

Vanderbilt Law Review

Volume 12
Issue 1 *Issue 1 - Symposium on Nuclear Energy
and the Law*

Article 7

12-1958

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Recommended Citation

Gerald L. Hutton, *Workmen's Compensation and Radiation Injury*, 12 *Vanderbilt Law Review* 145 (1958)
Available at: <https://scholarship.law.vanderbilt.edu/vlr/vol12/iss1/7>

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WORKMEN'S COMPENSATION AND RADIATION INJURY

GERALD L. HUTTON*

The utilitarian and research value of radioisotopes,¹ x-ray and fluoroscopic devices, cyclotrons and other particle accelerators,² nuclear reactors,³ and other materials or devices emitting ionizing radiation is unquestioned.⁴ Ionizing radiation, however, can prove harmful as well as beneficial depending upon the care which is exercised in its use. Numerous cases of x-ray⁵ and radium⁶ injuries are reported in the literature, such injuries dating from 1896 when Roentgen first announced the discovery of x-rays. The most publicized cases of radiation injury are those occurring in the radium poisoning or "dial painters" cases in the 1920's.⁷

Unlike most noxious materials encountered in industry and the environment generally, ionizing radiation cannot be detected by the unaided senses.⁸ Depending upon the radiation dose⁹ received and other

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The opinions expressed herein are those of the author and do not necessarily reflect the views of the U. S. Atomic Energy Commission or its general counsel.

1. A radioisotope may be defined as a form of an element with identical chemical properties as the stable form, but having a different atomic weight and exhibiting the property of radioactivity. Cobalt 60, for example, is cobalt metal which has been irradiated in a nuclear reactor and emits ionizing radiation. The radioactive form of cobalt cannot be distinguished from the non-radioactive cobalt by chemical means. There are approximately 1200 different radioisotopes, fifty of which occur in nature, and the balance being produced in nuclear reactors or particle accelerators.

2. A particle accelerator is a machine which accelerates sub-atomic particles to great velocities which are employed to alter or split target atoms. Although a wide range of radioisotopes can be produced in accelerators, such production is relatively costly.

3. A nuclear reactor or atomic pile is an apparatus utilizing fissionable material and capable of sustaining a nuclear chain reaction. It is the primary source of radioisotopes.

4. See Hutton, *Applied Atomic Energy Research*, NATIONAL COUNCIL FOR THE SOCIAL STUDIES, SCIENCE AND THE SOCIAL STUDIES, TWENTY-SEVENTH YEARBOOK, ch. 8 (1956-57); HAHN, THERAPEUTIC USE OF ARTIFICIAL RADIOISOTOPES (1956); Libby, *Radioisotopes*, NUCLEONICS (Sept. 1957).

5. Dr. E. H. Grubbe is reported to have suffered the first case of x-ray dermatitis within a few weeks after Roentgen announced the discovery of x-rays. For other early x-ray injuries see Codman, *A Study of the Cases of Accidental X-ray Burns Hitherto Recorded*, 9 PHILADELPHIA MEDICAL JOURNAL (1902).

6. Saunders & Montgomery, *Chronic Roentgen and Radium Dermatitis*, 110 J.A.M.A. 23 (1938); Evans, *Radium Poisoning: Review of Present Knowledge*, 23 AM. J. PUB. HEALTH 1017 (1933).

7. Martland, *Occurrence of Malignancy in Radioactive Persons*, 15 AM. J. OF CANCER 2435 (1931); Martland, *Occupational Poisoning in Manufacture of Luminous Watch Dials*, 92 J.A.M.A. 466 (1929).

8. Special instruments such as geiger counters and scintillation counters are used to detect ionizing radiation. Dosimeters, pocket ionization chambers, and film badges worn on the person are used to measure the radiation dose received by such persons and are known as "personnel instrumentation."

9. Several terms are used to describe radiation dose. "Rem" is the abbrevi-

considerations, there may be a relatively long latent period between the time that an injurious radiation dose is received and the manifestation of physiological damage or impairment.

INCREASED POTENTIAL FOR RADIATION INJURY

The rapid expansion of the atomic energy industry, the increased uses of nuclear materials and ionizing radiation by industrial and commercial concerns, have brought many workers into contact with significant levels of radiation for the first time. Prior to inception of the atomic energy program only a relatively small number of employees engaged in painting watch dials and instrument panels with luminous paints, fabricating radon sources for medical use, using x-ray machines or radium capsules for radiographing metallic structures, were potentially exposed to ionizing radiation in the course of their employment. More than 5000 firms, institutions, hospitals, universities and individuals are utilizing reactor and cyclotron-produced radioisotopes and radium for a wide variety of uses. Of this number approximately 50 per cent are industrial firms using radioactive materials in one or more of their manufacturing or assembling operations.¹⁰ More than 600 companies are employing radiographic devices incorporating sealed sources of Cobalt 60, or Iridium 192 to "x-ray" boilers, ship structures, and other metallic or dense objects. Several thousand thickness or density gages incorporating sealed sources of Strontium 90 or other beta-emitting radioisotopes are currently used in the manufacture of cigarettes, aluminum, copper, adhesives, abrasives, plastics, paper, and a wide variety of other materials. Some firms, in addition to using radioisotopes produced in nuclear reactors, also employ x-ray machines and radium for certain operations. It is probable that several industrial concerns will own and operate production and power reactors within the next few years, thereby adding to the potential for radiation exposure.

The increased use of ionizing radiation has given rise to many questions. Of first concern is the question as to whether adequate measures are being taken to assure that workers and the general public will not be unduly exposed to or injured by such materials or devices. Considerable discussion of the radiation safety controls employed in this field by facilities of the Atomic Energy Commission is found

ated term for roentgen-equivalent-man and means that dose of ionizing radiation that when absorbed by man produces a biological effect equivalent to absorption by man of one roentgen of x or gamma radiation. A "millirem" is one-thousandth of a rem. Other terms in common use are "rad," "roentgen," and "roentgen-equivalent-physical" (rep).

10. For general information pertaining to use of radioisotopes controlled by the United States Atomic Energy Commission, see AEC, *ATOMIC ENERGY FACTS* (1957); AEC, *ISOTOPES—AN EIGHT YEAR SUMMARY OF U.S. DISTRIBUTION AND UTILIZATION* (1953); AEC, HUTTON, *RADIOISOTOPES—USES, HAZARDS, CONTROLS*.

in the open literature. Several papers and other works have been published regarding the regulatory authority and control measures of the Atomic Energy Commission and other federal agencies¹¹ and state and local governments.¹² It is to be noted that seven states¹³ have promulgated comprehensive radiation safety regulations. Twenty-five other states have some regulations pertaining to ionizing radiation.

Notwithstanding radiation safety control measures, radiation incidents have occurred.¹⁴ Increasing attention is being devoted to the question as to whether a worker has an adequate remedy if he is injured by or develops an occupational disease as a result of exposure to ionizing radiation. The Connecticut General Assembly, for example, on April 13, 1957 approved a resolution authorizing and directing the State Legislative Council to study the effects of atomic energy from the viewpoint of workmen's compensation and the statute of limitations. Several other groups such as the Atomic Power Investigating Commission of Illinois have given serious study to the subject of adequate compensation for radiation injuries.¹⁵ This has also been a matter of serious study for labor officials and labor leaders.¹⁶

AEC experience with regard to workmen's compensation claims based on radiation injury is relatively limited. Claims have been allowed in 10 cases. New York and other states have made awards in 12 cases based on radiation injury, or involving ionizing radiation as a contributory factor. Other countries, such as Japan and France, have experienced approximately the same number of compensation claims. (Thirty-six awards were made for radiation injury or disease in 1954 under the Japanese Compensation Act but these awards included claims for injury from ionizing radiation and also ultra-violet rays.)

A quantitative appraisal of the potential for radiation injury is outside the scope of this paper. It is clear, however, that a workman

11. Aebersold & Hutton, *Federal Regulation of Atomic Energy Activities*, 7 CLEV.-MAR. L. REV. 77 (1958); Hutton, *Public Control of Radiation Emitters*, 69 PUB. HEALTH REP. 1133 (1954); Health Physics Conference, Lowenstein, *Legal Aspects of Control* (1955).

12. Bergsma & Rechen, *A Radiation Program in a State Health Program*, 45 AM. J. PUB. HEALTH 184 (1955); New England Governors' Conf., New England Comm. on Atomic Energy, *Atomic Energy and New England* (1955); Atomic Industrial Forum, Harris, *State Activities in Atomic Energy* (1956); Pofcher, *Legislating Atomic Health and Safety*, National Safety News (1956).

13. New York, California, Pennsylvania, Texas, Connecticut, Michigan, and Massachusetts.

14. A number of incidents involving radiation over-exposure which resulted in injury or death are listed in *Radiation Protection in Commission Activities, Radiation Safety and Major Activities in the Atomic Energy Program, July-December 1956*. S. Doc. No. 2, 85th Cong., 1st Sess. (1957).

15. See § 5 Report of the Atomic Power Investigation Comm. of Ill., *Legislation and Education* (1957) discussing compensation for radiation injuries under Illinois law.

16. IAIABC Proceedings, Biemiller, *Atomic Hazards for Workers* (1956); U.N. Geneva Conf., Greene, *Workmen's Compensation Aspects of the Peaceful Uses of Atomic Energy* (1955).

should have an adequate legal remedy whether he stands alone as an isolated case of radiation injury or is one of a large group of injured employees. It is equally clear that evidentiary¹⁷ and procedural¹⁸ difficulties could prove insurmountable barriers to recovery, in some cases, if an action is brought at common law for injuries not covered by the compensation statute. It may be argued with effect that the workman does not have an adequate, certain, and prompt remedy at common law or under current workmen's compensation statutes if he suffers a radiation injury or acquires a radiation induced disease.

DEFICIENCY OF COMMON LAW REMEDY

Prior to enactment of the workmen's compensation statutes an employee's chances of recovering against an employer were minimal. A great many accidents suffered by workmen, for example, can be attributed to the negligence of a fellow worker. The employer in such instances could plead the "fellow servant" rule as a defense. This rule, first enunciated by the courts in 1837, prevented an employee from recovering from his master if the injury complained of was the result of a fellow servant's negligence. A second defense available to the employer was assumption of risk. The servant was held to assume the ordinary risks of a particular occupation by accepting employment therein. Contributory negligence on the part of an employee was held to be a bar to his recovery against an employer although this rule was modified by many legislatures prior to enactment of workmen's compensation statutes.

Aside from these defenses available to an employer, the employee in many cases did not possess sufficient facts to prove a cause of action. Further, the high costs of litigation, economic distress during the period of disability, and extended delaying action on the part of a defendant employer also operated to frustrate justice for the injured employee. In other cases the employee was barred by the statute of limitations before he learned of the extent of his injury or became truly disabled.

ENACTMENT OF REMEDIAL LEGISLATION

The courts were reluctant to modify the employer's defenses although many of them finally conceded that it was unreasonable to conclude that an employee assumed the risk of his employer's negligence by accepting employment. The Federal Employers' Liability Act of

17. Hutton, *Evidentiary Problems in Proving Radiation Injuries*, 46 GEO. L.J. 52 (1957); Hutton, *Res Ipsa Loquitur and Actionable Radiation Injury*, 25 TENN. L. REV. 327 (1958).

18. Hutton, *Statute of Limitations and Radiation Injury*, 23 TENN. L. REV. 278 (1954).

1908 and the state workmen's compensation statutes¹⁹ adopted since that date were intended to correct many of the inequities which prevailed in employee actions against the master. A review of the case law indicates, however, that the workman is not necessarily assured of prompt and commensurate compensation in many cases. Claims are defeated on procedural grounds. Delays and litigation occur too frequently. Compensation for serious injuries is usually inadequate in relation to the damages suffered.

WORKMEN'S COMPENSATION STATUTES, GENERALLY

Workmen's Compensation Statutes are premised on the theory that as between the employer and employee the former should bear the cost of personnel injuries which should be treated as another cost of production. The injury complained of must occur in the course of and arise out of the employment.²⁰ In general there must be a causal relationship between the employment and the injury, or the injury must originate in some risk incident to or related to the employment.²¹ Liability under such acts is *ex contractu* in nature and not *ex delicto*.²² The basic objective is to facilitate payment of compensation promptly and without unnecessary delay or costs.²³

If a particular injury or occupational disease is within the scope of the statute it is compensable and the amount of recovery is usually specified. Negligence of employer or employee is not an issue. The employer cannot set up the defenses of assumption of risk, contributory negligence, or the fellow servant rule. The statutes are intended to give a speedy remedy, more certain recovery, and reasonable compensation. The primary advantage to the employer is that recovery is limited and determinate.

Some statutes are elective and the parties can accept or reject coverage.²⁴ The law may not cover all types of employment.²⁵ Occupational diseases may not be covered²⁶ or the coverage may be

19. The first Workmen's Compensation statute was enacted by New York in 1910 but was held invalid by the New York courts inasmuch as it was compulsory rather than elective. In 1917, however, the U. S. Supreme Court held that either compulsory or elective statutes were valid exercise of the state police power. See PROSSER, TORTS 520 (2d ed. 1955).

20. "We have repeatedly held that an injury to be compensable must arise out of as well as in the course of the employment." *Underwood Typewriter Co. v. Sullivan*, 196 Tenn. 238, 243, 265 S.W.2d 549, 551 (1954).

21. *Morris v. Hermann Forwarding Co.*, 18 N.J. 195, 113 A.2d 513 (1955); *Coston v. Carnegie-Illinois Steel Corp.*, 125 N.E.2d 736 (Ohio 1952).

22. *Sommers v. Hartford Acc. & Indem. Co.*, 277 S.W.2d 645 (Mo. Ct. App. 1955); *New Amsterdam Cas. Co. v. Popovich*, 18 N.J. 218, 133 A.2d 666 (1955).

23. *Moody & Sons v. Dedeaux*, 223 Miss. 832, 79 So. 2d 225 (1955).

24. Several state legislatures have changed elective acts to compulsory statutes in the past several years. Some acts are compulsory only in respect to certain types of employment.

25. Employers with specified small numbers of employees are exempt under many acts.

26. Mississippi and Wyoming provide no coverage for occupational diseases.

limited. In some states both injuries and occupational diseases are encompassed in the workmen's compensation act. In other states the term "injury" is used in a narrow sense and occupational diseases are covered in a separate occupational disease act. The injured employee bears the burden of proof in establishing all of the requisite elements of the claim.²⁷ The statute is remedial in nature and is to be liberally construed.²⁸ If there is any substantial doubt as to its meaning it should be construed in favor of the employee.²⁹ It is not a charity, however, and must be interpreted in accordance with legislative intent and in accordance with logical rules.³⁰ If an injury or disease is not covered by workmen's compensation, an injured employee may bring a common law action.

INJURY REFERABLE TO A DEFINITE TIME AND PLACE

Injuries of a traumatic origin, traceable to a definite time and place, involving radioactive materials or other radiation emitters will not present any unusual problems if the employer and employee are subject to the workmen's compensation act and the accident or traumatic incident arose out of and in the course of employment. Illustrative of such incident is a hypothetical instance of a radium capsule rupturing and an employee inhaling large amounts of radium and radon gas and becoming seriously contaminated. It is conceivable that a chemical explosion might scatter radioactive materials or expose shielded radioactive sources, thereby leading to acute radiation exposure. These types of incidents leading to an acute radiation exposure that could be established as occurring at a definite time and place would be compensable on the same basis as any other accident or single event causing bodily injury. Questions of damages or degree of injury might differ from the conventional accident, but the injury would fall within the coverage of practically all workmen's compensation statutes.

LOW LEVEL RADIATION EXPOSURE OVER A PERIOD OF TIME

A considerably different, and more difficult, problem is presented if a radiation dose is received over a period of time, or in unknown doses, ultimately leading to disease or dysfunction of some bodily organ. This type of radiation induced disease, bodily infirmity, dysfunction or malfunction of essential and nonessential organs and structures

27. *Schaefer v. Central News Co.*, 179 Pa. Super. 559, 118 A.2d 268 (1955).

28. *Pfahler v. Eclipse Pioneer Div. of Bendix Aviation Corp.*, 38 N.J. Super 156, 118 A.2d 425 (App. Div. 1955).

29. *Townsley v. Miami Roofing & Sheet Metal Co.*, 79 So. 2d 785 (Fla. 1955); *Bailey v. American General Ins. Co.*, 154 Tex. 430, 279 S.W.2d 315 (1955); *Carey v. Schroeder Mining Co.*, 74 Wyo. 37, 283 P.2d. 1005 (1955).

30. *Bulman v. Sanitary Farm Dairies*, 247 Iowa 488, 73 N.W.2d 27 (1955).

would not be compensable in a great many states. Even though apparently compensable, certain defenses, as noted later, might be used to defeat compensability.

LIMITATIONS ON NOTICE AND FILING CLAIMS

The latent period between the time that an injurious dose of radiation is received and the manifestation of physiological damage is frequently several years. Bone sarcoma developed in some of the radium-dial painters fifteen years or more after their last possible exposure to luminous paint. Malignant tumors have developed in some patients receiving therapeutic doses of x-rays some twenty years after the last treatment. Skin cancer has been delayed as long as fifty years. The average latent period for lung cancer in miners of radioactive ores was approximately 17 years, the total radiation dose probably exceeding 1000 rem. Many of the radium poisoning victims were virtually symptom free for a period of ten years or more although some died within three years after substantive intake of the luminous paint. Many cases can be cited portraying the insidious effects of ionizing radiation several years after the last exposure. (It is to be noted, of course, that delayed latent effects are not unique to radiation induced disease. Cancer due to tar fumes may develop 10-20 years after injurious exposure).

The typical workmen's compensation statute involves two basic limitations—a very short time limitation for giving notice to the employer and a longer, but still short, time for filing a claim. The great majority of courts have construed the notice requirement liberally, excusing lack of notice where there were extenuating circumstances and the defendant was not unduly prejudiced thereby. Many statutes expressly provide that defect in notice is not a bar unless the employer proves that he was unduly prejudiced thereby. More serious difficulty has been encountered with regard to the limitations on filing a claim. Not only do the time limits vary widely, but the time from which the statute of limitations begins to run also varies. The time limitation may also differ depending upon whether one is dealing with an accidental injury or an occupational disease.

Illustrative of such variances are the following: claim for occupational disease must be filed in Ohio within six months after disability due to the disease began. Washington provides that a claim for occupational disease must be filed within one year after the claimant has notice from a physician that he has an occupational disease. Several statutes begin to run from the last date of exposure. A number of statutes provide two time limitations such as one year from date of knowledge or five years after the last exposure. The 1957 New York legislature wrote in an exception to the two year statute

of limitations for "disablement due to ionizing radiation or radioactive substances" providing that such claims shall not be barred for failure to file a claim within two years provided that such claim is filed after such two-year period and within ninety days after disablement and after knowledge that the disease was due to the nature of the employment. This exception, however, pertains to delayed or latent pathological bone, blood, or lung changes or malignancies.

The statute of limitations laid down by the legislatures are unduly harsh in many instances and unclear in many respects. The fact that a claimant has received an erroneous diagnosis from one or several physicians will not toll the statute of limitations in most jurisdictions. It is to be noted that many jurisdictions hold that equitable estoppel may be invoked to prevent a defendant from pleading the statute of limitations where fraudulent concealment of the cause of action can be shown.

A statute that begins to run from the last date of exposure or the date of injury or date of disablement will bar many claims for occupational disease due to radiation. Many of the radium poisoning cases knew of their disability a number of years before they died, but they did not know it was due to radium and their earlier occupation painting watch dials. Accordingly, they would not have filed a compensation claim even if the New Jersey statute had covered radiation injury or disease.³¹ On the other hand, a statute such as New York's goes to the other extreme and may be criticized as being equally unrealistic as present short-term limitations for radiation injury. The statute of limitations is favored in the law. It is essential to avoid stale claims against which the defendant will be placed at a great disadvantage. Should a company and its insurance carrier be subjected to a suit for radiation injury fifty years after an employee terminates his employment?

The Tennessee rule with regard to occupational diseases appears to be reasonable, providing that a disease or condition is an occupational disease if it has developed to the extent that it *can* be diagnosed as an occupational disease and suit must be commenced within one year after the beginning of incapacity for work resulting from an occupational disease. See *Wilson v. Van Buren County*³² pertaining to the occupational disease of silicosis and the notice and limitations provisions of Tennessee law.

31. It is interesting to note that the New Jersey compensation statute was not amended to cover radium poisoning and necrosis until four years after the first radium injury from luminous paint was detected. This first amendment, however, gave no relief from the statute of limitations where clinical symptoms did not occur for several years after last exposure.

32. 196 Tenn. 487, 268 S.W.2d 363 (1954).

INADEQUATE COVERAGE OF RADIATION INDUCED DISEASES

Some workmen's compensation statutes do not cover occupational diseases of any type. Others include a number of occupational diseases but do not list diseases due to ionizing radiation. Of those statutes that purport to cover radiation injury or disease by schedule, an examination of the language employed indicates that it is much too narrow to encompass the great majority of such diseases that might occur. The occupational disease schedule of Arizona,³³ for example, lists as an occupational disease "[u]lceration of the skin or destruction of tissue due to the prolonged exposure to roentgen rays or radium emanations."

This provision covers ulceration of the skin or destruction of tissue; the exposure must be prolonged; the radiation must be roentgen (x-rays) or radium emanations. The language is obviously too narrow to cover delayed or latent injury from Cobalt 60, Polonium 210 and the many other reactor-produced radioisotopes that do not involve roentgen rays or constitute radium emanations.

The Idaho statute³⁴ is broader in this regard:

6. Radium poisoning by or disability due to *radioactive* properties of substances or to Roentgen ray (x-ray) in an occupation involving *direct* contact therewith, handling thereof, or exposure thereto.

It might be a fine question in some cases as to whether disability was due to the chemical toxicity or radioactivity of certain radioactive materials. The word "direct" also introduces a question as to whether persons working in the vicinity of a radioactive source, perhaps in the next room, receiving scattered radiation over a period of time, would be covered as opposed to the worker actively engaged in operating radioactive devices or working directly with radioactive materials.

The Ohio statute was originally very narrow, covering "[r]adium poisoning: Any industrial process involving the use of radium and other radioactive substances in luminous paint."³⁵ This was clearly directed at covering diseases such as incurred by the radium dial painters. The schedule was later amplified by the following:

All other occupational diseases: A disease peculiar to a particular industrial process, trade or occupation and to which an employee is not ordinarily subjected or exposed outside of or away from his employment.³⁶

This language could give difficulty. Can it be said that leukemia is peculiar to a paper mill that uses a radioactive thickness gage? Can

33. ARIZ. REV. CODE ANN. § 23-1102 (12) (1956).

34. IDAHO CODE ANN. ch. 12 § 72-1204 (1947). (Emphasis added.)

35. OHIO REV. CODE ANN. § 4123.68 (Q) (Baldwin 1958).

36. OHIO REV. CODE ANN. § 4123.68 (X) (Baldwin 1958).

it be said that skin cancer is peculiar to the wide range of industries that use some form of radiation emitters in their industrial processes? Aren't most persons subjected to substantial quantities of radiation outside of their employment, considering background radiation, gastrointestinal x-ray studies, chest x-rays, etc.? Does this language rule out an employee who received measurable quantities of radiation outside of the particular job he holds, or has received significant radiation in earlier employment?

Many other examples may be cited of statutes which either do not cover radiation related diseases at all, cover only a small number of possible diseases, or are fairly broad in scope, but employ language that could narrow the field of coverage. It is to be noted of course that many statutes purport to cover all occupational diseases by a general provision such as "any and all occupational diseases." It is necessary, however, to check the definition of "occupational disease" in such cases to determine whether such general provision is as broad as it appears.

*Kress v. City of Newark*³⁷ is an interesting x-ray injury suit in which defendant argued that plaintiff's exclusive remedy was under workmen's compensation. Plaintiff worked around x-ray machines for a number of years and was assigned as an x-ray technician in 1939. In 1945 she first noticed brown spots on her hands. The warts would break off and bleed. She alleged that she was advised to apply salve to the affected areas and she had nothing to worry about. A year later the condition was diagnosed as squamous cell carcinoma. Operations were necessary to remove the damaged skin and graft skin. Defendant argued that there was traumatic aggravation of a pre-existing skin cancer and the condition was compensable. The court held:

There is no merit in this contention because there is no evidence whatever that the trauma aggravated an underlying dormant condition. The laceration merely revealed the existence of the carcinoma which, according to the medical experts resulted from overexposure to X-ray beams and is a matter of slow development over a period of years, or at least months, depending upon the sensitivity of the particular individual. In other words, this was not a dormant condition rendered active by trauma; it was revealed by trauma. Therefore any claim under the act would have failed for lack of proof of an injury by "accident" resulting in disability within the intentment thereof. Nor does plaintiff's condition fall within any of the compensable occupational diseases provided for under the act as it stood . . . prior to the amendment thereof in 1949 . . . , which amendment was after the institution of the present action.³⁸

The court reversed and remanded for trial de novo, considering the \$90,000 judgment as excessive. As noted by the court, the New Jersey

37. 8 N.J. 562, 86 A.2d 185 (1952).

38. *Id.* at 189.

statute has been amended to cover this type of situation for future purposes. Amendments were also effected by several other states to cover radium injuries (for future purposes) after the publicized radium poisoning cases of the 1920's.

PROOF OF COMPENSABLE RADIATION INJURY OR DISEASE

Even if an employee discovers at an early date a possible radiation injury or radiation induced disease and is not barred by the statute of limitations, and the particular condition falls within the statutory language and there is no problem of coverage, he may still encounter serious difficulty in proving that he has an occupational disease due to radiation or has incurred a radiation injury.

The claimant in a workmen's compensation case has the burden of proof to establish all necessary elements of his claim. His case must be established with legal certainty; it is not enough that his case merely be probable.³⁹ The claimant must establish a causal relationship between his employment and the injury of which he complains.⁴⁰ The burden of proof rests upon the petitioner to establish that the injury arose out of and in the course of the employment.⁴¹ The award must be predicated upon competent evidence.⁴²

Although practically all courts give a liberal construction to the act, it is frequently stated that this rule of liberal construction applies to the law and not to the evidence supporting a claim. The rule of liberal construction does not permit the court to make an award where requisite proof has not been offered.⁴³

Many jurisdictions, however, hold that any reasonable doubt as to whether an injury arose out of the employment must be resolved in favor of the employee. As noted in *Great American Indemnity Co. v. Friddell*:⁴⁴

The Workmen's Compensation Act must be liberally construed, Tennessee Code Section 6901, and any reasonable doubt as to whether an injury arose out of the employment within the meaning of the Act must be resolved in favor of the employee . . . absolute certainty is not required to support an award in this state Expert opinion on the mysterious functioning of the human body must always be more or less uncertain and speculative.

Essentially all diseases or conditions associated with excessive exposure to ionizing radiation may be caused by other agents or they

39. *Richardson v. Tunica Hardwood Co.*, 81 So. 2d 470 (La. 1955).

40. *Martin v. Board of County Comm'rs, Manatee County*, 79 So. 2d 513 (Fla. 1955).

41. *Nashville Bridge Co. v. Todd*, 286 S.W.2d 861 (Tenn. 1956); *Wilhart v. L.A. Warlick Const. Co.*, 195 Tenn. 344, 259 S.W.2d 655 (1953).

42. *Griffeth v. County of Barrow*, 92 Ga. App. 698, 89 S.E.2d 895 (1955).

43. *Jones v. Yankee Hill Brick Mfg. Co.*, 161 Neb. 404, 73 N.W.2d 394 (1955); *Mahoney v. Nitroform Co.*, 36 N.J. Super. 116, 114 A.2d 863 (App. Div. 1955).

44. 198 Tenn. 360, 280 S.W.2d 908 (1955).

are idiopathic in nature and the precise cause has not been determined. Various blood dyscrasias have been observed in connection with such exposures. Leukemia, a disease characterized by over-production of white blood cells, can be induced by radiation as a direct or indirect effect. Leukemia also occurs, however, independent of any significant radiation exposure. The new cases reported each year are somewhere in the range of 65 to 100 cases per million population. The incidence rate in some areas (e.g., San Francisco) is twice as high as in certain other areas. The etiology of this disease is not fully understood. To establish that it developed as a result of excessive radiation dose may be exceedingly difficult, particularly in view of the facts (1) that it will occur in a certain percentage of employees irrespective of radiation dose, and (2) there is no clinical test that can differentiate leukemia induced by radiation (either as a direct or indirect action) and leukemia due to other unknown causes.

Aplastic anemia may result from radiation damage to the red bone-marrow. It is frequently confused with other blood disorders and the incidence rate is low. Several other agents, including certain antibiotics may contribute to development of aplastic anemia. Skin cancer may be attributable to ionizing radiation, arsenic, ultra-violet rays, coal tar, or any of a great number of other chemical and physical carcinogens. Carcinogens are found in a great number of industrial operations and may be of non-occupational origin. Radiation dermatitis is difficult to differentiate from other skin conditions. Loss of hair may be due to ionizing radiation, arsenic, glandular disturbances, and a number of other causes. Radiation may be suspect in Keratosis; yet, the condition may in fact be due to creosote, tar, ultra-violet rays, etc.

Ionizing radiation may contribute to an injury or death in an indirect fashion. Heavily irradiated skin may apparently heal, but is more easily damaged by blows, friction, and wounds. The irradiated person may have lowered resistance to infection. Several years after the radiation injury he may suffer a non-occupational blow or other trauma leading to infection and death. In this hypothetical case, the original radiation injury contributes to the later infection and death. Can it be stated, to the satisfaction of the compensation board or the court, that the death is due to a compensable injury or occupational disease? It is possible in another hypothetical case that the kidneys may be damaged by radiation, ultimately leading to hypertension after a slow process and possibly death. It is doubtful that hypertension would be related to the earlier radiation dose.

PRE-EXISTING CONDITIONS

A common defense to a compensation claim is that the condition complained of was a pre-existing one, antedating employment by de-

fendant. This defense is particularly effective in the case of diseases that may develop over a wide range of years such as silicosis, tuberculosis, malignancy. It is likely that this defense will be set up in the case of claims involving ionizing radiation. There are several precancerous conditions that may, but not necessarily, become malignant. Leukoplakia, disease of the mucous membranes, may ultimately develop into cancer. Similarly, certain apparently benign tumors and wart-like growths may become malignant. If a person with such growths is occupationally exposed to ionizing radiation and malignancy develops at a later date, a claim is likely to be presented. It may be argued in such cases that the lesions were aggravated by radiation.

It is to be noted that an injury need not be attributable solely to employment. Aggravation of a pre-existing condition arising out of and in the course of one's employment is compensable in Tennessee and many other jurisdictions.⁴⁵ If a pre-existing condition is aggravated, accelerated, or contributed to, or precipitated by covered employment, the resulting claim is compensable.⁴⁶ It has been stated that blood changes will not occur in an individual unless the radiation dose exceeds 25-30 rem. This statement may be valid when dealing with "averages" of "normal" subjects. In an individual case, however, where the specific person involved has a border-line condition, less radiation may be required to create an abnormal picture. Even though an employee is more prone or susceptible to disease than the ordinary, healthy individual the disease he acquires is compensable if it arises in the course of and out of his employment.⁴⁷

It is probable that medical testimony from qualified experts may conflict on certain points relating to radiation injury or disease. It is to be noted that the compensation board, or court, may disregard expert medical testimony.⁴⁸ In some cases expert medical testimony has been dispensed with, the courts relying upon citation of medical opinion. It has been held that greater weight should be accorded the attending or treating physician's testimony when the medical testimony is in conflict.⁴⁹

45. "It may be, and the preponderance of the evidence is, that neither the 'spur' condition disclosed by the x-ray pictures, nor the arthritis, was originally caused by this injury of October 29. But if that injury aggravated a pre-existing injury or disease, the disability is nevertheless compensable." *Rhyne v. Lunsford*, 195 Tenn. 664, 671, 263 S.W.2d 511, 514 (1953). "An aggravation of an existing disease or infirmity is compensable though the accident would not have caused the result in the case of a normal man." *Root v. City of Duluth*, 247 Minn. 243, 76 N.W.2d 698, 701 (1956). Cf. *Bush Bros. & Co. v. Williams*, 197 Tenn. 273, 273 S.W.2d 137 (1954).

46. *Southern Eng'r & Elec. Co. v. Chester*, 83 S.2d 811 (Miss. 1955).

47. *Reynolds v. General Motors Corp.*, 38 N.J. Super 874, 118 A.2d 724 (1955).

48. *Schaefer v. Central News Co.*, 179 Pa. Super. 559 118 A.2d 268 (1955).

49. *Bialko v. H. Baker Milk Co.*, 38 N.J. Super. 169, 118 A.2d 412 (App. Div. 1955).

OTHER CONSIDERATIONS

Some statutes exempt the "ordinary diseases of life." Tuberculosis, presumably is an ordinary disease of life and would not be compensable under such statutes. Yet, the courts have allowed claims for tuberculosis as an occupational disease. These decisions reflect the liberal view that some courts extend to compensation claims in order to make coverage as broad as possible consistent with legislative intent and the language of the statute. There may be cases, however, where a claimant may wish to bring a common law action for greater damages than the compensation act would permit. In such cases plaintiff's counsel might argue that the malignant condition, the cataracts, the dermatitis, although due in whole or part to conditions of employment, was an ordinary disease of life and therefore outside the scope of the act.

Willful disobedience of reasonable rules and regulations adopted by the employer may bar an employee if such disobedience contributes in whole or part to his injury provided such rules are posted in a conspicuous location or otherwise brought to the employee's attention. Inequitable results probably occur with regard to such provisions which are found in a number of statutes. The workman may be deceased or otherwise unable to refute a charge of violating such rules. Fellow workmen may be reluctant to testify against an employer if they are still employed by the company which attempts to assert such defense against a claim.

It is well recognized, furthermore, that many rules are "disseminated" insofar as records of the firm are concerned and yet employees are not in fact apprised of such rules. Some levels of supervision may be unaware of such rules. Also, in order to expedite a particular job a workman may be instructed to disregard a particular rule. Will the supervisor admit such instruction on his part if he is still employed by the defendant company? It is not too uncommon for the safety department to develop stringent safety rules, but no attempt is made to enforce them.

It is submitted that violation of a company's safety rules should not be a valid defense if the injured employee is deceased or otherwise unable to testify, and in all cases defendant should bear the burden of proving that claimant (1) had *actual* knowledge of the rule in question, (2) reasonable efforts were made to enforce such rules, and (3) claimant *willfully* rather than inadvertently violated such rules. It is to be observed that "misconduct" under the Tennessee rule will not bar an employee unless such misconduct is willful and the employer bears the burden of proof in such cases.⁵⁰

50. Hoodenpyle v. Patterson, 197 Tenn. 621, 277 S.W.2d 351 (1955).

THE REMEDY IS INADEQUATE

Many radiation injuries are not necessarily disabling and compensation would not be allowed. Radiation induced sterility, for example, does not affect the employee's ability to earn wages. Epilation, scars, and burns may constitute serious and painful damage and yet not be disabling. The basic concept of our modern workmen's compensation and occupational disease statutes may be seriously questioned in basing recovery solely on "disability." The intense physical suffering and mental anguish that would justify a judgment of \$50,000 or possibly \$100,000 or more, results in an award of 65 per cent of the claimant's average weekly wage for three or four years. It is difficult to conceive that a man's life is to be measured in terms of a maximum of \$8,000, \$10,000, \$12,500. Even though a claimant meets all of the statutory requirements—satisfies the notice and filing of claims requirements, successfully bears the burden of proof to establish all the requisites of the claim, the award is too frequently a token payment, not commensurate with the damages incurred.

Another consideration, particularly pertinent to radiation injury, is the fact that many statutes limit the amount which may be allowed for medical diagnosis and therapy. The diagnosis and treatment of radiation injuries and diseases frequently is complex, drawn out, and expensive and many acts would be inadequate in this respect. Possibly a more equitable approach to employee injuries and diseases would be a two-fold system of insurance, and a right to tort action if negligence can be established. In defending the tort action the employer would be deprived of his common law defenses of "assumption of risk" and "fellow servant rule" but not "contributory negligence." The latter would be considered in mitigation of the damages but not to defeat a suit. To satisfy constitutional considerations the act should be strictly construed as in derogation of common law and a ceiling could be placed upon recovery in the tort action (*e.g.*, a maximum recovery of \$50,000).

A number of suggestions have been made with regard to presumptions that might be permitted by the courts in the case of radiation injury. It has been suggested that radiation monitoring records be accorded a prima facie presumption of correctness inasmuch as there may be a long lapse of time before they are used and authenticating testimony may not be available. This suggestion may be seriously questioned.

The many variables involved and possible errors in calculating probable exposures make it particularly important that a person desiring to use such monitoring records establish that they are reasonably accurate and authentic records pertinent to the case in question. An employee does not control the monitoring system and knows

little about either the procedures that were supposed to be followed and those that actually were employed. It is doubtful that he would be in a position to overcome the prima-facie presumption of correctness of such records. It is to be noted, of course, that such records might be admitted under the "best evidence rule" if many years had elapsed and authenticating testimony of the person who prepared such records was not available. This writer suggests that it is the better view to treat such records as any other documentary evidence, subject to authentication and possible impeachment.

CONCLUSION

If the workman who suffers a radiation injury or acquires an occupational disease due to ionizing radiation is to receive *adequate recompense*, substantive revision of the workmen's compensation statutes of the forty-eight states is indicated. In some respects these revisions are necessary to meet problems posed by the unique properties of radiation—delayed latent effects, etc. From a broader view, however, radiation injury and disease is merely a special problem which serves to point up the inadequacy and inequity which prevails throughout the workmen's compensation system, a system which is neither insurance nor an adequate substitute for a tort action.

The legal profession and courts have employed fine legal reasoning in order to bring more injuries and diseases within the scope of the workmen's compensation statutes whenever the language of the statutes permitted such construction. It is possible, unless such statutes are radically revised or supplemented by liberal federal legislation, that an increasing number of lawyers will direct their legal talent to reversing the tendency to widen the scope and coverage of such statutes by liberal construction. Until such time as the remedy under workmen's compensation statutes is both certain and commensurate with the damages incurred, it is possible that a common law action is preferable from the employee's viewpoint than recovery under the compensation statute.