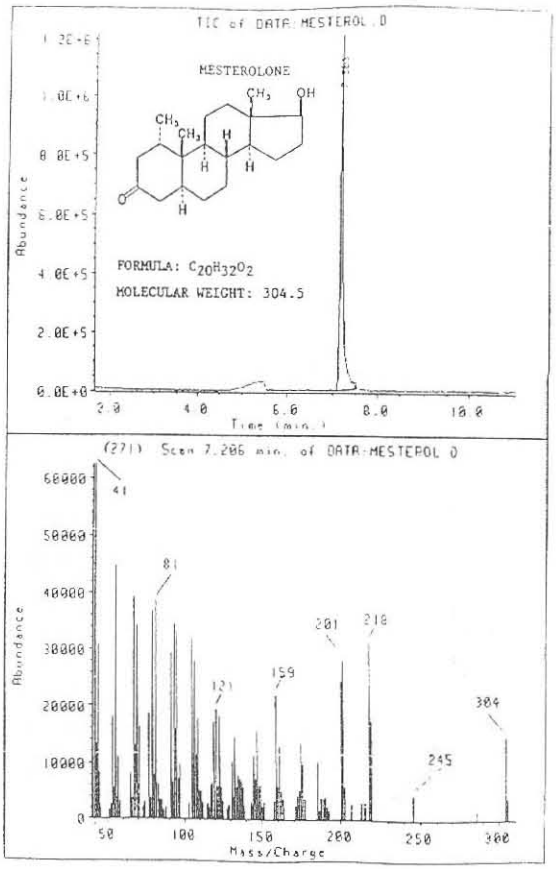
43
124
147
185
230
288
358
400
Mass/Charge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MESTEROLONE
FORMULA: C20H32O2
MOLECULAR WEIGHT: 304.5
Abundance
Time (min.)
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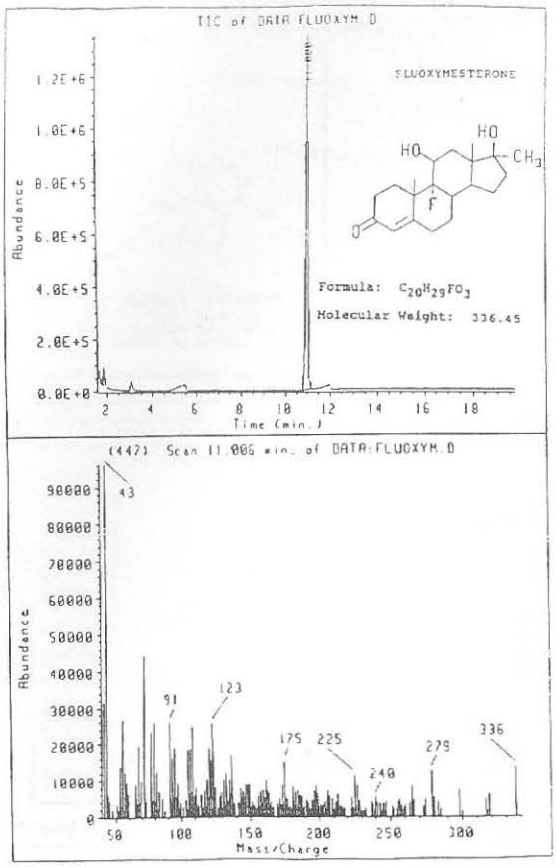
41
81
121
159
201
218
245
304
Mass/Charge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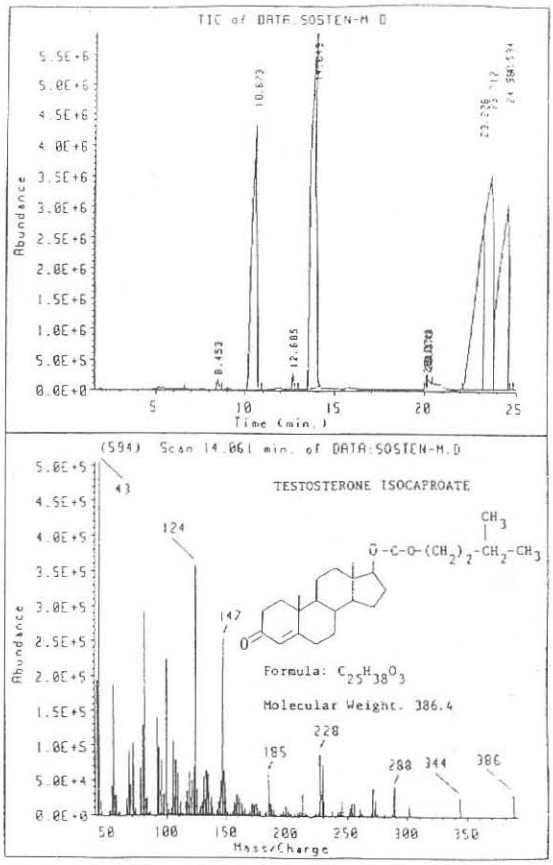
43
91
123
175
225
240
279
336
Mass/Charge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10.673
12.685
Abundance
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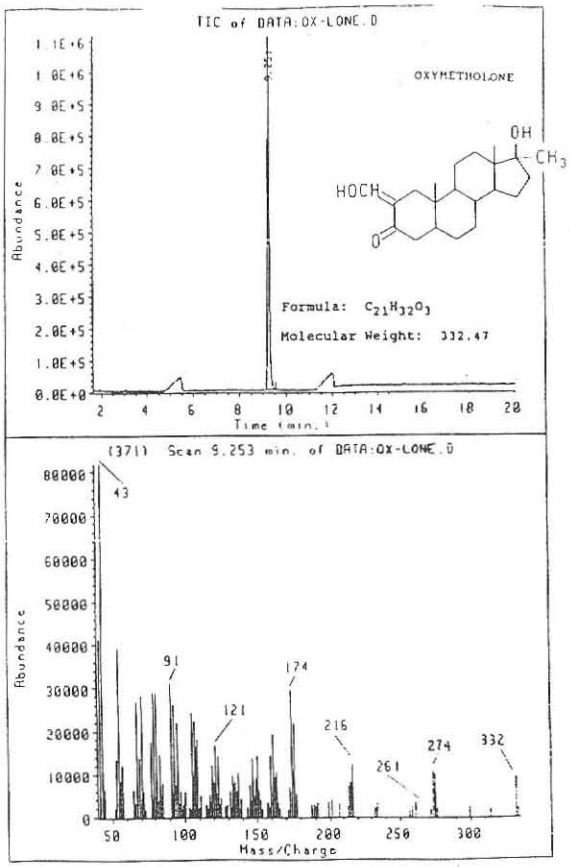
Molecular Weight: 386.4
43
124
147
185
228
288
344
386
Mass/Charge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-CH3
HOCH
Formula: C21H32O3
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Time (min.)
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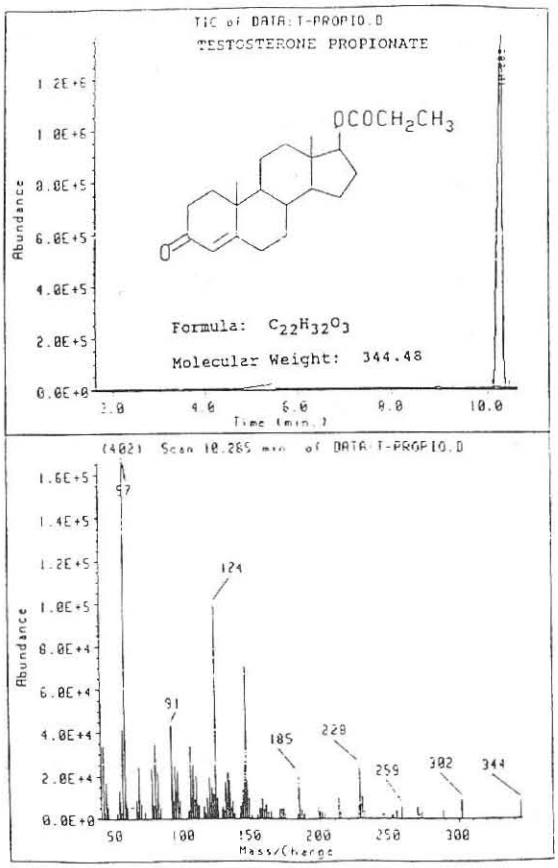
91
121
174
216
261
274
332
Mass/Charge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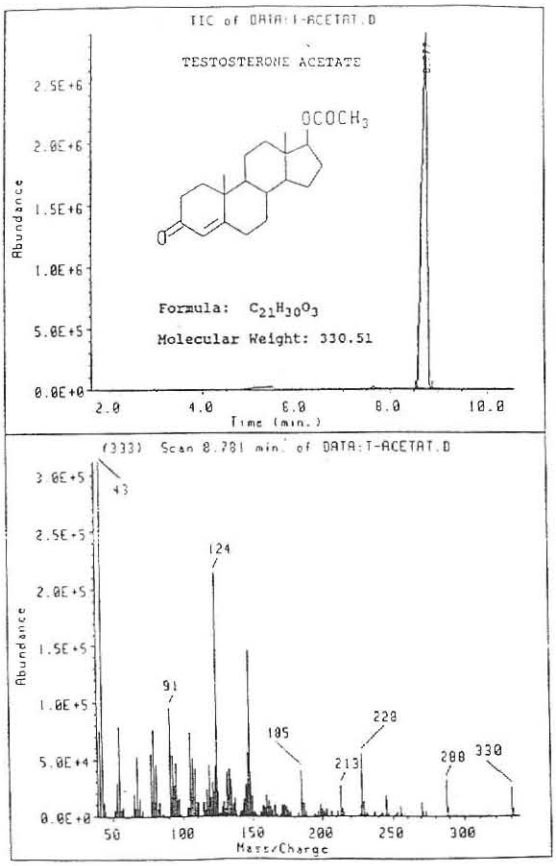
124
91
185
228
259
302
344
Mass/Charge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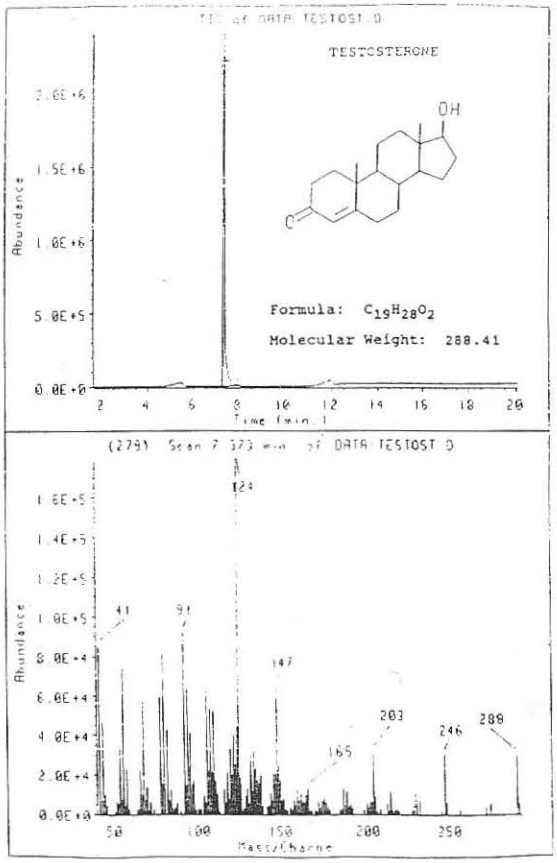
124
91
185
228
213
288
330
Mass/Charge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OH
Formula: C19H28O2
Molecular Weight: 288.41
Abundance
Time (min.)
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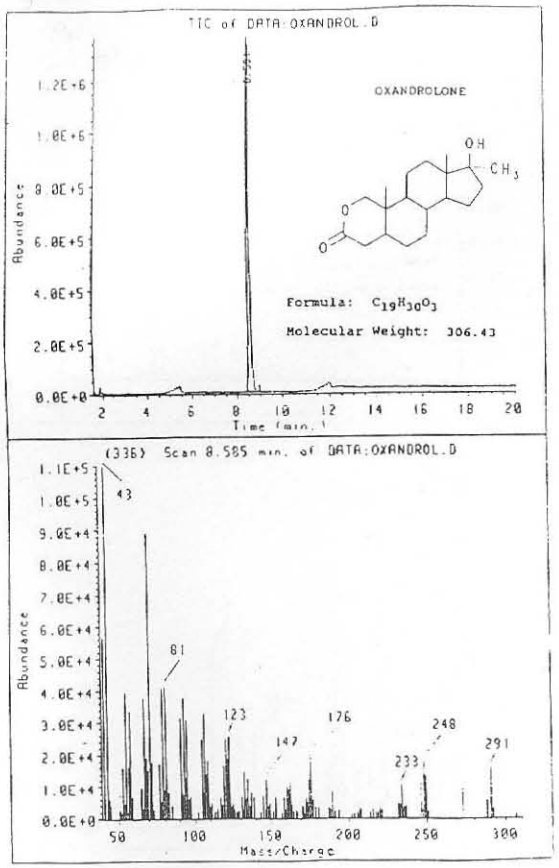
41
91
147
203
246
288
165
Mass/Charge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Formula: $C_{19}H_{30}O_3$
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Time (min.)
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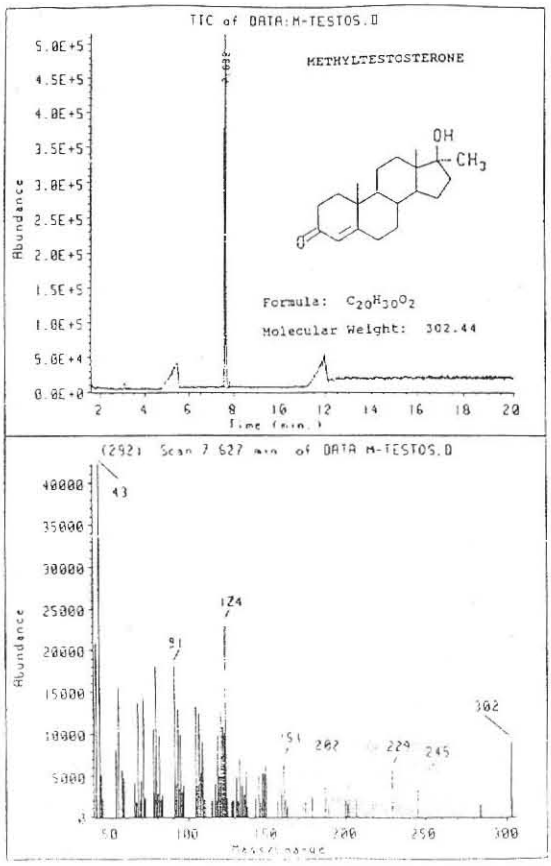
81
123
147
176
233
248
291
Mass/Charge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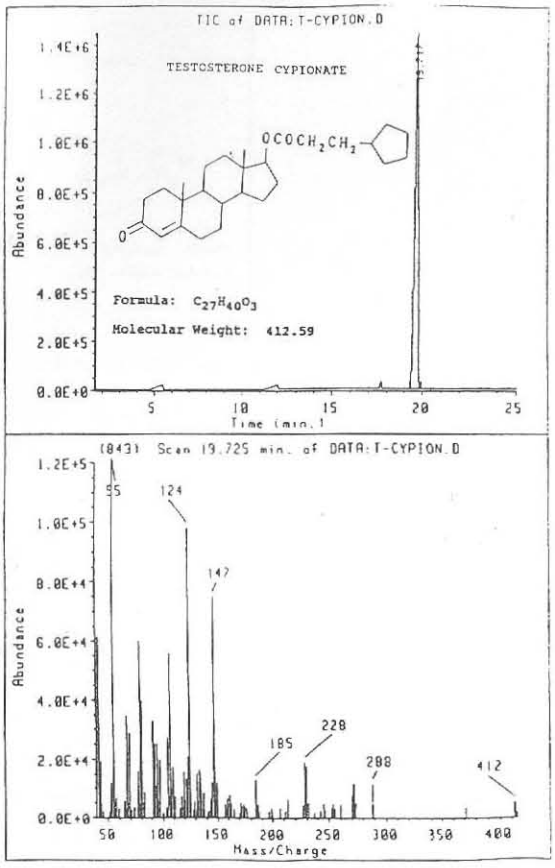
91
124
151
202
229
245
302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Formula: $C_{27}H_{40}O_3$
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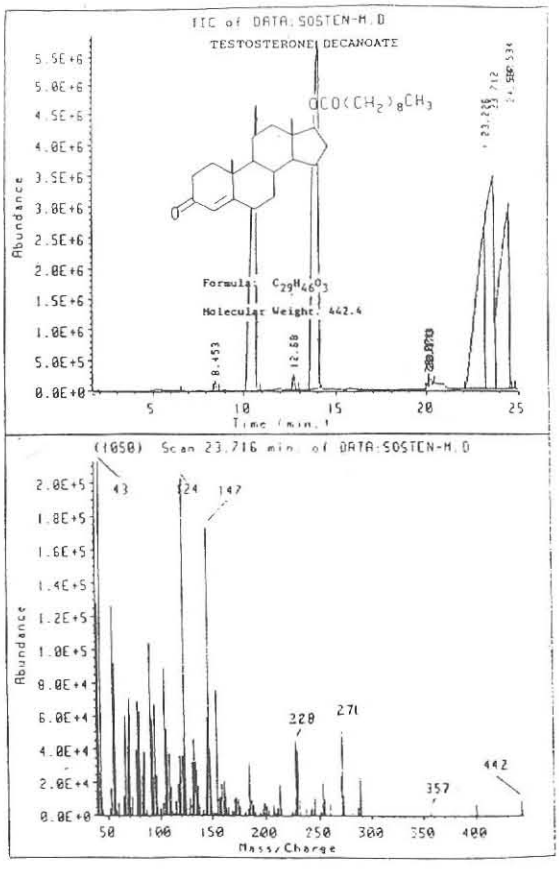
124
147
185
228
288
412
Mass/Charge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Formula: $C_{29}H_{46}O_3$
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Abundance
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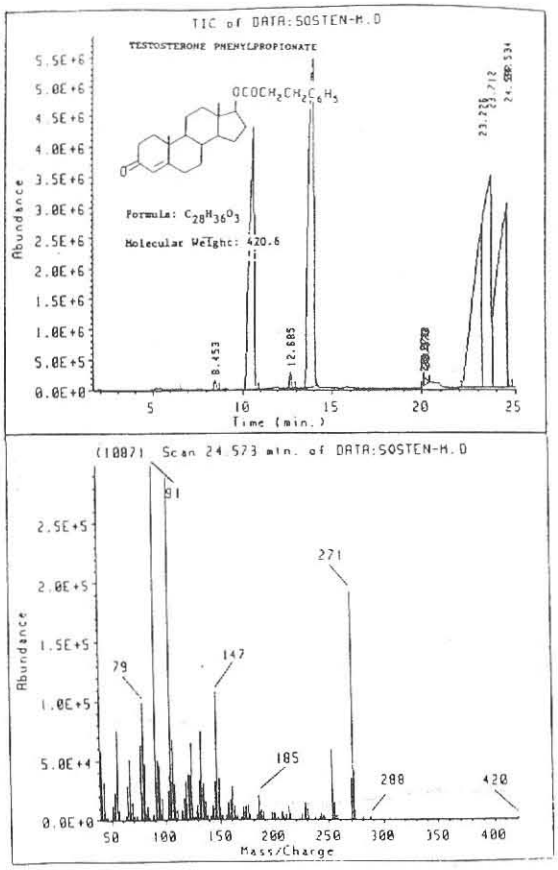
124
147
228
271
357
442
Mass/Charge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Abundance
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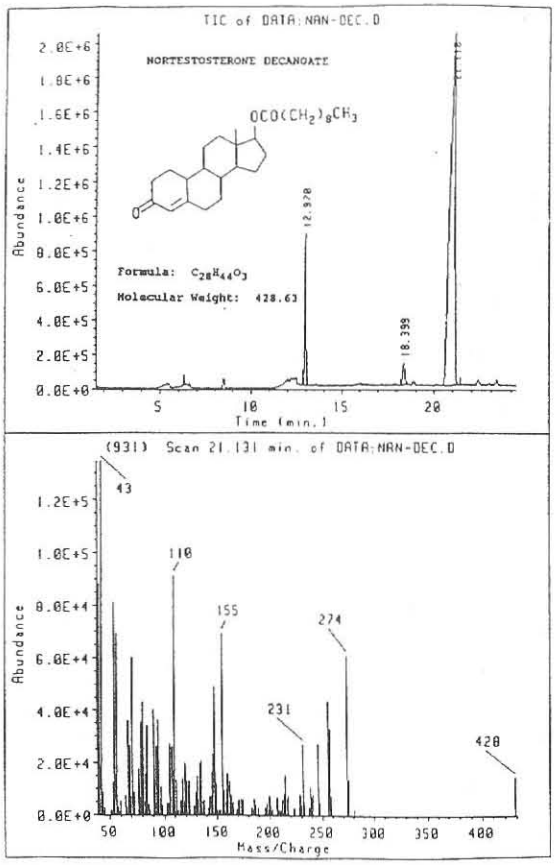
Abundance
Mass/Charge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Formula: $C_{28}H_{44}O_3$
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Abundance
Time (min.)
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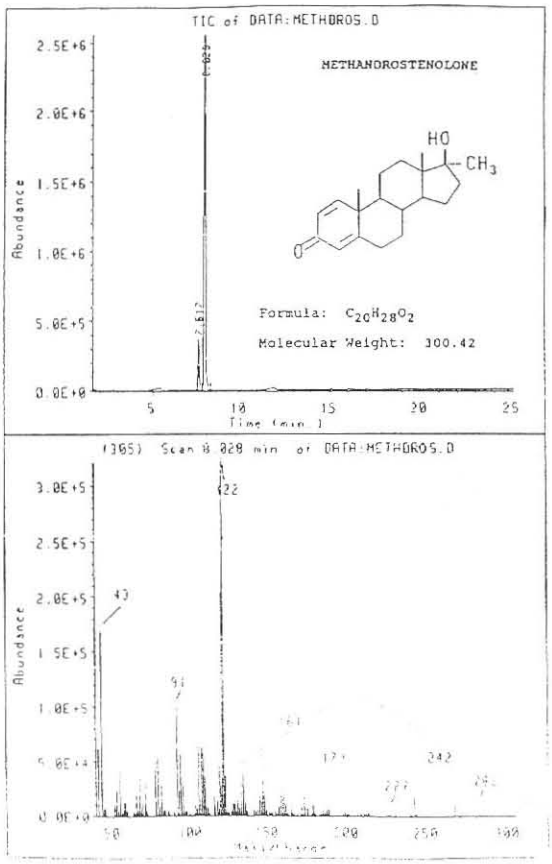
Abundance
Mass/Charge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Formula: $C_{20}H_{28}O_2$
Molecular Weight: 300.42
Abundance
Time (min.)
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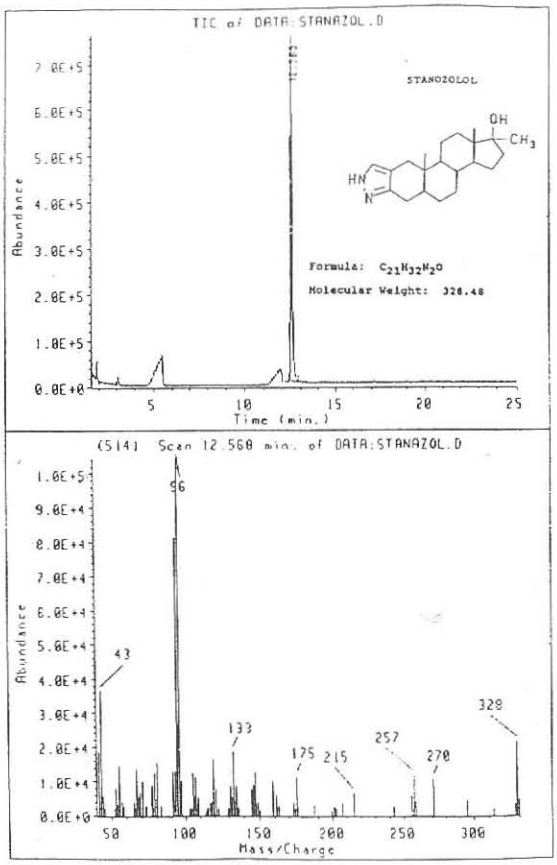
Abundance


TIC of DATA:STANAZOL.D
STANOZOLOL
Formula: $C_{21}H_{32}N_2O$
Molecular Weight: 328.48
Abundance
Time (min.)
(514) Scan 12.560 min. of DATA:STANAZOL.D
Abundance
Mass/Charge