Dr. Carl J. Johnson—Star Witness for Radiation Hysteria

by

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A study by Dr. Carl J. Johnson of cancer rates downwind from the atomic bomb testing site in Nevada supported a class-action lawsuit that began an orgy of fallout hysteria in southwestern Utah and was the major study cited in support of the Radiation Exposure Compensation Act (RECA) passed in 1990. The Johnson study is also expected to be cited in support of S-791. On April 12, 2011 U. S. Senator Tom Udall (D-NM) led a bipartisan group of senators in introducing S-791, the Radiation Exposure Compensation Act Amendments of 2011, which would among other things expand compensation to all counties in Idaho, Montana, Colorado, New Mexico, and to areas not now covered in Utah, Nevada, and Arizona and increase the payment from $50.000 to $150,000 to any person (or their heirs) exposed to fallout who have been or will later become a victim of cancers covered by RECA.

RECA grew out of an atmosphere of fear, panic, and emotional hysteria about a fallout-induced cancer epidemic in southwestern Utah. Fallout hysteria began to take root when Stewart Udall arrived in St. George, Utah in the fall of 1978, accompanied by a drumbeat of publicity, to hold a series of meetings with local cancer victims and/or their relatives. At a press conference held to announce plans for a class-action lawsuit against the United States, Udall is quoted as saying that he was stunned by the abnormally high number of suspected fallout cancer victims: "The enormity of it is the shocking thing," Udall said. "There are two to three time more of every type of cancer than we had assumed."[1] Udall returned to St. George in 1981 to set up a study under the direction of Dr. Carl J. Johnson to support his lawsuit---a totally invalid study that is the major focus of this article.

Two ladies made comments on *Clouds of Doubt* aired by the Salt Lake TV station *KUTV* in 1979 indicating that a real atmosphere of fear did exist in southwestern Utah:

"We are all so very frightened…the town is terrified when the word cancer is mentioned."[2]

"We're all shocked…we have all become very nervous…it's a frightening thing. We're paralyzed with fear."[3]

The following quotes are from activists, politicians and liberal media types who joined forces with Udall to support a fallout-induced cancer epidemic in southwestern Utah---an epidemic known as the Utah nuclear tragedy.

"Udall was quoted often in local newspapers that fall. After interviewing 125 people during a four-day period in October 1978, the Washington lawyer said the enormity of the situation was shocking, cancer rates were three or four times greater than normal."[4]

"The sturdy Mormon families [are] struggling with tragedies inflicted by a cancer epidemic foisted on them by the Atomic Energy Commission."[5]

"U. S. Representative Dan Marriott, speaking at a press conference in St. George, said he wanted an explanation from the Federal Government on why southern Utah cancer rates were twice that of the rest of Utah."[6]

"In 1953, the military had tested eleven atomic bombs at Yucca Flats, Nevada, which resulted in immense clouds of fallout floating downwind…Thirty years later, however, half the residents of St. George had contracted cancer."[7]

"Reputable scientists now suspect that the test caused a phenomenally high rate of cancer and thyroid disease among residents of S. George."[8]

"Utahans experienced an epidemic of cancer and other radiation-related illnesses as a

result of radioactive fallout from nuclear weapons testing in the Fifties and Sixties."[9]

"Thousands of citizens throughout the West continue to get sick and die from radiation-exposure-caused illnesses…the small southern Utah town of Parowan in Iron County saw eighty-five to ninety cancer deaths a year."[10]

"Twenty-five years later an alarming number of people living in southwestern Utah are dead or dying from various forms of cancer. Now several scientists are accusing the government of leaving the American people with a terrible legacy that will ultimately affect hundreds of thousands of people."[11]

"Everybody knew that radiation caused cancer. The Atomic Energy Commission knew what would happen…there's a real tragedy in Utah now. Ones that haven't died are still suffering."[12]

"There is no question there has been and will continue to be a large increase in cancer in the exposed [St. George] population."[13]

It was mostly anecdotal accounts that supported the claim of a fallout-induced cancer epidemic in southwestern Utah. The main exception was the study conducted by Dr. Carl Johnson, a well-known antinuclear activist, at the request of Udall to support the class-action lawsuit *Allen v. United States.*

The *Allen* trial began on September 20, 1982 in the Federal District Court in Salt Lake City. Johnson, who was the star witness at *Allen,* directed a survey in 1981 of 1212 heads of families in Iron, Kane, and Washington counties in southwestern Utah and in several small Arizona and Nevada towns exposed to fallout radiation in the 1950s. "Family" included all persons related by blood or marriage to the head of the family. Johnson, himself, never came to the area covered by the survey. Unpaid volunteers carried out the survey---most of the volunteers

were fierce critics of the testing program. The surveys were completed in several months.

Respondents reported a total of 288 cancers among 4,125 family members, which is 60% higher than the 179 expected according to published cancer incidence rates for all Utah Mormons. Note that 1212 heads of families found 288 cancers among only 4,125 family members. It is astonishing that each head counted on the average less than four family members related by blood or marriage---the mostly Mormon families in the area tend to be very large with uncles, aunts, and cousins by the dozens. This point will be addressed later.

Johnson's results appeared to show for the first time large excesses of many types of solid cancers linked to fallout exposure in Iron, Kane, and Washington counties and selected adjacent areas. The cancers cited by Johnson as caused by fallout radiation were not medically validated. The 4,125 people represent less than 20% of the total population of the area in the 1950s of about 25,000. Dr. Johnson would later publish his results in the *Journal of the American Medical Association (*JAMA) in 1984.[14]

The government lawyers raised several issues about the Johnson survey during the *Allen* trial. They noted that Johnson's finding of excess cancers was not based on medical records; that lay people lack knowledge to distinguish malignant growths from benign non-cancerous growths; and that the survey was vague as to what constituted a "family."[15] The author will raise a related issue later concerning the Johnson survey based on findings that many members of one "family" not afflicted with cancer were not counted producing an overestimate of the fallout effects on cancer rates.

It is natural for most lay people to be impressed with the Johnson study. The Johnson study was used by Senator Orin Hatch (R-Utah) in 1990 to pass RECA in 1990. More recently, Representative Jim Matheson (D-Utah) has cited the Johnson study to support expansion of

RECA to all counties in Utah and beyond. It will be interesting to see if supporters of S-791 cite the Johnson study in support of S-791. The Johnson study has been cited over and over again by activist, authors, politicians and liberal media types in support of a fallout-induced cancer epidemic in southwestern Utah.

However, critics of the Johnson survey are quick to point out that setting up a proper epidemiological study is extremely difficult, even when done by top professionals. For example, at the congressional hearing conducted by Senator Edward Kennedy in Salt Lake City[16] on April 20, 1979, Dr. Joseph Lynn Lyon was asked how much money was needed to do a comprehensive study of the effects of fallout on all cancer rates in southern Utah. Dr. Lyon said such a study would take several years: "In terms of cost, we've made estimates in the order of several million dollars. I don't see how we can pare them down. There is a tremendous amount of technical work that needs to be done…There is no simple way around it"[17]

Scientific studies aimed at linking cancer risk to exposure of ionizing radiation are costly and time-consuming. For example, the Center for Disease Control selected a team of investigators from the University of Washington to conduct a study of the effects on cancer rates of releases of large quantities of radioiodine from operations at the Hanford Nuclear Site in eastern Washington. The study took thirteen years and cost $19.5 million.[18]

How was the quick and cheap Johnson survey actually carried out? To answer this question, the author has: Researched local newspaper accounts; conducted interviews with several of the volunteers and others who had first-hand information about how the Johnson survey was conducted; and interviewed his own brother, attorney John L. Miles, who was a member of the St. George law firm, Wright, Atkin and Miles engaged by Udall to help with *Allen.* John Miles made the law firm's files available to the author.

Local newspaper articles about the Johnson survey are interesting. These articles clearly show that Udall, himself, was involved in getting this study underway and, hence, cast doubts on the credibility of the survey. According to the April 21, 1981 edition of *The Spectrum* (then known as the *Color Country Spectrum,* a southwestern Utah daily) Udall returned to St. George, Utah in 1981 to gather data to support the lawsuit. Under the direction of Udall, a Dixie College sociology professor began a survey of people who lived in southwestern Utah from 1951 to 1963;

> "Philip Williams will be gathering statistics of the number of death among residents during that time period for the St. George legal firm of Atkin and Wright. The data will then be turned over to Stewart Udall. All of the statistics he collects will be analyzed by Dr. Carl Johnson called a 'major professional on the research side of the relation between radiation and cancer.'"[19]

The following quote is from the front page of the May 15 issue:

> "Udall and Williams are asking all people who lived in southwestern Utah between 1952 and 1961 to attend a public hearing May 16 at Dixie High in the school auditorium. The meeting is to recruit volunteers for a study that will be used in a lawsuit. Udall will appear at the meeting to explain the suit."[20]

The front page of the May 16 issue reads**:**

> **"**Local Residents Enlisted for Cancer Study**.** 'We're coming up to a critical period.' Udall emphasized to the group. Williams said that 'cancer hasn't shown up in many families yet, but what about a year from now.' Williams was positive that the result of the study would show a greatly abnormal rate of cancer in southwestern Utah."[21]

After this meeting a rumor spread throughout southwestern Utah that the trial lawyers

would demand hundreds of millions of dollars on behalf of those who suffered death or illness. A *Deseret News* article reported that "Cancer claims against the United States could go as high as $1 billion. So far the claims have been set at a maximum of $1 million each."[22] This rumor introduced a strong financial conflicts of interest among all concerned, particularly those volunteers making the survey who had cancer victims in their families.

Another interesting headline and a long article is found on the front page of the June 28 issue:

> " Survey to Show Cancer Rate High**.** Surveys have already been completed and forwarded to a Colorado doctor for a study of cancer rates among people who lived in Parowan, Paragonah, Kanab and Fredonia during the 'bomb years' of nuclear testing in Nevada. The studies were sent to Dr. Carl Johnson former director of Jefferson County health department by way of Arizona attorney Stewart Udall, who hopes to use the statistic in his ongoing suit against the federal government on behalf of alleged cancer-stricken radiation victims."[23]

An interesting assertion by Williams is found on the front page of the June 30 issue:

> "Udall's interest [in the survey] is simply because he's convinced that the results will show an abnormal rate of cancer, but Udall and the other attorneys have gone to great length to make sure it's done in a professional way----the methods of the survey and all, that's done under Dr. Johnson's direction."[34]

The July 22 headline reads:"Radiation Film Continues as a Good Recruiting Tool**."** The article reveals that Dixie College professors Phil Williams and Joe Green for the last week had been showing *Paul Jacobs and the Nuclear Gang*---a documentary about the atomic testing in Nevada that may have affected St. George residents:

"With the film they hope to attract more volunteers for the cancer rate study conducted under the direction of Colorado health department official Dr. Carl Johnson. 'We can't afford to hire people to get the data we need.' Green told the audience. The film was shown for three nights. Williams plans further showing of the film, which features several local residents, next week. Green emphasized that though results of the study might be used in an ongoing lawsuit against the government, 'We are, in no way, connected to the lawsuit.'"[25]

This is an astonishing statement. According to *The Spectrum* articles in April and May, Udall and associates in a St. George law firm were directly involved in starting the survey under the direction of Phil Williams. Later, Dr. Carl Johnson was asked to be involved in the survey. Why the backtracking?

On August 27, Williams and Green were invited to speak before the St. George Chamber of Commerce. *The Spectrum* reports that Williams "noted that the study is not related to the ongoing lawsuit against the federal government."[26]

Carl J. Johnson in his trial testimony and his 1984 article[27] also identified a subgroup of 289 downwinders who in 1981 recalled at the time of the test having skin burns, eye burns, hair loss, change in hair coloration, nauseas and diarrhea at the time of the tests---characteristic symptoms of acute effects of high doses of radiation. Among these people, Johnson reported a 4500% increase in leukemia and a 500% increase in non-leukemia malignancies. Such symptoms are characteristic of very high doses of radiation---400 rads or more.

In his opinion, Judge Jenkins cited dose estimates made by plaintiff's witness, Dr. John Gofman, repeatedly as a basis for deciding which of the claimants deserved awards. He also leaned heavily on the Dr. Carl Johnson's survey. Page 371 of the *Allen* opinion reads:

"Gofman applied the linear dose-response model to the evidence of increased cancer incidence reported by the Johnson survey to retrospectively estimate the dose that would account for the observed increase. The dose estimates so arrived at are substantially in excess of those offered by the Government...the Gofman analysis further buttresses the conclusions reached by this court upon review of other evidence in this case."[28]

Dr. Ralph Lapp, who was among the first to protest the atmospheric testing of atomic bombs in Nevada, had the following to say about the opinion of Judge Jenkins: "His opinion shows that he amassed much information, but, in accepting Gofman's estimates, he showed poor judgment. He should have sought a consensus opinion of experts. He failed to perceive that Gofman is on the fringe of the scientific community in his risk estimation.[29]

Lapp had much more to say about the *Allen* trial:

" In court, different expert witnesses have presented juries with sharply different estimates of dose. In *Allen*, the plaintiffs' witness, Dr. J. W. Gofman, arrived at probabilities of causation that exceeded 50 percent for some downwind residents. These figures were based on very high estimates of dose, and a dose-response relationship that led to a cancer risks factor 37 times higher that those derived from the Japanese bomb victims. Dr. Gofman presented no direct evidence for his estimates of Utahans' exposure but relied upon data from an amateur epidemiologist, Dr. Carl Johnson."[30]

Dr. Charles R. Smart, chief of surgery at the Latter Day Saints Hospital in Salt Lake City and founder of the Utah Cancer Registry testified at the *Allen* trial. The *New York Times* quoted part of Smart's testimony.

"The only way, I think, you can tell whether there are any cancers caused by radiation is if you find an excessive number, more than expected, and there aren't more

than expected down there…in order for me to make any scientific judgment, I would have to say there was evidence of an increase from the Utah Cancer Registry data, and we show no evidence of an increase."[31]

On May 10, 1984 Judge Jenkins handed down his decision and made awards to ten claimants in amounts from $250,000 to $600,000. Eight awards went for leukemia, one award for breast cancer and another for thyroid disease. On April 20, 1987, the Tenth Circuit of Appeals reversed Jenkins' decision on grounds the U.S. cannot be sued for "discretionary" actions. The Supreme Court declined to hear the appeal.

Dr. Charles E. Land, well-known professional epidemiologist of the National Cancer Institute, has written a thorough review of epidemiological studies of Utah downwinders. After listing the six towns selected by Johnson for analysis of cancer incidence, Land noted that leukemia clusters had already been reported in all of these communities except for Kanab and Bunkerville, and that excess risks are more likely if communities are selected because rates are known to be high compared with other communities.[32]

The survey included only two Iron County towns, Parowan and Paragonah, but excluded Cedar City, Enoch, Kanarraville, and Newcastle---hence about 80% of the 1960 population of Iron County was not included in the survey. Enterprise and Hurricane in Washington County were also excluded. Land also writes:

"Although the usual scientific marketplace tends to work well over the long term in separating valid from invalid findings, invalid studies can result in considerable confusion in the short term. That possibility seemed particularly likely in the case of the Johnson article, which was published in the most widely circulated medical journal in the United States."[33]

Dr. Ralph E. Lapp in reviewing the Johnson study writes:

> "It's no credit to JAMA that such a loose-jointed epidemiology got through peer review….Finally, the National Cancer Institute (NCI) intervened. It undertook a thorough-going radioepidemiology aimed at verifying Dr. Johnson's result. As published in the *American Journal of Epidemiology,* the investigation found no evidence of excess cancer mortality. It turns out that Utah has the lowest cancer mortality of any of the 48 contiguous states."[34]

Dr. Stella G. Machado *et al.* made the NCI findings known in January 1987. Machado *et al.* writes:

> 'The possible implications of the Johnson study for public health are serious, and it is therefore important that its findings be subjected to rigorous critical evaluation and to independent verification from another data source. The present study was conducted to see whether the findings of the incidence study could be substantiated from official mortality statistics.'[35]

The Machado *et al.* 1987 study is an exhaustive three-year epidemiological study of cancer mortality rates in Washington, Iron and Kane counties following the atmospheric testing program. Annual cancer mortality statistics were obtained from the National Center for Health Statistics. The study found that the relative cancer risk in these counties was less than that for their counterparts elsewhere in Utah. The per-year cancer death rate was 113 per 100,000 for the three exposed counties compared to 122 per 100,000 for the rest of the state. The U.S. yearly rate over the same time period was 166 per 100,000.[36]

The results of the NCI study are substantially at odds with the results of the Johnson study. For example, Johnson reported a fivefold increase for leukemia, eightfold for thyroid

cancer, twofold for breast and brain cancer, threefold for melanoma, and eleven-fold for bone cancer relative to nationwide rates. The reported magnitude of excess risk for all cancers was even higher than that observed in the heavily exposed (doses of 100 or more rads) survivors of the atomic bombs dropped on Hiroshima and Nagasaki, or in patient populations given large therapeutic doses of x-rays. In sharp contrast, the NCI study reported a significant deficit in cancer mortality relative to the rest of the state of Utah and the nation in Iron, Kane, and Washington counties and reported no evidence of excess risk for any solid cancer sites. The Machado *et al.* study did document excess cases of childhood leukemia---five of these cases were found in Washington County.

It is interesting to compare the per-year cancer death rate of Washington County (101 per 100,000) with the per year cancer death rates of five fallout-free counties in northern California, namely, Colusa (208 per 100,000), Lassen (177 per 100,000), Modoc (142 per 100,000), Pluma (179 per 100,000), and Trinity (150 per 100,000) during the period from 1950 to 1979.[37] These California counties were very similar to Washington County in population and racial composition in the 1950s. The author encourages the reader to Google *Cancer Mortality Maps and Graphs*. These color-coded maps show that Washington County had one of the lowest cancer mortality rates during every five-year period from 1950 through 2004.

The number of people included in any epidemiological study is essential information. The Johnson survey found 288 cancers over a thirty-year period in a population of 4125 people where only 179 were expected. The ratio 288/4125 =0.07 is higher according to Johnson's data than the expected ratio of 179/4125=0.04. Obviously, both the numerator and the denominator of the "found" ratio must be correct in order to make a meaningful comparison with the expected ratio. The smaller the denominator the larger the "found" ratio.

Regarding the Johnson study, the author has determined that Johnson's found ratio (288/4,125) has a denominator (4,125) that is too small. The argument presented below is based on interviews with several local people who were involved in the Johnson survey, on several members of one extended family and on interviews with attorney, John L. Miles, of the St. George law firm engaged by Stewart Udall.

The evidence comes from checking out in detail the Elmer Pickett "family." Pickett's list of cancer victims by 1981 includes his wife, a sister, a sister-in-law, a mother-in-law, a five-year-old niece, an uncle, a grandmother, and two great uncles. A "family," according to Carl Johnson, includes all persons related by blood or marriage to the head of the family. Pickett reported nine cancers among only sixteen members of his "family." Instead he should have reported nine cancers among 217 exposed "family" members (see below). Simply adding the cancer victims to your "family" and not adding in other healthy family members produces an incorrect denominator. If every one of the over 1212 heads of a "family" included in the Johnson survey failed to include just four other non-cancer victims in his extended "family," the denominator should be 8973 instead of 4125, giving a found ratio of 288/8973= 0.032---a ratio smaller than the expected one.

Pickett has told his story to authors of six popular books about the Utah nuclear tragedy; in a special congressional hearing conducted by Senator Edward Kennedy in Salt Lake City on April 20, 1979: in a special town meeting conducted by Senator Orrin Hatch (R-Utah) in 1979; in a special town meeting conducted by Jake Garn (R-Utah) in 1979; to Peter Jennings on a 1994 television program; and to the local, national, and foreign media.

The number of people that should be included in Pickett's "family" has been determined by interviewing several members of his extended family. We have found that the "family" has to

consist of Pickett and his wife, his dad and mother, his six kids, two sisters with their ten kids, and one brother with four kids, his four grandparents, his six uncles and aunts and their thirty three children. All of these people must be counted (seventy exposed people) since Pickett's list of cancer victims includes a niece, a sister, an uncle and a grandmother. For example, just counting the one uncle without counting the other uncles and aunts is not valid. Not counting their children is also not valid---you can be sure that any of these children would be on Pickett's list if he or she had contracted cancer. All were exposed to some level of fallout. His niece was born and lived all her short life (five years) in northern Utah where the fallout exposure was about six times less than in the St. George area.

Pickett's list also includes his mother-in-law and sister-in-law as cancer victims. So it is necessary to include members of his wife's extended family which includes his mother-in-law, father-in-law, two sisters-in-law and a brother-in-law and their eleven children who were exposed to fallout---a total of sixteen additional "family" members. These people lived in Utah during the fallout period, but none of them lived in Washington County.

All great uncles and great aunts alive during the fallout period, their children, and even their grandchildren, who were exposed to fallout should also be included. The two great uncles who died of cancer in 1959 are Joe Thompson and George Thompson. Just including their children and grandchildren, who were exposed to fallout, adds sixty-two more people to the "family" making a total of 148 "family" members. Including the children and grandchildren of other great uncles and aunts increases the list of "family" members to 217.

One of the nine cancers deaths in Pickett's "family" is from cervical cancer (mother-in-law in 1953) and another is from prostate cancer (great uncle in1959). Both of these cancers are not linked to radiation exposure. Hence, there were only seven possible fallout-caused cancers in

the "family" over a period of about thirty years among 217 people.

Recent US cancer statistics (about 1,500,000 new cases per year per 300,000,000 people) show an average of one new cancer case per 200 people per year. Over a thirty year period (1950 to 1980) about thirty cancer cases are expected per 200 people. Conclusion: There was a deficit not an excess of cancers in Pickett's "family."

Pickett's great uncles and aunts were 80 plus years old during the fallout era. Their children were 40 plus years old and many of their grandchildren were classmates of myself and my ten brothers and sisters during the fallout era. The author wishes to thank the members of the Pickett "family" for helping me develop this information. The information we developed goes pass the 1980s to the present day. The family members helping me could only cite 3 additional cancers in this extended family since 1980. What a healthy family! And one of the most respected group of people in all of southwestern Utah.

Authors, activist and reporters will continue to cite the invalid Johnson study and completely ignore the Machado *et al.* study. For example, activist Mary Dickson in her recent article in *The Spectrum* titled *Claims of Safety Defy Scientific Evidence* states: "I can cite endless studies: Carl Johnson's 1984 study that found a startling increase in cancer rates among residents living in an area of Utah downwind of the test site."[38]

Clearly Dr. Ralph E. Lapp was correct. Judge Jenkins' opinion showed poor judgment in accepting Gofman's estimates based on the Johnson study. The *Allen* trial illustrates that the legal community as a whole, and judges in particular need to be more sophisticated about the scientific basis of risk assessment. Judges need to attend to the scientific evidence more closely, and exclude marginal or unreliable evidence more often.

Some final comments. People find the discussion of fallout-induced cancer deaths almost

irreverent. The author can sympathize with this point of view. The discussion is not pleasant. On the other hand, we are facing situations where we need to know precisely the risks involved in radiation exposure. Furthermore, the psychological impact of the fallout scare has plagued southwestern Utah downwinders for sixty years. One downwinder expressed the concerns of many: "When a Geiger counter is run across my body, it clicks. In the back of my mind is the unspoken dread. When will the bomb inside me go off?[39]

How many downwinders have been affected psychologically? What kinds of stress-related symptoms, mental and physical, have the emotionally traumatized downwinders had to deal with when believing that their future health has been seriously impacted by the tests? It may be that the downwinders suffered less from the fallout than from the generated stress.

The author has lingering doubts about whether fallout caused all of the five childhood leukemia deaths in Washington County documented by the Machado *et al.* study. First, consider the case of the four-year-old Enterprise youth who was born in 1955 and died in 1959. Nearly 90% of the fallout came prior to 1955---less than 1% before 1953 and 87.5% from March to June of 1953.[40] During his four years of life he was exposed to more whole-body radiation from natural background sources than from fallout. Next, consider the childhood leukemia case diagnosed in September of 1954. Since essentially no fallout fell on the St. George area prior to the end of March of 1953, it seems reasonable that any radiation-induced leukemia would not be diagnosed until the spring of 1955 due to the two years or more latency period for radiation-induced leukemia. Therefore, it could be argued that a leukemia case diagnosed in September 1954 occurred too soon to be linked to fallout. Finally, consider the cases of two other childhood leukemia cases diagnosed just after the 1958 Asian flu epidemic. Both these youngsters were diagnosed with leukemia shortly after being hospitalized with severe cases of influenza. A recent

British study has indicated that influenza is a risk factor for childhood leukemia.[41]

The complete story of how lawyers, activists, politicians and the media caused an orgy of fallout hysteria to take root in southwestern Utah beginning in October of 1978 over the long term effects of fallout during the 1950s is told in the author's book *The Phantom Fallout-Induced Cancer Epidemic in Southwestern Utah* available from amazon.com. The author also debunks many myths and fantasies that are deeply entrenched in the minds of many downwinders.

Notes

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3. Ibid., voice of unidentified lady.
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12. Linus Pauling, *Clouds of Doubt, op. cit.*
13. Karl Morgan, *Clouds of Doubt, op. cit.*
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20. Ibid., May 15, 1981.
21. Ibid., May 16, 1981.
22. *Deseret News*, December 21, 1978.

23. *Color Country Spectrum,* June 28, 1981.

24. Ibid., June 30, 1981.

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27. Carl J. Johnson, *op. cit.*

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29. Ralph E. Lapp, *My Life with Radiation: The Truth about Hiroshima* (Madison, Wisconsin: Cogito Books, 1994) 89.

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