Letters to the Editor

Salaries and Hirings in the Forensic Science Professions: Preliminary Results of a National Survey of Some Criminalistics and Related Laboratories

Sir:

We were interested in compiling data that would characterize hirings and salaries among forensic science caseworkers, primarily in criminalistics laboratories throughout the country. Information was sought that would allow us to identify numbers of actual hirings for the years 1976 to 1980 according to state, job title, educational background, years of experience, and salary. At the time of the original survey, we also requested estimates for anticipated hirings in 1981 to 1982. Our primary goal was to obtain data for estimations of future manpower demands as a guide to the needed output for forensic science educational programs. In addition, we wanted to determine past and future trends in terms of numbers of hirings in various parts of the country and in various forensic science specialties. Finally, we sought salary information that might allow more realistic laboratory budgeting within the forensic science professions as well as the offering of salaries that would be competitive with respect to related professions.

Our survey was sent to over 250 government forensic science laboratories, with the vast majority being "criminalistics" labs. Others falling under the general category of forensic science laboratories were also included. For instance, bureaus of alcohol, tobacco, and firearms; departments of public safety; public health labs; medical examiner or coroner labs; arson bureaus; highway patrols; and so on. Thirty-nine responses were received. As promised in the questionnaire, individual laboratories are not identified in our compiled results. While we do not feel that the number of replies is sufficient to justify meaningful salary hiring projections over the different regions in the country as we had originally intended, averaged data are presented in the accompanying Table 1. These preliminary results do not distinguish between new or added hirings or mere replacements (this distinction will be addressed in future surveys). We have also not attempted to correlate salaries or hiring trends with lab size or type for this first survey. Questions necessary to establish this will be included for subsequent questionnaires, and summarized if sufficient responses are received.

For each job title cited (criminalist, serologist, firearms examiner, and so forth), specific educational backgrounds (no college degree, B.S. in science field, B.S. in forensic science/criminalistics, M.S. in science field, M.S. in forensic science/criminalistics, Ph.D., and others) and number of years of experience (0, 1, 2 to 5, and 6 to 30) were requested for each year of the study. Within any individual category, there were frequently no entries or perhaps a single entry, thus preventing us from giving significant averages at the full level of detail into which our survey inquired. We hope to regularly initiate these surveys in coming years and expect that with increasing numbers of responses, more information can be made statistically valid.

For this preliminary presentation, various categories have been lumped together. In Table 1, we distinguish between only three job titles: "criminalists," "criminalists who are laboratory directors," and "all others." The latter includes job titles of toxicologist, serologist, photographer, document examiner, latent print examiner, polygraph examiner, or firearms examiner. We have made only two categories for educational background: "bachelor's degree or less" and "masters degree or higher." Four categories characterizing the number

TABLE 1—*Summary of hirings and average salaries[a] for 39 responding laboratories.*

Qualifications	Years of Experience	Numbers of New Hirings[b] and Average Salaries[c]													
		1976		1977		1978		1979		1980		1981		1982	
						CRIMINALIST, NOT LAB DIRECTOR									
Bachelors' or less	0	(14)	10 503	(12)	10 746	(6)	12 551	(23)	11 855	(13)	14 123	(17)	13 629	(13)	10 405
	1	(7)	10 726	(10)	11 065	(8)	14 233	(5)	15 417	(11)	14 889	(7)	15 392	(5)	20 000
	2-5	(12)	10 650	(5)	13 108	(14)	15 061	(22)	16 865	(32)	18 124	(40)	18 908	(5)	17 849
	6-30	(0)		(0)		(1)	12 376	(3)	28 353	(1)	26 349	(0)		(0)	
Masters' or higher	0	(0)		(1)	15 132	(2)	14 200	(2)	16 048	(1)	17 000	(0)		(0)	
	1	(1)	13 482	(0)		(0)		(0)		(0)		(0)		(0)	
	2-5	(1)	17 524	(2)	15 456	(1)	18 408	(1)	18 000	(4)	14 246	(2)	22 585	(1)	28 000
	6-30	(0)		(0)		(0)		(0)		(1)	22 412	(0)		(0)	
	total hirings	35		30		32		56		63		66		24	
						CRIMINALIST, LAB DIRECTOR									
Bachelors' or less	0	(0)		(0)		(0)		(0)		(0)		(0)		(0)	
	1	(0)		(0)		(0)		(0)		(0)		(0)		(0)	
	2-5	(4)	13 824	(7)	17 079	(6)	17 858	(1)	18 145	(4)	21 778	(4)	20 178	(0)	
	6-30	(0)		(0)		(1)	17 992	(0)		(0)		(0)		(0)	
Masters' or higher	0	(0)		(0)		(0)		(1)	32 000	(0)		(0)		(0)	
	1	(0)		(0)		(0)		(0)		(0)		(0)		(0)	
	2-5	(0)		(0)		(0)		(0)		(1)	29 441	(0)		(0)	
	6-30	(0)		(1)	12 000	(0)		(0)		(0)		(0)		(0)	
	total hirings	4		8		7		2		5		4		0	
						OTHER[d]									
Bachelors' or less	0	(0)		(1)	14 000	(0)		(0)		(0)		(0)		(0)	
	1	(1)	11 436	(1)	11 436	(1)	10 200	(0)		(1)	14 000	(3)	14 833	(1)	16 000
	2-5	(6)	14 143	(2)	13 428	(1)	12 636	(2)	19 660	(4)	17 141	(0)		(1)	22 000
	6-30	(0)		(3)	21 000	(3)	15 076	(2)	13 000	(1)	20 000	(1)	23 000	(0)	
Masters' or higher	0	(0)		(0)		(0)		(0)		(0)		(0)		(0)	
	1	(0)		(0)		(0)		(0)		(0)		(0)		(0)	
	2-5	(0)		(0)		(0)		(0)		(0)		(0)		(0)	
	6-30	(0)		(0)		(0)		(1)	17 472	(0)		(0)		(0)	
	total hirings	7		7		5		5		6		4		2	
Grand total hirings (all categories)		46		45		44		63		74		74		26	

[a] Average salaires paid to the newly hired personnel when the hiring took effect or, for 1980 to 1982, average *anticipated* salaries for future hirings (as projected at the time of the questionnaire).

[b] The number of new hirings appear in parentheses.

[c] Average salaries are rounded to the nearest dollar.

[d] Includes all job titles other than criminalist, for example, toxicologist, serologist, photographer, document examiner, latent print examiner, polygraph examiner, and firearms examiner.

of years of experience are presented. The numbers of hirings within each category and total hirings reflect only those 39 laboratories that responded to our survey. It is not clear that we could extrapolate these numbers to the total number of laboratories on the mailing list we had compiled of questionnaire recipients. It should also be emphasized that data for both 1981 and 1982 were projections at the time of the survey in 1980. The very low hiring projections for 1982 may represent either actual budgetary projections or may merely be a falloff resulting from the difficulty of projecting two years ahead in government operations.

Anticipated salaries are often not readily defined since expected salary increments and raises can change significantly. Responding labs based these projected salaries on present salary guidelines (as of 1980). Inspection of the table reveals occasional dips or breaks in anticipated trends of higher salaries with more experience or with the passage of time. This most likely is an artifact of the small number of responding labs; an individual lab making a number of hirings in a given category at a significantly high or low salary can appreciably distort the tabulated average salaries.

Some noteworthy features of the results include a sharp increase in number of hirings of criminalist (not lab directors) in 1979 and 1980 (and expected for 1981) relative to totals for 1976 to 1978. A similar trend is apparent among forensic scientists other than "criminalists." However, no such increased hirings are seen among "criminalist lab directors," suggesting that laboratory size may be growing rather than the number of such laboratories. Finally, we illustrate that very substantial *ranges* of salary may exist within specific categories. For example, for criminalists (not lab directors) hired in 1980 with no experience, starting salaries ranged from $8 230 to $17 638, a remarkable range. With one year experience, the range was from $11 500 to $19 000 and with 2 to 30 years experience, salaries varied from $17 000 to $26 349.

In conclusion, we emphasize that our data is preliminary. We hope to develop a better reporting system, to get information from more laboratories, and to collect new data every one or two years. With increasing laboratory participation, we should be able to draw a useful picture of future hiring trends in forensic science laboratories. Toward this end, we hope that this article will trigger a broader response for future questionnaires.

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Committee on Accreditation of Fellowships in Forensic Psychiatry

Sir:

The Committee on Accreditation of Fellowships in Forensic Psychiatry is jointly sponsored by the American Academy of Psychiatry and the Law (AAPL) and the Psychiatry Section of the American Academy of Forensic Sciences (AAFS). The Committee was created to establish standards for training programs in forensic psychiatry, to develop criteria for the evaluation of training programs in forensic psychiatry, to plan for the implementation of an accreditation mechanism for training programs in forensic psychiatry, and, if possible, to implement an accreditation program for fellowships in forensic psychiatry.

Need for Accreditation

The American Board of Forensic Psychiatry offers graduates of fellowships in forensic psychiatry two years of credit for one year of fellowship towards completion of the experience re-

quirement for eligibility to be examined by the Board. As there are no standards for accreditation of fellowship training programs in forensic psychiatry, there is no way to determine if persons who have completed a fellowship year have received adequate didactic instruction and adequate supervised clinical experiences. There is no core content, no generally understood meaning, to an assertion that one has completed a fellowship in forensic psychiatry, unless there can be an agreed standard for such training programs and a mechanism for determining whether or not a given program is in conformity to that standard.

It is the responsibility of organized forensic psychiatry to insure that those persons who enter our subspecialty are provided with quality training programs. As there is no other organization that has accepted the responsibility for developing standards and an accreditation mechanism, it falls to AAFS and AAPL to do so.

Proposed Stages in Developing and Accreditation Mechanism

1. The first stage has been the establishment of a jointly sponsored Committee on Accreditation of Fellowships in Forensic Psychiatry, composed of Directors of Training Programs in Forensic Psychiatry, to pool their experiences and to develop standards that should be met by any worthwhile training program in our subspecialty. This summary report is the fruit of the deliberations of the members of that committee.

2. The second stage is the endorsement of those standards by AAFS and AAPL, after careful review and possible amendment. This is the stage for which the present summary report has been written. Such endorsement will provide moral force for the standards. It is hoped that the American Board of Forensic Psychiatry will provide further support for the standards by declaring that only graduates of programs that conform to the standards will be given special consideration (two years of credit towards the experience requirement for one year of fellowship); graduates of programs that do not conform to the standards would not be eligible for such consideration.

3. The third stage will require that the Committee design a practicable mechanism for evaluating whether or not a given training program is in conformity with the standards. (There has been no formal response from the Liaison Committee on Graduate Medical Education, or its successor in the national accreditation process for residencies in psychiatry, to our inquiry as to the willingness of that body to undertake an accreditation survey for us.)

4. The fourth stage will entail the implementation, monitoring, and periodic revision of the accreditation mechanism, so that qualified training programs will be able to be certified as such. Over the course of time, both the standards and the accreditation mechanism may evolve and some form of standing committee would be needed to provide ongoing guidance, supervision, and control over the development of the standards and the accreditation process.

Outcome of Training in Forensic Psychiatry

The head of the subcommittee on training in forensic psychiatry is Dr. Seymour Pollack of the Institute of Psychiatry, Law and Behavioral Science, University of Southern California, School of Medicine, Department of Psychiatry. Dr. Pollack's original report was presented in the *Preliminary Report on Standards*, submitted to the Officers and Executive Committee of AAPL and dated 24 April 1981. It is impossible to concisely reproduce that report, let alone trace the course of discussion of it in the various meetings of the Committee and the open panel discussions with the members of AAFS and AAPL. What follows must be seen as a condensed and transfigured statement.

As forensic psychiatry is a young and evolving field, it is important not to prematurely close its development by imposing a single philosophy on all training programs. The outcome of each training program must remain a derivative of the unique beliefs and assets of its director, faculty, and clinical resources. It is less important that there be *a* specific out-

come than that there be *some* clearly conceptualized and articulated statement of the ideal outcome to which the training program is directed. No training program should be accredited unless it can specify its goals, its objectives, the means by which it will evaluate whether or not it is attaining its ends, and the mechanism by which it can self-correct its methods to insure that the product of the program is consistent with the goals and objectives of the program.

The only general goal upon which consensus was obtained is that a training program in forensic psychiatry should make excellence possible. This goal of fostering the development of trainees, in the context of the philosophy of the specific training program, is sufficiently broad to prevent premature closure in our field.

Didactic Core Curriculum

The head of the subcommittee on didactic core curriculum is Dr. Howard Zonana of the Department of Psychiatry at Yale University, New Haven, CT. His initial report, presented in the *Preliminary Report on Standards,* has been the focus of considerable and detailed discussion by the Committee and has been recently revised. The main features of his revised report are here set forth.

The training program must not only teach the facts of our field to fellows, but also teach them how to reason from those facts. In the acquisition of specific data, the fellow must keep in mind the rational processes in which the data must be used. Forensic psychiatry is not merely a set of fixed information, it is a clinical skill in which psychiatric expertise is applied to legal ends. The forensic psychiatrist is not merely a psychiatrist who has acquired a limited knowledge of the law; he is a practitioner of a medical subspecialty with its own body of knowledge, methods, and principles.

The didactic content of the training program must include lectures and demonstrations, civil forensic psychiatry, criminal forensic psychiatry, legal regulation of psychiatry, the evolution of forensic psychiatry and special concerns of the field, principles of correctional psychiatry, and basic issues in law that are particularly relevant to forensic psychiatry.

As illustrations of the types of subject matter that should be included in the didactic program, the following are cited:

1. Civil Forensic Psychiatry: conservators and guardianships, child custody determinations, parental capacity assessments, termination of parental rights, child abuse, child neglect, psychiatric disability determinations for social security/workers compensation/private insurance coverage, testamentary capacity, psychiatric negligence and malpractice, and personal injury litigation.
2. Criminal Forensic Psychiatry: competence to stand trial, competence to enter a plea, testimonial capacity, voluntariness of confessions, insanity defense, diminished capacity, sentencing considerations, and release of persons acquited by reason of insanity.
3. Legal Regulation of Psychiatry: civil commitment, confidentiality, right to treatment, right to refuse treatment, informed consent, professional liability, and ethical guidelines and issues.
4. Evolution and Special Issues in Forensic Psychiatry: the history of forensic psychiatry, assessment of dangerousness, amnesia, organic brain syndromes, neuropsychiatric assessment, psychopathy/antisocial personality, and the role and responsibilities of forensic psychiatrists.
5. Correctional Psychiatry: approaches to the treatment of incarcerated persons, administrative considerations in the operation of a treatment program in a correctional setting, security, rape and sexual problems in a correctional setting, the history of correctional psychiatry, and ethical issues in correction setting.
6. Basic Issues in Law: the nature of law and its foundations in case law/common

law/statute/administrative regulation, the structure of the federal and state court systems, use of a law library, theory and practice of punishment, basic civil procedure, basic criminal procedure, due process, jurisdiction, mens rea, responsibility, tort law, legislative processes, and equal protection.

7. Landmark Cases: In the U.S. legal system such cases have been set forth in the syllabus of the American Board of Forensic Psychiatry. Major cases in Canadian law and British law are not included in the ABFP listing. Because of the need to keep up to date, fellows should also review the latest case decisions from major courts, in addition to studying existing lists of classic cases.

Supervised Clinical Experiences

The head of the subcommittee on supervised clinical experiences is Dr. J. Richard Ciccone of the Department of Psychiatry at the University of Rochester School of Medicine, Rochester, NY. Because of the close relationship between didactic demonstrations and clinical case experiences, there is an overlap between Dr. Ciccone's report and Dr. Zonana's report.

A balance in the training program's weekly schedule should exist between didactic presentations and clinical case experiences. In general, in any average week, a fellow should spend between 15 (at minimum) and 25 (at maximum) h devoted to carefully supervised clinical experiences. The balance of the time may be devoted to didactic presentations, for example, lectures, seminars, demonstrations, reading assignments, thoughtful reflection, and research. It is important that the training program be weighted towards meaningful learning experiences, rather than mere service commitments.

The clinical experiences must include criminal forensic psychiatry, civil forensic psychiatry, and legal regulation of psychiatry. In the course of the year, each fellow should have performed a minimum of 30 clinical case assessments in civil and criminal forensic psychiatry, at least ten in the civil area and at least ten in the criminal area. In at least 25 of those 30 assessments, a written case report should be required. The fellow should have an opportunity to witness at least ten in-court appearances of a forensic psychiatric expert witness and should have the responsibility/opportunity of testifying in court on at least five cases. In the course of the training year, the fellow should prepare at least three assessments related to aiding the court in the sentencing of criminal offenders, at least one assessment in domestic relations, at least one civil commitment assessment, at least one personal injury assessment, and at least one civil competency assessment.

In the criminal law, the clinical experiences should include male and female adolescents and adults covering a variety of ages. Incarcerated defendants and defendants on bail, that is, persons seen both as inpatients and outpatients, should be available for assessment. Evaluations should encompass such issues as the competence to stand trial, competence to confess, criminal responsibility, and postconviction therapeutic recommendations. Opportunities should be provided for consultation with lawyers, probation officers, and judges. Written reports should be drafted to conform to the special requirements of forensic psychiatry and training in report writing should be provided.

In the civil law, the clinical experiences should include such cases as child custody, termination of parental rights, and Workers' Compensation/Social Security/private insurance assessment of psychiatric impairment and civil commitment.

In the area of legal regulation of psychiatry, the fellow should be provided with a minimum of ten cases for assessment; preferably he should do the assessment himself. However, if that is impossible, intensive seminar case review, averaging 2 h per case for ten cases, may be substituted. The cases should include civil commitment, confidentiality, patients' rights, professional liability, and ethical issues. Preferably the fellow should assess patients who are refusing their medication, contesting their involuntary hospitalization, and whose capacity to provide competent/voluntary/informed consent is at issue.

In the area of special topics in forensic psychiatry, the fellow should be provided with a minimum of five cases for assessment including examples of potential or present dangerousness, psychopathy, organic brain syndromes, neuropsychiatric testing, and double-agent ethical problem cases. While it is preferable for the fellow to examine the cases, if that is impossible, then an intensive seminar case review may be substituted, averaging 2 h per case for five cases.

Among the clinical settings in which the fellow should function are state or federal prisons, maximum security treatment centers, federal and state trial courts for hospitalization, and court clinics. At least 25 h in the course of the year must be set aside for field experiences distributed among these settings.

The fellow should have regularly scheduled clinical case supervision each week, in addition to the scheduled didactic courses and seminars. The supervision should be provided by a (preferably certified) forensic psychiatrist. It is recommended that the fellow have access to supervision from a second forensic psychiatrist to provide a diversity of viewpoints to the fellow. In cases that entail assessment of children and families, access to a child psychiatrist and a family systems therapist is recommended for supplemental supervision.

In the course of the fellow's clinical work, opportunities should be provided for active collaboration with judges, attorneys, psychologists, psychiatric nurses, social workers, probation officers, correction officers, police officers, and relevant professional and paraprofessional personnel throughout the legal and medical systems.

Library Resources

The two heads of this subcommittee on library resources are Dr. Park E. Dietz, McLean Hospital/Harvard University, Belmont, MA and Dr. Jonas Rappeport, Chief Medical Officer, Supreme Bench, Baltimore, MD. It is apparent that no fixed list of books will meet the needs of an evolving subspecialty, so that any list will have to be periodically revised, with new works added and outdated books deleted.

The current list, dated 8 April 1981, includes 15 textbooks, 12 reference books, and 13 research monographs.

Legal Resources

The head of this subcommittee on legal resources is Dr. James Cavanaugh, Jr. So closely associated with the work that citation is warranted is Mr. Barbara A. Weiner, J.D. Both are from the Rush-Presbyterian-St. Luke's Medical Center's Department of Psychiatry, Chicago, IL. The report has been substantially modified since it was originally drafted in the *Preliminary Report on Standards.*

The training program should include an attorney as a resource functioning as an active and ongoing presence within the educational process. The attorney should have particular responsibility in the development and presentation of the legal segment of the didactic core curriculum.

A minimum of 25 h in the course of the fellowship training year should be devoted to acquisition of legal information in the didactic core curriculum. Among the essential elements to be addressed are foundations/sources of law, the structure of the court systems, use of a law library, criminal procedure, civil procedure, theory and practice of punishment, responsibility, jurisdiction, due process, and mens rea.

In addition to the attorney who functions within the training program, elective opportunities for legal learning are recommended. Such opportunities may be found in law school courses, consultation with public defenders and prosecutors, consultation with the law departments of hospitals, government agencies, and guest lectures from visiting private practitioners of law.

Research

The head of this subcommittee on research is Dr. Park E. Dietz of the McLean Hospital/Harvard University, Belmont, MA.

The training program should provide the fellow with basic training in research in forensic psychiatry, such that the fellow learns to obtain and evaluate critically published research findings in the subspecialty and such that the fellow is equipped to make some contribution to the scholarly or scientific development of forensic psychiatry.

The fellowship training program should include a research requirement for completion of its training program. Suitable research projects would include: a scholarly review suitable for publication in a refereed journal, a clinical study suitable for publication in a refereed journal, participation in ongoing, externally funded research at a level of effort equivalent to at least two months of full-time work, production of a videotape or film suitable for presentation at a major national meeting, production of a practice manual in a selected area, and preparation of an annotated bibliography on some topic in forensic psychiatry.

The fellowship training program should include the resources that would make such research possible. These must include, at minimum, accessibility to a major medical library; accessibility to a major law library; accessibility to at least one behavioral science research resource, such as computer processing; a programmable calculator; a one-way mirror observation room; videotape equipment; endocrine assays; psychotropic drug assays; electroencephalography; computerized tomography; polygraphy; penile plethysmography; or a medical examiner's office.

Teaching

The head of this subcommittee on teaching is Dr. David J. Barry of the University of Rochester Medical Center, Rochester, NY.

The training program should provide opportunities to foster the fellow's development as a teacher of forensic psychiatry. Such opportunities should be consistent with the fellow's acquisition of the essential knowledge and skills of the subspecialty, so that the bulk of the fellows teaching should be scheduled after he has received his own basic training in forensic psychiatry. It is important that the fellow have exposure to senior teachers in the field.

Among the suitable teaching opportunities are: teaching basic psychiatry to lawyers and probation and correction officers; teaching basic forensic psychiatry to medical students, interns, and residents in general and child psychiatry; teaching forensic psychiatry to parole and police officers; and teaching selected relevant issues to nonpsychiatric physicians (for example, professional liability, informed consent, and confidentiality).

Faculty

The two heads of this subcommittee on faculty are Dr. Robert L. Sadoff of the University of Pennsylvania and Dr. Phillip J. Resnick of the University Hospitals of Cleveland, OH.

The training program in forensic psychiatry should be built upon the foundation of a residency program in psychiatry that has been approved/accredited by the Liaison Committee on Graduate Medical Education or its successor accrediting organization.

The Director of the Fellowship Training Program in forensic psychiatry should be a senior member of the faculty of the accredited (by LCGMR) residency program in psychiatry, at least at the rank of assistant professor or assistant clinical professor of psychiatry. The director should be eligible for examination by the American Board of Forensic Psychiatry and, after 1983, have been certified as a Diplomate of the American Board of Forensic Psychiatry.

Additional faculty available as resources to the training program should include a child psychiatrist, an experienced forensic psychologist, and an attorney. Because of the nature of

departmental rules regarding appointments to faculty, it may not be possible for the psychologist and the attorney to be members of the faculty of the residency training program in general psychiatry, but they should have a designated de facto faculty role within the training program in forensic psychiatry.

Conclusion

This summary report, in combination with the *Preliminary Report on Standards* of 24 April 1981, constitutes the official recommendations of the Committee on Accreditation of Fellowship Training Programs in Forensic Psychiatry, jointly sponsored by the Psychiatry Section of the American Academy of Forensic Sciences and the American Academy of Psychiatry and the Law.

It is hoped that this summary will lead to a formal endorsement of these criteria for accreditation of training programs in forensic psychiatry and authorization to develop and implement a practicable mechanism for the accreditation of fellowship programs that conform to the standards outlined in the Committee's recommendations.

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Swabbing for Trace Marihuana

Sir:

We note that swabbing of hands to collect trace amounts of marihuana is not a new technique, but we find that detection of tetrahydrocannabinol (THC) in extractions from the swabs is limited with traditional laboratory analyses. In 1969, Stone and Stevens [*1*] reported collection of trace amounts of marihuana from the hands of persons who smoked or handled the substance. And, in 1971, Robinson [*2*] demonstrated the collection and identification of trace marihuana (constituents) from the hands of autopsy cases. However, attempts by the authors and counterparts in their respective agencies to use the techniques described by these researchers have been disappointing. Laboratory extractions from specimens collected in the field seldom yielded more than indications of THC, even when analyzed by means of gas chromatography (less mass spectroscopy) in addition to thin-layer chromatography and the color tests such as the Duguenois-Levine. The development of affordable computer controlled gas chromatograph/mass spectrometer (CG/MS) systems in recent years has extended the drug detection capabilities of many forensic science laboratories, including those with which the authors are associated. With the advent of these extended detection capabilities has come a renewed interest in collecting trace amounts of marihuana by means of swabbing the hands of those who are suspected of handling the substance. Presented below are refined procedures developed by the authors for the taking and processing of swabbings from hands to detect trace marihuana.

Methods

Recommended materials for collecting swabbings from the hands of suspects are selected to facilitate field acquisition and application, as well as, laboratory processing.

Materials needed to swab for marijuana residue:

- lighter fluid (Ronsonol® used in tests),
- wooden applicator (152.40-mm [6-in.]) cotton tipped swabs,
- glass tubes (7Ml) with rubber stoppers (Vacutainer® used in tests), and
- disposable rubber gloves.

Note: plastic applicator swabs or plastic containers should not be used because plasticizers interfere with instrumental analysis.

Recommended procedure for swabbing hands of persons suspected of handling or smoking marihuana:

1. Insure that the operator's hands are not contaminated with marijuana:
   - Wash hands.
   - Put on rubber gloves.
2. Prepare a control:
   - Wet a swab with lighter fluid. (It should be wetted, but not to the point of dripping, by squirting solvent on it.)
   - Air dry swab.
   - Insert cotton tip of the swab into the open end of a glass tube marked "control" and break off the applicator.
   - Cap glass tube.

Note: do not touch the cotton swab or bring it in contact with spout of solvent container.

3. Swab the hands of the suspect:
   - Wet swabs as in (2) above, one at a time, as they are used.
   - Swab hands using no less than two swabs per hand.

—Assure that portions of the hands most logically exposed in the handling or smoking are thoroughly swabbed.
—Assure that areas where residue would logically be retained, fingernail edges, fingernail beds, and so forth are carefully swabbed.
—Swabs must be wet to be effective.
—Do not rewet swabs. When the one being used dries out, use another.

- Air dry swabs.
- In the same manner as was used with the control, place each swab in an appropriately marked glass tube such as "right hand" or "left hand" (multiple swabs from a given hand may be combined in a single glass tube because the laboratory can combine them for analysis).

Note: for all other objects suspected of containing marihuana residue, such as packages, furniture, and so forth prepare and process swabs in the same manner as outlined for swabbing of hands. Be careful to swab all areas that would logically collect residue such as corners, creases, edges, and so forth.

Recommended procedures for extracting and analyzing residue from swabs:

1. Place the swabs in a beaker containing about 30 mL of petroleum ether and stir magnetically for 10 to 15 min.
2. Pour the petroleum ether into another beaker and evaporate over a steam bath until approximately 1 mL remains.
3. Transfer the remaining petroleum ether extract into a small test tube (6 by 50 mm) and evaporate to dryness over a steam bath.

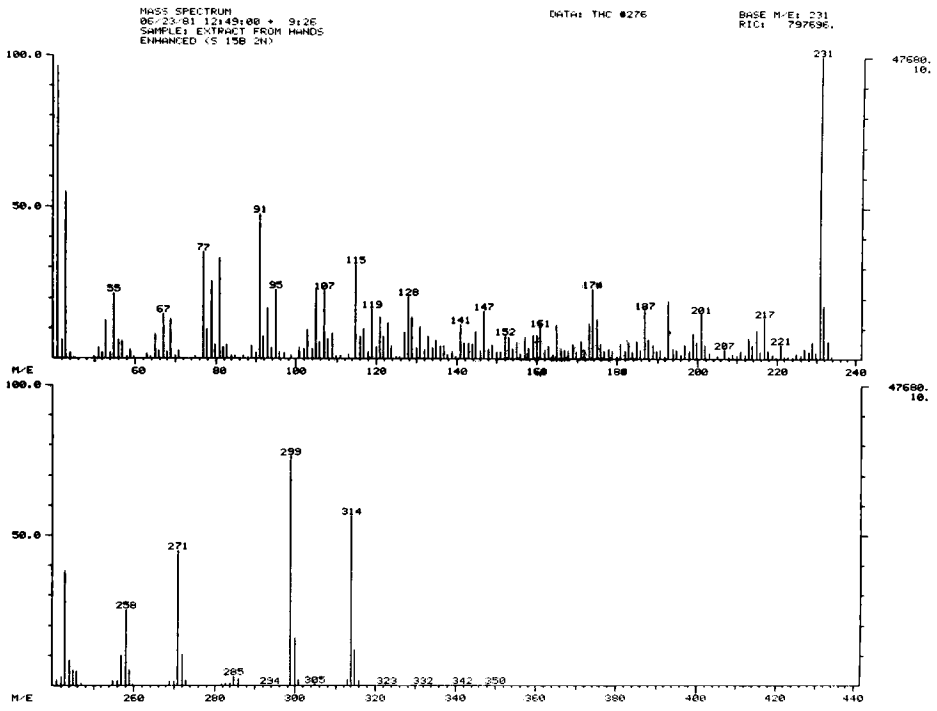

FIG. 1—*Mass spectrum of THC from a positive swab specimen.*

4. Add 5 to 10 μL of methanol to the test tube with a micro syringe.
5. Collect the disolved extract with a micro syringe and inject into a CG/MS.

Note: using the CG/MS system with operating parameters specified below, THC has a retention time of about 2 min and 35 s.

The gas chromatograph used was a Perkin-Elmer Sigma 3B with 3% OV−1 on Chromosorb Q in a 1.8-m (6-ft) packed column (Perkin-Elmer). The injection temperature was 250°C. The Helium carrier gas flowed at a rate of 30 mL/min. The isothermal program was at 240°C. The mass spectrometer was a Finnigan 1020 at 70 eV. The separator temperature was 240°C with the mainfold (mass analyzer) temperature at 80°C.

The mass spectrum of THC obtained during analysis of a positive swab sample is shown in Fig. 1.

Discussion

Field tests and supporting laboratory analyses conducted under controlled conditions show that trace marihuana can be detected in the extract of swabs taken from the hands of an individual who has handled marihuana (manicured or packaged) up to at least 4 h after he last handled it. The washing of ones' hands, the wearing of gloves, or vigorous dry-wiping reduces the effective operational interval, but controlled tests to determine the relative reductions have not been conducted. Although THC has been detected in swabbings from hands subjected to smoke from burning marihuana, no controlled tests have been conducted to determine operational parameters under which positive results could routinely be expected. The same holds true for swabbings from containers, windshields, and furniture.

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