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PROVING CAUSATION IN TOXIC TORT CLAIMS:

WILL THE JUDICIARY BEND?

A Thesis

Presented to

The Judge Advocate General's School, United States Army

The opinions and conclusions expressed herein are those of the author and do not necessarily represent the views of either The Judge Advocate General's School, the United States Army, or any other governmental agency.

by Captain Lyle Moe, JAGC

United States Army

39TH JUDGE ADVOCATE OFFICER GRADUATE COURSE

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PROVING CAUSATION IN TOXIC TORT CLAIMS:

WILL THE JUDICIARY BEND?

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ABSTRACT: This thesis examines causation standards traditionally applied to claims brought for personal injury resulting from toxic torts. The background and unique nature of the area of toxic torts are examined to determine why traditional rules of causation often bring inequitable results. Models for new causation standards are discussed which propose different rules in an attempt to more accurately meet the realities of claims which do not fit well under the existing tort structure. Recent caselaw is reviewed to determine whether the judiciary is modifying toxic tort causation standards or if it continues to apply traditional tort rules to such claims. This thesis concludes that courts are reluctant to carve out different standards to accommodate the complex nature of these claims.

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I. Introduction

A. A Model Case Involving Toxic Torts[1]

Joe and Jan Johnson lived in a large city for thirty years. Upon retirement, the Johnsons decided to move to lake country. They selected a lot on the edge of Lottery Lake where they planned to live their retirement years in peace and tranquility.

Unknown to the Johnsons, 20 miles to the north of their property, Mop Manufacturing had a large furniture plant. Mop dumped their waste products in a metal holding pit five miles to the west of the plant and burned them. When the holding pit was full, the ashes were hauled to an open landfill another mile down the road. The ashes were leveled out over a mile square area and left to decompose. Rainfall washed the ash residue into several nearby streams and a large marsh.

Unknown to anyone at the time, the waste from Mop Manufacturing contained chemicals which were carcinogenic[2] to humans. One of these chemicals, benzene, was known to cause cell damage in humans even in low doses. A second chemical, trichorethylene (TCE), was also known to cause genetic damage.

Five years after settling into their new home, Joe developed an irritating rash on his left leg and later a hacking cough and a slight fever that refused to go away. Three years later, Joe developed stomach cancer and he died nine years after moving into his retirement home. An autopsy revealed that Joe's body contained high concentrations of benzene and TCE. Jan was then tested and she had similar concentrations of the chemicals in her body.

State and federal agencies were notified and they immediately sought the source of the chemical. Tests revealed that the source of the contamination was Mop Company. Its waste products contained various cleaning and polishing materials that broke down into the dangerous chemicals.

At this time, occupants of two nearby homes were surveyed to determine the state of their health. Paul and Pat Parker lived in the first home and Steve and Sue Smith lived several miles away. Paul Parker died the previous year of colon cancer after exhibiting the same symptoms as Joe Johnson. Pat Parker felt fine except for some numbness in her ankles. Sue Smith had several malignant stomach tumors removed and presently had digestive problems. Steve Smith had problems with a rash but otherwise felt good. And finally, Jan Johnson had a slight rash on her arm and several years ago, she unexpectedly lost the vision in her right eye. During the first physical, Doctors

confirmed that Jan, Pat, Steve and Sue all had over two times the acceptable level of benzene and TCE in their bodies.

Jan Johnson, Pat Parker and Steve and Sue Smith sued Mop Company for damages based on theories of negligence and strict liability. Jan sued for emotional distress resulting from contamination of her drinking water, a wrongful death action on behalf of her husband and for an enhanced risk[3] of future injuries. Jan was awarded damages for the wrongful death of her husband but was denied damages for emotional distress and enhanced risk because she had no physical injury which could be traced to Mop Company's actions. Three years later, Jan developed the very same cancer as her late husband and she then sued for present injury and for emotional distress. Mop Company was awarded a summary judgment dismissal in their favor because these claims were not brought in the initial suit.

Pat Parker sued for the wrongful death of her husband and for enhanced risk of future injury. She was awarded damages for the wrongful death claim but was denied damages for the enhanced risk claim because again she did not exhibit a present injury. At trial, three experts testified that it was very possible that she would contract cancer. She also claimed that she was forced to bring the suit prematurely or she would exceed the two year statute of limitations. Nevertheless, the court ruled against her stating that the evidence was

based on statistics and not a direct correlation involving benzene or TCE. Four years later she developed the same type of cancer as her late husband. She then sued for present injury, emotional distress and enhanced risk of future injury. The court summarily dismissed this second claim by concluding that she already had her day in court against Mop Company and she could not now bring further personal injury claims against them.

Sue Smith sued on the basis of present injury and claimed that her stomach tumors were a direct result of the benzene in her body and she had four experts testify to this fact. They each said it was very possible that the tumors were triggered by the chemical but they could not say so within a medical probability. The defendant's presented voluminous amounts of epidemiological studies and other expert testimony that contradicted plaintiff's evidence. Additionally, the defendants noted that Sue Smith was always a heavy smoker. The court determined that Sue had not met the burden of proof for present injury and thus she could not claim emotional distress and enhanced risk of future injury. Steve Smith was also denied recovery because the court determined that his rash could not be adequately linked to the chemicals in question even though four experts testified his type of rash only accompanies the onset of severe health problems associated with benzine ingestion. However, the court felt that the plaintiff's evidence was not sufficiently documented by adequate epidemiologic research.

Thus, in the above fact situation, only Jan and Pat received damages but in each case the award was for the wrongful death of their husbands. The remaining claims were all dismissed for various reasons. Ten years after the first litigation, all four plaintiffs had died from a cancer similar to the type exhibited by Joe Johnson and Pat Parker over a decade earlier. None of the four recovered damages for lengthy hospital stays, extreme pain and suffering, private medical care, constant fear of death from cancer, or for premature death. After the initial litigation, Mop changed their methods of waste disposal and they now bury large cannisters of waste underground in the landfill. Several of the cannisters have already ruptured and their contents now leach into the water supply. Meanwhile the lakeshore where the plaintiffs once lived has already been developed into a popular vacation area with over 150 lake cabins for rent throughout the year.

B. Complex Problems Associated With Toxic Tort Claims

The Lottery Lake situation presents issues which arise every day throughout the country. People commonly sue for damages resulting from pollution, spills, and contamination from public and private activities. Many of the claims involve "toxic torts" which have characteristics unlike that of other personal injury claims.

A toxic tort is most commonly defined as a case involving a personal injury resulting from exposure to a toxic substance which may be chemical, biological or a radiological agent. Generally the injury results from genetic or biochemical disruption, exposure is usually chronic and repeated and the injury shows up after a delay or latency period.[4] For example, in the Lottery Lake situation, the chemicals benzene and TCE were known to be carcinogenic to humans. Exposure occurred every time the plaintiffs drank water from their wells over a period of five to ten years. Although several of those exposed contracted cancer within five years, others did not exhibit the same symptoms until ten years later.

A major problem associated with toxic tort litigation is the delay from the time of the exposure to the chemical or biological substance until evidence is presented in court. For example, no appeals court upheld a damage claim against an asbestos manufacturer until 1973 even though cases of asbestosis[5] were reported as early as 1924.[6] Delays occur because scientists must conduct epidemiological studies to quantify the effect a chemical may have on humans. These studies require a large number of individuals exposed to a chemical compared against a large sample of the population that was not exposed to the chemical. A large group exposed over a greater period of time usually results in a more accurate study.[7]

Although an individual is ill for months, it may be difficult to link his symptoms to any type of toxic chemical until it is too late. Effects vary depending on the individual, the dose involved and the frequency of the occurrence.[8] For example, the symptoms found with low-level exposure to PBB (polybrominated biphenyls) include: nausea, dizziness, depression, nervousness, tiredness, loss of balance, muscle weakness, and blurred vision.[9] If a worker exposed to such a chemical is in his late fifties or early sixties, he may initially believe such symptoms are a natural result of the aging process. As a result, he may fail to seek necessary medical care.

It is often difficult for the plaintiff to prove that a chemical caused a specific physical injury. In one case, a worker assembled nuclear weapons for several years and Film badges used to record dosage levels of radiation indicated that he had been exposed on several occasions. He also worked as a material handler without a Firm badge so his total exposure was unknown. He later developed cancer and died. His estate sued and several doctors testified that the cancer could have been caused by the radiation and that the plaintiffs tumors possibly arose from the radiation. The court dismissed the action because the experts could not state the cause of the cancer to a reasonable medical certainty. Therefore, there was not enough evidence of causation to allow a jury to decide the issue.[10]

In another case, Vietnam veterans and members of their families sued to recover for personal injuries allegedly caused by Agent Orange, a defoliant used during the Vietnam War to expose enemy ground troops.[11] Plaintiff's experts relied on over thirty-four pages of medical and scientific evidence consisting of epidemiological studies and animal studies. The court determined that the epidemiological studies were inconclusive, the animal studies were inadmissible, the plaintiff's expert's testimony was unreliable.[12] Therefore, the court granted the defendant's motion for summary judgment.[13]

More recently, plaintiffs claimed damages for exposure to trichloroethylene (TCE) and other chemical discharges.[14] As in the Agent Orange case, the plaintiffs were confronted with the issue of whether their expert testimony was reliable and relevant.[15] The court held that the law does not limit toxic tort plaintiffs solely to epidemiological proof. They also held that the plaintiffs' experts could testify regarding their studies and beliefs and that the jury could resolve such a disputed factual issue as causation.[16]

In a similar case, the plaintiff sought to prove that a flu shot caused his multiple sclerosis (MS)[17]. The plaintiff presented evidence of the proximity between his vaccination and the disease, known links between other vaccines and MS, known links between the flu vaccine and other neurological ailments, and the similarity between MS and the

condition that is a known result of the vaccine. The court held that it would only allow causation to be proved by epidemiological evidence and that neither side had provided such information.

The above cases indicate that plaintiffs are faced with different acceptable methods of proof of harm as well as varying burdens of proof. Again, the nature of the toxic tort claim results in inconsistent opinions on whether the plaintiff has actually suffered any real harm.

Discovering when a person is suffering from a disease as a result of chemical exposure can present numerous problems. Symptoms include increased blood pressure, decreases in the number of red blood cells, increases in white blood cells, increases in specific enzymes, decreases in the rate of nerve impulse transmission, rashes, and IQ and personality trait changes.[18] Effects may be subtle and remain undetected until a disease has progressed to an advanced stage. Even where there are minor dosages of toxic chemicals, however, carcinogenic effects have been documented.[19] Even a small dose of a chemical can be harmful if the system being attacked has little regenerative capacity such as the nervous system. In cases that involve chronic ingestion such as the Lottery Lake case, clinical tests for a chemical are usually negative even though the symptomatology is clear.[20] Normally the first indications of chemically caused disease are neurological. As the exposure increases, clear clinical effects can be

found. Eventually the dose rises until death is the immediate result of the exposure.[21] Therefore, if a claim is brought early, if may be extremely difficult to show physical injury which forms the basis for other claims. If a case is brought late, time may have erased the memories of witnesses and records of exposure.

Those responsible for chemical contamination are at an advantage when a plaintiff attempts to prove injuries resulted from exposure to a given chemical. "The amount of research that would have to be done to specify all the possible effects of the ten most commonly found organic contaminants in drinking water is unbelievable. If a single dose level in a single animal species were to be tested, there would have to be 603 different experiments. If a full protocol of two species, two sexes, and three doses were used, 1.16 x 10[14] tests would have to be conducted. That is 100 thousand billion tests for a mere ten chemicals. Even the tests that are being done, are aimed at cancer, and not the debilitating subliminal toxic effects."[22] Further complicating factors are that it can take forty years for a disease to appear after ongoing low dose exposure to a toxic chemical. During that time period, a person may be subjected to a wide range of other diseases and chemicals. Or, he may be a heavy smoker or maintain a poor diet. If or when he does decide that there is a correlation between his disease and his work or his disease and another party's activities, it may be impossible to prove the extent of his exposure. Adequate

records and testimony will usually be nonexistent.[23]

Another interesting factor into the equation of toxic tort litigation is how much risk the public is willing to take. The public readily accepts some things and would not think of permitting other things. Risks resulting from naturally occurring contaminants are accepted about twenty times more readily than those due to man-made sources and risks taken voluntarily are about a hundred times more acceptable than risks taken involuntarily.[24] Thus depending on the person, X may feel the nature of his work with nuclear components requires that he takes risks and that certain health hazards cannot be avoided. He may feel that his job is like that of a physician who makes his rounds every day in a busy hospital. In order to do his job well, the doctor cannot continuously think about what disease each patient may have and how it will affect him in the future. Likewise Y may actually expect that his life will be short because of the nature of his work and from experience with co-workers health problems. In such case he may not consider bringing a claim for injury no matter what occurs. In each company there could be thousands like him who could provide valuable and significant data on causation but they will never step forward to reveal their health history. Conversely, there may be just as many people who feel that they should be fully protected against health hazards on the job regardless of warnings, prior knowledge or the nature of their work. These people may deluge the courts with claims

even when no evidence other than exposure is available.

The important question is who is the real victim that should be compensated. There must be consistent guidelines on causation, sufficiency of evidence, reliability of testimony and relevancy of various studies so that both the plaintiff and the defendant know where they stand in a toxic tort suit. Claimants with fears of injury or increased future risk of injury who have not yet suffered any identifiable present harm may have exhausted much of the defendant's assets before those with more identifiable and immediate claims even began to litigate.[25]

II. Background of Damage Claims in Toxic Tort Cases

Claims for injury in the toxic tort area have centered around four main areas[26] and have been brought on various theories including products liability, negligence, and strict liability.[27] An examination of the types of claims exposes the traditional attitude of the judicial system to relatively new causes of action.

A. Common Types of Claims for Damages

1. Claims for Physical Disease and Present Injury

Two cases best illustrate the nature of the issues surrounding claims for present injury in a toxic tort case. In the first, the court was faced with a claim by the family of X who had worked for a manufacturing company for the past fourteen years.[28] The family brought a claim under a wrongful death statute since the worker had died from cancer of his colon and liver. X worked in a battery plant which produced nickel/cadmium batteries. He was never directly involved with the production of the batteries but his job required that he visit the plant periodically. During such visits he was exposed to fumes from the manufacturing process. The plaintiffs claimed that the fumes contained chemicals that caused the cancer that resulted in his death.[29]

The plaintiffs produced an expert witness who testified that the cancer that caused the death of X was more likely than not, caused by his exposure to toxic fumes during his lifetime. The expert's opinion was derived from extensive research and investigation and he testified to a reasonable medical probability.[30] The lower court concluded that the expert had not properly determined the composition of the fumes and the amount of exposure. They also determined that the expert's analysis of the cause of cancer was not proper and that the opinion of the defendant's expert was more probable. The lower court ruled that the plaintiff's expert testimony was inadmissible because it was not based on epidemiological, animal, or in vitro studies showing a significant link between the disease of the plaintiff and the purported

cause.[31] The court of appeals, however, determined that the lower court should have permitted the plaintiffs to present their evidence to the jury who could then give the appropriate weight to the testimony. They held that epidemiological studies are not required to establish a cause-effect relationship in all toxic tort cases and that a plaintiff in a tort suit is not required to show scientific certainty but legal sufficiency. Therefore, an expert's opinion need not be generally accepted in the scientific community before it is allowed to be submitted to the jury.[32]

In reaching their decision, the appeals court noted a case which reached the opposite conclusion. In the Brock case, which involved the birth control drug Bendectin, the court had determined that statistically significant epidemiological proof that the drug was a teratogen[33] was required before the plaintiff could allege that the drug caused her child's birth defects.[34] Even though the Brock court declined to hold that epidemiologic proof is necessary in all toxic tort cases,[35] the fact that opposite conclusions are reached in the same circuit on the same issue of causation, indicates the problems a prospective plaintiff faces when deciding how or even where to bring suit against a party responsible for his injury.

A second case concerning present injury claims involved several plaintiffs who had ingested water from wells contaminated by a

chemical company.[36] Symptoms included frequent headaches, dizziness, nose bleeds, sore throat, nausea, and frequent vomiting and loss of liver and kidney functions. The court permitted plaintiff's experts to testify about loss of kidney and liver functions since they testified to a reasonable medical certainty.[37] The defendants, however, argued that the lower court had erroneously awarded damages for impairment to immune systems and learning disorders. The defendant's claimed that evidence was not in conformity with a generally accepted explanatory theory.[38] The court determined that without the requisite clinical tests and a widely accepted medical basis for reaching conclusions in the case, the plaintiff's experts' opinions were insufficient to sustain the burden of proof that the contaminated water damaged the plaintiffs' immune system.[39]

Both of the above cases indicate that although a plaintiff has what appears to be a well-documented claim against the defendant in a toxic tort case, it may be very difficult to keep the case in court. The plaintiff has to be more than exposed to a toxic chemical, he must be harmed in a manner acceptable to the court.

2. Claims for Mental Distress

A common claim in a toxic tort case is cancer phobia or anxiety from fear of developing cancer in the future.[40] Courts that consider

this claim usually allow damages if there is an underlying physical condition that is present and if the plaintiff can give the necessary amount of proof needed to show that his fear is real. To do so, the plaintiff must demonstrate a likelihood that he will contract future disease.[41]

In a recent case,[42] the court determined that the plaintiff must suffer a contemporaneous physical injury; or have been in some personal physical danger caused by the defendant's negligence and manifest physical symptoms of the distress; or have been subject to an underlying tort involving a direct invasion of the plaintiff's rights, such as defamation or malicious prosecution before he could recover for emotional distress. The court further determined that subcellular harm was not sufficient to support emotional distress damages but they would allow such damages if the plaintiff could prove physical danger or an underlying tort such as battery.[43]

In another case,[44] the court considered whether a plaintiff should be compensated for mental anguish after being exposed to a chemical which could cause a latent disease even though that disease was not medically probable. The court examined a number of cases where plaintiffs recovered for fear of paralysis, fear of hydrophobia, lockjaw, or blood poisoning and noted that none of them even considered the concept of probability. In this case, the plaintiff was injured by the

accumulation of asbestos fibers in his lungs. Plaintiff's experts had determined that there was a connection between asbestos exposure and both mesothelioma and cancer. The court reasoned that mental anguish would reasonably follow after the plaintiff was informed by his physician, who is certainly a reliable source, that he now had a heightened risk of developing deadly diseases.[45] Thus, the court determined that the plaintiff should be compensated for mental anguish proximately caused by exposure to asbestos, even though the evidence raised a substantial concern and not a medical probability.[46]

Therefore, the court awarded damages for subjective fear of disease that could reasonably occur based on expert testimony. The court did not draw lines or define a mandatory threshold for causation Recent cases seem to engage in a similar case by case analysis and allow a much more liberal examination of the sufficiency of the plaintiff's case when confronted with mental distress claims.

3. Medical Surveillance Claims

Claims for medical surveillance are claims for the expense of ongoing medical monitoring of a plaintiff's health after exposure to a toxic chemical. [47] In such instances, a doctor has advised the plaintiff to seek periodic checkups after exposure to a toxic chemical. Such visits may extend over a period of five to 20 years depending on the

average latency period of the effects of some chemicals. The plaintiff may spend thousands of dollars a year for medical treatment and still not manifest an illness or physical injury that requires immediate attention. Courts normally allow such damages but the recovery is limited by how well the plaintiff proves his claim.[48] Courts are divided on the issue of whether such costs should be allowed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), one of the many federal statutes governing toxic pollution,[49] but most allow payment of such claims under common law theories of negligence.[50]

Medical surveillance is allowed based on the rationale that it is consistent with well-accepted legal principles, it encourages individuals exposed to hazardous chemical to seek regular medical checkups to foster early detection and treatment of a disease, and that it actually deters polluters because of the significant liability involved.[51] It is also seen as a more equitable measure since the individual has been wrongfully exposed to dangerous chemicals and he should not have to pay his own expenses when medical intervention is necessary. Also, public health interests justify judicial intervention even when the risk of disease is problematic.[52] Most cases allow for such claims if the plaintiff can prove the extent of his exposure to chemicals, the toxicity of the chemicals, the types of diseases for which the plaintiff is now at risk, and that such surveillance is reasonable and

necessary.[53]

Therefore, medical monitoring is allowed if the plaintiff can properly prove his case. This concept seems consistent not only with basic legal principles but also with common sense and equity. If such costs were not allowed those responsible for contamination could escape liability until a potential plaintiff actually became sick. Not only would the responsible party escape the expense of his mistake, but the victim would pay for extensive medical care for a considerable amount of time.

4. Enhanced Risk Claims

Claims for enhanced risk of future injury are based on the fact that a person has been exposed to a chemical which will later cause disease or injury; therefore, he should be compensated now.[54] One expert testifying in a toxic tort case gave the following analogy which describes the nature of the claim. He noted that the effect of exposure to carcinogenic materials is like a switch which when turned on affects the genetic material and may or may not result in cancer. The process may take 20 or 30 years from the time of exposure before cancer appears in a person. What we do know is that there is a progression of steps that occur and that when a switch is turned on, it is usually not turned off. Out of millions of cells in the body, you may

get a switch turned on. That is the damage that occurs from the exposure. Then, there is an increased risk of getting cancer but some individuals may not get the disease. Other factors in life may eliminate or reduce the risk of cancer. But, scientists believe that in many cases, the first switch causes more switches to be flipped, ultimately resulting in cancer.[55]

Most courts have been reluctant to allow claims for potential but unrealized injury unless there is substantial proof that injury could occur.[56] For example, if X breathes fumes from a broken gas line while employed at a factory, those fumes may contain known toxins. Some co-workers in the same work area may die immediately from the exposure, and others may be hospitalized. X may have smelled the vapors but immediately left the area and suffered no adverse effects. Five years later he learns that he was exposed to a dangerous and deadly vapor. Even now, he has never been sick. The problem then becomes whether X is a victim who should receive damages now since it is inevitable that he will contract lung cancer within twenty years.

Many courts deny the claim for increased risk of damages based on several policy reasons. First, the potential for speculative lawsuits is endless. It would be impossible to predict how and when you could draw the line to say that someone's injury is much more potentially dangerous than someone else's if no physical manifestation has

occurred. Also, inevitable inequity would result if no underlying physical harm was required since those who do actually develop cancer would be significantly undercompensated and those who do not develop the disease would have a windfall.[57]

Courts vary on the standards of proof required before permitting an award for enhanced risk of future harm. Some require a medical certainty of future harm, some require a reasonable certainty and others allow the claim only when the plaintiff exhibits some present manifestation of the disease.[58] Still other courts have allowed such a claim where there is less than a 50 percent chance of contracting a disease in the future.[59] Therefore, although burdens of proof for increased risk of future disease claims vary widely, the claim is recognized since there is an unquantified injury to a person's health and to their life expectancy. Because of problems of time, proof and the nature of diseases accompanying most toxic tort injuries, common sense dictates that the plaintiff be presently compensated for his injury if he meets the required criteria set out by the court.

The next section discusses problems that are common to various theories of recovery in toxic tort claims. Some problems arise from the nature of the tort and others arise from the nature of the traditional law applied to these claims.

B. Evidentiary Problems in Toxic Tort Cases

Various problems in toxic tort litigation center around the evidence used to prove the plaintiff's case. Issues of reliability, relevancy and sufficiency of the evidence are often litigated. These problems coupled with the courts reluctance to permit variance from standards derived from the conventional tort arena results in a certain amount of inconsistency and vagueness even within the same jurisdictions. The following sections discuss these problems.

1. Types of Evidence

As noted before, a lawsuit cannot be based only on the mere possibility of some future harm. Plaintiffs often introduce evidence derived from epidemiological studies and risk assessment. Such studies show the increased risk of disease in the future and predict whether someone exposed to a certain chemical could contract a specific disease. Even where a court permits recovery for diagnostic examinations without an actual physical injury, recovery is not allowed if the injury is speculative or resistant to proof.[60] Thus, the important consideration is the type of evidence that courts will permit to prove toxic tort claims.

The methods used to prove causation in toxic torts normally deal

with mathematical predictions of disease in a group of people. Many intervening factors are not considered and many others have to be assumed. But, it is virtually impossible to prove direct causation which distinguishes these cases from other personal injury claims. Cancers and mutations provide no physical evidence of the cause of the change. Therefore, direct examination or observation of an individual is of little value.[61]

Epidemiological evidence is often used to assess causation especially where there are multiple substances known to be associated with a particular disease or which will increase the risk of contracting a disease. This method either compares the incidence of disease across exposed and unexposed populations, or it compares the incidence of exposure across sick and healthy populations.[62] The problem is that such data can only approximate the percentages of causation. There will be physical differences, genetic differences, differences in diet, health patterns, and sleep patterns. Even a slight change in location can dramatically alter risk percentages.[63]

Quantitative risk assessment is also used to prove causation. This method is similar to that of epidemiology except predictions are based on the number of individuals afflicted with certain diseases in a particular area. It is a statistical process that uses data from laboratory tests or epidemiological studies to predict the number of

cancer cases resulting from exposure to a specific toxic substance.[64] Regulators use quantitative assessments to establish industry standards for toxic chemical exposure. In fact there is really no other way to set such standards. The only other alternative would be to ban any substance suspected of being a carcinogen or to directly expose individuals to possible carcinogens to provide data. Neither of these methods are acceptable. Therefore, we can only approximate standards by mathematical equations.[65] So, an individual is protected by measurements based on reported occurrences by his fellow man. The potential for imprecision and failure to detect is immense.

Sufficient evidence for regulatory proceedings may not be adequate in a civil case. Regulatory action can allow more uncertainties. The standard of proof in a regulatory action is that a reasonable medical concern exists while civil liability is based on a preponderance of the evidence.[66] Throughout the analysis, however, the 50 percent required by the preponderance standard always rests on major uncertainties. Too much data for quantitative studies is derived from animal analysis. There may be no biological similarities between the experiment and the effect on a human. Other factors such as the amount of the dose, the scientific procedure employed, the number of subjects tested and the interpretation of the data may all taint the conclusion that humans would be affected in a similar way.[67]

These issues are often raised in civil suits for damages and line drawing is the natural outcome. Damages are awarded based on events that have already occurred, that of the exposure to the chemical. But, the value of a claim may depend on whether another event will ever occur. In such case, the defendant's subsequent conduct may be the overriding cause. Perhaps a person smokes two packs of cigarettes a day. Or each evening, he spend four hours in his hobby shop working with cleaning solvents and paint while he restores his favorite car. Thus, enhanced risk claims, mental distress claims and even claims for medical surveillance are always contingent on events other than the initial chemical exposure which is the focus of litigation. Very often juries are asked to award damages for diseases that will never develop.[68]

A third type of evidence that must be available to give credence to epidemiological or quantitative risk data is expert testimony. Courts will be quite liberal in admitting expert testimony derived from well recognized scientific principles; however the method of evidence must be sufficiently established to have gained general acceptance in the particular field in which it belongs.[69] Federal Rule of Evidence 702 provides that if scientific, technical or other specialized knowledge will aid in understanding the evidence or to determine a fact, a witness may testify about the matter as an expert if he is qualified by knowledge, skill, experience, training, or education. Testimony of an expert is

admissible if he is a qualified expert testifying on a proper subject which is in conformity with a generally accepted explanatory theory, the probative value of which outweighs its prejudicial effect.[70]

What is generally accepted can be a particular problem in toxic litigation. For example, in Agent Orange litigation,[71] the plaintiffs used evidence derived from studies of laboratory animals subjected to extreme exposure to agent orange with unknown human significance. Some of the experiments were new and had not been done before and others involved a type of exposure that would be different from that of the actual exposure in Vietnam. The plaintiffs were asked to produce other epidemiological studies to quantify the probability that their injuries were caused by the herbicide. Such records could not be obtained primarily because of the inadequate records and the passage of time. The district court determined that the expert testimony presented was not adequate to show that the agent could have caused the plaintiff's illness. At the same time, the defendants used state and federal government studies and agency studies that showed the effects of Agent Orange on veterans. These studies were found to be reliable and acceptable.[72] This case demonstrates the obstacles facing a plaintiff when confronting a defendant with resources far superior to his own.

In a related Agent Orange case,[73] the appeals court affirmed the

the district court's dismissal of a damage case and noted that expert testimony did not show that the chemical harmed humans. The court said the question was not what the dioxin will do to animals or even what it will do to humans exposed to it in an industrial accident. The relevant question was what agent orange will do to friendly personnel exposed to it. The court also noted that when an epidemiological study is done by a public agency, there is a presumption of admissibility countered only by showing the report's untrustworthiness.[74] The reasoning of this case seems to avoid the real issue of causation and get bogged down in the facts.

Another example of the treatment of expert testimony is Johnson v. United States.[75] There the court determined that expert testimony could not be admitted because the witnesses could not provide reliable information. The court made such an observation because neither expert served on national committees on the subject, neither agreed with other reliable reports and both used statistical methods that were not normally used by experts in that particular field of science. The court said that when the existence of an effect is only hypothetical theory, then the calculation should not be accepted as valid evidence on causation.[76] Here the court seems to step into the scientific realm and make judgments on what is acceptable evidence for experts to use.

Conversely, the court in Kehm v. Procter & Gamble,[77] considered government epidemiological studies on toxic shock syndrome even though defendants claimed that such evidence was not factual findings and not based on tests done by qualified experts in the field. The court determined that the procedures were widely accepted in the field of epidemiology, the investigations were trustworthy, and the methods used to collect the information was reliable.[78]

Therefore, from the previous cases, it is clear that the court has to make a subjective determination of the validity of various scientific studies. Regardless of the number of experts, the number of experiments, or the standard of proof cited by the court in a particular case, the decision has to be on a case by case basis. No strict quidelines can be employed when experts oppose each other. The plaintiff may feel like he is rolling the dice. The court's subjective determination of relevancy and reliability is actually based on a subjective determination by the experts of their tests and extrapolations.

Because of the uncertainties of the effect of a toxic substance, admission of expert testimony in civil litigation cannot be based on an objective checklist of criteria. Unlike negligence in an automobile case where the trier of fact can immediately see the damage caused by the drunk driver or examine the cause and effect of a broken bone, many

future damage awards and even present damage awards in the toxic tort arena must be based on some degree of speculation. A sobering example of this is despite all the years of testing and years of litigation, exactly how asbestos fibers affect the body in a way that cancer occurs in not known. Despite countless dollars on research, neither the causes of cancer in humans or the mechanisms by which cancer develops are known. Scientists only know that exposure to certain chemicals causes cancer to occur more frequently to those exposed that to those not exposed.[79] Therefore, if present damages must be measured by imprecise expert determination, the confusion and uncertainty is magnified when determining damages for future injuries.

2. Standards of Proof

Much of the speculation and litigation in a toxic tort case centers around the risk of future disease claims since as noted above, the effects may not appear for years. Courts impose various standards of proof in such claims. Most courts describe the required appropriate standard of proof in terms of reasonable certainty or reasonable probability but other terms such as in all likelihood, reasonably probable, medically probable, probable, more probable than not, a probability, more likely than not, greater than fifty percent, reasonable medical certainty or any combination of these terms have been applied in future injury claims.[80] Such a maze of choices results in a lack of

meaning and precision when applied to a future damage claim. An example of the meaningless standard of proof that results is illustrated in Stites v. Sundstrand Heat Transfer, Inc.,[81] where the court dealt with contaminated drinking water. Landowners ingested trichloroethylene (TCE) seeping from a manufacturing plant. Plaintiffs sought damages for increased risk of cancer. The manufacturer claimed that TCE was not even a carcinogen and that the residents were exposed to only a mild dose. The landowners claimed that TCE had damaged their immune systems and thus they had a greatly increased risk of a number of illnesses including cancer. The federal district court granted the defendant's motion for summary judgment and said for damages based on future consequences, the plaintiffs must demonstrate with a reasonable certainty that the consequences will occur. They further defined reasonable certainty as "more than a reasonable probability, describes the highest degree of probability, and has practically the same meaning as in all likelihood."[82] When a court articulates such a meaningless standard, frustration by future litigants in inevitable.

Before a plaintiff can recover for a risk of future injury, he must first demonstrate that he has suffered a present injury. Traditionally, plaintiffs can satisfy this requirement by proving that a victim is suffering from a physical injury that is symptom-producing.[83] In the toxic tort area, a disease may not manifest itself for years so claims must be based on probabilities. Most courts still require symptomatic

physical injuries before they will consider the question of increased risk of future harm.[84]

Thus, very often a plaintiff will face an almost impossible task of proving a claim by groups of experts even though experience shows that a specific disease after exposure is almost certain. For example, X may have been drinking contaminated groundwater for years. Before he decides to present his case, he must pour over ill-defined standards of proof to decide whether he should bring his case. He must also consider if the cost outweighs the benefit. From the cases discussed, very often the defendant's evidence seems to carry a additional weight because most courts stress the potential for unlimited litigation. The avenues of proof available for the plaintiff include statistics, comparisons and expert testimony all of which is may be cost prohibitive for the average plaintiff. The result is that large class actions are brought for reasons of economy and public perception. In such cases, some members of the class may never get their day in court because procedural complexities cause the matter to take years for completion. The end result can be that an individual or family who innocently drank tapwater could encounter longterm disease and eventually death and yet are only perceived as numbers in a class action that never quite made it to court.

A clear example is the Ayers case[85] where 339 residents of Jackson Township in the state of New Jersey ingested water

contaminated by toxic pollutants leaching into their water supply from a landfill established by the township. One landfill was the subject of many complaints and had been cited by the state for various violations. The township opened another landfill in 1972 where they did not monitor the quantity and types of wastes dumped and they ignored their duty to control where and how wastes were deposited. Experts testified that potential effects of the chemicals involved included liver and kidney damage, mutations and alterations in genetic material, damage to blood and reproductive systems, neurological damage and skin irritations. In November 1978, the residents were told by their local board of health not to drink their water and to limit washing and bathing to avoid prolonged exposure to the water. The township placed 40 gallon water barrels outside of each residents home for drinking and bathing water. The barrels were often filled with dirt and debris and froze over when the weather was cold. Litigation and appeal of this case took until 1987. Even though the court stated that the jury could have reasonably inferred that future risk was medically significant, it denied the cause of action for increased risk of injury because the court characterized the proof as unquantified.[86]

A practical analysis of this case is quite sobering. Until some actual physical injuries occur, the defendant in such a situation would not have to concern itself with the legal implications of its pollution and negligence for years, even where the state health department has

closed down a water source. A homeowner unable to leave the area would face financial ruin since his real estate would undoubtedly be worthless. Damage to his health would be inevitable and perhaps he would not began to see compensation for twenty to thirty years. Even then, the defendant may be insolvent or plaintiff's recovery will be miniscule because of the large number of claims.

3. Practical Problems[87]

In addition to the problems of causation and economics, the plaintiff also must show correlation between his evidence and his claim. As in the Agent Orange litigation, animal studies and empirical studies without proper expert testimony may not keep the plaintiff in court. In addition, there may be interactions of chemicals that cause unknown effects that again require a complete new approach. Toxic torts by definition involve latency periods that not only affect causation but also make it next to impossible to maintain records and establish events that may have occurred fifteen years ago. A chemical may also affect a male differently than a female or one race different than another since often the extent of damage hinges on the genetic makeup of the affected person. Of course age is always an important factor. It may preclude recovery if a victim is advanced in age or drastically alter the effects of a chemical in the event the victim is still in his formative years.

Additionally, different chemicals have different triggering levels

at which they began to manifest toxic or irreversible effects. One chemical may trigger a tumor in three years, another not until fifteen years later, but in both cases, the genetic alteration occurred at the time of exposure. And, different contaminants have widely varying potencies. Though twelve different chemicals exist in a water source, perhaps only three exist in high enough doses to trigger toxicity. The plaintiff may impeach his own case should his evidence focus on the wrong data.

All of the above factors are practical roadblocks to the successful litigation of a toxic tort case. Besides the legal and procedural factors, the plaintiff must also make certain he is pursuing all potential claims. The inhalation of asbestos fibers for example, causes or increases three different diseases.[88] Asbestosis is the most common type of asbestos related diseases. It is nonmalignant and is characterized by scarring of the lungs. The disease is not always fatal, but can be disabling because of the decline in pulmonary function. The time between exposure to asbestos and the development of the disease is between ten and forty years.

The second related disease is lung cancer. The connection between exposure to asbestos and the development of lung cancer is based on epidemiological studies. The combination of cigarette smoking and exposure to asbestos appears to present a greater risk of lung

cancer than does either alone.

Third, an individual may suffer from mesothelioma which is a malignant tumor which arises in the membrane lining the lungs and the chest cavity. This may develop with only minimal exposure to asbestos. The latency period between exposure and onset of mesothelioma is twenty-five to forty years.

In addition to the above, the jury weighs the conflicting evidence and inferences and determines the credibility of witnesses. They must determine the facts and sort out even the most technical evidence. Few if any will have the scientific expertise to accurately determine damages. In those cases where there are boxes of evidence and years of testimony to be weighed, one wonders how a decision is determined. As can be seen by the cases discussed in the next section, hard and fast rules in the area of toxic torts seldom exist.

4. Judicial Treatment

A fourth area that complicates the litigation of toxic tort claims is the judicial treatment of increased risk of future disease. Three rules are imposed which may limit claims depending on the jurisdiction.

The first rule, the rule against claim splitting, means that X may

only bring one cause of action for damages that arise from a single act regardless of whether his claims are for past, present or future damages.[89] This rule is based on the policy that the defendant should be protected against vexatious litigation and that it is against public policy to permit claimants to consume the time of the courts by continuing to litigate matters that have already been in court and been ruled upon, or that the claims should have been properly settled in some prior action.[90] This rule was discussed in a case where the plaintiff developed dermatitis and swelling of his retina immediately after taking an anti-cholesterol drug.[91] Over sixteen years later, the plaintiff developed cataracts which he claimed were caused by the drug. the defendants maintained that the plaintiff should have brought his claims at the time of the reaction. The court, however, said he probably would have been laughed out of court because the nature of the claim would have been so speculative. And, to bring the present action, the plaintiff would have to split the claim. The court then examined the basis for the rule and noted that there is a judicial trend away from strict enforcement of the rule against claim splitting. Therefore, the court allowed the claim to go to trial.[92]

In another case, the plaintiff had developed asbestosis and sought damages for an increased risk of cancer.[93] The court noted that allowing later suits prevents claimants from bringing anticipatory lawsuits and causes lengthy litigation because the full effects are not

yet known. Thus, the defendant is protected against speculative lawsuits and the plaintiff is allowed to bring his case when the claim actually matures. Otherwise, the plaintiff may not be receive proper compensation for his injuries if he is forced to bring all claims in the original suit.[94]

Both cases provide rules which are directly applicable to the victim of a toxic tort such as chemical contamination of a water supply. Regardless of the award received if the plaintiff brings a claim for sickness and physical injury, it is not possible for him to know the extent of his injuries should cell mutation cause much greater injury in future years. Again, the comparison can be made between an automobile injury and a chemical ingestation case. In the automobile injury, the injuries are visible and apparent and even pain and suffering and decreased enjoyment of life can be quantified to a much greater degree than in the typical serious toxic future damage case. With chemical ingestion, no one can predict what medical treatment will be required, the type of disease and the extent of loss of enjoyment of life. And, it is possible that the plaintiff may not be affected at all in the future. Therefore, it appears that claim splitting cannot be rationally applied to a toxic tort claim.

A second rule that affects bringing of a future claim is the particular state statute of limitation that may apply. States require that

claims for personal injury be brought within a certain time period after the injury.[95] If the period of limitation is set at the time of exposure without allowing time for discovery of the effects of exposure, the claimant may be precluded from bringing his claim. The statute of limitation may have already run before he begins to suffer any ill effects.

Many jurisdictions have remedied this problem by modifying the period of limitations so a victim can bring his claim within a period after which he discovers the injury or should have reasonable discovered it.[96] Congress adopted this line of reasoning by preempting state statutes of limitations that may govern a victim who is exposed to any hazardous substance, or pollutant or contaminant, released into the environment from a facility.[97] The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), established a discovery rule which provides that the controlling commencement date for the running of state statutes of limitation becomes the date the victim knew or reasonably should have known that the personal injury was caused or contributed to by the hazardous substance or pollutant or contaminant concerned.[98] Therefore, today, if the nature of the plaintiff's claim fits within the above definition as most will in the event of a toxic tort claim, he is not limited by time constraints of state law when bringing an action for personal injury.

A third rule is the all or nothing rule where if the required proof is made, the future effects are treated as certain to happen and the injured party is awarded full compensation. This could amount to a windfall, but, if the proof does not establish a high degree of likelihood, such as a greater than 50-percent chance, the injured party receives no future damages, and he cannot later receive damages for later consequences.[99] This is the traditional rule even though there is support for a pro rata approach where x would receive a percentage of recovery equal to his chance of incurring future harm. This pro-rata approach or simple probability approach is followed in England.[100]

The inequities of this rule are quite obvious. X may have what is determined to be a forty to forty-five percent chance of future injury. By the rule, he receives nothing for future damages even though the percentage is actually very high. In addition, regardless of what later diseases may occur, X may not then bring damages for the harm. A recent New Jersey case illustrates this possibility.[101] There, the plaintiff had asbestos injuries to his lungs and a doctor testified that there was a high probability that he would get cancer. The court noted that they had already adapted to the realities of toxic torts by modifying their statute of limitations and the single controversy rule and thus, they would not permit introduction of evidence for future risk of injury where the evidence could not meet a reasonable medical probability standard.[102] Therefore, even though X could receive damages for

medical surveillance and present injury, perhaps the more important claim of future risk of injury was precluded.

It is apparent that the nature of proof, practical difficulties, the battle of experts and jurisdiction dependent rules all result in a high degree of speculation when trying to forecast whether a person has a strong toxic tort claim. The next section discusses the few consistent rules that are applied to these claims.

III. Traditional Judicial Treatment of Toxic Tort Claims

This section discusses how courts have treated the types of claims brought in toxic tort litigation. Several cases have provided in-depth discussion of some or all of the claims. These will be discussed throughout this section since they form the foundation for the law applied in most cases presently being litigated.

A. Physical Injury

The basis rule for all claims in toxic court cases is discussed in Bernier v. Raymark Industries, Inc.,[103] where workers developed lung cancer and died years after inhaling asbestos. Their families sued for damages for the physical injuries caused by the asbestos. The court determined that a judicially recognizable cause of action does not arise

until there has been a manifestation of physical injury to a person sufficient to cause him actual loss, damage or suffering.[104] The court examined other jurisdictions and determined that persons who inhale asbestos fibers may not know when they will contract a disease or they may not even contract a disease; therefore, the actionable harm is the manifestation of disease in the body and not the exposure itself.[105]

The Parker case[106] noted previously, discusses present injury in the context of toxic torts in great detail. The court notes that traditionally, juries decide causation where general experience or common sense dictate that men know or anticipate some events are generally followed by another event; but, that is not the case with cancer causing toxic chemicals. Second, traditionally, expert testimony provides a scientific sequence of events that can be used to trace an injury to a specific point of trauma. Third, probabilities of causation as given by scientists, usually allow a case to go to the jury if there is sufficient proof and relationships are not just based on coincidence.[107] The court then articulates the general rule that a plaintiff has a cause of action in a toxic tort claim if there is a reasonable probability of a causal connection between the act and a present injury.[108]

Therefore, courts require evidence of a sequence of events to establish causation that are derived from expert testimony based on comparisons of those exposed and those not. As discussed before,

various problems with evidence may make this difficult and at times, inequitable.

B. Mental Distress

The general rule governing damages for mental distress as a result of toxic torts was explained in Sterling v. Velsicol,[109] a case where a number of plaintiffs suffered numerous injuries after ingesting contaminated water. Among Plaintiffs' claims was one for mental distress based on fear of contracting cancer and other related diseases. The court noted that damages for mental distress generally are not recoverable where the connection between the anxiety and the existing injury is either too remote or tenuous.[110] However, the central focus for the court was not on the underlying odds that the future disease will occur, but on the mental anguish resulting from the chance than an existing injury will lead to a future disease. Therefore, fear of contracting cancer is a present injury which allows for damages for mental distress.[111] The court noted that those jurisdictions that had considered this question determined that cancerphobia is a specific type of mental anguish.[112] Thus, the general rule is that mental distress caused by the fear of contracting cancer is compensable even if X does not have a physical injury other than his fear of future disease. As long as there is a reasonable connection between the plaintiff's mental anguish and his fear of a future disease, recovery will be allowed.[113]

C. Enhanced Risk Claims

The majority of courts that have considered the issue of whether a victim should receive damages for the enhanced risk of future disease have determined that recovery depends on establishing a reasonable probability that the harm will occur.[114] Other courts have permitted recovery if proof of future injury is reasonably certain or only if the plaintiff has exhibited some present manifestation of disease.[115] Even though commentators have overwhelmingly called for recovery where there is a significantly enhanced risk of injury, courts require proof of the existence of present injury before granting the award.[116] Therefore, the plaintiff must provide evidence to show that there is at least a 50 percent chance that he will contract a disease in the future before his claim for increased risk will be allowed.[117]

Thus, even though a plaintiff may be unable to prove a causal relationship between exposure and the disease, the majority of courts deny the award without proper proof because of the speculative quality of an unquantified claim and the difficulty of managing the litigation. Juries would be asked to award damages in many cases where there is no later disease and even expert testimony did not support the award.

D. Medical Surveillance

Claims for medical surveillance after exposure to a toxic chemical were considered in Ayers.[118] The court noted that compensation for reasonable and necessary medical expense is consistent with well-accepted legal principles and consistent with the important public health interest in fostering access to medical testing for individuals whose exposure to toxic chemicals creates an enhanced risk of disease.[119]

The Ayers court considered caselaw which provides a vivid illustration of the underlying basis for claims for medical monitoring costs. In Reserve Mining Co. v. E.P.A.[120] the issue was whether the court should grant injunctive relief compelling the defendant to cease discharging waster from its iron ore processing plant into the air of Silver Bay, Minnesota, and the water of Lake Superior. The court determined that it could not be said that the probability of harm is more likely than not and the level of probability of harm did not readily convert into a prediction of consequences.[121] But it noted that the contaminant in the air and water gave rise to a reasonable medical concern for the public health and the public's exposure to the contaminant created some health risk. Therefore, an injunction should be allowed to stop the health hazard as a precautionary and preventive measure to protect public health.[122] The Ayers court noted that the critical holding of the Reserve mining case was that public health

interests may justify judicial intervention when the risk of disease is problematic.[123] In addition to the likelihood of disease, the significance and extent of exposure to chemicals, the toxicity of the chemicals, the seriousness of the diseases for which individuals are at risk and the value of early diagnosis were all critical factors for allowing costs of medical surveillance.[124] Therefore, the court in Ayers stated the general rule that the cost of medical surveillance is a compensable item of damages where expert testimony shows that such monitoring is reasonable and necessary.[125] The court noted that such testimony must be based on the significance and extent of exposure to chemicals, the toxicity of the chemicals, the diseases involved, the chance of the onset of the disease, and the value of early diagnosis.[126] In reaching its conclusion, the court said that medical intervention should not depend on the sufficiency of proof that the occurrence of the disease is probable. Instead, intervention should be permitted even if the risk is unquantifiable if a reasonable basis for intervention is shown and there is a significant risk of serious disease.[127]

Thus, medical monitoring costs are different from enhanced risk claims since the victim is seeking reimbursement for a program of regular medical testing and evaluation that is set up to avoid more serious future complications. Physicians that are experts in the field can testify to the seriousness of the exposure to various chemicals and the types of disease that could arise. Absent medical monitoring, the

victim may discover his disease at an advanced stage and medical treatment costs at that time will undoubtedly be far greater than the costs of periodic checkups. Also, the defendant was the cause of the contamination. Therefore it is he and not the victim who should bear the burden of financing the gamble on the future and take steps to minimize later damage.

In summary, a plaintiff may receive an award for physical injury resulting from a toxic tort if he can show a reasonable probability that the injury was caused by the toxic chemical. If he is seeking damages for enhanced risk of future disease or injury he also must show that there is a reasonable probability or a medical certainty that he will contract the claimed injury in the future. If he seek damages for mental distress, however, he is held to a lower standard of causation; he must show a reasonable connection between his fear and the future disease. In such case, a separate physical injury is not required. Likewise, in claims for medical surveillance he only need show that based on expert testimony, medical monitoring is reasonably necessary. Therefore, all four claims require that the plaintiff come forth with sufficient evidence to prove causation. Although the burden is less on two of the claims, the plaintiff is always faced with the problem of obtaining credible evidence because of the latent effect of toxic chemicals on the human body.

IV. Proposed Reforms in Determining Damages in Toxic Tort Cases

Because of the many problems associated with proving damages in toxic tort cases discussed in section II. B., numerous proposals have been made to modify causation standards to reflect the realities of a specialized type of injury. Courts have long struggled to accommodate tort doctrines into the realm of toxic-tort litigation. But, the overwhelming conclusion of writers and commentators is that common-law tort doctrines are not suited to the resolution of such injury claims and that some form of statutorily-authorized compensation procedure is required if the injuries sustained by victims of chemical contamination are to be properly processed.[128] Common obstacles cited by commentators are practical difficulties common in mass exposure litigation, including the identification of the parties responsible for environmental damage; the risk that responsible parties are judgment proof; the expense of compensating expert witnesses in specialized fields such as toxicology and epidemiology; and the strong temptation for premature settlement because of the cost and complexity of protracted multi-party litigation.[129] This section discusses various proposals made in the last several years.

A. Caselaw

At least one court has stated that causation standards have proved to be unworkable and has hinted at reform. In Ayers, the court

noted that the problems of causation in enhanced risk claims may be remedied by a legislation that eases the burden of proving causation in toxic tort cases where there has been a statistically significant incidence of disease among the exposed population. Ayers suggested that a funded source of compensation be established for persons significantly endangered by exposure to toxic chemicals.[130] This approach contemplates a lower burden of causation for the plaintiff and perhaps resembles the standard of proof required in medical surveillance claims.

Significantly, the court in Allen v. United States[131] shifted the burden of proof to the defendants where the plaintiffs showed that ionizing radiation was hazardous, that the plaintiff was exposed to substantial concentrations of the radiation, and that plaintiff's injury was consistent with radiation. The court stated that shifting the burden of proof reflects a sound application of important legal policies to the practical problems of trying a lawsuit. Where a strong factual connection exists between defendant's conduct and the plaintiff's injury, but causation is problematical, the burden should be shifted to the wrongdoer, in order to do substantial justice between the parties.[132]

This approach again comports with the medical certainty requirement of proof, that is a significant relationship between the injury and the toxic chemical or toxic tort. The Allen court recognized

that where proof is difficult to obtain, the burden should be on the tortfeasor to disprove the relationship between their action and the injury to the plaintiff.

The next several proposals were previously set out in law review articles. These are certainly not all of the proposals for modified causation standards for toxic torts but these represent a summary of numerous ideas which may permit a more equitable settlement of toxic tort claims.

B. Proposals by Commentators

The first proposal involves a combination of a qualitative showing of causation with proof that the manufacturer acted negligently in introducing an unreasonably dangerous product.[133] Qualitative evidence would include proof of substantial exposure to the substance and an injury consistent with that substance. This would eliminate the more probable than not standard or similar standards that courts now wrestle with. Proof that a product was unreasonably dangerous would require a finding that a manufacturer acted negligently in marketing a product when it should have known that the product posed a serious risk to human health. The jury would then determine whether the manufacturer's decision to market the product was reasonable. If the plaintiff could show both the proof of a qualitative link and the

distribution of an unreasonably dangerous product, then the defendant would have to prove that the product was safe, the hazards were not foreseeable, benefits outweighed potential costs at the time of marketing, or that the plaintiff was not exposed to substantial concentrations of the product.[134]

This approach lessens the burden on the plaintiff since the significant relation standard is a lower burden than the traditional "more probable than not" standard or the "within a reasonable medical certainty standard" as now used by courts. This method presents a more realistic procedure for litigating toxic claims since essentially the burden of proof is shifted to the defendant who usually has the resources to provide necessary statistical and expert data to the jury.

A second proposal suggests a case-by-case adaptation to the unique nature of toxic torts. Its central goal is to determine causation in a manner that is legally and scientifically sound.[135] By this proposal, courts would broaden the range of evidence accepted on causation issues and parties could introduce many types of evidence such as animal and in vitro experiments, epidemiological data, and analogous medical cases. The jury would be free to decide which of these sources are reasonable. Then, a more likely than not test would be applied to test the strength of the fact-finder's belief instead of applying this test to each element of the parties case. By such method, juries would not

be instructed that the preponderance standard means that plaintiffs must prove a fact probability greater than 50%, rather they would be instructed that plaintiffs must establish certain facts including causation by evidence which convinces juries that the fact is more likely true than not. Next, the causation burden would be phrased in the terms of "substantial potential cause" or "substantially increased the risk of disease." The court would ensure that substantial would not be defined as a probability greater than 50% or any other arbitrary level. Finally, juries would be permitted to discount their award without setting a probability estimate. For example, a smoker exposed to a toxic chemical would recover less than a non-smoker suffering from the same disease.[136]

This method may give more flexibility to the fact-finder in toxic tort cases but it does not clearly define what types of evidence would be allowed. Again, the court would be faced with subjective determinations of relevancy and reliability to guard against prejudicial or potentially meaningless evidence reaching the jury. This method does, however, fall in line with other proposals suggesting a lesser burden of proof for the plaintiff. It would also seem that eliminating percentage definitions would cause less confusion and foster a more analytical and less subjective determination of fault. That is, the factfinder would be free to view the evidence as presented without the court first deciding that a deposition or statement did not meet the

more probable than not standard and thus it should not be considered.

A third proposal involves less speculation and appears to be a cleaner way to handle future injury claims. Under this proposal, courts would recognize claims for significantly increased risks of future disease but the relief would be in the form of a court order awarding the victim insurance coverage of the increased risks of disease he is subject to and requiring the wrongdoer to pay the premium.[137] Causation would be proved by evidence that X has a present injury that is capable of developing into a specific disease in the future and that the specific future disease is reasonably probable to occur. Reasonable probability would be defined to mean that on thoughtful analysis of the medical and scientific evidence, there is a probability that the disease will occur. Both the requirements of present injury and reasonable probability of occurrence would have to be established by expert testimony that conforms to a substantially accepted explanatory theory.[138]

This proposal presents a seemingly far less expensive way for the defendants to take responsibility for their actions. Rather than relying on the jury to set arbitrary values on injury, insurance would compensate the victim if he contracts a disease. Also, the standard of causation appears to be lessened to accommodate the nature of the claim. Again, however, the definition of a compensable claim is subject

to a case by case determination. An obvious problem is that the insurance coverage would seem to amount to no more than coverage for medical monitoring and medical care. Enhanced risk of future disease is a present claim to compensate for a lessened quality of life and the argument would readily be made that an award of such damages should be immediate should the plaintiff meet the burden of proof. He then should be allowed to use or enjoy such compensation as he see fit. This proposal does not sufficiently address that aspect of toxic tort claims.

C. Legislation

The territory of Guam recently passed legislation which actually shifts the burden of proof to the defendant in the event of a toxic tort much like the court did in the Allen case.[139] The following is a summary of that bill.

1. Summary[140]

Guam determined that its statutory and common law shall facilitate the compensation of those exposed to certain chemical substances and mixtures, and that persons exposed to toxic substance shall be entitled to compensation for all damages arising from exposure to such substances. Exposure to a toxic substance is defined as contact with any part of the body including ingestion or breathing. Exposure

levels for liability are based on those set by federal regulatory agencies.

Any person who has been exposed to toxic substances at a level above federally permitted levels of exposure shall be entitled to bring an action for damage against: a. the manufacturer of the toxic substances who shall be strictly liable for all damages; b. any other person who is responsible for the claimant's exposure to the toxic substances. Such other person shall be liable for damages if their negligence results in the claimant's exposure to toxic substances. Violations of federal cleanup regulations constitute negligence per se for the purposes of this legislation.

Recoverable damages include injury, increased risk of illness or injury, lost income, medical expenses, pain and suffering, emotional distress (whether or not accompanied by physical manifestation or illness), loss of ability to enjoy life, loss of consortium, loss of ability to procreate, medical expenses for treatment or monitoring, and any other direct or indirect effects of exposure. In addition, punitive damages are recoverable against any person who conceals the harmful effects of toxic substance or against any person who acts with reckless indifference to human health in the manufacture, use, storage or cleanup of toxic substances.

The parties responsible for the exposure have the burden of disproving an increased likelihood of disease or injury to the exposed person. All doubts are resolved in favor of the exposed person, and it is not necessary for an exposed person to prove that he has suffered or will suffer a particular illness or injury because of the exposure. Instead, it is sufficient that there is a statistical association between exposure and the incidence of a particular illness or injury. Studies indicating harmful effects of exposure on animals create a presumption that exposure of humans will also be harmful and will cause similar results.

A cause of action accrues at the time of exposure, regardless of whether physical manifestation of injury has occurred. Any action must be brought within four years of the date of the last exposure, or within two years of the date of discovery of the harm caused by the exposure, whichever is later.

2. Comments

The Guam legislation incorporates virtually all of the characteristics of the three proposed models discussed above. There is a shift of the burden of proof to the defendants to disprove an increased likelihood of disease or injury to an exposed person; the cause of action accrues at the time of exposure regardless of physical

manifestation; recoverable damages include present, future, medical, emotional damages and loss of ability to enjoy life; strict liability is premised on a very lenient standard of any contact with a toxic substance at levels above federal limits; and all doubts are resolved in favor of the exposed person. Additionally, the exposed person need not prove he has suffered or will suffer a disease, instead he only need show a statistical association between exposure and the disease or injury and he is aided by presumptions based on animal studies.

This legislation responds to the complex nature of a toxic tort claim and remedy in a more practical and functional manner than any caselaw previously discussed. The legislation presumes that the defendant is in the best position to disprove the plaintiff's claim once the plaintiff has shown some evidence of the connection between his injury and the actions of the defendant. More importantly, the requirements for causation and compensation for injuries are not defined by subjective standards that only invite unfairness and confusion.

In light of the above proposals, the next section discusses recent caselaw to ascertain whether the judiciary is responding to pleas for more workable rules to resolve toxic tort claims in a more responsible and equitable manner. Cases will be discussed from the state, federal trial and federal appellate level.

V. Judicial Response to Proposed Changes

A. State

Recently, Texas considered whether plaintiffs could recover under a products liability theory where they were unable to identify the specific manufacturer of a product.[141] Suit was brought by the survivors of a person who died from cancer of the lungs caused by exposure to asbestos. The victim died over twenty-eight years after her initial exposure to a board containing asbestos. Although the plaintiffs could not establish who manufactured the board, they named five companies as defendants because they "dominated the market of asbestos-containing wallboard" at the time of the victim's exposure.[142]

Petitioners claimed that collective liability theories should be adopted which shift the burden of proof to the defendant to show that it was not he who committed the act. The court determined that various theories advanced were not applicable since the plaintiff could not show any causal connection with the plaintiff's injury,[143] nor could he trace the product to any of the defendants. Thus the collective liability theories were wrongfully applied to the facts in the case.[144]

This case demonstrates that a court will not shift the burden of

proof to the defendant where there is no basis whatsoever for the claimed injury. Plaintiff still must show some correlation between the injury and the product in question.

New Jersey considered a case where the plaintiff developed bilateral thickening of both chest walls and calcification of the diaphragm after exposure to asbestos.[145] Plaintiff's expert testified that there was a high probability that he was at risk for developing cancer. Therefore, plaintiff claimed damages for enhanced risk of disease and asserted that he should have a present cause of action for a significant but unquantified enhanced risk of future injury.[146]

The court noted that the state had a long-standing rule that prospective damages are not recoverable unless they are reasonably probable to occur. It also noted that numerous articles have been written that encourage recognition of an enhanced-risk cause of action even if the threat of contingent harm is less than probable, or is unquantified.[147] The court then noted that cases are almost uniform throughout the country in requiring that the plaintiff prove that the prospective disease is at least reasonably probable to occur before award damages for enhanced risk.[148] After weighing various arguments, the court concluded that the reasonable probability standard would not be modified. Their decision was based on the fact that New Jersey had adopted a discovery rule which eliminated the statute of

limitations controversy and they had removed the single controversy rule so that the plaintiff could split his cause of actions. Therefore, they had already eliminated potential unfairness since the plaintiff did not have to wait to bring a claim until his injury manifested itself.[149]

This case indicates the court has at least considered the major problems once associated with toxic tort claims--that of limited time to bring the claims and only being allowed one day in court even though other actions could arise later. They did not, however, address the question of how the plaintiff could obtain sufficient evidence to meet the standard of causation or who should have that burden. They again followed the traditional test for enhanced risk of future injury claims.

Another New Jersey case considered whether plaintiffs should be allowed more time than that permitted by statute to file a claim against a governmental entity.[150] Even though this case did not directly address the issue of causation, it serves as a good example of a court's willingness to adapt to the complexities of a toxic tort. Plaintiffs had various medical disorders such as stomach disorders, neurological defects, skin rashes, various forms of cancer, learning disabilities and other illnesses. Plaintiffs filed a late claim but said that they were unable to comply with the time requirements because of the severity of their injuries and inability to investigate the circumstances surrounding the complained of occurrence. They had been investigating a landfill for

two months and circulating medical questionnaires to solicit information from area residents. They had also formed citizen's groups to investigate the landfill and hired a lab to test various wastes, pollutants and other dangerous substances in the area.[151]

The court determined that there may be sufficient reasons for failure to file a timely claim such as excusable neglect or mistake, serious physical injuries, complexity of litigation and ignorance of statutory requirements.[152] The court further noted that trial courts consider combinations of factors when exercising authority to grant extensions of time. The court found that plaintiffs' efforts to identify the parties responsible for creating conditions at the landfill to be sufficient reason alone to excuse noncompliance with filing requirements.[153] Thus, this case represents an obvious accommodation by the court of the complexities involved in toxic tort claims.

B. Federal District Court

In Ball v. Joy Manufacturing Co.,[154] the court continued to require a separate actionable injury before they would allow a claim to recover the costs of future medical monitoring. The court ruled that mere exposure to toxic substances is not a physical injury in itself.[155] This case reaffirms the basic rule in a toxic tort claim; that some physical injury must be proved.

In Werlein v. United States,[156] the court considered claims arising from contamination of a water supply. This case highlights the fact that courts do not grant summary judgment in favor of the defendant just because the plaintiff does not have sufficient epidemiological proof of causation for the basis of increased risk claims. The court held that plaintiffs are not limited solely to epidemiological proof of the injury. Expert testimony detailing the adverse health effects of toxic substances in the water supply was enough to allow the claim to go to the jury unlike previous cases where comparison studies were required.[157] This case is an example of what appears to be an allowance of a more liberal evidentiary standard for present injuries from toxic chemicals.

The Werlein court also determined that medical monitoring costs would be allowed if a plaintiff can prove that he has present injuries that increase his risk of future harm. The court did not define what was sufficient for a physical injury but they based their ruling on a prior determination of the harmfulness of TCE and other substances to which plaintiffs had been exposed.[158] Thus, the court appears to follow similar earlier medical monitoring standards but it also appears that the court may more readily find that there is a physical injury depending on the nature of the substance involved.

The Werlein court also considered the standard of proof for emotional distress claims arising from the contaminated water supply. The defendants claimed that the plaintiffs could not recover because the plaintiffs had not provided sufficient evidence that they exhibited physical manifestations of the emotional distress as required by the applicable state law. The court, however, found that emotional distress claims in this context could be based on subcellular harm and also they could be based on a physical danger theory. Where experts could testify to these matters, the issue could reach the jury.[159] Again, the court in Werlein appears to be quite liberal in allowing evidence in to prove claims for emotional distress. The court did not get involved in complex causation definitions or words of art but appeared to take a practical approach as they did with the medical monitoring claim and allow the jury to decide the issues.

The necessity of a physical injury before bringing a claim for emotional distress was also required by the court in Maddy v. Vulcan Materials Co.,[160] where the plaintiff based his claim not on negligence but on an intentional tort. The defendant had allowed airborne toxic gases to filter into the plaintiffs yard. The plaintiffs alleged that since their claim for emotional damages was based on the intentional tort of trespass, an underlying physical injury was not required. The court, however, ruled that physical injury is required before allowing an emotional distress claim and applied traditional tort law to the fact

situation.[161] This case indicates that causation rules for emotional distress will not be set aside because the plaintiff bases his claim on intentional conduct rather than negligence.

A recent Vermont case demonstrates the continued traditional application of the medical certainty rule of causation for toxic tort evidence. In Graham v. Canadian Nat. Ry. Co.,[162] a family suffered a variety of ailments over a period of years including respiratory problems, skin ailments such as sores, skin eruptions and rashes, nausea, memory loss, impaired vision and loss of power of concentration, gastrointestinal ailments, diarrhea and blisters. The family commenced an action against a railroad company that had applied chemicals along the tracks adjacent to its property.

Beginning in 1963, and over a period of 20 years, there was evidence of consistent application of chemical herbicides to the areas around the tracks to destroy noxious plant life. In 1984, there was a large yellow cloud that appeared in heavy concentration over the railroad property which resulted from aerial spraying by the railroad. In 1986, resurfacing of the railroad caused a brown substance to remain on the tracks and at the same time, dead birds and animals began to appear on the property of the plaintiffs. Also, duck ponds bubbled and foamed during the heat of the day. In 1987, members of the family discovered white powdery substances in and around the railroad tracks.

The plaintiffs claimed that this was a chemical spill which produced burning sensations in the throats and nasal passages of members of the family. CNR, the railroad company, acknowledged that the substance was probably caustic soda which leaked from a hopper car.

Plaintiffs experts included their family physician, a specialist in Epidermitology and Toxicology, and a physician with post graduate studies in molecular genetics who had conducted experiments with animal species. They concluded that ailments were definitely related to chemical exposure and there was an increased risk for cancer in the future.

A veterinarian who had observed domestic and wild animals and birds in various debilitated conditions around the yard testified that such illnesses occurred immediately after sprayings and contact with whatever chemicals the railway was using at the time. Wild ducks and deer were in various debilitated conditions, animal life exhibited elevated body temperatures and birds developed skin problems, irritated eyes, and their feathers molted. Dead bees were discovered along the tracks and ties. The veterinarian testified that the cause of the symptoms experienced by the animal life on the farm was chronic exposure to chemicals and pesticides. Also, vegetation turned unusually brown during the periods of herbicide spraying, and during heavy rain, a white foamy substance washed down the trees on the farm property.

Some trees defoliated at heights of 20 to 30 feet from the base and garden plants and apple and cherry trees all exhibited abnormalities.

In spite of the above evidence, incredibly enough, the court found that the plaintiffs failed to establish that the spraying of herbicides, leakage of chemicals, and caustic soda spills caused their ailments with any reasonable medical certainty.[163] The defendant's expert testified that there could have been other causes and the low dosages of various chemicals in this case were not enough to cause harm to human life.

This case presents a classic example of not seeing the forest for the trees. Even though the railroad company introduced numerous chemicals to the plaintiff's farm through intentional acts of spraying and negligent acts of spilling, the plaintiff's were forced to provide proof within a reasonable degree of medical certainty that their strange ailments were caused by the defendant's acts. The evidentiary and probably more importantly, the economic burden was on the plaintiffs, and ability to test the substances were severely limited. Meanwhile the defendant did not have to act until the plaintiff met the high standard of proof. It would appear in this case that common sense was not a factor. The plaintiffs exhibited illnesses that could not be traced to anything but chemical exposure, and the totality of the evidence from plant and animal life was overwhelming. The court, however, dismissed the complaint. Thus, a rigid application of traditional tort rules resulted in

the plaintiff being barred from presenting his case to the court.

The court in Renaud v. Martin Marietta Corp.[164] considered a case where a defense contractor had discharged known carcinogens into the water supply of a town. Two compliance orders had been issued informing the contractor that they violated the requirements of the Colorado Hazardous Waste Act. The contractor failed to stop its activities until the EPA issued a cease and desist order.

Plaintiffs alleged that this contaminated water caused twelve primary and other related injuries. Four of the plaintiffs were children who developed cancer, one of whom developed leukemia, one plaintiff suffered from kidney cancer, five children suffered from seizure disorders and two were children with birth defects of the heart. Plaintiffs found it difficult to obtain evidence since the Defendants did not keep records which were required to be maintained by state law.

The court in Renaud, determined that the plaintiffs should have provided epidemiological evidence and since they did not, they failed to met their causation burden.[165] Even though the plaintiffs provided direct evidence of exposure to the chemical, the court determined that since they did not submit any circumstantial evidence of exposure, they had not established a prima facie case.[166]

This case again seems to set an inequitable burden on the plaintiffs. They must prove causation in a case which can only be proved like so many other toxic tort cases by a full examination of the defendants records and activities. The defendants benefit from their own violations of hazardous waste laws in this type of civil action since they did not keep any records or make them available.

The case of Turpin v. Merrell Dow Pharmaceuticals Inc.,[167] shows the difficulties of relying on epidemiological studies which the court required in the previous case. In Turpin, the plaintiffs contended that a drug prescribed for nausea and vomiting during pregnancy, Bendectin, caused various deformities to their child's hands and feet. The plaintiffs attempted to prove teratogenicity (that the drug could cause birth defects), by experts testifying on analogous chemical structures, animal studies, and epidemiological studies. The court examined over thirty other epidemiological studies concluding that there was not a statistically significant association between the drug and human birth defects. Furthermore, they determined that it is not more likely or more probable than not that a causal relationship exists between the drug and birth defects. Therefore summary judgment was appropriate.[168]

The plaintiff's experts had reanalyzed epidemiological studies of the defendants and offered other evidence besides that of epidemiological studies and were prepared to testify to a reasonable

degree of medical certainty that Bendectin is associated with limb reduction defects. The court, however, examined numerous other cases agreeing with the defendant's assessment of epidemiological studies and found that since over thirty studies concluded that no significant association existed, the plaintiffs had failed to meet their burden.[169]

This case represents a good example of the court trying to sort out the truth in a battle of the experts. The court makes a determination whether a case should proceed based on the number of studies done which could in fact all be following an erroneous line of analysis. Even though the plaintiff has other evidence which refutes or adds to the equation, the court's determination is governed by past studies. Therefore, the outcome of this case is predictable when courts are tied to traditional causation models.

In Friedman v. F.E. Myers Co.,[170] the plaintiffs had been exposed to PCBs when a submersible water pump manufactured by the defendants malfunctioned and contaminated their water supply. The court determined that one plaintiff who was disoriented and dizzy after drinking and showering with the water showed sufficient evidence for her claim for physical injury. Two other defendants testified that they felt the shower water was oily and evidence showed they had excessive amounts of PCBs in their body. The court, however, ruled that they failed to present sufficient evidence to reasonably conclude

that they suffered physical harm.

The plaintiffs also sued for fear of future disease and increased risk of cancer. Significantly, the court here did not exclude expert testimony or grant summary judgment. Instead, it determined that the jury should make the determination of causation after listening to the plaintiff's experts and give appropriate weight to the testimony.[171] This case was in line with an earlier minority view presented in Ramirez v. Richardson-Merrell, Inc.,[172] where the court determined that it was for the jury to decide whether expert opinions based on animal studies, structural analysis, and in vitro studies were valid.[173]

The Friedman case illustrates that some courts realize they should let the fact-finder sort out conflicting testimony at trial. It would seem that some highly technical expert testimony should be tested at trial since earlier motions to exclude rest on subjective determinations by the court. Moreover, when the defendant moves for summary judgment, traditionally, evidence is to be viewed in the light most favorable to the non-moving party and conflicts are to be resolved in his favor.[174] When a physician states that a chemical caused cancer to a reasonable degree of certainty, it would seem that the court should not cut off such testimony before it reaches the fact-finder in a court of law under proper cross-examination.

C. Federal Courts of Appeal

Several federal appeals court cases have considered causation related issues in the past two years. The following section discusses several important cases from various jurisdictions.

In Christophersen v. Allied-Signal Corp.,[175] the court considered a case where a worker's widow alleged damages after her husband was exposed to fumes in a battery factory. Plaintiffs contended that such fumes contained particles of nickel and cadmium that caused the cancer that resulted in death to plaintiff's husband. The court determined that expert testimony concerning causation in toxic tort cases does not have to be supported by epidemiological studies.[176] The court reasoned that an expert's opinion does not have to be generally accepted in the scientific community before it can be sufficiently reliable and probative to be submitted to the jury and perhaps support a jury finding.[177] Therefore, this case represents a more liberal line of reasoning than earlier cases which required that proper epidemiological studies be conducted. The Christophersen case seems to represent a much more accepted and realistic approach to causation. As previously noted, the jury should decide how various evidence should be weighed.

The Deluca case arising in the third circuit succinctly sums up the rationale for considering other than only traditional expert

testimony.[178] This case again examined claims arising from the morning sickness drug, Bendectin. Although a consolidated case of over 800 claims determined that ingestion of Bendectin during fetal growth is not by a preponderance of the evidence a proximate cause of human birth defects, this court again examined the evidence provided by expert witness testimony. Previous cases had examined a large number of human epidemiological studies and none concluded that there was a statistically significant association between Bendectin and birth defects. The Deluca court, however, determined that plaintiffs were not bound by previous proceedings in which they were not parties and that plaintiffs must instead produce admissible evidence from which a jury could reasonably find that their injuries were caused by Bendectin.[179]

The court noted that other courts had determined that Bendictin could not have caused birth defects based on the large number of cases that had agreed with this determination. This court, however, concluded that prior judicial opinions cannot be the basis of the present decision because they do not address the question of whether reasonable experts would rely upon the epidemiological evidence presently being offered.[180] The court further noted that they had previously rejected the general acceptance test of admissibility because it was too vague and because nose-counting often led to the exclusion of helpful evidence in contradiction to the spirit of the Federal Rules of Evidence. Thus expert testimony could not be excluded simply because the weight of

scientific opinion leans against it.[181]

This case gives a clear indication of the problems with premature rulings on motions of dismissal before the toxic tort case is permitted to go before a jury. Regardless of past cases and past studies relied on by other courts, experts in a new case may furnish ample reliable and relevant testimony that would convince a jury that the plaintiff is entitled to his requested remedy. As long as the court finds that the expert is qualified to testify, evidence should be tried by the jury.

Still another third circuit case, provides significant guidance in the area of medical monitoring. In Paoli R.R. Yard PCB Litigation,[182] the court determined that a cause of action for medical monitoring can be premised on proof of exposure to hazardous substances resulting in the potential for injury and the need for early detection and treatment without requiring a showing of physical injury. The court predicted that Pennsylvania would recognize a cause of action for medical monitoring established by proving that: 1. Plaintiff was significantly exposed to a proven hazardous substance through the negligent actions of the defendant. 2. As a proximate result of exposure, plaintiff suffers a significantly increase risk of contracting a serious latent disease. 3. That increased risk makes periodic diagnostic medical examinations reasonably necessary. and 4. Monitoring and testing procedures exist which make the early detection and treatment of the disease possible

and beneficial. The factors would have be to proved by competent expert testimony.[183]

Paoli actually represents an adoption of a causation standard similar to that suggested by proposal two in section IV. above. The court is allowing other evidence besides epidemiological evidence, causation is based on significant exposure to a proven hazardous substance, and evidence is weighed by the jury on a case by case basis.

Summary of Caselaw:

Review of the above cases indicate that courts are in fact relaxing some traditional rules in the area of toxic torts to permit more evidence to be considered at lesser burdens of proof. Several cases have modified causation standards to lessen the burden of proof by the plaintiff. More evidence is permitted to reach the jury and it is for the jury to decide questions regarding the weight of evidence. More time to bring an action was allowed in at least one case because of the nature of toxic tort latency and discovery. And, courts are not tied to established epidemiological evidence but are instead permitted to rely on other evidence such as expert testimony and other comparable studies.

VI. Comments by Toxic Tort Practitioners

This section is a discussion of comments supplied by several individuals who have practiced in the area of toxic torts for some time. Their comments address questions concerning whether present standards are workable and what changes should be made.

Lawyer A is the head of a litigation department for the U.S. Navy in Washington, D.C.[184] After being involved with numerous toxic tort cases he indicated that he sees no change in causation standards now being applied to toxic tort claims. Based on his experience he would make causation standards more clear for the plaintiffs so they know where they stand when deciding whether to bring suit. He also indicated that to his knowledge, the United States Navy has never been found liable for personal injuries arising from toxic tort claims. Because of their decided advantage as far as discovery and evidentiary standards, the plaintiff if often motioned out of court.

Lawyer B is an attorney with the Department of Justice in Washington, D.C. and has worked as a litigator for the past four years in the area of toxic torts.[185] He noted that the plaintiff usually arms himself with medical toxicologists, immunologists, and epidemiologists to testify in their behalf in toxic tort claims. However, they often fail because they assume that with exposure, X also has the symptoms regardless of the dose; therefore, their causation is weak. He said it is

very hard to quantify risk in the areas of toxic tort and believes it is best to leave causation standards as they are even though it appears that in most cases, the government and plaintiff's experts cancel each other out.

Lawyer C is in private practice and has worked in the area of personal injury, workmen's compensation and products liability for the past 15 years.[186] He sees problems with the law surrounding toxic torts and feels that it is actually automobile law that is being applied to damages involving complex chemical and toxic injuries. Measurement of damages, nature of the injuries and future risk of damages do not lend themselves to the law that is now applied. He feels that the one size fits all theory just does not work and instead, toxic tort law should be adapted to the realities of the problems posed by toxic chemicals. He suggested a method whereby awards to plaintiffs could be for each separate injury or the defendant could choose to settle on a lump sum for his actions. He also advised that probability tests may be unworkable and instead, expert testimony should be directly weighed by the jury.

From the comments of the above three lawyers, it seems likely that present causation rules applied to toxic torts cause inequitable results. The plaintiff is confronted with unclear standards and is forced to construct an elaborate and expensive case with often

unpredictable results. Even so, they see little modification of the rules by the courts.

VII. Conclusion

An examination of recent toxic tort litigation indicates that few courts have made any bold efforts to incorporate significantly different models of causation for personal injuries. Most courts continue to follow traditional patterns of proof which require that the plaintiff come forth with certain amounts of evidence depending on the type of claim. Though there has been a lessening of the burdens of proof in some instances and courts often allow more evidence to be considered, burdens of proof for present and future toxic tort claims still do not facilitate a prompt and fair disposition of a toxic chemical injury. Even though in most cases, the defendant is a large corporation, a large company or the government, each of whom have vast resources of information and funding at their fingertips, the plaintiff must pursue his case as he would any other negligence claim. The difference is that litigation such as this that requires numerous experts. Prolonged investigation is tremendously expensive and discovery may last for years. The effects on the claimants health, however, may be and usually are devastating and fatal. Regardless of the outcome of litigation, latent effects and fear of cancer and cancer related diseases

can reduce the claimant's life to one of mere existence. The result is constant preoccupation with even the most minor changes in physical and mental conditions.

The defendant is in the best position to disprove claims against him that may have resulted from his product. Even though burden shifting is a drastic step when viewed in the context of tort law, toxic tort claims are an area that demand such a shift. Rather than being a disaster for the defendant, such a measure may be a much less expensive procedure. The defendants could handle claims in an administrative manner and would undoubtedly make certain that they had properly tested their products and made every effort to keep records that would eliminate spurious and unfounded claims.

Presently, a defendant could market an untested product with virtually no records on composition and toxicity and reap huge profits for five to ten years before the court system could even begin to check his efforts. Scenarios that can be envisioned can be frightening to say the least. If a company discharges wastes that ravage a water supply or ruin a farm, present standards of proof insure that it is protected from answering to its victims for years to come. Even then, the plaintiff's claims amount to a virtual crapshoot depending on his experts and the position of the law in the jurisdiction in view of ongoing changes. Modifications should be made in line with proposals by

commentators where the burden actually swings to the defendants. Legislation discussed from the territory of Guam addresses virtually every problem area and sets a standard for a reasonable and workable solution.

Although each area of the law should not be subject to its own rules of evidence and procedure, the nature of toxic chemicals and their attendant damage require that a new and more workable system be devised to not only protect human beings from their own waste but to do so in a practical and meaningful manner. The present system of toxic tort law protects the wrongdoers at the expense of the public. By the time the hurdles are cleared the race is over.

1 The following fact scenario is purely fictitious and is not based on any particular court case.

2 A substance that produces cancer. Webster's New World Dictionary (2d College ed. 1980).

3 Meaning that she had a much higher likelihood of contracting cancer because of the same exposure as her husband; therefore, she should be compensated for what would amount to a shorter life. Gold, Causation in Toxic Torts: Burdens of Proof, Standards of Persuasion, and Statistical Evidence, 96 Yale L.J. 376 (1986).

4 Id.

5 A type of lung disease caused by inhalation of asbestos fiber. Webster's New World Dictionary (2d College ed. 1980).

6 See Cooke, Fibrosis of the Lungs Due to the Inhalation of Asbestos Dust, British Medical Journal 2 (1924) p 147. The first case to uphold a verdict against an asbestos manufacturer was Borel v. Fibreboard Paper Products Corp., 493 F.2d 1076 (5th Cir. 1973), cert. denied, 419 U.S. 869

(1974).

7 For example, in the asbestos litigation area, over 1500 members of an insulation workers union in the New York area were examined for pulmonary asbestosis. After 1982, 11,000 cases were pending against Johns-Manville Corporation. See W. Lundquist, Innovations in Mass Tort Litigation, (Paper given at the American Association of Law and Science, January 23, 1984).

8 David W. Schnare and Martin T. Katzman, Chemical Contamination and its Victims (1989) p. 14 (hereafter referred to as Schnare).

9 Id. at 15.

10 Parker v. Employers Mutual Liability Insurance Company of Wisconsin, 440 S.W. 2d 43 (Tex. 1969).

11 In re Agent Orange Product Liability Litigation, 611 F. Supp. 1223 (E.D.N.Y. 1985), aff'd on other grounds, 818 F.2d 187 (2d Cir. 1987).

12 Id. at 1231.

13 Id. at 1256.

14 Werlein v. United States, 746 F.Supp. 887 (D.Minn. 1990).

15 Id. at 899.

16 Id. at 901.

17 Hupp v. United States, 563 F. Supp. 25 (S.D. Ohio 1982).

18 Schnare at 14.

19 M. Unger and J. Olsen, Organochlorine Compounds in the Adipose Tissue of Deceased People With and Without Cancer, Environmental Research 23 (1980): 257-63

20 H.C. Scharnweber, G.N. Spears, and S.R. Cowles, Chronic Methyl Chloride Intoxication in Six Industrial Workers, Journal of Occupational Medicine 16 (1979):112.

21 Schnare at 16.

22 Id. at 18.

23 See Kelsey, Thompson, and Evans, Methods in Observational Epidemiology, (New York: Oxford University Press 1986) pp. 14-16.

24 D. Latai, D.D. Lanning, and N.R. Rasmussen, The Public Perception of Risk, in The Analysis of Actual and Perceived Risks, ed. V. T. Covello, W.G. Flamm, J.V. Rodericks, and R.G. Tardiff (New York: Plenum Press, 1983).

25 For example Johns-Manville Corp. went through bankruptcy after the flood of asbestos cases brought against the company. See In re Johns-Manville Corp., 68 Bankr. 618, 624-25, aff'd 843 F.2d 636 (2d Cir.).

26 See Schnare pp. 46-75.

27 See generally Discussion of caselaw set out in Ayers v. Jackson Tp., 525 A.2d 287 (N.J. 1987). See also, Johnson v. Armstrong Cork Co., 645 F.Supp. 764,766 (W.D.La. 1986).

28 Christophersen v. Allied-Signal Corp., 902 F.2d 326 (5th Cir. 1990).

29 Id. at 363.

30 Id. at 365.

31 Id. at 366.

32 Id. at 367.

33 Meaning an agent which causes malformation of the fetus. Webster's New World Dictionary (2d College ed. 1980).

34 Brock v. Merrell Dow Pharmaceuticals Inc., 874 F.2d 307 (5th Cir.), modified, 884 F.2d 166 (5th Cir. 1989).

35 874 F.2d at 313.

36 Sterling v. Velsicol Chemical Corp., 855 F.2d 1188, 1202 (6th Cir. 1988).

37 Id. at 1203.

38 Id. at 1207.

39 Id. at 1209.

40 E.g. Gideon v. Johns-Manville Sales Corp., 761 F.2d 1129 (5th Cir. 1985).

41 See Gale and Goyer, Recovery for Cancerphobia and Increased Risk of Cancer, Cumberland Law Review 15 (1985): 723, 730,31.

42 Werlein v. United States, 746 F.Supp. 887 (D.Minn. 1990).

43 Id. at 906.

44 Dartez v. Fibreboard, 765 F.2d 456 (Tex. 1985).

45 Id. at 468.

46 Id.

47 Schnare at 74.

48 Id.

49 Section 9607(a)(4)(B), the liability section of CERCLA states:

> Any person who accepts or accepted any hazardous substances for transport to disposal or treatment facilities or sites selected by such person, from which there is a release, or a threatened release which causes the incurrence of response costs, of a hazardous substance, shall be liable for . . .
>
> (B) Any other necessary costs of response incurred by any other person consistent with the National Contingency Plan;

Since the phrase "necessary costs of response" is not defined courts have differed on whether medical monitoring is allowed under this statute. See Werlein v. United States, note 42.

50 Recovery is allowed if the plaintiff can prove that he has present injuries that increase his risk of future harm. Werlein at 904.

51 See Ayers v. Jackson Tp., 525 A.2d 287 (N.J. 1987). The court discusses the logic behind medical surveillance claims and references numerous articles that explore the issue.

52 Id.

53 Id.

54 See Mary Carter Andrues, Proof of Cancer Causation in Toxic Waste Litigation: The Case of Determinacy Versus Indeterminacy, 61 S. Cal. L. Rev. 2075 (1988).

55 Testimony of medical expert in Ayers, supra at 303,304.

56 Ayers at 305.

57 Id. at 306.

58 See Ayers at 306, 307 and 308 where the court presents a summary of cases with varying results depending on the burden of proof required.

59 See Valori v. Johns-Manville Sales Corp., No. 82-2686 (D.N.J. Dec. 11,

1985) (allowed admission of evidence that plaintiff suffered from asbestosis had a forty-three percent likelihood of contracting lung cancer to prove claim of enhanced risk of cancer); and Lewitt v. Johns-Manville Sales Corp., No. 81-2950 (D.N.J. Mar. 11, 1985) (allowed evidence of increased risk of cancer from asbestosis although less than a reasonable medical probability).

60 Schnare at 74.

61 See S. Epstein, The Politics of Cancer 40 (1978); Estep, Radiation Injuries and Statistics: The Need for a New Approach to Injury Litigation, 59 Mich. L. Rev. 259, 266-78 (1960).

62 A. Lilienfeld, Foundations of Epidemiology 14 (1976).

63 P. Enterline, Asbestos and Lung Cancer: Attributability in the Face of Uncertainty. Chest 78 (Supp.2) (1980):377. See also Black & Lilienfeld, Epidemiologic Proof in Toxic Tort Litigation, 52 Fordham L. Rev. 732, 744-49 (1984).

64 See Andrues, supra, note 51 at 2105.

65 Id. at 2105.

66 Id. at 2106.

67 Id.

68 See Id. at 308 and 309.

69 Frye v. United States, 293 F. Supp. 1013 (D.C. Cir. 1923).

70 Sterling at 1208.

71 Lilley v. Dow Chemical Co., 611 F. Supp. 1267 (E.D.N.Y. 1985), aff'd, 818 F.2d 145 (2nd Cir. 1987).

72 Id. at 1273.

73 In re Agent Orange, 818 F.2d 187, 193.

74 See Fed. R. Evid. 803(8)(C), regarding public records and reports.

75 597 F. Supp. 374, 409 (D. Kan. 1984).

76 Id. at 426.

77 724 F.2d 613 at 618 (8th Cir. 1983)

78 Id.

79 See B. Castleman, Asbestos: Medical and Legal Aspects 39-122 (2d ed. 1986).

80 See David Ashton, Decreasing the Risks Inherent in Claims for Increased Risk of Future Disease, 43 U. Miami L. Rev. 1081, 1103-04 (1989). Ashton lists a number of cases that have developed the varied language attached to the standard of proof in enhanced risk claims.

81 660 F. Supp. 1516 (W.D. Mich. 1987).

82 Id. at 1524.

83 Ashton at 1113.

84 See generally Kanner, Emerging Conceptions of Latent Personal Injuries in Toxic Tort Litigation, 18 Rutgers L.J. 343.

85 Ayers v. Jackson Tp., 525 A.2d 287 (N.J. 1987).

86 Id. at 308.

87 The information in this section is based on Schnare pp. 41-44.

88 From discussion in Larson v. Johns-Manville, 399 N.W.2d 1 (Mich. 1986).

89 See Ayers 525 A.2d at 300.

90 Wulfjen v. Dolton, 151 P.2d 846, 848 (1944).

91 Martinez-Ferrer v. Richardson-Merrill, Inc., 164 Cal. Rptr. 591 (1980).

92 Id. at 597.

93 Eagle-Picher, 481 So.2d 517 (Fla. App. 1985).

94 Id. at 521.

95 See Note, Developments in the Law--- Toxic Waste Litigation, 99 Harv. L. Rev. 1458, 1606-07 (1986). This articles discusses numerous state statutes of limitations.

96 See Ayers, 525 A.2d at 289,299.

97 See Comprehensive Environmental Response, Compensation and Liability Act section 309(a), 42 U.S.C. 9601-9674 (Supp. V. 1987). (Also known as CERCLA).

98 Id.

99 See Wilson v. Johns-Manville Sales Corp., 684 F.2d 111 (1982).

100 Id. at note 44. See also King, Causation, Valuation, and Chance in Personal Injury Torts Involving Preexisting Conditions and Future Consequences, 90 Yale L.J. 1353, 1376-87 (1981).

101 Mauro v. Raymark Industries, Inc. 561 A2d 257 (N.J. 1989).

102 Id. at 267. Note that the reasonable medical probability standard is perceived as greater than a fifty percent chance. See Ashton, note 76 at 1089.

103 516 A.2d 534 (Me. 1986).

104 Id. at 543.

105 Id. at note 7. This note gives a good summary of the existing caselaw at that time from various federal circuits on toxic substances that do not cause noticeable physical harm until years after exposure.

106 440 S.W.2d 43.

107 Id. at 46.

108 Id. See also Ayers at note 81. Ayers gives a lengthy discussion on causation and compares caselaw from various jurisdictions.

109 855 F.2d 1188 (6th Cir. 1988).

110 Id. at 1206.

111 Id.

112 Id. at note 24.

113 Id. Note, that the court in Ayers did not permit recovery for emotional distress because New Jersey prohibited damages for pain and suffering. The court determined that emotional distress was a type of pain and suffering.

114 Anderson v. W. R. Grace & Co., 628 F. Supp. 1219 (D. Mass. 1986).

115 Ayers at 306 and 307 provides an exhaustive list of cases and the standard required for recovery for enhanced risk claims.

116 Id. at 307.

117 See Ashton at note 76.

118 525 A.2d 287 (N.J. 1987).

119 Id. at 311.

120 514 F.2d 492 (8th Cir. 1975).

121 Id.

122 Id.

123 Ayers at 312.

124 Id.

125 Id.

126 Id.

127 Id. at 309, 310.

128 See Ginsberg & Weiss, Common Law Liability for Toxic Torts: A Phantom Remedy 9 Hofstra L. Rev. 859, 920-30 (1981); Rosenberg, The

Causal Connection in Mass Exposure Cases: A Public Law Vision of the Tort System, 97 Harv. L. Rev. 851, 855-59 (1984); Trauberman, Statutory Reform of Toxic Torts Relieving Legal, Scientific, and Economic Burdens on the Chemical Victim, 7 Harv Envtl. L. Rev. 177, 188-202 (1983); Developments in the Law--Toxic Waste Litigation, 99 Harv. L. Rev. 1458, 1602-31 (1986) and Note, The Inapplicability of Traditional Tort Analysis to Environmental Risks: The Example of Toxic Waste Pollution Victim Compensation 35 Stan. L. Rev. 575, 581-88 (1983).

129 Ayers at 299.

130 Ayers at 308.

131 588 F. Supp. 247 (D. Utah 1984), reversed on other grounds not related to causation, 816 F.2d 1417 (1987).

132 588 F. Supp. at 411.

133 Wagner, Trans-Science in Toxic Torts, Schnare, Chapter 6. That chapter was adapted from 96 Yale Law Review 428 (1986).

134 Id.

135 Gold, Causation in Toxic Torts: Burdens of Proof, Standards of Persuasion, and Statistical Evidence, 96 Yale L.J. 376,393 (1986).

136 Id. at 393-400.

137 Ashton, Decreasing the Risks Inherent in Claims for Increased Risk of Future Disease, 43 U. Miami L. Rev. 1081,1118 (1989).

138 Id. at 1119,1120.

139 Bill No. 1398 of the Twentieth Guam Legislature, First Regular Session, 1989.

140 The next several paragraphs are derived from the legislation set out in Appendix A.

141 Gaulding v. Celotex Corp, 772 S.W.2d 66 (Tex. 1989).

142 Id. at 68.

143 Id.

144 Id. at 70.

145 Mauro v. Raymark Industries, Inc. 561 A.2d 257 (N.J. 1989).

146 Id. at 260.

147 Id. at 261,262.

148 Id. at 264.

149 Id. at 267.

150 Lamb v. Global Landfill Reclaiming, 543 A.2d 443 (N.J. 1988).

151 Id. at 446.

152 Id. at 450.

153 Id. at 451.

154 1990 U. S. Dist. Lexis 16011 (S.D. W. Va.).

155 Id.

156 746 F. Supp. 887 (D.Minn. 1990).

157 Id. at 901.

158 Id. at 905.

159 Id. at 906.

160 737 F. Supp. 1528 (D. Kan. 1990).

161 Id. at 1535.

162 749 F. Supp. 1300 (D. Vt. 1990).

163 Id. at 1316.

164 749 F. Supp. 1545 (D. Colo. 1990).

165 Id. at 1554.

166 Id.

167 736 F. Supp. 737 (E.D. Ky. 1990).

168 Id. at 744.

169 Id. at 744.

170 706 F. Supp. 376 (E.D. Pa. 1989).

171 Id. at 381.

172 WL 9724 (E.D. Pa. Sept. 4, 1986).

173 Id.

174 See Fed. R. Civ. Proc. 56 and comments.

175 902 F.2d 362 (5th Cir. 1990).

176 Id. at 367.

177 Id.

178 Deluca v. Merrell Dow Pharmaceuticals, Inc., 911 F.2d 941 (3rd Cir. 1990).

179 Id. at 952.

180 Id. at 953.

181 Id. at 955.

182 916 F.2d 829 (3rd Cir. 1990).

183 Id. at 852.

184 This information is based on a telephone interview with Lt. Col Alan Roach, United States Marine Corps on March 12, 1991.

185 This information is based on a telephone interview with Steve Talson, Department of Justice, Washington, D.C. on March 6, 1991.

186 This information is based on a telephone interview with Gary Kendall of Charlottesville, Virginia on March 5, 1991.

TWENTIETH GUAM LEGISLATURE
1989 (First Regular Session

Bill No. 1398 (LS)
As amended by Committee on Rules

AN ACT TO ADD A NEW CHAPTER 41 TO TITLE 10, GUAM CODE ANNOTATED, TO COMPENSATE THOSE EXPOSED TO CERTAIN CHEMICAL SUBSTANCES. TO CITE THE CHAPTER AS THE TOXIC SUBSTANCES EXPOSURE COMPENSATION ACT OF 1989. AND TO REPEAL PUBLIC LAW 20-110.

BE IT ENACTED BY THE PEOPLE OF THE TERRITORY OF GUAM:

Section 1. A new Chapter 41 is hereby added to Title 10, Guam Code Annotated, to read:

Chapter 41
Toxic Substances Exposure Compensation Act

Section 41101. Legislative Findings. The Legislature finds that:
(1) Residents of Guam are being constantly exposed to a large number of dangerous chemical substances and mixtures;
(2) Among the many chemical substances and mixtures which are being developed and produced, there are some whose manufacture, processing, distribution in commerce, use, or disposal may present an unreasonable risk or injury to human health or the environment;
(3) Individuals have a well-grounded fear of injury or illness arising from exposure to such dangerous chemical substances and mixtures;
(4) Because of the toxicity of certain chemical substances and mixtures, no definite testing of the effects of these chemical substances and mixtures on humans is available;
(5) Tests conducted on animals indicate that certain chemical substances and mixtures are very harmful to animals and may cause harm to humans;

(6) The effective protection of the physical and mental health of Guam's residents and their ability to enjoy life requires that those exposed to certain chemical substances and mixtures be compensated by those responsible for the manufacture and distribution of those substances: and

(7) For a variety of reasons, including lack of ambiguity of data, the long lead time between exposure and illness, and the presence of disease from other causes, case law in other jurisdictions has created an unacceptable burden on persons exposed to toxic substances to prove causation and the likelihood of harm.

Section 41102. Policy. It is declared to be the policy of Guam that:

(a) The statutory and common law of Guam shall facilitate the compensation of those exposed to certain chemical substances and mixtures;

(b) Person exposed to toxic substance shall be entitled to compensation for all damages arising fro exposure to such substances.

Section 41103. Definitions. As used in this Chapter, the following terms are defined to mean:

(1) Toxic substance shall mean polychlorinated biphenols, dioxins, furans or halogenated chlorofluoroalkanes.

(2) Exposure shall mean any contact from any source with skin, eyes, ears, hair or other part of the human body, including but not limited to contact through ingestion or breathing.

(3) Federally permitted levels of exposure shall mean the maximum levels of exposure of humans as determined by federally regulatory agencies, ...

(4) Persons shall mean and include individuals, governmental entities, including but not limited to the United States or the government of Guam, whichever the case may be, and corporations, partnerships and other business entities.

Section 41104. Liability for exposure to toxic substance. (1) Any person who has been exposed to toxic substances at a level above federally permitted levels of exposure shall be entitled to bring an action for damage against:

(a) The manufacturer of the toxic substances or any person who incorporates a toxic substance in the manufacture of a product. Such persons shall be strictly liable for all damages resulting from human exposure to toxic substances at levels above federally permitted levels of exposure.

(b) Any other person who is responsible for the claimant's exposure to the toxic substances. Such other persons shall be liable for damages under this Chapter if their negligence results in the claimant's exposure to toxic substances.

(1) Persons responsible for exposure shall include: Any person who controls the toxic substance after its manufacture who controls any product which contains a toxic substance, provided that such person is negligent in the use, storage, disposal, cleanup or other control of the toxic substance. Violations of federal cleanup regulations shall constitute negligence per se for the purposes of this Chapter.

(2) Recoverable damages shall include injury, increased risk of illness or injury, lost income, medical expenses, pain and suffering, emotional distress (whether or not accompanied by physical manifestation or illness), loss of ability to enjoy life, loss of consortium, loss of ability to procreate, medical expenses for treatment or monitoring, and any other direct or indirect effects of exposure.

(3) Punitive damages shall be recoverable under this Chapter against any person who conceals the harmful effects of toxic substance or against any person who acts with reckless indifference to human health in the manufacture, use, storage or cleanup of toxic substances.

(4) Persons who recover damages under this Chapter shall receive interest on all amounts recovered, from the date of injury until the date paid, at the rates set out in 26 U.S.C. s6621(a)(1), plus attorney's fees, and costs of suit.

(5) In proving increased likelihood of injury, the following rules shall apply:

(a) Once showing of exposure of a toxic substance above federally permitted levels has been made, the parties responsible for the exposure shall have the burden of disproving an increased likelihood of disease or injury to the exposed person;

(b) All doubts shall be resolved in favor of the exposed person;

(c) It shall not be necessary for an exposed person to prove that he has suffered or will suffer a particular illness or injury because of the exposure; instead, it shall be sufficient that there is statistical association between exposure and the incidence of a particular illness or injury; and

(d) Studies indicating harmful effects of exposure on animals shall create a presumption that exposure of humans will also be harmful and will cause similar results.

(6) A cause of action for exposure under this Chapter shall accrue at the time of exposure, regardless of whether physical manifestation of injury has occurred. Any action under this Chapter must be brought within four (4) years of the date of the last exposure, or within two (2) years of the date of discovery of the harm caused by the exposure, whichever is later.

. . . .