

## Letters to the Editor

### **DNA Testing Not Ready for Court?! A Tale of Two Surveys**

In two recent court cases in which the prosecution sought to introduce the results of deoxyribonucleic acid (DNA) typing, the defense introduced the results of telephone surveys of crime laboratory directors and molecular biologists in attempts to raise questions about the admissibility of such test results. These surveys were conducted at court expense in the case of *State of Indiana v. Hopkins*. One survey entitled "Survey of Members of American Society of Crime Laboratory Directors" was conducted by Dr. Brian Vargas of Indiana University and ultimately included responses from 241 crime laboratories (of which 204 responses were from crime laboratory directors); the other, entitled "Survey of Scientists Regarding DNA Typing," was conducted by the Survey Research Center of the University of Kentucky and comprised responses of 215 members of the Molecular Biology and Genetics Section of the American Society for Microbiology. The questions on both surveys were apparently prepared by William C. Thompson from the University of California at Irvine. A highlight of these surveys (and presumably the reason they were introduced by the defense) was the response of crime laboratories to the question of whether the DNA testing done by Lifecodes, Cellmark, and Forensic Science Associates was ready for casework: less than half of respondents felt that the DNA testing performed by these companies was ready for casework.

Because these surveys may be introduced in other cases involving DNA testing, I feel that the forensic science community should be aware of their serious flaws. I had an opportunity to study these surveys while preparing my testimony in the case of *State of Minnesota v. Schwartz* and gave a detailed critique of each in the course of my testimony. The comments below summarize what I feel are the surveys' most glaring deficiencies.

### *Qualifications of Survey Respondents*

If the results of surveys are to be introduced to aid a court in deciding the admissibility of a scientific test, a fundamental question that arises is whether or not the respondents have the necessary qualifications to express an opinion of that test. Had, for example, each of the 204 crime laboratory directors surveyed appeared in court, would the court accept them as experts in the relevant scientific disciplines (forensic serology or molecular biology)? On the other hand, had the 215 molecular biologists and geneticists surveyed appeared in court would the court accept them as experts in the use of DNA testing for purposes of identification? Neither survey elicited sufficient information on the backgrounds of the respondents to establish their qualifications to render an opinion on the use of DNA testing for identification purposes.

Although the survey of crime laboratory directors sought information on whether their laboratories did serological testing and whether they or their laboratory personnel had studied the scientific literature on DNA testing, these respondents were not queried regarding their educational background (degrees and subject fields), their record of scientific publication, or their own specialty (if any) within the forensic sciences. Many laboratory directors have not been educated as scientists, many would not hold themselves out to be scientists, and among those directors who are scientists, many are not serologists. The respondents were also not asked about their current active involvement in casework. Because of their managerial role, even those crime laboratory directors who are serologists may not have been involved in casework for a number of years.

The survey of molecular biologists and geneticists paid greater attention to the educational backgrounds and research experience of respondents. As indicated above, a total of 215

members of the Molecular Biology and Genetics of the American Society of Microbiology participated in the survey; all were holders of terminal degrees and all were affiliated with research organizations. None was queried about his record of research publications; none was queried about his experience working with forensic case samples or his involvement as an expert witness in court.

#### *Problems with Questions Regarding DNA Technology*

Careful study of the substantive questions about DNA technology asked in both surveys reveals the omission of significant questions. For example, the respondents to the survey of crime laboratory directors were asked whether the testing methods of Lifecodes, Cellmark, and Forensic Science Associates met the admissibility standards of their states. However, these respondents were not asked what those standards were. States may follow the Frye Rule with various modifications or may apply a relevancy standard. Further, the form of the original question solicits a legal opinion from persons whose legal expertise cannot be determined.

The survey of molecular biologists and geneticists devoted a number of questions to potential problems with DNA testing. For example, respondents were asked whether they worked with samples contaminated with salts, detergents, dirt or soil, organic solvents, bacteria, and "organic debris" (not otherwise defined). Nearly half of the respondents indicated they worked with samples contaminated with salts, detergents, and organic solvents. Presumably these respondents are referring to the reagents usually used in the course of isolating DNA for analysis. It should be pointed out that the use of these agents indicates that DNA is unaffected by them.

Ten questions on the survey of molecular biologists and geneticists dealt with technical problems that might arise in the course of a DNA analysis. For example, one question asked whether residual contaminants could cause partial digestion of DNA, while another asked whether residual contaminants could affect the electrophoretic mobility of DNA fragments. At no point were the respondents asked whether there were routine tests that would reveal whether a particular problem such as partial digestion had been encountered. Moreover, respondents were not asked whether the presence of contaminants would more likely result in a false positive (erroneous match of DNA from different sources) or a false negative (failure to match DNA samples from the same source). Nor was it ever suggested in the survey that a laboratory might render an inconclusive opinion.

#### *Potential for Misinterpretation of Survey Results*

The manner in which the survey results were presented was potentially misleading. The results were summarized in a series of graphics that potentially obscured relevant information. As indicated above, one result of these surveys was the response of crime laboratories to the question of whether DNA testing was ready for casework: less than half of respondents felt that such testing was ready for casework. This result was presented in a stacked bar graph in which the responses "Unfamiliar With Test" and "Don't Know/Unsure" were lumped together with the "No" responses. Actually, a majority of those respondents who had a definite opinion believed that DNA testing was ready for casework.

#### *Conclusions*

The surveys of crime laboratory directors and of molecular biologists and geneticists failed to demonstrate that their respondents were qualified to render opinions on the general acceptability of DNA analysis in forensic science. The survey of molecular biologists and geneticists contained ambiguous questions and also omitted crucial questions. The most impor-

tant finding of the survey of crime laboratory directors was presented in a potentially misleading fashion. Consequently, I do not believe that either survey should be given any weight in deciding the admissibility of DNA testing in the field of forensic serology.

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#### **Discussion of "Some Special Observations on Infrared Luminescence"**

Dear Sir:

In Vol. 33, No. 3, May 1988 of this *Journal*, an article entitled "Some Special Observations of Infrared Luminescence" appeared. This is a competent well-written article dealing, in part, with laser induced infrared luminescence. It makes reference to an article coauthored by me (see Ref 2) dealing with the original laser research.

I am curious, however, why it does not reference similar work published by me in 1983 (see *JOFS*, July 1983, pp. 692-696), even though a figure from my paper is reproduced in this manuscript of 1988 (see May 1988, p. 640).

I am confident that this is an oversight on the part of the authors.

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#### **Author's Response**

Dear Sir:

This author would like to thank Dr. Dalrymple for pointing out the oversight stated and extends his apologies.

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#### **Discussion of "Bite Mark Impressions: A Review of Techniques and Materials"**

Dear Sir:

Congratulations on the generally excellent review of bite mark impression techniques by Bension et al. in the Sept. 1988 issue (pp. 1238-1243). However, I must take exception to one aspect of the "representative impression technique" described in the article.

The authors carefully note that "alternate methods of recording bite mark indentations abound" and reference many of them briefly. However, they describe one technique in detail, with favorable comments. The reader could easily infer that the technique described is the best method available. I think this would be unfortunate.

First let me say that I agree with the authors' enthusiasm for the vinyl polysiloxane impression materials. My criticism of their "representative technique" deals with the unnecessarily complex and cumbersome method presented to produce a relatively rigid external backing. The method they describe consists of making an impression, allowing it to set, adapting orthopedic tape, and then, to lock the tape in place, adding a second layer of impression material. A second and third piece of tape are then added with intermediate layers of impression material. Of course, at least two impressions should be made.

Far simpler, less time-consuming methods are available that are at least as accurate. When there are multiple bite marks or time limitations, this can be important.

A one-step method for producing a suitable backing is to add a stiff-setting silicone putty to the bite mark impression before removal. After experimenting with many different techniques, our office has preferred to use the following simple method, similar to that described by Souviron, which we have found to be fast and effective.

A single thickness of gauze is cut to approximately the size of the bite mark. Immediately after syringing the impression material in place, the gauze is carefully placed on top of the material so that portions of the gauze become embedded and portions remain above the surface. Rapid-setting plaster is then mixed to about the consistency of sour cream and placed on the set impression. The plaster will provide a firm backing that is reliably bound to the impression [1].

A word about the possibility of distorting the impression through use of a backing material. Phillips and others state that the setting expansion of gypsum products (such as plaster) may range from 0.06 to 0.5% [2]. Our own tests on possible distortion as a result of plaster gave results well within this range. This compares favorably with Hexcelite, which Benson et al. (citing a commercial source) state has a dimensional distortion on cooling of "less than 2%."

In summary, I thank the authors for this excellent contribution to the literature. However, I encourage readers not to adopt the "representative technique" described in the article without thorough consideration of alternative methods.

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### References

- [1] Souviron, R., Mittleman, R. E., and Valor, J., "Obtaining the Bitemark Impression (Mold) from Skin," *FBI Law Enforcement Bulletin*, Jan. 1982, pp. 8-11.
- [2] Phillips, R. W., *Skinner's Science of Dental Materials*, W. B. Saunders, Philadelphia, 1982.

### Author's Response

Dear Sir:

I appreciate your complimentary letter regarding our recent article on bite mark impressions. I fully agree that many bite mark impression techniques are available which in many ways might be better candidates as a "representative technique." Our initial effort in the article was primarily to discuss the dental materials used in bite mark impression techniques. The "representative technique" was included as an example of why the selection of

materials is important. Admittedly, that point should have been more clearly stated. Thank you for sharing your experience with the vinyl polysiloxane/gauze/gypsum technique and your testing results.

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### Addendum on "Cocaine in a Pregnant Woman"

Sir:

In the March 1989 issue of the *Journal*, we reported on high maternal:fetal cocaine concentration ratios when comparing blood (9.1:1), brain (6.5:1), and kidney (10.6:1) [1]. In animal experiments with cocaine high ratios have also been found [2] as well as reduced uterine blood flow in pregnant ewes [3]. Cocaine-induced vasoconstriction is a possible mechanism of spontaneous abortion, and hence, these studies and our report add to the factual basis for such a theory.

Unfortunately, the ratios were printed incorrectly in Table 1 and the abstract of the published article. We have provided the entire table below with the necessary corrections.

TABLE 1—Cocaine concentrations.

Source	Mother	Fetus	Maternal:Fetal Ratios
Blood	13.7 mg/L	1.5 mg/L <sup>a</sup>	9.1:1 <sup>b</sup>
Brain	29.3 mg/kg	4.5 mg/kg	6.5:1
Liver	1.34 mg/kg	0.87 mg/kg	1.5:1
Kidney	14.6 mg/kg	1.37 mg/kg	10.6:1
Nasal swabs	detected <sup>c</sup>		
Urine	detected <sup>c</sup>		

<sup>a</sup>This is an estimated value since the limited amount of fetal blood precluded rigorous quantification.

<sup>b</sup>Based upon estimated fetal blood concentration.

<sup>c</sup>No quantitation performed.

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### References

- [1] Mittleman, R. E., Cofino, J. C., and Hearn, W. L., "Tissue Distribution of Cocaine in a Pregnant Woman," *Journal of Forensic Sciences*, Vol. 34, No. 2, March 1989, pp. 481-486.
- [2] Shah, N. S., May, D. A., and Yates, J. D., "Disposition of Levo-[3H] Cocaine in Pregnant and Nonpregnant Mice," *Toxicology and Applied Pharmacology*, Vol. 53, No. 2, April 1980, pp. 279-284.
- [3] Woods, J. R., Plessinger, M. A., and Clark, K. E., "Effect of Cocaine on Uterine Blood Flow and Fetal Oxygenation," *JAMA*, Vol. 257, No. 7, Feb. 1987, pp. 957-961.