Diesel Fumes

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> [T]he plaintiffs' bar with expertise in airborne inhalable carcinogens is surely probing for the next mass tort … . [D]efense attorneys would be well-served to be on the lookout for plaintiff lawyers trying to leverage their inhalable carcinogen expertise in diesel exhaust (DE) cases.

David N. Lutz, *Diesel Exhaust—The Next Asbestos?* For the Defense 16 (Nov. 2005).

I. Introduction

Exposure to diesel engine exhaust ("DE") is a potential public health hazard: that conclusion represents the current general consensus among scientists and the federal and state governments. Initially, scientists and others considered exposure to DE to be an occupational health hazard, affecting such workers as miners, railroad workers, and drivers of diesel-fueled trucks and forklifts. *See* U.S. Department of Labor ("DOL"), *Safety and Health Topics, Diesel Exhaust* (July 6, 2005) [available at http://www.osha.gov/SLTC/dieselexhaust/recognition.html] [hereinafter DOL *Safety*]. More recently, "the wide use of diesel engines in transportation [has] provide[d] significant opportunity for environmental exposures … ." DOL *Safety*, *supra*. Thus, DE exposure is currently considered not only a potential occupational health hazard, but a possible health threat to the general public as well. Witness the headline in the November 16, 2006, issue of *The Oregonian*, at A-1: *Metro Area Chokes on Off-Road Rigs' Fuel—Two-Thirds of the Soot over Portland Comes from Diesel Exhaust, Which Poses a Health Risk and Could Lead to Cancer*, by James Mayer.

This article will first look at the composition of DE and consider its potential health risks. The article will then examine the DE cases surfacing in the courts. Finally, the article will detail new governmental regulations for DE.

But first, a word about language. The terms "diesel fumes" and "diesel exhaust" are often used interchangeably. However, at least one court has distinguished between "fumes" and "exhaust": the Nebraska Court of Appeals has "recognize[d] that diesel fumes and diesel exhaust result from two separate chemical processes—vaporization and combustion, respectively," but stated that "[w]hether the two processes and their resulting byproducts affect the lungs differently is not found within the record." *Dunn v. Metro Area Transit*, 2002 WL 31819591, at *12 (Neb. Ct. App. Dec. 17, 2002). It should be noted that other courts have not made the distinction between diesel "fumes" and "exhaust" recognized by the *Dunn* court. Therefore, defense counsel may want to consider whether the "fumes" *versus* "exhaust" issue is relevant in a particular case.

II. What Is Diesel Engine Exhaust ("DE")?

According to the U.S. Environmental Protection Agency ("EPA"), DE is composed of hundreds of components, which may be in either a gaseous or particulate form. Gaseous components include carbon dioxide, oxygen, nitrogen, carbon monoxide, and nitrogen and sulfur compounds. Gaseous components known to be "of toxicologic relevance" include the aldehydes (*e.g.*, formaldehyde), benzene, polycyclic aromatic hydrocarbons (known as "PAHs") and nitro-PAHs.

The particles present in DE have a center core of elemental carbon, which adsorbs (gathers on its surface) organic compounds and small amounts of sulfate, nitrate, metals, and other trace elements. Generally, the organic compounds range from about 20 percent to 40 percent of particle weight. Many of those compounds are known to have carcinogenic and mutagenic properties.

These DE particles are extremely small. So-called "fine" particles have a diameter of <2.5_m (a "_m" is a "micro-meter" or one-thousandth of a millimeter). The "fine" particles include a subgroup of "ultrafine" particles, with a diameter of <0.1_m. As a group, these particles have a large surface area, which makes them "an excellent medium" for adsorbing organic compounds. Because these particles are so small, they are easily inhaled deep into the lungs.

The chemical composition and particle sizes of DE "vary significantly" depending upon the type of engine (heavy duty or light duty), the engine operating conditions (idling, accelerating, decelerating), and the formulation of the fuel (high or low sulfur). In addition, there are differences between on-road and nonroad engines—used in construction, agricultural and industrial applications— because the nonroad engines are generally based upon older technology.

See EPA, *Health Assessment Document for Diesel Engine Exhaust* (2002), at section 1.2 ("Composition of Diesel Exhaust") [available at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060]. Preferred citation as stated by the EPA.: U.S. Environmental Protection Agency (EPA) (2002). Health assessment document for diesel engine exhaust. Prepared by the National Center for Environmental Assessment, Washington, DC, for the Office of Transportation and Air Quality; EPA/600/8-90/057F. Available from: National Technical Information Service, Springfield, VA; PB2002-107661, and http://www.epa.gove/ncea.

III. The Possible Health Risks of Exposure to DE

In 2002, the EPA prepared an exhaustive health assessment for exposure to DE. Entitled *Health Assessment Document for Diesel Engine Exhaust*, the EPA Assessment examined information concerning the "possible health hazards" associated with exposure to DE. The EPA concluded that long term (*i.e.*, chronic) inhalation exposure is likely to pose a lung cancer hazard to humans, as well as damage the lung in other ways depending on exposure. Short term (*i.e.*, acute) exposures can cause irritation and inflammatory symptoms of a transient nature, these being highly variable across the population. The assessment also indicates that evidence for exacerbation of existing allergies and asthma symptoms is emerging. The assessment recognizes that DE emissions, as a mixture of many constituents, also contribute to ambient concentrations of several criteria air pollutants including nitrogen oxides and fines particles, as well as other air toxics.

EPA, Health Assessment Document for Diesel Engine Exhaust (2002), at Abstract [available at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060] [hereinafter EPA Assessment].

The EPA does note that, "[e]ven though the evidence for potential human health hazards for DE is convincing and persuasive," there are "uncertainties." One uncertainty relates to technological advances in the automotive industry. Specifically, the observations underlying the 2002 EPA Assessment are based upon exposure to exhaust from diesel engines that were built prior to the mid-1990s. The EPA recognizes that there have been changes in the composition of DE from on-road vehicles, but points out that there is "no definitive information to show that the emission changes portend significant toxicological changes." Moreover, the EPA opined that "[t]he mode[s] of action for DE toxicity in humans is not understood, and hence knowledge is lacking about the role of exhaust mixture components in modulating the toxicity." Nevertheless, the EPA concluded that, even though the information on health risks is based upon exposure to older technologies, it is still applicable to "current-day exposures." However, the EPA acknowledges that as new and cleaner diesel engines replace existing engines, "the general applicability of the conclusions in [its] assessment will need to be reevaluated." *See* EPA Assessment, *supra*, at Sec. 9.6 ("Summary and Conclusions") and Abstract.

In addition to the EPA, numerous other agencies, regulatory bodies, and media outlets have identified a wide-ranging litany of potential public health hazards posed by DE. Consider the following reports:

· U.S. Environmental Protection Agency, Region 1, New England *Diesel Exhaust* [available at http://www.epa.gov/cgi-bin-epaprintonly.cgi] [last viewed Nov. 20, 2006]

> Pollution from diesel engines is a widespread problem across New England and it significantly contributes to air pollution, particularly in urban areas … . When inhaled repeatedly, the fine particles in diesel exhaust may aggravate asthma and allergies or cause other serious health problems including lung cancer.

· Safety Online, *Firefighters at High Risk for Cancer* (Nov. 17, 2006) [available at http://www.safety-online.com/content/news/article.asp?docid=a658db0c-f125-48ca-b319-51b298a5ea51].

> [F]irefighters are more likely to develop testicular cancer, non-Hodgkin's lymphoma, prostate cancer and multiple myeloma compared with the general population … . Firefighters are exposed to many carcinogens, including benzene, *diesel engine exhaust*, chloroform, soot, styrene and formaldehyde … . These chemicals can be inhaled or absorbed through the skin and exposure occurs both at the scene of a fire and in the firehouse, where the fire trucks produce *diesel exhaust*.

[Emphasis added.]

· California Environmental Protection Agency, Air Resources Board, *Health Effects of Diesel Exhaust Particulate Matter*, with Bibliography [available at http://arb.ca.gov/research/diesel/dpm_draft_3-01-06.pdf] [last viewed Nov. 20, 2006]:

> In 1998, California identified diesel PM [particulate matter] as a toxic air contaminant based on its potential to cause cancer, premature death, and other health problems … .

· Summary of Health and Environmental Effects of Diesel PM Exposure for California

Premature deaths (2000 *per* year)

Lung cancer (250 *per* year)

Decreased lung function in children

Chronic bronchitis

Increased respiratory and cardiovascular hospitalizations

Aggravated asthma

Increased respiratory symptoms

Lost workdays

Reduction in visibility (ten to 75 percent of total)

Global warming (second to carbon dioxide).

Except for lung cancer, the health effects are based on the assumption that diesel exhaust PM is approximately as toxic as the general ambient PM mixture.

· Oregon Department of Environmental Quality, Kevin Downing, Diesel Programs Manager (quoted in Metro Area Chokes on Off-Road Rigs' Fuel—Two-Thirds of the Soot over Portland Comes from Diesel Exhaust, Which Poses a Health Risk and Could Lead to Cancer, by James Mayer, The Oregonian, at A-1 (Nov. 16, 2006)):

> Exposure to diesel is one of the leading health risks from breathing outdoor air in Oregon.

In addition to the reports excerpted above, the American Lung Association of California published articles in 2002 and 2004 identifying such hazards as high DE levels found in school buses, the link between DE

and asthma, and the risk of cancer from DE exposure. In 2006, the University of London's Institute of Cancer Research also addressed cancer risks posed by DE.

- American Lung Association of California, *Public Health and Diesel* (2004) [available at http://www.californialung.org/spotlight/diesel_health.html]
- American Lung Association of California, *Recent Scientific Findings on Health Effects of Air Pollution and Diesel Exhaust* (May 2002) [available at http://www.californialung.org/spotlight/cleanair03_research.html]
- The Institute of Cancer Research, University of London, *Diesel Fume Cancer Risk (April 1, 2006) [available at* http://www.icr.ac.uk/research/research_highlights/5864.shtml].

However, an important counterweight to the articles listed above may be found in the *Annals of Oncology*, in which a Turin, Italy, study "did not find an association between occupational exposure to diesel exhausts and lung cancer risk." Richiardi *et al*, *Occupational Exposure to Diesel Exhausts and Risk for Lung Cancer in a Population-Based Case-Control Study in Italy*, Annals of Oncology (2006) [available at http://annonc.oxfordjournals.org/cgi/content/abstract/mdl307v1].

IV. The FELA Cases

To date, most of the cases alleging health problems from DE exposure have been brought under the Federal Employers' Liability Act ("FELA"), 45 U.S.C. §51 *et seq.*, which governs the railroad industry. Under FELA, a railroad "shall be liable in damages" to a person suffering injury or death while employed by the railroad if that injury or death results from the railroad's negligence. FELA, 45 U.S.C. §51 states:

> Sec. 51. Liability of common carriers by railroad, in interstate or foreign commerce, for injuries to employees from negligence; employee defined
>
> Every common carrier by railroad while engaging in commerce between any of the several States or Territories, or between any of the States and Territories, or between the District of Columbia and any of the States or Territories, or between the District of Columbia or any of the States or Territories and any foreign nation or nations, shall be liable in damages to any person suffering injury while he is employed by such carrier in such commerce, or, in case of the death of such employee, to his or her personal representative, for the benefit of the surviving widow or husband and children of such employee; and, if none, then of such employee's parents; and, if none, then of the next of kin dependent upon such employee, for such injury or death resulting in whole or in part from the negligence of any of the officers, agents, or employees of such carrier, or by reason of any defect or insufficiency, due to its negligence, in its cars, engines, appliances, machinery, track, roadbed, works, boats, wharves, or other equipment.
>
> Any employee of a carrier, any part of whose duties as such employee shall be the furtherance of interstate or foreign commerce; or shall, in any way directly or closely and substantially, affect such commerce as above set forth shall, for the purposes of this chapter, be considered as being employed by such carrier in such commerce and shall be considered as entitled to the benefits of this chapter.

A. The First Case

In 2002, in the first case of its kind in the country, an Ohio jury awarded $625,000 to a railroad worker who alleged he had contracted asthma from inhaling DE while working as a locomotive engineer. On Line

Lawyer Source, *Asthma Railroad Lawsuit Considered First of Its Kind* (Feb. 23, 2004) [available at http://www.onlinelawyersource.com/news/fela-lawsuit.html]. On appeal, the Ohio Court of Appeals affirmed the judgment of the trial court in favor of the railroad worker. *Cutlip v. Norfolk Southern Corp.*, 2003 WL 1861015 (Ohio Ct.App. April 11, 2003) (not reported in N.E.2d). The Ohio Supreme Court twice declined further appeal. See *Cutlip*, *appeal not allowed*, 795 N.E.2d 682, *reconsideration denied*, 798 N.E.2d 408 (Ohio 2003).

In *Cutlip*, plaintiff brought a FELA suit against Norfolk Southern Corporation and Norfolk & Western Railway. Plaintiff alleged that he was "'unnecessarily exposed to diesel fumes because of certain practices and conditions'" at his place of employment. *Terry v. Ottawa Cty. Bd. of Mental Retardation & Developmental Delay*, 847 N.E.2d 1246, 1261 (Ohio Ct. App.), *appeal allowed*, 850 N.E.2d 71 (Ohio 2006) (explaining *Cutlip* and quoting *Cutlip* plaintiff). (In *Cutlip*, the court uses the term "diesel fumes." However, in the context of the case, the court arguably should have used the term "diesel engine exhaust," and that terminology will be used in examining the case).

At trial, plaintiff had presented three experts: (1) plaintiff's treating pulmonologist; (2) a doctor specializing in internal medicine and holding a public health degree in occupational medicine; and (3) an industrial hygienist. On appeal, defendants argued that the opinions presented by plaintiff's experts were unreliable under Ohio Evid. R. 702 and *Daubert*. In analyzing the expert's testimony, the court noted that the Ohio Supreme Court had "adopted the *Daubert* factors." *Cutlip*, *supra*, at *6 [citation omitted].

1. Plaintiff's expert witnesses: the doctors

Plaintiff's treating pulmonologist testified "to a reasonable degree of medical certainty" that plaintiff's asthma was related to his DE exposure. The pulmonologist had learned that plaintiff had smoked in the past, but had quit sometime around 1990. The pulmonologist opined that smoking caused emphysema and chronic bronchitis, not asthma, and he knew from plaintiff's pulmonary function studies that plaintiff did not have emphysema. He therefore concluded that, if the smoking had played any part in plaintiff's lung problems, it had played a "'very negligible'" part. *Cutlip*, *supra*, 2003 WL 1861015, at *2 (quoting expert).

Plaintiff had lost part of his lung due to a gunshot wound to the chest during the Vietnam War. However, the pulmonologist further testified that he had measured plaintiff's lung function in proportion to the amount of plaintiff's remaining lung.

Plaintiff's expert in internal medicine had examined plaintiff, administered a number of clinical tests, and obtained plaintiff's medical history. After review, he concluded that plaintiff had asthmatic bronchitis as a result of exposure to DE at his job. Further, based upon his review, this expert eliminated smoking as a cause of plaintiff's asthma.

Neither medical expert had attempted to quantify the volume of DE to which plaintiff had been exposed. They knew only that plaintiff worked full-time on the railroad.

a. An "acceptable level" of exposure

On appeal, the defendants first argued that the medical experts' testimony was unreliable because the experts had not "conducted studies to test the amount of diesel exhaust in [plaintiff's] work environment." *Cutlip*, *supra*, 2003 WL 1861015, at *6.

The court rejected defendants' argument. The court explained that plaintiff's experts had arrived at their diagnosis by using the technique of "differential diagnosis," which satisfies the reliability requirement of *Daubert* under Sixth Circuit law. *Cutlip*, *supra*, at *7.

The court defined a "differential diagnosis" as:

> the determination of which of two or more diseases with similar symptoms is the one from which the patient is suffering, by a systematic comparison and contrasting of the clinical findings. The elements of a differential diagnosis may consist of the performance of physical examinations, the taking of medical histories, and the review of clinical tests, including laboratory tests. A doctor does not have to employ all of these techniques in order for the doctor's diagnosis to be reliable.

Cutlip, *supra*, at *7 [citation and internal quotation marks omitted].

In the case at bar, the court noted that both medical experts had testified that they had personally examined plaintiff, reviewed his medical records, taken a history, ordered tests, and reviewed the test results. In addition, the experts had considered and ruled out other possible causes of plaintiff's asthma (*i.e.,* smoking and the chest wound). Based upon that evidence, the court concluded that the experts' testimony was reliable under *Daubert* and Ohio Evid. R. 702.

b. "Dose/response" and the "threshold phenomenon"

Defendants further argued that the medical experts' testimony was unreliable because neither expert testified as to a "dose/response relationship" or a "threshold phenomenon" for exposure to DE. Under Sixth Circuit law, a "dose/response relationship" means "[a] relationship in which a change in amount, intensity or duration of exposure is associated with a change—either an increase or decrease—in the risk of disease." The "threshold phenomenon" is "[a] certain level of exposure to an agent below which disease does not occur and above which disease does occur." See *Cutlip*, 2003 WL 1861015, at *8 [citation and internal citations omitted].

The court rejected defendant's argument, citing Sixth Circuit law that "a sound differential diagnosis obviates the need for evidence of the dose/response relationship or the threshold phenomenon." *Cutlip*, *supra*, 2003 WL 1861015, at *8 (citing *Hardyman v. Norfolk & W. Ry. Co.*, 243 F.3d 255, 262 (6th Cir. 2001)).

In *Cutlip,* no expert testified about studies indicating a dose/response relationship or a threshold level for DE on a railroad. However, the court noted the testimony of plaintiff's medical experts that "(1) diesel fumes are toxic; (2) diesel fumes cause asthma; (3) [plaintiff] had substantial exposure to diesel fumes on the job; (4) [plaintiff] has asthma; and (5) his asthma is not related to his prior smoking habit or the chest wound from Vietnam." *Cutlip*, *supra*, at *9. Finding that the medical experts' causation testimony was based upon "a sound differential diagnosis," the court held it admissible. *Cutlip*, *supra*.

2. Plaintiff's expert witness: the industrial hygienist

Plaintiff's expert industrial hygienist testified only about general industry standards with respect to toxic materials in the workplace. On appeal, defendants contended that this expert's testimony was unreliable for the same reasons as the doctors' expert testimony: "because he did not participate in studies measuring the effects of diesel fumes on railroad workers, he never measured the amount of diesel fumes in [defendants'] locomotive cabs, he conducted no studies of [plaintiff's] working conditions, and so forth." *Cutlip*, *supra*, 2003 WL 1861015, at * 9. As with the doctors' expert testimony, the court rejected defendants' contentions. The court specifically noted that the hygienist did not testify as to causation or negligence in general, pointing out that defendants did not challenge the hygienist's qualifications or argue that the field of industrial hygiene was not "good science." *Cutlip*, *supra*.

B. Subsequent FELA Cases

In the years following *Cutlip*, railroad workers filed additional FELA lawsuits alleging injury from exposure to DE. For example, in *Norfolk Southern Railway Co. v. Estate of Wagers*, 833 N.E.2d 93 (Ind. Ct. App.

2005), *transfer denied*, 855 N.E.2d 995 (Ind. 2006), Wagers worked for defendant railroad as a track laborer and backhoe operator. He died of lung cancer. Wagers' estate brought a FELA suit, alleging that Wagers' lung cancer was caused by his exposure to diesel fumes and exhaust, asbestos fibers, and herbicides. Wagers also had a "significant history" of smoking. *Wagers*, *supra*, 833 N.E.2d at 99.

As in *Cutlip*, at issue in *Wagers* was the admission of expert scientific testimony on causation. The plaintiff in *Wagers* relied upon the expert testimony of one Dr. Parkinson, who stated that he knew Wagers had both personal and work-related exposures that could cause lung cancer, but opined that, although Wagers' exposure "to diesel fumes and asbestos played a significant role in the induction of his lung cancer," he (Parkinson), "[could not] estimate what proportion of risk was to cigarette smoking and what proportion to [Wagers'] exposure in the workplace." *Wagers*, 833 at 99 (quoting Parkinson's opinion letter). At deposition, Parkinson testified that he did not know the frequency with which Wagers would have encountered the toxic materials, but based upon the depositions of Wagers' coworkers, he assumed that Wagers would have worked with diesel equipment four to five hours *per* day. Parkinson could not testify to any reasonable degree of medical certainty that Wagers would not have developed lung cancer had he not been exposed to asbestos or diesel fumes. Moreover, Parkinson stated that he did not have any "specific quantitative data" regarding Wagers' exposure to asbestos and diesel fumes. *Wagers*, *supra.*

The trial court admitted Parkinson's expert testimony. Pursuant to an interlocutory appeal, defendant railroad argued that Parkinson's testimony was inadmissible. Defendant contended that the testimony was not reliable under Indiana Evid. R. 702 because it was not based upon any specific information regarding Wagers' dose of exposure to asbestos and diesel fumes.

The Indiana Court of Appeals rejected defendant's argument. Like the Ohio Court of Appeals in *Cutlip*, the *Wagers* court admitted plaintiff's expert causation testimony notwithstanding the absence of "specific quantitative data" regarding Wagers' exposure to DE. The court concluded:

> Based on the depositions of Wagers's co-workers, Parkinson could have reasonably inferred that Wagers was "exposed on a daily basis to diesel fumes and diesel exhaust approximately five hours per day over a period of 21 years." … Admittedly, Parkinson's opinion that workplace chemical exposure was a contributing cause of Wagers's lung cancer was not based on the results of any medical tests or the examination of x-rays or medical records that reveals any asbestos exposure. However, the evidence indicates that Wagers had more than a casual exposure to diesel fumes. Moreover, Parkinson testified that the scientific evidence absolutely demonstrates that diesel fumes are carcinogenic. Parkinson testified in his deposition about stacks of articles in scientific journals that support this conclusion. Parkinson relied on his review of the exposure evidence and his knowledge of the deleterious effects of diesel fumes to come to his conclusions. We hold that his testimony was admissible under [Indiana] Evid. R. 702.

Wagers, 833 N.E.2d at 108 [citation omitted].

Although the court held the evidence admissible under Indiana Evid. R. 702, it noted that *Daubert* and its progeny were "helpful" in applying that rule. *Wagers*, *supra*, 833 N.E.2d at 102.

The court also rejected defendant's challenge to the relevancy of Parkinson's testimony under Indiana R. Evid. 401. The court opined that the testimony was not based upon any "novel scientific theory" and that Parkinson's expertise was "directly related to one of the central facts at issue, namely, whether Wagers's exposure to diesel fumes and asbestos had a causal relationship to his lung cancer." *Wagers*, *supra*, 833 N.E.2d at 109.

See also, *Wilson v. CSX Transp., Inc.*, 2003 WL 1233536 (Tenn. Ct. App. March 18, 2003) (not reported in S.W.3d). The plaintiff brought an action under FELA for the death of her husband from a cancerous brain tumor. The husband worked as a carman for defendant railroad. One of plaintiff's experts testified that the husband was "exposed repeatedly to diesel exhaust" and a multitude of other chemicals. *Wilson*, 2003 WL 1233536, at *1. Another expert testified that the group of chemicals to which the husband was exposed "was eminently involved in a causal relationship to his cancer." *Wilson*, *supra*, at *2. Based upon its conclusions that the experts' testimony was reliable under Tennessee Evid. R. 702 and *Daubert* and trustworthy under Tennessee Evid. R. 703, the court held the testimony admissible, *Wilson*, *supra*, at *4, *6. The court did not expressly adopt *Daubert*, but found its nonexclusive list of factors to determine reliability "useful" in applying Tennessee Rules of Evidence 702 and 703. *Wilson*, *supra*, at *4

C. What the FELA Cases Teach

To date, almost all DE cases have been brought under FELA. As is evident from the discussions of *Cutlip, Wagers,* and *Wilson,* courts have signaled that, at least under that statute, it may be difficult for defense attorneys to exclude expert scientific opinions on causation under *Daubert* and the evidence rules. In his article, *Diesel Exhaust —The Next Asbestos*, For the Defense 16, 18 (Nov. 2005), author David N. Lutz cites a number of studies showing a "relatively modest relative risk" of lung cancer from DE exposure and suggests this low risk "may create opportunities for *Daubert/Frye* motions to exclude causation opinions." Lutz, *supra,* at 19. However, to the extent the studies cited by Lutz—most of which were done prior to 1999—are still relevant, the courts in the FELA cases have not been looking at relative risk. Rather, the courts have considered whether or not the particular plaintiff suffered health effects from exposure to DE, concluding that a differential diagnosis of DE-related disease is sufficient for admissibility. Moreover, the issue of general causation (whether exposure to DE causes disease) appears not to have been disputed by defense counsel. See, *e.g.*, *Norfolk S. Ry. Co. v. Estate of Wagers*, 833 N.E.2d 93, 104 (Ind. Ct. App. 2005), *transfer denied*, 855 N.E.2d 995 (Ind. 2006) (noting that defendant railroad did not "attack … the premise that asbestos and diesel fumes can cause lung cancer").

Lutz also suggests that the low relative risk of lung cancer from DE exposure, as compared to asbestos exposure, can make it difficult to sort out other causes of a plaintiff's cancer—that is, that the plaintiff's expert "may have difficulty opining that the disease would not have occurred but for the DE exposure." *Lutz*, *supra*, at 19. However, the few cases that have addressed exposure to DE do not appear to distinguish DE from other possible causes of a plaintiff's disease. Recall *Wagers*, where plaintiff's medical expert acknowledged that plaintiff had had both personal and work-related exposures that could cause lung cancer—even noting that plaintiff's exposure "to diesel fumes and asbestos played a significant role in the induction of his lung cancer"—but declined to estimate the proportion of risk due to cigarette smoking *versus* the proportion due to workplace exposure. *Wagers*, *supra*, 833 N.E.2d at 99.

Although defense challenges to the admissibility of a plaintiff's expert scientific testimony as to causation may be difficult under FELA, it should be pointed out that "the standard of causation under FELA is substantially more liberal than that governing ordinary common-law negligence actions." *Wagers*, *supra*, 833 N.E.2d at 100. Moreover, "FELA imposes liability upon railroad employers if the railroad's negligence played any part, even the slightest, in the employee's death or injury." *Wagers*, *supra*. The railroad is liable "for even the improbable or unexpectedly severe consequences of its wrongful act." *Wagers*, *supra*. FELA has such a liberal standard of causation that, "a finding of contributory negligence, even in excess of 50 percent, does not bar recovery." *Wagers*, *supra*. Finally, under FELA, the jury has a much greater role than in common-law negligence actions, such that the jury's right to determine the question of the employer's liability must be "most liber-

ally viewed," and the jury has a greater role in drawing inferences than does the jury in common-law actions. *Wagers*, *supra*.

It is not clear, however, whether the "relaxed" causation standard under FELA also lowers the threshold for the admissibility of expert scientific testimony in FELA cases. In *Wagers*, *supra*, the trial court made that determination. However, the Indiana Court of Appeals declined to decide the issue because the expert scientific testimony at issue met the requirements for admissibility under Indiana Evid. R. 702. *Wagers*, *supra*, at 101.

D. The Statute of Limitations Defense

In addition to focusing increased scrutiny on the issue of general causation (*i.e.*, whether DE causes disease) and more rigorously vetting other potential exposures, as suggested by Lutz, counsel may consider a defense based on the FELA three-year statute of limitations. *See* FELA, 45 U.S.C. §56 ("No action shall be maintained under this chapter unless commenced within three years from the day the cause of action accrued."). Under FELA, the statute of limitations begins to run when "the employee becomes aware of his disease and its cause." *Kichline v. Consolidated Rail Corp.*, 800 F.2d 356, 358 (3d Cir. 1986). Even though a plaintiff continues to be exposed to a defendant's alleged negligence (*e.g.*, exposure to DE), once the plaintiff has discovered an injury and its cause, the plaintiff must sue or forgo the remedy. *Kichline*, *supra*, at 360. See *United States v. Kubrick*, 444 U.S. 111, 120 n.7 (1979) (FELA cause of action accrues when employee "knows or should know" of injury and that injury was work related); *Gay v. Norfolk & W. Ry. Co.*, 483 S.E.2d 216, 219 (Va. 1997) ("An employee's mere suspicion of an injury or its probable cause, standing alone, is not the operative standard for determining when a cause of action accrues under FELA. Rather, all the relevant evidence must be considered.").

V. The Workers' Compensation Cases

At least two DE exposure cases have involved workers' compensation claims, one of which involved the issue of the admissibility of expert testimony as to causation. In *Dunn v. Metro Area Transit*, 2002 WL 31819591 (Neb. Ct. App. Dec. 17, 2002) (not designated for permanent publication), plaintiff had worked for 31 years as a mechanic for Metro Area Transit, repairing diesel buses. Plaintiff claimed that his exposure to diesel fumes at work caused chronic obstructive pulmonary disease ("COPD"), which left him totally disabled. Plaintiff was awarded workers' compensation.

At the trial before the workers' compensation court, plaintiff's expert testified that "diesel fumes are known to be an irritant and a cause of workplace respiratory [symptoms]," concluding that plaintiff's work exposure to diesel fumes was a "materially [*sic*] and substantial factor in his severe obstructive pulmonary disease." *Dunn*, *supra*, 2002 WL 31819591, at *4 (quoting plaintiff's expert). The expert did not inspect plaintiff's workplace, but, instead, relied upon what plaintiff told him about his daily exposure.

Plaintiff's employer appealed, asking the court "to reject, as a matter of law, the expert's testimony based on his inability to quantify [plaintiff's] exact exposure level to diesel fumes and exhaust." *Dunn*, *supra*, at *10. The court declined, noting that the cases it had referenced in its opinion "clearly show[ed] that such stringent proof [was] not required." *Dunn*, *supra*. The court affirmed the workers' compensation award, concluding that plaintiff "was exposed to a heightened level of diesel fumes and exhaust in the course and scope of his employment; that the diesel fumes and exhaust contributed to [plaintiff's] COPD [chronic obstructive pulmonary disease]; that [plaintiff] [was] permanently and totally disabled; and that [plaintiff] [was] entitled to a workers' compensation award, including medical and hospital expenses." *Dunn*, *supra*, at *16. Thus, as in the FELA cases, the court in *Dunn* admitted plaintiff's expert testimony notwithstanding the absence of specific numerical data regarding plaintiff's exposure to DE.

In *State ex rel. City of Martinsburg v. Sanders*, 632 S.E.2d 914 (W. Va. 2006), firefighters brought a negligence claim against their city employer, seeking medical monitoring damages for alleged "significant exposure to diesel exhaust from fire engines and/or emergency vehicles stored at fire station." *Sanders*, *supra*, 632 S.E.2d at 916. The court concluded that the firefighters' claim fell within the scope of West Virginia's workers' compensation statute "as an occupational disease arising out of and during the course of employment." *Sanders*, *supra*, 632 S.E.2d at 920. Because that statute provides employers with immunity from suit, the court held that the firefighters' negligence suit against the city was barred. *Sanders*, *supra.*

VI. The Regulations and Preemption

Pursuant to the Clean Air Act ("CAA"), 42 U.S.C. ch. 85, the EPA has promulgated extensive regulations governing emission standards for both moving and stationary sources of DE.

A. The 2007 Highway Rule

In 2001, the EPA issued a rule governing the sulfur content of diesel fuel for cars, trucks and buses. *See* EPA, *Regulation of Fuels and Fuel Additives*, 66, No. 12, Part 80, Fed.Reg. 5135–5159 (Jan. 18, 2001) [available at http://www.epa.gov/otaq/regs/hd2007/frm/frdslreg.pdf]. The EPA added technical amendments to the rule on August 30, 2006. The amendments became effective on October 30, 2006. *See* EPA, *Amendments to Regulations for Heavy-Duty Diesel Engines*, 71, No. 168 Fed.Reg. 51481-51489 (Aug. 30, 2006) [available at http://www.epa.gov/fedrgstr/EPA-AIR/2006/August/Day-30/a14429.htm]. *See* 40 C.F.R. pt. 86 (*Control of Emissions From New And In-Use Highway Vehicles and Engines* [available at http://www.gpoaccess.gov/cfr/index.html].

The so-called "2007 Highway Rule" requires a 97 percent reduction in the sulfur content of highway diesel fuel, from 500 parts *per* million ("ppm") (low sulfur diesel or "LSD") to 15 ppm ("ULSD"). ULSD allows the use of advanced pollution-control technology for heavy-duty trucks and buses, allowing engine and vehicle manufacturers to meet 2007 emission standards. ULSD also allows the use of advanced pollution-control technology in diesel-powered cars, SUVs, and light trucks.

The rule phases in the new standards over a period of years, from June 2006 through 2010. Refiners began producing ULSD as of June 1, 2006, and ULSD was available at retail stations beginning October 15, 2006. Cars, trucks, and buses with advanced pollution control technology were available beginning with the 2007 model year. The EPA estimates the new rule will lead to a significant reduction in DE pollution. *See* EPA, *Regulatory Announcement: Direct Final Rule and Notice of Proposed Rulemaking: Revisions to Motor Vehicle Diesel Fuel Sulfur Transition Provisions and Technical Amendments to the Highway Diesel, Nonroad Diesel, and Tier 2 Gasoline Programs* [available at http://www.epa.gov/otaq/regs/fuels/diesel/420f05051.htm][last updated March 6th, 2006]; EPA, Office of Transportation and Air Quality, EPA420-F-06-064, Program Update, *Introduction of Cleaner-Burning Diesel Fuel Enables Advanced Pollution Control for Cars, Truck and Buses* (Oct. 2006) [available at http://www.epa.gov/oms/highway-diesel/regs/420f06064.htm].

B. Nonroad Diesel Engines

Nonroad diesel engines are used primarily in construction and agricultural and industrial applications. In 2004, the EPA adopted a rule to reduce emissions from future nonroad diesel engines. The rule provides for a comprehensive program to regulate nonroad diesel engines and diesel fuel as a system. Under the rule, new standards for diesel engines begin to take effect in the 2008 model year and phase in over a number of years. The rule also adopts diesel fuel sulfur reductions of more than 99 percent. According to the EPA, use of this reduced-sulfur fuel will not only provide "significant" health benefits, but will also facilitate the intro-

duction of high-efficiency catalytic exhaust emission control devices, which are damaged by high amounts of sulfur. The fuel controls will be phased in beginning in mid-2007. The rule for nonroad diesel engines is based "largely" on the EPA's 2007 Highway Rule. EPA, *Control of Emissions of Air Pollution from Nonroad Diesel Engines and Fuel*, 69, No. 124, Fed.Reg. 38957-39006 (June 29, 2004) [available at http://www.epa.gov/fedrgstr/EPA-AIR/2004/June/Day-29/a11293a.htm]; EPA, Clean Air Nonroad Diesel—Tier 4 Final Rule [available at http://www.epa.gov/nonroad-diesel/2004fr.htm] [last updated Oct. 18, 2006]. *See* 40 C.F.R. pt. 60 (*Standards for Performance for New Stationary Sources*). [available at http://www.gpoaccess.gov/cfr/index.html].

C. Preemption

To the extent that a plaintiff asserts state claims based upon DE exposure, such as strict liability or negligence, defense counsel may be able to raise a preemption defense under the CAA, 42 U.S.C. §7543 ("State Standards"). Note, however, that even a successful preemption defense as to state claims may still leave a plaintiff with a claim for violation of the CAA regulations. *See* Lutz, *supra,* at 21.

1. New motor vehicles and new motor vehicle engines

The CAA expressly preempts state standards for emission control of new motor vehicles or new engines:

> No State or any political subdivision thereof shall adopt or attempt to enforce any standard relating to the control of emissions from new motor vehicles or new motor vehicle engines subject to this part.

42 U.S.C. §7543(a).

Moreover,

> no State or political subdivision thereof shall adopt or attempt to enforce any standard or requirement of certification, inspection, or approval which relates to motor vehicle emission.

42 U.S.C. §7543(c).

However, the CAA does provide for a mandatory waiver of these prohibitions to any state that has adopted standards ("other than crankcase emission standards") for the control of emissions from new motor vehicle engines or new mot or vehicles prior to March 30, 1966. Subject to certain conditions, the EPA will grant the waiver if the state determines that the adopted standards will be, "in the aggregate, at least as protective of public health and welfare as the applicable Federal standards." 42 U.S.C. §7543(b)(1).

2. New nonroad vehicles and engines

For nonroad vehicles or engines, the CAA expressly preempts state standards for emissions from (1) new engines smaller than 175 hp and used in construction or farm equipment or vehicles; and (2) new locomotives or new engines used in locomotives. 42 U.S.C. §7543(e)(1)(A), (B).

The CAA does not prevent states from adopting emission standards for those nonroad vehicles or engines not expressly listed in the statute. To the contrary, the CAA authorizes California to adopt and enforce standards for such nonroad vehicles or engines, so long as those standards will be, "in the aggregate, at least as protective of public health and welfare as applicable Federal standards." 42 U.S.C. §7543(e)(2)(A). States other than California can adopt standards that are "identical" to the California standards. 42 U.S.C. §7543(e)(2)(B).

Section 42 U.S.C. §7543(e)(2) does not specifically preempt a state from setting emission standards for nonroad vehicles or engines not covered by the statute. Arguably, for these noncovered vehicles or engines,

defense counsel could claim implied preemption. Case law appears to support such an argument. See, *e.g.*, *Engine Mftrs. Assoc. v. EPA*, 88 F.3d 1075-1087-88 (D.C. Cir. 1996). *See also* Lutz, *supra*, at 21.

VII. The Future

In 1992, a plaintiffs' attorney wrote an article for *Trial* magazine discussing how to establish a viable FELA claim based upon DE exposure. *See* William P. Gavin, *Railroad Diesel Exhaust and Lung Cancer, Establishing a Viable Claim Under FELA*, Trial 60 (Nov. 1992). A decade later, in 2002, the first DE exposure case, brought under FELA (and the Locomotive Inspection Act, 49 U.S.C. §§20701-20703 ("LIA")), went to a jury. Since then, only a relative handful of DE exposure cases have been litigated. However, that picture may be changing.

On September 30, 2005, a group of plaintiffs filed what appears to be the first DE exposure class action. Plaintiffs asserted claims under FELA and LIA, as well as a claim under federal regulations dealing with locomotive safety standards. See *Taylor v. CSX Transp., Inc.*, 2006 WL 2550021 (N.D. Ohio Aug. 31, 2006). Plaintiffs in the action were employed by the various railroads as engineers or conductors. Plaintiffs alleged that, during the course of their employment they were "exposed to, inhaled, and/or ingested diesel fumes and diesel exhaust emissions, gasses [*sic*], and other injurious substances, including known human carcinogens and other toxic substances." This exposure allegedly caused respiratory and pulmonary problems, including asthma, chronic obstructive pulmonary disease ("COPD"), and emphysema. *Taylor*, *supra*, 2006 WL 2550021 at *2. Plaintiffs sought an order certifying the class action and an order for declaratory relief, monetary damages, and attorneys' fees and costs. *Taylor*, *supra*.

On May 4, 2006, another group of plaintiffs filed a similar class action against railroads other than those defending in *Taylor*, but raised the same allegations as the *Taylor* plaintiffs. The court has consolidated the two actions "for the purposes of discovery and the resolution of legal issues." See *Crowl v. Norfolk S. Ry. Co.*, 2006 WL 2551071, at *2 (N.D. Ohio Aug. 31, 2006).

In addition to actions under federal statutes, plaintiffs have recently brought claims under state law. For example, in May 2006, Our Children's Earth Foundation and the Environmental Law Foundation filed suit in San Francisco to protect children from diesel engine exhaust emitted from school buses. Plaintiffs brought suit against Laidlaw Transit, Inc.—"the largest private school bus contractor in North America"—under California's Safe Drinking Water and Toxic Enforcement Act of 1986. Plaintiffs are seeking a court order requiring Laidlaw to provide warnings about "the harmful effects" of DE emitted from school buses by the beginning of the next school year. *See* Our Children's Earth, *Insider Update* (April2006/July 2006) [available at http://www.ocefoundation.org/update_apr_jul06.htm].

Will DE exposure cases, like the asbestos exposure cases, flood the courts? It is too early to tell, but recent filings indicate that such cases will be part of the future legal landscape. The plaintiffs' bar will likely have myriad opportunities to litigate DE cases, given reports that DE exposure involves not only potential occupational health hazards, but possible environmental contamination affecting the public at large. Defense attorneys should be aware of these developments and be prepared for what could be the next mass tort.