L.Ed.2d 743 (1984). The class was defined as "those persons who were in the United States, New Zealand or Australian Armed Forces at any time from 1961 to 1972 who were injured while in or near Vietnam by exposure to Agent Orange or other phenoxy herbicides, including those composed in whole or in part of 2,4,5-trichlorophenoxyacetic acid or containing some amount of 2,3,7,8-tetrachlorodibenzo-p-dioxin." 100 F.R.D. at 729. The class also included spouses, parents, and children of the veterans born before January 1, 1984 directly or derivatively injured as a result of the exposure.

A separate class was certified on the issue of punitive damages under Federal Rule of Civil Procedure 23(b)(1)(B). Potential class members were allowed to opt out of the Rule 23(b)(3) class but not out of the Rule 23(b)(1)(B) class. 100 F.R.D. at 728.

Extensive notice of the class certification was given. See 597 F.Supp. 746, at 756-57. The notice included a Request for Exclusion Form to be completed by anyone wishing to opt-out of the class. Id.

Over 2.6 million veterans from the United States, Australia, and New Zealand served in Vietnam during the relevant period. Letter from Arvin Maskin, Trial Attorney, Torts Branch of the Department of Justice dated March 29, 1985. The number of persons from that group said to have been exposed to Agent Orange has been estimated in the order of 600,000 or more. See 597 F.Supp. 740, at 756. The class size is far larger since it includes family members of the exposed veterans.

As of May 6, 1984, the Eastern District's Clerk's Office had received 2,440 requests to be excluded from the class, but a substantial number of these opted back in. See 597 F.Supp. 740, at 756. The 281 plaintiffs in the captioned cases under consideration at this time, together with the plaintiff in Lilley v. Dow Chemical Co., Civil Action No. 80-2284, appear to comprise all the opt-outs whose claims are now pending in this court. Some of the remaining opt-outs apparently have not yet filed suit; if they do, their cases presumably will be transferred to this court. A considerable number of opt-outs have been dismissed without opposition or for a variety of reasons not germane to the present discussion.

After settling with members of the class on May 7, 1984, defendants moved on July 24, 1984 for summary judgment in the opt-out cases and a number of cases brought by civilians. On December 10, 1984, the court heard oral argument on defendants' motion. Defendants offered overwhelming proof that no causal connection exists between exposure to Agent Orange and development of miscarriages or birth defects. In response, the veterans' wives and children produced no evidence sufficient to create an issue of material fact on causation. See also In re "Agent Orange" Product Liability Litigation, 603 F.Supp. 239 (E.D.N.Y. 1985) (dismissing claims of wives and children against government).

The court denied summary judgment in the case of Lilley v. Dow Chemical Co., Civil Action No. 80-2284. Defendants' motion to reargue was granted, expedited discovery occurred, and oral argument was heard on April 15, 1985. This case is considered in a separate memorandum granting summary judgment for defendants. ___ F.Supp. ___ (E.D.N.Y. 1985) (forthcoming).

The court adjourned consideration of the opt-out veterans' claims against the chemical companies to allow

plaintiffs' counsel time to produce evidence of causation. Counsel produced the affidavit of Dr. Barry M. Singer and 189 accompanying affidavits on January 24, 1985. At that time, the court, at the request of plaintiffs' counsel, allowed plaintiffs fifteen days to produce additional affidavits; the court's order stated that "no further extensions [would] be granted." See Order dated January 24, 1985. Nevertheless, on March 12, 1985, without leave for late filing, counsel produced a second affidavit by Dr. Singer with 93 accompanying affidavits. On that day, counsel also produced a general affidavit by Dr. Samuel S. Epstein with 15 accompanying affidavits.

Subsequently, counsel for plaintiffs, by application dated April 23, 1985, sought 60 additional days to file further affidavits on behalf of 21 opt-out plaintiffs on whose behalf nothing has been submitted by plaintiffs' counsel. This motion for additional time was denied on April 29, 1985.

Counsel for defendants moved to strike these additional materials as untimely on March 13, 1985 and again on March 18, 1985. The court reserved decision and granted defendants' request to adjourn oral argument on the summary

judgment motion from March 18 until April 15. Oral argument was heard on that date. In view of the importance of the matter, rejection on the ground of lateness of any papers heretofore filed seems inappropriate. The court has in fact considered all of the voluminous papers filed up to April 30, 1985 by both sides, as well as all documents in all the related MDL cases, including those studies and reports filed on the court's own motion as it announced from time to time that it was taking judicial notice. Since no objection to the taking of judicial notice has been made, all of the papers encompassed in the more than 6,000 docket entries in this complex multidistrict litigation are before the court and are relied upon in deciding the motion for summary judgment. See Federal Rules of Evidence, Rule 201.

III. FACTS

In support of their contention that Agent Orange did not cause the various ailments that allegedly afflict the veteran plaintiffs, defendants rest upon a number of epidemiological studies. As this court has indicated in extensive and repeated recorded colloquy with counsel and in prior opinions, e.g., In re "Agent Orange" Product Liability Litigation, 597 F.Supp. 740, 777-95 (E.D.N.Y. 1984), all

reliable studies of the effect of Agent Orange on members of the class so far published provide no support for plaintiffs' claims of causation. See also In re "Agent Orange" Product Liability Litigation, 603 F.Supp. 239 (E.D.N.Y. 1985) (granting summary judgment against the veterans' wives and children in their case against the government for failure to show causation).

A. Epidemiological Studies

Epidemiological studies rely on "statistical methods to detect abnormally high incidences of disease in a study population and to associate these incidences with unusual exposures to suspect environmental factors." Dore, "A Commentary on the Use of Epidemiological Evidence in Demonstrating Cause-in-Fact," 7 Harv. Envtl. L. Rev. 429, 431 (1983). In their study of diseases in human populations, epidemiologists use data from surveys, death certificates, and medical and clinical observations. Id.

A number of sound epidemiological studies have been conducted on the health effects of exposure to Agent Orange. These are the only useful studies having any bearing on causation.

All the other data supplied by the parties rests on surmise and inapposite extrapolations from animal studies and industrial accidents. It is hypothesized that, predicated on this experience, adverse effects of Agent Orange on plaintiffs might at some time in the future be shown to some degree of probability.

The available relevant studies have addressed the direct effects of exposure on servicepersons and the indirect effects of exposure on spouses and children of servicepersons. No acceptable study to date of Vietnam veterans and their families concludes that there is a causal connection between exposure to Agent Orange and the serious adverse health effects claimed by plaintiffs. Chloracne and pophyria cutanea tarda are the only two diseases that have been recognized by Congress as having some possible connection to Agent Orange exposure, but no proof has been shown of any relationship of these diseases to these plaintiffs. See In re "Agent Orange" Product Liability Litigation, 597 F.Supp. 740, 856 (E.D.N.Y. 1984) (of all Vietnam veterans, no chloracne and 2 porphyria cutanea tarda cases are recognized as having a connection with Vietnam, but not necessarily with Agent Orange); Veterans

Administration, Adjudication of Claims Based on Exposure to Dioxin or Ionizing Radiation, 50 Fed. Reg. 15848, 15849-50 (April 22, 1985). See also, e.g., Tr. at 182 (Hearings March 5, 1985) (comments of David Dean for Plaintiffs' Management Committee) ("chloracne without disability is not compensable" out of Agent Orange funds).

1. Miscarriages and Birth Defects

The claims of the opt-out wives and children were dismissed orally on December 10, 1984 and many of them subsequently rejoined the class. Evidence regarding their claims is, however, still relevant because it suggests that the veterans' concerns about their ability to reproduce healthy children are, like their concerns about their own health problems, unrelated to Agent Orange exposure. It must be recalled that plaintiffs' counsel pressed these claims of children and wives with at least as much vigor as those of the veterans, relying on much the same kind of inadequate proof now reasserted in connection with the veterans' claims.

The studies to date conclude that there is as yet no epidemiological evidence that paternal exposure to Agent

Orange causes birth defects and miscarriages. See, e.g., Erickson, Mulinare, et al., "Vietnam Veterans' Risks for Fathering Babies with Birth Defects," 252 J.A.M.A. 903-12 (1984); J.D. Erickson, J. Mulinare, et al., Vietnam Veterans' Risks for Fathering Babies with Birth Defects, published by the U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control (August, 1984) ("CDC study"); J.W. Donovan, et al., Case-control Study of Congenital Anomalies and Vietnam Service (Birth Defects Study): Report to the Minister for Veterans' Affairs, January 1983, published by Australian Government Publishing Service, Canberra (1983) ("Australian study"); Donovan, MacLennan and Andena, "Vietnam service and the risk of congenital anomalies," 140 Med. J. of Australia, 394 (March 31, 1984). See also, e.g., the discussion of lack of proof of causation in In re "Agent Orange" Product Liability Litigation, 597 F.Supp. 740, 749, 775-95 (E.D.N.Y. 1984).

In a comprehensive epidemiological examination of 96 categories of birth defects occurring among subsequently conceived offspring of American servicemen who served in Vietnam, the authors of the CDC study concluded: "This study provides strong evidence that Vietnam veterans, in

general, have not been at increased risk of fathering babies with the aggregate of the types of defects studied here." CDC study at 2. The CDC study further concluded: "At present, no adverse human reproductive effects have been shown to be related to exposure to phenoxy herbicides and dioxin." Id. at 67 (emphasis supplied).

The conclusions of the Australian study are similarly negative:

> There is no evidence that Army service in Vietnam increases the risk of fathering children with anomalies diagnosed at birth.

Donovan, MacLennan and Andena, "Vietnam service and the risk of congenital anomalies," 140 Med. J. of Australia 394 (March 31, 1984). See also CDC study at 6-7 (number of offspring of Vietnam veterans with serious birth defects no greater than the population at large); cf. House Rep. No. 98-592 on Veterans' Dioxin and Radiation Exposure Compensation Standards Act, reprinted in 1984 U.S. Code Cong. & Admin. News 4449, 4453 ("insufficient credible scientific evidence" that veterans exposed to Agent Orange are experiencing higher incidence of medical problems).

2. Veterans' Health

Epidemiological studies addressing the effect of Agent Orange exposure on veterans' health have not furnished support for plaintiffs' claims. They have been negative or inconclusive.

The Air Force study is the most intensive examination to date of Agent Orange effects on exposed veterans. See Air Force Health Study, An Epidemiologic Investigation of Health Effects in Air Force Personnel Following Exposure to Herbicides (February 24, 1984) (Ranch Hand II Study--1984 Report). This study utilized 1,024 matched pairs of men for analysis. Id. at v. Essentially all those who had participated in the fixed wing spraying and who could be located were studied. The conclusion was negative. In summary,

> This baseline report concludes that there is insufficient evidence to support a cause and effect relationship between herbicide exposure and adverse health in the Ranch Hand group at this time.

Id. at iii. Significantly, "no cases of chloracne were diagnosed clinically or by biopsy." Id. at iii, XV-9.

The small Ranch Hand sample and other factors, particularly the length of time it takes for most cancers to develop, support the conclusion that more work is needed before any firm conclusion can be reached respecting morbidity. Id. at v. The authors suggest a 20-year mortality follow-up study. Id. at v., XVIII-1-3.

The Ranch Hand Study authors state that "[i]n full context, the baseline study results should be viewed as reassuring to the Ranch Handers and their families at this time." Id. at iii; see also id. at XIV-4 to XIX-9. Their study offers no solace to plaintiffs in the instant litigation. It is at best inconclusive. See In re "Agent Orange" Product Liability Litigation, 597 F.Supp. 740, 788 (E.D.N.Y. 1984).

A comprehensive study by the Centers for Disease Control may be available after mid-1989. See Centers for Disease Control, Protocol for EpidemiologicStudies of the Health of Vietnam Veterans (November 1983). But cf. McIntyre, "End to Dioxin Study Fund Asked," Newsday, May 1, 1985, at 25, col. 1 (White House scientist Alvin L. Young, a toxicologist, recommends that no further research on dioxin

should be funded, "because research has failed to show it causes cancer or birth defects in humans.").

No valid state study supports plaintiffs' causality claims. See In re "Agent Orange" Product Liability Litigation, 597 F.Supp. 740, 787 (E.D.N.Y. 1984); see also 3 Agent Orange Review 1 (July 1984) (describing ongoing studies); Agent Orange Advisory Committee to the Texas Department of Health, Guy R. Newell, Chairman, Development and Preliminary Results of Pilot Clinical Studies 13, 15-19 (March 26, 1984) (Texas study).

Two recently-released studies fail to establish any causal connection. A comparison of New York State Vietnam veterans with veterans of that era who did not serve in Vietnam revealed no increased incidence of disease. Lawrence, et al., Mortality Patterns of New York State Vietnam Veterans, 75 AJPH 277 (1985). The authors note that the long induction period involved in some of the diseases suggests the need for further study, but conclude:

> Overall, these studies show no remarkable disease differences between Vietnam veterans and other veterans of that era. To the extent that Vietnam service may be indicative of dioxin-contaminated herbicide exposure, we find no suggested association with cause of

death.

Id. at 279.

The comprehensive three-part Australian study is similarly negative. Australian Veterans Health Studies, The Mortality Report (1984). In 1980, the government of Australia commissioned the Commonwealth Institute of Health to conduct a series of scientific studies of the health of Vietnam veterans and their families. The Commission undertook a retrospective cohort study of mortality among former national servicemen of the Vietnam era, which is reported in Part I of the Report. Australian forces that served in Vietnam were exposed at least as heavily as United States forces to Agent Orange. See Tr. at 479 (San Francisco Hearings, August 24, 1984).

This study sought to determine whether death rates among Vietnam veterans were higher than among comparable non-veterans for all causes of death combined. The study included 46,166 subjects: 19,209 veterans who served in Vietnam or Vietnam waters for over 90 days and did not die prior to two years of service, and 26,957 non-veterans. Information about the study subjects was obtained through

death registers, medical certificates, and military and nonmilitary records. The follow-up rate was high, and the authors conclude that the data used was of "high quality." "Executive Summary," at vii.

The study found the death rate among study subjects--both veterans and non-veterans--"statistically significantly lower than expected for Australian males, taking age and calendar year into account." Id. Mortality among veterans was not higher than that among non-veterans in a statistically significant sense, except among Veterans who were members of The Royal Australian Engineers. Id. at viii. Part III of the Report offers several possible explanations for this discrepancy, none of them attributable to Agent Orange. See Part III, "The Relationship Between Aspects of Vietnam Service and Subsequent Mortality Among Australian National Servicemen of the Vietnam Conflict Era," at 41-46 (1984).

With respect to specific causes of death, the Report found no statistically significant difference in death rates from cancer among veterans and non-veterans. In particular, the study found that:

> there was no statistically significant difference in the death rates from soft tissue sarcoma or non-Hodgkin's lymphoma. Other studies have indicated that both cancers are possibly caused by phenoxy acetic acid herbicides • • • sprayed in Vietnam."

Part I, "Executive Summary," at ix.

The study found no statistically significant difference in death rates from a number of other causes of death, including diseases of the skin, of the musculoskeletal system and connective tissue, of the blood, and of the neoplasmic, endocrine, nutritional, metabolic, and circulatory systems. Id. at ix-x; see also id. at 79-90. The study attributed a higher veteran mortality rate from diseases of the digestive system to alcoholism. Id. at x; see also id. at 88.

While cautioning that diseases such as cancer may take longer to develop, id. at ix, the Australian study found no evidence of an excess of deaths among the veterans studied due to "unusual causes." Id. at x. Such evidence--had it surfaced--"might have suggested that some deaths of veterans might have been caused by a specific toxin or pathogen." Id. (emphasis supplied).

Congress agrees with this generally negative assessment of the effect of Agent Orange exposure. The House Report accompanying the recent Veterans' Dioxin and Radiation Exposure Compensation Standards Act, Pub. L. No. 98-542, 98 Stat. 2725 (1984), states that "[t]here is no consensus of opinion in the scientific community that exposure to dioxin causes any identifiable disability other than chloracne." House Rept. No. 98-592 (Veterans' Affairs Comm.) at 5, reprinted in 1984 Cong. & Ad. News 4449, 4451. As of May 22, 1984, Senator Cranston noted that:

> Although 13 chloracne cases have been granted service connection, the VA reported in a May 17, 1984 letter * * * that it appeared after review that none of the cases, in fact, involved chloracne.

Cong. Rec. Sen. S.6145 (daily ed. May 22, 1984). The House Report concluded that "it is generally agreed that there is insufficient credible scientific evidence that this group of veterans has demonstrated they are experiencing any higher incidence or frequency of medical problems related to their possible exposure to dioxin while in service as to warrant a statutory presumption that such medical problems are related

to military service." House Rept. at 7, reprinted in 1984 Cong. & Ad. News 4449, 4453.

Plaintiffs cite a number of studies conducted on animals and industrial workers as evidence of a causal link between exposure to TCDD and the development of various hepatotoxic, hematotoxic, genotoxic, and enzymatic responses None of these studies do more than show that there may be a causal connection between dioxin and disease. None show such a connection between plaintiffs and Agent Orange.

Plaintiffs also rely on several depositions and affidavits by experts. As indicated below, to the extent that these experts rely on available epidemiological studies, the studies supply no basis for an inference of causation. There is simply no other reliable data on which an expert can furnish reliable testimony. Thus, no expert tendered by plaintiffs would be permitted to testify under Rules 702 and 703 of the Federal Rules of Evidence.

B. Expert Affidavits

Even most of plaintiffs' experts express doubt about causation, except for some ill-defined possible

"association" as compared with associations with any specific other products or natural carcinogens; none supports the conclusion that present evidence permits a scientifically acceptable conclusion that Agent Orange did cause a specific plaintiff's specific disease. See, e.g., Report of Dr. Hyman J. Zimmerman, Comments on Porphyria Cutanea Tarda & Related Matters ("[t]he relevance of [liver destruction and cancer] to man and the relevance of liver injury and PCT to exposure to DIOXIN remains to be evaluated by proper epidemiologic studies.") (Plaintiffs' Supplemental Memorandum in Support of Plaintiffs' Opposition to Defendants' Motion for Summary Judgment, Ex. 8; emphasis supplied); Deposition of Dr. Ellen Silbergeld, at 321 ("I think there is an association [between exposure to Agent Orange and lymphoma]") (Id., Ex. 2; emphasis supplied);Deposition of Dr. Marvin Schneiderman, at 50 ("rhabdomyosarcoma • • • is more likely, in my opinion, to have been related to that exposure than to some other not known ill-defined set of causes." (Id., Ex. 3; emphasis supplied.); id. at 144 ("Lymphocitic lymphoma • • • could be related to exposure • • • to Agent Orange") (Id., Ex. 3; emphasis supplied);Deposition of Dr. Maureen C. Hatch, at 54 ("there may be a causal association") (Opt-out Plaintiffs'

Opposition to Defendants' Motion to Dismiss, or in the Alternative, for Summary Judgment, Ex. 6; emphasis supplied).

It is significant that like Doctors Singer and Epstein, whose affidavits are described in detail below, the various experts referred to in the preceding paragraph apparently had no physical contact with individual plaintiffs. For example, Dr. Silbergeld, whose opinion is relied upon heavily in plaintiffs' briefs, states:

> In preparing this affidavit, I have not seen any material related to the plaintiffs in this litigation, no medical records or other descriptions of the medical status of these persons.

Undated Aff. of Dr. Ellen K. Silbergeld, ¶ 4 at 2, Ex. 5 to Opt-Out Plaintiffs' Opposition to Defendants' Motion to Dismiss or, in the Alternative, for Summary Judgment.

Plaintiffs' Supplemental Memorandum in Support of Plaintiffs' Opposition to Defendants' Motion for Summary Judgment devotes considerable attention to the specific background of one David Lambiotte, with reference to expert opinions inferring that his illnesses were caused by Agent Orange exposure. Id. at 3-6. Much of this discussion is

irrelevant to the specific opt-out cases currently before the court. Mr. Lambiotte, for example, is a member of the class and filed a claim form seeking to share in the settlement proceeds. See Claim No. 28397 (on file at Agent Orange Computer Center).

Plaintiffs offer the opinion of two experts who conclude that in the cases of the specific opt-out plaintiffs before the court, exposure to Agent Orange caused adverse health effects. One is Dr. Singer's submission. The other is Dr. Epstein's.

1. Dr. Singer's Affidavit

Plaintiffs submitted two affidavits on causation by Dr. Barry M. Singer. Their wording is virtually identical. Dr. Singer's affidavits were accompanied by 282 "affidavits" by individual veteran plaintiffs. The latter are form statements, signed by either the plaintiff or his attorney, or both. A representative set of statements is attached as Appendix "A" to this opinion.

The forms typically allege that the plaintiff "saw spraying of Agent Orange, entered defoliated areas and

consumed local food and water." The forms then describe the plaintiff's diagnosed medical problems and refer to an attached "checklist" for a description of alleged Agent Orange related symptoms.

The checklists allow the individual to identify any or all of a number of symptoms which they attribute to their exposure to Agent Orange in Vietnam. In addition to general symptoms such as fatigue, space is provided in which to indicate specific skin, skeletal-muscular, gastro-intestinal, visual and behavioral disorders, as well as to identify any tumors as malignant or nonmalignant. Finally, the checklist asks for information about the individual's offspring. A perusal of the checklists reveals that plaintiffs believe they suffer most frequently from "behavioral" disorders: memory loss, increased irritability, anger and anxiety, insomnia, confusion, depression, and tremors.

The final part of the form affidavits describes the individual's medical history, and asks for a description of tobacco, alcohol, and drug use. This portion also alleges no exposure to any toxic chemical besides Agent Orange.

Dr. Singer, who is board certified in internal medicine, hematology, and oncology, reaches a number of conclusions based on his review of the numerous form affidavits with their attached checklists. He bases his opinion on his medical background, a review of the literature on the biomedical effects of Agent Orange, and an examination of the individual affidavits. He apparently did not examine any medical records nor any plaintiffs. In discussing his conclusions, the numbers from his two separate affidavits will be combined.

Dr. Singer notes at the outset that 2,4-D, 2,4,5-T, and 2,3,7,8-tetrachlorodibenzo-p-dioxin ("dioxin") "are potent and toxic agents capable of inducing a wide variety of adverse effects both in animals and in man." Singer Aff. ¶ 5 (emphasis supplied). See also In re "Agent Orange" Product Liability Litigation, 597 F.Supp. at 778 (dioxin one of most powerful poisons known). Dr. Singer then analyzes the various ailments suffered by the individual affiants.

Fifty-four plaintiffs, Dr. Singer reports, suffer from some form of hepatic (liver) abnormality, either

abnormal liver function tests, hepatitis, cirrhosis of the liver, or pericentral steatosis. He notes that liver disorders have been reported to develop in humans after industrial exposure and accidents, and in dogs, rats, mice, and primates after subacute and chronic exposure. For example, "[i]n both mice and rats, small doses of TCDD predictably produce an increase in liver weight." Aff. ¶ 6.

Dr. Singer also asserts that 2,4,5-T "produces liver enzyme abnormalities • • • liver swelling and centrilobular necrosis" (death of a central liver lobule, or functional unit of the liver), and that one plaintiff suffered from a bile duct microadenoma (small, usually benign tumor in the passage between the liver and gall bladder) and from fatty metamorphosis of the liver. He concludes that "these compounds <u>are capable of producing</u> marked alteration in hepatic architecture and function" and that the liver abnormalities plaintiffs allege are "<u>consistent with</u>" the known effects of polychlorinated herbicides. (Emphasis supplied.) Although Dr. Singer does not reveal the studies that he relies upon to reach this conclusion, it is clear he is not referring to studies that analyze the effects of Agent Orange on exposed veterans. In any event, the liver disorders Dr. Singer finds in the

animal and industrial studies differ substantially from those plaintiffs report they suffered.

Dr. Singer next notes that many affiants suffer from asthenic (exhaustion) symptoms: "[f]atigue was present in [211] patients, numbness of the extremities in [206], tremor in [114] and depression in [219] [and] [228] patients complained of increased irritability, increased anger was present in [215], increased anxiety in [219], sleep disturbances in [188], increased aggression in [167], and confusion in [149] patients." Aff. ¶ 7. He notes that such neurological effects have been reported to result from industrial accidents and testing in animal models, again without naming his sources or specifying what quantity of 2,4,5-T was involved. He concludes that many neurological symptoms complained of by the plaintiffs are "clearly compatible with" the known effects of dioxin on the human nervous system. (Emphasis supplied.)

Dr. Singer next discusses the affiants complaining of weight loss (57), decreased appetite (88), and gastrointestinal disturbances (178). He asserts that nausea, vomiting, diarrhea, and abdominal pain have been reported after industrial exposure to polychlorinated

herbicides; he adds that TCDD produces weight loss in primates, rodents, and fowl. Dr. Singer thus concludes that the affiants' symptoms are "compatible with known biological effects of polychlorinated herbicides." (Emphasis supplied.)

Dr. Singer again relies on animal and industrial exposure studies in reaching his conclusion that the elevated cholesterol or triglyceride levels alleged by thirteen affiants "are compatible with" exposure to polychlorinated herbicides." Aff. ¶ 9 (emphasis supplied).

Similarly, unnamed studies of rats and primates convince him that the decreased reproductive capacity claimed by nine plaintiffs "would be compatible with known effects of polychlorinated herbicides." Aff. ¶ 12 (emphasis supplied).

Sixteen of the plaintiffs allege that they suffer from some form of cancer, including Hodgkin's Disease. Dr. Singer cites animal and industrial exposure studies that conclude that exposure to TCDD leads to cancer of the hard palate and the stomach, and increases the incidence of sarcomas and lymphomas. He also refers to a study allegedly

conducted in North Vietnam between 1962 and 1968 which found an increased incidence of liver cancer, although he does not mention in which segment of the population. Cf. Frank, 13A Courtroom Medicine, § 24.30 at 24-12 ("[h]ematologic malignancies have been reported with pesticide exposure, but, since there have been no population-based studies, a cause-and-effect relationship cannot be proven at this time.") (emphasis supplied). Based on these studies, Dr. Singer asserts that polychlorinated herbicides "would represent potential causative factors in the tumors claimed by the affiants." Aff. ¶ 10 (emphasis supplied).

Dr. Singer next turns to what may be broadly described as plaintiffs' dermatological difficulties: hair loss (93), rash (226), acne (105), and other skin problems such as peeling, hypopigmentation, and photosensitivity (211). Only two plaintiffs specifically mention chloracne, but Dr. Singer warns that it may be confused with acne without a careful physical examination. Mammals exposed to TCDD, Dr. Singer notes, have developed alopecia (baldness) and contact dermatitis (inflammation of the skin caused by allergy to a substance). Dr. Singer concludes: "Thus polychlorinated herbicide exposure may well constitute a

cause of the dermalogic difficulties complained of by plaintiffs." (Emphasis supplied.)

Dr. Singer's final analysis focuses on 324 complaints of chronic sore throat, lymphadenopathy (simple enlargement of the lymph nodes), sinus congestion and inflammation. Dr. Singer attributes these problems to Agent Orange exposure. Animal studies have shown, he states, that polychlorinated herbicides may induce "thymic atrophy" in animals. Cf. J.E. Schmidt, 1-2 Attorneys' Dictionary of Medicine, at A-298 & T-52 (atrophy, a wasting away, is usually due to defective nutrition; the thymus may be a gland of internal secretion but its function is not understood). He also relies on animal studies finding a number of alterations in the immune system after exposure to TCDD: phytohemagghetining transformation of spleen cells, decline in serum globulin concentrations, increased sensitivity to bacterial endotoxins, depressed T-cell rosette formation, and delayed hypersensitivity. Although he does not reveal the dosage of TCDD involved in creating these aberrations in the functioning of the immune system, he concludes that they "could be a contributing factor in the infectious symptoms experienced by some of the plaintiffs." (Emphasis supplied.)

As a review of Dr. Singer's affidavit reveals, he attributes some 37 separate diseases, disorders, and symptoms--including baldness and diarrhea--to exposure to Agent Orange. He mentions only two doubtful examples of chloracne and none of porphyria cutanea tarda, the two afflictions Congress considered worthy of a statutory presumption of service connection, although not without reservations. See House Report, supra, reprinted in 1984 U.S. Code Cong. & Admin. News 4447, at 4453 ("insufficient credible scientific evidence" that veterans exposed to Agent Orange suffer increased adverse health effects).

Stripped of its verbiage, Dr. Singer summarizes his overall conclusion by stating that if the affiants are telling the truth and if there is no cause for their complaints other than Agent Orange, then Agent Orange must have caused their problems. Dr. Singer states:

> Assuming the truth of the affidavits submitted, and absent any evidence of pre-existing, intervening, or superseding causes for the symptoms and diseases complained of in these affidavits, it is my opinion to a reasonable degree of medical probability (that is, more likely than not) that the medical difficulties described by the affiants were proximately caused by exposure to Agent Orange.

(Emphasis supplied.)

Put differently, Dr. Singer's analysis amounts to this: the affiants complain of various medical problems; animals and workers exposed to extensive dosages of TCDD have suffered from related difficulties; therefore, assuming nothing else caused the affiants' afflictions, Agent Orange caused them. One need hardly be a doctor of medicine to make the statement that if X is a possible cause of Y, and if there is no other cause of Y, X must have caused Y. Dr. Singer's formulation avoids the problem before us: which of myriad possible causes of Y created a particular veteran's problems. To take just one of the diseases reported by plaintiffs in an undifferentiated form, and relied upon by Dr. Singer, hepatitis: this is a disease common in the civilian population and there is not the slightest evidence that its incidence is greater among those exposed to Agent Orange than those not exposed. See, e.g., J.E. Schmidt, 1 Attorney's Dictionary of Medicine H36-37 (1977) (listing various forms).

As section IV.A.3 will show, Dr. Singer's conclusory allegations lack any foundation in fact. His

analysis, in addition to being speculative, is so guarded as to be worthless.

2. Dr. Epstein's Affidavits

Plaintiffs belatedly submitted affidavits by Dr. Samuel S. Epstein. He has been specially trained in the fields of pathology, bacteriology, and public health. He is currently Professor of Occupational and Environmental Medicine at University of Illinois Medical Center in Chicago. Among his 239 publications are a number of articles on the effects of exposure to 2,3,7,8-tetrachlorodibenzo-paradioxin ("TCDD"). His credentials clearly suffice to qualify him as an expert pursuant to Rule 702 of the Federal Rules of Evidence.

Dr. Epstein submitted a general or master affidavit on the scientific literature on causation. This 65-page affidavit is substantially identical to an earlier brief submitted by plaintiffs dated September 18, 1984 in opposition to the motion for summary judgment--some time before Dr. Epstein was retained on February 27, 1985. Dep. of Dr. Epstein at 14 (April 11, 1985). An extensive deposition of Dr. Epstein dated April 11, 1985 adds nothing

of a substantive nature to the affidavit, but consists of a devastatingly successful showing of his lack of knowledge of the medical and other background of those on whose behalf he submitted affidavits.

Just as in plaintiffs' brief, Dr. Epstein reviews over one hundred epidemiological studies of the effects of TCDD on animals and on humans as a result of industrial accidents. These studies were submitted to the court and have been made a part of the record in the multidistrict litigation. They were discussed orally on the record during argument of the motion and rejected as virtually useless in establishing causation.

Dr. Epstein also relies on affidavits by Doctors Carnow, Silbergeld, and Singer which were separately submitted in the "opt-out" cases. None of these affidavits are helpful in supporting causation. The Carnow affidavit is discussed in the opinion granting summary judgment in Lilley v. Dow Chemical Co., ___ F.Supp. ___ (E.D.N.Y. 1985) (forthcoming). Dr. Epstein concludes that "a causal relationship exists between exposure to Agent Orange and a wide range of toxic multi-system and multi-organ effects." Aff. at 63.

The court has reviewed these and other like studies dealing with animal laboratory studies, industrial accidents, and other products. They suggest that dioxin may cause diseases in animals, including man. They are not correlated to those exposed to Agent Orange in Vietnam. At most, they collectively have the probative force of a scintilla of evidence.

Dr. Epstein also submitted fifteen individual affidavits of causation. In reaching conclusions with respect to the individual plaintiffs, he says that he generally relied upon their military service records, Veterans Administration medical records, and interview questionnaires, symptomology checklists, and affidavits completed by plaintiffs. See Attachments to Dr. Epstein's Deposition submitted as Appendix A to Defendants' Supplemental Memorandum in Opposition to Plaintiffs' Motion for Partial Summary Judgment and Reply Memorandum in Further Support of Defendants' Motion to Dismiss and/or for Summary Judgment, Dep. at 474 ff. Each affiant-plaintiff states in general terms that he was exposed to Agent Orange.

Each of the fifteen plaintiffs described by Dr. Epstein reports that he suffers from a number of diseases and has varying family histories and personal habits as follows: cancer of the ileum (family history of cancer; 1-1/2 packs of cigarettes per day); Hodgkin's Disease, coronary artery disease, cavernous angioma of the brain, bile duct microadenoma (no family history; infrequent smoker); chloracne, infertility (no family history; nonsmoker); brain cancer (family history of lung cancer; nonsmoker (now deceased)); malignant astrocytoma of the brain (no family history; smokes two packs of cigarettes per day); chronic hepatitis (no family history; nonsmoker; nondrinker; subsequent exposure to chlorinated hydrocarbon solvents); basil cell carcinoma of the skin (no family history; one pack of cigarettes per day); chronic hepatitis (no family history; one pack of cigarettes per day; moderate drinker); chloracne (no family history; two packs of cigarettes per day; moderate drinker; possible exposure to toxic substances at a sewage plant); squamous and basal cell carcinomas of the lip (no family history; cigarette smoker; alcohol consumption unknown); chronic hepatitis and child with multiple birth defects (no family history; current nondrinker with history of alcohol abuse); chloracne (no family history); chloracne (no family history; nonsmoker);

carcinoma of the bladder (no family history; nonsmoker); cancer of the colon (nonsmoker).

In sum, Dr. Epstein attributes some fourteen different diseases and afflictions to exposure to Agent Orange of fifteen plaintiffs. Dr. Epstein's affidavits, even if considered timely, are insufficient to oppose the motion for summary judgment. All the diseases in the cases he relies upon are found in the general population of those who were never exposed to Agent Orange. There is no showing that the incidence of the diseases relied upon are greater in the Agent Orange-exposed population than in the population generally. It must be borne in mind that these are fifteen cases not taken at random but deliberately s :ted because of their claims from a population of 2,400,000 who served in Vietnam.

IV. LAW

A. Legal Standards Governing Expert Opinion

In determining whether an expert opinion is sufficient to withstand a summary judgment motion, courts undertake a detailed inquiry into the admissibility of the

proffered testimony. In a case such as the one before us, Rules 102, 104(a), 401-403, 702-703 and 803(18) of the Federal Rules of Evidence control the inquiry. See Fed. R. Ev. 101; Weit v. Continental Illinois National Bank and Trust Co., 641 F.2d 457, 467 n.38 (7th Cir. 1981) (Rules of Evidence apply to summary judgment motions), cert. denied, 455 U.S. 988, 102 S.Ct. 1610, 71 L.Ed.2d 847 (1982). Rule 104(a) of the Federal Rules of Evidence requires a court to make a preliminary inquiry into the admissibility of expert testimony. See In re Japanese Electronic Products Antitrust Litigation, 723 F.2d 238, 260 (3d Cir. 1983) (in limine rulings on admissibility appropriate even when not required by Rule 104), cert. granted, 105 S.Ct. 1863 (1985). The preponderance of the evidence standard generally governs in such a determination. Cf. Lego v. Twomey, 404 U.S. 477, 484, 489, 92 S.Ct. 619, 624, 626, 30 L.Ed.2d 618 (1972).

1. Admissibility of Epidemiological Studies

In a mass tort case such as Agent Orange, epidemiologic studies on causation assume a role of critical importance. Cf. In re Swine Flu Immunization Products Liability Litigation, 508 F.Supp. 897, 907 (D. Colo. 1981) ("[w]here * * * the exact organic cause of a disease cannot

be scientifically isolated, epidemiologic data becomes highly persuasive."), aff'd sub nom. Lima v. United States, 708 F.2d 502 (10th Cir. 1983). Confronted with the reality of mass tort litigation, courts have been forced to abandon their traditional reluctance to rely upon epidemiological studies. Dore, "A Commentary on the Use of Epidemiological Evidence in Demonstrating Cause-in-Fact," 7 Harv. Envtl. L. Rev. 429 (1983).

Commentators have approved the growing judicial reliance on such scientific evidence. See, e.g., Black & Lilienfeld, "Epidemiologic Proof in Toxic Tort Litigation," 52 Ford. L. Rev. 732 (1984); Symposium on Science and the Rules of Evidence, 99 F.R.D. 187 (1983); Gianelli, "The Admissibility of Novel Scientific Evidence: Frye v. United States, a Half-Century Later," 80 Colum. L. Rev. 1197 (1980); Korn, "Law, Fact, and Science in the Courts," 66 Colum. L. Rev. 1080 (1966).

One vehicle for the admissibility of such studies has been Federal Rule of Evidence 803(8), the public records and reports exception to the hearsay rule. This exception is based upon our experience that public officials who are scientists generally perform their duties accurately and

faithfully. Grant, "The Trustworthiness Standard for the Public Records and Reports Hearsay Exception," 12 W. State U. L. Rev. 53, 56 (1984); see also In re Japanese Electronic Products Antitrust Litigation, 723 F.2d 238, 265 (3d Cir. 1983) ("reports of investigations are presumed to be reliable."), cert. granted, 105 S.Ct. 1863 (1985). Subsection (8)(C) of the rule allows as evidence "factual findings resulting from an investigation made pursuant to authority granted by law, unless the sources of information or other circumstances indicate lack of trustworthiness." See City of New York v. Pullman, Inc., 662 F.2d 910, 914 (2d Cir. 1981) (discretion of trial court emphasized), cert. denied, 454 U.S. 1164, 102 S.Ct. 1038, 71 L.Ed.2d 320 (1982).

A number of courts have found epidemiological studies conducted by the government sufficiently trustworthy. The Fourth Circuit recently held admissible under Rule 803(8)(C) epidemiological studies of toxic shock syndrome conducted by the Federal Centers for Disease Control and three state health departments. Ellis v. International Playtex, Inc., 745 F.2d 292 (4th Cir. 1984). The court noted that CDC and the state health departments used "uniform procedures and methods that are widely accepted by

their peers" and carried out the studies in a timely and impartial manner. Id. at 301.

Plaintiffs have failed to show, under Rule 803(8)(C), that the various state and national studies averted to above were flawed. See also Kehm v. Proctor & Gamble Mfg. Co., 724 F.2d 613, 617-20 (8th Cir. 1983) (affirming admissibility of CDC and state studies showing link between use of tampons and incidence of toxic shock syndrome; studies were timely, conducted in skillful manner and no motive probative of untrustworthiness present).

CDC epidemiological studies have been heavily relied upon in the swine flu cases. See, e.g., In re Swine Flu Immunization Products Liability Litigation, 508 F.Supp. 897, 907 (D. Colo. 1981), aff'd sub nom. Lima v. United States, 708 F.2d 502 (10th Cir. 1983); see also Cook v. United States, 545 F.Supp. 306 (N.D. Cal. 1982); Migliorini v. United States, 521 F.Supp. 1210, 1218 (M.D. Fla. 1981); Heyman v. United States, 506 F.Supp. 1145 (S.D. Fla. 1981); cf. Reyes v. Wyeth Laboratories, 498 F.2d 1264, 1270 n.1 (5th Cir.) (CDC studies admitted to show incidence of polio), cert. denied, 419 U.S. 1096, 95 S.Ct. 687, 42 L.Ed.2d 688 (1974).

In the Agent Orange litigation, the federal, state, and Australian government studies discussed above are on file having been subject to the court's judicial notice. In re "Agent Orange" Product Liability Litigation, 603 F.Supp. 239, 246 (E.D.N.Y. 1985). These studies are reliable, and would be admitted under Rule 803(8)(C). Ellis v. International Playtex, Inc., 745 F.2d 292 (4th Cir. 1984). See also Black & Lilienfeld, "Epidemiologic Proof in Toxic Tort Litigation," 52 Ford. L. Rev. 732 (1984). Plaintiffs have made no objections to their admissibility and in fact rely specifically on the Ranch Hand Study in supporting their case for causation. See Tr. at 44 (Hearings on April 15, 1985).

The fact that the federal government was a defendant in related Agent Orange cases does not suggest a motive for untrustworthiness by the independent government scientists who conducted the studies. The Swine Flu cases cited supra found no such motive even though there the government was the defendant. Compare United States v. Esle, 743 F.2d 1465, 1474 (11th Cir. 1984) (affirming exclusion of market surveys where radio stations conducting them had motive to exaggerate number of Hispanic listeners).

These epidemiological studies alone demonstrate that on the basis of present knowledge, there is no question of fact: Agent Orange cannot now be shown to have caused plaintiffs' numerous illnesses.

The parties, and especially plaintiffs, rely on over one hundred epidemiological studies not conducted by government officials and as such not subject to the 803(8)(C) exception. Such privately conducted studies may be admissible as learned articles under Rule 803(17) and some of them would qualify under Rule 803(6) and other exceptions to the hearsay rule. At trials, they are commonly analyzed under Rule 703 as a basis for expert opinion rather than as independently admissible. Cf. In re Japanese Electronic Products Antitrust Litigation, 723 F.2d 238, 275-84 (3d Cir. 1983) (discussing admissibility of privately conducted economic reports under Rules 702-703), cert. granted, 105 S.Ct. 1863 (1985).

Were they relevant, almost all of these privately conducted studies would be admitted as evidence-in-chief under a variety of the above hearsay exceptions, including Rules 803(24) and 804(5) (catchall exceptions based on need and general reliability). There is no need at this point to

analyze them individually. Most of the studies rely on inapposite data and would be excluded under Rules 401 to 403. Some of them on industrial exposure have been recognized as flawed. See, e.g., Palmer v. Stora Kopparbergs Bergslags Aktiebolac (S.Ct. Nova Scotia, Sept. 23, 1983) (Nunn, J.), slip op. at 174-81 (refusing to enter injunction against spraying of 2-4-D,2,4,5-T-phenoxy herbicides in part because expert studies, such as Hardell's, showing alleged adverse health effects were widely recognized as flawed).

The many studies on animal exposure to Agent Orange, even plaintiffs' expert concedes, are not persuasive in this lawsuit. In a jointly-authored article, Dr. Ellen K. Silbergeld writes that "laboratory animal studies • • • are generally viewed with more suspicion than epidemiological studies, because they require making the assumption that chemicals behave similarly in different species." Hall & Silbergeld, "Reappraising Epidemiology: A Reponse to Mr. Dore," 7 Harv. Envtl. L. Rev. 441, 442-43 (1983). Dr. Silbergeld further notes that "[a]nimal studies are aimed at discovering a dose-response relationship, while epidemiological studies show an association between exposure and disease." Id. at 443 n.18.

There is no evidence that plaintiffs were exposed to the far higher concentrations involved in both the animal and industrial exposure studies. Cf. In re "Agent Orange" Product Liability Litigation, 597 F.Supp. 740, 782 (E.D.N.Y. 1984). The animal studies are not helpful in the instant case because they involve different biological species. They are of so little probative force and are so potentially misleading as to be inadmissible. See Fed. R. Ev. 401-403. They cannot be an acceptable predicate for an opinion under Rule 703. See In re "Agent Orange" Product Liability Litigation, 603 F.Supp. 239, 247 (E.D.N.Y. 1985).

2. Admissibility of Expert Opinion Under Rule 702

Rule 702 of the Federal Rules of Evidence provides for opinion testimony by experts "if scientific, technical or other specialized knowledge will assist the trier of fact to determine a fact in issue" and the witness is "qualified as an expert by knowledge, experience, training or education." The court must first determine whether the expert is sufficiently qualified in his or her field to be allowed to testify. Frazier v. Continental Oil Co., 568 F.2d 378, 383 (5th Cir. 1978). The court must also

determine whether the proffered evidence would be helpful to the trier of fact, although doubts should be resolved in favor of admissibility. In re Japanese Electronic Products Antitrust Litigation, 723 F.2d 238, 279 (3d Cir. 1983), cert. granted, 105 S.Ct. 1863 (1985); see also Kline v. Ford Motor Co., Inc., 523 F.2d 1067, 1070 (9th Cir. 1975) (within discretion of trial judge to determine whether expert opinion on causal connection between defects in steering column and auto accident was helpful).

Until recently the assumption of the Federal Rules favoring admissibility was sometimes applied with less force in cases involving novel scientific evidence. Cf. Rule 102 of Federal Rules of Evidence. Once governed by the Frye test of general acceptance in the relevant scientific community, Frye v. United States, 293 F. 1013 (D.C. Cir. 1923), the assessment of novel testimony now involves a balancing of the relevance, reliability, and helpfulness of the evidence against the likelihood of waste of time, confusion and prejudice. United States v. Downing, 753 F.2d 1224 (3d Cir. 1985); United States v. Williams, 583 F.2d 1194, 1198 (2d Cir. 1978), cert. denied, 439 U.S. 1117, 99 S.Ct. 1025, 59 L.Ed.2d 77 (1979). But cf. Note, "Expert Testimony Based on Novel Scientific Techniques:

Admissibility Under the Federal Rules of Evidence," 48 Geo. Wash. L. Rev. 774 (1980) (arguing that a modified Frye test is preferable to balancing adopted in Williams).

Courts abandoning Frye stress Rule 702's liberal attitude towards the admissibility of relevant expert testimony whenever it would be helpful to the trier. When either the expert's qualifications or his testimony lie at the periphery of what the scientific community considers acceptable, special care should be exercised in evaluating the reliability and probative worth of the proffered testimony under Rules 703 and 403. See Downing, supra, 753 F.2d at 1239 (qualifications and professional stature of expert as well as non-judicial uses to which the scientific technique is put may constitute circumstantial evidence of the technique's reliability); cf. Huber, "Safety and the Second Best: The Hazards of Public Risk Management in the Courts," 85 Colum. L. Rev. 277, 333 (1985) ("a Ph.D. can be found to swear to almost any 'expert' proposition, no matter how false or foolish").

(a) Admissibility of Dr. Singer's Testimony

(i) Qualifications as an Expert. Federal Rule 702 embodies a liberal policy towards qualification as an expert. The court makes the determination based on the witness' actual qualifications and knowledge of the subject matter and not his title. Mannino v. International Manufacturing Co., 650 F.2d 846, 851 (6th Cir. 1981). Thus, it is not determinative that Dr. Singer is not an epidemiologist.

It is disturbing that Dr. Singer has shown no great interest in the subject of critical importance in this case. He does not belong to any epidemiological societies. Cf. Kubs v. United States, 537 F.Supp. 560, 562 (E.D. Wisc. 1982) (peer review important). Apparently his only publication after eighteen years of practice is a co-authored article addressing leukemia therapy--a subject far removed from the population-based studies Dr. Singer purports to rely upon in his affidavit. See Black and Lilienfeld, supra, at 775 (arguing that a medical doctor should be allowed to testify on toxic tort causation "only if he could demonstrate knowledge of epidemiology."). He does, nevertheless, have a distinguished record as practitioner and teacher. In keeping with the spirit of rule 702, Dr. Singer will be considered an expert although

obviously he would not be held in the same esteem on the critical issue of causation and the effects of toxic substances as Dr. Epstein or some of the other experts relied upon by plaintiffs and defendants.

(ii) Helpfulness. Dr. Singer's testimony addresses one of the most hotly contested issues in the protracted Agent Orange litigation--causation--and would therefore assist the trier of fact. Breidor v. Sears, Roebuck and Co., 722 F.2d 1134, 1139 (3d Cir. 1983). His general scientific technique consists of making an inference from epidemiologic data and animal studies that the particular plaintiff considered by him suffers from an affliction causally connected to Agent Orange exposure. This technique has been accepted by a sufficient number of courts to allow judicial notice to be taken of its general acceptance. See Federal Rules of Evidence, Rule 201; United States v. Downing, 753 F.2d 1224, 1237 (3d Cir. 1985). The method of drawing inferences employed by Dr. Singer could withstand the flexible approach to Rule 702 admissibility followed in the Second and Third Circuits. See Downing, supra, at 1240; United States v. Williams, 583 F.2d 1194 (2d Cir. 1978), cert. denied, 439 U.S. 1117, 99 S.Ct. 1025, 59 L.Ed.2d 77 (1979). Acceptability of the scientific

technique under Rule 702 does not, as indicated infra, assure the testimony's compliance with the requirements of Rules 703 and 401 to 403.

(b) Admissibility of Dr. Epstein's Testimony

Ample authority exists for refusing to consider the untimely affidavits of Dr. Epstein. See, e.g., Tabatchnick v. G. D. Searle & Co., 67 F.R.D. 49, 55 (D. N.J. 1975); cf. Marx & Co., Inc. v. Diners' Club, Inc., 550 F.2d 505, 508 n.9 (2d Cir.) (prejudicial effect of inadmissible testimony heightened by its untimely and surprise nature), cert. denied, 434 U.S. 861, 98 S.Ct. 188, 54 L.Ed.2d 134 (1977). Nevertheless, the court has considered it in deference to the policy of deciding cases on the merits where that is possible. See Fed. R. Civ. Pro. 1.

Dr. Epstein's affidavits and deposition demonstrate that his testimony would meet the standards of Rule 702. He is clearly a highly qualified expert in the field, his testimony meets the helpfulness requirement, and his analytical technique--inference from epidemiological data and medical records--is acceptable. Just as in the case of Dr. Singer's testimony, however, compliance with

Rule 702 does not guarantee admissibility under Rules 703 and 403.

3. Rule 703

Rule 703 of the Federal Rules of Evidence attempts to delimit the bases upon which an expert may rely in testifying to those "reasonably relied" upon "by experts in the field." It provides:

> The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to him at or before the hearing. If of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence.

Neither Dr. Singer nor Dr. Epstein based his conclusions on observations. But cf. Dep. of Dr. Epstein at 16 ("I had some conversations with the clients"--none of whom is apparently involved in the opt-out cases now before the court); documents at Dep. 474 ff. Rather, each one relied almost wholly upon the specific anecdotal written information supplied by the plaintiffs and upon general studies and literature.

The trial court must decide whether this data is of a type reasonably relied upon by experts in the field. Rule 104(a), Federal Rules of Evidence. See State v. Rolls, 389 A.2d 824, 829-30 (Me. 1978) (relying on Federal Rule of Evidence 703 to interpret Maine's equivalent Rule).

Courts have adopted two general approaches to Rule 703: one restrictive, one liberal. Arnolds, "Federal Rule of Evidence 703: The Back Door is Wide Open," 20 The Forum: Tort and Insurance Practice Section, American Bar Association 1, 7 (Fall 1984). The more restrictive view requires the trial court to determine not only whether the data are of a type reasonably relied upon by experts in the field, but also whether the underlying data are untrustworthy for hearsay or other reasons. The more liberal view, best represented by In re Japanese ElectronicProducts Antitrust Litigation, 723 F.2d 238 (3d Cir. 1983), cert. granted, 105 S.Ct. 1863 (1985), allows the expert to base an opinion on data of the type reasonably relied upon by experts in the field without separately determining the trustworthiness of the particular data involved. Arnolds, supra, at 7.

Although the Second Circuit has not squarely addressed this issue, there is some indication that it would adopt a narrower view than that espoused by the Third Circuit. In Shatkin v. McDonnell Douglas Corp., 727 F.2d 202 (2d Cir. 1984), the panel alluded to a trial court's "discretionary right under Fed. R. Evid. 703 to determine whether the expert acted reasonably in making assumptions of fact upon which he would base his testimony," id. at 208, and cited with apparent approval the restrictive approach outlined in Zenith Radio Corp. v. Matsushita Electric Industrial Co., Ltd., 505 F.Supp. 1313 (E.D. Pa. 1981), before it was affirmed in part and reversed in part sub nom. In re Japanese Electronic Products Antitrust Litigation, 723 F.2d 238 (3d Cir. 1983), cert. granted, 105 S.Ct. 1863 (1985). The trial court had developed its own set of standards for determining reasonable reliance, but the Court of Appeals for the Third Circuit found these standards too restrictive.

In reversing, the Third Circuit found the trial court had erred in ignoring the "unequivocal and uncontradicted affidavits" from the experts that the materials they had relied upon were of a type reasonably relied upon by experts in their respective fields. Id.

at 276. The trial court, the Court of Appeals appropriately noted, must make a factual inquiry under Federal Rule of Evidence 104(a) to determine what data experts find reliable. The district court should not, however, have substituted its own views of "reasonable reliance" for those of the experts. Id. at 277.

Even assuming the Second Circuit would agree with the more permissive approach of the Court of Appeals in Japanese Electronic Products, the Third Circuit did not dispute that "'the assumptions which form the basis for the expert's opinion, as well as the conclusions drawn therefrom, are subject to rigorous examination.'" Id. (quoting Zenith, 505 F.Supp. at 1328). See also Wilder Enterprises, Inc. v. Allied Artists Pictures Corp., 632 F.2d 1135, 1143-44 (4th Cir. 1980) (expert's testimony properly excluded under Rule 703 where no facts presented to support his calculations nor any proof that underlying data was of a type reasonably relied upon by experts in the field); Carlson, "Collision Course in Expert Testimony: Limitations on Affirmative Introduction of Underlying Data," 36 U. Fla. L. Rev. 234, 240-41 & n.26 (1984) (trial court tests appropriateness of expert's reliance upon out-of-court data). "Rigorous examination" is especially important in the mass

toxic tort context where presentation to the trier of theories of causation depends almost entirely on expert testimony.

"Though courts have afforded experts a wide latitude in picking and choosing the sources on which to base opinions, Rule 703 nonetheless requires courts to examine the reliability of those sources." Soden v. Freightliner Corp., 714 F.2d 498, 505 (5th Cir. 1983). The trial court's examination of reasonable reliance by experts in the field requires at least that the expert base his or her opinion on sufficient factual data, not rely on hearsay deemed unreliable by other experts in the field, and assert conclusions with sufficient certainty to be useful given applicable burdens of proof. Courts must undertake this inquiry while taking care not to infringe upon the fact-finder's role of assessing the weight of the expert testimony. Poller v. Columbia Broadcasting System, Inc., 368 U.S. 464, 473, 82 S.Ct. 486, 491, 7 L.Ed.2d 458 (1962).

(a) Reliance on Inadmissible Evidence

Rule 703 permits experts to rely upon hearsay. The guarantee of trustworthiness is that it be of the kind

normally employed by experts in the field. The expert is assumed, if he meets the test of Rule 702, to have the skill to properly evaluate the hearsay, giving it probative force appropriate to the circumstances. Nevertheless, the court may not abdicate its independent responsibilities to decide if the bases meet minimum standards of reliability as a condition of admissibility. See Fed. R. Ev. 104(a). If the underlying data is so lacking in probative force and reliability that no reasonable expert could base an opinion on it, an opinion which rests entirely upon it must be excluded. Fed. R. Ev. 401, 402. The jury will not be permitted to be misled by the glitter of an expert's accomplishments outside the courtroom. Fed. R. Ev. 403; see also, e.g., United States v. Esle, 743 F.2d 1465, 1474 (11th Cir. 1984) (expert opinion based on untrustworthy market surveys); Barrel of Fun, Inc. v. State Farm Fire & Casualty Co., 739 F.2d 1028, 1033 (5th Cir. 1984) (unreasonable for expert to rely upon voice stress analysis); United States v. Cox, 696 F.2d 1294, 1297 (11th Cir.) (affirming exclusion of expert testimony that was based on hearsay knowledge of historical events not reasonably relied upon by experts in the field), cert. denied, 104 S.Ct. 99, 78 L.Ed.2d 104 (1983); Soden v. Freightliner Corp., 714 F.2d 498, 503-06 (5th Cir. 1983) (exclusion of expert opinion based on

unreliable accident statistics); Dallas & Mavis Forwarding Co., Inc. v. Stegall, 659 F.2d 721, 722 (6th Cir. 1981) (testimony of state trooper offered as an expert regarding cause of accident based on story of biased eye witness "the sort of hearsay testimony" Rule 703 meant to foreclose); Toys "R" Us, Inc. v. Canarsie Kiddie Shop, Inc., 559 F.Supp. 1189, 1205 (E.D.N.Y. 1983) (excluding expert opinion based on surveys lacking "sufficient indicia of trustworthiness" under Rule 703).

In In re Swine Flu Immunization Products Liability Litigation, 508 F.Supp. 897 (D. Colo. 1981), aff'd sub nom. Lima v. United States, 708 F.2d 502 (10th Cir. 1983), a case that resembles the one now before the court, the trial judge struck the testimony of one of plaintiff's experts. In formulating his opinion that plaintiff's Guillian-Barre Syndrome ("GBS") was caused by a swine flu vaccination, the doctor had relied on two exhibits. One, compiled by plaintiff's attorney, was a summary of all GBS cases treated in Colorado hospitals from October 1976 until August 1977. The other also reported on GBS cases in Colorado during the same time period, but relied instead on data retrieved from a computer listing, the International Classification of Diseases Adapted. This code listed diseases other than GBS,

which the court noted is an extremely difficult disease to diagnose, and medical clerks decided which of the diseases listed actually were GBS. 508 F.Supp. at 903.

The court excluded the doctor's testimony because the underlying data was "based upon hearsay evidence not reasonably relied upon by experts in neurology and epidemiology" and was "of a rudimentary nature." Id. at 904. Although the doctor himself claimed that epidemiologists would rely on information of the type gathered by the medical clerks, two other experts disagreed. They stated that the medical clerks were incapable of judging which of the listed diseases were in fact GBS and so had overstated the incidence of the disease.

O'Gee v. Dobbs Houses, Inc., 570 F.2d 1084 (2d Cir. 1978), is not to the contrary. There, the court affirmed the admissibility of testimony by a physician retained for the litigation who had seen plaintiff more than four years after her accident. The physician was allowed to testify not only to what plaintiff had told him about her injuries, but also to what she had told him about her prior physicians' conclusions. The physician stated, however, that he was relying not on plaintiff's statements alone; he

had before him the reports of at least two of the prior treating physicians and the hospital records. The Second Circuit found no abuse of discretion in admitting the physician's opinion, but observed:

> [W]hile expert witnesses are to be permitted to explain the basis of their opinions, we do not here decide that that leeway extends to the kind of multiple hearsay that would have been present here in the absence of the doctors' reports.

Id. at 1089; see also Slaughter v. Abilene State School, 561 S.W. 2d 789, 791 (Tex. 1977) (doctor's testimony predicated upon both hearsay and personal knowledge admissable); Smith v. Tennessee Life Insurance Co., 618 S.W.2d 829, 832 (Tex. Civ. App. 1981) ("report of private investigators is not • • • the type of hearsay data that a doctor can rely upon in forming his expert opinion").

Reliance on patient statements to render a medical opinion is usually justified as trustworthy because patients have a strong incentive to tell their treating physician the truth--the desire to recover. Rheingold, "The Basis of Medical Testimony," 15 Vand. L. Rev. 473, 495 (1962). While this indicia of trustworthiness was absent in the O'Gee case, supra, the medical records provided ample

corroboration. Cf. Ferebee v. Chevron Chemical Co., 736 F.2d 1529, 1535 (D.C. Cir.) (treating physicians' reliance on test results and physical examination of patient to conclude his illness caused by exposure to paraquat), cert. denied, 105 S.Ct. 545, 83 L.Ed.2d 432 (1984). Necessity is also a consideration in justifying reliance on hearsay to render expert advice. United States v. Aluminum Co. ofAmerica, 35 F.Supp. 820 (S.D.N.Y. 1940); Maguire & Hahesy, "Requisite Proof of Basis for Expert Opinion," 5 Vand. L. Rev. 432, 446-47 (1952).

(i) Dr. Singer

Plaintiffs' checklists and "affidavits," illustrated by Appendix "A" to this opinion, submitted with Dr. Singer's affidavits are not material that experts in this field would reasonably rely upon and so must be excluded under Rule 703. Although the court would usually hold a full Rule 104(a) hearing prior to making such a determination, the unreasonableness of Dr. Singer's affidavits is so blatant that a hearing would be useless. The court takes judicial notice--based on hundreds of trials--that no reputable physician relies on hearsay checklists by litigants to reach a conclusion with respect

to the cause of their afflictions. See United States v. Downing, 753 F.2d 1224, 1238 n.18 (3d Cir. 1985); cf. Mannino v. International Manufacturing Co., 650 F.2d 846, 853 (6th Cir. 1981) (experts often rely on studies, literature and tests in testifying).

It is significant that none of plaintiffs' experts assert that they normally rely on hearsay checklists such as those in Appendix "A" in reaching conclusions as to the causes of their patients' illnesses. Compare In re Japanese Electronic Products Antitrust Litigation, 723 F.2d 238, 277 (3d Cir. 1983), cert. granted, 105 S.Ct. 1863 (1985). The bald assertion of plaintiffs' counsel that Dr. Singer's affidavit was "based upon the kind of information which any treating or examining physician would require in rendering an opinion" does not suffice. See Tr. at 64 (April 15, 1985). Instead, courts look to evidence from experts in the field as to the reliability of the materials in question, In re Japanese Electronic Products, supra, 723 F.2d at 277, as well as their own experience and common sense.

Here we have statements of problems ranging from baldness to the most serious cancers. It verges on the absurd to use affidavits such as those in Appendix "A" to

determine both disease and cause. While courts allow reliance on patient statements, they are based upon a personal history corroborated by medical records, a physical examination and medical tests. O'Gee v. Dobbs Houses, Inc., 570 F.2d 1084 (2d Cir. 1978). See also Rheingold, "The Basis of Medical Testimony," 15 Vand. L. Rev. 473, 488 (1962).

No case cited by plaintiffs has gone so far as to allow a doctor to rely on such self-serving laypersons' general affidavits and checklists prepared in gross for a complex litigation. The influence of glimmering gold at the end of the litigation is particularly evident in the affidavits signed by plaintiffs' counsel. See Appendix "A." These affidavits resemble the compilations ruled inadmissible in the swine flu case discussed earlier. See In re Swine Flu Immunization Products Liability Litigation, 508 F.Supp. 897, 903 (D. Colo. 1981), aff'd sub nom. Lima v. United States, 708 F.2d 502 (10th Cir. 1983). There, medical clerks were held unqualified to determine which diseases were actually GBS. Here, plaintiffs and their counsel are even less qualified to determine the nature and cause of their afflictions.

Plaintiffs may argue that Dr. Singer's reliance upon such checklists was necessary in light of the size of this litigation and the number of parties involved. Yet, after six years of litigation, it does not seem too much to expect plaintiffs' counsel to have obtained more persuasive medical and other records. In any event, necessity justifies reliance on such blatant hearsay only when "the surroundings" convince the court that the data relied upon is otherwise truthworthy. United States v. Aluminum Co. of America, 35 F.Supp. 820, 823 (S.D.N.Y. 1940).

Here, the usual inducement to candor with a physician--the hope of successful treatment or diagnosis--was wholly lacking. Cf. Fed. R. Ev. 803(4). Instead, plaintiffs had every incentive to be overinclusive in describing their symptoms, as an examination of one of their checklists makes clear. See Appendix "A."

(ii) Dr. Epstein

Dr. Epstein's affidavits on individual causation are not as vacuous as are Dr. Singer's. Dr. Epstein, while not a treating physician, purports to rely at least in part on medical and military records to corroborate the extent of

plaintiffs' exposure and the nature of their illnesses. See O'Gee v. Dobbs Houses, Inc., 570 F.2d 1084, 1089 (2d Cir. 1978); cf. Johnston v. United States, 597 F.Supp. 374, 406 (D. Kan. 1984) (noting plaintiff's failure to call his treating physicians).

It is significant that no medical records of any of the nearly 300 opt-out plaintiffs have been submitted by plaintiffs. Nor are there any affidavits or letters from any treating or examining physicians. There is nothing from any person who has even seen a plaintiff and observed any medical condition. No scrap of verification of a single plaintiff's claim is supplied by plaintiffs. The only material remotely resembling what would be required was elicited, over plaintiffs' attorney's objection, at Dr. Epstein's deposition. See, e.g., Dep. at 16, 40-41, 76-78, 136, 474 ff; Appendix "B" to Defendants' Supplemental Memorandum in Opposition to Plaintiffs' Motion for Partial Summary Judgment and Reply Memorandum in Further Support of Defendants' Motion to Dismiss And/or for Summary Judgment.

Dr. Epstein relies in the main on the same self-serving hearsay used by Dr. Singer. In all of the

individual affidavits, Dr. Epstein bases his finding of exposure to Agent Orange on such plaintiffs' statements:

> I was exposed to Agent Orange. I was sprayed with Agent Orange. I saw the spraying of Agent Orange. I entered defoliated areas. I consumed local food. I drank local water.

As in the case of the studied failure to support any medical claim, there is no support for exposure: no place, no date, no circumstance is given.

Given the difficulty of determining dose-response relationships in toxic tort situations, cf. Ferebee v. Chevron Chem. Co., 736 F.2d 1529 (D.C. Cir.), cert. denied, 105 S.Ct. 545, 83 L.Ed.2d 432 (1984); Allen v. United States, 588 F.Supp. 247 (D. Utah 1984), the amount and existence of exposure to Agent Orange may be critical under plaintiffs' theory of causation. Claims of exposure without detail cannot suffice. Such analyses as those based on HERBS tapes of spraying missions and personnel locations seem necessary. See, e.g., Analysis of Drs. Stellman referred to in Appendix "J" of Special Master Feinberg's Report to the court dated February 27, 1985. Reference to the Veterans Administration's Agent Orange Registry does not alleviate the hearsay problem since placement in the

Registry is based on plaintiffs' complaints, not medical records or results of an examination. Even if the examination is negative, the veteran's name is carried in the Registry. Nor is it dispositive that most or all of these fifteen plaintiffs were field soldiers.

Dr. Epstein also relies on unverified hearsay information regarding plaintiffs' personal habits and possible exposure to toxic substances other than Agent Orange. How much a plaintiff smokes and whether he has been exposed to other harmful substances are crucial to the issue of causation.

Dr. Epstein relies on the sparsest medical records in concluding no family history of the disease in question exists as to some of the plaintiffs he considers. The fact that a family history is not recorded in such medical records does not show the nonexistence of family history.

Plaintiffs have submitted no evidence that other physicians would rely upon material of this kind in reaching a medical conclusion as to causation.

To the extent Dr. Epstein has reviewed plaintiffs' medical records, he relies on them only to show that the disease complained of did not manifest itself prior to service in Vietnam. Temporal sequence is not, of course, the equivalent of causation. We must, as Dr. Epstein concedes, recognize the huge array of carcinogens and other harmful substances other than Agent Orange that people are exposed to--whether in Vietnam or in this country.

Even were we to ignore the deficiencies outlined above, it is a fatal flaw in Dr. Epstein's material, as in Dr. Singer's, that no account is taken of the relative degree of specific health problems of those exposed to Agent Orange as compared with those not exposed. All the studies to date indicate no significant differences.

(b) The Requirement of "Sufficient Basis"

Courts excluding expert opinion as not based on data reasonably relied upon in the field often note that the expert's conclusions are speculative or unfounded in fact. This was the approach of Judge Skelly Wright in Merit Motors, Inc. v. Chrysler Corp., 569 F.2d 666 (D.C. Cir. 1977), a complex antitrust case. To establish the requisite

antitrust injury plaintiffs relied almost exclusively on their expert's report which set forth a theory of "inherent" economic effect. Id. at 671. Judge Wright, for the court, approved the trial court's grant of summary judgment, finding that the expert had made "unsupported assumptions about the elasticities of demand in various markets and that he virtually ignore[d] the impact of the dominant forces in the automobile market: General Motors and Ford." Id. at 673; see also Barris v. Bob's Drag Chutes & Safety Equipment, Inc., 685 F.2d 94, 101-02 n. 10 (3d Cir. 1982) (trial court properly excluded expert testimony as to strength of fibers in harness where no showing that expert relied on facts or data from plaintiff's other expert); United States v. Various Slot Machines on Guam, 658 F.2d 697, 700 (9th Cir. 1981) (summary judgment appropriate where opposition to motion consisted of expert opinions merely asserting without factual basis that certain slot machines were not gambling machines).

Similarly, in Pennsylvania Dental Association v. Medical Service Association, 745 F.2d 248 (3d Cir. 1984), cert. denied, ___ S.Ct. ___ (April 15, 1985), the Third Circuit affirmed the exclusion of an expert's opinion lacking any factual predicate in the record. In attempting

to define the relevant market for purposes of establishing an antitrust violation, plaintiffs' expert made a number of conclusory statements not based on any evidence in the record. Id. at 261-62 n.7. The appellate court affirmed under Rule 703 and the Merit Motors case, finding the affidavit insufficient to create a material issue of fact.

Instructive is the way courts address the problem of expert opinions insufficiently based on facts in the context of deciding appropriate damages. Thus in Shu-Tao Lin v. McDonnell Douglas Corp., 742 F.2d 45 (2d Cir. 1984), the Second Circuit found that the trial below had been incurably tainted by an expert's "lengthy, extravagant, and non-probative projections of • • • future income." Id. at 49. The trial court had undertaken a detailed analysis of the expert opinion in deciding the question of remittitur, concluding that the expert's projection that decedent's income would have vastly increased was based only on "unclear tax records." 574 F.Supp. 1407, 1410 (S.D.N.Y. 1983). Nor did the expert offer any studies or empirical data as a basis for his conclusion about the projected increase. Id. See also Shatkin v. McDonnell Douglas Corp., 727 F.2d 202, 208 (2d Cir. 1984) (affirming district court's exclusion of testimony that contained "assumptions and

assertions • • • so unrealistic and contradictory as to suggest bad faith"; same expert as testified in Shu Tao Lin, supra.); Drayton v. Jiffee Chemical Corp., 591 F.2d 352, 364 (6th Cir. 1978) ("no reasonable person would, in the ordinary affairs of life, act upon the astronomical projections and assumptions made by plaintiffs' expert • • •."); Scheel v. Conboy, 551 F.2d 41, 43 (4th Cir. 1977) (rejecting unfounded assumptions in expert opinion on future economic loss); McFarland v. Gregory, 425 F.2d 443, 448 (2d Cir. 1970) (affirming exclusion of expert's testimony where he had no knowledge of property in question and his conclusions were conjectural); cf. Arkansas State Highway Commission v. Roberts, 246 Ark. 1216, 441 S.W.2d 808, 811-12 (1969) (expert evidence regarding value of certain condemned land rejected as unfounded in fact).

Experts must ground their opinions on verifiable propositions of fact in commercial cases as well as tort actions. For example, in DiRose v. PK Management Corp., 691 F.2d 628 (2d Cir. 1982), cert. denied, 461 U.S. 915, 103 S.Ct. 1896, 77 L.Ed.2d 285 (1983), the Second Circuit rejected the testimony of plaintiff's expert on valuation as "simplistic" and granted a new trial. Id. at 631. The

court wrote: conclusions that "rest upon conclusory and subjective opinions will not suffice." Id. at 632.

Courts are particularly wary of unfounded expert opinion when causation is the issue. In Tabatchnick v. G. D. Searle & Co., 67 F.R.D. 49 (D.N.J. 1975), the court refused to allow the testimony of plaintiff's expert that an oral contraceptive caused certain adverse neurological effects. The expert relied in part on the notion that the symptoms stopped when plaintiff discontinued use of the pill, yet the testimony had been that the symptoms continued for some time. Id. at 55. Labelling the expert's opinion a "bare conclusion," the court admonished that careful screening of expert testimony on causation was "especially important when the subject is emotionally charged, as it is here." Id.; see also Cunningham v. Rendezvous, Inc., 699 F.2d 676, 678 (4th Cir. 1983) (under Rule 703, expert on cause of ship's sinking properly limited to hypotheses "supported by or consistent with the evidence"); Horton v. W. T. Grant Co., 537 F.2d 1215, 1218 (4th Cir. 1976) (affirming refusal to admit expert testimony on whether design defect of television set caused fire where no showing that set expert used to reach conclusions had not been previously tampered with); Gilbert v. Gulf Oil Corp., 175

F.2d 705, 709 (4th Cir. 1949) ("expert testimony may not be received unless it appears that the witness is in possession of such facts as would enable him to express a reasonably accurate conclusion as distinguished from guess or conjecture"); compare Bieghler v. Kleppe, 633 F.2d 531 (9th Cir. 1980) (denying summary judgment where accident reconstruction expert's affidavit, which was based on visits to the site, discussions with plaintiffs, and examination of motorcycle involved, unequivocally concluded that defendant's negligence caused accident).

Because the rational basis for rules of evidence requires the rejecting of inadequately supported expert testimony, state courts follow the same practice as federal courts. For example, in State v. Tyler, 77 Wash.2d 726, 466 P.2d 120, 137 (1970), vacated on other grounds, 408 U.S. 937, 92 S.Ct. 2865, 33 L.Ed.2d 756 (1972), the Supreme Court of Washington found that the two psychiatrists whose opinion testimony was offered to show lack of criminal intent had no reasonable medical knowledge upon which to base an opinion. The doctors had no knowledge of the quantities, strengths or dosages of cocaine, amphetamines, Dexamyl, marijuana and LSD ingested by defendant or of the intervals in which they were taken. The experts had not examined the accused directly

before or after the commission of acts allegedly committed under the drugs' influence. Without any facts on which to base their opinions with reasonable medical certainty, the Supreme Court found that the doctors' testimony had been properly excluded as speculative and argumentative. See also Brugh v. Peterson, 183 Neb. 190, 159 N.W.2d 321 (1968) (error to admit the opinion of plaintiff's expert on speed of vehicle because it depended on the resolution of many variables, rested on assumptions and amounted to mere statement of possibility).

As these cases illustrate, the testimony of Doctors Singer and Epstein is insufficiently grounded in any reliable evidence. Framing Dr. Singer's testimony as a hypothetical does not defeat the need for an adequate basis. Cunningham v. Rendezvous, Inc., 699 F.2d 676, 678 (4th Cir. 1983). The conclusions Doctors Singer and Epstein reach are also insufficient as a basis for a finding of causality because they fail to consider critical information, such as the most relevant epidemiologic studies and the other possible causes of disease. "[E]ven if a witness is eminently qualified, even if there is merit to his views, and even if F.R. Evid. 702, 703, 704 and 705 are most liberally interpreted, there must be and ought to be

some reliable factual basis on which the opinions are premised." Johnston v. United States, 597 F.Supp. 374, 401 (D. Kan. 1984).

Dr. Epstein's lengthy master affidavit and Dr. Singer's affidavits contain numerous references to mostly unidentified studies on the effects of exposure to TCDD on animals and on workers after industrial accidents. As already noted, such studies involve doses of dioxin far more concentrated than those alleged to have been inflicted upon any of the veterans. In re "Agent Orange" Product Liability Litigation, 597 F. Supp. 740, 783 (E.D.N.Y. 1984). Neither doctor analyzes the epidemiological studies conducted on Vietnam Veterans. The doctors' failure to consider and discuss the studies that address the actual population and amount of exposure involved in this lawsuit confirms the conclusion that their opinions are legally incompetent.

Central to the inadequacy of plaintiffs' case is their inability to exclude other possible causes of plaintiffs' illnesses--those arising out of their service in Vietnam as well as those that all of us face in military and civilian life. For example, the largest number of

plaintiffs considered by Dr. Singer suffer from symptoms such as exhaustion, depression, sleep disturbances, anxiety and anger. He concludes that these symptoms are "compatible with" exposure to dioxin. As scientific literature establishes, such symptoms are also frequently identified with Vietnam stress syndrome due to battle and other military stresses. DeFazio, "Dynamic Perspectives on the Nature and Effects of Combat Stress" in Stress Disorders Among Vietnam Veterans: Theory, Research and Treatment 23 (C. Figley, ed. 1978); Shatan, "Stress Disorders Among Vietnam Veterans: The Emotional Content of Combat Continues" in id. 43 (both articles on file as subject to court's judicial notice). The onset of stress syndrome may be delayed and the symptoms may persist for decades. DeFazio, supra, at 34-35. Dr. Singer in no way rules out stress syndrome as the cause of plaintiffs' neurological symptoms.

Similarly, Dr. Singer has no basis for concluding that the affiants' dermatological difficulties result from exposure to Agent Orange. While many plaintiffs have become bald since leaving Vietnam, baldness is often a natural part of aging. C. Vallis, Hair Transplantation for the Treatment of Male Pattern Baldness 45 (1982) ("[i]n normal men

advancing age is accompanied by an increase in the incidence and extent of baldness.") (on file as subject to court's judicial notice). Similarly, with respect to dermatitis one source notes:

> There are many forms and many causes. Dermatitis may be caused by inhaling, eating, or touching substances to which the person is allergic. It may be initiated by infection, by exposure to the sun, by poisons, by the application of certain medicinal preparations, by injury, by certain plants (as poison ivy), by exposure to x-rays or radium rays, etc.

J.E. Schmidt, 1 Attorneys' Dictionary of Medicine, at D-25-26 (1977).

Both Doctors Singer and Epstein attribute plaintiffs' lymphatic difficulties to Agent Orange exposure. Neither considers the possibility that these plaintiffs suffer from filariasis, a disease affecting the lymphatic system which is caused by tropical worms prevalent in Vietnam. Lawsuits have recently been brought in this court seeking to hold the government liable for the failure to treat this disease in Vietnam veterans. See, e.g., Bernagozzi v. United States, No. 85-CV-1121 (E.D.N.Y. filed Mar. 25, 1985); Hartman v. United States, No. 85-CV-1122

(E.D.N.Y. filed Mar. 25, 1985); Naples v. United States, No. 85-CV-1123 (E.D.N.Y. filed Mar. 25, 1985) (all subject to court's judicial notice).

Plaintiffs' experts also opine that exposure to Agent Orange has caused the various liver diseases indicated in the checklists. Compare Tr. at 179-80 (March 5, 1985) (no causal relationship between cirrhosis of the liver and Agent Orange exposure) (remarks of Plaintiffs' Management Committee member David Dean). Dr. Singer does not indicate whether the plaintiffs whose cirrhosis of the liver he attributes to Agent Orange are or were heavy alcohol consumers. See T. Chen & P. Chen, Essential Hepatology 185 (1977) ("[c]irrhosis of all types ranked seventh among the leading causes of mortality in 1973, accounting for 33,000 deaths. Cirrhosis due to alcoholism predominates in the United States * * *.") (on file as subject to court's judicial notice). The undifferentiated hepatitis described by plaintiffs may be caused by alcohol consumption as well as by many other factors in civilian life, including eating contaminated shellfish and blood transfusions. See, e.g., Chen & Chen, supra, at 181-82 (alcohol). Of the plaintiffs with hepatitis considered by Dr. Epstein, one admittedly is a "moderate drinker"; the other has a history of alcohol

abuse; and the full alcohol history of any of the plaintiffs has not been explored by Dr. Epstein. Dr. Singer does not discuss the alcohol consumption or other life experiences of the affiants he assumes have hepatitis.

Dr. Singer's failure to discuss the individual plaintiffs' medical histories and personal habits is endemic to his analysis. He does not consider alternative possible causes of illness, even when those potential causes are admitted by the plaintiffs themselves in their affidavits. As the defendants have pointed out without contradiction, certain plaintiffs admit that (a) they smoke several packs of cigarettes a day, (b) they have been exposed to polychlorinated biphenyls (PCBs), (c) they have taken various drugs (Darvon, Donnatol, marijuana), (d) they have suffered from certain conditions (diabetes, malaria, veneral disease, goiter) that they do not claim are related to exposure to Agent Orange, but which are related to other adverse health conditions, and (e) they drink large quantities of alcohol (e.g., 42 beers a week). For example, one plaintiff affiant, James H. Yarborough, claims to suffer from tuberculosis as a result of exposure to Agent Orange, while admitting to a family history of tuberculosis.

Dr. Singer still concludes that his tuberculosis was caused by Agent Orange exposure.

On the issue of cancer, Dr. Epstein has himself acknowledged that the approach he uses in Agent Orange of ignoring all other possible causes of illness is invalid. In his treatise, The Politics of Cancer, Dr. Epstein writes:

> Cancer is now a killing and disabling disease of epidemic proportions. More than 53 million people in the United States (over a quarter of the population) will develop some form of cancer, from which approximately 20 percent of the U.S. population will die. It is estimated that 765,000 new cancer cases will be diagnosed in 1979, and there will be 395,000 cancer deaths. Cancer deaths this year alone were about five times higher than the total U.S. military deaths in all the Vietnam and Korean war years combined.
>
> Cancer strikes not only the elderly, but also other age groups, including infants. Among males, cancer is the second leading cause of death for all age groups except 15-34 years, where it is exceeded by violent deaths, accidents, homicide, and suicide.

S. Epstein, The Politics of Cancer 4 (Anchor Press ed. 1979) (on file as subject to court's judicial notice). He also cites with approval the conclusion of the "blue ribbon HEW draft document, 'Estimates of the Fraction of Cancer in the

United States Related to Occupational Factors,'" which states:

> Most cancers have multiple causes: It is a reductionist error and not in keeping with current theories of cancer causation to attempt to assign each cancer to an exclusive single cause.
>
> * * *
>
> Reasonable projections of the future consequences of past exposure to established carcinogens suggested that at least five of them (benzene, arsenic, chromium, nickel oxides, and petroleum fractions) may be comparable in their total effects to asbestos.
>
> * * *
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> These projections suggest that occupationally related cancers may comprise as much as 20 percent or more of total cancer mortality in forthcoming decades. Asbestos alone will probably contribute up to 13-18 percent, and the data (on the other five carcinogens) suggest at least 10-20 percent more. These data do not include effects of radiation, or effects of a number of other known chemical carcinogens. Although exposure to some of the more important occupational carcinogens has been reduced in recent years, there are still many unregulated carcinogens in the U.S. workplaces; a number of occupations are characterized by excess cancer risks that have not yet been attributed to specific agents.
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> * * *
>
> The conclusion that a substantial fraction of cancers in the United States are occupationally related is not inconsistent with conclusions that a substantial fraction of cancers are also associated with other factors, such as cigarette smoking and diet.