

FOR PUBLICATION
UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT

In re: HANFORD NUCLEAR
RESERVATION LITIGATION,

JEANNE JAROS, et al., on their own
behalf and as representatives of
classes of similarly situated
persons,

Plaintiffs-Appellants,

v.

E. I. DUPONT,

Defendant-Appellee.

No. 98-36142

D.C. Nos.
CV-91-03015-AAM
CV-90-03017-AAM

In re: HANFORD NUCLEAR
RESERVATION LITIGATION,

E. S. CRISWELL, AREL
QUESSENBERRY, LUTHER STACY, JR.,
RAYMOND L. SWAIM, BETTY L.
SWAIM, JAMES R. SWAIM and JOHN
S. SWAIM, on their own behalf and
as representatives of classes of
similarly situated persons,

Plaintiffs-Appellants,

v.

E. I. DUPONT DE NEMOURS and
GENERAL ELECTRIC COMPANY,

Defendants-Appellees.

No. 98-36143

D.C. Nos.
CV-91-03015-AAM
CV-90-03106

In re: HANFORD NUCLEAR
RESERVATION LITIGATION,

CHUCK SEAMAN, as personal
representative for Frieda Theresa
Seaman, Deceased; MARK SEAMAN,
JR.; CHUCK SEAMAN,
Plaintiffs-Appellants,

v.

E. I. DUPONT DE NEMOURS AND
COMPANY, a Delaware corporation;
GENERAL ELECTRIC COMPANY, a
New York Corporation,
Defendants-Appellees.

No. 98-36144
D.C. Nos.
CV-91-03015-AAM
CV-91-03080-AAM

In re: HANFORD NUCLEAR
RESERVATION LITIGATION,

ANDRA L. EVENSON, et al.,
Plaintiffs-Appellants,

v.

E. I. DUPONT DE NEMOURS AND
COMPANY,
Defendant-Appellee,

and

U.S. ENVIRONMENTAL PROTECTION
AGENCY, et al.,
Defendants.

No. 98-36147
D.C. No.
CV-91-03015-AAM

In re: HANFORD NUCLEAR
RESERVATION LITIGATION,

KATHRYN HAMILTON, DIANA
COTTAM, JAMES and JANET BOYD
and CONNIE SOPER, on their own
behalf and as representatives of
classes of similarly situated
persons,

Plaintiffs-Appellants,

v.

E. I. DUPONT DE NEMOURS AND
COMPANY; GENERAL ELECTRIC CO;
UNC, INC., ATLANTIC RICHFIELD
COMPANY, ROCKWELL
INTERNATIONAL CORPORATION,
WESTINGHOUSE ELECTRIC
CORPORATION and WESTINGHOUSE
HANFORD COMPANY,

Defendants-Appellees.

No. 98-36149

D.C. Nos.
CV-91-03015-AAM
CV-90-03069-AAM

In re: HANFORD NUCLEAR
RESERVATION LITIGATION,

ROSEMARY MILLER,

Plaintiff-Appellant,

v.

E. I. DUPONT DE NEMOURS;
GENERAL ELECTRIC,

Defendants-Appellees.

No. 98-36173

D.C. No.
CV-91-03015-AAM
OPINION

Appeal from the United States District Court
for the Eastern District of Washington
Alan A. McDonald, District Judge, Presiding

Argued and Submitted September 14, 2000
Submission Vacated September 18, 2001
Resubmitted October 15, 2001
Seattle, Washington

Filed June 18, 2002

Before: Mary M. Schroeder, Chief Judge,
Alfred T. Goodwin and Michael Daly Hawkins,
Circuit Judges.

Opinion by Chief Judge Schroeder

COUNSEL

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ington, Roy S. Haber, Eugene, Oregon, Michael Bloom and Michael Axline, Eugene, Oregon, Stanley M. Chesley, Waite, Schneider, Bayless & Chesley, Co, Cincinnati, Ohio, John S. Moore, Velikanje, Moore & Shore, P.C. Yakima, Washington, for the plaintiffs-appellants.

William R. Jentes and Kevin T. Van Wart, Kirkland & Ellis, Chicago, Illinois, William R. Squires III, Summit Law Group, Seattle, Washington and Lee Radford, Moffatt, Thomas, Barrett, Rock & Fields, Idaho Falls, Idaho, for the defendants-appellees.

OPINION

SCHROEDER, Chief Judge:

These appeals raise fundamental questions concerning how courts should grapple with causation issues in mass tort cases. The appellants are among thousands of plaintiffs who filed suit for damages allegedly arising out of their exposure to harmful levels of radioactive emissions from the Hanford Nuclear Reservation over a period of many years. They filed these actions under the Price-Anderson Act, 42 U.S.C. § 2011 *et seq.*, against E.I. DuPont and other entities who operated the nuclear facility under license agreements with the federal government during the relevant period. Appellants appeal the district court's summary judgment dismissal of their claims at the end of the second of three scheduled phases of discovery, when the court determined that appellants had not demonstrated individual exposure to a threshold level of radiation the court deemed capable of causing harm. The court established that threshold harmful level by determining the radiation exposure level for each of various categories of plaintiffs, grouped by age and gender, that would double the risk of illness when compared to the risk faced by the general population. That level is sometimes referred to as the "doubling dose."

Appellants here contend that the district court prematurely ruled on the merits of their individual claims because the second phase of discovery was to deal with issues of generic rather than individual causation, issues that were reserved for a later phase. They also contend that the district court erred as a matter of law in requiring plaintiffs to establish exposure to a threshold, “doubling dose” level of radiation as an element of generic causation. In addition, they challenge evidentiary rulings that disallowed the opinions of several experts on causation issues.

After a review of the record in this case and of the evolving case law in the area of toxic exposure, we conclude that the district court should not have dismissed the appellants’ claims at this stage of the litigation. This is principally because the district court inappropriately relied upon cases that deal with the test to apply in order to determine whether a substance has the capacity to cause harm. *See Daubert v. Merrell Dow Pharm., Inc.*, 43 F.3d 1311 (9th Cir. 1995) (considering expert testimony regarding the morning sickness drug Bendectin’s capacity to cause limb defects). More relevant guidance for this case is found in cases dealing with whether a known toxic substance, like radiation, was in fact responsible for plaintiffs’ illnesses. *See In re Three Mile Island Litig.*, 193 F.3d 613 (3d Cir. 1999), *amended by* 199 F.3d 158 (3d Cir. 2000). Such guidance will also be helpful to the district court in reexamining the proffered opinions of plaintiffs’ experts. We therefore reverse and remand for further proceedings, with a suggestion that the district court rule promptly upon the pending requests for class certification.

BACKGROUND

The Hanford Nuclear Weapons Reservation (“Hanford”), was constructed during World War II and was the first large-scale plutonium manufacturing facility in the world. It occupies a 560-square mile area of southeastern Washington and abuts the Columbia River. Hanford’s operations began in

1944 and soon grew to produce the majority of the plutonium used in the nation's nuclear weapons program, including the plutonium for the atomic bomb dropped on Nagasaki. In addition to plutonium (Pu-239), other radionuclides, including radioactive iodine (I-131), were created in the plutonium manufacturing process. Each of the five defendants in this case serially operated Hanford under contract with the United States for differing time periods between 1943 and 1987. The defendants are E. I. Du Pont de Nemours & Company, General Electric Company, UNC Nuclear Industries, Incorporated, Atlantic Richfield Company, and Rockwell International Corporation, (collectively, "defendants").

In 1987, the United States Department of Energy ("DOE") created the Hanford Environmental Dose Reconstruction Project ("HEDR"), overseen by the Centers for Disease Control. The underlying purpose of the HEDR was to estimate and reconstruct all radionuclide emissions from Hanford from 1944 to 1972, in order to ascertain whether neighboring individuals and animals had been exposed to harmful doses of radiation. Analyzing Hanford emissions over a 75,000 square mile area, the HEDR created a series of computer models and algorithms to estimate the timing of radionuclide releases into the air and the water of the Columbia River. The HEDR also examined the environmental and atmospheric transport of the releases, i.e. how radiation traveled through the air, settled into the soil, and dispersed into ground and surface water, and the resulting exposure to individuals who lived in the surrounding urban and suburban areas. Of particular concern to the HEDR were the estimated doses of I-131 received by the thyroid glands of humans, principally through consumption of milk from cows that ingested contaminated vegetation on neighboring farms and pastures. The HEDR concluded that I-131 emissions peaked during the period from 1944 to 1946, when an estimated 88% (685,000 curies) of Hanford's total iodine emissions occurred. HEDR explained that in later years, emissions declined because of technological advances.

In 1990, the Technical Steering Panel of HEDR released a report entitled *Initial Hanford Radiation Dose Estimates* which publicly disclosed for the first time that large quantities of radioactive and non-radioactive substances had been released from Hanford, beginning in the 1940s. This disclosure sparked a blaze of litigation. Thousands of individual plaintiffs filed complaints in the District Court for the Eastern District of Washington, alleging varying illnesses caused by exposure to Hanford's toxic emissions. Plaintiffs alleged that defendants acted intentionally or negligently, and that the radioactive and other toxic emissions reached numerous off-site residents through ingestion of contaminated vegetables, meat, fish, drinking water and milk, swimming in the irradiated Columbia River, and inhalation of toxic air. Many plaintiffs also claimed loss of real property value. In the district court's words:

[P]laintiffs, who conceivably could number into the hundreds of thousands, consist of all those persons who, at some time during the last 50 years, resided and/or had some property interest in an area which covers most of southeastern Washington, a portion of northeastern Oregon, and a small portion of western Idaho. . . . Given the scope of the plaintiffs' claims, particularly with regard to the number and differing types of emissions and the differing harms alleged to have resulted from each, the potential enormity of this litigation, as well as the dollar amount of any recovery, is almost staggering.

In 1991, the district court consolidated all of the Hanford-related actions and directed preparation of one consolidated complaint, designating specific lead and liaison counsel for all parties. The joint consolidated complaint was filed as a class action, but the district court has not yet ruled on class certification, and the plaintiffs proceeded individually. Several other plaintiff groups joined in the litigation after the filing of the joint consolidated complaint, alleging the same tort claims as

those contained in the joint consolidated complaint. Collectively, the plaintiffs pleaded claims of negligence, strict liability, trespass, nuisance, misrepresentation, negligent and intentional infliction of emotional distress, wrongful death, and conspiracy. They sought compensatory damages for physical, emotional, and economic harm, punitive damages, medical monitoring, compelled disclosure of all relevant information, and abatement and remediation of ongoing and threatened releases of radioactive and non-radioactive hazardous substances.

The district court's partial summary judgment order that is the subject of this appeal, addressed only those claims for present and future injury based on state tort claims brought under the Price-Anderson Act, 42 U.S.C. § 2210(n)(2).

The district court filed its first Case Management Discovery Plan on February 20, 1992. It set forth a sensible discovery schedule divided into three phases. Phase I, projected to last for one year, permitted discovery through document production and interrogatories. Plaintiffs were to obtain information about Hanford's operating and emissions history, and defendants were to conduct discovery pertaining to plaintiffs' exposures, medical histories, and relevant illnesses and injuries. Phase II discovery would focus on causation and provided for designation and disclosure of all scientific expert witnesses and for the filing of the experts' proffered reports. A separate rebuttal period would conclude Phase II, affording each party the opportunity to respond to opposing expert witnesses. The parties and the district court anticipated dispositive motions on the critical issues of causation at the close of Phase II. Phase III discovery would encompass general liability and any other remaining pre-trial issues.

The district court extended Phase I three times in three years, with Phase I finally winding down in March 1995. At the beginning of Phase II, and at the parties' request, the district court allowed for limited discovery on liability and oper-

ations at Hanford, but reiterated that Phase II would focus on causation and conclude with dispositive motions.

Meanwhile, plaintiffs' motions for class certification remained outstanding. The district court addressed the issue in an August 1994 order, concluding that it would not, at that time, alter its order consolidating plaintiffs into groups. Instead, the court reserved decision on the propriety of class certification pending further discovery on causation issues.

Once Phase II discovery was underway, the district court, on October 3, 1995, adopted plaintiffs' proposal to bifurcate discovery on issues regarding "generic causation," from discovery on issues of "individual causation." The order did not define the terms. "Generic causation" has typically been understood to mean the capacity of a toxic agent, such as radiation, to cause the illnesses complained of by plaintiffs. If such capacity is established, "individual causation" answers whether that toxic agent actually caused a particular plaintiff's illness. *See Sterling v. Velsicol Chem. Corp.*, 855 F.2d 1188, 1200 (6th Cir. 1988) (defining generic causation as "whether the combination of the chemical contaminants and the plaintiffs' exposure to them had the capacity to cause the harm alleged" and separate from individual proximate cause determinations); *In re "Agent Orange" Product Liab. Litig. MDL No. 381*, 818 F.2d 145, 165 (2d Cir. 1987) ("[t]he relevant question, therefore, is not whether Agent Orange has the capacity to cause harm, the generic causation issue, but whether it *did* cause harm and to whom") (emphasis in original).

In its order bifurcating Phase II discovery, the district court directed the parties to proceed with discovery related only to generic causation and to anticipate dispositive motions before proceeding further. Discovery on individual medical causation was deferred to an unspecified date in the future.

Over the following years, the parties bitterly debated discovery matters. In particular, the parties disputed the appro-

appropriate burden of proof plaintiffs would need to meet in order to survive dispositive motions on issues of generic causation. Plaintiffs, relying on their own understanding of generic causation and the district court's earlier discovery orders, consistently maintained that at the generic causation stage of the proceedings, they needed to prove only that the emissions released from Hanford had the capacity to cause the claimed illnesses. Plaintiffs retained and prepared their scientific experts accordingly, with the expectation that the deferred phase of causation discovery would allow them to garner causation evidence about the individual, particularized illnesses of each plaintiff.

Defendants, on the other hand, argued that plaintiffs' distinction between generic and individual causation was "academic." They claimed that to establish generic causation, this court's opinion in *Daubert v. Merrell Dow Pharm., Inc.* ("*Daubert II*"), 43 F.3d 1311 (9th Cir. 1995), required plaintiffs to demonstrate that they had been exposed to a specific dose of radiation that statistically "doubled their risk" of harm. Unless exposed to such a "doubling dose," defendants alleged, plaintiffs could not prove by a preponderance of the evidence that their claimed illnesses, which also appear in the unexposed general population, were more likely than not caused by Hanford's emissions.

As generic causation discovery progressed, the district court strictly enforced the deadlines it had established for the exchange of reports prepared by scientific expert witnesses. The court emphasized that requests for extensions of time or leave to supplement expert reports would be intensely scrutinized and allowed "only upon a showing of clear necessity." In the court's Third Case Management Discovery Order, issued March 13, 1996, the court stated that it would allow the parties to supplement their proffered scientific evidence with information not available until after the court's deadline only upon a "compelling demonstration from records actually produced that it is the only appropriate relief."

Plaintiffs stress that they had a difficult time complying with the district court's directives and that their case suffered as a result. They complain that inadequate compliance with discovery orders had impeded their efforts to timely review all necessary documents. They were not allowed to supplement their experts' reports with updated scientific evidence, including cutting edge research from Chernobyl. Nor were plaintiffs permitted to correct errors in one report prepared by an important atmospheric dispersion expert who, on his own, discovered a coding error in his model simulating the distribution of iodine and plutonium.

The parties' divergent views of generic causation became clear in the summary judgment motions filed by defendants in March and June of 1997. Defendants argued that plaintiffs could not proceed with discovery unless they could offer admissible expert evidence to prove that, for each of the complained of illnesses, the relevant plaintiff had been exposed to that specific dose of radiation that statistically doubled the risk of persons in the general population contracting those illnesses. Defendants claimed that plaintiffs could not prove such exposure for any ailment other than thyroid cancer, and asked the court to limit the litigation to (1) claims allegedly caused by iodine releases during the peak emission period of 1944-51, and (2) thyroid cancer claims. To support their motion, defendants offered hundreds of exhibits, affidavits, and scientific reports detailing what they claimed were deficiencies in the plaintiffs' causation evidence. Defendants linked their summary judgment motion to dozens of in limine motions challenging the admissibility of plaintiffs' expert witnesses, commonly known as "*Daubert* motions." See *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993). Defendants urged the district court to exclude the testimony of any scientific expert witness who could not link his or her opinion to statistical evidence demonstrating that exposure to Hanford emissions more than doubled a plaintiff's risk of harm.

Each plaintiff group filed its own opposition to defendants' consolidated motion for summary judgment. All groups

insisted that at the generic causation stage of the proceedings, they needed only to prove that the emissions released from Hanford were capable of causing their various claimed illnesses, and that they had offered sufficient evidence to meet this burden. The doubling of the risk standard had no place at this stage of the case, they claimed, because radiation is capable of causing cancer and other serious illnesses at even the lowest levels of exposure. Plaintiffs' opposition motions were accompanied by their own plethora of expert affidavits and scientific reports.

Defendants supported their reply with additional affidavits to respond to plaintiffs' evidence. Plaintiffs then moved for leave to file sur-replies in order to respond to the additional affidavits. The district court denied plaintiffs' motion, but construed it as a continuing motion to strike. Plaintiffs nevertheless attempted to file additional expert affidavits, but the court found their attempts "intolerable" and instructed that any future attempts to circumvent the court's directives would result in sanctions.

In December 1997, after more than five years of discovery, the district court held oral argument to address plaintiffs' burden of proof. The parties addressed their views on whether plaintiffs' claims could survive without epidemiological proof of causation, i.e. the "doubling of the risk" standard, and they addressed the appropriate standard of proof under Washington state tort law. The court did not hold an evidentiary hearing on the admissibility of any of the scientific expert testimony.

Almost nine months later, the district court entered a 762-page order granting in large part defendants' motion for summary judgment. *See In re Hanford Nuclear Reservation Litig.*, No. CY-91-3015-AAM, 1998 WL 775340 (E. D. Wash. Aug. 21, 1998). The order set forth rulings on all pending *Daubert* motions, refused an evidentiary hearing on those motions, and denied plaintiffs' requests for oral argument.

Relying on our decision in *Daubert II*, the district court agreed with defendants that to survive summary judgment on issues of generic causation, each individual plaintiff had to prove not only that radiation is capable of causing injury, but that he or she had been exposed to a threshold dose of radiation that statistically doubled the risk of harm over the risk that exists for the general population. The court reasoned that plaintiffs lacked direct proof that Hanford's radioactive emissions caused their asserted health conditions (which also occur in the unexposed, general population), and therefore could never establish generic causation without statistical, epidemiological evidence. The court stated that "[s]tatistical proof is sufficient to get a claim before a jury only if it shows a 'doubling of risk' between exposure and the condition. In cases where statistical proof must be resorted to, such proof meets the 'more likely than not' sufficiency standard only if a 'doubling of risk' is shown." The district court thus established a threshold for generic causation for each claimed illness, based on the specific dose of radiation an average individual would need to be exposed to in order to "double" his or her risk of harm in comparison to unexposed individuals in the general population.

After determining the applicable burden of proof to survive summary judgment on generic causation, the court considered the admissibility of each challenged scientific expert opinion by applying the "doubling of the risk" standard. Expert testimony indicating only that the radiation emitted from Hanford was capable of causing a disease was excluded as irrelevant unless it also passed muster under the "doubling of the risk" standard, i.e., unless the expert opined that the radiation emissions amounted to a "doubling dose." In all, the district court excluded the testimony and opinions of seventeen of plaintiffs' proposed expert witnesses, either completely or in part, as unreliable and/or irrelevant under *Daubert*. See *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993). Any plaintiff whose claim necessarily relied on an excluded expert's opinion was dismissed from the litigation.

From plaintiffs' remaining scientific expert evidence, the court derived specific dose amounts and adopted them as the threshold "doubling doses." Any individual plaintiff who had been exposed to less than the official "doubling dose" — which varied according to a plaintiff's age and proximity to Hanford at the time of exposure and the particular illness alleged — was dismissed from the litigation, irrespective of whether that individual suffered from a documented medical condition. For example, the district court ruled that plaintiffs asserting thyroid cancer claims could not proceed to trial unless there was proof of I-131 exposure in excess of: 5 rads for those aged 0 to 4 at the time of exposure; 10 rads for those aged 5 to 9 at the time of exposure; 33 rads for those aged 10 to 19 at the time of exposure; and 100 rads for those aged 20 and over at the time of exposure. All thyroid cancer claims, including claims for thyroid nodules and adenomas, based on exposures equivalent to or less than the articulated "doubling doses" were dismissed with prejudice.

In the end, the few claims that survived summary judgment were those meeting the court's time, age, proximity, and dose requirements for (1) thyroid cancer, (2) non-autoimmune clinical and subclinical hypothyroidism, (3) bone cancer, (4) lung cancer, (5) salivary cancer, and (6) breast cancer if the female plaintiff was lactating at the time of exposure. Any plaintiff who asserted an emotional distress claim based on exposure to radiation could proceed with discovery only if he or she first proved exposure in excess of at least one of the "doubling doses." In the absence of such actual exposure, the district court determined that "fear of contracting a physical condition is not reasonable because there is not the requisite level of increased risk."

The district court properly certified its partial summary judgment order as a final judgment for appeal pursuant to Fed. R. Civ. P. 54(b), because it disposed of some but fewer than all claims. See *Arizona State Carpenters Pension Trust Fund v. Miller*, 938 F.2d 1038, 1039-40 (9th Cir. 1991); *Tex-*

aco, Inc. v. Ponsoldt, 939 F.2d 794, 798 (9th Cir. 1991). After plaintiffs' motion to alter or amend the judgment, pursuant to Fed. R. Civ. P. 59(e), was denied, they filed these timely appeals.

This appeal is separate from other Hanford related litigation in *Berg, et al., v. E.I. DuPont de Nemours & Co., et al.*, Nos. 99-35979 and 00-35062. Plaintiffs-appellants in that appeal also brought state law tort claims under the Price-Anderson Act and were originally part of this litigation. The *Berg* plaintiffs were severed from this action on September 20, 1996 when delays peculiar to that litigation threatened to interfere with the district court's case management schedule. Additional plaintiffs, denominated the *Jim* plaintiffs, were consolidated with the *Berg* plaintiffs on September 1, 1998. Their appeal was briefed and argued separately to this panel and we also decide it today.

DISCUSSION

I. Generic Causation v. Individual Causation: Violation of the Discovery Plan

Plaintiffs contend that the district court's discovery order led them reasonably to believe that to survive summary judgment on generic causation, they needed only to prove that they were exposed to the type of radioactive and non-radioactive emissions released from Hanford that were capable of causing the alleged illnesses. Plaintiffs argue that by adopting the defendants' "doubling of the risk" standard, the court deviated from its own discovery orders and prematurely decided issues of individual causation. Moreover, they contend that by changing the rules so late in the game, the district court prejudiced their case because their mistaken expectations shaped their production of expert reports and response to dispositive motions.

[1] The relevant case law and the record here reflect that plaintiffs' expectations about the parameters of generic causa-

tion described in the district court's discovery orders were justified. Causation in toxic tort cases is typically discussed in terms of generic and specific causation. *See e.g., Raynor v. Merrell Pharm., Inc.*, 104 F.3d 1371, 1376 (D.C. Cir. 1997). General, or "generic" causation has been defined by courts to mean whether the substance at issue had the capacity to cause the harm alleged, while "individual causation" refers to whether a particular individual suffers from a particular ailment as a result of exposure to a substance. *See Bonner v. ISP Technologies, Inc.*, 259 F.3d 924, 928 (8th Cir. 2001); *Sterling*, 855 F.2d at 1200 (explaining the difference between generic and individual causation); *In re "Agent Orange"*, 818 F.2d at 165 ("[t]he relevant question . . . is not whether Agent Orange has the capacity to cause harm, the generic causation issue, but whether it did cause harm and to whom. That determination is highly individualistic, and depends upon the characteristics of individual plaintiffs (e.g. state of health, lifestyle) and the nature of their exposure to Agent Orange"); *Jones v. Allercare, Inc.*, 203 F.R.D. 290, 301 (N.D. Ohio 2001) ("relevant question in this case will not be whether the products have the capacity to cause harm, but whether the products caused harm and to whom. Thus, the real causation issue in this case is individual, not general, in nature"). *See also Hilao v. Estate of Marcos*, 103 F.3d 767, 788 (9th Cir. 1996) (Rymer, J. dissenting in part and concurring in part) (contrasting "generic causation — that the defendant was responsible for a tort which had the capacity to cause the harm alleged — with individual proximate cause and individual damage").

[2] Defendants have not cited a case that articulates a contrary understanding of generic causation. Given this authority, we believe the appropriate understanding of generic causation is the one plaintiffs assert: whether exposure to a substance for which a defendant is responsible, such as radiation at the level of exposure alleged by plaintiffs, is capable of causing a particular injury or condition in the general population.

In order to prevail on their claims, however, plaintiffs must establish both generic *and* individual causation. This means that they must establish not only that the toxic substances released from Hanford are capable of causing the conditions complained of, but in addition, that Hanford emissions were the cause-in-fact of their specific conditions. Given this two-step process, the district court's decision to bifurcate discovery on issues of causation was reasonable.

Plaintiffs argue, however, that the "doubling dose" test plays no part in the initial generic causation inquiry and that they were prejudiced by the district court's decision to apply that standard. It is this ruling by the district court that is at the heart of this appeal.

[3] The district court's order bifurcating discovery in October 1995 did not itself put plaintiffs on notice that the court would use the "doubling dose" test to weigh the sufficiency of their generic causation evidence. For example, in that Phase II discovery order, the court explained that it decided to bifurcate causation discovery because "general issues of generic causation logically must occur prior to calculation of an individual's dose." At that time, the district court deferred discovery on questions of individual medical causation and did not refer to the "doubling of the risk" standard. Nor did the district court mention, in its Third Case Management Discovery Plan of January 1996, setting deadlines for the exchange of generic causation reports and contemplating related dispositive motions, any nexus between generic causation and "doubling of the risk."

[4] Because the district court's discovery orders were not clear, the plaintiffs could not reasonably have anticipated that most of their case would be dismissed on the ground they had failed to prove individualized exposure to specific threshold doses. The plaintiffs offered expert reports to establish that radiation is capable of causing their alleged illnesses. These included estimates of dose ranges received by certain catego-

ries of plaintiffs. The defendants point out that the plaintiffs' expert reports contain dosage estimates and defendants contend this demonstrates that plaintiffs were aware that the district court intended to adopt "doubling doses" as part of generic causation. Plaintiffs' expert evidence is, however, consistent with their claimed understanding of generic causation, since plaintiffs would have to show exposure to more than de minimis emissions to establish generic causation. Indeed, even the district court repeatedly acknowledged that plaintiffs firmly believed the "capable of causing" standard, and not "doubling of the risk," defined generic causation up until the time the court granted summary judgment for defendants.

[5] We conclude plaintiffs are correct in their understanding of generic causation, and we believe their case was prejudiced by the district court's belated decision that required plaintiffs to meet specific threshold dose levels of exposure. The district court erred in dismissing plaintiffs' claims on that ground before discovery reached the phase of individual causation. The court should, consistent with its own discovery orders, have limited its ruling to whether the evidence showed the defendants' alleged emissions were capable of causing the illnesses from which plaintiffs' suffered.

The district court blurred its own two-step causation inquiry by looking to cases about substances that are not known to cause harm. By accepting defendants' argument that plaintiffs' case could be established only by epidemiological evidence, the court discounted plaintiffs' scientific evidence of generic causation. The court in essence skipped the generic causation inquiry and decided issues of individual causation without the benefit of full discovery or particularized medical evidence. According to the court's own orders, the parties were to grapple with individual causation issues at a later stage.

[6] Such a distinction between generic and individual causation is not new in the area of toxic torts. We agree with the

Sixth Circuit that where the distinction is made, it must be strictly observed. In *Sterling v. Velsicol Chemical Corp.*, the Sixth Circuit faced a class action comprised of plaintiffs who claimed injuries resulting from drinking water contaminated by defendant's chemical waste burial site. 855 F.2d 1188 (6th Cir. 1988). The critical issue before the court was whether sufficient evidence supported a finding of causation between defendant's disposal of toxic chemicals and plaintiffs' injuries. *See id.* at 1198. In that order, the court recognized the appropriateness, up to a point, of separating generic from individual causation, but stressed that generalized proofs cannot establish individualized damages.

[A]s is appropriate in this type of mass tort class action litigation, [the trial court] divided its causation analysis into two parts. It was first established that Velsicol was responsible for the contamination and that the particular contaminants were *capable* of producing injuries of the types allegedly suffered by the plaintiffs. Up to this point in the proceeding, the five representative plaintiffs were acting primarily in their representative capacity to the class as a whole. This enabled the court to determine a kind of generic causation — whether the combination of the chemical contaminants and the plaintiffs' exposure to them had the capacity to cause the harm alleged. This still left the matter of *individual* proximate cause to be determined. Although such generic and individual causation may appear to be inextricably intertwined, the procedural device of the class action permitted the court initially to assess the defendant's potential liability for its conduct without regard to the individual components of each plaintiff's injuries. However, from this point forward, it became the responsibility of each individual plaintiff to show that his or her specific injuries or damages were proximately caused by ingestion or otherwise using the contaminated water. We cannot emphasize this point

strongly enough because generalized proofs will not suffice to prove individual damages. The main problem on review stems from a failure to differentiate between the general and the particular. This is an understandably easy trap to fall into in mass tort litigation. Although many common issues of fact and law will be capable of resolution on a group basis, individual particularized damages still must be proved on an individual basis.

Id. at 1200 (emphasis in original).

[7] At the close of the first half of the causation phase of discovery in this case, the only relevant question for the district court, under its own discovery orders, was similar to that recognized by the Sixth Circuit in *Sterling* as the question capable of generic treatment: “whether the combination of the chemical contaminants and the plaintiffs’ exposure to them had the capacity to cause the harm alleged.” *See id.* Because discovery in this case had not yet commenced on issues of individual causation, the district court should not have ventured into individual determinations at this stage of discovery when there had not yet been full disclosure of individual plaintiff’s circumstances.

II. “Doubling of the Risk”

Plaintiffs further contend that the threshold level the district court required the plaintiffs to meet, a level that doubled the risk of suffering the alleged injuries, is not relevant to a case in which there is scientific evidence that the substance is capable of causing the injuries complained of. Defendants contend on appeal that the district court properly employed the “doubling of the risk” test as the appropriate standard for determining whether Hanford’s emissions were capable of causing plaintiffs’ harms.

The only Ninth Circuit cases defendants offer to support this argument are the same cases the district court relied upon:

Daubert II, 43 F.3d 1311; and *Schudel v. General Elec. Co.*, 120 F.3d 991 (9th Cir. 1997), *abrogated on other grounds by Weisgram v. Marley Co.*, 528 U.S. 440 (2000). These cases, however, are inapposite because they deal with substances for which there was no scientific evidence of capacity to cause the plaintiffs' injuries. For that reason statistical epidemiological evidence was held to be necessary.

The critical issue in *Daubert II* was whether the plaintiffs' expert witnesses could produce enough evidence to survive summary judgment on the causation question of whether the morning sickness drug Bendectin, that plaintiffs' mothers ingested during pregnancy, caused the plaintiffs' individual birth defects. *See Daubert II*, 43 F.3d at 1313. Because there was no definitive evidence that Bendectin is a substance capable of causing birth defects, plaintiffs' case was entirely circumstantial. The only evidence plaintiffs had that Bendectin caused their own birth defects was (1) proof that their mothers took Bendectin during pregnancy, and (2) epidemiological evidence that mothers who used Bendectin during pregnancy bore more children with birth defects than mothers who did not use Bendectin. *See id.* at 1314-15.

In reviewing the admissibility of expert testimony, we required plaintiffs to show that their experts could offer testimony that Bendectin "more likely than not" caused their birth defects. *See id.* at 1320 (relying on California tort law). Because plaintiffs relied primarily on epidemiological evidence, this meant that plaintiffs had to establish "not just that their mothers' ingestion of Bendectin increased somewhat the likelihood of birth defects, but that it more than doubled it." *Id.* We said that "only then can it be said that Bendectin is more likely than not the source of their injury." *Id.* In *Daubert II*, the experts were unable to provide this type of evidence and their testimony was excluded.

Two years later, we decided *Schudel*, where plaintiffs alleged neurological and respiratory problems resulting from

exposure to allegedly toxic cleaning solvents. See *Schudel*, 120 F.3d at 993. Defendants argue on appeal that scientific expert testimony was improperly admitted at trial. To determine whether the testimony was relevant and thus properly admitted, we looked to Washington state's burden of proof, which requires a plaintiff to "show that the act complained of probably or more likely than not caused the subsequent disability." See *id.* at 996 (quoting *O'Donoghue v. Riggs*, 73 Wash.2d 814, 440 P.2d 823, 830 (1968)) (internal quotations omitted). We described Washington's standard as being "virtually the same standard under California tort law applied in *Daubert II*," so we evaluated the expert testimony in light of the "more likely than not," standard used in *Daubert II*. *Id.* Because the "sole causation evidence" was testimony that the substance "could possibly" have caused one of plaintiff's neurological symptoms, we reversed. *Id.* at 996-98. There was no other scientific evidence of generic toxicity or individual causation.

It is critical to stress that the plaintiffs in *Daubert II* had no scientific evidence that Bendectin was capable of causing birth defects (generic causation), and therefore were required to produce epidemiological studies to prove that Bendectin more likely than not caused their own particularized injuries (individual causation). Similar considerations motivated the court in *Schudel*.

[8] The case before us is different. Radiation is capable of causing a broad range of illnesses, even at the lowest doses. This has been recognized by scientific and legal authority. See *In re Three Mile Island Litigation*, 193 F.3d at 643 ("there is scientific consensus that ionizing radiation can cause cancer"); Wash. Rev. Code § 70.99.010 (2002) ("[r]adioactive wastes are highly dangerous, in that releases of radioactive materials and emissions to the environment are inimical to the health and welfare of the people of the state of Washington, and contribute to the occurrences of harmful diseases, including excessive cancer and leukemia"). To show generic causa-

tion, plaintiffs had to establish by scientific evidence that radiation was capable of causing the type of injuries plaintiffs actually suffered. Plaintiffs offered expert testimony to show the generic capacity of levels of radiation emitted from the Hanford facility to cause the illnesses experienced by the plaintiffs.

[9] The district court's choice of the "doubling dose" forced the plaintiffs to prove that they were exposed to a specific level of radiation, without regard to individualized factors, such as heredity, that might raise the likelihood of contraction of cancer at lower levels of exposure. The district court erred in requiring epidemiological evidence which would, like the standard rejected by the Third Circuit in *In re Three Mile Island Litig.*, require a plaintiff to prove exposure to a specific threshold level of radiation that created a relative risk of greater than 2.0.

Although, as noted in our discussion of the physics involved here, many observations of atomic behavior lead to counter-intuitive conclusions, we nevertheless think that common sense alone mitigates against establishing a bright line threshold for safe irradiation. We do not believe, for example, that a person who has been exposed to 10 rem of radiation is at risk for developing a neoplasm, but someone exposed to 9.99 rem is not.

In re Three Mile Island Litig., 193 F.3d at 727 n.179.

[10] We agree with the Third Circuit that the validity of a claim should not depend on whether a plaintiff was exposed to a fraction of a rem lower than the "doubling dose."

This analysis is fully consistent with the "Reference Guide on Epidemiology" contained in the Federal Judicial Center's *Reference Manual on Scientific Evidence* and upon which defendants rely. The Manual explains how epidemiological

proof can be adapted to meet the “more likely than not” burden of proof by requiring statistics to reflect a relative risk factor of 2.0 before a plaintiff can recover. The discussion there, however, recognizes that when available, known individual risk factors are also relevant. The Manual states that it limits its discussions to the role of epidemiology in proving individual causation. Federal Judicial Center, *Reference Manual on Scientific Evidence*, 167-169 (1st ed. 1994). See also Federal Judicial Center, *Reference Manual on Scientific Evidence*, 386 (2d ed. 2000) (concluding that the court should consider other available factors “[b]efore any causal relative risk from an epidemiologic study can be used to estimate the probability that the agent in question caused an individual plaintiff’s disease”).

III. Emotional Distress Claims

The plaintiffs’ complaints also included claims for intentional and negligent infliction of emotional distress based on an increased risk of disease rather than a present physical injury. The district court dismissed all such emotional distress claims unless the individual plaintiff could demonstrate exposure in excess of one of the “doubling doses” it had adopted.

We hold in the companion appeal, *Berg, et. al., v. E.I. DuPont de Nemours & Co., et. al.*, that the district court lacks jurisdiction to consider such claims under the Act absent physical injury. On remand, the district court should reconsider plaintiffs’ emotional distress claims in light of that holding.

IV. Evidentiary Rulings

Plaintiffs also raise several challenges related to the district court’s rulings on the defendants’ motions in limine challenging the experts’ reports plaintiffs proffered.

Early in 1994, the district court appointed a neutral scientific advisor, Dr. Thomas Pigford, as a special master under

Fed. R. Civ. P. 53, to help the court in reviewing the HEDR findings. Dr. Pigford eventually prepared an independent report that he filed under seal with the district court in December 1994. The plaintiffs argue that the district court should have sought advice from Dr. Pigford in making its rulings on the motions in limine. It is within a district court's discretion to appoint a master, and to decide the extent of the duties of a special master. *See Johnson Controls, Inc., v. Phoenix Control Sys., Inc.*, 886 F.2d 1173, 1176 (9th Cir. 1989). The district court did not abuse its discretion by limiting its reliance on Dr. Pigford to issues related to the HEDR findings.

The plaintiffs also challenge the district court's failure to hold an evidentiary hearing in response to the defendants' *Daubert* motions and the district court's rulings on those motions. The plaintiffs submitted two sets of expert reports in the generic causation phase of discovery. The first set addressed how much radiation was released from Hanford, where the radiation traveled, and how plaintiffs were exposed to radiation. The second set addressed the health effects from such exposures. It consisted of expert testimony, reports, and declarations that attempted to demonstrate that radiation is capable of causing the diseases and conditions alleged.

The defendants filed in limine motions challenging many of plaintiffs' experts on *Daubert* grounds. The district court ruled on those motions in its summary judgment order. The court excluded seventeen of plaintiffs' experts' evidence either wholly or in part and plaintiffs challenge all of those rulings on appeal. The defendants' challenges and the district court's rulings involved at least in part an assessment that the experts' opinions were not relevant because they did not offer opinions about the doses necessary to double the risk of contracting the plaintiffs' alleged illnesses.

The district court thus relied on a standard we have determined to be erroneous in assessing the relevancy, or "fit," of

plaintiffs' experts. We therefore reverse. On remand, the district court should assess the plaintiffs' proffered expert testimony as it relates to the generic causation inquiry, i.e., whether the radiation released from Hanford has the capacity to cause the illnesses alleged by plaintiffs.

The district court did not necessarily abuse its discretion in refusing to hold an evidentiary hearing on the defendants' *Daubert* motions. District courts are not required to hold a *Daubert* hearing before ruling on the admissibility of scientific evidence. *United States v. Alatorre*, 222 F.3d 1098, 1100 (9th Cir. 2000). The district court could have determined that it has an adequate record before it to make its ruling. It had the experts' reports, some deposition testimony, and the experts' affidavits. *See Oddi v. Ford Motor Co.*, 234 F.3d 136, 154 (3d Cir. 2000) (finding no abuse of discretion for failure to hold an evidentiary hearing when district court had depositions and affidavits of plaintiffs' experts). Nevertheless, because we are remanding the case for reconsideration of the district court's rulings on the motions in limine in light of our decision on the "doubling dose" standard employed by the district court, we encourage the court to hold a hearing on remand to provide plaintiffs with an opportunity to respond to the defendants' challenges, including an opportunity to question defendants' expert opinions, submitted in support of their *Daubert* motions. The parties should also be allowed to supplement their expert reports on remand.

CONCLUSION

For all of the foregoing reasons, we conclude that the district court erred by granting summary judgment and dismissing individual claims that failed to meet a specific, threshold, "doubling dose" during the generic causation phase of discovery. We therefore reverse and remand to the district court for resolution of generic causation issues before determining individual causation issues. We recommend that the court resolve the pending motions for class certification as soon as possible,

and suggest that the court consider such certification only for questions of generic causation common to plaintiffs who suffer from the same or a materially similar disease.

Phase II discovery should be permitted to proceed and encompass the time, geography, and source terms of emissions as well as expert evidence as to the levels of exposure capable of causing each of the alleged illnesses in question. Individual determinations of causation should then be made in accordance with Washington state common law. *See* 42 U.S.C. § 2014(hh); *Kennedy v. Southern California Edison Co.*, 268 F.3d 763, 767 (9th Cir. 2001).

REVERSED AND REMANDED.