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Toxic Torts and Environmental Law Committee

CARBON NANOTUBES: THE NEXT ASBESTOS?

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Carbon nanotubes (CNTs) hold promise for many beneficial applications. However, there have been concerns and calls for a moratorium raised over "mounting evidence" that CNT may be the "new asbestos,"[1] or at least deserving of "special toxicological attention" due to prior experiences with asbestos.[2] The shape and size of some agglomerated CNTs are similar to asbestos—the most "desirable." And because CNTs for structural utility are long and thin—characteristics thought to impart increased potency to asbestos fibers—discussions of parallels between these two substances are natural. Thus, given the legacy of asbestos-related injury and the thousands of cases litigated each year, consideration of possible implications of the use of CNTs in research and in consumer products is prudent.

First reported in 1991[3], CNTs epitomize the emerging field of nanotechnology, defined by some as the "ability to measure, see, manipulate, and manufacture things usually between 1 and 100 nanometers."[4] CNTs are a type of carbon-based engineered nanoparticle generally formed by

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4 National Science and Technology Council (NSTC). 2007. The National Nanotechnology Initiative. Strategic Plan. Washington DC: NSTC, Committee on Technology, Subcommittee on Nanoscale Science, Engineering, and Technology. December. Available at http://www.nano.gov/ NNI_Strategic_Plan_2004.pdf.

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EDITOR'S MESSAGE

I want to thank our contributors for this extraordinary issue. Fionna Mowat and Joyce Tsuji from Exponent have given us an excellent article on the science related to carbon nanotubes. Sarah Thomas Pagels and Michael Rosenberg have provided us with insight into recent product liability developments in Wisconsin. Mauricio Llamas has outlined Mexico's National Wastes Management Program. James Vetter from Marsh addresses environmental issues that can arise in bankruptcy transactions. Janci Chunn Lindsay, Kirk O'Reilly, Rhonda Kaetzel and Mark Roberts at Exponent address the limitations of studies assessing the "injuriousness" of specific exposure to Benzene. And Julie Goulet provides an analysis of a recent Supreme Court's opinion on Arranger liability.

Thank you all for your interest and participation in the Committee. We look forward to seeing you at the next Committee meeting at the ABA Mid-Year Meeting in Orlando, Florida, February 3-10, 2010.

TATERA V. FMC CORPORATION: WHEN IS A PRODUCT NOT A PRODUCT?

By: Sarah Thomas Pagels and Michael Rosenberg[1]

On May 12th, the Wisconsin Court of Appeals held in *Tatera v. FMC Corporation* that strict product liability does not apply to asbestos brake linings supplied, but not sold, to an intermediary processor which processed the linings and returned them to the defendant for incorporation in the finished product.[2] The case is of significance for both plaintiffs and defendants, within and without asbestos litigation.

The Plaintiff's case centers around Walter Tatera's alleged exposure to asbestos working at B&M Machine, a machine shop owned by his father. Tatera was diagnosed with and died of malignant mesothelioma in 2004. Tatera alleged that he was exposed to, among other things, asbestos-containing friction brake linings supplied by FMC to B&M for processing. Tatera's job involved grinding asbestos-containing brake linings to the right shape and size for reincorporation into FMC's final brake system. Employee testimony indicated that this grinding work put "dust all over the shop." Defendant FMC was a successor to the Stearns Company, a manufacturer of industrial brakes and clutch components in Milwaukee. FMC did not manufacture the brake lining itself, but purchased it from other brake lining manufacturers.[3] Plaintiff alleged that FMC sent over 18,000 friction lining parts to B&M to be machined, which were then returned to FMC for assembly into the final brake system.

Plaintiff's complaint alleged strict liability and negligence

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[1] Sarah Thomas Pagels is an associate at the Milwaukee, Wisconsin office of Whyte Hirschboeck Dudek, S.C., specializing in defending clients in products liability, toxic tort and general commercial litigation matters. Michael D. Rosenberg is a shareholder at the Milwaukee, Wisconsin office of Whyte Hirschboeck Dudek, S.C., specializing in defending clients in products liability, personal injury, and toxic tort litigation matters.

[2] *Tatera v. FMC Corporation*, 2009 WI App 80, 768 N.W.2d 198 (2009).

[3] Note that although FMC purchased materials from several brake lining (on November 3, 2009, the Wisconsin Supreme Court granted the party's petition for review) manufacturers, only one, Kelsey-Hayes, remains a Defendant in the underlying case.

MEXICO'S NATIONAL WASTES MANAGEMENT PROGRAM

Mexican Federal Government takes one important step towards a National Waste Management Comprehensive Policy

BY: MAURICIO LLAMAS, ESQ.

With the formal presentation of Mexico's National Program for the Prevention and Comprehensive Management of Wastes, Felipe Calderón's Administration has finally established and defined the Federal Government's Policy in the matter. The Program basically establishes applicable policies and goals, including the adoption of the 3R's policy and the application of the Shared Responsibility principle; thus, it is expected to see more interaction of the government with the private sectors, encouraging management plans and agreements, and as the corresponding instruments are developed, enforcement actions against certain specific producers and importers may be increased. The Program is a step forward towards a real comprehensive waste management scheme in Mexico; although, there are still many actions to be taken before it can be said that General Wastes Law's ambitious goals are achieved.

On April 14, 2009 Mr. Felipe Calderón, President of the Mexican Republic presented the National Program for the Prevention and Comprehensive Management of Wastes[1] (The "Program"), which is an instrument required by the General Law for the Prevention and Comprehensive Management of Wastes (the "General Waste Law"). In accordance with the 190 pages document, main objectives of the Program may be summarized as follows:

Development of actions to reduce wastes generation;

Encourage wastes segregation;

Reuse and recycle;

Reduction of the amount of wastes destined for final disposal; and

Value recovery of the materials that compose the wastes.

Prevent and minimize the generation of wastes through the development of legal and economic instruments (including Management Plans);

The active participation of the three levels of government and diverse sectors of the private industry that are involved in the generation and management of wastes;

Reduce wastes confinement through recycling or reuse;

Develop sufficient environmental infrastructure for the collection, reuse, recycling and final disposal of wastes;

National Information Services to provide data on comprehensive wastes management; and

Comply with the responsibilities acquired by Mexico in international treaties related to such matter.

The above mentioned goals are considered and integrated to each strategic line of action that the Program will implement for each category of wastes contemplated in the Wastes Law, including:

Urban Solid Wastes

Special Management Wastes

Hazardous Wastes

Metallurgical and Mining sectors' wastes.

The Program also includes a summary of the Basic Diagnostic for the Comprehensive Management of Wastes (the "Diagnostic"), an instrument also required by article 25 of the General Waste Law, that must contain nationwide generated types of wastes, their composition and existing infrastructure for their comprehensive management.

One of the most important changes established by the General Waste Law back in 2003 was the introduction of Special Management Wastes ("SMWs") as a new category, defined as those generated in productive processes that are not considered hazardous and cannot be considered as urban solid wastes. Certain Industrial non hazardous wastes and end-of-life products fall into these categories, including wastewater treatment sludge, construction residual materials and electronic wastes. In this regard, it must be considered that information on SMWs contained in the Diagnostic is

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[1] The full and complete Spanish version of the Program is available at: http://www.ine.gob.mx/descargas/pnpgir_ver%20_int.pdf

ENVIRONMENTAL RISK DURING RESTRUCTURING AND BANKRUPTCY

By: James Vetter

Bankruptcy and restructuring has accelerated in our professional world in the past twelve months. For example, the rate of businesses filing for corporate bankruptcy protection increased by 45 percent in 2009. Even where bankruptcy can be avoided, pressures are increasing on the balance sheets and cash-flow statements of more robust companies.

As companies become more financially challenged, the risk profile changes within the company, including issues around environmental matters. Environmental risk is an important factor to manage for businesses in the following situations:

Those moving toward bankruptcy, or entering or contemplating emergence from bankruptcy;

Those seeking to avoid bankruptcy through a workout, and

Those that may have contractual counter-party risk from M&A deals, lending or joint ventures with companies in bankruptcy.

Companies entering bankruptcy can address environmental issues during the bankruptcy and be positioned for successful emergence. At the same time, creditors and other counter-parties with an interest in the bankrupt company can take steps to protect their environmental risk profile.

There are three areas that should be considered as part of any success process involving environmental issues in bankruptcy:

Understanding one's risks and exposures;

Alternatives for addressing, resolving and discharging environmental liability, and

Solutions for managing environmental liabilities.

Risk and Exposures

Environmental risks and exposures can develop from widely diverse sources.

Operating Risk Profile. Environmental losses from operations can have material financial impacts even during normal economic and operating times. In downturns, cash-flow pressure may influence compliance and risk investment decisions, such as capital improvements and headcount. This can negatively influence overall environmental performance and possibly lead to increased probability of an operational event and release resulting in cleanup costs, and possibility of substantial third-party claims and business interruption. In addition, decisions to close facilities or halt construction can increase environmental risk through the release of stored chemicals, migration of contamination, and consequential violation of hazardous waste laws. A number of states are highlighting the risk posed by closed or abandoned facilities and are making this a key focus of regulatory enforcement in 2009.

Legacy Risks. Existing environmental contamination and associated regulatory and contractual obligations represent the most common environmental exposures to be considered during bankruptcy. Known issues can result in substantial financial cleanup obligations and uncertainty around cost projections, and "unknowns" can create significant financial variability and uncertainty. Quantification, disposition, and management of legacy risks tend to comprise the most significant environmental challenges in a bankruptcy or workout, particularly with respect to the direct cost of cleanup and indirect costs such as third-party claims and legal defense costs. For business partners, reliance on contractual mechanisms, such as indemnification or prior insurance programs may not be adequate in the current environment. A best practice in this area is "risk mapping" to identify actual and potential exposures, and quantify them.

Environmental Liability Disposition during Bankruptcy

Companies entering bankruptcy with environmental liabilities have four common disposition strategies that may occur. Each alternative has advantages and disadvantages as well as opportunities and risks.

Discharge of Environmental Claims. Companies entering bankruptcy may seek to have outstanding claims discharged or essentially erased. This provides the greatest relief upon emergence.

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Upcoming TTEL Programs and Meetings

CLE Webinar

Renewable Energy: Legal Challenges and Solutions for the Green Economy
November 20, 2009 (Co-Sponsored with the ABA Standing Committee on Environmental Law)

CLE Teleconference

An International Perspective on Comparative Toxic Tort, Environmental and Product Liability Legal Systems
December 8, 2009

Business Meeting at the ABA MidYear Meeting

Oralndo, FL
February 3-9, 2010

Annual CLE Meeting

Arizona Biltomore Resort
Phoenix, Arizona
April 9-10, 2010

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LIMITATIONS OF TOXICOGENOMIC STUDIES TO ASSESS TOXIC EXPOSURES AND INJURY FROM BENZENE

By: Janci Chunn Lindsay, Kirk O'Reilly, Rhonda Kaetzel, Mark Roberts

Toxicognomics

Toxicogenomics is an emerging field of science that explores the response of genes and proteins to toxic substances. As a discipline, it melds toxicology with genomics in order to understand toxicity at the molecular level. Toxicogenomics methods are expected to provide valuable insights for understanding how toxic substances affect cellular function and how changes in gene expression may relate to adverse effects and disease. However, the relationships between changes in gene expression, corresponding protein expression and adverse health effects, such as various types of cancer, are still being sorted out and are proving much more complex than originally anticipated.[1, 2] Toxicogenomics as a scientific tool has recently been exploited by those who would attempt to assign "genetic footprints" or "molecular signatures" to chemical exposure scenarios in order to provide scientific evidence to support or refute injury claims present, or not yet manifested. But, despite claims to the contrary, Toxicogenomic studies to date do not provide a clearly defined and universally accepted benzene exposure signature that can be linked to an accepted disease mechanism in humans.

Benzene

Benzene is an aromatic hydrocarbon that has long been used in various industries as a solvent and a precursor to petroleum-derived products such as plastics, and rubber. It is a natural constituent of crude oil and a byproduct of the combustion of carbon-based fuels.[3] Benzene is ubiquitous in the industrialized world with no persons having zero exposure.[4] It is clear from scientific studies on animals and epidemiologic studies in humans that chronic exposures to high levels of benzene induces hematoxicity and has the potential to induce specific types of leukemia; therefore, benzene is classified as a carcinogen and levels of this chemical are regulated both in the workplace and the environment.[3, 5, 6]

What is less clear is the precise dose and length of benzene exposure required to induce disease in humans. This uncertainty is due to the large variability in response amongst highly exposed study populations with few developing benzene-induced toxicity and fewer yet that develop the leukemias most closely associated with benzene exposure. Further, there is no consensus within the scientific community as to the precise mechanism(s) of benzene induced leukemogenesis. What has become clear in recent years, however, is that there are probably several paths to leukemogenesis in response to certain chemicals such as benzene, and that these paths are impacted by particular genetic makeup and exposure scenario of those highly exposed individuals.[7, 8]

Studies that examined the influence of benzene and its metabolites on human gene and protein expression *in-vitro* and *in-vivo*

A recent study by Gillis *et al*. analyzed the response at the gene and protein level of human peripheral blood cells (PBMCs) to benzene metabolites in a laboratory dish (*in-vitro*). It is the metabolites of benzene that are thought to most influence hematoxicity. The authors claimed that the purpose of the study was to identify early cell responses to these metabolites in order to identify a "molecular signature" that could aid towards identifying actual cases of acute benzene poisoning in people

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1 Mattes WB, Pettit SD, Sansone SA, Bushel PR, Waters MD (March 2004). "Database development in toxicogenomics: issues and efforts". *Environ. Health Perspect*. 112 (4): 495–505.

2 EPA Interim Genomics Policy

3 HSDB. 2009. Hazardous Substances Data Bank. Available online at http://toxnet.nlm.nih.gov/cgi-bin/sis/search/f?./temp/~uxm1DN:1

4 Johnson et al. 2007. A critique of benzene exposure in the general population. Sci Total Environ. 374(2-3):183-98. Epub 2007 Jan 29.

5 Rothman et al. 1996. Hematotoxocity among Chinese workers heavily exposed to benzene. Am. J. Ind. Med. 29(3):236-246.

6 Aksoy M, Dincol K, Erdem S, Akgun T, and Dincol G. 1972. Details of blood changes in 32 patients with pancytopenia associated with long-term exposure to benzene. Br. J. Ind. Med. 29:56-64.

7 Lan et al 2005. Polymorphisms in cytokine and cellular adhesion molecule genes and susceptibility to hematotoxicity among workers exposed to benzene. Cancer Res. 2005 Oct 15;65(20):9574-81.

8 Lan et al 2009. Large-scale evaluation of candidate genes identifies associations between DNA repair and genomic maintenance and development of benzene hematotoxicity. Carcinogenesis. 30(1):50-8. Epub 2008 Oct 31.

BURLINGTON NORTHERN: THE REQUISITE INTENT FOR ARRANGER LIABILITY UNDER CERCLA

By: Julie C Goulet

Introduction

A little knowledge is a dangerous thing,[1] but knowledge alone does not rise to the level of intent —- or so is implied by the United States Supreme Court's decision in *Burlington Northern & Santa Fe Railway Co. v. United States*, 556 U.S. __ (2009). In *Burlington Northern*, the Supreme Court defined the scope of liability and the apportionment of damages under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. §§ 9601 et seq. ("CERCLA"). The following article will discuss the Court's statement on Arranger Liability.

In *Burlington Northern*, the Court establishes that "intentional steps to dispose of a hazardous substance" must be shown to establish Arranger Liability under § 107(a)(3). Therefore, an entity is not an Arranger simply because it has knowledge that a product would spill or leak during the transfer of the product from seller to buyer. Instead, in order to be considered an Arranger, the entity must have the requisite intent to dispose of the hazardous substance. In order to show that the seller intended to dispose of the product, the Plaintiff must provide evidentiary support of the seller's motives and the court must engage in a fact-specific inquiry.

Background

From 1960 to 1989, Brown & Bryant, Inc. ("B&B"), an agricultural distributor, operated a parcel of land located in Arvin, California. As part of its business, B&B purchased and stored various hazardous chemicals, including the pesticide D-D, which it bought from Shell Oil Company ("Shell"). Originally, B&B purchased D-D in 55-gallon drums; beginning in the mid-1960s, however, Shell began requiring its distributors to maintain bulk storage facilities for D-D. From that time forward, B&B purchased D-D in bulk. Over time, many of these chemicals spilled during transfers and deliveries, and as a result of equipment failures. Shell was aware of the spills of D-D.

Although both the United States District Court for the Eastern District of California and Ninth Circuit acknowledged that Shell did not qualify as a "traditional" Arranger under section 9607(a)(3), Shell was found liable under a broad category of Arranger. The District court found Shell liable by finding that the spill was a foreseeable byproduct of the transaction giving rise to Arranger Liability. The Ninth Circuit concluded that an entity could arrange for disposal even if it did not intend to dispose of a hazardous substance. Therefore, Shell was liable as an Arranger. The United States Supreme Court reversed.

Discussion

Definition of Arranger.

In *Burlington Northern*, the Court defines what it means to be an "Arranger" under CERCLA. Under §9607(a) (3), an entity may be liable if that entity "arrange[s] for disposal…of hazardous substances." Since the definition of "Arranger" is absent from the statute, the Court turned to Merriam-Webster's Collegiate Dictionary to determine the common parlance of the meaning to "arrange," which implies a directed purpose.[2] However, the CERCLA statute fails to delineate the requisite state of mind an entity must possess for the disposal to be the directed purpose of the transaction.[3] For instance, could a seller be liable as an Arranger if he/she has some knowledge of the buyer's planned disposal motive or whose motives for the "sale" of a hazardous substance are less than clear? Therefore, the Court needed to confirm what level of intent is necessary for an entity to be an Arranger or whether knowledge alone of the spills is sufficient for liability to attach.

The Decision

The Supreme Court concluded that Shell was not liable as an Arranger for the contamination that occurred at B&B's Arvin facility. Shell's mere knowledge that spills and leaks continued to occur is insufficient grounds for concluding

[1] *See* Alexander Pope, *An Essay on Criticism* (1789) ("A little knowledge is a dangerous thing; drink deep, or taste the Pierian spring: there shallow droughts intoxicate the brain, and drinking largely sobers us again").

[2] *Burlington Northern*, 556 U.S. __ (*quoting* Merriam-Webster's Collegiate Dictionary 64 (10th ed. 1993) (defining "arrange" as "to make preparations for: plan[;]…to bring about an agreement or understanding concerning")).

[3] *See Cello-Foil Prods., Inc.*, 100 F. 3d 1227, 1231 ("[I]t would be error for us not to recognize the indispensable role that state of mind must play in determining whether a party 'otherwise arranged for disposal…of hazardous substances'").

that Shell "arranged for" the disposal of D-D within the meaning of § 9607(a)(3). In order to qualify as an Arranger, Shell must have entered into the sale of D-D with the intention that at least a portion of the product be disposed of during the transfer process by one or more of the methods described in § 9603(3).

Facts Looked Upon by the Court

The Court found that the determination of whether an entity is an Arranger requires a fact-intensive inquiry that looks beyond the parties' characterization of the transaction as a "disposal" or a sale." By means of this fact-intensive inquiry, the Court could then discern whether the arrangement was one Congress intended to fall within the scope of CERCLA's strict liability provisions. Two facts that the Court found relevant in Shell's defense were that B&B was sloppy and Shell took measures to encourage their distributors to reduce the likelihood of spills.

The Court gave great weight to the fact that B&B was sloppy. The question permeating CERCLA cases is whether and to what extent a party associated with a contamination site may be held responsible for the full costs of remediation. The District and Ninth Circuit Court's holdings paved the way for a seller with mere knowledge of spills occurring to be liable for the costs of remediation. Sellers would then be liable for their sloppy distributors, even though their acts are outside the scope of their control. Had the Court ruled in line with the lower courts, it would have opened up the floodgates of liability for sellers. Consequently, this would have had a chilling effect on transactions. However, the Court appeared to consider that a seller needs to have more involvement in the actual disposal of hazardous wastes. Holding Shell liable under the theories of the lower courts for B&B's sloppiness would be equivalent to holding an entity liable for selling a new and useful product. Therefore, the seller has to actually intend the disposal for Arranger Liability to attach.

The Court emphasized the fact that Shell took numerous steps to encourage its distributors to reduce the likelihood of spills. Shell's preemptive measures, which included providing distributors with detailed safety manuals, requiring them to maintain adequate storage facilities, and providing discount for those who took safety precautions, shielded them from liability. The remedial measures diffused the fact that Shell had knowledge of the spills by providing the requisite evidentiary support that they did not intend for B&B to dispose of the products.

Burlington Northern's New Direction for CERCLA Arranger Liability Cases

CERCLA was designed to promote the "timely cleanup of hazardous waste sites" and "ensure that the costs of such cleanup efforts were borne to those responsible for the contamination." *Burlington Northern*, 556 U.S. __ (*quoting Consolidated Edison Co. of N.Y. v. UGI Util., Inc., Western, Inc.*, 423 F. 3d 90, 94 (2d Cir. 2005). However, courts have treated the determination of "responsible parties" by considering the need to satisfy the broad remedial purposes of CERCLA. Consequently, courts have struggled with balancing the attempt to minimize the costs of the clean up on Plaintiffs, especially when dealing with orphan shares, and holding the proper entities responsible. The lower courts' decisions in this case, for instance, advance the broader sweep of liability of CERCLA by holding entities with mere knowledge responsible. The Court in *Burlington Northern*, however, appears to be taking steps to define the limitations of CERCLA's overwhelming remedial statutory scheme by requiring that Plaintiff's provide evidentiary support to justify CERCLA's strict liability when holding one responsible as an Arranger.[4]

Conclusion

Good lawyering will be the key in Arranger cases under CERCLA. The Court took an important stand in limiting CERCLA's "overwhelming" remedial scheme by imposing a requisite level of mens rea in holding an entity responsible for the disposal of hazardous waste. Consequently, Plaintiffs must now take additional steps to win their case.

Although CERCLA remains a strict liability statute, the Court's opinion in *Burlington Northern* may offer sobering relief for "Arranger" defendants. After *Burlington Northern*, the facts will now dictate the outcome of the case more than ever. In addition, summary judgment under section 107(a)(3) will be less likely.[5]

Continued on page 11

[4] *See e.g., United States v. Pesses*, 794 F. Supp. 151, 157, n. 21 (W.D. Pa. 1992) (finding that the term "arrange" is not defined in CERCLA. However, a liberal judicial interpretation of the term is required in order to achieve CERCLA's "overwhelmingly remedial" statutory scheme").

[5] See John M. Barkett, *Burlington Northern: The Super Quake and Its Aftershocks*, Chemical Waste Litig. Reporter: Interim Bulletin, May 15, 2009, at 7.

B.B. Wolf vs. Curly Pig

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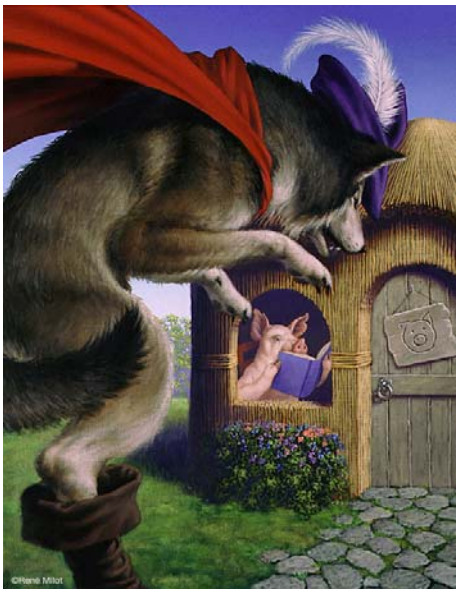

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Defending Liberty Pursuing Justice

BURLINGTON...

Continued from page 9

Sellers with knowledge of spills made by their distributors should be very proactive in providing remedial measures to limit the spills. Educating their distributors, such as providing training manuals or instructions, and awarding incentives for "clean" practices will work favorably for sellers.

In cases where finding of evidentiary support for the seller's intent may prove more challenging, such as due to the time between the complaint and the alleged sale and clean up, the burden of proof will likely be outcome determinative because a plaintiff will have to prove the alleged Arranger's intent.[6] This will be an additional burden for Plaintiffs, especially in complex CERCLA cases with multiple parties. Plaintiffs have to weigh the costs of settlement and the risk of losing at trial due to a lack of the requisite evidentiary support to prove the motives of alleged Arrangers. However, CERCLA remains a strict liability statute, but after *Burlington Northern*, a little more intent and a greater amount of evidence is needed to justify Arranger Liability. Therefore, a little knowledge may still be a dangerous thing — just make sure your facts are straight.

6 *Id*. at 16.

BENZENE...

Continued from page 7

(*in-vivo*). They further asserted that the results of their study would enable them to tell within a high degree of certainty whether or not someone had been "injuriously" exposed to benzene. The actual results of their study indicated that benzene metabolites alone could not stimulate a significant reproducible response at the gene or protein level in PBMCs. Their results showed that, in some pre-stimulated PBMCs, certain benzene metabolites could augment the production of certain molecules (cell growth factors and inflammatory mediators termed "cytokines") at the protein level. However, these results were not statistically supported at the genomic level, or in cells that had only been stimulated with the benzene metabolites alone and not pre-stimulated with other agents.[9]

Other researchers have done studies on peripheral blood cells and blood serum from humans who have actually been exposed themselves to high levels of benzene in the workplace. These researchers have noted that there are differences in several genes and proteins in the serum and PBMCs from Chinese shoe factory workers who have been chronically exposed to high levels of benzene as compared to a control population.[10,11] Notably, in the study by Forrest *et al*., twenty nine genes were found to be significantly altered compared to non-exposed workers among the six matched groups studied. However, amongst all the genes and proteins studied by each of these researchers investigating the same chemicals, only one of these genes (TNF-a) was found to be altered in the Gillis study using the same affymetrix microarray Gene Chip on the same type of cells. Further, in the Gillis study, only one of two subjects' PBMC's exposed to the benzene metabolite benzenetriol expressed TNFa at the mRNA level, the other did not. And most importantly, TNF-a was not expressed differentially at the protein level in response to the benzene metabolites by cytokine analysis (Table 1. Gillis et al 2008). It is the protein that is the ultimate expression of the coding gene.

With regard to the two *in-vivo* studies by Forrest and Vermeulen *et al*., of the 29 genes found altered in the cells in the Forrest study, only Platelet factor 4, (PF4) was found to be down-regulated in the PBMC's of the benzene exposed workers and also in the serum of these (same) workers in the Vermeulen study. PF4 inhibits angiogenesis and can effect endothelial cell growth but has not been associated with leukemogenic processes, in fact, inhibitors of angiogenesis are used to slow the progression of cancer in chemotherapeutics.

CONCLUSION

To recap, none of the genes or proteins found altered in the Gillis study were found altered similarly

9 Gillis et al. 2007 Identification of human cell responses to benzene and benzene metabolites. Genomics. 90(3):324-33.

10 Forrest et al 2005. Discovery of novel biomarkers by microarray analysis of peripheral blood mononuclear cell gene expression in benzene-exposed workers. Environ Health Perspect.113(6):801-7.

11 Vermeulen et al 2005. Decreased levels of CXC-chemokines in serum of benzene-exposed workers identified by array-based proteomics. Proc Natl Acad Sci U S A. 102(47):17041-6. Epub 2005 Nov 14

in other *in-vivo* studies that examined cells and serum from subjects with actual benzene exposure. Further those genes and proteins found to be altered by Gillis and others in response to benzene and its metabolites have not been implicated to play a clear role in leukemogenesis. It is also noteworthy that the cells, PBMCs that were studied by these groups are not thought to be the cells that promote leukemogenesis, as these cells reside in the bone marrow, not the peripheral circulation.

It is important to understand that the study of Genomics itself is a relatively new field. Most scientists that specialize in its study do not fully understand the complete relevance of changes at the DNA level in terms of ultimate changes at the protein level and how those changes may promote, prevent or maintain the disease process. If these molecules are not viewed *in-toto*, one is missing a clear picture of biological response. Taken a step further, if one does not look at the human body system as a whole rather than the sum of its parts, one might miss an important step in biological response. The same can be said of isolating a single cell type from the body, exposing them to benzene metabolites and then making assumptions about whether "injurious" responses seen in a dish are equivalent to "injurious" responses in the body. We are still learning the implications of changes at the genomic and proteomic levels and how they ultimately impact the disease process with respect to leukemogenesis. We are still learning how to combine statistical parameters to the results of these experiments so that they may be compared accurately between laboratories much in the way forensic evidence would be. To date, one of the most significant limitations to these studies has been reproducibility amongst similar studies and relevancy to disease process, as is highlighted by the above examples. These inconsistencies highlight the need for extreme caution and scientific diligence when using genomic and proteomic techniques to help derive regulatory limits, or to attempt to define chemical exposure and injury scenarios for toxic trespass litigation.

BANKRUPTCY...

Continued from page 5

However, in practice it is often difficult for companies to obtain full discharge without protracted legal proceedings, and it is more common for claims to be settled with the government and parties that are also responsible for the pollution in exchange for release from future claims against the reorganized company. This settlement can put other potentially responsible parties at risk as they may be saddled with an increased share of the liability. In addition, companies relying upon indemnities for unknown pre-existing risks could be wholly unprotected.

Section 363 Asset Sales. Companies in bankruptcy reorganization may seek to raise cash through sales of assets – either individual property or entire business units. Environmental liability runs with the land and a potential purchaser, because a 363 court order stating that the purchase is made "free and clear of all liens and claims" may not eliminate the purchaser's liability as a new owner/operator under applicable environmental law.

Environmental Trust. Section 554 of the bankruptcy code provides bankrupt companies the potential to abandon assets of limited value. In reality, this ability is very limited for contaminated property based on case law from the United States Supreme Court. The typical outcome for contaminated property, in lieu of outright abandonment, is for the bankrupt company to create an "environmental trust." The trust owns the property, has the responsibility to remediate contamination, and subsequently sells the property. Remediation obligations are typically funded through the bankruptcy proceedings and the proceeds from the sale may be returned to the bankrupt entity's estate.

Rejection of Indemnity Obligations. The bankruptcy code permits companies to seek rejection of contracts that have been fully performed on one side (so-called executor contracts), including certain environmental indemnity obligations of a bankrupt company. Where such rejection is possible, it may create a significant financial risk to the other party that was relying upon future performance of that indemnity. Even if rejection is not possible, an environmental indemnity obligation also could be discharged through the bankruptcy proceedings.

Each of these scenarios provides opportunities for companies entering into bankruptcy to mitigate liabilities if financial uncertainties around known and unknown risks can be

quantified and risks managed as part of the process. These outcomes can also create increased risk for third-party business entities with contractual rights that a bankruptcy may eliminate.

It is possible to mitigate these increased risks to third parties through risk management solutions.

Corporate Restructuring

Companies undergoing restructuring do so to either optimize financial performance or to avoid bankruptcy. In doing so they drive efficiency measures throughout the organization, and seek to raise and conserve cash.

Corporate restructuring is in large part about seeking "opportunity" for improvement. Realizing those opportunities requires thoughtful questioning and consideration, and suspension of pre-conceived notions early in the restructuring process. Issues involving environmental and real estate are no exception. The following are questions that should be considered at the outset of corporate restructuring regarding the intersection of real estate and environmental.

Real Estate

What is the highest and best use analysis for individual to maximize income from the property?

Have all possible alternatives been considered that may be available, especially if the property has residual environmental issues?

If closing a number of plants, is there efficiency in prioritizing and sequencing of property sales to maximize return and minimize risk?

Can maximum price be yielded with speed through traditional real estate channels, or are they alternative, specialized channels and buyer who should consider?

What are the advantages of using a competitive bidding process to move the property-maximize income-cash, decrease sales cycle-time, and reduce frictional costs?

If a facility is being held, what can be done with environmental liabilities and infrastructure to minimize carrying costs?

Environmental

Is there any active remediation at the facility that may need to be accelerated due to potential agency and public scrutiny?

What are the impacts to environmental permits and exposures to new regulations or regulatory focus?

Have all environmental risks from operations been inventoried, and what is the most cost effective way to address these and prepare the property for closure?

Does environmental decommissioning need to be completed and in what sequence?

Have costs been projected for full life-cycle purposes in the event of a divestiture for negotiating purposes?

What is the probability of unknown, pre-existing conditions being discovered or raised by potential purchasers and having that uncertainty erode asset value for the property?

Should environmental liabilities be managed through more standard purchase and sale agreement provisions (e.g. indemnity, purchase price adjustment or escrow), or an environmental liability buy-out?

Environmental Risk Management and Insurance Solutions

In both restructuring and bankruptcy, environmental risk and exposures have two basic types of financial uncertainties:

- Cost escalation around known risks (arising from increased governmental interest as a result of a bankruptcy filing); and
- New costs surfacing from previously unknown risks.

Managing these financial risks and uncertainties is a critical necessity when trying to:

- Maximize restructuring financial outcomes;
- Maximize asset value from sales under Section 363 and Environmental Trusts for companies in bankruptcy; and
- Minimize or eliminate liability to third parties from environmental liability discharges and rejection of contractual indemnities.

Environmental risk management can play a key role in managing these uncertainties. Parties can use any of the three following environmental risk management tools to control the financial uncertainties discussed above.

Pollution Legal Liability This insurance policy can cover risk from unknown risks, including legacy or operational risks. Core coverage can include: cleanup; third-party bodily injury and property damage; legal defense and business interruption. These policies can be manuscripted and coverages enhanced to meet client

and situation specific needs. In addition, Excess of Indemnity coverage can also be provided to protect third parties from failure of bankrupt companies to meet indemnity obligations. PLL is the policy most frequently used to control risk, and there is a wide range of carriers who can provide this coverage.

Remediation Cost Cap. This insurance policy is used to cover cost over-runs around known environmental risks. Cost Cap requires sufficient known information about a pollution condition so that a remediation plan, schedule and cost can be forecasted. The insurance carrier underwrites the risk and agrees on an "attachment point" for the remediation above, which it will play claims should the attachment point be exceeded or overrun.

Environmental Liability Buyouts

In a normal transaction involving a buyer and seller, environmental liabilities are identified and quantified and the deal negotiation involves one entity taking on responsibility or both companies sharing responsibility for environmental matters-all with associated disclosures and indemnities. Often this process can result in an impasse to the deal consummation. Even where the deal is done, it requires that the company use resources to manage the environmental risks, and potentially tap into future earnings to adjust for increases in costs due to the uncertainty with the contingent nature of environmental risks. Regardless, it requires effort and costs outside the company's core business mission of producing products or services.

There is an alternative to deals not closing or having to assume long term liability. That alternative is use of an Environmental Liability Buyout. In essence a liability buyout is where a third party specialist will come into a deal or site, value the associated liabilities, and assume those liabilities contractually and with regulators in return for financial consideration-funding for the risk. This is a powerful option as the third party can assume the core remediation issues, and associated frictional costs regarding execution and management of the risk(s).

Summary

There are environmental risk management solutions available for that can help companies in restructuring or bankruptcy. A thoughtful analysis of risk and use of environmental risk management vehicles can help enable positive outcomes for companies in either business situation.

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This article is not intended to provide legal advice.

MEXICO...

Continued from page 4

scarce and deficient since this is a category of recent creation and regulation, enforcement and participation of all sectors within society is insipient; thus, the federal government has little or no information on the matter.

In light of the abovementioned situation, the government has established concrete actions in order to develop and encourage the comprehensive management of the SMWs, including the following:

Goals

Define which wastes should be considered as SMWs and should be subject to Waste Management Plans ("MPs"); Mexican Official Standards that will deal with this matter are currently in development;

Induce the necessary conditions that will allow for the States within the Mexican Republic to take control over SMWs jurisdiction;

Prevent and minimize the generation of SMWs by creating legal and economic instruments (including MPs);

Encourage the active participation of the diverse sectors of the private industry;

Develop the necessary infrastructure to achieve comprehensive management;

Reduce those SMWs that emit green house gases; and

Create a comprehensive waste management Information system for SMWs.

Strategies:

Amend the existing legal framework, create new laws and instruments and develop local Programs for Comprehensive Management of Wastes ("Local Programs");

Instill the necessity to create

and design products with an environmental perspective (3Rs policy) in order to prevent and minimize the generation of SMWs;

Encourage development of Management Plans for SMWs (specially for those that emit green house gases) based on the applicable Official Standards;

Encourage governmental entities to establish environmental policies (i.e. green acquisitions and recycling);

Promote scientific and technological research to achieve better comprehensive management.

Actions:

Create the Mexican Official Standard that will determine which SMWs are subject to Management Plans;

Strengthen the framework of the Clean Industry Certification process (compliance certification granted by the Mexican Environmental Authorities);

Develop the required infrastructure to achieve the comprehensive management of SMWs.

In this case, further devolvement of existing legal framework is considered necessary since comprehensive management of SMWs is relatively new; therefore the Program has contemplated certain actions:

At a Federal Level:

Amend the exiting legal instruments (proposals include amending the Constitution);

Create the required NOMs; and

Execute agreements regarding waste management with different sectors of society (producers, importers, distributors, retailers, consumers and users among others).

At a Local Level:

Induce the creation of Local Waste Management Laws & Programs.

At a Municipal Level

Encourage the creation of municipal regulations and ordinances;

Execute agreements with State and Federal government.

The 3R's policy has been integrated into the Program, not only for better development of the comprehensive management of wastes, but also as a policy that will promote sustainable development, therefore the following strategies are established to include 3R's policy into the economic cycles.

Encourage development of designs that will extend life cycle of products and allow for the use of its wastes for production cycles by recycling and reuse of the raw materials;

Promote the adequate final disposal of wastes;

Create special certificates or eco labels to stimulate the green acquisitions and the use of recycled materials; and

Induce the participation of all sectors of society (Shared Responsibility Principle) in order to promote the 3R's policy.

Since the Program was created as a dynamic and strategic tool to attend the comprehensive management needs of the different wastes' streams, it includes mechanisms that will allow for the evaluation and follow up of the same; giving the government and society the possibility to analyze its outreach. The evaluation of the Program will be specific and will take place after each of its phases has been implemented.

[2] Defined by the General Wastes Law as: Principle by means of which it is recognized that urban solid wastes and special management wastes are generated by activities which satisfy society´s needs, through value chains of production, process, packaging, distribution, product consumption, and, in consequence, their comprehensive management is a social co-responsibility and requires the joint, coordinated and differenced participation of producers, distributors, consumers, byproducts users, and of the three government levels, as it may correspond, under a market feasibility scheme and environmental, technological, economical and social efficiency". (Art. 5.XXXIV)

TATERA...

Continued from page 3

claims against FMC. The trial court granted FMC summary judgment on both counts, and the Plaintiff appealed. The Court of Appeals affirmed the grant of summary judgment on strict liability, but reversed on negligence grounds, finding issues of material fact whether FMC provided adequate warnings to B&M.

Analysis of the Strict Liability Claim

The crux of the issue with regard to the strict liability claim is whether, under Wisconsin law applying the Restatement (Second) of Torts § 402A (1965)[4], a party can be held strictly liable for a product provided to the employee of a subcontractor for further processing before reaching the ultimate consumer. The court stated that the issues were: (1) whether FMC was a "seller," (2) whether Tatera was a "consumer," and (3) whether brake linings were "products" within the meaning of § 402A? In this case of first impression, the Wisconsin Court of Appeals found that § 402A did not cover this scenario.

FMC was not a seller under § 402A

The Court of Appeals found that FMC did not fit the definition of a "seller" under the prior cases in Wisconsin, because it neither sold the product nor put the "product" into the stream of commerce. Instead, FMC provided the product to B&M for additional processing before incorporating the brake linings into the final product – industrial brake and clutch components – which it then sold to automotive companies. The decedent was a brake grinder at B&M and not a purchaser of a car that had asbestos-containing brakes.

In support of her position that *Tatera* was a seller, Plaintiff relied heavily on a Pennsylvania case, *Kalumetals Inc. v. Hitachi Magnetics Corp.*[5], which the Court distinguished. *Kalumetals* held that Hitachi, the supplier of swarf (a mineral mix), which was sent to another company for drying (Kalumetals), was a seller simply because it placed the product in the stream of commerce – despite the fact that there was no actual sale and despite the fact that processing of the swarf was involved. This was largely due to the fact that in Pennsylvania, the definition of "seller" included bailors and lessors.[6] In contrast, Wisconsin has not recognized this extension of the definition of a seller. In addition, the court in *Kalumetals* found that Hitachi placed the product into the stream of commerce and to not apply § 402A would be contrary to the public policies supporting § 402A.[7] The Wisconsin Court rejected this conclusion, finding that even if FMC put the product into the stream of commerce it did not manufacture it and was not a seller under § 402A.[8]

The Court also noted that FMC was not the only member of the marketing chain available to the injured party for redress. Kelsey-Hayes, a friction product defendant that allegedly supplied linings to FMC, remained a defendant in the case and was a viable defendant. Although not expressed in the opinion, presumably the Court found the presence of a viable defendant in the chain adequate to satisfy the public policy concerns behind § 402A, which seeks to allow injured plaintiffs an avenue for recovery for injuries sustained from unreasonably dangerous products.[9] Based in part on the fact that FMC did not actually sell the linings to B&M, but merely subcontracted with B&M to provide grinding services before the linings were incorporated into a final product, industrial brakes and clutches, the Court found that FMC did not qualify as a "seller" under Wisconsin law or § 402A.

Tatera was not a user or consumer

The Court also found that Tatera, as an employee of a subcontractor, was not a user or consumer as defined by § 402A. The Court relied on FMC's interpretation of comment 1 to § 402A that indicated that a user or consumer means the "ultimate" user or consumer of the finished product. The Court noted that the comments stated under this interpretation, consumer or user must be just "one short step" from the ultimate consumer, such as the cook in a restaurant, and excludes the person who processes a product for someone other than the ultimate consumer. The comments also do

[4] Wisconsin has adopted the Restatement (Second) of Torts, § 402A and some of the comments, but to date, it has refused to adopt the Restatement (Third) of Torts regarding strict liability.

[5] 21 F. Supp. 2d 510, 515-16 (W.D. Pa. 1998)

[6] 21 F. Supp. 2d at 515.

[7] 21 F. Supp. 2d at 515-16.

[8] 2009 WI App 80 at ¶ 19-20

[9] 2009 WI App. 80 at ¶21.

not define the intermediate processor as a "user," but in fact expressly refrain from taking any position on the issue. Thus, the Court found that Walter Tatera (as an intermediate processor at B&M) could not qualify as either a user or consumer under these facts.

Friction brake linings are not products

The Court further found that friction brake linings are not "products" as defined by §402A.

On this issue, Plaintiff again relied on *Kalumetals* to support her position that the product at issue here is "friction brake linings." The plaintiff argued that the brake linings were products because FMC supplied them to B&M with the intent that Tatera and other machinists would grind them and because those brake linings arrived at B&M in the same condition as when they left FMC. On the other hand, FMC argued that the finished product was "brakes" and not brake linings, and that the brake linings did not fit the requirements of § 402A. Interestingly, the Court of Appeals found that even if they accepted the Plaintiff's view that the product was "friction brake linings" rather than brakes, friction brake linings is not a product under the language of § 402A. Indeed, the Court of Appeals distinguished the cases cited by both parties and admitted that it had found no case law to support its position. The Court also declined to extend the definition of a product in § 402A to cover the friction brake linings in the middle of processing based on public policy.

The Court of Appeals stated that although a public policy found in *comment p* of § 402A, which contemplated the shifting of the burden to the intermediate party who makes changes to a product during processing in certain cases, this situation did not justify expanding the definition of a "product" to permit a strict liability claim against FMC in these circumstances.[10] The Court held that the public policy considerations set forth in *Kalumetals* and *comment p* did not apply, particularly in light of the fact that they found no case law to support such an extension of liability under these facts.

As the Wisconsin Court noted, there is limited case law in this area. Research reveals only one other related case, from the Supreme Court of Indiana, which has held that a product liability claim could not lie against the seller of product that was intended to be sold fully assembled, when the plaintiff, an employee of a third party hired to assemble the final product, was injured during the assembly process.[11]

The position taken by the Wisconsin Court of Appeals – that an asbestos-containing product in "process" is not a product – is distinct from that taken by some other courts, which have found that a raw asbestos fibers, which are incorporated into a final asbestos-containing product, is a product that can subject to §402A liability.[12]

Conclusion

There is little case law and little guidance in the Restatement regarding the application of strict liability when the product is undergoing an intermediate process before it is placed into the stream of commerce. The Court in *Tatera* reached the opposite conclusion as the Court in *Kalumetals*. The only other similar case, the *Vaughan* Court focused on the user issue to preclude liability and glossed over the definition of a product. If the Wisconsin Supreme Court affirms the Court of Appeals decision or simply refuses to accept the petition for review, the Court of Appeals opinion in *Tatera* will be a useful tool for Defendants in similar situations.

[10] Comment p states: "In the absence of decisions providing a clue to the rules which are likely to develop, the Institute has refrained from taking any position as to the possible liability of the seller where the product is expected to, and does, undergo further processing or other substantial change after it leaves his hands and before it reaches those of the ultimate user or consumer.…The question is essentially one of whether the responsibility for discovery and prevention of the dangerous defect is shifted to the intermediate party who is to make the changes. No doubt there will be some situations, and some defects, as to which the responsibility will be shifted, and others in which it will not." *Id*. at ¶ 28.

[11] *Vaughan v. Daniels Co.,* 841 N.E.2d 1133, 1142 (Ind. 2006)("We hold that "use" of a product under the Indiana Products Liability Act does not include assembly and installation where the seller retains an obligation or arrangement with the purchaser to deliver a fully assembled and installed product.")(also collecting cases discussing the definition of a product and definition of "user").

[12] *See e.g., Jenkins v. T&N PLC,* 45 Cal. App. 4th 1224, 53 Cal. Rptr. 2d 642, 645 (Cal. Ct. App. 1996)(giving an overview of the law on liability for a component part, and holding that raw asbestos fibers are a product subject to strict liability); *Hammond v. North American Asbestos* 97 Ill. 2d 195; 205, 454 N.E.2d 210 (Ill. 1983)(holding that raw asbestos fibers, even if they are processed into another final product before sale, are a product subject to § 402A liability).

NANOTUBES...

Continued from page 1

the addition of energy to a carbon source to produce rolled-up tubular sheets measuring several nanometers in width by up to tens of microns in length. CNTs can be single-walled (SWCNTs) or multi-walled (MWCNTs), the latter formed by 2 to 50 concentric tubular graphite sheets.

CNTs are being developed for a multitude of uses in new drugs and medical devices, building and structural materials, military and automotive applications, and electronics. One forecaster estimates that the global market for CNTs was approximately $51 million in 2006, with an estimated compound annual growth rate of 75 percent and estimated global market reaching over $800 million by 2011.[5] CNTs exhibit extraordinary mechanical properties with a strength-to-weight ratio hundreds of times that of steel.[6,7,8] They can be highly conductive or insulating, and can be functionalized or modified for specific purposes. Each type of CNT has unique properties, including shape, chemical composition, and surface characteristics, among others, each of which affect their behavior and potential for toxicity.

One of the few studies to examine potential CNT exposure generated SWCNTs by mechanical agitation in a laboratory setting, along with a pilot field study. The study indicated that airborne concentrations of CNTs were "very low" (<53 μg/m^3), and airborne CNTs agglomerated readily into clumps more than 1 μm in diameter.[9] Agglomeration due to the action of Van der Waal's forces on CNTs causes them to form "ropey" structures in air that settle rapidly[8,10], which may limit exposure, although re-suspension may be possible. In addition to variation in length, some CNTs may form tangled, balled structures, whereas others appear to form straighter, agglomerated structures.[11]

Most concerns regarding CNTs are related to their 1) small size, and hence high surface areas and potentially high reactivity when inhaled; 2) fiber-like shape, which has known toxicological consequences; and 3) potential for biopersistence. Studies of CNTs in the respiratory system of rodents indicate that these structures are capable of eliciting inflammation, granulomas, and formation of fibrous tissue and interstitial fibrosis[8,10,11,12,13,14,15,16] much like effects observed following adequate exposure to certain asbestos and fiber types. CNTs have also been associated with signs of cardiovascular effects in mice following administration to the respiratory tract.[17]

The mechanism of action for asbestos is through generation of reactive oxygen species; however, nanotubes—with a basic carbon structure—may be more biocompatible with cellular components. Variation in the results of CNT toxicity studies is likely due to 1) methods of administration that result in CNTs being either more agglomerated or more dispersed in the lung and 2) wide possible differences in CNT characteristics. Larger agglomerated forms in the lung tend to be more associated with transient inflammation and foreign-body reaction (i.e., granulomas), whereas more dispersed particles result in CNTs entering the alveolar septum (tissue between adjacent air sacs), where they tend to cause fibrosis.[15,18] Some research indicates that metal impurities (e.g., Fe, Ni)

5 http://www.bccresearch.com/report/NAN024C.html

6 Service, R.F. 1998. Superstrong nanotubes show they are smart, too. *Science* 281(5379):940–942.

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8 Lam, C.W., J.T. James, R. McCluskey, et al. 2006. A review of carbon nanotube toxicity and assessment of potential occupational and environmental health risk. *Crit Rev Toxicol* 36:189-217.

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10 Warheit, D.B. 2006. What is currently known about the health risks related to carbon nanotube exposures? *Carbon* 44:1064–1069.

11 Poland, C.A., R. Duffin, I. Kinloch, et al. 2008. Carbon nanotubes introduced into the abdominal cavity of mice show asbestos-like pathogenicity in a pilot study. *Nature Letters* 3(7):423–428.

12 Donaldson, K., R. Aitken, L. Tran, et al. Carbon nanotubes: A review of their properties in relation to pulmonary toxicology and workplace safety. *Toxicol Sci* 92(1):5–22.

13 Muller, J., F. Huaux, and D. Lison. 2006. Respiratory toxicity of carbon nanotubes: How worried should we be? *Carbon* 44:1048–1056.

14 Tsuji, J.S., A.D. Maynard, P.C. Howard, et al. 2006. Forum Series. Research strategies for safety evaluation of nanomaterials, Part IV: Risk assessment of nanoparticles. *Toxicol Sci* 89(1):42–50.

15 Mercer, R.R., J.F. Scabilloni, L. Wang, et al. 2008. Alteration of deposition pattern and pulmonary response as a result of improved dispersion of aspirated single walled carbon nanotubes in mouse model. *Am J Physiol Lung Cell Mol Physiol* 294:L87–L97.

16 Takagi, A., A. Hirosa, T. Nishimura, et al. 2008. Induction of mesothelioma in p53 +/- mouse by intraperitoneal application of multi-wall carbon nanotubes. *J Toxicol Sci* 33(1):105–116.

17 Li, Z., T. Hulderman, R. Salman, et al. 2007. Cardiovascular effects of pulmonary exposure to single-wall carbon nanotubes. *Environ Health Perspect* 115(3):377–382.

18 Li, J.G., W.X. Li, J.Y. Xu, et al. 2007. Comparative study of pathological lesions induced by multiwalled carbon nanotubes in lungs of mice by intratracheal instillation and inhalation. *Environ Toxicol* 22:415-421.

might contribute to the toxicity of CNTs.[19] Similarly, asbestos fibers differ in toxicity depending on their properties (e.g., amphibole versus serpentine fibers). Due to their chemical stability, CNTs, if not cleared from the lung, may persist, a factor that has been found to be directly linked to asbestos toxicity.[20,21]

Research related to drug or medical applications indicates the importance of surface properties of CNTs in clearance. Intravenous injection of mice with pristine SWCNTs resulted in retention within organs, with little elimination over the 3-month study, but low apparent toxicity.[22] Conversely, intravenous injection of mice with SWCNTs that were functionalized to be more biocompatible (e.g., biological molecules attached to increase water solubility) showed low uptake by organs, little evidence of toxicity, and clearance from the body over 2 to 3 months.[23]

Recent studies have heightened concerns about "asbestos-like" toxicity of CNTs. Takagi et al. reported that MWCNTs injected into the abdomen of a sensitive strain of mice were more potent in causing "mesothelioma"-like lesions than crocidolite asbestos.[16] A follow-up to this study using a lower dose administered by single intrascrotal injection in a less sensitive strain of mice reported similar results, and indicated that the resulting lesions also involved adjacent organs and tissues and "metastasized" to the pleura.[24] Poland et al., reported that long, straight MWCNTs exhibited a short-term "asbestos-like" response (granulomas) when injected into the abdomen of mice, as evidenced by injury to the "mesothelial lining," whereas tangled or short (with low aspect ratios) MWCNTs did not produce such responses.[11]

Although these results reflect similarity in toxicity for CNTs that are similar in form to more toxic asbestos fibers, they have limitations for concluding that CNT exposure would result in asbestos-related disease in humans. Both studies were short term (7 or 180 days), and neither reported actual mesothelioma. Humans likely would be exposed to CNTs via inhalation (rather than injection) and at doses significantly lower than those administered experimentally, particularly given the propensity of CNTs in air to agglomerate into larger structures; thus, these studies are unable to evaluate whether CNTs would reach the deep lung and travel to the pleural or peritoneal lining, or whether subsequent mesothelioma would develop. More recently, NIOSH presented preliminary findings showing that 56 days after pharyngeal aspiration (mimicking inhalation), long and thin MWCNTs can penetrate the lining of the lungs in mice (same strain as used by Poland et al.) and translocate beyond the lung to associated lymph nodes and the pleura, the site of asbestos-related disease.[25,26] This research also reported inflammation and fibrosis of the lungs. Additional findings from short-term and subchronic CNT inhalation studies are also forthcoming, indicating similar inflammatory and fibrotic effects in rodents.[27,28] NIOSH is planning longer-term studies to investigate issues such as effects of different strains or species, dose, inhalation exposure, and ultimately whether mesothelioma or cancer may develop.

Are CNTs the next asbestos? The jury is still out, but precautionary steps are being taken. On October 31, 2008, EPA released a notice that CNTs are distinct from graphite or other carbon allotropes listed in the Toxic Substances and Control Act (TSCA) inventory and thus can be considered new chemicals under TSCA Section 5, requiring a pre-manufacture notice for manufacturers or importers.[29] At least one insurance company issued a draft notice banning coverage of CNTs,[30] but then withdrew the notice.[31] Legal reviews have weighed in on this issue as well.[32]

19 Shvedova, A., E. Kisin, R. Mercer, et al. 2005. Unusual inflammatory and fibrogenic pulmonary responses to single-walled carbon nanotubes in mice. *Am J Physiol: Lung, Cell, and Molecular Physiology* 289:698–708.

20 Bernstein, D.M., R. Rogers, and P. Smith. 2005. The biopersistence of Canadian chrysotile asbestos following inhalation: Final results through 1 year after cessation of exposure. *Inhalat Toxicol* 17:1–14.

21 Bernstein, D.M., K. Donaldson, U. Decker, et al. 2008. A biopersistence study following exposure to chrysotile asbestos alone or in combination with fine particles. *Inhalat Toxicol* 20:1009–1028.

22 Yang, S.-T., X. Wang, G. Jia, et al. 2008. Long-term accumulation and low toxicity of single-walled carbon nanotubes in intravenously exposed mice. *Toxicol Lett* 181:182–189.

23 Liu, Z., C. Davis, W. Cai, et al. 2008. Circulation and long-term fate of functionalized biocompatible single-walled carbon nanotubes in mice probed by Raman spectroscopy. *PNAS* 105(5):1410–1415.

24 Sakamoto, Y., D. Nakae, N. Fukumori, et al. 2009. Induction of mesothelioma by a single intrascrotal administration of multi-wall carbon nanotube in intact male Fischer 344 rats. *J Toxicol Sci* 34(1):65–76.

25 Castranova, V., A. Hubbs, D. Porter, et al. 2009. Persistent pulmonary fibrosis, migration to the pleura, and other preliminary new findings after subchronic exposure to multi-walled carbon nanotubes. NIOSH Science Blog. Department of Health and Human Services, Centers for Disease Control and Prevention. March 19. Available at http://www.cdc.gov/NIOSH/blog/nsb031909_mwcnt.html.

26 Hubbs, A., R.R. Mercer, J.E. Coad, et al. 2009. Persistent pulmonary inflammation, airway mucous metaplasia and migration of multi-walled carbon nanotubes from the lung

The regulatory and insurance actions apply to all CNTs, despite the evidence, consistent with existing knowledge, indicating that only certain types may be a concern for "asbestos-like" health risks. Continued research will be required to discern which types or properties of CNTs are most hazardous, thereby allowing for design and management of CNTs to realize their ultimate benefits.

2010 TIPS CALENDAR

January

14-17 **Annual TIPS Midwinter Symposium on Insurance, Employment and Benefits** — **Hyatt Regency Coconut Point Resort and Spa, Bonita Springs, FL**
Contact: Debra D. Dotson – 312/988-5597

26-29 **FSLC Midwinter Meeting** — **Westin St. Francis Hotel, San Francisco, CA**
Contact: Felisha A. Stewart – 312/988-5672

February

3-9 **ABA Midyear Meeting** — **The Swan Hotel, Orlando, FL**
Contact: Felisha A. Stewart – 312/988-5672

April

8-9 **2010 Emerging Issues in Motor Vehicle Product Liability Litigation** — **Arizona Biltmore Resort & Spa, Phoenix, AZ**
Contact: Donald Quarles – 312/988-5708

9-10 **19th Annual Toxic Torts Spring CLE Meeting** — **Arizona Biltmore Resort & Spa, Phoenix, AZ**
Contact: Debra D. Dotson – 312/988-5597

April

17-21 **TIPS/ABOTA National Trial Academy** — **Grand Sierra Resort & Spa, Reno, NV**
Contact: Donald Quarles – 312/988-5708