

Welcome.

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The testimony of an industrial hygienist has become an integral part of a toxic tort case. A trained industrial hygienist can develop information that creates a historical picture of a plaintiff's exposure to a toxic substance or a particular product. That exposure can be compared to the lifelong exposure in a dose reconstruction analysis. This article explains the use of a dose reconstruction and the role of the attorney in helping to develop the facts that the industrial hygienist would incorporate into the analysis.

Edward J. McCambridge and William F. Mahoney, Editors

Retrospective Exposure Assessment and Its Application in Toxic Tort Defense Litigation

By Cameron Turner

Introduction

The industrial hygienist plays an invaluable role in toxic tort defense. Typically, the industrial hygienist's role is to examine a toxic tort plaintiff's exposure history and offer opinions as to whether cumulative exposures or exposures to certain products or substances caused or contributed to the development of the plaintiff's alleged injury. A competent industrial hygienist bases his or her opinions on studies performed using sound methodology that demonstrate expected exposures to a hazardous substance over a standard period of time. These studies, coupled with information reviewed by the industrial hygienist relating to a specific plaintiff's exposure profile, may allow an industrial hygienist to calculate a plaintiff's total exposure or "dose" to a particular product or substance and determine the role, if any, that specific exposure played in the development of the injury.

Like any other field of science, industrial hygiene is constantly developing. Retrospective exposure assessment or "dose reconstruction" has been performed by industrial hygienists for some time in the field and now is beginning to make its way into the courtroom. Defined simply, retrospective exposure assessment is exactly what the name indicates – a look back in time at an exposure history to quantify the exposure and its potential for producing a disease or injury. The hazardous substance at issue might be any that an industrial hygienist is capable of measuring.

This article will examine how retrospective exposure assessment has been used in industrial hygiene practice and in

the toxic tort litigation arena. We will review the basics of how an industrial hygienist performs retrospective exposure assessment, and further, how toxic tort litigators can arm industrial hygienists with the necessary information for performing a thorough and competent retrospective exposure assessment. Finally, we will examine some of the obstacles litigators can expect to encounter in attempting to introduce the concept of retrospective exposure assessment to the courtroom.

Retrospective Exposure Assessment in the Field

Retrospective exposure assessment has its origins in epidemiological studies. Epidemiological studies and dose reconstruction studies are, however, distinct. Epidemiological studies examine disease patterns in exposed groups, while dose reconstruction examines the risk of developing a disease by assessing exposure to a hazardous substance.

Examples of how retrospective exposure assessments have been used in industrial hygiene practice are numerous. For example, in the 1990's, the Department of Energy conducted a two-phase dose reconstruction project at the Savannah River Site to evaluate historic release of radioactive and chemical materials at the facility. Beginning in the late 1970's, the Defense Threat Reduction Agency of the Department of Defense performed dose reconstructions for veterans who had participated in activities in the vicinity of nuclear weapons tests in New Mexico, Nevada and the Pacific from 1945 to 1962. These studies were used in conjunction with a compensation program established in the 1980's for veterans who claimed to have developed various forms of cancer from radiation and fallout exposure during the nuclear weapons tests. The Office of Compensation Analysis and Support (OCAS) of NIOSH performs dose reconstruction for the similar purpose of determining whether radiation-exposed workers may attribute cancers to their exposure.

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The historic use of retrospective exposure assessment has focused on populations of exposed individuals, as demonstrated in the examples above. The challenge for industrial hygienists and lawyers is to extrapolate retrospective exposure assessment to the litigation arena, where a claimant's exposure history is almost always at issue.

The Role of the Lawyer

Effective use of retrospective exposure assessment in toxic tort litigation requires a diligent investigation by the lawyer. The key component of any toxic tort case is the product identification deposition. The product identification deposition serves a greater purpose beyond just determining whether the plaintiff was or was not exposed to particular products. The product identification deposition can and should be used to reconstruct a plaintiff's detailed history of exposure, as a complete exposure history is essential to perform a retrospective exposure assessment. The use of anecdotal information such as this is supported in the literature, particularly when done in conjunction with available written records.

The logical way to conduct a thorough product identification deposition is to walk the plaintiff or witness chronologically through the plaintiff's exposure history. For each exposure identified, details must be explored. The lawyer should seek not only identification of the products or sources of exposure, but also estimates of duration of exposure as accurately as the witnesses can provide. Often, witnesses are unable or unwilling to estimate exposure duration. However, attorneys must be persistent in their efforts to force product identification witnesses to estimate durations of exposure as accurately as possible without speculating. An effective technique is to "zone in" on the duration of exposure by having the witness agree that the exposure was less than or more than certain periods of time. Obviously, the narrower the range of time, the more useful the estimate is to the industrial hygienist. However, a broad range is more useful to the industrial hygienist than no estimate at all.

Additionally, while walking the witness through the plaintiff's exposure history, the attorney must establish as accurately as possible the dates of exposure. Through this information, the attorney can supply the industrial hygienist with information about the product at issue at the time the plaintiff was exposed to it. For example, in asbestos litigation, the date the product was used can provide information about whether the product even contained asbestos, and if it did, how much. Furthermore, dates of exposure may also relate to whether certain exposures are excluded from consideration for latency reasons.

The attorney must also elicit as detailed a description as possible of the products identified. Information regarding the physical description of the product, the appearance and size of the product's container, logos or identifying marks, and any specific trade names or models of a product can also supply information relating to whether the product contained a hazardous substance, and if so, to what extent.

In addition to exploring the plaintiff's exposure caused by his or her own activities, the attorney must also explore whether the plaintiff was exposed to the same products or activities from other persons in the plaintiff's vicinity. As is often true, the plaintiff may have been exposed to the same hazardous substance contained in other products used by others in the vicinity of the plaintiff. The toxic tort attorney must thoroughly explore every potential source of exposure and obtain the same information regarding duration of exposure from each potential source.

In cases involving occupational exposure to a hazardous substance, another useful way to assign durations of exposure is to walk the witness through the plaintiff's typical day while performing each job at each location. The attorney should explore when the plaintiff was actually working, how often that work involved the hazardous substance at issue, how often breaks were taken and the length of breaks, and the typical schedules of the tradesmen working around the plaintiff.

In addition to developing testimony about duration and frequency of exposure, the attorney must elicit details about the conditions of exposure. For example, in cases involving occupational exposure, the attorney must develop an understanding of *how* the plaintiff did his or her job – i.e. what tools or machines did the plaintiff use and what precautions or protective devices, if any, were available. Furthermore, the attorney must explore whether any controls were in place to reduce the plaintiff's exposure. Was the plaintiff's work area ventilated? Did the plaintiff work indoors or outdoors? Finally, the attorney must determine the plaintiff's proximity to each source of exposure. This information, combined with information regarding ventilation, can assist the industrial hygienist in determining the extent to which the plaintiff was exposed to substances that the plaintiff may not have been using directly.

In addition to the hazardous substances at issue, the plaintiff may have been exposed to other substances over his or her lifetime that may have contributed to or even independently caused the injury. The attorney must explore the possibility of other types of exposure and develop the details of these exposures thoroughly.

Of course, deposition testimony is not the only source of exposure information in a toxic tort case. Often, written discovery

responses provide some exposure information. Social security records can be useful, particularly in providing concrete dates that a plaintiff worked certain jobs. Medical records often contain detailed exposure histories and tend to be more objective, as a plaintiff is much more likely to provide an accurate exposure history to someone providing medical treatment.

Aside from the product identification deposition, perhaps the most useful exposure information comes directly from the sites where the plaintiff was exposed. The plaintiff's employers and job site owners can often provide information such as invoices, specifications, job logs, personnel files, safety programs, air sampling data, blueprints, floor plans and countless other documents that shed light on the sources of the plaintiff's exposure as well as the conditions under which the plaintiff was exposed. A tour of the exposure site may be even more useful to the industrial hygienist, provided the site is substantially the same as when the plaintiff was exposed.

Once the exposure history is compiled, the attorney must be sure to pass along the information to the industrial hygienist in an objective manner. The attorney should never provide the industrial hygienist with document summaries or exposure summaries. Instead, the deposition transcripts and other documents should be transmitted to the industrial hygienist on a clean slate to ensure the integrity of the industrial hygienist's review.

The Role of the Industrial Hygienist

The overall objectives of a retrospective exposure assessment are to assess the relative risk for disease based on the exposure information and, further, to attribute the relative contribution, if any, of different sources of exposure to that risk. Relative risk is quantified by mathematic formulas industrial hygienists use. For example, if an industrial hygienist were assigned the task of determining whether a person's lung cancer could be attributed in part to a history of asbestos exposure, the industrial hygienist might use the following formula: $\text{relative risk} = 1 + k_c \times \text{exposure}$ expressed in fibers/cc. In this formula, k_c represents the OSHA permissible exposure level of 0.1 fibers/cc. Where relative risk is greater than two, the industrial hygienist would conclude that, more likely than not, the person's asbestos exposure history contributed to the development of lung cancer. Obviously, the formula depends on the hazardous substance and the injury for which risk is being assessed. One common element of the formulas, of course, is the exposure history, which begs the question of how the industrial hygienist calculates the exposure.

Put simply, the industrial hygienist calculates total exposure by "adding up" the exposed individuals lifetime exposures. In the context of litigation, this is more of a challenge and involves a degree of uncertainty, since the industrial hygienist has not usually performed sampling of the hazardous substance at the plaintiff's site of exposure. Instead, the industrial hygienist often relies on the information provided to him or her by the attorney. The industrial hygienist then consults data from controlled and competent studies that have been performed on the products containing the hazardous substance to which the plaintiff claims exposure. Using the figures from these studies and taking into account any aggravating or mitigating factors related to exposures, the industrial hygienist totals the plaintiff's individual exposures to determine a cumulative lifetime exposure. This information tells the industrial hygienist whether the total exposure is sufficient to attribute the plaintiff's injury on a more likely than not basis to the exposure. At the same time, the industrial hygienists can draw similar conclusions about the role, if any, of each of the individual exposures.

Of course, this whole process involves some uncertainty and requires the industrial hygienist to make some assumptions. Estimates of exposure duration may be inaccurate. Even when industrial hygiene studies or site-specific measurements are available, problems may arise when, for example, limited data are available for individuals, job sites or periods of exposure; improper or different sampling methods are employed within the exposure assessment; area samples are used to represent personal samples; or, biased sampling methods are used. Uncertainty may be defined as "a lack of knowledge about factors affecting exposure or risk." The EPA exposure assessment guidelines broadly categorize uncertainty into three types: "scenario uncertainty", defined as "uncertainty regarding missing or incomplete information needed to fully define the exposure and dose;" "parameter uncertainty," defined simply as "uncertainty regarding some parameter;" and "model uncertainty," defined as "uncertainty regarding gaps in scientific theory required to make predictions on the basis of causal inferences". Scenario uncertainty may arise from errors in professional judgment by the industrial hygienist, incomplete analyses and general errors in information provided to the industrial hygienist. Parameter uncertainty encompasses measurement and sampling errors and variability that necessarily occurs within populations. Model uncertainty relates to conceptual and mathematical models chosen by the industrial hygienist in lieu of other plausible alternative models.

Fortunately, industrial hygienists have methods of accounting for uncertainty in retrospective exposure assessment, and uncertainty by no means renders exposure assessment an invalid or unreliable process. First and foremost, it is important for the industrial hygienist to candidly characterize the degree of uncertainty involved in his or her exposure assessment. Uncertainty characterization involves nothing more than a qualitative discussion of the potential sources of uncertainty and an explanation as to why

certain sets of data and information were selected and why others were rejected. In some instances, this qualitative discussion may be all that is necessary. Beyond that, though, the industrial hygienist may need to perform a quantitative uncertainty assessment.

In the 1990's, industrial hygienists and other exposure assessors began to apply "Monte Carlo" simulation techniques to evaluate exposed individuals. This technique has greatly improved uncertainty assessment and reduced the overall problems historically associated with exposure assessment. Monte Carlo simulation is a probabilistic model that accounts for parameter uncertainty. It is a technical process that, through the development of software, has been applied in the environmental health arena.

Legal Obstacles to Retrospective Exposure Assessment

An attorney contemplating the use of retrospective exposure assessment in a case must consider and plan for legal obstacles he or she may encounter, including first and foremost, a *Daubert* or *Frye* challenge.

As the court in *Frye* stated, "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." This language created what is commonly referred to as the "general acceptance" standard.

The United States Supreme Court in *Daubert* held that the Federal Rules of Evidence superseded the *Frye* standard with respect to admissibility of expert evidence in federal cases. Under *Daubert*, the court must determine pursuant to Federal Rule of Evidence 702 whether the expert will testify to, "(1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue." The *Daubert* court provided an incomplete list of criteria for the court to consider in determining whether the expert testimony will be admitted: (1) whether the theory or technique has been tested; (2) whether the theory or technique has been subjected to peer review and publication; (3) the known or potential rate of error; and (4) whether the theory or technique is widely or generally accepted in the scientific community. Of course, just as many states have adopted the Federal Rules of Evidence, many states also apply the *Daubert* standard of expert admissibility.

Although not the sole dispositive factor, the *Frye* "general acceptance" standard is one criterion in the *Daubert* analysis. As indicated above, retrospective exposure assessment has been used in a variety of applications, including by the United States government to evaluate claims of injury resulting from radiation exposure. Certainly this supports the argument that retrospective exposure assessment is an accepted technique. However, attorneys seeking to employ retrospective exposure assessment must anticipate the argument that the use of the technique in the context of toxic tort litigation is less established. The distinction may be significant in the eyes of some judges, since by necessity, retrospective exposure assessment in the litigation context relies more on anecdotal evidence and estimates than does a retrospective exposure assessment in an exposure scenario that continues to exist and where more variables are either known or controlled. As indicated above, these issues all relate to the concept of uncertainty, which should be addressed by the industrial hygienist as part of the exposure assessment process.

The "general acceptance" criteria and the other *Daubert* criteria examining whether the technique has been tested and the potential rate of error are similar. The attorney's arguments addressing these issues should be supported by affidavits from not only the testifying industrial hygienist but, ideally, other competent industrial hygienists. Furthermore, the attorney must consider calling each expert to testify at an evidentiary hearing on the issue of whether to admit the testimony relating to retrospective exposure assessment.

Retrospective exposure assessment has been a subject in the published literature, as the citations throughout this article demonstrate. While some of the earlier articles dealing with exposure assessment are somewhat skeptical about its reliability, the recent literature has moved towards acceptance of the technique when done thoroughly and with appropriate uncertainty evaluation. The Environmental Protection Agency published revised guidelines for exposure assessment in 1992, embracing and outlining a detailed approach to the process. As part of such an approach, industrial hygienists performing retrospective exposure assessments in the context of litigation should, where actual site-specific or plaintiff-specific exposure data is not available, base their calculations on exposure level data contained in the literature. To highlight the importance of this point, consider the case of *Castellon v. Chevron USA*, a Southern District of Texas case in which the court excluded retrospective benzene exposure assessment testimony from the plaintiff's expert. In that case, the court noted that the plaintiff's expert's technique "would have been spared the skepticism that has greeted it" had it been based on data in the published literature.

The attorney may also encounter the obstacle of admitting expert testimony that refers to the plaintiff's exposures to products or sources other than products or sources at issue in the lawsuit. Some states have statutory and case law that deem inadmissible

an injured plaintiff's exposures to products other than those at issue in the case or ultimately at issue at trial. This may create a significant problem in that an accurate retrospective exposure assessment requires that *all* exposures be accounted for. This obstacle is particularly problematic in asbestos litigation, where the plaintiff's most significant and intense exposures may have come from products manufactured by now-bankrupt entities that are not parties to the lawsuit. Indeed, as unfortunate as it may be, a complete retrospective exposure assessment may not be possible in jurisdictions with laws such as these.

Conclusion

Retrospective exposure assessment has been used in various applications in the workplace, and its use in toxic tort litigation is developing. In order to gain acceptance of retrospective exposure assessment in the courtroom, attorneys must work diligently with competent industrial hygienists to reduce and account for the uncertainty built into the process. Furthermore, attorneys must look realistically and selectively at the case, jurisdiction, venue, judge and any other factors that affect whether the technique will be deemed reliable and admissible. This careful approach is required by all attorneys involved in toxic tort litigation if retrospective exposure assessment is to gain "general acceptance" beyond the scientific community and in the courtroom.

Foot notes

1 Transcript from audiotapes of June 27, 2002 AIHA conference presentation, "Asbestos Exposure Dose Reconstructions", speaker Frederick Boelter, CIH.

2 Transcript from audiotapes of June 27, 2002 AIHA conference presentation, "Asbestos Exposure Dose Reconstructions", speaker Morton Corn.

3 Makhijani, Arjun, "Dose Reconstruction and Epidemiological Studies", Institute for Energy and Environmental Research: SDA Vol. 5, No. 3 (March 1997).

4 "Savannah River Site Environmental Dose Reconstruction Project – Phase II: Public Workshops", Federal Register, Vol. 63, No. 24 (February 5, 1998).

5 "A Review of the Dose Reconstruction Program of the Department of the Defense Threat Reduction Agency: Public Summary", The National Academy of Sciences (2003).

6 Id

7 See "Dose Reconstruction" web page of the Office of Compensation Analysis and Support (OCAS) at www.cdc.gov/niosh/ocas/ocasdose.html.

ANNOUNCEMENT

Effective May 1, 2003 Segal McCambridge Singer & Mahoney LTD has expanded its presence in the East. David Weinberg (admitted in New Jersey, Pennsylvania, Maryland and numerous U.S. district courts) John Turlik (admitted in Pennsylvania, Ohio, Maryland, and numerous U.S. district courts and Bob Connor (admitted in Pennsylvania, New Jersey, New York, Maryland and numerous other U.S. district courts) have joined SMSM as Partners. Ted Eder (Admitted New York) Thomas Bernier (admitted Maryland, numerous U.S. district courts) Bob Coleman (admitted Pennsylvania and numerous U.S. district courts) Lisa Wildstein (admitted in New Jersey, Florida and numerous U.S. district courts) and Bud Sullivan (admitted Maryland) have joined the firm as associates. These experiences trial attorneys in toxic tort litigation strengthen the SMSM offices in Philadelphia and New Jersey and add offices in New York City and Baltimore to the SMSM presence in the East.

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Segal McCambridge Singer & Mahoney, Ltd. was founded in 1986 and has grown to having offices in Chicago, Illinois, Austin, Texas, Philadelphia, Pennsylvania, Princeton, New Jersey, Brighton, Michigan, New York, New York and Baltimore, Maryland. It represents a wide variety of clients in products liability, medical malpractice, professional liability, municipal and public officer liability, construction litigation, general defense and toxic tort defense. The founding partners' experience in toxic tort cases dates back to the 1970's in pesticide and asbestos litigation. Today, the firm acts as national coordinating counsel in asbestos litigation to numerous companies including Garlock, Anchor Packing, Congoleum, Weil-McLain, Durametallic, DAP and Chicago Fire Brick. The firm also acts as national trial counsel for these and others in asbestos litigation. The philosophy of Segal McCambridge Singer & Mahoney, Ltd. has remained the same since its inception: provide state-of-the-art legal services with an extraordinary level of responsiveness and personalized attention to each client and each case.

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