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Got Mold? Improving Plaintiff's Toxic Mold Causation Problems with the Introduction of DNA and Mycotoxin Extraction Testing

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GOT MOLD? IMPROVING PLAINTIFFS' TOXIC MOLD CAUSATION PROBLEMS WITH THE INTRODUCTION OF DNA AND MYCOTOXIN EXTRACTION TESTING

I. INTRODUCTION

In some areas of the United States people are fleeing their homes and even having them destroyed due to health problems caused by a dangerous intruder. It is greenish, black, dangerous, and growing fast.[1] The intruder is black mold.[2] Its scientific name is stachybotrys chartarum.[3] Black mold is causing people to leave homes and abandon beautiful buildings across the country. A family in Oregon, for instance, had their home burned to the ground after mold was found inside.[4] In Hawaii, the Hilton Hawaiian Village Hotel in Waikiki shut down one of its towers because of mold growth in some of the rooms.[5] Even trendy Park Avenue apartments in New York City are being abandoned due to mold infestations.[6] The reason for the panic is due to the realization that black mold is an organism that can have a severe effect on public health.[7]

Black molds or fungi comprise a large population of ubiquitous organisms present in the environment.[8] Over the past fifteen to twenty years, however, toxic mold exposure has become more hazardous and

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1 *See* CDC, *Questions and Answers on Stachybotrys Chartarum and Other Molds*, Nov. 2004, *available at* http://www.cdc.gov/mold/pdfs/stachy.pdf (describing the species of toxic mold known as Stachybotrys Chartarum).

2 *See* discussion *infra* Part II.A (discussing black mold and the health effects associated with it).

3 *See infra* notes 51-52 and accompanying text (explaining the scientific name for black mold).

4 *Toxic Intruder Has Families fleeing Their Homes*, ABC NEWS, Nov. 29, 2006, *available at* http://abcnews.go.com/2020/story?id=123794&page=1 [hereinafter ABC]. In Oregon, the O'Hara family was forced to hire their local fire department to burn their $450,000 home to the ground after mold was found inside. *Id.* Mark O'Hara referred to the home as "basically just a house that poisoned my family." *Id.* Scientists attributed the family's nosebleeds and headaches to mold found in the O'Hara home. *Id.*

5 Andrew Gomes, *Mold Closes New Hilton Tower*, HONOLULU ADVERTISER, July 25, 2002, at A1 (describing how construction on one of the new towers of the Hilton Hawaiian Village was shut down due to mold growth inside of the walls).

6 *Bianca Jagger Hit With Contempt of Court: Bianca Jagger Fined $500 for Contempt of Court for Withholding Apartment Rent Over Mold Issue*, ABC NEWS, Sept. 6, 2006, *available at* http://abcnews.go.com/Entertainment/wireStory?id=2402872. Bianca Jagger, former wife of Rolling Stone Mick Jagger, claimed her Park Avenue apartment in New York City unlivable due to toxic mold infestation. *Id.*

7 *See infra* Part II.A (discussing what mold is and the possible health effects it has on those who are exposed).

8 *See infra* Part II.A (discussing the many different types of molds).

frequent.[9] As a result, scientific and medical literature now addresses black molds as being possible pathogens in human disease.[10] After hurricane Katrina, the Center for Disease Control and Prevention ("CDC") issued new, revised warnings as to health effects of toxic mold exposure.[11] Climate changes, improper building environmental controls, poor building maintenance, and energy efficient building practices generate opportunities for people to have a greater exposure to black molds.[12] Thus, the question remains: who is to be held responsible for the outbreak of such a dangerous organism?[13] In most situations, it is not difficult for an exposed person to find someone they believe to be responsible for toxic mold growth.[14] However, the problem exposed individuals seem to have is convincing courts of law of the relationship between their disease and the mold growth.[15] As personal injury mold cases begin to surface across the country, proving causation through scientific expert testing emerges as the primary obstacle to recovery for mold-exposed plaintiffs.[16]

Causation is the primary impediment to a mold-exposed plaintiff's personal injury claim.[17] Because studies examining specific levels of the hazardous nature of mold are inconsistent, the plaintiff's case often rests entirely on opinions offered by scientific experts.[18]

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[9] *See infra* Parts II.A-B (discussing the hazardous health effects of mold and the rise in mold litigation over the past twenty years).

[10] *See infra* Part II.A (noting the fact that mold can cause a variety of health problems, especially respiratory ailments).

[11] *See infra* note 63 (stating the adverse health effects the CDC recognizes as related to mold exposure).

[12] *See infra* Part II.B (discussing possible reasons experts have stated for the increase in mold exposure across the country).

[13] *See* discussion *infra* Part II.B (noting the recent history of mold litigation and who plaintiffs attempt to hold responsible); ABC, *supra* note 4 (the common defendant seems to be either insurance or construction companies).

[14] *See* discussion *infra* Part II.B (more and more homeowners are filing insurance claims and lawsuits over toxic mold). *See also* ABC, *supra* note 4. In Texas, more than 14,000 insurance claims involving mold related issues were filed in 2006 alone. *Id.* As a result, insurance companies in Texas have asked the state to allow them to drop mold coverage from homeowners' policies. *Id.*

[15] *See* discussion *infra* Part II.C (noting that many experts believe there is no conclusive proof that serious illnesses are caused by exposure to mold).

[16] *See infra* Part II.C (discussing causation problems plaintiffs have in toxic mold suits).

[17] Causation is defined as "[a] necessary link between a wrongful act and resulting damage which grounds liability." BLACK'S LAW DICTIONARY 233 (8th ed. 2004).

[18] *See infra* Part II.C (discussing the scientific uncertainty in mold exposure cases giving rise to the need for expert testimony).

Rule 702 of the Federal Rules of Evidence ("FRE"), along with notable federal case law, governs expert admissibility in federal courts.[19] Therefore, when courts analyze certain scientific testing related to mold exposure, decisions of admissibility are often determined on whether or not the court recognizes the testing as meeting the governing standards.[20] Thus, it is often the case that inconsistent decisions arise due to the amount of discretion left up to the courts.[21] The inconsistency surrounding admissibility standards causes plaintiffs to have a difficult time proving causation in toxic mold personal injury cases.[22] Consequently, creating mold detection testing that can consistently pass governing standards is necessary.

As such, new scientific testing involving extracting, recovering, and identifying toxic mold DNA in human tissue and fluids provides mold exposure plaintiffs with the opportunity to present their theory of causation to a jury and circumvent the stringent admissibility standards that have for so long damaged mold plaintiffs' cases.[23] DNA testing is used in many areas of medicine and is known for its accuracy and reliability.[24] Along these lines, when courts analyze scientific testing with flexibility, more and more plaintiffs will have the opportunity to present scientific testing, such as DNA extraction, and thus end the miscarriage of justice that has long plagued toxic mold litigation.[25]

This Note proposes that, when faced with mold exposure cases, federal and state courts should admit expert testimony on DNA extraction testing under the Federal Rules of Evidence. Part II of this Note begins with a general discussion of mold, continues with mold's potential effects on human health, and concludes with an explanation of the past, present, and future of mold detection testing.[26] Part III begins

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19 *See infra* Parts II.C.1-2 (discussing how Rule 702 and 703 of the FRE, along with significant federal case law such as *Daubert v. Merrell Dow Pharmaceuticals* and *Frye v. U.S.*, govern the admissibility of expert testimony in the courtroom).

20 *See infra* Part II.D (discussing the various mold detection testing used in the past and present).

21 *See* discussion *infra* Parts II.C.3, II.D.1, III.A.1-2 (noting inconsistent court decisions relating to admissibility of mold detection testing).

22 *See infra* Part II.C (noting the difficulty plaintiffs have in proving causation in toxic mold cases).

23 *See* discussion *infra* Part III.B (applying DNA extraction testing to the standards that have to be met to be admitted into court as expert testimony).

24 *See* discussion *infra* Parts II.D.2, III.B (identifying and then analyzing DNA testing in many scientific fields).

25 *See* discussion *infra* Parts IV.A-B (analyzing a two-step approach courts should use when analyzing scientific expert testimony).

26 *See infra* Part II (discussing mold and the scientific testing used to detect its presence).

with a jurisdictional analysis of toxic mold case law and continues with an analysis of DNA extraction testing, specifically demonstrating how this methodology satisfies federal standards on scientific expert admissibility.[27] Finally, Part III proposes that policy reasons–such as fairness and jury integrity–support the admission of expert testimony in mold exposure cases.[28] Part IV of this Note outlines a model approach courts should consider that may help cure the abuse of discretion involving scientific expert testimony in toxic mold litigation.[29] Part V concludes with the proposal that scientific expert testimony on DNA extraction testing is reliable and should, therefore, be admissible in mold exposure cases.[30]

II. BACKGROUND

In order to fully understand the implications of both federal statutory and case law in the area of mold exposure litigation, it is important to have a basic comprehension of mold and the causation problems mold triggers.[31] Health issues surrounding toxic mold are the main reason personal injury mold litigation is on the rise across the United States.[32] The unique nature of mold exposure injuries, combined with the lack of legislation establishing clear standards for unsafe levels of mold, only aggravates efforts to establish causation in the courtroom.[33] Plaintiffs confront causation problems in most cases by seeking expert help to assist the trier of fact in understanding evidence and determining causation.[34] This is no different for mold exposure plaintiffs who must use scientific expert testimony to establish causation.[35] However, existing scientific evidence on the health effects of mold is not fully

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27 *See infra* Parts III.A-B (analyzing the accuracy and reliability of DNA testing in many areas of science, including toxic mold testing).

28 *See infra* Part III.C (arguing for the jury to have the opportunity to hear more expert testimony).

29 *See infra* Part IV (contributing a judicial approach based on flexibility and relevancy).

30 *See infra* Part V (concluding with a proposal that DNA extraction testing be admissible in mold exposure cases).

31 *See* discussion *infra* Parts II.A-C (discussing toxic mold and the obstacles surrounding mold litigation).

32 Julie S. Elmer, *A Fungus Among Us: The New Epidemic of Mold Claims*, 64 ALA. L. REV. 109, 109 (2003).

33 *See* discussion *infra* Part II.B (discussing the emergence of mold litigation).

34 *See* discussion *infra* Part II.C (noting causation problems plaintiffs experience in mold litigation).

35 *See* discussion *infra* Part II.C (stating that plaintiffs have to use scientific expert testimony to prove causation).

accepted; thus, the major challenge in such litigation becomes whether such expert testimony meets established admissibility standards.[36]

In establishing the groundwork, Part II.A describes what toxic mold is and the health issues associated with it.[37] Part II.B discusses the history of mold litigation and the various policy arguments that have arisen along the way.[38] Part II.C discusses the relevant causation problems that confront expert witnesses in toxic mold cases.[39] Specifically, Part II.C explains the various standards used in determining the admissibility of scientific evidence.[40] Part II.D concludes with an examination of the mold detection testing used in the past and the current testing used today.[41]

A. What is Toxic Mold?

Molds are fungi that can come in an array of species.[42] They reproduce by releasing tiny spores that continually travel through indoor and outdoor air.[43] Mold lands on wet or damp areas and begins to grow and digest the material on which it rests.[44] Mold growth poses particular

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[36] *See* Daubert v. Merrell Dow Pharm., 509 U.S. 579, 592-93 (1993) (requiring expert opinions to be the product of reliable principles and methods, including peer review and scientific testing of theories).

[37] *See* discussion *infra* Part II.A (describing the many types of mold and the health issues that can result from exposure).

[38] *See* discussion *infra* Part II.B (explaining the history mold litigation).

[39] *See* discussion *infra* Part II.C (discussing major causation problems mold-exposed plaintiffs experience).

[40] *See* discussion *infra* Parts II.C.1-2 (setting forth admissibility standards laid out in the FRE and federal case law).

[41] *See* discussion *infra* Part II.D (explanation of current mold detection testing).

[42] David F. Blundell, *Proliferation of Mold and Toxic Mold Litigation: What is Safe Exposure to Airborne Fungi Spores Indoors?*, 8 ENVTL. LAW. 389, 391 (2002). There are more than 100,000 species of mold on Earth, with at least 1,000 species commonly found in the United States. *Id.* Of the 100,000 different types of mold, only a few are potentially harmful to human health. *Id.*

[43] *See* U.S. Environmental Protection Agency, *A Brief Guide to Mold, Moisture, and Your Home*, http://www.epa.gov/mold/moldresources.html [hereinafter EPA]. Mold spores can enter homes through doorways, windows, heating, ventilation, and air conditioning systems. *Id.*

[44] *See* EPA, *supra* note 43. Molds can be found almost anywhere there is moisture, oxygen, and something to feed on. *Id.* Susan Lillard, *Mold . . . What is it All About?*, Feb. 16, 2006, *available at* http://mold-help.org/. Molds can grow on areas such as rotting logs and fallen leaves, or in moist areas. *Id.* Molds can be found in damp basements, closets, and bathrooms, even after the area has dried up. *Id.* Also, fresh food storage places are subject to mold exposure, including refrigerator drip trays, house plants, humidifiers, garbage cans, and mattresses. *Id.* The most common and most dangerous place that molds grow is inside wall cavities and the flooring of homes. *Id.* Wherever there is material that the

problems for humans in that some species of mold cause adverse health effects.[45] Mold spores produce toxic substances, or fungal metabolites, called mycotoxins, which are known to have serious health effects on humans.[46] Mycotoxins enter the body through inhalation or contact with the skin.[47] Mycotoxin producing mold is commonly referred to as toxic mold.[48]

Toxic mold comes in many forms and is known by such names as stachybotrys chartarum, aspergillus, penicillium, trichoderma, and helminthosporium.[49] Of the estimated 100,000 existing species of mold, only a few thousand can currently be identified and only very few have been identified "toxic molds" by the CDC.[50]

The most well known and studied toxic mold is stachybotrys chartarum.[51] Stachybotrys, also known as "black mold," is considered to

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molds may feed on is where they will grow, such as wood, ceiling tiles, and plasterboards. *Id.*

[45] Nana Nakano, *Toxic Mold in California: Recent Verdicts and Legislation*, ANDREWS TOBACCO INDUS. LITIG. REP., July 12, 2002, at 10. Exposure to molds can cause a number of adverse effects, including allergic reactions, asthma attacks, and infections. *Id.* Most healthy individuals have built up a tolerance to mold and do not experience significant adverse reactions to the average household mold. *Id.* However, people with weak immune systems can suffer sever aggravation of existing conditions based on their exposure to mold. *Id.*

[46] Blundell, *supra* note 42, at 392. The following factors determine the impact of mold on humans: 1) the species of the mold involved; 2) the mycotoxins the species produces; 3) quantity and duration of one's exposure to the mold; 4) and the individual susceptibility of the individual exposed. *Id.*

[47] *See* ALEXANDER ROBERTSON IV, *Microbiological Contamination Litigation a/k/a 'The Mold Monster'*, MEALEY'S EMERG. TOXIC TORTS 26 (1999) (discussing human contact with mycotoxins).

[48] *See id.* (defining mycotoxins); s*ee also* Stephen J. Henning & Daniel A. Berman, *Mold Contamination, Liability and Coverage Issues: Essential Information You Need to Know for Successfully Handling and Resolving Any Claim Involving Toxic Mold*, 8 HASTINGS NW. J. ENVTL. L. & POL'Y 73, 81 (2001) (discussing how the term "toxic mold" is a media term that has evolved over the years to describe the limited grouping of molds that have the potential to cause human health problems).

[49] Edward H. Cross, *Toxic Mold: The Fourth Wave of Construction Defect Litigation?*, 40 ORANGE COUNTY L. 26, 27-28 (1998). Toxic strains of mold are suspected of causing symptoms such as fatigue, nausea, headaches, depression, tremors, rashes, respiratory distress, intestinal hemorrhage, diarrhea, vomiting, and bleeding of the lungs. *Id.* Some toxic molds produce mycotoxins that have been classified as human carcinogens. *Id.*

[50] *See* John Mitby, *Out of the Dark: The Emergence of Toxic Mold Litigation* (2002), *available at* http://www.axley.com/articles.html?pf=1&CID=7&AID=38; *see also* CDC, *infra* note 63 (explaining mold species that are identified as toxic).

[51] *See* Abba I. Terr, *Stachybotrys: Relevance to Human Disease*, 87 ANNALS ALLERGY ASTHMA IMMUNOLOGY 57, 63 (2001). Stachybotrys–commonly known as black mold—is usually found growing in basements or showers. TOXIC MOLD LITIGATION 3 (Raymund King ed., ABA 2003). Stachybotrys was first discovered after a mysterious illness affecting

be the most dangerous toxic mold.[52] Black mold is known as the most dangerous toxic mold because of its ability to release chemicals known as "macrocyclic tricothecenes and immunotoxins."[53] With their toxic and immune-suppressing capabilities, tricothecenes are allegedly responsible for severe medical complications in some individuals, including neurological and cardiopulmonary disorders.[54]

Along with black mold, there are two other main mycotoxin-producing molds that are not as potent as stachybotrys but can still have the same disease-causing effect: aspergillus and penicillium.[55] Aspergillus is distinguished from stachybotrys in that it does not produce tricothecenes, but is just as dangerous due to its ability to produce one of the most potent carcinogens, aflatoxin B.[56] Also, penicillium spores have the highest concentrations of mycotoxins.[57] Thus, aspergillus and penicillium may not be as widely known as stachybotrys but these molds are still capable of growing indoors and are just as capable of causing health problems.[58]

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farm animals in the 1930's was linked to black mold. *Id.* More specifically, widespread disease and death of Ukrainian horses in 1939 was linked to stachybotrys. *Id.*; *see also* Bruce Flammey & Kimberly Wind, *Breaking the Mold*, 42 ORANGE COUNTY LAWYER 22, 22 (2000) (stating that Stachybotrys chartarum is especially harmful to small children, and possibly having a potential link with Sudden Infant Death Syndrome (SIDS)).

[52] Henning & Berman, *supra* note 48, at 81. Stachybotrys is one of the most common of the toxic molds. *Id.*

[53] *See* Henning & Berman, *supra* note 48, at 81. Tricothecenes pose a double threat: in addition to the toxic nature of their chemical makeup, tricothecenes are capable of releasing immunotoxins, which suppress the immune system. *Id.* Black mold's ability to launch a two-pronged toxic and immuno-suppressive attack gives black mold its unsavory distinction. *Id.*

[54] *See* Henning & Berman, *supra* note 48, at 81. Tricothecenes are known to cause serious medical problems such as memory loss, fatal lung disease, and neurodysfunction. *Id.*

[55] *Id.* at 82. Aspergillus and Penicillium do not produce tricothecenes or immuno-suppressing chemicals. *Id.* However, exposure to these two different kinds of molds have been linked to allergies, asthma, respiratory infections, and hypersensitivity pneumontsis. *Id.*

[56] *Id.* Aspergillus infections occur following inhalation of Aspergillus spores present in the environment. Vince Bolton, Research and Development for Detecting Fungi and Mycotoxins (Oct. 6, 2006) (unpublished manuscript, RealTime Laboratories) (on file with author) [hereinafter RealTime].

[57] *See* Harriet M. Ammann, *Is Indoor Mold Contamination a Threat to Health?*, (2001), http://www.mold-survivor.com/harrietammann.htm (last visited Sept. 4, 2007). "Viability of spores is not essential to toxicity, so that the spore as a dead particle can still be a source of toxin." *Id.*

[58] *See* Henning & Berman, *supra* note 48, at 82. Various diseases and infections have been linked to stachybotrys, aspergillus, and penicillium. *Id.* at 81-82.

The adverse health effects of mold exposure are diverse in nature and vary among individuals.[59] The effects are generally characterized as allergic, inflammatory, or toxic.[60] However, toxic molds elicit far more serious health effects.[61] When exposed to mycotoxin producing mold through inhalation, individuals with a weakened immune system experience severe respiratory problems.[62] Nevertheless, there is division among the scientific community regarding the effect of mold on human health.[63]

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[59] Edward H. Cross, *Litigation À la Mol:, Mold Related Indoor Air Quality Claims May Eventually Generate More Litigation than Asbestos*, LOS ANGELES LAWYER, Jan. 2002, at 28-30. Mold exposure can have different effects on people depending on one's age and immune system. *Id*.

[60] *See id*. Typical allergy-related symptoms of mold may include runny nose, congestion, eye irritations, and asthma. Blundell, *supra* note 42, at 391. *See also* Miller v. Lakeside Vill. Condo. Ass'n, Inc., 2 Cal. Rptr. 2d 796, 803 (Cal. Ct. App. 1991) (showing a link between the mold in plaintiff's housing unit and plaintiff's allergic reaction and severe aggravation of asthma).

[61] Blundell, *supra* note 42, at 391-92. Toxic mold is associated with agonizing symptoms such as fatigue, nausea, headaches, rashes, diarrhea, vomiting, and bleeding of the lungs. *Id.* The mycotoxin producing toxic molds can be inhaled, ingested, or exposed to the skin. *Id*. *See also* Ruth A. Etzel, *Mycotoxins,* 287 JAMA, Jan. 23, 2002, at 425. While inhalation of mycotoxins is the most potent route of exposure, ingestion of mycotoxins is of minimal concern. *Id. But see* G. Holcomb Jr. et al., *Outbreaks of Gastrointestinal Illness of Unknown Etiology Associated with Eating Burritos-United States, October 1997-October 1998*, 281 JAMA, Apr. 14, 1999, at 1263-64 (discussing serious health effects from ingested mycotoxins and how mycotoxins were a suspected cause in the late 1990s outbreaks of gastrointestinal illness associated with eating burritos in seven states across the United States).

[62] Nakano, *supra* note 45, at 10 ("Studies have suggested that individuals such as children, immuno-compromised people (e.g. those with HIV) or pregnant woman appear to be more susceptible to negative health effects from mold exposure.").

[63] *See* EPA, *supra* note 43. The Environmental Protection Agency (EPA) and the Centers for Disease Control and Prevention (CDC) currently recognize only adverse health effects associated with mold exposure pertaining to allergic reactions, asthma, and other respiratory complaints. *Id.* The CDC suggests that only fever and shortness of breath are two of the more serious reactions to mold exposure. CDC, *Facts About Mold and Dampness*, http://www.cdc.gov/mold/dampness_facts.htm [hereinafter CDC]. The CDC explains the potential health effects of mold in buildings and homes by suggesting these adverse health effects, such as respiratory mold infections, may develop in people with pre-existing chronic disease. *Id*. However, some scientists still maintain that exposure to mold may cause serious health effects from benign to fatal. *See* Robert Hartwig, *Mold and the Insurance Industry: Truth and Consequences*, INSURANCE INFORMATION INSTITUTE, Aug. 2002, http://www.iii.org/media/presentations/mold (last visited Oct. 10, 2006) (presentation listing alleged health effects of stachybotrys). The health problems associated with stachybotrys include such serious health effects as pulmonary hemorrhage, liver damage, central nervous system damage, cancer, and even death. *Id.*; *see also,* Robert E. Dales, Richard Burnett & Harry Zwanenburg,, *Adverse Health Effects Among Adults Exposed to Home Dampness and Molds*, 143 AM. REV. RESPIRATORY DISORDERS 505 (1991) (discussing a study linking mold to lower respiratory symptoms). *See generally* American Academy of Pediatrics Committee on Environmental Health, *Toxic Effects of Indoor Molds*, 101

The differing views among the scientific community are due to the lack of conclusive proof of a causal relationship between mold and some of its alleged health effects.[64] Despite this lack of conclusive proof in the scientific community, plaintiffs continue to bring personal injury claims based on mold exposure.[65] Further, many courts have not only allowed plaintiffs to bring claims forward, but have also agreed that serious health problems can result from exposure to mold.[66] Plaintiffs from across the country have followed suit bringing claims alleging mold exposure negatively affected their health.[67]

PEDIATRICS 712 (1998) (statement describing mold's potential for causing severe respiratory problems in infants).

[64] *See* CDC, *supra* note 63 (asserting no test currently exists to prove association between stachybotrys chartarum and certain health effects).

[65] *See, e.g.,* New Haverford P'ship v. Stroot, 772 A.2d 792, 795 (Del. 2001). The court recounted alleged health problems of tenants suing landlord for damages stemming from landlord's negligence in allowing mold to develop in the apartment complex. *Id.* The court found that the methodology underlying plaintiff's expert's causation opinion supported the trial court's decision to admit the testimony. *Id.* at 800. The methodology, differential diagnosis, appeared to have insulated the expert's opinion from a *Daubert* challenge:

> [Dr.] Johanning testified that he followed the scientifically accepted procedure of obtaining a medical history and a detailed questionnaire from the plaintiffs. He then ruled out other possible causes of plaintiffs' health problems by reviewing that information together with the blood test results and the data collected from the apartment buildings. The foundation for an expert's causation opinion need not be established with the precision of a laboratory experiment.

Id. at 800. *See* Allison v. Fire Ins. Exch., 98 S.W.3d 227, 237 (Tex. App. 2002) (showing plaintiff's allegations of serious health symptoms). Plaintiff brought a claim alleging his brain damage was due to exposure of stacybotrys mold. *Id.* at 239. Plaintiff offered supportive expert testimony of the causal link between his brain damage and exposure to stachybotrys. *Id.* at 239.

[66] *See New Haverford P'ship*, 772 A.2d at 801 (upholding a substantial jury award to a plaintiff who alleged that exposure to mold caused permanent cognitive impairment, increased risk of tuberculosis, and osteopenia); *see also,* Mondelli v. Kendel Homes Corp., 631 N.W.2d 846 (Neb. 2001) (allowing expert witnesses to testify in order to link toxic mold exposure to the resulting personal injury). *See generally* Centex-Rooney Constr. Co. v. Martin County, 706 So. 2d. 20 (Fla. Dist. Ct. App. 1997) (recognizing and accepting scientific evidence indicating the disastrous health risks associated with exposure to toxic mold). Even though Centex-Rooney is a property damage toxic mold case, the case provides an example of how a plaintiff can establish causation through the use of expert witnesses. *Id.*

[67] *See, e.g.,* Brandt v. Rokeby Realty Co., No. 97C-10-132-RFS, 2006 WL 1942314, at *1 (Del. Super. Ct. 2006) (plaintiff brought a personal injury action seeking to recover for health and emotional problems he suffered allegedly because of mold growth in his office building); Sutton v. Hermitage Mobile Home Sales, Inc., No. B175955, 2006 WL 1314023, at 1 (Cal. Ct. App. 2006) (plaintiff filed an action for personal injury damages against a mobile home sales company after she found toxic mold inside the home); *see also* Roche v. Lincoln Prop. Co., 278 F. Supp. 2d 744 (E.D. Va. 2003) (plaintiffs claiming toxic mold exposure

Plaintiffs in cases such as *Mondelli v. Kendel Homes Corporation*[68] and *Centex-Rooney Construction Company v. Martin County*,[69] decided in Nebraska and Florida respectively, brought claims of mold exposure specifically claiming exposure as the cause of adverse health effects.[70] An additional case in Delaware, *Minner v. American Mortgage & Guaranty Company*,[71] alleged various illnesses due to exposure to mold in a workplace.[72] Whether every case of mold exposure causes serious health effects remains unclear.[73] However, the increasing number of plaintiff suits alleging adverse health effects stemming from toxic mold exposure suggests that when one is exposed to toxic mold a health problem of some degree is likely to occur.[74]

B. History Surrounding Toxic Mold, the Relevant Toxic Mold Litigation, and Regulations

Although mold has only recently emerged as an epidemic, some believe moldy homes have been a problem since Biblical times.[75] Even

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health problems such as memory loss, chronic headaches, sinus problems, chest congestion, and shortness of breath as a result of leaky fixtures and plumbing in their apartment building); Minner v. Am. Mortgage & Guar. Co., 791 A.2d 826 (Del. Super. Ct. 2000) (plaintiffs alleging they suffered various illnesses as a result of mold infestation in their workplace).

[68] Mondelli v. Kendel Homes Corp., 631 N.W.2d 846 (Neb. 2001).

[69] Centex-Rooney Constr. Co. v. Martin Co., 706 So. 2d. 20 (Fla. App. 1997).

[70] *See Mondelli*, 631 N.W.2d at 846; *see also Centex-Rooney*, 706 So. 2d at 20. In both cases, plaintiffs testified that mold exposure was the main cause to their emerging respiratory problems. *See* discussion *infra* Part III.A.1 (discussing plaintiffs in both cases using experts to show causation linking mold exposure to the adverse health effects).

[71] Minner v. Am. Mortgage & Guaranty Co., 791 A.2d 826 (Del. 2000).

[72] *See* discussion *infra* Part III.A.2 (comparing the *Minner* case with other cases involving toxic mold-exposed plaintiffs). In *Minner*, plaintiff alleged health problems such as asthma, headaches, and sinus problems. *See Minner*, 791 A.2d at 826.

[73] *See* CDC, *supra* note 63 (outlining various health effects the CDC recognizes mold exposure may cause).

[74] *See supra* notes 65-67 (discussing various cases where plaintiffs brought personal injury claims due to alleged mold exposure).

[75] *See Leviticus* 14:33-45 (New American Standard Bible). Christians believe human awareness of mold can be traced back to the Bible itself. *Id.* In Leviticus 14:37-42, the Lord tells Moses and Aaron how to rid a house of mold:

> [H]e shall look at the mark, and if the mark on the walls of the house has greenish or reddish depressions and appears deeper than the surface; then the priest shall come out of the house, to the doorway, and quarantine the house for seven days. And the priest shall return on the seventh day and make an inspection. If the mark has indeed spread in the walls of the house, then the priest shall order them to tear out the stones with the mark in them and throw them away at an unclean place outside the city. And he shall have the house scraped all around inside, and they shall dump the plaster that they scrape off at

though mold has existed for thousands of years, experts believe mold growth inside of homes is increasing.[76] Some believe the change in building materials during the past twenty years is the main reason behind the rise in mold growth.[77] In the past, builders designed buildings to have cross ventilation, open windows, and doors.[78] With the recent upsurge in tract housing and the use of cheaper building materials, buildings have become more prone to mold growth when wet than those built with traditional building materials.[79] The change in

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> an unclean place outside the city. Then they shall take other stones and replace *those* stones; and he shall take other plaster and replaster the house.

Id.

[76] *See* Mitby & Trost, *supra* note 50. The authors discuss that despite the American public's infatuation with cleanliness, the level of potentially harmful mold infestation in residential and business structures has reached an all-time high in the past twenty years. *Id.* The authors offer several explanations of why the increase of mold growth inside homes has taken place. *Id.* The article discusses that the increase in mold awareness and litigation may be the direct result of changes in building materials and recent construction ideas. *Id.* The authors specifically mention the inefficient erection of new homes during the surging economy of the 1990s as providing a breeding ground for toxic mold. *Id.* The rapid pace of construction throughout the 1990s allowed many homes and office buildings to be built with defects allowing water and moisture to move slowly into the interior of the structures. *Id.* Once toxic mold has the opportunity to seep inside the structures, the mold has a perfect environment to begin to grow due to the minimal water evaporating drafts and numerous sources of food available. *Id.*

[77] *See* Barry MacNaughton, *Toxic Mold-It's Not the New Asbestos*, L.A. BUS. J., Nov.-Dec. 2002, *available at* http://ecjlaw.com/pdfs/realestate-nove2002.pdf (noting climate changes, improper building environmental controls, poor building maintenance, and energy efficient building practices have created opportunities for people to have a greater exposure to black molds). *See also* Andy Dworkin, *Mold Leaves a Trail of Victims, Lawsuits*, THE OREGONIAN, Aug. 19, 2001, at A1 (noting modern building methods encourage mold growth—when airtight buildings with poor ventilation have water leaks, "they trap high humidity and become hothouses for passing mold spores.").

[78] Gene Heady, *Stuck Inside These Four Walls: Recognition of Sick Building Syndrome Has Laid the Foundation to Raise Toxic Tort Litigation to New Heights*, 26 TEX. TECH. L. REV. 1041, 1043 (1995). In the late 1970's, architects started to design buildings that were more airtight in order to retain heat or air conditioning, thereby increasing energy efficiency during the then energy crisis. *Id.* Andrew Harvey, the President of the American Society of Heating and Ventilation Engineers noted in 1905 that:

> Within the next 10 years, the people of every state of the Union will have become so well informed of the necessity for properly ventilated schools and public buildings that it will be considered as great a crime to construct these buildings without providing for sufficient and proper ventilation, as it would be to erect a building without a proper foundation.

Id. at 1041 n.1.

[79] *See* Ralph C. McCullogh II & Michael M. Shetterly, *Problems With Synthetic Stucco*, 10 S.C. LAW, Nov.-Dec. 1998, at 32-34. The use of plasterboard, plywood, and synthetic stucco is now common in most homes and buildings. *Id.* at 34. Synthetic stucco, which is prone to water penetration, has become a popular construction material. *Id.* Synthetic stucco is

building materials, combined with the fact that people spend more time indoors, is one possible explanation for the rise in mold litigation over the past two decades.[80]

Modern day mold litigation can be traced back to the 1970s, when the first cases of building-induced health effects became widely known.[81] Toxic mold litigation became very popular in the 1990s, especially in warmer states.[82] The most well-known and defining case in toxic mold litigation, *Allison v. Fire Insurance Exchange*, took place in the heart of Texas.[83]

Allison is one of the first cases where a plaintiff prevailed over an insurance industry due to the insurer's failure to deal with a viable mold claim.[84] The plaintiffs brought suit alleging that their insurance company delayed in dealing with the mold problem in their home, thus allowing stachybotrys to spread throughout the house.[85] The Texas

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designed to keep water out of a building, but if water seeps in, the water becomes trapped and cannot be drained from inside the wall. *Id.* Thus, the water stained walls weaken the infrastructure of the building and become a hotpot for mold breeding. *Id.* Additionally, there has also been discussion of linking the use of central ventilation and air conditioning ("HVAC") systems to mold breeding grounds. *See* Nakano, *supra* note 45, at 10 (noting that when there is a leak in an air conditioning unit, the constant water intrusion combined with the poor ventilation encourages mold growth).

[80] Heady, *supra* note 78, at 1087. The author states that with the increase in poorly designed buildings combined with a longer work week for most Americans, more and more people are at risk to mold exposure. *Id.*

[81] TOXIC MOLD LITIGATION 3, 2 (Raymund King ed., ABA 2003). These building-induced effects were described publicly as the sick building syndrome ("SBS"). *Id.* The term sick building syndrome is used to describe situations in which building occupants experience health effects that appear to be linked to their time spent in a building, but no real illness or cause can be specifically identified. *Id.*; EPA, *Indoor Air Facts No. 4: Sick Building Syndrome*, Feb. 1991, *available at* http://www.epa.gov/iaq/pubs/sbs.html.

[82] *See* John Parker Sweeney & Sheri A. Mullikin, *The "Mold Monster": Myth or Menace?*, MEALEY'S LITIG. REP. MOLD 19 (2001) (noting that the majority of toxic mold suits were in California, Texas, the Southwest, and the Great Lake States, where the warm and moist climate contributes to the growth of mold).

[83] *See* Allison v. Fire Ins. Exch., 98 S.W.3d 227 (Tex. App. 2003).

[84] *Id.*

[85] *Id.* at 248. The Plaintiffs first noticed mold in the home after a hardwood floor buckled due to a water leak. *Id.* at 234. Plaintiffs notified their insurance company, Fire Insurance Exchange, of the leak and subsequent mold growth, prompting the insurer to send someone to investigate. *Id.* The plaintiff's contractors recommended that the entire floor be replaced to rid the home of mold. *Id.* However, the insurance adjuster claimed the mold damage was from an older leak and offered to repair only the portions of the floor damaged by water and mold. *Id.* About ten years after the first leak and initial mold outbreak, plaintiffs hired a mold expert to analyze the mold growth in their home. *Id.* at 235. The expert advised plaintiffs to move out of the home immediately due to a buildup of stachybotrys mold. *Id.* Thus, plaintiffs brought suit against the insurance company

Court of Appeals ruled for the plaintiffs and awarded damages based on the insurer's failure to adhere to the insurance contract.[86] Consequently, mold suits based on property damage and insurers' bad faith to remedy the problem increased drastically in the past decade.[87] Major issues that arise and ultimately may lead to a denial of a plaintiff's claim are the lack of legislative guidelines that set forth safety standards for mold exposure and failure to show causation due to the exclusion of expert testimony during trial.[88]

In response to the increase in mold growth issues, some states, along with the federal government, passed legislation setting forth guidelines and safety standards for mold exposure.[89] California's Toxic Mold Protection Act was the first piece of legislation enacted to address mold exposure by itself.[90] The purpose of California's Toxic Mold Protection

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claiming that the insurer's delay forced them to endure extended exposure to mold, resulting in illness. *Id.* at 236. Illnesses claimed were asthma, memory loss, and fatigue. *Id.*

[86] *See id.* at 227. S*ee also* Melinda Wood Allen, *Texas Lassoes Mold Industry*, CLAIMS MAG., Aug. 2003, at 14 (noting that the case has been heard on appeal more than one time and the verdict in plaintiff's favor has been reduced on each appeal). Despite the reduction, *Allison* revealed that plaintiffs can win mold contamination suits. *Id.*

[87] *See supra* notes 65-67 (noting case law involving property damage allegedly caused by mold).

[88] *See* discussion *infra* Part II.C (discussing how failure to prove causation is damaging to a plaintiff's mold exposure claim).

[89] *See Current Mold Legislation*, MOLD REPORTER, May 2003, *available at* http://moldreporter.org/vol2no6/currMoldLeg. California's Toxic Mold Act of 2001 became the model for many states to follow. *Id.* Maryland developed a Task Force on Indoor Air Quality in response to mold exposure across the state. *Id.* Similar legislation also passed in Pennsylvania, New Jersey, and New York. *Id.* New York legislation, the Toxic Mold Protection Act, directs the state Department of Health to create a task force to decide exposure limits for indoor environments. *Id.* Other states, such as Massachusetts, also have legislation that directs the state to create a task force to decide mold exposure limits for indoor environments. MASS. GEN. LAWS. ch. 12669 § 3 (2002). The Massachusetts Toxic Mold Protection Act states that the task force shall:

> 1. [A]dopt permissible exposure limits to mold for indoor environments that avoid adverse effects on health, with an adequate margin for safety, and avoid any significant risk to public health…
> 2. Develop mandates for removal and assessment for key mycotoxin producing molds such as Stachybotrys, Chaetomoim, Aspergillus…

Id.

[90] CAL. HEALTH & SAFETY CODE §§ 26100-26157 (Deering 2001). California's Toxic Mold Protection Act ("TMPA") and Real Property Disclosure Provision, codified at CAL. CIV. CODE § 1102.6, went into effect January 1, 2002. Jany Jacob, *Toxic Black Mold-The Next Asbestos*, SEATTLE DAILY J., July 25, 2002, *available at* http://www.djc.com/news/en/11135666.html. The Toxic Mold Protection Act establishes permissible mold exposure limits in the state of California. CAL. HEALTH & SAFETY CODE § 26102. Section 26102 of the Act reads: "The department shall consider the feasibility of adopting permissible exposure

Act was to direct the California Department of Health Services to establish permissible mold exposure limits.[91] Legislation setting forth permissible exposure limits of mold and establishing guidelines for states to follow brings together policy concerns of fairness, integrity, and efficiency which were previously non-existent.[92]

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limits to mold in indoor environments." *Id.* Section 26103 of the TMPA describes the adoption of permissible exposure limits to mold in indoor environments. CAL. HEALTH & SAFETY CODE § 26103. Sections 26103(a)(4)-(b)(1) read:

> (a) If the department finds that adopting permissible exposure limits to mold in indoor environments is feasible, the department, in consultation with the task force convened pursuant to Section 26101.7, shall:
>
> (1) Adopt permissible exposure limits to mold for indoor environments that avoid adverse effects on health, with an adequate margin of safety, and avoid any significant risk to public health.
>
> (2) Notwithstanding paragraph (1), balance the protection of public health with technological and economic feasibility when it adopts permissible exposure limits.
>
> (3) Utilize and include the latest scientific data or existing standards adopted by authoritative bodies.
>
> (4) Develop permissible exposure limits that target the general population.
>
> (b) The department shall consider all of the following criteria when it adopts permissible exposure limits for molds in indoor environments:
>
> (1) The adverse health effects of exposure to molds on the general population, including specific effects on members of subgroups that comprise a meaningful portion of the general population, which may include infants, children age 6 years and under, pregnant women, the elderly, asthmatics, allergic individuals, immune compromised individuals, or other subgroups that are identifiable as being at greater risk of adverse health effects than the general population when exposed to molds.

Id. Section 26101(e) defines "department" as follows: "the State Department of Health Services, designated as the lead agency in the adoption of permissible exposure limits to mold in indoor environments, mold identification and remediation efforts, and the development of guidelines for the determination of what constitutes mold infestation." CAL. HEALTH & SAFETY CODE § 26101.

[91] CAL. HEALTH & SAFETY CODE §§ 26100-26157. Section 26147 of the Toxic Mold Protection Act requires residential landlords with knowledge or notice of mold in the building to provide written disclosure to both prospective and current tenants of the presence of mold. CAL. HEALTH & SAFETY CODE § 26147. Section 26143 of the Toxic Mold Protection Act discusses commercial and industrial landlords with knowledge of or notice of the presence of mold in the building who have an affirmative duty, within a reasonable time, to remediate it. CAL. HEALTH & SAFETY CODE § 26143.

[92] *See* discussion *infra* Part III.C (arguing policy reasons such as fairness and integrity call for more scientific expert testimony to be admitted into evidence).

On the federal level, Michigan Representative, John Conyers, Jr., introduced House Bill 5040, providing national guidelines for mold inspection and remediation.[93] The bill called for the CDC, the Environmental Protection Agency ("EPA"), and the National Institutes of Health ("NIH") to study the health effects of mold growth and establish standards of acceptable levels of mold.[94] House Bill 5040 did not pass the introduction level however, and the same bill was reintroduced to Congress on March 13, 2003, as House Bill 1268, only to receive the same fate.[95] Currently, there is no federal legislation setting guidelines for mold inspection and remediation.[96]

The introduction of toxic mold legislation on both the state and federal level and the release of federal administrative guidelines, suggests a realization among government officials that mold is indeed a threat to human health.[97] However, due to the lack of universal guidelines and nationally accepted standards concerning safe levels of mold exposure, it is very difficult for plaintiffs to establish causation in mold exposure cases.[98]

C. Causation Problems Preventing Admissibility of Scientific Expert Testimony

Alleged mold-exposed plaintiffs have to prove injury and causation in order to prevail.[99] Plaintiffs in a mold exposure suit must present a

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[93] H.R. 5040, 107th Cong. (2002).

[94] *Id.* at § 102. The bill also included a federal toxic mold insurance program, section 602, and a tax credit for toxic mold inspection and remediation, section 501. *Id.*

[95] H.R. 1268, 108th Cong. (2003). Following H.R. 1268, there has been no major federal legislative action proposing mold inspection and remediation guidelines. 108 Bill Tracking, H.R. 1268, available in LEXIS, LESIG library, BLTRCK file. Various government agencies have provided guidelines relating to mold. The EPA provides information that serves as an educational background on mold. *See* EPA, *Mold Remediation in Schools and Commercial Buildings* (2001), http://www.epa.gov/iaq/molds/index.html [hereinafter EPA #2]. The EPA guidelines focus mainly on discussing remediation guidelines for domestic and commercial buildings. *Id.* As of September 2006, the EPA has not provided national guidelines for mold detection, investigation, or evaluation. *Id.*

[96] *Congress Takes on Killer Mold*, ABC NEWS, May 9, 2006, http://abcnews.go.com/US/story?id=91026&page=1. There are no current federal standards for mold risks. *Id.*

[97] *See supra* Part II.A (noting the health problems associated with mold).

[98] *See* Chenise S. Kanemoto, *Scientific Expert Admissibility in Mold Exposure Litigation: Establishing Reliability of Methodologies in Light of Hawaii's Evidentiary Standard*, 26 U. HAW. L. REV. 99, 110 (2003) (noting that in order to establish causation in mold exposure cases, plaintiffs must use expert testimony).

[99] *See supra* note 65; *see also* Walter J. Andrews et al., *Daubert v. Merrell Dow Pharmaceuticals Provides Key Challenge to Mold Injury Causation Evidence*, SG004 ALI-ABA 19, 27 (2001); Elizabeth L. Perry, *Why Fear the Fungus? Why Toxic Mold Is and Is Not the Next Big Toxic Tort*, 52 BUFF. L. REV. 257 (2004).

prima facie case of negligence in order to establish liability for injuries.[100] This includes proving negligence on behalf of the defendant in allowing moisture to intrude and proving the moisture resulted in mold growth, thus causing damages or injuries.[101] Scientific expert testimony is the only way for plaintiffs to associate mold exposure with the alleged injury; thus, it is important for plaintiffs to have expert testimony admitted in order to prove causation, both general and specific.[102] However, defendants have been successful at excluding scientific expert testimony.[103]

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[100] *See, e.g.*, Mondelli v. Kendel Homes Corp., 631 N.W.2d 846, 852 (Neb. 2001) (discussing how plaintiffs have to show the elements of negligence to prove causation in a mold construction defect case). The elements of negligence are: (1) duty; (2) breach; (3) causation; and (4) damages. WILLIAM L. PROSSER & PAGE KEETON, PROSSER & KEETON ON THE LAW OF TORTS § 30, 164-65 (5th ed. 1984).

[101] Cross, *supra* note 49, at 32. The plaintiff has to prove that the mold contamination was in fact the cause of the personal injuries being claimed. *Id.*

[102] *See* Blundell, *supra* note 42, at 394-95. Causation in a mold exposure case requires proof of general and specific causation. *Id. See also* Merrell Dow Pharm., Inc. v. Havner, 953 S.W.2d 706, 714 (Tex. 1997). General causation is proven when a plaintiff shows that the mold at issue is capable of causing the injuries from which the plaintiff suffers. *Id.; cf. In re* Hanford Nuclear Reservation Litig., 292 F.3d 1124, 1133 (9th Cir. 2002). Specific causation is proven when a plaintiff proves that the mold actually entered the plaintiff's body and therefore contributed to the plaintiff's injuries. *Id. See also Havner*, 953 S.W.2d at 714. "General causation is whether a substance is capable of causing a particular injury or condition in the general population, while specific causation is whether a substance caused a particular individual's injury." *Id.* Epidemiology is the most common used scientific method of establishing general causation in the toxic torts context. Raad et al., *Epidemiology, Molecular Mycology, and Environmental Source of* Fusarium *Infection in Patients with Cancer*, INFECTION CONTROL HOSPITAL EPIDEMIOLOGY, Sept. 2002, at 532-37. Epidemiology is the study of the occurrence of disease in populations. *Id.* Courts have consistently and universally agreed that epidemiology is the most relevant type of evidence in toxic tort cases. MICHAEL D. GREEN ET AL., REFERENCE MANUAL ON SCI. EVID. 333, 335 (2d. ed. 2000). Epidemiological studies are used to demonstrate that exposure to a particular toxin increases the risk of a particular injury. Raad *supra* note 102, at 532-37.

[103] *See, e.g.*, Nat'l Bank of Commerce v. Associated Milk Producers, Inc., 22 F. Supp. 2d 942, 984 (E.D. Ark. 1998) (exhibiting the district court's exclusion of plaintiff's experts from testifying, thereby dismissing plaintiff's complaint for lack of causation); *see also* Geffcken v. D'Andrea, 137 Cal. App. 4th 1298 (Cal. Ct. App. 2006) (involving a claim alleging exposure to toxic molds in plaintiff's residence and place of work). In *Geffken*, Superior Court of California excluded the scientific evidence offered by plaintiff's experts and thereby entered judgment in favor of defendants. *Geffcken,* 137 Cal. App. 4th at 1312. The court held that the expert's testimony that mycotoxins had caused plaintiffs' ailments was speculative and conjectural, and thus inadmissible. *Id.* at 1311. The trial court excluded the expert testimony based on two reasons: "[F]irst, it found that 'he is not qualified to express any relevant opinions.'" Second, it impliedly found that there was no reasonable basis for his opinion that the exposure to mycotoxins had caused appellants' ailments. *Id*. The court concluded that the expert was unable to establish that any of the information presented would have any evidentiary value, and thus the court was not abusing discretion by

When expert testimony is excluded from evidence as a manner to prove causation, the lack of evidence prevents mold-exposed plaintiffs from bringing potentially valid claims before the court.[104] Specific causation is difficult to meet without scientific evidence, and plaintiffs cannot prevail without the necessary causal link between mold mycotoxins and disease.[105] In order to prove causation, plaintiffs are forced to rely on circumstantial evidence coupled with a diagnosis of symptoms associated with mold exposure.[106] In order to establish causation based on circumstantial evidence, plaintiffs in mold exposure cases must use expert testimony.[107] Therefore, understanding the Rules of Evidence and the relevant judge-made law governing the admission of expert testimony is important when evaluating a toxic mold case.[108]

This Part begins with a discussion of the relevant rules in the FRE regarding expert testimony.[109] Part II.C.2 discusses the evolution of the federal common law regarding expert testimony.[110] Part II.C.3 concludes

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excluding this evidence. *Id.* When a judge grants a defendant's Motion in Limine to exclude expert witnesses from testifying as to causation, the case is more than likely subject to summary judgment for lack of causation. *Id.*

104 *See* Danielle Conway-Jones, *Factual Causation in Toxic Tort Litigation: A Philosophical View of Proof and Certainty in Uncertain Disciplines*, 35 U. RICH. L. REV. 875, 928 (2002) (arguing "the toxic tort plaintiff should not be penalized unjustly for the inherent uncertainty of medical diagnoses"). Scientific expert testimony provided by toxic tort plaintiffs should be admissible to support plaintiff's causation argument "so long as such diagnoses are based on medically valid techniques or methodologies." *Id. See also* Michael D. Green, *Expert Witnesses and Sufficiency of Evidence in Toxic Substances Litigation: The Legacy of Agent Orange and Bendectin Litigation*, 86 NW. U. L. REV 643, 681 (1992) (discussing the harsh evidentiary threshold currently in place regarding expert witness testimony).

105 *See* EPA #2, *supra* note 95 (noting more studies are needed to get a clear picture of the health effects related to mycotoxins). *But see Mondelli*, 631 N.W.2d at 856 (concluding that "[t]he list of publications which have addressed the presence of microbiological organisms and their relationship to asthma and allergies showed that the scientific community has generally accepted the principle that a connection exists between the presence of mold and health.").

106 *See* New Haverford P'Ship v. Stroot, 772 A.2d 792, 796 (Del. 2001) (holding expert testimony as to the excessive presence of mold in plaintiff's home and the causation thereof was properly admitted).

107 *See supra* notes 102-04 and accompanying text (discussing the need for expert testimony to prove causation in mold exposure cases).

108 *See* discussion *infra* Parts II.C.1-2 (explaining federal rules and case law governing expert testing).

109 *See* discussion *infra* Part II.C.1 (discussing the background of the Federal Rules regarding scientific expert testimony).

110 *See* discussion *infra* Part II.C.2 (explaining United States Supreme Court case law establishing guidelines for expert testimony).

with a jurisdictional comparison of the guidelines courts use when analyzing expert testimony.[111]

1. Federal Rules of Evidence ("FRE")

When uncertainty exists in toxic tort cases, the legal system allows for scientific expert testimony to provide the court with scientific or technical knowledge necessary to make factual determinations.[112] Specifically, Rule 702 of the FRE governs the admissibility of expert testimony at trial.[113] The primary consideration in admitting expert testimony is whether it will assist the trier of fact in understanding and determining the facts of the case.[114] The FRE also provides the trial judge with the discretionary role of making the preliminary determination of whether an expert is qualified.[115] Combining the broad language and the discretionary nature of the FRE demonstrates that the FRE regarding expert admissibility remain open to judicial interpretation.[116]

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[111] *See* discussion *infra* Part II.C.3 (comparing *Frye* and *Daubert* guidelines for expert testimony).

[112] *See* FED. R. EVID. 702.

[113] *Id.* Specifically, the Federal Rules of Evidence provide:

> If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.

Id. In order to fully understand the Federal Rules of Evidence, FRE 702 should be read with FRE 703. FRE 703 explains that if the underlying facts or data are "of a type reasonably relied upon by experts in the particular field in forming opinions or inferences," then the underlying facts or data do not need to be admitted in order for the expert to be able to testify. FED. R. EVID. 703.

[114] *See* FED. R. EVID. 702. A Note from the Advisory Committee states:

> Whether the situation is proper for the use of expert testimony is to be determined on how well the evidence assists the trier. There is no more certain test for determining when experts may be used than the common sense inquiry whether the untrained layman would be qualified to determine intelligently and to the best possible degree the particular issue without enlightenment from those having a specialized understanding of the subject involved in the dispute.

Id.

[115] FED. R. EVID. 104(a). FRE 104(a) states: "Preliminary questions concerning the qualification of a person to be a witness, the existence of a privilege, or the admissibility of evidence shall be determined by the court. . . " *Id.*

[116] *See* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579 (1993); *see also*, Richard Langerman, *Neurocognitive Sequelae of Toxigenic Mold: Dealing with the Frye/Daubert*

2. The Evolution of Federal Common Law: *Frye v. United States*

The stimulus for the federal expert admissibility standard was the 1923 case of *Frye v. United States*.[117] *Frye* addressed the admissibility of scientific expert testimony regarding a "systolic blood pressure deception test[,]" or lie detector test.[118] The United States Court of Appeals for the District of Columbia held that the appropriate test for admissibility of scientific evidence is whether the evidence is a scientific technique "sufficiently established to have gained general acceptance in the particular field in which it belongs."[119] For nearly seventy years, the majority of federal and state jurisdictions followed the "general acceptance" test established in *Frye*.[120]

Even with the adoption of the FRE in 1975, some courts remain in dispute as to whether or not the expert admissibility rules supersede the "general acceptance" idea developed in *Frye*.[121] The broad standard of

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Challenge, ATLA-CLE 449 (2004) (discussing the decision in *Daubert* which allowed trial judges to assess the methods and principles employed by experts).

[117] Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).

[118] *Id.* In 1923, the offered lie detector test was considered to be novel science. *Id.* at 1014. The decision states, "[c]ounsel for defendant, in their able presentation of the novel question involved, correctly state in their brief that no cases directly in [sic] point have been found." *Id.*

[119] *See id*. (holding that the lie detector test at issue had not gained enough scientific recognition, or "general acceptance" among the scientific community to justify admission). *See also* People v. Kelly, 549 P.2d 1240 (Cal. 1976) (holding that experts testifying must be qualified to do so and when experts testify, the correct scientific procedures must be used in the particular case). Under the *Kelly-Frye* rule, the expert testifying about a new scientific methodology must satisfy a three part test: "[f]irst, that the reliability of the new technique has gained general acceptance in the relevant scientific community, second, that the expert testifying to that effect is qualified to do so, and, third, that correct scientific procedures were used in the particular case." Geffcken v. D'Andrea, 137 Cal. App. 4th 1298, 1309 (Cal. Ct. App. 2006).

[120] *Daubert*, 509 U.S. at 585. However, the primary criticism of the *Frye* test is that it is overly restrictive in admitting testimony based only on the theory of "general acceptance." *Id. See* Brief for Physicians, Scientists, and Historians of Science as Amici Curiae Supporting Respondents at 3, Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579 (1993) (No. 92-102). "The quality of a scientific approach or opinion depends on the strength of its factual premises and on the depth and consistency of its reasoning, not on its appearance in a particular journal or no it popularity among other scientists." *Id.* Although there has been much controversy surrounding the application of the "general acceptance" test, many jurisdictions continue to follow the test, including the Ninth Circuit. *Daubert*, 509 U.S. at 584; *see also* Perry, *supra* note 99, at 289 (discussing *Frye* jurisdictions, including: New York, Arizona, California, Florida, Maryland, Michigan, Nebraska, Pennsylvania, Washington, Alaska, Colorado, Illinois, Kansas, and Missouri).

[121] *Daubert*, 509 U.S. at 587. C*ompare* U.S. v. Williams, 583 F.2d 1194 (2d Cir. 1978) (noting that *Frye* is superseded by the FRE), *with* Christopher v. Allied-Signal Corp., 939 F.2d 1106, 1111 (5th Cir. 1991) (holding that *Frye* and the Rules coexist with each other).

the Federal Rules of Evidence, coupled with the restrictive standards set forth in *Frye,* resulted in judicial discourse and much uncertainty as to what standard to use, ultimately resulting in the landmark United States Supreme Court case of *Daubert v. Merrell Dow Pharmaceuticals*.[122]

3. The Controversy of Expert Admissibility Testing: *Frye* vs. *Daubert*

Daubert is the breakthrough federal case discussing scientific expert admissibility standards.[123] Exactly seventy years after *Frye*, the United States Supreme Court found an occasion to analyze the *Frye* test and, in doing so, the Court overruled *Frye* as the appropriate test in determining admissibility of expert witnesses.[124] In *Daubert*, the Court found that the adoption of the Federal Rules of Evidence superseded the "general acceptance" standard as the main criterion for determining expert testimony admissibility.[125] The Court identified several factors that trial courts should consider in determining whether expert testimony is reliable and admissible.[126] The Court proposed the following factors, which are not intended to be exhaustive:

> (1) whether or not the theory has been tested or proven to be valid;
> (2) whether the theory has been subject to peer review and/or publication;
> (3) whether or not there is a known or potential rate of error and if there are any relevant governing standards; and

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122 Daubert v. Merrell Dow Pharm., 509 U.S. 579 (1993).

123 *See Daubert*, 509 U.S. at 579; *see also* Kumho Tire Co. v. Carmichael, 526 U.S. 137 (1999) (holding expert admissibility standards developed in *Daubert* apply not only to scientific expert testimony, but to all types of expert testimony).

124 *See Daubert*, 509 U.S. at 585 (holding that "'[g]eneral acceptance' is not a necessary precondition to the admissibility of scientific evidence under the Federal Rules of Evidence").

125 *Id.* at 588. The Court noted that to "establish a standard of evidentiary reliability[,]" each step in the expert's reasoning must be supported by "good grounds." *Id.* at 589-90. In *Daubert*, plaintiffs alleged a prescription anti-nausea drug ingested by plaintiffs caused birth defects in their children. *Id.* at 582. Plaintiffs wanted to admit certain epidemiological evidence indicating the prescription drug was capable of causing birth defects. *Id.*

126 *See id.* at 593-94 (basically using the "general acceptance" test alongside three other factors: testability, peer review and publication, and potential rate of error). Not only must the expert's testimony be reliable, it must be relevant. *Id.* at 593; *see also* United States v. Downing, 753 F.2d 1224, 1237 (3rd Cir. 1985) (noting that there must be a logical connection between the expert's theory and the expert's conclusion).

> (4) whether or not the theory or technique has been generally accepted as valid by the relevant scientific community.[127]

The Court in *Daubert* maintained that the FRE's specific limitation of testimony to "scientific knowledge" considers regulation of the subjects and theories about which an expert may testify.[128] Yet, the Court qualified its definition of "scientific knowledge" to some extent by concluding that the subject of scientific testimony does not have to be known with certainty because there are no real certainties in science.[129] Therefore, the Court in *Daubert* shifted the emphasis from "general acceptance" in the scientific community established in *Frye* to the reliability of the underlying test or technique.[130]

While federal courts are bound by the FRE and United States Supreme Court decisions interpreting the Rules, state courts remain

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[127] *See Daubert*, 509 U.S. at 593-94. In addition to the criteria set forth in *Daubert*, courts have also considered other factors as relevant in assessing the reliability of expert testimony:

> (1) whether the expert is proposing to testify about matters growing directly out of independent research he or she has conducted or whether the opinion was developed expressly for purposes of testifying;
> (2) whether the expert has unjustifiably extrapolated from an accepted premise to an unfounded conclusion;
> (3) whether the expert has adequately accounted for obvious alternative explanations;
> (4) whether the expert is being as careful as he would be in his regular professional work; and
> (5) whether the field of expertise claimed by the expert is known to reach reliable results for the type of opinion offered.

FED. R. EVID. 702, Advisory Committee's note. *See* Claar v. Burlington N.R.R., 29 F.3d 499 (9th Cir. 1994) (analyzing under the third prong above, testimony was excluded when the expert failed to consider other obvious causes for the plaintiff's condition); *see also* Gen. Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997) (in discussing the second prong above, the Court held that in some cases a trial court "may conclude that there is simply too great an analytical gap between the data and the opinion proffered"). *But see* Ambrosini v. Labarraque, 101 F.3d 129 (D.C. Cir. 1996) (presenting the possibility of some un-eliminated causes being a question of a weight, so long as the most obvious causes have been considered and reasonably ruled out by the expert).

[128] *See Daubert*, 509 U.S. at 589. The requirement in FRE 702 that an expert's testimony be relevant to "scientific knowledge" establishes a standard of reliability to be enforced by trial judges. *Id.* at 590.

[129] *Id.* at 590. The Court thus declared that "[t]he focus, of course must be solely on principles and methodology, not on the conclusions that they generate." *Id.* at 595.

[130] *See id.* at 590.

divided as to what evidentiary standard applies to scientific experts.[131] Since the Supreme Court's decision in *Daubert*, some states continue to follow *Frye*.[132] Although *Frye* remains the minority view, a number of state trials are still carried out in *Frye* jurisdictions.[133] Courts in *Frye* jurisdictions do not see a need to change the evidentiary standards to those set forth in *Daubert*.[134] In sum, due to the inconsistent use of evidentiary tests in *Frye* and *Daubert* jurisdictions, more toxic mold cases relying on scientific expert testimony continue to be decided inconsistently.[135] The inconsistency of toxic mold case verdicts may also be attributed to the fact that there is no accepted method of scientific expert testing used to prove causation.[136]

D. Scientific Expert Testimony in Toxic Mold Cases

The inconsistent nature surrounding toxic mold verdicts is primarily due to the courts not fully accepting scientific expert testing.[137] Courts exclude certain expert testimony because the testimony does not convince courts of its reliability and accuracy.[138] Part II.D.1 discusses current mold detection methods, such as environmental air sampling

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[131] *See* Bert Black, *Post-Daubert and Joiner Caselaw: The Good, The Bad, and The Ugly*, SC33 ALI-ABA 145, 169 (1998) (exhibiting a table that portrays the current status of *Daubert* and *Frye* in United States jurisdictions).

[132] *See* Frye v. U.S., 293 F. 1013 (D.C. Cir. 1923); *see also* Kanemoto, *supra* note 98, at 116 n.138 (identifying the *Frye* jurisdictions as follows: Alabama, Arizona, California, Colorado, Florida, Illinois, Kansas, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nevada, New Jersey, New York, Pennsylvania, and Washington). *Id.*

[133] Kanemoto, *supra* note 98, at 116-17. Despite the establishment of the *Daubert* standard regarding admissibility of scientific evidence, there are some jurisdictions that still carry out *Frye* hearings to determine if the evidence offered by experts should be admitted as necessary to prove causation, or if the evidence is overly prejudicial and thus should not admitted. *Id.*

[134] *See* State v. Copeland, 922 P.2d 1304, 1314 (Wash. 1996) (discussing that the application of *Frye* "has not been so difficult . . . as to call for its abandonment"); *see also* Dow Chem. Co. v. Mahlum, 970 P.2d 98, 108 n.3 (Nev. 1998) (holding that "we do not presently perceive a need to adopt *Daubert*.").

[135] Louis A. Jacobs, *Giving Lie to Antiquated Notions About Scientific Evidence*, 22 AM. J. TRIAL ADVOC. 507 (1999). *Daubert* hearings–which were created for courts to determine the soundness of an expert's opinion—add confusion and inconsistency. *Id.* A *Daubert* hearing was meant to be a manageable evidentiary hearing where the trial judge could outline and evaluate the qualifications of an expert prior to trial. *Id.* at 537-38. These hearings are not required in every case or for every expert. *Id.* at 540.

[136] *See* discussion *infra* Part II.D (discussing the various tests used in mold detection testing).

[137] *See* discussion *infra* Part II.D.1 (noting inconsistent court decisions involving certain mold detection testing).

[138] *See* discussion *infra* Part II.D.1 (stating reasons why courts exclude mold detection testing methods such as air sampling and antibody testing).

and antibody testing, and explains why both tests fail to consistently convince courts of their reliability.[139] Part II.D.2 concludes with a discussion of a new method of testing, considered to be reliable and accurate in other areas of science, thus providing positive support for the use of this testing in toxic mold detection.[140]

1. Common Mold Exposure Tests Used Today

The key for any plaintiff's claim in a toxic mold exposure case is the admissibility of expert testimony to prove causation.[141] Plaintiffs' experts commonly assert that mold exposure intensifies existing medical conditions such as asthma or allergies.[142] The two methods commonly used to establish causation in mold cases are environmental sampling and the combination of antibody and blood serology testing.[143]

Environmental sampling testing supports an argument that excessive mold levels probably contributed to the plaintiff's injuries.[144] When samples are taken, either through surface sampling or air sampling, the goal is to trap mold spores so they may be identified.[145] Once the mold is captured and identified, mycotoxins can then be

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[139] *See* discussion *infra* Part II.D.1 (describing popular methods of mold detection testing used by many experts).

[140] *See* discussion *infra* Part II.D.2 (explaining DNA extraction testing).

[141] *See* Elmer, *supra* note 32, at 112 (discussing the fact that a mold-exposed plaintiff will not have a valid claim of toxic mold exposure without proof of causation).

[142] *See, e.g.,* New Haverford P'ship v. Stroot, 772 A.2d 792, 796 (Del. 2001) (noting that plaintiff's expert argued the increased severity of plaintiff's asthma was due to the high concentration of toxic mold in the home).

[143] *See* Geffcken v. D'Andrea, 137 Cal. App. 4th 1298, 1301 (Cal. Ct. App. 2006) (noting plaintiff's experts used environmental sampling data and a mycotoxin antibody test along with a blood serology test to prove causation in a mold exposure case); *see also* Whisnant v. United States, No. C03-5121, 3 (W.D. Wash. 2006) (conferring that plaintiff's expert used a blood serology test to prove plaintiff had an allergic response to mold exposure). *See generally* Andrews, *supra* note 99, at 41. A process called differential diagnosis is also used in some mold detection cases. *Id.* In differential diagnosis, a physician examines a patient, takes the medical history of the patient, does testing as indicated from the exam and history, and then considers and eliminates alternative causes of illness. *Id.* As a methodology, and not applied to a single patient, differential diagnosis is recognized as reliable in the medical field. *Id.* Differential diagnosis is known as the "basic method of internal medicine." *In re* Paoli, 35 F.3d 717, 755 (3rd Cir. 1994).

[144] Kanemoto, *supra* note 98, at 129 nn. 245-46. Proper environmental testing involves an analysis of surface and air sampling. *Id.* Surface sampling is done by swabbing a surface of visible mold. *Id.* If mold is present, then air sampling is usually not necessary for use in identification of mold in a suspected area. *Id.* Air sampling is accomplished by collecting mold spores on Petri dishes and then incubating them in a laboratory so that the organisms captured can grow and be identified. *Id.*

[145] *Id.* at 130.

detected.[146] Despite the practical and straightforward nature of environmental sampling, the testing is not consistently admitted in toxic mold exposure cases.[147] Problems courts find with environmental sampling usually include poor handling of the data and a lack of real probative value when testing purely for mycotoxin presence.[148] The fact of the matter is that "'[i]t does not necessarily follow from the mere presence of a toxigenic species [of mold] that mycotoxins are present.'"[149]

The second method used to establish causation in toxic mold exposure cases is antibody and blood serology testing.[150] Serology is a blood test used to detect the presence of antibodies against a microorganism.[151] Some experts use this type of testing to detect the presence of mycotoxins in exposed plaintiffs.[152] The problem associated with antibody testing is that courts rule that the testing method is not generally accepted in the scientific community.[153] The inconsistencies

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146 *See Geffcken*, 137 Cal. App. 4th at 1308 (stating that when mycotoxins are shown to be present, plaintiffs find it much easier to prove causation).

147 *See id.* (holding that the probative value of expert's environmental sampling testing was minimal at best, because it failed to show the presence of mycotoxins at plaintiff's residence). The California Appellate Court noted, "even if the presence of mold spores is assumed, [appellants] cannot present competent or generally accepted scientific evidence establishing the presence of mycotoxins from such spores." *Id.* at 1306. The court went on to discuss the fact that if the expert wished to test for mycotoxins, mycotoxin testing such as "gas chromatography" and "mass spectrometry" should have been conducted. *Id.* at 1308. The court used the *Frye* test to exclude the expert testimony noting, "these scientific techniques failed to satisfy the *Kelly-Frye* requirements." *Id.* at 1312. *But see New Haverford P'Ship*, 772 A.2d at 800 (admitting testimony on environmental sampling results despite the fact that minimal outdoor samples were taken for comparison). The Delaware Supreme Court concluded that "the failure to conduct extensive baseline testing goes to the weight of the experts' opinions, not their admissibility." *Id.*

148 *Geffcken*, 137 Cal. App. 4th at 1308. In *Geffcken*, the expert apparently mishandled the data and the court concluded "there's no direct way to match the [sample] locations with the reported results." *Id.*

149 *Id.*

150 *See infra* note 152 (discussing cases where experts used antibody testing to prove causation).

151 Whisnant v. United States., No. C03-5121, No. C03-5121 FDB, 2006 U.S. Dist. LEXIS 80312, at *2 (W.D. Wash. Oct. 24, 2006). There is only one laboratory in the United States that conducts a mycotoxin antibody test. *Id.*

152 *See Whisnant*, No. C03-5121 FDB, 2006 U.S. Dist. LEXIS 80312, at *3 (W.D. Wash. Oct. 24, 2006) (noting that expert used antibody blood testing in a mold exposure case); *see also Geffcken*, 137 Cal. App. 4th at 1309 (exhibiting the use of antibody blood serology testing in a toxic mold exposure case).

153 *See* Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923). *See also Geffcken*, 137 Cal. App. 4th. at 1309. The court held in *Geffcken* that the mycotoxin antibody test was unreliable and not generally accepted in the scientific community "as a valid technique to determine human exposure to mycotoxins." *Id.* at 1310. Also, the court held that the antibody testing has not gained acceptance in the scientific community as a valid technique

surrounding the admissibility of environmental sampling and antibody and blood serology testing evidence has led to new mold exposure testing.[154]

2. The Emergence of New Toxic Mold Detection Testing

In an effort to meet plaintiffs' needs for a mold exposure test that consistently satisfies admissibility standards, scientific experts are developing a more reliable, specific, and rapid method of detecting the presence of toxic mold in humans.[155] Specifically, the new method of testing detects toxic mold DNA and mycotoxins in human body fluids and tissues.[156] The purpose behind the new testing is to identify mycotoxins:

> in human tissue or body fluids, the identification of mycotoxins may serve as a potential diagnostic method to 1) identify patients at risk for developing disease states related to mold infections, or 2) rapidly determine the cause of diseases related to mold infections so that effective treatment regimens can be developed for patients exposed to molds and experiencing symptoms resulting from mold infection.[157]

DNA and mycotoxin extraction testing involves identifying specific toxic mold species in patient tissue or body fluids.[158] The new testing

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to assess human exposure to toxic mold. *Id.* The court held that lack of validation of the testing led to its inadmissibility. *Id.*

[154] *See* discussion *infra* Part II.D.2 (discussing the evolution of DNA extraction testing used to locate toxic mold DNA in human tissue and body fluids).

[155] *See* RealTime, *supra* note 56, at 4 (describing the accuracy and reliability of DNA extraction testing when used in detecting mold DNA in human tissue).

[156] *See* Kaisu Jalava et al., *Semiquantitative Detection by Real-Time PCR of Aspergillus Fumigatus in Bronchoalveolar Lavage Fluids and Tissue Biopsy Specimens from Patients with Invasive Aspergillosis*, 41 J. OF CLINICAL MICROBIOLOGY 4304 (Sept. 2003); *see also*, Cathal E. O'Sullivan et. al., *Development and Validation of a Quantitative Real-Time PCR Assay Using Fluorescence Resonance Energy Transfer. . . Pulmonary Aspergillosis*, 41 J. OF CLINICAL MICROBIOLOGY 5676 (Dec. 2003).

[157] *See* RealTime, *supra* note 56, at 3. The testing provides certain methods for detecting and identifying in human tissues and body fluids, "fungal DNA from fungal spores, and 2) mycotoxins produced by fungi." *Id.* at 4. Supplementing detection testing, is also mycotoxin and DNA extraction procedures for human tissue and body fluids. *Id.*

[158] *Id.* at 4. The method consists of extracting and recovering DNA of the mold species from the human tissue or body fluid. *Id.* Next, identification of the mold species takes place. *Id.* This is done by amplifying the DNA, probing the DNA, then specifically identifying the mold species. *Id.* RealTime Laboratories notes that although the idea of

involves a process of extracting, recovering, and identifying mycotoxins.[159] The testing can detect up to twenty-four species of molds.[160] In theory, the detection testing creates an opportunity to detect a specific mycotoxin sample.[161] Critical to the development of new testing such as this is the performance of clinical trials, or experimentation, in other areas of medicine to help facilitate growth of the test.[162] The use of clinical trials is meant to establish an understanding of how similar testing will work in other areas of medicine and to provide a basis for the testing to be used in a differential diagnosis.[163] The belief is that pursuing clinical trials in other areas of medicine will create an opportunity to evaluate mold detection testing in this capacity.[164]

In summary, when combining the federal rules regarding admissibility of scientific expert testimony with toxic mold detection testing, plaintiffs face obstacles in admitting expert testimony.[165] Current scientific expert testing regarding toxic mold detection does not consistently convince courts as being an acceptable method to exhibit the adverse health effects of toxic mold.[166] Despite the fact that scientific testing is not consistently allowed by trial court judges, recent case law

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DNA sequencing of mold organisms is an established practice, the DNA probes involved in this testing are unique. *Id.*

[159] *See id.* at 5. Body fluids that may be used for these studies include: "urine, nasal secretions, nasal washes, bronchial lavages, bronchial washes, spinal fluid, sputum, gastric secretions, seminal fluid, other reproductive tract secretions, lymph fluid, whole blood, serum, and plasma." *Id.* The specific assay used in this testing utilizes "microspheres (beads) that are coupled to DNA and/or monoclonal antibodies to detect mycotoxin antigens." *Id.* at 6.

[160] *Id.* at 6. This is done by employing the DNA probe and linking the probes to assay microspheres. *Id.* The microspheres (beads) allow the linkage of sixteen antibodies to mycotoxins. *Id.* The linkages will allow the human samples, which include blood, spinal fluid, urine, and tissue that have been exposed to toxic mold species to be determined. *Id.* The toxic mold species that the test specifically detects are "Aspergillus, Penicillium, Stachybotrys, and Fusarium." *Id.*

[161] *Id.* During the testing, several readings will be available from the microsphere bead set, creating the capability of having up to 100 unique assays with one single sample. *Id.*

[162] *Id.* at 7. Studies are currently conducted in four main areas: detecting toxic mold in Bone Marrow transplant patients, detecting mycotoxins in the muscle of Lateral Sclerosis patients, detecting mycotoxins in pulmonary fibrosis patients, and detection of mycotoxins in lung cancer. *Id.* at 7-8. The tests used in the clinical trials range from Polymerase Chain Reaction Studies (PCR) to Enzyme Linked Immuno-Sorbant Assay (ELISA). *Id.*

[163] *See id.* at 8.

[164] *Id.*

[165] *See* discussion *supra* Part II.C (discussing causation problems plaintiffs face in toxic mold litigation).

[166] *See supra* Part II.D.1 (noting court decisions excluding air sampling and antibody testing).

demonstrates that courts are allowing more expert witnesses to testify in order to link mold exposure to the resulting injury.[167] The emergence of new mold detection testing, mainly involving the identification of fungal DNA, will help plaintiffs establish a standard causation test for determining mold exposure.[168] However, the fact that some courts allow scientific expert testimony while other courts exclude similar testimony demonstrates the need for a consistent standard for courts to follow when judging the admittance of expert testimony in toxic mold exposure cases.[169] A consistent standard will also aid juries in understanding the adverse health effects that toxic mold can have on humans and, thus, ultimately help plaintiffs have their day in court.[170]

III. ANALYSIS

When confronted with a toxic mold exposure case, federal and state courts should admit scientific expert testimony on DNA extraction testing pursuant to the established admissibility standards.[171] Part III.A begins by differentiating case law between *Frye* and *Daubert* jurisdictions regarding the admissibility of scientific expert testimony in toxic mold exposure cases.[172] Part III.B argues how DNA and mycotoxin extraction and identification testing will get past federal guidelines regarding admissibility of scientific expert testimony, specifically using the methodology of differential diagnosis.[173] Finally, Part III.C discusses the fundamental policies served by allowing scientific expert testimony on DNA and mycotoxin extraction and identification testing to juries, thus bypassing the inconsistent discretionary judgment of a trial court judge.[174]

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[167] *See supra* note 65. *See, e.g., Mondelli*, 631 N.W.2d at 856. The Nebraska Supreme Court noted that even though there was no established standard regarding mold levels, "the scientific community has generally accepted the principle that a connection exists between the presence of mold and health." *Id.*

[168] *See* discussion *infra* Part III.B (applying DNA extraction testing to mold detection by proving its reliability and acceptability in other areas of science).

[169] *See* discussion *infra* Part IV (discussing a possible approach courts could take when judging scientific expert testimony).

[170] *See* discussion *infra* Part III.C (arguing juries should have the opportunity to hear more expert testimony to ensure fairness and integrity in the judicial system).

[171] *See infra* Part III.B (arguing DNA extraction testing is more reliable and accurate than other mold detection tests).

[172] *See infra* Part III.A (analyzing court decisions in *Frye* and *Daubert* jurisdictions).

[173] *See infra* Part III.B (applying DNA extraction testing along with the scientific methodology of differential diagnosis to prove causation in toxic mold cases).

[174] *See infra* Part III.C (discussing policy reasons for allowing more scientific expert testimony to reach the jury).

A. Analysis of Frye *and* Daubert *Case Law*

Absent scientific support for toxic mold claims, plaintiffs cannot satisfy causation or meet their ultimate burdens of proof.[175] A plaintiff's chance of being fully compensated for personal injuries due to mold exposure is difficult if the plaintiff does not satisfy the requirements set forth regarding the admissibility of scientific expert testimony in the appropriate jurisdiction.[176] Relying on different standards for the admissibility of scientific evidence from state to state causes toxic mold verdicts to be inconsistent.[177] This inconsistency creates difficulty for plaintiffs attempting to prevail in some jurisdictions over others.[178]

1. Plaintiff-Friendly *Frye* Jurisdictions

Despite the Supreme Court ruling in *Daubert*, some jurisdictions continue to follow the scientific expert testimony standard set forth in *Frye*.[179] For example, in *Mondelli v. Kendel Homes Corporation*,[180] a toxic mold exposure case decided in a former *Frye*-friendly jurisdiction, the Nebraska Supreme Court admitted expert testimony of causation provided by plaintiffs based on the court's approval of the expert's testimony.[181] The court determined that if the expert testimony is

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[175] Andrews, *supra* note 99, at 31. Plaintiffs in toxic mold suits have to prove "that the defendant knew or should have known of the danger mold presented to the plaintiff." *Id.*

[176] *Id.*

[177] *See* Perry, *supra* note 99, at 289. The author discusses how the Supreme Court decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.* rejected the *Frye* test for admissibility of scientific evidence. *Id.* The Court held in *Daubert* that "something more than 'general acceptance' within the scientific community was required for admissibility." *Id.* The *Frye* test sets forth the premise that scientific evidence can only be admitted, based on the discretion of the judge, if it has gained general acceptance in the scientific field. *Id. Daubert*, in comparison, holds that scientific evidence be reliable pursuant to empirical testing, peer review, above average rate of error in scientific testing, as well as general acceptance in the scientific community. *See Daubert*, 509 U.S. at 593-94.

[178] *See* discussion *infra* Parts III.A.1-2 (comparing plaintiff-friendly *Frye* jurisdictions with *Daubert* jurisdictions).

[179] *See supra* note 65. *See also* Perry, *supra* note 99, at 289. There are still other states that follow their own standards for scientific admissibility of evidence, other than the *Frye* and *Daubert* standards. *Id.* Under *Frye*, an expert witness must show that he or she has relied on scientific principles, procedures, and methods that have gained general acceptance in the field in which the expert is testifying. *Frye*, 293 F. at 1013.

[180] Mondelli v. Kendel Homes Corp., 631 N.W.2d 846 (Neb. 2001).

[181] *See id.* at 856. Plaintiffs brought suit against Kendel Homes Corporation for construction defects, and also against the city for negligence due to poor inspection and approval plans of the premises. *Id.* at 852. *But see* Schafersman v. Agland Coop, 631 N.W.2d 862, 876 (2001) (holding that for trials commencing on or after October 1, 2001, Nebraska trial courts would be required to evaluate admissibility of expert testimony under *Daubert*). In *Mondelli,* the court admitted the testimony because of the expert's

admitted, "the record would have contained evidence about which reasonable minds could differ."[182] The court stresses that admitting expert testing data and allowing the jury to hear certain testimony will help the court in reaching a more legitimate result.[183] The holding in *Mondelli* exhibits a relatively lax requirement of admissibility of scientific evidence in *Frye* jurisdictions, because the expert only provided proof of certain publications showing the hazardous health effects of toxic mold.[184]

Another *Frye* jurisdiction case, which utilized a more plaintiff-friendly admissibility standard, was *Centex-Rooney Construction Co. v. Martin Co*.[185] In *Centex-Rooney*, a Florida district court allowed two experts to testify about publications concerning the adverse health effects of mold, both of which the court believed to be generally accepted within the scientific community on the link between mold and health concerns.[186] Even though *Centex-Rooney* is a property damage and construction-related toxic mold case, the court's ruling illustrates how a plaintiff can establish causation of adverse health effects from toxic mold through the use of expert witnesses.[187]

The two aforementioned cases exhibit that mold experts, testifying in jurisdictions adhering to the *Frye* standard, are much more likely to have their evidence admitted even without a clear scientific link between mold and human disease.[188] When courts utilize the *Frye* standard, the general trend seems to be favoring admittance of expert testimony relating to alleged mold exposure injuries that are general in nature.

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familiarity with scientific publications on mold and health hazards. *Mondelli*, 631 N.W.2d at 856. The expert testified that toxic mold was a cause of asthma and "rhinitis." *Id.* at 855. The expert did not testify as to any other causal links such as sick building syndrome or chronic fatigue syndrome. *Id.* At this time, the court accepted the mold detection testing of the expert as proof of the cause of asthma, because of the scientific publications on mold that the expert provided. *Id.* at 856. Thus, the testimony was "generally accepted" in the scientific community. *Id.*

182 *Mondelli*, 631 N.W.2d at 858.

183 *Id.* at 858; *see also* discussion *infra* Part III.C (arguing that when juries have the opportunity to hear testimony, fairness and legitimacy is better achieved).

184 *Mondelli*, 631 N.W.2d at 856. The court came to the conclusion of allowing the expert testimony without indicating how the evidence would have established general or specific causation. *See* Andrews, *supra* note 99, at 40.

185 Centex-Rooney Constr. Co. v. Martin Co., 706 So. 2d at 20 (Fla. App. 1997).

186 *Id.* at 26. The court in *Centex-Rooney* returned an $11.5 million verdict for plaintiffs in this toxic mold exposure case. *Id.* at 28.

187 *See supra* note 65 (demonstrating how plaintiffs can prove causation in toxic mold cases).

188 *See supra* note 181 (revealing that courts will allow certain expert testimony without a clear causal link between mold and human disease).

However, courts not adhering to the *Frye* standard require both proof of specific causation and proof that plaintiffs have experts available to link mold exposure to the exact personal injuries of the plaintiff.[189] As a result, toxic mold claims involving personal injury are far less successful in jurisdictions adhering to the *Daubert* standard.[190]

2. *Daubert* Jurisdictions: When the Testimony Gets Tough

In toxic mold exposure cases, defendants often try everything in their power to prevent plaintiffs' expert testimony from being admitted.[191] When defendants challenge expert testimony, the burden shifts to plaintiffs to have their expert witness demonstrate that "mold is capable of causing a particular injury or condition in the general population."[192] Courts, in most cases, strictly enforce the factors set forth in *Daubert* when evaluating expert testimony.[193]

An Arkansas case, *National Bank of Commerce v. Associated Milk Producers*,[194] highlights a *Daubert* style analysis in a toxic mold related personal injury case.[195] In *National Bank of Commerce,* the plaintiff alleged exposure to mycotoxins from contaminated aerosol milk particles produced during the cheese-making process at his workplace and was later diagnosed with laryngeal cancer.[196] The plaintiff employed an expert who brought forth testimony that mycotoxins are found in cattle feed and can be excreted by cows through milk.[197] The defendant challenged the admissibility of the plaintiff's expert testimony that the

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189 Elmer, *supra* note 32, at 114.

190 *See* Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 592-95 (U.S. 1993) (noting trial courts must act as "gatekeepers," mandating a demonstration of the reliability and relevance of an expert's opinion before it is admitted into evidence); *see also* discussion *infra* Part III.A.2.

191 *See supra* note 103 and accompanying text. A *Daubert* challenge to expert testimony, specifically toxic mold cases, requires experts to prove general and specific causation. *See* Blundell, *supra* note 42, at 395.

192 *See* Perry, *supra* note 99, at 291 (citing Patrick J. Perrone et al., *Excluding Expert Witness Testimony in Mold Litigation*, MEALEY'S MOLD LITIG. REPORT: MOLD 3 (June 2001)). In mold litigation, a plaintiff must prove the mold exposure was the direct cause of his or her injuries. *Id.* at 295. This is referred to as specific causation. *Id.*

193 *See supra* note 127 and accompanying text (stating the factors that scientific expert testimony must meet in *Daubert* jurisdictions).

194 Nat'l Bank of Commerce v. Assoc. of Milk Producers, 22 F. Supp. 2d 942 (E.D. Ark. 1998).

195 *Id.* (plaintiff brought suit against employer blaming his laryngeal cancer on exposure to mycotoxins while he worked on the production line in a cheese factory).

196 *Id*. at 945.

197 *Id.* Mycotoxins are produced by mold that can be found in cattle feed. *Id.*

contaminated milk caused his cancer.[198] The Arkansas District Court used the *Daubert* analysis, finding that the expert did not identify any publication, study, or direct scientific evidence demonstrating that exposure to mycotoxins could cause laryngeal cancer in humans.[199] In the absence of evidence showing a causal link between mycotoxins and laryngeal cancer, the plaintiff could not establish exposure to toxic mycotoxins.[200] The district court agreed with the defendant's expert witness who stated that "there is no scientific basis by which one could come to an opinion that aflatoxin causes laryngeal cancer to a standard of a reasonable scientific probability," and held the plaintiff did not use an appropriate scientific methodology. [201] The plaintiff in *National Bank of Commerce* did not demonstrate that the basis for the causation was anything more than speculation, which is exactly the sort of expert testimony *Daubert* seeks to exclude.[202] Thus, when comparing *National Bank of Commerce*, decided in a *Daubert* jurisdiction, to cases decided in

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[198] *Id*.

[199] *Id.* at 982-83; s*ee also* Andrews, *supra* note 99, at 37. Additionally, the court found a lack of any indirect scientific evidence demonstrating that exposure to mycotoxins could cause such cancer. *Nat'l Bank of Commerce,* 22 F. Supp. 2d at 976.

[200] *Nat'l Bank of Commerce,* 22 F. Supp. 2d at 983. The court noted that, despite the large amount of research into mycotoxins and reported connections to liver and kidney diseases, including cancer, "[t]here have been no epidemiological associations reported in the 35 years of study of aflatoxins. . . and laryngeal cancer." *Id*. at 956. Plaintiff also brought two other bases on which to strengthen the claim, a "no threshold" theory and differential diagnosis. *Id* at 967. Plaintiff used a "no threshold" theory to exhibit that just a single carcinogenic molecule could have caused the cancer. *Id.* at 958. Also, the plaintiff used the testimony of his expert witness to consider and rule out other possible causes, thus differential diagnosis. *Id.* at 963-68. The court held, consistent with *Daubert*, that testimony of a valid differential diagnosis combined with a "no threshold" theory cannot eliminate the need for some scientific proof to show the causal connection between mycotoxins and laryngeal cancer. *Id.* at 967.

[201] *Id*. at 974. The court recognized that it was the duty of the judiciary to not merely rely on the claims of the plaintiff's expert, but to act as "gatekeeper" and assess scientific reliability for itself:

> [S]omething doesn't become 'scientific knowledge' just because it's uttered by a scientist; not [sic] can an expert's self-serving assertion that his conclusions were 'derived by the scientific method' be deemed conclusive, else the [Daubert] opinion could have ended with footnote two. . . [I]t is our responsibility to determine whether those experts' proposed testimony amounts to 'scientific knowledge,' constitutes 'good science,' and was 'derived by the scientific method.'

Id. at 983 (quoting Daubert v. Merrell Dow Pharm., Inc., 43 F.3d 1311, 1315-16 (9th Cir. 1995)).

[202] *See supra* notes 126-29 and accompanying text (discussing the admissibility standards set forth by *Daubert*).

Frye jurisdictions, it is evident that *Daubert* jurisdictions require more stringent proof of determining causation.[203]

Minner v. American Mortgage & Guaranty Company is another case in which defendants used a *Daubert*-style attack on the admissibility of plaintiff's expert testimony in a toxic mold exposure suit.[204] The decision reached in *Minner*, however, was not as expected.[205] The plaintiffs brought suit for injuries from long-term mold exposure at work against their employer and offered opinions of scientific expert witnesses, whose testimony and opinions supported plaintiff's allegations.[206] The defendants challenged the testimony and successfully convinced the Delaware Superior Court that some of the scientific testimony used could not be admitted due to its unreliable probative value.[207] The Delaware court's ruling allowed certain testimony, yet excluded other testimony, based on the idea that the jury should decide how reliable the testimonies of certain experts are.[208] Thus, when comparing *Minner* with *National Bank of Commerce*, courts applying *Daubert* also rule inconsistently in determining what testimony given by scientific experts should reach the jury.[209]

The decision in *Minner*, although not as strict as other cases using *Daubert*-style attacks, demonstrates how defendants can be successful in

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[203] *Compare* Nat'l Bank of Commerce v. Associated Milk Producers, Inc., 22 F. Supp. 2d 942 (E.D. Ark. 1998) (rejecting expert testimony on causation in *Daubert* jurisdiction), *with* Mondelli v. Kendel Homes Corp., 631 N.W.2d 846 (Neb. 2001) (allowing expert testimony as proof of causation in a *Frye* jurisdiction).

[204] Minner v. Am. Mortgate & Guaranty, 791 A.2d 826 (Del. Super. Ct. 2000). Plaintiffs alleged permanent disabilities, including cognitive defects, as a result of long-term exposure to toxic mold and mycotoxins while at their place of employment. *Id.* at 833.

[205] *Id.* at 872. The court disagreed with both sides, excluded some testimony, and allowed other testimony. *Id.* The court explained that some of the scientific methodologies used by plaintiffs were not scientifically reliable and may produce incorrect results, but that other methodologies used were not unsound. *Id.* at 870.

[206] *Id.* at 847. Expert testimony supported the position that plaintiffs' exposure to toxic mold and mycotoxins at their workplaces caused permanent injuries such as cognitive impairment and neuropsychological deficits. *Id.*

[207] *Id.* at 849-55.

[208] *Id.* at 872. The court noted:

> This text shows that there is a factual and scientific basis for . . . seemingly inconsistent diagnosis. Therefore, the jury should decide what effect to give his testimony. There is a sufficient indicia of reliability to support the evidentiary reliability of . . . testimony. The decision concerning whether the diagnoses of Plaintiffs' experts or the Defendants' experts are to be believed should be left to the trier of fact.

Id.

[209] *See* discussion *supra* Part III.A.2 (analyzing inconsistent application of the *Daubert* standard in *Daubert* jurisdictions).

attacking plaintiffs' expert witnesses.[210] Nevertheless, there is great significance associated with the *Minner* decision, mainly in that it gives plaintiffs hope that expert testimony offered in toxic mold cases may reach the jury despite the fact the court may view the testimony as not fully valid or reliable.[211] As a result, plaintiffs can read decisions such as *Minner* as possibly starting a trend in *Daubert* jurisdictions: allowing more scientific evidence to reach the jury when there are different opinions surrounding causation, so long as there is at least some scientific testimony present that the court deems reliable.[212] Based on the *Minner* decision, offering new scientific expert testing in toxic mold cases, such as DNA and mycotoxin extraction testing, may not be as difficult for plaintiffs as it was previously.[213] As evidenced by the *Minner* court's ruling in favor of admissibility of the expert testing, if there is any "indicia of reliability" surrounding the testing then some courts will allow the testimony to reach the jury.[214] Therefore, when combining decisions such as *Minner* with the successful admissibility record of DNA testing in other areas of law, the probability of DNA extraction testing in toxic mold cases meeting the established reliability requirement is very high.[215]

B. Application of DNA and Mycotoxin Extraction Testing

A testifying expert witness is not required to rely solely upon published studies or peer-reviewed research to dependably testify about causation.[216] Under *Daubert* and prior case law such as *Minner*, the methodology surrounding the expert's conclusion is chief to admissibility.[217] Thus, the idea permits the use of a single-patient

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[210] *See Minner*, 791 A.2d at 826-72; *see also supra* note 103 (discussing certain tactics defendants use to attack plaintiff's experts).

[211] *See Minner*, 791 A.2d at 826-72; *see* discussion *infra* Part III.C, Part IV (discussing policy reasons favoring more scientific expert testimony to reach juries).

[212] *See supra* notes 204-09 and accompanying text (discussing the holding *Minner*, in which the court excluded some expert testimony and allowed other expert testimony).

[213] *See infra* Part III.B (analyzing DNA extraction testing and how the testing passes admissibility standards).

[214] *See supra* note 205 and accompanying text (allowing certain expert testimony when there is some reliability surrounding the methodology).

[215] *See* discussion *infra* Part III.B (discussing the application of the new testing in areas of toxic mold litigation).

[216] *See* Andrews, *supra* note 99, at 9.

[217] *See Minner*, 791 A.2d at 872 (holding the jury should decide what effect to give an expert's testimony when there is a sufficient indicia of reliability to support an expert's testimony).

methodology such as "differential diagnosis."[218] As noted earlier, differential diagnosis is a standard clinical technique that identifies the cause of a medical condition by eliminating other likely causes.[219] Given the fact that differential diagnosis is a reliable and recognizable methodology in medicine, an accurately performed differential diagnosis may satisfy *Daubert*.[220] Given that the purpose underlying DNA and mycotoxin extraction testing is to differentiate exposed human tissue or body fluids from the unexposed, the testing presents the most accurate opportunity to satisfy the purpose behind differential diagnosis.[221]

In the absence of evidence of a general and specific cause of a mold-related illness, a "differential diagnosis" that toxic mold caused a plaintiff's alleged illness lacks sufficient scientific reliability.[222] The Delaware case of *New Haverford Partnership v. Stroot* demonstrates differential diagnosis.[223] The plaintiffs in *Stroot* offered expert testimony of differential diagnosis, claiming the plaintiffs' injuries were mainly caused by mold growth inside their apartments.[224] The plaintiffs used air sampling to determine causation.[225] In response, the defendants argued air sampling was insufficient to establish a baseline level of mold in the apartments.[226] The Delaware Supreme Court held that the methodology underlying the expert's causation opinion, differential diagnosis, supported the trial court's decision to admit the testimony

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[218] *See supra* note 143 (defining differential diagnosis and discussing the use of the methodology).

[219] *See supra* note 143 and accompanying text (explaining the elimination of alternative diseases through the method of differential diagnosis).

[220] *See* Andrews, *supra* note 99, at 10; *see also* New Haverford P'ship v. Stroot, 772 A.2d 792, 800 (Del. 2001) (noting how differential diagnosis can impact mold-related litigation).

[221] *See* discussion *supra* Part II.D.2 (discussing the purpose surrounding DNA extraction testing). *See also* Andrews, *supra* note 99, at 10. Differential diagnosis involves physicians trying to identify which single disease a patient is exposed to, rather than differentiate which of a variety of exposures has caused the disease underlying the symptoms. *Id.* The sole purpose of differential diagnosis is to differentiate and identify which disease underlies certain symptoms. *Id.*

[222] Andrews, *supra* note 99, at 10.

[223] *See New Haverford P'Ship*, 772 A.2d at 792-801.

[224] *Id.* at 795-97.

[225] *Id.* at 796; *see also* discussion *supra* Part II.D.1 (discussing air sampling as one of the tests used to detect mold and help prove causation).

[226] *New Haverford P'Ship*, 772 A.2d at 799-800. Defendants argued that absent a baseline level of mold, plaintiff's experts' opinion that levels of mold in the apartments were "excessive" was not methodologically sound. *Id.* Additionally, defendants argued that the plaintiff's experts did not rule out any other potential causes of the plaintiff's injuries. *Id.* at 800.

and thus defeated the defendant's *Daubert* challenge.[227] In this context, the court's decision seems to suggest that the *Daubert* standard is lower for opinions based on a differential diagnosis.[228] When analyzing the decision, it seems the court relied upon both the plaintiffs' offered causation evidence and the established principle of differential diagnosis to come to the conclusion that the testimony was reliable. The *Stroot* decision is the first case involving differential diagnosis in a toxic mold exposure case.[229] Thus, the *Stroot* decision demonstrates that courts will look more favorably upon scientific expert testimony with the desire to prove causation, if it is offered along with the underlying principle of differential diagnosis. Based on the preceding analysis, *Stroot* may provide a basis for plaintiffs to circumvent *Daubert* requirements.

Rebuttal of *Daubert* can take place in cases that will use new mold detection testing such as DNA and mycotoxin extraction and identification. The first requirement of *Daubert* is whether the offered knowledge or testing can be or has been tested empirically.[230] Attacking this first requirement is the successful result of the DNA testing based on laboratory studies and procedures conducted in other capacities.[231] The other tests used in conjunction with the DNA testing include established tests, such as Polymerase Chain Reaction Studies ("PCR") and Enzyme Linked Immuno-Sorbant Assay ("ELISA").[232] These tests are well established and, when used in conjunction, satisfy the second and fourth requirements of *Daubert*: (1) whether the theory or technique has been subjected to peer review and publication, and (2) whether the

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[227] *See id.* at 800. *But see Geffcken*, 137 Cal. App. 4th at 1308 (holding that the expert's air sampling test could not be admitted because it did not show the presence of mycotoxins at plaintiff's residence). However, differential diagnosis was not used by the plaintiff's expert in *Geffcken*. *Id.* These two cases exhibit that the same test can be used in similar circumstances, but the methodology underlying the causation test is the telling factor if the testimony will be admissible or not.

[228] *See* Andrews, *supra* note 99, at 10. Differential diagnosis as a methodology does rely to an extent on the expert's opinion. *Id.*

[229] *Id.*

[230] *See* Daubert v. Merrell Dow Pharm., 509 U.S. 579, 593 (1993).

[231] *See* discussion *supra* Part II.D.2 (explaining DNA testing in other capacities). The DNA test designs were based upon test kits originally developed for grains and foodstuffs. RealTime modified, adapted, and validated the unique DNA testing procedure for use in human diagnosis. *See* RealTime, *supra* note 56, at 8. This is necessary to ensure that mycotoxins and mold DNA can be measured and detected in human tissue and fluids. *See id.*

[232] *See supra* notes 160-62; *see also* RealTime, *supra* note 56, at 1. The PCR and the ELISA tests are approved by the FDA and used similarly in clinical trials to diagnose bacterial, viral, and some fungal agents. RealTime, *supra* note 56, at 1.

methodology is generally accepted among the scientific community.[233] These requirements are met due to the common use and general acceptance of DNA testing in other scientific and legal capacities.[234]

The final requirement of *Daubert* is whether there is a high known or potential rate of error.[235] DNA extraction testing passes this requirement due to the test specificity in that it tests known areas of the DNA, isolated from the human tissue.[236] The need to use DNA probes in human testing for all organisms, including molds, is increasing because of the speed and accuracy of the test.[237] Additionally, and most importantly when considering the *Stroot* decision, DNA and mycotoxin extraction testing is primarily used as causation testing for the underlying methodology of differential diagnosis.[238] Thus, when applying DNA extraction testing to prove causation with the underlying methodology of differential diagnosis, plaintiffs' scientific experts have a valid argument on why their testimonies should not be excluded from reaching the jury.[239]

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[233] *Daubert*, 509 U.S. at 593-94; *see also supra* note 162. PCR and ELISA testing are both recognized tests used in viral and bacterial infections, as well as fungal infections. The DNA extraction testing used in a mold detection capacity is very similar to the ELISA test that is used for Herpes 1 and 2 diagnosis. Thus, the testing of PCR and ELISA is well accepted among the scientific community for use in clinical medicine. RealTime, *supra* note 56, at 8.

[234] *See supra* note 162 (discussing other areas of medicine where DNA testing is commonly used).

[235] *See Daubert*, 509 U.S. at 594 (discussing the final requirement that must be met in the standard set by the Supreme Court).

[236] *See* RealTime, *supra* note 56, at 1, 3-5. The test focuses on known areas of the DNA isolated from known samples of fungal organisms. *Id.* The specificity is equal to the specificity of PCR tests for viruses and bacteria, which is greater than 99 percent. *Id.* at 3. The most interesting concept of DNA testing is that is fast and accurate. *Id.* at 3-4. According to RealTime, other analytical techniques can take days or weeks to complete. *Id.*

[237] *See id.* at 3-5. Such tests can be used to accurately diagnose the presence of a specific mold causing disease. *Id.* In the past and even now, culturing has been the primary technique to determine the presence of fungal elements in tissue or body fluids. *Id.* The analysis of such cultures usually takes four to six weeks in the laboratory, usually because of the difficulty in growing and identifying the fungal organism. *Id.* Due to the difficulty and time-consuming analysis of cultures, DNA probing of tissue is highly suggestive and the use of testing such as Polymerase Chain Reaction (PCR) is more appropriate and helpful. *Id.*

[238] *See supra* text accompanying notes 162-64. Differential diagnosis is one of the primary purposes behind the use of the clinical trials. RealTime, *supra* note 56, at 7-8.

[239] *See infra* Part III.C (arguing public policy favors allowing juries to hear scientific expert testimony such as DNA extraction testing).

C. Public Policy Favors Admitting Expert Testimony in Toxic Mold Cases

Policies of fairness and jury integrity provide additional reasons for admitting expert testimony in toxic mold exposure cases. It is highly unfair to penalize toxic mold exposure plaintiffs due to the fact that not all of the scientific evidence needed to prove causation will be admitted. Additionally, although the current scientific knowledge of mold effects on human health do not meet the relatively high legal standard of general acceptance in some cases, the jury, nonetheless, should be given the opportunity to weigh the credibility of the evidence. Presenting juries with an opportunity to weigh evidence on both sides of a lawsuit brings more legitimacy, and ultimately more consistency, to court decisions. Given the history behind toxic mold litigation, courts have fallen behind in trying to preserve both ideas.

It is unjust to demand that toxic mold exposure plaintiffs meet stringent standards of causation at the admissibility stage when scientists and physicians are still in the process of researching medical and biological evidence linking mold exposure to hazardous health effects.[240] At the admissibility stage of litigation, plaintiffs' experts have to demonstrate by a preponderance of the evidence that their opinions are reliable, not that they are correct.[241] Since there are no universal exposure standards in place to indicate whether mold levels are inherently unsafe, this should not bar plaintiffs from being able to seek judicial relief.[242] Thus, federal and state courts should admit reasonably reliable scientific expert testimony, thereby leaving the ultimate decision of liability to the jury.[243]

The primary goal in mold exposure litigation is to achieve a balance between allowing enough expert testimony to ensure plaintiffs have a fair chance at trial, and preventing unreliable, and not fully accepted, scientific evidence from being admitted.[244] There are ways to confront

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[240] *See* Green, *supra* note 104, at 681. "[S]tronger and better evidence is unavailable through no fault of anyone and a decision based on the preponderance of the available evidence, rather than imposing an evidentiary threshold, would seem in keeping with the role of the civil justice system." *Id.*

[241] *See In re* Paoli, 35 F.3d 717, 744 (3rd Cir. 1994) (stating that the "evidentiary requirement of reliability is lower than the merits standard of correctness.").

[242] *See* EPA, *supra* note 43.

[243] *See* New Haverford P'ship v. Stroot, 772 A.2d 792, 800 (Del. 2001) (noting that juries should have the ultimate responsibility of determining the admissibility of scientific evidence).

[244] *See supra* Part III.A (comparing court decisions allowing and excluding certain scientific expert testimony).

this problem without excluding evidence the trial judge, subjectively, sees as unfit. Cross examination, presentation of contrary evidence, and careful instruction on the burden of proof can be ways for defendants to attack plaintiff testimony.[245] To exclude scientific expert testimony before the jury has a chance to fully digest its probative value and reliability puts plaintiffs at a major disadvantage from the beginning of the case. Allowing both sides to present reliable and relevant evidence seems to be the most equitable answer for the inconsistency surrounding toxic mold litigation.

In summary, admitting scientific expert testimony such as DNA extraction testing will not give plaintiffs an advantage or windfall in toxic mold exposure cases. Rather, admitting testing such as this will only level the playing field for plaintiffs with valid claims, who are already faced with an uphill battle in proving causation in toxic mold claims.[246] Ultimately, this may involve changing the way some courts conduct analysis surrounding scientific expert testimony.

IV. CONTRIBUTION: A MODEL APPROACH TO CURE THE ABUSE OF DISCRETION INVOLVING SCIENTIFIC EXPERT TESTIMONY

The existing ambiguity surrounding the admission of scientific expert testimony in both federal and state court lies with the courts' application of clearly established rules. Courts' application of the FRE should reflect the intent to ensure that all claims are given the chance to be adjudicated fairly. A model approach, manufactured from court decisions described herein, would set the necessary balance between the competing interests of having legitimate complaints and the probative value of scientific expert testimony. Therefore, these general guidelines will help remind federal and state courts to maintain the FRE's intent and purpose.[247] Revision of the FRE itself is unnecessary because the problem lies with the recent application that may set a trend contrary to the FRE's purpose.[248]

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[245] *See* Daubert v. Merrell Dow Pharm., 509 U.S. 579, 596 (1993). Directed Verdict and Summary Judgment can also be used in the event that the admitted testimony turns out to be not reliable. *Id.*

[246] *See* discussion *supra* Part II.C (discussing the many causation issues plaintiffs confront in toxic mold litigation).

[247] *See supra* notes 113-15 and accompanying text (stating the purpose behind FRE 702 and 703).

[248] *See supra* Part III.A (analyzing the inconsistent Rule application in federal and state court decisions).

Thus, this general two-step approach that encompasses the FRE's intent limits the problem of judicial discretion. This includes combining the idea of informing trial judges of the impact and significance of certain scientific testimony with a call for a more meaningful appellate review process involving expert evidentiary rulings.[249] The impact of this approach favors admittance of scientific evidence, with an emphasis on educating the trier of law on the significance and relevancy of certain testimony, thus allowing the trier of fact the opportunity to determine the probative value of the offered testimony.[250] This is a model approach, not a model decision, and the author realizes the admittance of scientific expert testimony may not be appropriate in every situation.[251]

A. Step One: Educating the Court

The initial step in the model judicial reasoning is to address the requirement that scientific expert testimony be relevant and reliable.[252] The approach taken by the court should be one of flexibility, favoring admissibility. During a *Daubert* or *Frye* hearing, if the proponent of the scientific testimony can show that information in the testimony offers potentially admissible evidence, the relevance requirement should be fulfilled.[253] As a result, when one party is presenting completely irrelevant scientific evidence, the courts will have no problem refusing admittance of the offered testimony. However, meeting the reliability requirement of the FRE is likely where the difficulty lies for the plaintiff's experts.[254]

This is based upon the idea that trial judges are not always well-informed when it comes to certain issues. Naturally, scientific evidence

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[249] *See supra* note 127. "Abuse of discretion" is the proper standard of review of a district court's evidentiary rulings. *Joiner*, 522 U.S. at 155.

[250] *See infra* Part IV.A (describing the value of educating the judge on the value of certain scientific testimony).

[251] *See* discussion *supra* Part III.A. (noting situations where admitting scientific expert testimony is inappropriate and will add confusion and undue delay to the trial process).

[252] *See supra* Part II.C.3. The Federal Rules of Evidence, specifically Rule 702, assigns to the trial judge "the task of ensuring that an expert's testimony both rests on a reliable foundation and is relevant to the task at hand. Pertinent evidence based on scientifically valid principles will satisfy those demands." *Daubert*, 509 U.S. at 597.

[253] *See supra* Part II.C.3. Depending on the jurisdiction, a *Daubert* or *Frye* hearing is desired by the defendant at the pre-discovery stage of the trial and plaintiffs must be prepared to offer a convincing argument to the judge supporting the evidence. Jacobs, *supra* note 135, at 537-38.

[254] *See supra* Part III.A.2 (discussing the difficulty plaintiffs experience in *Daubert* jurisdictions when trying to meet admissibility standards).

is one issue where judges can use outside help. It is important to note that *Daubert* and *Frye* hearings are lawyer-driven rather than court-driven.[255] As a result, trial judges typically only know what each lawyer tells him or her, and very little beyond that. Thus, the key is to proactively educate the court without sounding too patronizing. Within this education process, the judge should approach pre-trial admissibility hearings with the necessary flexibility in order to give each side an appropriate and fair chance to present its evidence. Three ways for plaintiffs and defendants alike to approach *Daubert* hearings are through detailed complaints, focused discovery, and the early use of scientific requests for admission.

In most circumstances, complaints should be as simple as possible in order to not reveal too much information to the other side. However, in cases involving confusing and complex scientific evidence, it can be helpful to write a detailed complaint to educate the court on exactly what is at issue in this case. Plaintiffs may want to include scientific theories and the facts supporting the science when presenting their cause of action against the defendant. This may give the defense more time to prepare for the *Daubert* hearing, but it also structures the science in the plaintiff's terms from the outset of the case, forcing the defense to react rather than put forward their own theory.

Discovery and early scientific admission requests can also educate the court about the science surrounding the plaintiff's expert's assertions. In the case of toxic mold exposure, this involves the plaintiff including very detailed discovery requests regarding every aspect of possible exposure. Not every discovery request may be possible for the defendant to fulfill, but at least the plaintiff will demonstrate to the judge the scientific framework of the claim. This not only educates the judge about the plaintiff's claim, but it also shows the judge that a pre-discovery *Daubert* hearing is not a sufficient option because the plaintiff's expert is seeking specific facts upon which to build his or her opinion.

In sum, the key to this intended approach is for the court to act with flexibility when analyzing each of the three aforementioned ideas. Thus, if the plaintiff meets the recommendations set forth regarding detailed complaints and discovery requests, as long as the evidence is relevant, the court should favor admissibility and disregard attacks on the evidence in pre-trial *Daubert* hearings. However, it must be noted that if

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[255] *See supra* note 135 and accompanying text (discussing the premise behind *Daubert* hearings).

courts adhere to this flexible standard of relevancy, courts should not accept evidence or arguments claiming that information is only marginally relevant. Therefore, if judges abide by this flexible standard of relevancy, this will open up the door for more scientific evidence to get past pre-trial *Daubert* and *Frye* hearings.[256] This will result in more juries having the opportunity to hear evidence and testimony on scientific issues. Public policy states that when judging reliability on issues such as scientific evidence, juries rather than judges should be given the opportunity to hear and decide critical issues.[257] Ultimately, this approach will help ensure fairness and balance in the courtroom.

B. Step Two: Meaningful Appellate Review

The second part of the model judicial reasoning is to introduce a more meaningful appellate review process. Recall that in the case of *General Electric Company v. Joiner*,[258] the court held that "abuse of discretion" is the proper standard of review of a district court's evidentiary rulings.[259] The abuse of discretion standard also arguably applies to *Daubert* rulings.[260] Given that abuse of discretion is an extremely difficult standard to overcome and that a number of inconsistent rulings based on *Daubert* have hampered the concept of collateral estoppel, it would seem that the appeals court ought to have more leeway in overturning a trial judge's ruling.[261] Thus, a *de novo* standard of review seems to be the most appropriate for *Daubert* issues.[262] A *de novo* review of pre-trial hearings, such as *Daubert,* presents another occasion for plaintiffs to present their scientific evidence at the appellate level. If for no other reason, this should occur to establish uniformity of law within the federal and state court systems.

The model approach does not recommend that holdings such as *Joiner* need to be overturned. Rather, the approach calls for introducing a

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256 *See supra* note 135 (discussing pre-trial *Daubert* hearings).

257 *See supra* Part III.C (discussing public policy reasons such as fairness and jury integrity as additional reasons for favoring admissibility of scientific evidence).

258 *See* Gen. Elec. Co. v. Joiner, 522 U.S. 136, 141 (1997).

259 *Id.*

260 *See* Daubert v. Merrell Dow Pharm., 509 U.S. 579, 594-97 (1993). *Daubert* did not address the appellate review standard for evidentiary issues, but the holding did indicate that, while the Federal Rules of Evidence allow district courts to admit a somewhat broader range of scientific testimony than did prior law, they leave in place the trial judge's "gatekeeper" role of screening such evidence to ensure relevancy and reliability. *Id.*

261 *See supra* Part III.A.2 (analyzing inconsistent court rulings in *Daubert* jurisdictions).

262 *De Novo* is defined as "[a]n appeal in which the appellate court uses the trial court's record but review the evidence and law without deference to the trial court's rulings." BLACK'S LAW DICTIONARY 106 (8th ed. 2004).

more meaningful appellate review standard for *Daubert* hearings at the state level. Given the discretionary nature of *Daubert* hearings, both plaintiffs and defendants will, in some jurisdictions, come across courts that historically favor one over the other. This could be due to a number of reasons ranging from past jurisprudence to unfamiliarity. A solution to this problem is the idea that higher courts be given a second chance to review *Daubert* rulings from the lower courts. This means recognizing the problems created by *Daubert* and going beyond the abuse of a discretion standard. This is especially appropriate when considering that scientific evidence offered during *Daubert* hearings is highly based on factual evidence. Allowing both sides to present their scientific evidence a second time at the higher court level ensures that the lower court's exercise of discretion was not prejudicial in any way. Therefore, the most even-handed approach to evidentiary rulings surrounding scientific evidence should be a standard that allows the appellate court to analyze a matter as though it had not been heard before. At least with a *de novo* approach, if scientific evidence is denied admissibility a second time, there can be a better understanding of why it was not admitted, rather than more confusion, which seems to be the case surrounding *Daubert* rulings.

As this is a sample approach, federal and state courts must modify the reasoning according to the facts and arguments each party presents. However, this approach will aid the courts in addressing the Federal Rules of Evidence correctly and according to the liberal intent of the rules. The model approach suggests that courts must grant credence to both the plaintiff's and defendant's scientific evidence and analyze the evidence at pre-trial hearings with much more flexibility, thus giving each side a fair and balanced opportunity to present its claims.

Next, even if plaintiff's scientific evidence does not reach admissibility at the trial court level, the model approach suggests that a more meaningful appellate review process be put in place in order to ensure consistency, and thus bring an end to the confusion that surrounds evidentiary rulings involving scientific evidence. If federal and state courts adopt this model approach when analyzing scientific evidence, decisions will ultimately be more consistent. Consequently, if scientific evidence is looked upon more favorably by courts, new testing such as DNA extraction testing will have a better possibility of being admitted.

V. CONCLUSION

The importance of the toxic mold problem is reflected in the amount of mold-related cases across the nation. With more and more people experiencing adverse health effects and thus abandoning their homes and workplaces, the significance surrounding toxic mold litigation is increasing. The arrival of mold exposure litigation suggests a close examination of scientific expert admissibility standards. Although federal courts have yet to address the issue of admissibility of DNA extraction testing in the context of mold litigation, the volume of mold-related personal injury cases on national and local levels suggests that courts will soon be forced to do so. When courts apply the federal standards governing admissibility of scientific expert testing to DNA extraction testing, the testing will meet the relevancy and reliability requirements set out by the established rules and guidelines. Thus, when faced with mold exposure cases, federal and state courts should admit scientific expert testimony on DNA extraction testing pursuant to the Federal Rules of Evidence.

Reid S. Hooper[263]

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[263] B.B.A. '03, The George Washington University; M.S. '05 Valparaiso University; J.D. '08 Valparaiso University. This Note was inspired by my father and the breakthrough medical work he has accomplished in the area of toxic mold. Thus, I would like to first dedicate this Note to my father, Dr. Dennis G. Hooper. Second, I thank RealTime Labs for providing much of the research used in this Note and also for their continued support throughout the writing process. Third, I would like to thank my family and, of course, the love of my life, Monika Danko, for putting up with me during the very long one year progression of writing and editing. Forth, I want to thank two friends, Zach Hesselbaum and Seth Colclasure, who tolerated my erratic behavior and continued stress during the writing of this Note. Finally, I hope this Note improves the chances of those who have been negatively affected by toxic mold to receive the necessary justice that they desperately deserve.