

3897

1 (THE FOLLOWING PROCEEDINGS

2 WERE HAD IN OPEN COURT IN THE

3 PRESENCE OF THE JURORS:)

4

5 THE COURT: JURORS AND ALTERNATES ARE AGAIN PRESENT.

6 YOU MAY PROCEED, MR. RIFF

7

8 JOHN WHYSNER,

9 HAVING BEEN PREVIOUSLY SWORN, RESUMED THE STAND AND TESTIFIED

10 FURTHER:

11

12 DIRECT EXAMINATION (RESUMED)

13 BY MR. RIFF:

14 Q SO, DR. WHYSNER, WHEN YOU'RE LOOKING AT THIS MAP

15 OF EPI-STUDIES AND THE BOTTOM LINE RESULT OF THE STUDY,

16 WHETHER IT'S EXPRESSED IN AN S.M.R. OR THE OTHER KIND OF STUDY

17 THAT YOU'LL TELL US ABOUT BEING EXPRESSED AS A RELATIVE RISK,

18 YOU'RE LOOKING TO SEE HOW THAT NUMBER COMPARES WITH THE NUMBER

19 ONE. IS THAT TRUE?

20 A YES.

21 Q SO, FOR EXAMPLE, IN THE BENZENE STUDIES ABOUT
22 NON-HODGKIN'S LYMPHOMA OR THE SOLVENT STUDIES ABOUT
23 NON-HODGKIN'S LYMPHOMA, YOU'RE LOOKING TO GO SEE THE STRENGTH
24 OF THE ASSOCIATION BETWEEN, SAY, BENZENE AND NON-HODGKIN'S
25 LYMPHOMA IS IT NEAR ONE OR IS IT NOT NEAR ONE?

26 A CORRECT.

27 Q THAT'S ONE WAY TO LOOK AT IT?

28 A YES.

3898

1 Q AMONG THESE BRADFORD-HILL ELEMENTS, TOTAL, HOW
2 MANY ARE THERE?

3 A I THINK ORIGINALLY HE PUT FORTH NINE, BUT WHEN
4 THE E.P.A. AND THE -- SORT OF RECODIFIED IT, THEY'RE USING
5 ABOUT SEVEN OF THEM AS BEING THE MOST IMPORTANT ONES.

6 Q I WANT TO TRY, IF WE CAN, TO EVEN TRUNCATE THAT
7 LIST FURTHER TO THE ONES THAT YOU THOUGHT WERE THE MOST
8 CRITICAL, IMPORTANT, INFLUENTIAL, SENSITIVE, WHATEVER THE
9 RIGHT WORD IS, FOR THIS EXERCISE.

10 SO WHAT WOULD BE THE NEXT ONE, PLEASE?

11 A WELL, AND THIS IS ACTUALLY IMPORTANT BUT NOT
12 VERY IMPORTANT, BUT IT'S ESSENTIAL. THAT IS, THE CRITERIA
13 CALLED "TEMPORALITY." IN OTHER WORDS, THE DISEASE HAS TO
14 OCCUR AFTER THE EXPOSURE. IN OTHER WORDS, IF THE DISEASE
15 OCCURS BEFORE THE EXPOSURE, THEN IT'S NOT THOUGHT TO BE
16 ATTRIBUTED TO THE CHEMICAL.

17 SO THE STUDY HAS TO LOOK AT THINGS THAT OCCUR
18 AFTER THE EXPOSURE HAS HAPPENED. THAT'S SORT OF -- BUT THAT'S

19 AN IMPORTANT CRITERIA, BUT IT'S NOT ONE THAT YOU USUALLY HAVE
20 TO USE IN TERMS OF LOOKING AT STUDIES BECAUSE THEY USUALLY ARE
21 LOOKING AFTER EXPOSURES.

22 PROBABLY THE MOST IMPORTANT ONE IS CONSISTENCY.

23 IN OTHER WORDS, WE HAVE EXPOSURES TO CHEMICALS IN VARIOUS
24 GROUPS OF PEOPLE. AND LOTS OF THINGS CAN HAPPEN IN THOSE
25 GROUPS OF PEOPLE THAT WE'RE STUDYING. SO YOU CAN GET
26 RANDOMLY -- YOU CAN GET POSITIVE ASSOCIATIONS OR YOU CAN GET
27 AN ASSOCIATION JUST BECAUSE THERE'S SOMETHING THAT THAT GROUP
28 MAY HAVE BEEN EXPOSED TO THAT REALLY HAS NOTHING TO DO WITH

3899

1 THE CHEMICAL.

2 SO WHAT YOU'RE REALLY LOOKING FOR ARE PEOPLE WHO
3 HAVE BEEN EXPOSED TO A PARTICULAR CHEMICAL, BUT UNDER
4 DIFFERENT CIRCUMSTANCES OR DIFFERENT OCCUPATIONAL GROUPS, AND
5 IS THAT A CONSISTENT PICTURE? IN OTHER WORDS, DO YOU SEE A
6 CONSISTENTLY INCREASED S.M.R. AMONG STUDIES OF THAT CHEMICAL,
7 AND ARE THESE IN SORT OF DIFFERENT TYPES OF GROUPS OF PEOPLE?

8 Q FAIR ENOUGH. I THINK THAT COVERS THAT NICELY.

9 WHAT ELSE BY WAY OF IMPORTANT BRADFORD-HILL
10 ELEMENTS THAT YOU CONSIDERED IN DOING THE JOB WE GAVE YOU
11 HERE?

12 A SOMETIMES YOU'LL FIND AN INCREASE, BUT IF
13 THEY'VE BEEN ABLE TO MEASURE EXPOSURE LEVELS AND DIVIDED THE
14 PEOPLE WHO HAVE BEEN EXPOSED INTO DIFFERENT EXPOSURE LEVEL
15 GROUPS, IF YOU DON'T SEE THE DISEASE GOING UP WITH THE LEVEL
16 OF EXPOSURE, THEN YOU THINK TO YOURSELF: WELL, IT'S NOT
17 REALLY -- DOESN'T SEEM TO BE ASSOCIATED IN THAT SENSE.

18 SO THERE'S ANOTHER CRITERIA CALLED

19 "DOSE-RESPONSE RELATIONSHIP." OFTEN YOU DON'T HAVE THAT
20 INFORMATION IN STUDIES, BUT IF YOU DO, THEN THAT PROVIDES YOU
21 WITH EVEN A STRONGER BELIEF THAT THAT STUDY IS SHOWING YOU
22 SOMETHING BECAUSE IT'S GONE UP A LITTLE BIT WITH LOWER
23 EXPOSURES, MORE WITH HIGHER EXPOSURES, AND EVEN MORE WITH THE
24 HIGHEST EXPOSURES.

25 Q IS THAT THE SAME CONCEPT AS YOU WERE SHOWING US
26 EARLIER WITH RESPECT TO INCREASING THE DOSE OF ASPIRIN AND
27 ALCOHOL IN TERMS OF EFFECT?

28 A YES. EXCEPT WE WERE LOOKING AT DIFFERENT

3900

1 EFFECTS AT HIGHER DOSES. HERE YOU BELIEVE THAT MORE PEOPLE
2 SHOULD BE AFFECTED AT HIGHER EXPOSURE LEVELS.

3 Q IN TERMS OF YOUR METHODOLOGY IN APPLYING THE
4 BRADFORD-HILL ELEMENTS, WHAT OTHER ONES DO YOU THINK IS USEFUL
5 TO TALK ABOUT WITH THE JURY BEFORE GETTING INTO SOME OF THE
6 DATA?

7 A THERE'S SOMETHING CALLED "STATISTICAL
8 SIGNIFICANCE." THIS MEANS THAT WHEN YOU DO A COMPARISON
9 BETWEEN TWO DIFFERENT GROUPS, THERE ARE CERTAIN STATISTICAL
10 RULES THAT ONE HAS TO APPLY THAT MEAN THAT YOU WON'T GET THOSE
11 KINDS OF ASSOCIATIONS JUST FROM CHANCE. IN OTHER WORDS, WHAT
12 WE TRY TO DO IS WE TRY TO --

13 THERE'S SORT OF A RULE OF THUMB. THAT WOULD BE
14 THAT IT WOULDN'T OCCUR BY CHANCE ALONE MORE THAN 120 TIMES.

15 SO, IN OTHER WORDS, IF YOU HAVE 20 STUDIES, YOU
16 WOULD EXPECT ONE OF THEM COULDN'T BE POSITIVE JUST FROM
17 CHANCE. THIS HAS TO DO WITH THE WAY IN WHICH -- THE
18 MATHEMATICS IN WHICH THE STUDIES ARE ANALYZED. SO THE

19 STATISTICAL SIGNIFICANCE IS AN IMPORTANT ALSO PART OF THIS
20 ANALYSIS.

21 Q HOW IMPORTANT?

22 A IN MY EXPERIENCE AT I.A.R.C., FOR EXAMPLE,
23 PEOPLE DID NOT REALLY CONSIDER STUDIES TO BE POSITIVE UNLESS
24 IT WAS A STATISTICALLY SIGNIFICANT FINDING. IT WAS SORT OF A
25 RULE THAT YOU NOT ONLY HAD TO HAVE STATISTICAL SIGNIFICANT
26 FINDINGS, BUT YOU HAD TO HAVE CONSISTENTLY CONSISTENT
27 STATISTICALLY SIGNIFICANT FINDINGS AMONG DIFFERENT STUDIES.

28 Q BY THE WAY, THIS SLIDE THAT WE MAY OR MAY NOT

3901

1 SHOW, WHO PREPARED THIS SLIDE?

2 A I DID.

3 Q IS THERE ANY OTHER OF THE BRADFORD-HILL ELEMENTS

4 THAT YOU WANT TO TALK ABOUT AT THIS POINT TO HELP DESCRIBE

5 YOUR METHOD TO THE JURY?

6 A I DON'T THINK WE REALLY NEED TO AT THIS POINT.

7 Q OKAY. THEN I WANT TO CHANGE TOPICS A LITTLE BIT

8 AND APPLY A LITTLE BIT OF WHAT YOU WERE TELLING US TO SOME OF

9 THE SPECIFIC FACTS OF THIS CASE.

10 DOES THE WORD "PLIOFILM" MEAN ANYTHING TO YOU?

11 A YES.

12 Q THE JURY HAS HEARD A LITTLE BIT ABOUT THE

13 PLIOFILM COHORT AND THE PLIOFILM STUDY. SO WITH THAT

14 UNDERSTANDING, JUST REFRESH OUR MEMORY ABOUT WHAT THE PLIOFILM

15 STUDY AND COHORT ARE.

16 A PLIOFILM WAS A PROCESS IN WHICH PURE, NATURAL

17 RUBBER WAS USED IN ORDER TO PRODUCE TIRES. A LOT OF TIRES ARE

18 PRODUCED BY OTHER KINDS OF PROCESSES RATHER THAN NATURAL

19 RUBBER. IN THIS CASE PEOPLE WERE PRODUCING TIRES WITH NATURAL
20 RUBBER, AND IT WAS BEING DISSOLVED IN PURE BENZENE.

21 THE RUBBER WAS MIXED UP WITH THE BENZENE IN
22 ORDER TO MAKE IT INTO A LIQUID, AND THEN IT WAS ROLLED OUT AND
23 PROCESSED IN VARIOUS WAYS IN ORDER TO DEVELOP THE PLIES FOR
24 THE TIRE MANUFACTURING.

25 SO IN THE PLIOFILM COHORT PEOPLE WERE REALLY
26 EXPOSED TO LARGE AMOUNTS OF PURE BENZENE IN AN AREA WHERE THE
27 BENZENE WAS EVAPORATING OUT OF THE RUBBER IN ORDER TO MAKE THE
28 TIRES.

3902

1 Q WHEN WE SAY "THE PLIOFILM COHORT," C-O-H-O-R-T,
2 IS THAT REFERRING TO A GROUP OF PEOPLE?

3 A YES. THIS WAS THE GROUP OF WORKERS WHO WERE
4 USING THIS METHOD.

5 Q NOW, ARE YOU AWARE THAT PETER INFANTE FIRST
6 PUBLISHED SOMETHING ABOUT THE PLIOFILM COHORT IN ABOUT 1977?

7 A YES.

8 Q SINCE THEN, HAVE OTHER EPIDEMIOLOGISTS EVALUATED
9 THAT PLIOFILM COHORT TO TRY TO GET A HANDLE ON THE BENZENE
10 EXPOSURE THAT THOSE FOLKS RECEIVED?

11 A YES.

12 Q WHO DID THAT?

13 A THERE WAS A STUDY PUBLISHED BY RINSKY, ET AL. IN
14 1987. AND THESE ARE, AGAIN, PEOPLE THAT, I BELIEVE, WHO WERE
15 STILL AT THE NATIONAL INSTITUTE OF ENVIRONMENTAL -- I MEAN,
16 OCCUPATIONAL SAFETY AND HEALTH.

17 Q N.I.O.S.H?

18 A N.I.O.S.H. WHICH IS WHERE DR. INFANTE WAS DOING

19 HIS WORK FROM AT THE TIME, AND THEY CONTINUED TO FOLLOW THESE
20 PEOPLE. SO THEY LOOKED AT EXPOSURE EVALUATIONS. I THINK THEY
21 PUBLISHED A COUPLE OF PAPERS EARLIER THAN THAT THAT ACTUALLY
22 PUT OUT THEIR METHODOLOGY AND HOW THEY WERE DOING THIS.

23 AND IN THE STUDY IN 1987 WAS THE ONE WHERE THEY
24 DEVELOPED, AGAIN, THE S.M.R. RELATED TO THE EXPOSURE LEVEL
25 THAT THE PEOPLE HAD RECEIVED.

26 Q S.M.R. MEANS WHAT?

27 A STANDARDIZED MORTALITY RATE.

28 Q THAT IS ONE OF THOSE NUMBERS --

3903

1 THAT IS THE BOTTOM LINE OUTPUT NUMBER OF THE
2 EPIDEMIOLOGY STUDY THAT'S COMPARED TO THE NUMBER ONE?

3 A FOR A COHORT STUDY. A COHORT STUDY IS WHERE
4 YOU'RE COMPARING PEOPLE WHO HAVE AN EXPOSURE TO PEOPLE WHO
5 DON'T HAVE AN EXPOSURE.

6 Q NOW, LET ME ASK YOU SOMETHING. HAVE THE
7 SCIENTISTS PUBLISHED IN THE PEER-REVIEWED LITERATURE THE
8 RESULTS OF THE EXPOSURE ASSESSMENT FOR THE PLIOFILM COHORT AS
9 IT RELATES TO THE DISEASE A.M.L?

10 A YES.

11 Q DID THE PLIOFILM COHORT SHOW EXPOSURE TO
12 ASSESSMENT PUBLICATIONS IN YOUR OPINION, TO A REASONABLE
13 DEGREE OF SCIENTIFIC PROBABILITY, THAT BENZENE IS IN FACT
14 CAPABLE OF CAUSING A.M.L. IN HUMAN BEINGS?

15 A YES.

16 Q MAKING A NOTE. PLIOFILM. BENZENE. A.M.L.,
17 YES.

18 DR. WHYSNER, HAVE SCIENTISTS LOOKED AT THE

19 PLIOFILM COHORT TO SEE IF IN THIS GROUP OF BENZENE-EXPOSED
20 WORKERS WHETHER THERE WAS AN INCREASE IN NON-HODGKIN'S
21 LYMPHOMA IN THAT POPULATION?

22 A YES.

23 Q WHAT'S THE ANSWER?

24 A THERE WAS NOT. THEY FOUND EXACTLY A NUMBER OF
25 CASES AS THEY WOULD HAVE EXPECTED IN THAT GROUP OF PEOPLE IN
26 THE GENERAL POPULATION. AND THAT WAS PUBLISHED IN -- AN
27 UPDATE WAS DONE IN 2002.

28 Q LET ME ASK YOU THIS: ARE YOU FAMILIAR WITH THE

3904

1 CUMULATIVE DOSE MEASURE OR UNIT CALLED A "P.P.M. YEAR"?

2 A YES.

3 Q IN YOUR OPINION, TO A REASONABLE DEGREE OF
4 SCIENTIFIC PROBABILITY, WHAT IS THE CUMULATIVE DOSE EXPRESSED
5 IN P.P.M. YEAR NECESSARY TO INCREASE THE RISK OF A HUMAN BEING
6 CONTRACTING A.M.L. FROM BENZENE?

7 A IT WOULD BE AT LEAST 40 P.P.M. YEARS.

8 NOW, THERE HAVE BEEN OTHER PEOPLE WHO HAVE
9 ANALYZED THAT SAME PLIOFILM COHORT AND SAID IT MAY BE HIGHER
10 THAN THAT, AS HIGH AT 200 P.P.M. YEARS, BUT AT LEAST TAKING
11 THE RISKY STUDY THAT WAS DONE IN 1987, THEY DIDN'T FIND ANY
12 INCREASE UP TO 40 P.P.M. YEARS.

13 Q WOULD A FAIR SUMMARY OF WHAT YOU JUST SAID BE
14 THAT IN YOUR OPINION, TO A REASONABLE DEGREE OF SCIENTIFIC
15 MEDICAL PROBABILITY, HUMANS HAVE TO BE EXPOSED SOMEWHERE IN
16 THE RANGE OF BETWEEN 40 AND 200 P.P.M. YEARS BEFORE THE
17 EPIDEMIOLOGY SHOWS AN INCREASED RISK FOR INCIDENTS OF A.M.L.
18 FROM BENZENE?

19 A YES.

20 Q NOW, I WANT TO JUST STOP FOR A MOMENT.

21 (PAUSE.)

22 Q DR. WHYSNER, I WANT YOU TO ASSUME THAT AN EXPERT
23 IN EXPOSURE ASSESSMENT HAS COME AND TALKED TO THIS JURY NAMED
24 REISS, AND HIS ANALYSIS IS SHOWN ON EXHIBIT 110, WHICH IS IN
25 EVIDENCE, IS THAT MR. MOLINA'S BENZENE EXPOSURE BASED ON HIS
26 DEPOSITION TESTIMONY, THE BOTTOM LINE WAS BETWEEN 4.5 AND 7.8
27 -- 4.5 TO 7.8 P.P.M. YEARS.

28 DO YOU UNDERSTAND WHAT I'VE JUST SAID?

3905

1 A YES.

2 Q THAT'S LESS THAN 40 TO 200 P.P.M. YEARS?

3 A YES.

4 Q WELL, AND LET'S ASSUME FURTHER THAT DR. REISS
5 TOOK DR. NICAS' HIGHEST NUMBER FOR BENZENE EXPOSURE FOR MR.
6 MOLINA. THIS IS EXHIBIT 111 IN EVIDENCE. THIS IS SUMMARY OF
7 BENZENE EXPOSURE ESTIMATES FOR MR. MOLINA BASED UPON HIS,
8 DR. NICAS', INTERVIEW WITH DR. NICAS. AND HE COMES UP WITH A
9 BOTTOM LINE OF 9 TO 12.3 P.P.M. YEARS.

10 ARE YOU WITH ME?

11 A YES.

12 Q DR. NICAS AND DR. REISS COULD HAVE BEEN 100
13 PERCENT WRONG. THE NUMBERS COULD HAVE BEEN DOUBLE, 18 TO 24,
14 AND IT'S STILL LESS THAN THE 40 TO 200 P.P.M. YEARS THAT
15 YOU'VE TOLD US ABOUT, TRUE?

16 A YES.

17 Q AND THAT'S IF THE DISEASE IN QUESTION IN THIS
18 CASE WERE LEUKEMIA RATHER THAN NON-HODGKIN'S LYMPHOMA?

19 A YES.

20 Q NOW, WHAT I WANT TO DO IS HAVE YOU WALK US
21 THROUGH -- I'LL SAY BRIEFLY, WE'LL SEE HOW BRIEFLY THIS IS --
22 YOUR ANALYSIS OF THE EPI-STUDIES THAT YOU CONSIDERED IN
23 FORMING THE OPINIONS THAT YOU FORMED WITH RESPECT TO BENZENE
24 ON THE ONE HAND AND SOLVENTS ON THE OTHER HAND AND
25 NON-HODGKIN'S LYMPHOMA IN HUMANS.

26 ARE YOU WITH ME?

27 A YES.

28 Q LET'S GET YOUR ULTIMATE OPINION OUT ON THE TABLE

3906

1 FIRST. I THINK WE ALREADY HAVE YOUR OPINION, BECAUSE I'VE
2 ALREADY ASKED YOU WHETHER IN YOUR OPINION BENZENE AT ANY DOSE
3 AND ANY DURATION OF EXPOSURE IS CAPABLE OF CAUSING
4 NON-HODGKIN'S LYMPHOMA IN HUMANS, AND YOU HAVE GIVEN US YOUR
5 OPINION ALREADY ON THAT POINT, HAVEN'T YOU?

6 A YES.

7 Q LET ME CHANGE THE QUESTION.

8 DO YOU HAVE AN OPINION TO A REASONABLE DEGREE OF
9 MEDICAL OR SCIENTIFIC PROBABILITY WHETHER HYDROCARBON
10 SOLVENTS, REFINED PETROLEUM SOLVENTS -- WHATEVER YOU WANT TO
11 CALL THEM -- ARE CAPABLE IN ANY DOSE AND FOR ANY DURATION OF
12 EXPOSURE IN CAUSING NON-HODGKIN'S LYMPHOMA IN HUMANS?

13 A YES. WITH THE CAVEAT THAT WE'RE RESTRICTING
14 THIS NOW TO THE LEVELS THAT HAVE BEEN ACTUALLY STUDIED IN
15 PEOPLE.

16 Q WHAT'S YOUR OPINION?

17 A AT LEAST AT THE LEVELS THAT HAVE BEEN STUDIED IN
18 THE LITERATURE, THERE IS NO CAUSAL RELATIONSHIP BETWEEN

19 SOLVENT EXPOSURE AND NON-HODGKIN'S LYMPHOMA.

20 Q AND WHAT IS THIS CAVEAT YOU'RE LEAVING OUT?

21 WHAT ARE YOU TELLING US ABOUT EXPOSURES BEING STUDIED IN THE
22 LITERATURE?

23 A WELL, IT'S SORT OF A FINE POINT BUT -- BECAUSE
24 YOU CAN'T --

25 IF SOMEBODY SAYS TO YOU AT ANY DOSE, AT ANY TIME
26 COULD SOMETHING HAPPEN? WELL, WE CAN ONLY COMMENT ON WHAT'S
27 ACTUALLY BEEN STUDIED. WHAT WE ACTUALLY KNOW ABOUT. IN OTHER
28 WORDS, WHAT THE BOUNDS ARE OF THE EPIDEMIOLOGY STUDIES.

3907

1 SOME OF THESE EPIDEMIOLOGY STUDIES HAVE HAD VERY
2 LARGE EXPOSURES. FOR EXAMPLE, THE PLIOFILM COHORT PEOPLE WERE
3 EXPOSED TO INCREDIBLY HIGH AMOUNTS OF BENZENE.

4 SO WITHIN THOSE BOUNDS WE CAN MAKE A STATEMENT.
5 BUT I JUST DON'T WANT TO GET PUT INTO A SITUATION WHERE -- YOU
6 KNOW, YOU HAVE TO STAY WITHIN THE DATA THAT WE HAVE AVAILABLE
7 TO US, THE SCIENTIFIC DATA.

8 Q FINE. THEN LET ME ASK YOU THE QUESTION AND MAKE
9 IT CLEANER.

10 DO YOU HAVE AN OPINION, TO A REASONABLE DEGREE
11 OF MEDICAL AND SCIENTIFIC PROBABILITY, BASED UPON THE WORLD
12 PEER-REVIEWED LITERATURE THAT YOU HAVE STUDIED FOR SOLVENT
13 EXPOSURE -- ALL OF THAT LITERATURE -- BASED ON ALL OF THAT, IN
14 YOUR OPINION, ARE SUCH SOLVENTS CAPABLE OF CAUSING
15 NON-HODGKIN'S LYMPHOMA IN HUMANS?

16 A I DO HAVE AN OPINION ON THAT.

17 Q WHAT IS YOUR OPINION?

18 A THAT THEY DO NOT CAUSE NON-HODGKIN'S LYMPHOMA.

19 Q NOW, I WANT --

20 DID YOU, AS PART OF YOUR ANALYSIS, MAKE A

21 DISTINCTION BETWEEN EPIDEMIOLOGIC STUDIES THAT ARE COHORT

22 STUDIES ON THE ONE HAND AND CASE-CONTROL STUDIES ON THE OTHER

23 HAND?

24 A YES.

25 Q WHY?

26 A THEY JUST HAVE TO BE LOOKED AT IN DIFFERENT

27 WAYS. WHEN I DID MY ANALYSIS TO LOOK FOR CONSISTENCY, I

28 LOOKED FOR CONSISTENCY AMONG THE COHORT STUDIES, AND I LOOKED

3908

1 FOR CONSISTENCY AMONG THE CASE-CONTROL STUDIES.

2 Q I WANT YOU TO REMIND US, BECAUSE WE MAY HAVE
3 HEARD THIS FROM ANOTHER WITNESS, ABOUT THESE TWO STUDY DESIGNS
4 IN EPIDEMIOLOGY CALLED "COHORT" AND "CASE-CONTROL." NOW, TRY
5 TO CONFINE YOURSELF TO A SENTENCE OR A COUPLE -- COUPLE OF
6 SENTENCES OR A SHORT PARAGRAPH.

7 DEFINE OR DESCRIBE, RATHER, WHAT A COHORT STUDY
8 IS AND THEN WHAT A CASE-CONTROL STUDY IS IN TERMS OF THEIR
9 DESIGN, PLEASE.

10 A FOR A COHORT STUDY, ONE, AS I SAID BEFORE,
11 COMPARES PEOPLE WHO HAVE BEEN EXPOSED TO A CHEMICAL OR GROUP
12 OF CHEMICALS OR PEOPLE WHO HAVE NOT BEEN EXPOSED. AND THEN
13 WHAT YOU USUALLY DO, YOU LOOK AT A WHOLE RANGE OF DISEASES:
14 DIFFERENT KINDS OF CANCERS. MAYBE LOOK AT DIABETES, HEART
15 DISEASE -- JUST TO SEE WHETHER OR NOT PEOPLE WHO HAVE EXPOSED
16 TO THIS CHEMICAL HAVE INCREASED EITHER -- COULD BE INCREASED
17 RATES OF MORTALITY OR IT COULD BE INCREASED INCIDENTS. IF
18 YOU'RE JUST LOOKING AT PEOPLE THAT ACTUALLY HAVE THE DISEASE.

19 THAT'S WHAT YOU DO IN A COHORT STUDY. SO YOU

20 HAVE A COHORT OF PEOPLE THAT YOU ARE STUDYING.

21 Q IS THE PLIOFILM STUDY A COHORT STUDY?

22 A YES. THERE ARE SEVERAL OTHER STUDIES THAT HAVE

23 BEEN KNOWN FOR BENZENE --

24 Q PARDON ME. I KNOW I'M INTERRUPTING YOU, BUT

25 WHEN THE RESULT OF A COHORT STUDY ARE REPORTED BY

26 EPIDEMIOLOGISTS, ARE THEY REPORTED AS S.M.R.'S?

27 A YES.

28 Q AND, AGAIN, THAT IS COMPARING THAT NUMBER TO THE

3909

1 NUMBER ONE?

2 A USUALLY.

3 NOW, SOME PEOPLE MULTIPLY THE ONE BY A HUNDRED

4 SO YOU'RE --

5 YOU WILL SEE STUDIES WHERE YOU'RE COMPARING IT

6 TO THE HUNDRED. SO IF YOU HAD A DOUBLING, INSTEAD OF IT BEING

7 REPORTED AS AN S.M.R. OF TWO, IT WOULD BE REPORTED AS AN

8 S.M.R. OF 200. THAT DOESN'T MEAN IT'S 200-FOLD TIMES GREATER.

9 IT'S A DOUBLING. SO THERE ARE TWO DIFFERENT CONVENTIONS IN

10 THE WAY THAT S.M.R.'S ARE REPORTED.

11 Q CASE-CONTROL STUDIES ARE LITTLE MORE

12 COMPLICATED. PLEASE DESCRIBE THAT DESIGN FOR US.

13 A IN A CASE-CONTROL STUDY, AS OPPOSED TO A GROUP

14 OF PEOPLE WHO HAVE A PARTICULAR EXPOSURE, YOU LOOK AT A GROUP

15 OF PEOPLE THAT HAVE A PARTICULAR DISEASE. IN THE CASE WE'RE

16 INTERESTED HERE IS NON-HODGKIN'S LYMPHOMA.

17 SO WHAT YOU'LL DO IS TAKE A GROUP OF PEOPLE WHO

18 HAVE NON-HODGKIN'S LYMPHOMA AND THOSE ARE THE CASES, CASES OF

19 NON-HODGKIN'S LYMPHOMA, AND YOU COMPARE THEM TO CONTROLS.

20 AND THOSE CONTROLS COULD BE, FOR EXAMPLE, IF

21 SOMEBODY CAME INTO A HOSPITAL HAD NON-HODGKIN'S LYMPHOMA. THE

22 NEXT PERSON WHO IS ADMITTED TO THE HOSPITAL, FOR WHATEVER THEY

23 HAD, COULD BE THE CONTROL PERSON.

24 YOU TAKE THE CASES AND YOU MATCH THE CONTROLS

25 AND THEN YOU LOOK FOR DIFFERENCES IN TYPES OF EXPOSURES.

26 SO THERE YOU'RE ASKING THE QUESTION, DO PEOPLE

27 WHO HAVE NON-HODGKIN'S LYMPHOMA HAVE A HIGHER RATE OF BEING

28 EXPOSED TO CERTAIN KINDS OF CHEMICALS, OR ARE THEY IN CERTAIN

3910

1 KINDS OF PROFESSIONS? THERE ARE VARIOUS KINDS OF QUESTIONS

2 YOU CAN ASK ABOUT THOSE PEOPLE.

3 AND THERE WHAT WE DO IS WE TALK IN TERMS OF

4 EITHER AN ODDS RATIO --

5 WE TALK IN TERMS OF AN ODDS RATIO, "O.R."

6 Q SOMETIMES IT'S ALSO CALLED A "RELATIVE RISK"?

7 A RELATIVE RISK IS A TERM THAT CAN CUT BOTH WAYS.

8 RELATIVE RISK CAN BE USED IN A CASE CONTROL. IT MAY ALSO BE

9 USED IN A COHORT STUDY IF YOU'RE COMPARING TWO GROUPS OF

10 PEOPLE. SO LET'S JUST STICK WITH ODDS RATIO.

11 Q SO LET ME MAKE AN EXAMPLE. WOULD THIS BE AN

12 EXAMPLE OF A CASE-CONTROL STUDY: YOU LOOK AT CASES OF PEOPLE

13 WITH NON-HODGKIN'S LYMPHOMA, AND YOU ARE LOOKING AT

14 CONTROLS -- PEOPLE WITHOUT NON-HODGKIN'S LYMPHOMA TO SEE, FOR

15 EXAMPLE, WHETHER THEY'VE USED HAIR DYE?

16 A RIGHT.

17 Q OR BODY MASS INDEX?

18 A YES.

19 Q OR SMOKING?

20 A YES.

21 Q OR EXPOSURE TO SOLVENTS -- THAT KIND OF THING?

22 IS THAT WHAT WE'RE TALKING ABOUT?

23 A YES, UH-HUH.

24 Q NOW, DID YOU PREPARE A SLIDE THAT COLLECTS IN

25 THREE COLUMNS COHORT STUDIES OF BENZENE-EXPOSED WORKERS, WHICH

26 DESCRIBES THE NAME OF THE STUDY, THE PUBLICATION DATE, THE

27 TYPES OF WORKERS INVOLVED AND THE S.M.R. AND WHETHER THE

28 RESULT IS STATISTICALLY SIGNIFICANT OR NOT?

3911

1 A YES.

2 MR. RIFF: LET ME MARK FOR IDENTIFICATION AS 132- --

3 THE COURT: 6.

4 MR. RIFF: THANK YOU, YOUR HONOR. 132-6, THAT SLIDE.

5 AND I PROPOSE TO DISPLAY IT.

6 THE COURT: ANY OBJECTION?

7 MR. WAGNON: NO.

8 THE COURT: YOU MAY DISPLAY IT. THANK YOU.

9 (MARKED FOR IDENTIFICATION

10 EXHIBIT 132-6, SLIDE.)

11 MR. RIFF: YOUR HONOR, I'M GOING TO JUST QUICKLY FLIP

12 THROUGH A COUPLE OF THESE. THERE WE ARE.

13 Q NOW, STANDING UP AS NECESSARY WITH YOUR LASER

14 POINTER, PLEASE TELL US WHAT YOU'RE SHOWING US IN 132-6 AND

15 WHAT IT MEANS TO YOU TO A REASONABLE DEGREE OF MEDICAL OR

16 SCIENTIFIC PROBABILITY.

17 A WELL, IT MEANS THAT THE STUDIES AREN'T

18 CONSISTENTLY SHOWING ANY POSITIVE ASSOCIATION --

19 Q WAIT, DOCTOR. YOU'RE ASSUMING TOO HIGH A LEVEL
20 OF FAMILIARITY WITH THIS. LET'S START AT THE BEGINNING.
21 YOU'VE LISTED A STUDY BY SORAHAN IN 2005, RIGHT?

22 A YES.

23 Q THAT INVOLVES BENZENE WORKERS IN BRITAIN, YES?

24 A YES.

25 Q IT'S A COHORT STUDY, RIGHT?

26 A YES.

27 Q WHICH MEANS THAT THE RIGHT WAY TO REPORT OUT
28 THIS RESULT IS AS A STANDARD MORTALITY RATE AND IT'S 0.94,

3912

1 WHICH RESULT WAS NOT SIGNIFICANT, RIGHT?

2 A YES.

3 Q LET'S JUST FOCUS ON THAT ONE FOR SAKE OF

4 ARGUMENT.

5 IF THE WORKERS IN THIS STUDY, DR. SORAHAN'S

6 STUDY, IF THE EXPOSED TO BENZENE POPULATION AND THE

7 NON-EXPOSED POPULATION HAD EXACTLY THE SAME OUTCOME FOR

8 NON-HODGKIN'S LYMPHOMA, WHAT WOULD THAT NUMBER BE?

9 A ONE.

10 Q THAT NUMBER IS LESS THAN ONE, ISN'T IT?

11 A YES.

12 Q WELL, DOES THAT MEAN TO YOU, AS AN

13 EPIDEMIOLOGIST AND A PHYSICIAN, THAT BEING EXPOSED TO BENZENE

14 ACTUALLY HAS SOME HEALTH PROTECTIVE EFFECTS RELATIVE TO

15 NON-HODGKIN'S LYMPHOMA?

16 A NO.

17 Q WHY NOT?

18 A BECAUSE THE RESULT'S NOT STATISTICALLY

19 SIGNIFICANT. IT'S NOT RELIABLE ENOUGH.

20 Q SO JUST GOING ON, HERE'S A STUDY BY BLOEMEN,

21 2004, CHEMICAL WORKERS.

22 NOW, HERE, THIS RESULT OF NON-HODGKIN'S LYMPHOMA

23 EXPOSED COHORT WORKERS WAS 1.01. THAT'S MORE THAN ONE, RIGHT?

24 A YES.

25 Q THE RESULT WAS NOT SIGNIFICANT?

26 A YES.

27 Q AND WHEN YOU --

28 WHEN WE'RE TALKING ABOUT SIGNIFICANCE HERE,

3913

1 YOU'RE TALKING ABOUT STATISTICAL SIGNIFICANCE?

2 A YES.

3 Q SO NOW WE'RE MAYBE MAKING SOME SENSE OF THIS.

4 HERE'S THAT -- HERE'S RINSKY, YOU WERE TALKING

5 ABOUT. THIS IS THE PLIOFILM COHORT, ISN'T IT?

6 A YES.

7 Q HERE FOR THAT FAMOUS STUDY FOR NON-HODGKIN'S

8 LYMPHOMA EXACTLY THE SAME INCIDENCE OF NON-HODGKIN'S LYMPHOMA

9 FOR THE BENZENE-EXPOSED WORKERS AND THE NON-BENZENE-EXPOSED

10 WORKERS?

11 A YES.

12 Q IN ANY EVENT, THE RESULT WAS NOT SIGNIFICANT ONE

13 WAY OR THE OTHER STATISTICALLY?

14 A YES.

15 Q THESE ARE THE STUDIES OF THE COHORT STUDIES OF

16 BENZENE-EXPOSED WORKERS.

17 WELL, HERE'S ONE. THIS NUMBER IS THREE. DOES

18 THAT MEAN IN THIS STUDY, THE HAYES STUDY IN '97 -- LET ME BACK

19 UP.

20 HAYES STUDY IN '97 AND YIN '96, IS THIS THE SAME

21 GROUP OF WORKERS IN CHINA?

22 A YES.

23 Q AND FOR THESE --

24 NOW, HERE'S A RESULT THAT'S THREE TIMES THE

25 NUMBER ONE, RIGHT?

26 A YES.

27 Q AND YOU'VE WRITTEN "SIGNIFICANT" QUESTION MARK.

28 WHAT DOES THAT MEAN?

3914

1 A WELL, IT WAS REPORTED IN TWO DIFFERENT -- COUPLE
2 OF DIFFERENT PUBLICATIONS. IN ONE IT SHOWED IT WAS marginally
3 STATISTICALLY SIGNIFICANT, AND THE OTHER ONE IT WAS marginally
4 NOT. WE'RE RIGHT ON THE BORDERLINE.

5 IN ONE OF THE GROUPS THEY HAD REMOVED ONE OF THE
6 WORKERS FROM THE COHORT. I WASN'T QUITE CLEAR WHY THEY DID.
7 SO WE'RE RIGHT ON THE CUSP OF STATISTICAL SIGNIFICANCE IN THAT
8 PARTICULAR STUDY. IT'S NOT CLEARLY STATISTICALLY SIGNIFICANT.

9 Q NOW, IF THIS COLLECTION OF STUDIES WERE
10 PRESENTED TO AN I.A.R.C. PANEL -- WITHDRAWN.

11 HERE'S WHAT I WANT TO KNOW: LET'S TALK ABOUT
12 YOUR METHOD OF EVALUATING THIS COLLECTION OF STUDIES, COHORT
13 STUDIES OF BENZENE-EXPOSED WORKERS. LET'S JUST TALK ABOUT
14 STRENGTH OF ASSOCIATION, WHICH IS ONE OF THESE BRADFORD-HILL
15 THINGS.

16 IN YOUR OPINION, TO A REASONABLE DEGREE OF
17 SCIENTIFIC PROBABILITY, HOW WOULD YOU CHARACTERIZE THE
18 STRENGTH OF ASSOCIATION FOR THE PROPOSITION THAT THE BENZENE

19 CAUSES NON-HODGKIN'S LYMPHOMA IN HUMANS?

20 A WELL, USUALLY THE GUIDELINE FOR STRENGTH OF THE
21 ASSOCIATION STUDY HAS TO -- BECAUSE OF THE SIZE OF THE WORKERS
22 GROUPS WE'RE LOOKING AT, USUALLY THE STUDY HAS TO HAVE AN
23 S.M.R. OF TWO OR THREE BEFORE WE CONSIDER THE STRENGTH OF
24 ASSOCIATION TO BE ONE THAT WE WOULD REALLY CONSIDER THAT STUDY
25 TO BE AN IMPORTANT STUDY. IN THIS CASE, THERE'S ONLY ONE
26 STUDY.

27 NOW, WE HAVE TO TAKE INTO ACCOUNT THE FACT WITH
28 THE STATISTICAL SIGNIFICANCE ALWAYS, BUT PUTTING THAT ASIDE

3915

1 FOR A SECOND, THERE'S REALLY ONLY ONE OF THE EIGHT STUDIES
2 HERE THAT ONE WOULD CONSIDER TO HAVE A SUFFICIENT STRENGTH OF
3 ASSOCIATION THAT ONE WOULD CONSIDER THAT TO BE A, QUOTE,
4 "POSITIVE" STUDY.

5 Q LET'S TALK ABOUT THIS CONCEPT OF THE CONSISTENCY
6 OF RESULTS.

7 BASED ON THIS COLLECTION OF STUDIES, IN YOUR
8 OPINION, HOW DOES THE CONSISTENCY FACTOR -- WITHDRAWN.

9 IN YOUR OPINION, TO A REASONABLE DEGREE OF
10 MEDICAL OR SCIENTIFIC PROBABILITY, HOW DOES ONE CORRECTLY
11 EVALUATE THIS CONSISTENCY FACTOR FOR THIS COLLECTION OF
12 STUDIES?

13 A WE'LL, THEY'RE JUST NOT AT ALL CONSISTENT.
14 THERE'S ONLY ONE STUDY THAT I WOULD CONSIDER TO BE POSSIBLY A
15 POSITIVE STUDY IN THIS CASE. IN ALL THE OTHERS THE NUMBERS
16 ARE VERY SMALL AND THEY'RE NOT STATISTICALLY SIGNIFICANT. SO
17 I WOULD CONSIDER THIS GROUP OF STUDIES NOT TO BE AT ALL
18 CONSISTENT.

19 Q IF BENZENE CAUSED NON-HODGKIN'S LYMPHOMA IN
20 HUMANS OVER THIS COLLECTION OF STUDIES, WHAT WOULD YOU EXPECT
21 THESE NUMBERS ON THE FAR-RIGHT COLUMN TO LOOK LIKE?

22 A INCREASED TO A SUBSTANTIAL AMOUNT. THERE ARE
23 PLENTY OF EXAMPLES OF HUMAN CARCINOGENS, KNOWN HUMAN
24 CARCINOGENS, THAT I'VE LOOKED AT. AND IN THOSE CASES YOU SEE
25 CONSISTENT LARGE INCREASES IN THE NUMBERS OF CANCERS THAT ARE
26 IN EXCESS IN THE GROUP OF EXPOSED PEOPLE.

27 Q NOW, IF LATER ON IN THE DAY ON CROSS-EXAMINATION
28 COUNSEL WERE TO FOCUS SOLELY ON THIS ONE STUDY AND ASK YOU

3916

1 HALF AN HOUR, 45 MINUTES' WORTH OF QUESTIONS JUST ON THIS ONE
2 CASE STUDY -- THAT COULD HAPPEN -- I GUESS MY QUESTION IS:
3 WOULD IT BE YOUR VIEW OR NOT BE YOUR VIEW THAT THAT STUDY
4 NEEDS TO BE CONSIDERED IN THIS ENTIRE MASS OF STUDIES?

5 A YES.

6 Q DOES IT OR DOES IT NOT?

7 A YES. IT NEEDS TO BE CONSIDERED IN THE CONTEXT
8 OF ALL THE OTHER STUDIES.

9 Q SO THIS IS NOW --
10 132-6 IS COHORT STUDIES OF BENZENE-EXPOSED
11 WORKERS.

12 A I MIGHT JUST EXPLAIN ONE OTHER --

13 Q HOLD ON, PLEASE.

14 IS THERE SOMETHING ELSE ABOUT THIS THAT YOU NEED
15 TO ADD TO MAKE YOUR TESTIMONY COMPLETE?

16 A I JUST WANT TO EXPLAIN THERE ARE TWO NUMBERS
17 HERE. AND THAT'S BECAUSE THERE WERE ACTUALLY TWO COHORTS IN
18 THIS STUDY. THESE WERE SHOE WORKERS WORKING IN TWO DIFFERENT

19 COUNTRIES.

20 Q YOU'RE TALKING ABOUT THE FU STUDY FROM '96?

21 A YES.

22 Q THANK YOU.

23 SO IN YOUR OPINION, TO A REASONABLE DEGREE OF
24 SCIENTIFIC PROBABILITY, WHAT IS THE SUMMARY, THE TAKE-AWAY
25 POINT, THAT WE SHOULD TAKE AWAY FROM THIS PARTICULAR GROUP OF
26 COHORT STUDIES OF BENZENE-EXPOSED WORKERS?

27 A THAT THERE IS NO CAUSAL RELATIONSHIP BETWEEN
28 N.H.L. AND BENZENE EXPOSURE THAT HAS BEEN DEMONSTRATED IN

3917

1 THESE STUDIES.

2 Q NOW, I WANT TO TAKE SPECIAL NOTE OF ONE
3 PARTICULAR STUDY AND ASK YOU ABOUT IT. IT'S A STUDY BY
4 DRS. WONG AND RAABE.

5 DO YOU KNOW THAT STUDY FROM, I THINK, 2000?

6 A YES.

7 Q TELL THE JURY GENERALLY WHAT DRS. WONG AND RAABE
8 DID IN THAT STUDY, PLEASE.

9 A THERE HAD BEEN MANY COHORT STUDIES OF VARIOUS
10 PETROLEUM WORKERS, WHETHER THEY WORKED FOR VARIOUS PETROLEUM
11 COMPANIES AND THEY WORKED IN DIFFERENT COUNTRIES. AND THEY
12 TOOK ALL -- THEY TOOK 19 OF THESE COHORTS AND ANALYZED THEM
13 ALL TOGETHER TO SEE WHETHER OR NOT THERE WAS ANY INCREASE, AND
14 THEY LOOKED AT VARIOUS KINDS OF DISEASES AND SO FORTH. ONE OF
15 THE DISEASES THEY LOOKED AT WAS NON-HODGKIN'S LYMPHOMA. AND
16 THERE WERE OVER 300,000 PETROLEUM WORKERS THAT THEY USED --
17 THAT WERE IN THESE 19 COHORTS.

18 Q LET ME JUST STOP.

19 IS THIS TYPE OF STUDY THAT WONG AND RAABE DID IN

20 2000 CALLED A "META ANALYSIS," M-E-T-A ANALYSIS?

21 A YES.

22 Q IS THAT A RECOGNIZED, APPROPRIATE EPIDEMIOLOGIC

23 TOOL?

24 A YES, IT'S BEEN --

25 IT IS BECAUSE IT INCREASES THE NUMBER OF PEOPLE

26 IN A STUDY AND YOU CAN COMBINE GROUPS. I MEAN, IT HAS TO BE

27 DONE PROPERLY, BUT IT IS A RECOGNIZED METHOD NOW IN DOING

28 EPIDEMIOLOGY.

3918

1 Q AND WONG AND RAABE'S STUDY WAS PUBLISHED IN A
2 PEER-REVIEWED JOURNAL?

3 A YES.

4 Q IT LOOKED AT PETROLEUM WORKERS, RIGHT?

5 A YES.

6 Q AND DO YOU THINK THAT LOOKING AT PETROLEUM
7 WORKERS IS A RELEVANT STUDY FOR A CASE LIKE THIS WHERE WE'RE
8 LOOKING AT A GENTLEMAN WHO WAS EXPOSED TO REFINED HYDROCARBON
9 SOLVENTS?

10 A YES.

11 Q WHY? WHY IS THAT RELEVANT?

12 A WELL, IT'S A VERY LARGE GROUP OF PEOPLE WHO ARE
13 EXPOSED TO THESE REFINED HYDROCARBON SOLVENTS BECAUSE THAT'S
14 WHAT IS BEING PRODUCED IN REFINERIES.

15 Q OKAY. NOW --

16 A AND WITH THIS LARGE NUMBERS OF PEOPLE, EVEN IF
17 YOU HAD JUST SMALL INCREASES OR DECREASES, YOU COULD FIND
18 STATISTICAL SIGNIFICANCE BECAUSE THE NUMBERS ARE SO LARGE.

19 Q I THINK YOU TOLD US THIS STUDY INVOLVED 300,000

20 SUCH WORKERS?

21 A YES.

22 Q COMBINED 19 SUCH STUDIES?

23 A YES.

24 Q DID THE STUDY LOOK TO SEE IF NON-HODGKIN'S

25 LYMPHOMA WAS -- THE INCIDENCE OF NON-HODGKIN'S LYMPHOMA WAS

26 INCREASED IN THIS POPULATION?

27 A YES.

28 Q AND WAS IT?

3919

1 A NO.

2 Q EXPLAIN YOUR ANSWER, PLEASE.

3 A WELL, THEY FOUND A VERY SMALL DECREASED AMOUNT
4 OF -- I BELIEVE, IT WAS .99. THEY FOUND JUST A LITTLE BIT
5 LESS THAN WHAT ONE WOULD HAVE EXPECTED IN A NORMAL POPULATION
6 OF PEOPLE.

7 Q COMPARING NON-EXPOSED WORKERS AND EXPOSED
8 WORKERS, YOU'D EXPECT THE NUMBER ONE -- WITHDRAWN.

9 DO YOU REMEMBER IN THIS STUDY HOW MANY
10 NON-HODGKIN'S LYMPHOMA DEATHS DID THEY RECORD IN THIS
11 POPULATION?

12 A I DON'T REALLY RECALL SITTING HERE NOW.

13 Q WOULD LOOKING AT SLIDE 132-8 REFRESH YOUR
14 RECOLLECTION?

15 A YES.

16 Q DID YOU PREPARE SLIDE 132-8?

17 A YES.

18 Q DID I PREPARE SLIDE 132-8?

19 A NO.

20 Q WOULD YOU TAKE A LOOK AT SLIDE 132-8 AND REFRESH
21 YOUR MEMORY ON THAT POINT.

22 (PAUSE.)

23 A THERE WERE 408 PEOPLE WHO DIED FROM
24 NON-HODGKIN'S LYMPHOMA, AND THE NUMBER EXPECTED WOULD HAVE
25 BEEN 412. SO IN THIS CASE THE S.M.R. WAS .99.

26 Q WHAT'S THE TAKE-AWAY FROM THE WONG AND RAABE
27 STUDY ON THE QUESTION IN YOUR OPINION, TO A REASONABLE DEGREE
28 OF MEDICAL OR SCIENTIFIC PROBABILITY? WHAT IS THE BOTTOM LINE

3920

1 WITH RESPECT TO WHETHER BEING EXPOSED AS A REFINERY WORKER IS
2 OR IS NOT ASSOCIATED WITH AN INCREASE IN NON-HODGKIN'S
3 LYMPHOMA?

4 A THERE'S NO INDICATION THAT THERE IS ANY INCREASE
5 AMONG THIS GROUP OF WORKERS.

6 Q NOW, DID YOU ALSO, AS PART OF YOUR WORK, THEN
7 COLLECT UP OTHER PETROLEUM WORKER COHORT STUDIES? INDEPENDENT
8 OF THESE BENZENE-EXPOSED WORKERS, WHICH YOU'VE ALREADY LOOKED
9 AT, DID YOU COLLECT UP A LIST OF OTHER COHORT MORTALITY
10 STUDIES OF NON-HODGKIN'S LYMPHOMA IN PETROLEUM WORKERS?

11 A WELL, WHAT I DID WAS --

12 FIRST OF ALL, I LOOKED AT THE INDIVIDUAL STUDIES
13 AS WELL, NOT JUST AT THEIR META ANALYSIS TO SEE WHETHER OR NOT
14 THERE WAS ANYTHING THAT WOULD STAND OUT AND THERE REALLY
15 WASN'T. THE META ANALYSIS WAS CONSISTENT WITH WHAT ONE WOULD
16 JUST LOOK -- EXPECT FROM LOOKING AT ALL THE INDIVIDUAL
17 STUDIES.

18 BUT THEN WHAT I DID WAS -- THIS WAS PUBLISHED IN

19 2000. SINCE THAT TIME, SOME OF THESE SAME 19 COHORTS, THERE'S
20 BEEN MORE RECENT PUBLICATIONS, IN OTHER WORDS, UPDATES OF THE
21 MORTALITY STATISTICS ON THE PEOPLE. SO I LOOKED AT, I THINK,
22 AN ADDITIONAL SIX OR EIGHT OF THESE IN WHICH THEY HAD BEEN
23 UPDATED SINCE THAT TIME.

24 PLUS THERE WAS A WHOLE GROUP OF PETROLEUM
25 WORKERS FROM AUSTRALIA THAT WERE -- THAT WEREN'T INCLUDED IN
26 THIS ORIGINAL META ANALYSIS THAT THEN WERE PUBLISHED ABOUT,
27 AND SO I ALSO LOOKED AT THAT.

28 MR. RIFF: AND I'D ASK TO BE MARKED FOR IDENTIFICATION

3921

1 AS 132-9, A TABLE CALLED "COHORT MORTALITY STUDIES OF
2 NON-HODGKIN'S LYMPHOMA IN PETROLEUM WORKERS."

3 MAY THAT BE SO MARKED, YOUR HONOR?

4 THE COURT: IT MAY BE SO MARKED.

5 (MARKED FOR IDENTIFICATION

6 EXHIBIT 132-9, TABLE.)

7 BY MR. RIFF:

8 Q DO YOU HAVE THAT IN FRONT OF YOU THAT TABLE OR
9 CHART, I SHOULD SAY?

10 A YES.

11 Q DID YOU PREPARE IT?

12 A YES.

13 MR. RIFF: I PROPOSE TO DISPLAY IT, YOUR HONOR,

14 MR. WAGNON: NO OBJECTION.

15 THE COURT: YOU MAY.

16 BY MR. RIFF:

17 Q SO WHAT WE'RE LOOKING AT HERE IS YOUR TABLE OF
18 COHORT MORTALITY STUDIES OF NON-HODGKIN'S LYMPHOMA IN

19 PETROLEUM WORKERS. HERE'S THAT WONG AND RAABE THAT WE TALKED
20 ABOUT, RIGHT?

21 A YES.

22 Q AND YOU'RE TELLING US THAT THERE ARE STUDIES
23 SINCE THAT PUBLICATION THAT ALSO LOOK AT PETROLEUM WORKER
24 POPULATIONS TO SEE ABOUT THE INCIDENTS OF NON-HODGKIN'S
25 LYMPHOMA.

26 IS THAT WHAT YOU'RE TELLING US?

27 A YES.

28 Q GOING DOWN THIS LIST IN THE FAR RIGHT-HAND SIDE,

3922

1 WITH RESPECT TO THE STRENGTH OF ASSOCIATION AND WITH RESPECT
2 TO WHETHER THE RESULTS WERE SIGNIFICANT OR NOT SIGNIFICANT
3 STATISTICALLY, IN YOUR OPINION, WHAT IS THE MAJOR TAKE-AWAY
4 FROM THIS CHART?

5 A WELL, FIRST, THERE ARE NO STATISTICALLY
6 SIGNIFICANT INCREASES OR DECREASES. SO THERE IS NO REALLY
7 RELIABLE INFORMATION THAT ANY OF THESE WOULD BE DIFFERENT FROM
8 ONE.

9 AND, SECONDLY, THE NUMBERS ARE -- SOME OF THEM
10 ARE A LITTLE BIT HIGHER AND SOME ARE A LITTLE BIT LOWER. SO,
11 AGAIN, THE CONSISTENCY -- ON THE BASIS OF CRITERIA OF
12 CONSISTENCY, ONE WOULDN'T THINK THERE WAS ANY ASSOCIATION
13 SHOWN.

14 Q LET'S MOVE ON IN YOUR ANALYSIS.

15 TO THE EXTENT YOU HAVEN'T TOLD US, WHAT IS YOUR
16 BOTTOM-LINE OPINION TO A REASONABLE DEGREE OF MEDICAL OR
17 SCIENTIFIC PROBABILITY AS TO THE COHORT MORTALITY STUDIES OF
18 PETROLEUM WORKERS AND N.H.L?

19 A THAT THERE IS NO CAUSAL RELATIONSHIP THAT'S BEEN
20 SHOWN.

21 Q NOW, LET'S CHANGE TO YOUR ANALYSIS OF
22 CASE-CONTROL STUDIES FROM COHORT STUDIES.

23 AND I'D ASK THAT WE MARK AS 132-11 FOR
24 IDENTIFICATION, YOUR HONOR, A TABLE CALLED "CASE CONTROL
25 STUDIES OF OVER 4,000 NON-HODGKIN'S LYMPHOMA CASES AND
26 PETROLEUM-DERIVED BENZENE EXPOSURES."

27 THE COURT: YES, THAT MAY BE SO MARKED.

28 ///

3923

1 (MARKED FOR IDENTIFICATION

2 EXHIBIT 132-11, TABLE.)

3 BY MR. RIFF:

4 Q DO YOU HAVE THAT IN FRONT OF YOU?

5 A YES, I DO.

6 Q DID YOU PREPARE 132-11?

7 A YES.

8 MR. RIFF: I'D PROPOSE TO DISPLAY IT, YOUR HONOR.

9 MR. WAGNON: NO OBJECTION.

10 THE COURT: YOU MAY.

11 BY MR. RIFF:

12 Q SO IT SAYS, "CASE CONTROL STUDIES OF OVER 4,000

13 NON-HODGKIN'S LYMPHOMA CASES AND PETROLEUM-DERIVED BENZENE

14 EXPOSURES."

15 WHAT WERE YOU ATTEMPTING TO DO IN THE CREATION

16 OF EXHIBIT 132-11?

17 A COULD THE PROJECTOR BE RAISED UP A LITTLE BIT

18 BECAUSE WE'RE MISSING THE BOTTOM.

19 Q YES.

20 (PAUSE.)

21 A AGAIN, WE'RE TRYING TO LOOK AT PETROLEUM-DERIVED

22 BENZENE --

23 Q LOUDER, PLEASE.

24 A I'M SORRY. WE'RE TRYING TO LOOK AT

25 PETROLEUM-DERIVED BENZENE EXPOSURES.

26 WHAT THIS IS, AGAIN, YOU LOOK AT PEOPLE WHO HAVE

27 NON-HODGKIN'S LYMPHOMA, AND THEY ARE EITHER ASKED OR SOME

28 DETERMINATION IS MADE AS TO WHETHER OR NOT THEY HAVE BEEN

3924

1 EXPOSED TO BENZENE. AND YOU COMPARE THAT TO A GROUP OF PEOPLE
2 WHO HAVE NOT BEEN EXPOSED TO BENZENE TO SEE IF THERE IS ANY
3 INCREASE.

4 IN THIS CASE, AS I MENTIONED, WHAT'S CALLED THE
5 "ODDS RATIOS" AND WHETHER OR NOT THEY'RE STATISTICALLY
6 SIGNIFICANT. SO I WAS ABLE TO LOCATE 11 STUDIES THAT WERE
7 CASE-CONTROL STUDIES OF PEOPLE WHO HAD REPORTED BENZENE
8 EXPOSURE OR NOT BENZENE EXPOSURE. AND SOMETIMES THERE WAS
9 A -- THERE WERE ACTUALLY DIFFERENT AMOUNTS OF EXPOSURE
10 MENTIONED. SO SOMETIMES YOU CAN DO A TREND STATISTICAL
11 ANALYSIS --

12 Q LOUDER.

13 A SORRY. SO SOMETIMES YOU CAN DO A TREND
14 STATISTICAL ANALYSIS OR SOMETIMES YOU ARE JUST LOOKING AT THE
15 EXPOSED PEOPLE VERSUS THE NON-EXPOSED PEOPLE IN THAT GROUP.
16 THIS IS WHAT THIS SLIDE REPRESENTS.

17 Q LET ME ASK YOU THIS: IF I'M READING THIS
18 CORRECTLY, THERE IS ON THIS EXHIBIT ONE STUDY THAT HAS AN

19 INCREASED ODDS RATIO, THE RESULT OF WHICH IS STATISTICALLY
20 SIGNIFICANT.

21 AM I READING THAT RIGHT?

22 A YES.

23 Q DOES THAT MEAN, DR. WHYSNER, THAT THIS IS THE
24 RIGHT ANSWER, AND EVERYTHING ELSE IS THE WRONG ANSWER OR
25 BACKGROUND NOISE OR TO BE REJECTED OR SOMETHING LIKE THAT?

26 A NO, IT DOESN'T MEAN THAT.

27 Q EXPLAIN THAT, PLEASE.

28 A BECAUSE, FIRST OF ALL, THE ONE POSITIVE RESULT

1 IS NOT THAT HIGH. AND SECONDLY, WE DON'T -- IT'S NOT
2 CONSISTENT WITH ANY OF THE OTHER FINDINGS. SOME OF THEM ARE
3 LESS THAN ONE. SOME OF THEM ARE A LITTLE BIT GREATER THAN
4 ONE.

5 Q SO, IN YOUR OPINION, TO A REASONABLE DEGREE OF
6 SCIENTIFIC OR MEDICAL PROBABILITY, WHAT'S THE BOTTOM-LINE
7 TAKE-AWAY FROM THE COLLECTION OF CASE-CONTROL STUDIES LOOKING
8 AT PETROLEUM-DERIVED BENZENE EXPOSURES AND NON-HODGKIN'S
9 LYMPHOMA?

10 A THAT IT DOESN'T DEMONSTRATE ANY CAUSAL
11 ASSOCIATION.

12 Q OKAY. WE'RE ALMOST DONE WITH TABLES. I'VE GOT
13 ONE MORE I WANT TO SHOW YOU.

14 YOUR HONOR, MAY WE MARK AS 132-14 A TABLE
15 ENTITLED "CASE-CONTROL STUDIES OF NON-HODGKIN'S LYMPHOMA AND
16 PETROLEUM-DERIVED SOLVENT EXPOSURES"?

17 THE COURT: YES, IT MAY BE SO MARKED.

18 (MARKED FOR IDENTIFICATION

19 EXHIBIT 132-14, TABLE.)

20 BY MR. RIFF:

21 Q DO YOU HAVE THAT TABLE IN FRONT OF YOU?

22 A YES.

23 Q DID YOU PREPARE IT?

24 A YES.

25 MR. RIFF: NOW, IN THIS --

26 WELL, I WOULD LIKE TO DISPLAY 132-14, YOUR

27 HONOR, IF THERE'S NO OBJECTION.

28 MR. WAGNON: NO OBJECTION.

3926

1 THE COURT: IT MAY BE DISPLAYED.

2 BY MR. RIFF:

3 Q NOW, WHY DO YOU HAVE THE WORD "SOLVENT" IN
4 QUOTATION MARKS?

5 A THIS IS ONE OF THE DIFFICULTIES WITH STUDIES OF
6 SOLVENTS BECAUSE ALL SOLVENT MEANS IS THAT THE CHEMICAL IS
7 USED TO DISSOLVE SOMETHING. SO THERE ARE DIFFERENT CLASSES
8 AND TYPES OF CHEMICALS THAT ARE SOLVENT.

9 ONE EXAMPLE WOULD BE WATER. WATER IS A SOLVENT
10 BECAUSE IT'S USED TO DISSOLVE THINGS. HYDROCARBON SOLVENTS
11 DOESN'T INCLUDE WATER. SO IF YOU HAVE THE HYDROCARBON
12 SOLVENTS, THOSE ARE USED TO DISSOLVE THINGS THAT ARE USUALLY
13 NOT DISSOLVABLE IN WATER.

14 AND THEN THERE ARE GROUPS OF CHLORINATED
15 SOLVENTS. SO A LOT OF TIMES THE PROBLEM WITH THESE STUDIES IS
16 THEY WILL IDENTIFY THAT SOMEBODY HAS BEEN EXPOSED TO SOLVENT,
17 BUT IT REALLY DOESN'T TELL YOU ABOUT WHAT WE'RE INTERESTED IN
18 THIS PARTICULAR CASE, AND THAT IS A PETROLEUM-BASED SOLVENT.

19 SO WE'RE TALKING ABOUT THINGS THAT ARE ANALOGOUS
20 TO -- LIKE TOLUENE, XYLENE -- ALL THESE OTHER COMPONENTS OF
21 MINERAL SPIRITS OR STODDARD SOLVENTS OR WHATEVER. THESE ARE
22 ALL PETROLEUM-BASED SOLVENTS.

23 AND THERE'S A WHOLE OTHER CLASS OF SOLVENTS
24 CALLED "GLYCOL ETHERS" THAT REALLY DON'T HAVE ANYTHING
25 CHEMICALLY TO DO WITH EITHER CHLORINATED SOLVENTS OR
26 PETROLEUM-BASED SOLVENTS.

27 THERE'S LOTS OF STUDIES ABOUT SOLVENTS BUT I
28 REALLY TRIED TO FIND STUDIES WHERE YOU CAN ACTUALLY BELIEVE

3927

1 THAT WHAT THEY WERE TALKING ABOUT WAS A PETROLEUM-BASED
2 SOLVENT.

3 Q SO ON THIS EXHIBIT, AGAIN, IT'S THE FAMILIAR
4 FORMAT. YOU HAVE THE NAME OF THE STUDY AND THE YEAR OF THE
5 PUBLICATION. THE EXPOSURE OR EXPOSURES TESTED FOR IN
6 ASSOCIATION WITH NON-HODGKIN'S LYMPHOMA. IN OTHER WORDS, THE
7 KIND OF THE STUFF PEOPLE WERE EXPOSED TO, RIGHT?

8 A YES.

9 Q AND THEN OVER HERE THE ODDS RATIO AND WHETHER OR
10 NOT THERE WAS STATISTICAL SIGNIFICANCE, TRUE?

11 A YES.

12 Q AND HERE OF THESE NINE PUBLICATIONS, THERE'S
13 ONE, HARDELL '94, THAT SHOWS AN INCREASED ODDS RATIO THAT IS
14 STATISTICALLY SIGNIFICANT.

15 AM I READING THAT CORRECTLY?

16 A YES.

17 Q WELL, DOES THAT MEAN THAT HARDELL WAS THE RIGHT
18 ONE AND EVERYTHING ELSE IS WRONG?

19 A NO.

20 Q FOR THE REASONS YOU ALREADY HAVE EXPLAINED?

21 A CORRECT.

22 Q SO IN YOUR OPINION, TO A REASONABLE DEGREE OF

23 MEDICAL AND SCIENTIFIC PROBABILITY, WHAT IS THE CORRECT

24 TAKE-AWAY FROM THIS EXHIBIT AND YOUR ANALYSIS WITH RESPECT TO

25 CASE-CONTROL STUDIES OF SOLVENT EXPOSURES IN NON-HODGKIN'S

26 LYMPHOMA?

27 A "SOLVENT," MEANING PETROLEUM-BASED SOLVENT

28 EXPOSURES, THAT THERE IS NO CAUSAL ASSOCIATION, CORRECT.

3928

1 MR. RIFF: YOUR HONOR, THIS WOULD BE A VERY CONVENIENT
2 TIME TO BREAK. I KNOW IT'S A LITTLE EARLY, BUT WE'RE ABOUT TO
3 MOVE TO AN ENTIRELY NEW TOPIC.

4 THE COURT: THAT'S FINE.

5 ALL RIGHT. LADIES AND GENTLEMEN, WE'LL SEE YOU
6 BACK HERE AT 1:30, THE USUAL TIME.

7 PLEASE REMEMBER DO NOT DISCUSS THE CASE AMONG
8 YOURSELVES OR WITH ANYONE. DON'T FORM ANY OPINIONS ON IT
9 UNTIL THE MATTER IS SUBMITTED TO YOU. 1:30. THANK YOU.

10

11 (WHEREUPON AT 11:54 A.M. A RECESS
12 WAS HAD UNTIL 1:30 P.M. OF THE
13 SAME DAY.)

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(3929-4000)

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