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SUPERIOR COURT OF THE STATE OF CALIFORNIA
FOR THE COUNTY OF LOS ANGELES - COMPLEX

NC, A MINOR,

PLAINTIFF,

VS.

CASE NO. 21STCV22822

HAIN CELESTIAL GROUP, INC.;
BEECH-NUT NUTRITION COMPANY;
NURTURE, INC., PLUM, PBC, DBA
PLUM ORGANICS; GERBER PRODUCTS
COMPANY; WALMART, INC.; SPROUT
FOODS, INC.; RALPHS GROCERY
COMPANY; AND DOES 1 THROUGH 100,
INCLUSIVE,

DEFENDANTS.

CERTIFIED COPY

REPORTER'S TRANSCRIPT OF PROCEEDINGS

FEBRUARY 1, 2022

(DAY 2)

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HELD BEFORE:

THE HONORABLE AMY D. HOGUE

A P P E A R A N C E S

(ALL APPEARANCES VIA REMOTE)

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CHRISTOPHER CLEE, TECHNICIAN

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I N D E X

WITNESS: BEATE RITZ, M.D., PH.D.

DIRECT (RESUMED) CROSS

7 28

E X H I B I T S

EXHIBIT NUMBER	REFERENCED
119	13
679	33
14	44
87	48
27	50
4	53
629	70
682	74
92	78
630	80
7	81
92	87
683	89
684	93
57	107

1 LOS ANGELES, CALIFORNIA;
2 TUESDAY, FEBRUARY 1, 2022; 1:24 P.M.
3 BEFORE: HON. AMY D. HOGUE DEPARTMENT 7;
4 SUPERIOR COURT OF THE STATE OF CALIFORNIA
5 --000--
6
7
8 THE COURT: HELLO, IT'S JUDGE HOGUE SPEAKING.
9 CALLING THE NC MATTER.
10 MR. WISNER: YOUR HONOR, I'M HAVING A HARD TIME
11 HEARING YOU.
12 MR. PETROSINELLI, ARE YOU HAVING A HARD TIME
13 HEARING THE COURT?
14 THE COURT: MAYBE I'M NOT TALKING VERY LOUD.
15 CAN YOU HEAR ME BETTER NOW?
16 CAN YOU HEAR ME OKAY?
17 MR. PETROSINELLI: I CAN HEAR YOU FINE, JUDGE.
18 MR. WISNER: OKAY. THAT'S ON MY END. GIVE ME
19 ONE SECOND, YOUR HONOR. LET ME JUST FIX THE TECH
20 PROBLEM.
21 THE COURT: OKAY.
22 THE CLERK: YOUR HONOR, THIS IS THE CLERK. CAN
23 YOU HEAR ME?
24 THE COURT: YES, I CAN.
25 THE CLERK: OH, GREAT.
26 (OFF-RECORD COMMENTS)
27 MR. WISNER: SO WE ARE READY TO PROCEED
28 WHENEVER YOUR HONOR IS UNLESS THERE'S ANYTHING ELSE WE

1 NEED TO COVER.

2 THE COURT: I DON'T THINK SO.

3 YOU MAY PROCEED.

4 MR. WISNER: GREAT.

5 DR. RITZ, I THINK YOU'RE ON MUTE. LET'S GET
6 YOU OFF MUTE. PERFECT.

7 THE WITNESS: NOW I AM.

8

9 DIRECT EXAMINATION (RESUMED)

10 MR. WISNER:

11 Q ALL RIGHT. DOCTOR, I JUST HAVE A FEW LAST
12 THINGS I WANT TO COVER WITH YOU BEFORE WE HAND YOU OFF
13 TO OPPOSING COUNSEL FOR EXAMINATION. AND I WANT TO
14 COVER SOME THINGS THAT WERE SPECIFICALLY COVERED BEFORE
15 YOU TOOK THE STAND.

16 SPECIFICALLY, I WANT TO SHOW YOU SOME THINGS
17 THAT HAVE BEEN SAID ABOUT YOUR OPINIONS AND METHODOLOGY
18 AND I WANT TO JUST GET THE RECORD STRAIGHT, IF THAT'S
19 ACTUALLY WHAT YOU BELIEVE TO BE TRUE OR NOT OR WHATEVER
20 JUST SO WE CAN GET IT CLEARED UP.

21 SO THE FIRST THING I'M GOING TO SHOW YOU IS
22 THIS IS ACTUALLY A MOTION, DR. RITZ, THAT WAS FILED IN
23 THIS CASE. AND ON PAGE 39 OF THIS MOTION, THE
24 DEFENDANTS HERE AT THE VERY BOTTOM -- AND I'LL ZOOM IN
25 SO YOU CAN SEE IT. CAN YOU SEE IT? I KNOW IT GETS A
26 LITTLE FUZZY.

27 A YES, I CAN.

28 Q OKAY.

1 AND SO RIGHT HERE, IT SAYS, "BY DR. RITZ'S
2 ACCOUNT, HOWEVER, CONSISTENCY REFERS NOT TO
3 CONSISTENCY OF RESULTS, BUT THE CONSISTENCY
4 WITH WHAT SHE BELIEVES THE ANSWER TO BE."
5 DO YOU SEE THAT?

6 A YES.

7 Q AND, DOCTOR, THIS IS IN THE CONTEXT OF A
8 BRADFORD HILL ANALYSIS, AND I JUST -- LET ME JUST ASK
9 YOU VERY PLAINLY: IS THAT HOW YOU APPLIED THE
10 CONSISTENCY FACTOR IN YOUR ANALYSIS IN THIS CASE?

11 A ABSOLUTELY NOT. I DON'T HAVE BELIEFS. I MEAN,
12 THIS IS SCIENCE. THIS IS NOT ABOUT BELIEFS. THE ONLY
13 BELIEF WOULD COME IN IF I SAID, WELL, I BELIEVE THIS
14 ABOUT THE STUDY AND I TRY NOT TO SPECULATE.

15 GENERALLY, CONSISTENCY MEANS I GO TO THE
16 LITERATURE, I FIND OUT WHAT'S THERE, WHAT KIND OF FACTS,
17 AND I COMPARE, YOU KNOW, EVERYTHING THAT COMES IN WITH
18 WHAT I'VE ALREADY KNOWN THROUGH MY TRAINING. BUT THAT'S
19 NOT A BELIEF. THAT'S EVALUATING OF SCIENTIFIC EVIDENCE
20 AND MAKING SURE THAT THERE IS CONSISTENCY WITH WHAT THE
21 STANDARDS ARE, WHAT MY SCIENCE TAUGHT ME TO LOOK OUT
22 FOR.

23 THAT'S THE KIND OF CONSISTENCY I'M LOOKING FOR,
24 THE CONSISTENCY IN THE SCIENTIFIC REASONING.

25 Q DOCTOR, I JUST WANT TO MAKE SURE.

26 IS ANYONE ELSE HAVING HER BREAK UP A LITTLE BIT
27 IN HER ANSWER, OR ARE YOU GUYS ALL HEARING IT CLEAN?

28 THE COURT: I COULD HEAR HER FINE.

1 MR. WISNER: OKAY. SO I'LL JUST CONTINUE,
2 THEN. GREAT.

3 Q ALL RIGHT. DOCTOR, I WANT TO SHOW YOU A SLIDE
4 THAT WAS SHOWN TO THE COURT DURING THE OPENING STATEMENT
5 YESTERDAY BY THE DEFENDANTS.

6 AND THERE'S A QUOTE HERE FROM A DEPOSITION.
7 IT SAYS, "YOU SAY IT IS CONSISTENT WITH THE
8 EXPECTATION WITH RESPECT TO WHAT I THINK THE
9 ANSWER SHOULD BE. IF THE STUDY HAD BEEN DONE
10 CORRECTLY OR IF THE STUDY HAD BEEN DONE
11 UNBIASSED OR WHAT I KNOW FROM MECHANISMS, WHAT
12 I KNOW ABOUT THIS POPULATION, WHAT I KNOW ABOUT
13 THE EXPOSURE LEVEL, WHAT I KNOW ABOUT
14 CO-EXPOSURES AND WHAT I WOULD EXPECT TO SEE
15 GIVEN THE SIZE OF THE COHORTS, THE SIZE OF THE
16 STUDY."

17 DO YOU SEE THAT, DOCTOR?

18 A YES.

19 Q THEN DOWN HERE THERE'S A CITATION TO YOUR
20 DEPOSITION AT PAGE 133.

21 DO YOU SEE THAT?

22 A YES.

23 Q LET'S TAKE A LOOK AT YOUR DEPOSITION.

24 AND I'LL GO TO PAGE 133 AND I'LL BLOW THIS UP
25 SO WE CAN ALL SEE IT HERE.

26 AND ACTUALLY THE QUOTE THAT I JUST READ TO YOU
27 IS ACTUALLY FROM PAGE 134, STARTING ON LINE 5.

28 DO YOU SEE THIS AREA RIGHT HERE, DOCTOR?

1 A YES, I DO.

2 Q OKAY.

3 BUT I WANT TO GO OVER WHAT WAS SAID BEFORE THIS
4 IS WHAT YOU SAID TO PUT THIS INTO CONTEXT.

5 SO ON THE PRIOR PAGE THE QUESTION WAS PUT TO
6 THIS: WELL, IT ACTUALLY STARTS ON AN EARLIER PAGE.

7 IT SAYS, "OKAY, LET'S ASK THIS QUESTION: DID
8 THE NULL STUDIES THAT WE JUST TALKED ABOUT OF
9 ABDULLAH AND DOHERTY AND I THINK WE TALKED
10 ABOUT BEFORE SKOGHEIM, DO THEY SUPPORT YOUR
11 OPINION THAT THE CONSISTENCY CRITERION OF THE
12 BRADFORD HILL FACTORS WERE MET FOR 11 ASD?"

13 AND THEN I OBJECTED. THERE HAD BEEN A BUNCH OF
14 OBJECTIONS PRIOR TO THIS.

15 AND THEN FINALLY YOU RESPOND: "CONSISTENCY IS
16 A BROADER TERM IN THE BRADFORD HILL AS IT WOULD
17 MEAN, WELL, WHAT IS THE EXPECTATION, RIGHT? IS
18 IT CONSISTENT WITH MY EXPECTATION OF THIS
19 HYPOTHESIS?"

20 AND THEN YOU SAY RIGHT HERE: "IF I SEE A
21 NEGATIVE ASSOCIATION, IT WOULD DEFINITELY NOT
22 BE CONSISTENT WITH ANYTHING ELSE."

23 DO YOU SEE THAT?

24 A YES.

25 Q AND YOU GO ON.

26 "I KNOW ABOUT METALS OF THIS TYPE IN THE
27 LITERATURE AND ANIMAL STUDIES AND MECHANISTIC
28 STUDIES, ALL OF THOSE HAVE SHOWN THAT THESE

1 METALS ARE NEUROTOXIC, SO I WOULD DEFINITELY
2 NOT EXPECT TO SEE A NEGATIVE RESULT IN TERMS OF
3 -- SO THEN I HAVE A STUDY THAT ACTUALLY SHOWS A
4 NEGATIVE ASSOCIATION OR NO ASSOCIATION AND THEN
5 I HAVE A STUDY -- STUDIES WHO SHOW POSITIVE
6 ASSOCIATIONS."
7 AND THEN YOU SAY, "I LOOK AT ALL OF THEM AND
8 I'M SAYING, WELL, IS THIS CONSISTENT? NOT, OH,
9 ONE NEGATIVE, ONE NULL, TWO POSITIVES MAY BE
10 NULL OR SOMEWHERE NEXT TO NULL, NO, THAT'S NOT
11 WHAT YOU DO."
12 THEN THERE'S THAT QUOTE.
13 AND THEN YOU WENT ON TO SAY, "AND THAT IS
14 CONSISTENCY IN A SCIENTIFIC WAY. IT IS NOT
15 CONSISTENCY CHECKMARK ONE STUDY, YES, ONE STUDY
16 NO, ONE STUDY NULL, THAT IS SIMPLISTIC AND
17 THAT'S NOT SCIENCE."
18 THEN MR. PETROSINELLI ASKED YOU: "WHAT YOU
19 JUST EXPLAINED IS THE WAY THAT YOU UNDERSTAND
20 THE BRADFORD HILL CRITERION RE CONSISTENCY."
21 AND YOU SAY, "THAT IT IS CONSISTENT WITH THE
22 EXPECTATION OF WHAT SCIENCE HAS TO SAY ABOUT
23 THE DATA AND WHAT THE MEASURES THAT EACH OF THE
24 STUDIES ARE USING ARE ACTUALLY TELLING ME AS A
25 SCIENTIST, AND I'M NOT YOU, YOU KNOW, OTHERWISE
26 YOU COULD DO A COMPUTER ANALYSIS. I COULD SAY
27 OKAY, COMPUTER COUNT ONE, COUNT TWO, COUNT
28 THREE AND THEN WE TOOK AN AVERAGE. THAT'S NOT

1 HOW I DO MY ANALYSIS AND NOBODY HAS RECOMMENDED
2 THAT."

3 AND THEN MR. PETROSINELLI RESPONDED, "PERFECT."
4 DO YOU SEE THAT?

5 A YES.

6 Q ALL RIGHT.

7 SO I JUST WANT TO BE CLEAR, THAT QUOTE THAT THE
8 COURT -- THAT THEY WERE SHOWING THE COURT YESTERDAY
9 MORNING TRYING TO MAKE IT SEEM LIKE YOUR VIEW OF
10 CONSISTENCY IS, "DOES IT MATCH WHAT I EXPECT THE RESULTS
11 TO BE," CAN YOU PLEASE EXPLAIN WHAT YOU ACTUALLY SAID AT
12 YOUR DEPOSITION AND WHAT YOU DID HERE.

13 A WELL, THE EXPECTATION IS ACTUALLY A SCIENTIFIC
14 TERM. WE EVEN HAVE MEASURES WHERE WE CALCULATE THE
15 OBSERVED NUMBER OVER THE EXPECTED AND THAT'S CALLED AN
16 SMR IN OUR SCIENCE. AND WE GENERATE THE EXPECTED FROM
17 THE UNEXPOSED GROUP, SO HOW MANY CANCERS DO I EXPECT IF
18 THE EXPOSURE WOULD NOT EXIST AND I USE A POPULATION IN
19 WHOM THE EXPOSURE DOESN'T EXIST, THAT GIVES ME MY RATE.
20 THAT'S THE EXPECTED NUMBER I GET.

21 THEN I COUNT THE NUMBER OF CASES THAT WE
22 OBSERVE UNDER EXPOSURE, AND WE COMPARE THE OBSERVED TO
23 THE EXPECTED, SO THAT'S THE WAY I SEE EXPECTATION. IT'S
24 A VERY SCIENTIFIC WAY. IT'S A WAY IN WHICH WE MAKE SURE
25 THAT WE, YOU KNOW, USE SCIENTIFIC METHODS, ACTUALLY, AND
26 FORMULATE THE METHODS THAT WE ARE USING TO GENERATE THE
27 EXPECTED NUMBER AND THEN DEFEND THAT.

28 SO IT'S NOT MY OPINION. IT'S ACTUALLY THE WAY

1 THAT SCIENCE WORKS.

2 Q NOW, IN THE OPENING STATEMENT, THE COURT WAS
3 ALSO SHOWN THIS SLIDE WHICH CONTAINED QUOTES FROM
4 VARIOUS STUDIES, THE FIRST ONE BEING SKOGHEIM, 2021.

5 DO YOU SEE THAT?

6 A YES.

7 Q AND THIS WAS IN THE CONTEXT OF SAYING THAT, YOU
8 KNOW, THERE'S INCONSISTENT RESULTS AND THAT THE STUDIES
9 THEMSELVES ARE SAYING THERE'S A LACK OF CONSISTENCY.

10 NOW, I'D LIKE TO SHOW YOU THE SKOGHEIM PAPER.

11 SO I'M SHOWING YOU HERE, THIS IS EXHIBIT 119 IN
12 THE RECORD, AND DO YOU SEE THAT THIS IS IN FACT A COPY
13 OF THE SKOGHEIM PAPER, DOCTOR?

14 A YES, I SEE IT.

15 Q OKAY.

16 AND FIRST, THIS WAS A STUDY THAT WAS LOOKING AT
17 PRENATAL EXPOSURES, NOT POST-NATAL; IS THAT RIGHT?

18 A CORRECT.

19 Q WHAT, IF ANY, RELEVANCE DOES THAT HAVE TO YOUR
20 ANALYSIS?

21 A WELL, IT'S ALWAYS IMPORTANT TO LOOK AT EVERY
22 SINGLE SENSITIVE PERIOD IN NEURODEVELOPMENT, AND
23 PRENATAL EXPOSURES ARE OF COURSE CAPTURING A VERY
24 SENSITIVE PERIOD, BUT ANY KIND OF PRENATAL STUDY, YOU
25 HAVE TO BE, AS I TRIED TO EXPLAIN YESTERDAY, QUITE
26 CAREFUL. I'VE DONE LOTS OF PRENATAL EXPOSURE STUDIES.
27 THAT'S WHAT I ACTUALLY HAVE BEEN DOING FOR MORE THAN 20
28 YEARS IS MOSTLY LOOK AT THE PRENATAL EXPOSURES IN A LOT

1 OF WAYS. AND THERE ARE VERY SENSITIVE WINDOWS IN THE
2 PRENATAL TIME, BUT THERE ARE SO-CALLED "POSSIBLE
3 PARADOXICAL RESULTS YOU CAN GET WHERE ACTUALLY THE DOSE
4 RESPONSE RELATIONSHIP DOESN'T LOOK LINEAR ALL. IT COULD
5 LOOK -- IT COULD HAVE SOME WEIRD SHAPE.

6 AND THAT WEIRD SHAPE COMES ABOUT BECAUSE YOU'RE
7 HITTING A FETUS AT CERTAIN VULNERABLE STAGES IN THEIR
8 DEVELOPMENT AND YOU'RE NOT JUST PITTING ONE PART OF THE
9 BRAIN OR, YOU KNOW, ONE PART OF THIS DEVELOPING CHILD,
10 NO, YOU'RE HITTING THE WHOLE ORGANISM, AND SOME CHILDREN
11 MAY NOT TAKE THE SAME AMOUNT OF TOXIC AGENTS IN THE WAY
12 THAT OTHERS WOULD AND WE ACTUALLY GET A LOT OF ABORTIONS
13 OR STILLBIRTHS; ACTUALLY LEAD HAS BEEN ASSOCIATED WITH
14 STILL BIRTHS AND FETAL LOSS.

15 SO WE WOULD BE WORRIED THAT ACTUALLY AT VERY
16 HIGH LEVELS OF EXPOSURE WE MIGHT SEE A DROP IN THE RATE
17 OF CHILDREN WHO DEVELOP ADVERSE EFFECTS AFTER BIRTH AND
18 I EXPLAINED THAT AS THE LIVE BIRTH BIAS.

19 HOWEVER, AT OTHER PARTS OF THE EXPOSURE
20 SPECTRUM, YOU MIGHT EXACTLY SEE WHAT YOU WOULD EXPECT
21 FOR THAT DEVELOPMENTAL PERIOD WHERE THE BRAIN IS, IT
22 COULD BE BIRTH DEFECTS OF THE BRAIN IN THE FIRST
23 TRIMESTER, IT COULD BE MAJOR FUNCTIONS THAT ARE AFFECTED
24 IN THE SECOND TRIMESTER AND THEN MORE SYNAPTIC TYPE
25 FUNCTIONS LIKE WHAT WE SEE IN AUTISM WHEN YOU GET LATER
26 IN PREGNANCY.

27 SO I WOULD NEVER DISCOUNT ANY OF THESE STUDIES,
28 BUT I NEED TO LOOK AT THEM WITH WHAT I KNOW ABOUT FETAL

1 DEVELOPMENT.

2 Q IN THE STUDY IN THE INTRODUCTION OF THE PAPER,
3 THEY QUOTED THIS SECTION RIGHT HERE THAT SAYS, "ALL
4 TOGETHER, THERE'S STILL LIMITED KNOWLEDGE ON
5 PRENATAL EXPOSURE TO METALS OR VARIATIONS OF
6 MATERNAL LEVELS OF ESSENTIAL ELEMENTS IN
7 CLINICIAN-BASED ASD AND ADHD DIAGNOSIS IN
8 CHILDHOOD. IN ADDITION, THERE ARE
9 INCONSISTENCIES REGARDING STUDY DESIGNS AND
10 FINDINGS."

11 DO YOU SEE THAT?

12 A YES.

13 Q NOW, IF YOU NOTICE THIS IS RIGHT IN THE
14 INTRODUCTION PORTION.

15 DO YOU SEE THAT?

16 A YES.

17 Q NOW, WHEN AN AUTHOR IS IN THE PROCESS OF
18 DISPLAYING -- AND THIS WAS RAISED IN THE BRIEFING, SO I
19 KIND OF WANT TO FLUSH THIS OUT A LITTLE BIT -- VERY
20 OFTEN IN THE PUBLISHED STUDIES, DO AUTHORS SET THE STAGE
21 FOR WHY THEIR PAPER IS RELEVANT?

22 A WELL, THAT'S ACTUALLY HOW WE TEACH OUR STUDENTS
23 TO DO IT WHEN THEY START WRITING THEIR FIRST PAPERS, AND
24 OF COURSE WHAT WE DO WHEN WE WRITE THESE PAPERS, AND
25 I'VE WRITTEN ABOUT 400 BY NOW, WE SET UP THE STAGE. AND
26 ONE WAY YOU SET UP THE STAGE FOR YOUR PAPER IS BY
27 BRIEFLY REVIEWING THE RELEVANCE OF THE SUBJECT MATTER
28 AND THEN OUTLINING WHERE THE GAPS ARE.

1 AND WHEN YOU HAVE CERTAIN AUTHORS PREFER --
2 THERE ARE DIFFERENT PREFERENCES OF HOW TO DO THAT. I
3 GENERALLY LIKE TO TELL MY STUDENTS THAT THEY SHOULD NOT
4 SAY WE DON'T KNOW MUCH BECAUSE WE MIGHT KNOW A LOT, BUT
5 WE MIGHT NOT KNOW CERTAIN THINGS AND THAT'S WHY WE ARE
6 DOING THIS STUDY, WE ARE FILLING THIS GAP. BUT SOME
7 AUTHORS PREFER TO SAY, WELL, THEY HAVE A LOT OF
8 INCONSISTENCY AND WE ARE NOW GOING TO CONDUCT A STUDY
9 THAT WILL GIVE YOU THE END-ALL OF, YOU KNOW, KNOWLEDGE
10 THAT WILL HELP YOU GO BEYOND THE INCONSISTENCY.

11 NO ONE STUDY EVER DOES THAT, SO USUALLY
12 RECOMMEND NOT TO SAY THAT, BUT I DO SEE THAT.

13 Q OKAY.

14 SO THEN IN THE ACTUAL DISCUSSION IF YOU GO INTO
15 THE PAPER, THERE'S A SECTION ABOUT LEAD.

16 IS THIS HARD TO READ? PROBABLY IS. I'LL BREAK
17 IT UP.

18 A YEAH.

19 Q SO IT STARTS OFF BY SAYING, "LEAD IS ANOTHER
20 WELL-KNOWN DEVELOPMENTAL NEUROTOXICANT WITH NO
21 KNOWN SAFE LEVELS OF EXPOSURE FOR
22 NEURODEVELOPMENT."

23 DOCTOR, THAT'S SOMETHING THAT YOU'VE AGREED AND
24 TESTIFIED ABOUT ALREADY?

25 A YES.

26 Q AND THEN IT TALKS ABOUT, "WE IDENTIFIED A NON
27 LINEAR U SHAPED ASSOCIATION WITH PRENATAL LEAD
28 EXPOSURE IN ASD."

1 DO YOU SEE THAT?

2 A YES.

3 Q THEN THAT WAS, AGAIN, THAT U SHAPE IS THAT

4 EXACTLY WHAT YOU WERE TALKING ABOUT WHERE LOWER LEVELS

5 AND REALLY HIGH LEVELS MIGHT SHOW UP, BUT MAYBE THE

6 MIDDLE LEVELS DON'T; RIGHT?

7 A YES.

8 Q AND THEN AT THE BOTTOM PART OF IT, IT GOES

9 REGARDING -- "WE ALSO DETECTED INCREASED RISK AT HIGHER

10 LEVELS OF LEAD WHICH IS IN LINE WITH THE

11 LITERATURE ALTHOUGH PROSPECTIVE STUDIES ARE

12 LACKING WHEN IT COMES TO PRENATAL LEAD EXPOSURE

13 IN ASD."

14 DO YOU SEE THAT?

15 A YES.

16 Q SO WHEN THEY SAY THIS IS IN LINE WITH THE

17 LITERATURE BUT THERE'S A LACK OF PROSPECTIVE DATA IN

18 PRENATAL LEAD EXPOSURE, WHAT DOES THAT TELL YOU AS A

19 EPIDEMIOLOGIST READING THIS?

20 A SO THAT MEANS THERE'S QUITE A BIT OF LITERATURE

21 OUT THERE ON LEAD AND ASD, BUT IT'S PROBABLY FOR THE

22 POST-NATAL PERIOD AND FOR THE PRENATAL PERIOD WE WISH WE

23 HAD MORE PROSPECTIVE STUDIES.

24 AND THAT'S HOW YOU WOULD ARGUE IN ORDER TO TELL

25 THE READER PLEASE PAY ATTENTION TO MY STUDY BECAUSE WE

26 ARE ONE OF THE FEW THAT ACTUALLY DOES WHAT IS MISSING.

27 THAT'S EMPHASIZING THE GAP THAT YOU'RE FILLING.

28 Q AND THEN IN THE CON -- OH, SORRY, I'M HAVING

1 AUDIO PROBLEMS SO IF I INTERRUPT YOU IT'S BECAUSE I
2 THINK YOU'RE DONE AND YOU'RE NOT AND I APOLOGIZE.

3 A YEAH.

4 Q IT SAYS RIGHT HERE IN THE FINAL CONCLUSION,
5 "RESULTS FROM THE PRESENT STUDY SHOW SEVERAL
6 ASSOCIATIONS BETWEEN LEVELS OF METALS AND
7 ELEMENTS DURING GESTATION AND ASD AND ADHD IN
8 CHILDREN. THE MOST NOTABLE ONES INVOLVE
9 ARSENIC, CADMIUM, COPPER, MERCURY, MANGANESE,
10 MAGNESIUM AND LEAD. THE MEASURE OF BLOOD
11 LEVELS OF TOXIC LEVELS WERE IN LINE WITH
12 PREVIOUS STUDIES OF PREGNANT WOMEN IN NORWAY
13 AND OTHER EUROPEAN COUNTRIES."
14 DO YOU SEE THAT?

15 A YES.

16 Q AND WHEN YOU -- WHEN YOU'RE SAYING THAT YOURS
17 -- AND IT GOES ON TO SAY: "INDICATING THAT EVEN
18 POPULATION LEVELS OF THESE COMPOUNDS MAY HAVE
19 NEGATIVE IMPACT ON NEURODEVELOPMENT."
20 DO YOU SEE THAT?

21 A YES.

22 Q WHEN AN AUTHOR SAYS IT'S THIS LINE WITH OTHER
23 STUDIES, PREVIOUS STUDIES, IS THAT ESSENTIALLY SAYING
24 IT'S CONSISTENT?

25 A YES, THAT'S WHAT THEY ARE SAYING.

26 IT'S CONSISTENT WITH WHAT THEY EXPECT GIVEN THE
27 LITERATURE.

28 Q OKAY.

1 WE ALREADY TALKED ABOUT THE ARORA STUDY AND I
2 DON'T WANT TO SPEND TOO MUCH TIME THIS MORNING, I WANT
3 TO HAND YOU OVER TO OPPOSING COUNSEL, BUT LET'S QUICKLY
4 TAKE A LOOK AT THE WANG STUDY.

5 AGAIN, THEY HERE HAVE A QUOTE, "DUE TO THE LACK
6 OF CONSISTENCY AMONG THE VARIOUS STUDY FINDINGS
7 THE EFFECTS OF INORGANIC ARSENIC AND LEAD ON
8 ASD HAVE NOT BEEN ESTABLISHED."

9 DO YOU SEE THAT?

10 A YES.

11 Q ALL RIGHT. SO WE GO TO THE WANG STUDY.

12 WHERE THIS IS REFERRING TO IS, AGAIN, A QUOTE
13 FROM THE INTRODUCTION RIGHT HERE.

14 DO YOU SEE THAT QUOTE?

15 A YES.

16 Q OKAY. AND AGAIN, AND THEN THESE KIND OF
17 STATEMENTS IN THE INTRODUCTION, THEY ARE SETTING THE
18 STAGE FOR THE PUBLICATION AS WE DISCUSSED WITH THE
19 SKOGHEIM PAPER; RIGHT?

20 A CORRECT. YES, THAT'S WHAT THE PURPOSE IS.

21 Q SORRY.

22 NOW, DOCTOR, I KNOW YOU REVIEWED THE WANG STUDY
23 AND I KNOW YOU HAVE OPINIONS ABOUT IT.

24 GENERALLY, DO YOU THINK THAT THESE AUTHORS DID
25 A GOOD JOB WITH WHAT THEY PURPORT TO CLAIM IS A META
26 ANALYSIS?

27 A NO, THEY ACTUALLY DID NOT CONDUCT A META
28 ANALYSIS. THEY CONDUCT WHAT WE USUALLY REFER TO AS A

1 POOLED ANALYSIS. AND TO DO THAT IN THIS CONTEXT IS
2 ACTUALLY RATHER STRANGE BECAUSE YOU ARE POOLING MEANS,
3 YOU'RE USING THE DATA AND YOU ARE JUST COMBINING ALL
4 CASES, ALL CASE DATA TOGETHER AND ALL CONTROL DATA
5 TOGETHER ACROSS STUDIES. SO YOU ARE NOT COMPARING CASES
6 AGAINST CONTROLS ANYMORE WITHIN A STUDY TO GENERATE A
7 SUMMARY ESTIMATE FOR THE STUDY WITH ALL ITS PROBLEMS OR
8 ALL ITS ADVANTAGES.

9 EACH STUDY ITSELF MAY HAVE ACTUALLY USED A LOT
10 OF METHODOLOGIC APPROACHES THAT ARE SPECIFIC TO THE
11 STUDY THAT ARE VERY IMPORTANT TO RETAIN BECAUSE THE
12 CASES AND THE CONTROLS WERE TREATED IN EXACTLY THE SAME
13 WAY. THAT'S NOT THE SAME WHEN YOU GO ACROSS STUDIES.

14 SO, FOR EXAMPLE, THE WAY THAT THE BLOOD LEAD
15 WAS MEASURED MAY NOT -- WHICH LAB AND WHAT THE MINIMUM
16 DETECTION LIMITS IN EACH LAB WERE ARE LIKELY DIFFERENT
17 FROM STUDY TO STUDY, AND NOW YOU'RE BEHAVING AS IF THAT
18 DOESN'T MAKE ANY DIFFERENCE, YOU CAN JUST SUMMARIZE
19 ACROSS ALL CASES ACROSS ALL STUDIES AND ACROSS ALL
20 CONTROLS ACROSS ALL STUDIES AND IGNORE ALL OF THESE
21 METHODOLOGICAL DIFFERENCES.

22 AND THAT'S USUALLY NOT RECOMMENDED. THAT'S WHY
23 WE DO META ANALYSES IN THESE CASES, NOT POOLED ANALYSES
24 TO ACTUALLY PRESERVE THE SPECIFICS OF EACH STUDY IN
25 TERMS OF THESE ISSUES SO THAT WE ARE NOT COMPARING
26 APPLES AND ORANGES, BUT APPLES AND APPLES.

27 Q NOW, DOCTOR, IN THIS STUDY IT'S MY
28 UNDERSTANDING THAT THE -- THAT THEY FOUND PRETTY

1 CONSISTENT ASSOCIATIONS WITH ARSENIC BUT INCONSISTENT
2 RESULTS FOR DIFFERENT BIOMARKERS FOR LEAD; IS THAT
3 RIGHT?

4 A THAT'S CORRECT.

5 Q AND THAT SORT OF NOT SEEING A RESULT IN A
6 POOLED ANALYSIS IN LEAD, THEY SPECIFICALLY NOTED THAT
7 THERE WAS HETEROGENEITY IN IT; IS THAT RIGHT?

8 A YES, YES. AND THAT'S THE OTHER PROBLEM WHEN,
9 YOU KNOW, SOME HETEROGENEITY BETWEEN STUDY RESULTS MEANS
10 THAT THERE ARE VERY BIG DIFFERENCES IN THE AMOUNT OF
11 ASSOCIATION OR NOT ASSOCIATION THAT YOU'RE SEEING.

12 SO BASICALLY IT SAYS WE INCLUDE SOME STUDIES
13 THAT DID NOT SEE DIFFERENCES BETWEEN CASES AND CONTROLS,
14 OTHERS THAT DID PLUS STUDIES THAT MAY HAVE SHOWN THE
15 OPPOSITE, BUT WE'RE INCLUDING THEM ALL. AND WHEN YOU
16 HAVE A VERY HIGH MEASURE OF HETEROGENEITY IN A META
17 ANALYSIS, THAT'S USUALLY APT TO TAKE CARE AND GIVE A
18 WARNING TO THE READER BECAUSE IT MIGHT NOT BE
19 APPROPRIATE TO SUMMARIZE ACROSS THESE STUDIES. THAT'S
20 WHY WE USE THIS MEASURE TO GIVE US AN IDEA WHETHER IT'S
21 APPROPRIATE OR NOT APPROPRIATE TO ACTUALLY GENERATE THE
22 SUMMARY MEASURE.

23 WHAT WE TEACH AND WHAT I'VE BEEN TAUGHT IS THAT
24 IN THIS CASE YOU'RE ACTUALLY LOOKING AT THESE STUDIES
25 THAT HAVE MAYBE OPPOSITE RESULTS MUCH MORE DEEPLY AND
26 YOU TRY TO UNDERSTAND WHY THEY CAME UP WITH OPPOSITE
27 RESULTS.

28 IS A THERE A BIAS IN ONE STUDY OR THE OTHER?

1 DID THEY LOOK AT DIFFERENT TYPES OF POPULATIONS AT
2 DIFFERENT TIME POINTS IN DEVELOPMENT? WHAT IS IT THAT
3 REALLY GENERATES THIS OBVIOUS HETEROGENEITY AND YOU TRY
4 TO UNDERSTAND SCIENTIFICALLY WHAT THAT MEANS AND NOT
5 JUST GENERATE A SUMMARY ESTIMATE. AND BASICALLY
6 BRUSHING OVER ALL THESE DIFFERENT DIFFERENCES ACROSS
7 STUDIES.

8 MR. WISNER: OKAY. YOUR HONOR, COULD WE JUST
9 HAVE A QUICK RECESS. I CAN'T HEAR HER RIGHT NOW. I'M
10 HAVING REAL BAD AUDIO PROBLEMS. CAN YOU JUST GIVE ME
11 TWO MINUTES TO FIX, I'M SORRY?

12 THE COURT: OF COURSE.

13 (OFF-RECORD COMMENTS)

14 MR. WISNER: ALL RIGHT.

15 Q WELL, DR. RITZ, SO IN THIS STUDY IT SAYS RIGHT
16 HERE. "AFTER CONSIDERING" -- LET ME SHOW YOU RIGHT
17 HERE. IT SAYS, "AFTER CONSIDERING STRENGTH AND
18 LIMITATIONS OF THE BODY OF RESEARCH, WE HAVE
19 CONCLUDED THAT THERE IS CONSISTENT EVIDENCE
20 SUPPORTING A POSITIVE ASSOCIATION BETWEEN EARLY
21 LIFE ARSENIC EXPOSURE AND DIAGNOSIS OF ASD AND
22 INCONSISTENT EVIDENCE FOR LEAD EXPOSURE AND
23 ASD."

24 DO YOU SEE THAT?

25 A YES.

26 Q NOW, IT'S REALLY INTERESTING. THAT IF YOU GO
27 BACK TO THE CONCLUSION OF THIS STUDY, THE AUTHORS
28 EXPLAIN THAT A LITTLE BIT MORE.

1 THEY SAY, "THE EVIDENCE TO SUPPORT A
2 RELATIONSHIP -- FOR A RELATIONSHIP BETWEEN BODY
3 EXPOSURE TO LEAD AND ASD IS NOT CONSISTENT, BUT
4 OVERALL IT IS MORE SUPPORTIVE RATHER THAN
5 AGAINST IT."

6 DO YOU SEE THAT?

7 A YES.

8 Q AND I GUESS YOU HAVE YOUR CRITICISMS OF WHY THE
9 LEAD DATA IN THEIR META ANALYSIS OR POOL ANALYSIS DIDN'T
10 SHOW A RESULT OR NOT.

11 BUT WHEN THEY STATE HERE THAT IT'S MORE
12 SUPPORTIVE RATHER THAN AGAINST IT, I MEAN, IS THAT
13 ANOTHER WAY OF SAYING THAT IT'S MORE LIKELY THAN NOT?

14 A YES, THAT'S EXACTLY WHAT THEY ARE SAYING,
15 UM-HMM.

16 Q OKAY.

17 ALL RIGHT. DOCTOR, I WANT TO FINISH UP ON THE
18 REVERSE CAUSATION ISSUE.

19 AND IN THE DEFENSE OPENING SLIDES, THEY HAD
20 THIS DIAGRAM HERE DISCUSSING THE RESULTS OF THE ABDALLAH
21 -- AL-AYADHI PAPER, AND THIS ISN'T RENDERING PROBABLY
22 IT'S ACTUALLY IN THE ORIGINAL SLIDE IT SAYS IT UP THERE
23 IN THE HEADER, BUT IT'S NOT SHOWING RIGHT NOW, BUT IT'S
24 REFERRING TO THAT STUDY, OKAY, DOCTOR?

25 A YES.

26 Q AND THEY EXPLAIN HOW IN THAT STUDY THERE WAS
27 MEASUREMENTS TAKEN ON AVERAGE AT 8.8 YEARS AND THAT
28 CHILDREN ARE TYPICALLY, YOU KNOW, SYMPTOMATIC WITH ASD

1 AT 3, AND SO BETWEEN THIS PERIOD OF 3 AND 8.8 YEARS,
2 THEY WERE ARGUING THAT THE LEAD BURDEN THAT YOU'RE
3 SEEING IS REALLY A FUNCTION OF THESE THINGS THAT THEY
4 HAVE HIGHLIGHTED HERE; PICA, DECREASED ABILITY TO
5 METABOLIZE METAL AND NUTRITIONAL DEFECTS.

6 DO YOU SEE THAT?

7 A YES.

8 Q NOW, WE TALKED ABOUT PICA YESTERDAY. I DON'T
9 WANT TO TALK ABOUT IT AGAIN.

10 BUT LET'S TALK BRIEFLY ABOUT DECREASED ABILITY
11 TO METABOLIZE METALS, OKAY.

12 A UM-HMM.

13 Q IS THE DECREASED ABILITY TO METABOLIZE METAL IS
14 THAT REVERSE CAUSATION, DOCTOR?

15 A NO, THAT'S JUST THE ABILITY OR NON ABILITY TO
16 DEAL WITH WHAT COMES YOUR WAY. SO IF THERE WEREN'T ANY
17 EXPOSURES, THEN THE ABILITY, THE GENETIC OR PHYSIOLOGIC
18 ABILITY TO DEAL WITH THESE TOXINS WOULD BE IRRELEVANT,
19 RIGHT. THE TOXINS ONLY MATTER WHEN THEY HIT A
20 VULNERABLE ORGANISM. AND THIS JUST MEANS THERE'S A
21 VULNERABLE ORGANISM AND WE ARE HITTING IT NOW.

22 Q THEY EVEN CITE TO THIS QUOTE FROM THE STUDY.

23 "THE POSSIBLE EXPLANATION FOR THE RESULT IS
24 THAT AUTISTIC CHILDREN MIGHT LACK THE ABILITY
25 TO DETOXYFY TOXINS RESULTING IN AN ACCUMULATION
26 OF TOXIC SUBSTANCES IN THE BODY."

27 DO YOU SEE THAT?

28 A YES.

1 Q SORRY. IS IT BLURRY?

2 A YEAH, THERE ARE, YEAH.

3 Q YOU NOTICE RIGHT THERE IN THE QUOTE, THOUGH,
4 THERE IS NO PERIOD.

5 DO YOU SEE THAT?

6 A YES, I DO.

7 Q SO I WENT AHEAD AND I ACTUALLY LOOKED UP THE
8 ORIGINAL STUDY. THIS IS THE AL-AYADHI STUDY FROM 2005.

9 DO YOU SEE THAT?

10 A YES. AL-AYADHI.

11 Q THANK YOU. I'M NOT GOING TO SAY THAT CORRECTLY
12 SO I WON'T EVEN TRY.

13 AND THEN WE HAVE HERE THAT PORTION THAT THEY
14 QUOTED FROM. AND I'LL SHOW YOU THE PORTION THAT THEY
15 HIGHLIGHTED -- THEY QUOTED, THEY SAID, IT'S A PORTION --
16 IT WAS RIGHT HERE.

17 "THE POSSIBLE EXPLANATION FOR THIS IS THAT
18 AUTISTIC CHILDREN MIGHT LACK THE ABILITY TO
19 DETOXIFY TOXINS RESULTING IN AN ACCUMULATION OF
20 TOXIC SUBSTANCES SUBSTANCES IN BODY."

21 DO YOU SEE THAT THAT'S WHAT THEY QUOTED?

22 A YES.

23 Q I THINK WE SHOULD LOOK AT THE BEGINNING OF AND
24 AT THE END OF IT AND THEN SEE HOW IT RELATES TO REVERSE
25 CAUSATION.

26 THEY ACTUALLY START OFF BY TALKING ABOUT THE
27 MOST LIKELY EXPLANATION THAT IS AS MENTIONED EARLIER:

28 "DUE TO EXPOSURE TO TOXIC METALS THROUGH

1 DRINKING WATER, COMBUSTION EMISSIONS, SOIL,
2 PAINT CHIPS, FERTILIZER, FOOD, CAR EXHAUST, AND
3 SO FORTH; HOWEVER, A QUESTION MIGHT BE RAISED
4 CHILDREN WITH AUTISM SPECTRUM DISORDER ARE NOT
5 THE ONLY CHILDREN EXPOSED TO THESE TOXIC
6 HAZARDOUS CONDITIONS. NORMAL CHILDREN ARE ALSO
7 EXPOSED. THE POSSIBLE EXPLANATION FOR THIS IS
8 THAT AUTISTIC CHILDREN MIGHT LACK THE ABILITY
9 TO DETOXYFY TOXINS RESULTING IN AN ACCUMULATION
10 OF TOXIC SUBSTANCES IN THE BODY."

11 AND THEN IT GOES ON:

12 "AND LEADING TO ALTERATIONS IN BIOCHEMICAL
13 PROCESSES TAKING PLACE IN THE BODY."

14 DO YOU SEE THAT?

15 A YES.

16 Q THAT SECOND PART, THE "LEADING TO ALTERATIONS
17 IN THE BIOCHEMICAL PROCESS TAKING PLACE IN THE BODY" IS
18 THAT BEING -- AND THE FACT THAT THESE TOXIC METALS ARE
19 ACCUMULATING IN AUTISTIC CHILDREN, IS THAT A CASE FOR
20 REVERSE CAUSATION OR A CASE FOR CAUSATION, DOCTOR?

21 A YEAH, IT'S A CAUSE FOR CUMULATIVE CAUSATION.

22 SO IT'S WHERE YOU, YOU KNOW, OVER TIME, THE
23 BODY BECOMES MORE AND MORE VULNERABLE.

24 YOU COULD ARGUE WHY SHOULD THEY ALL OF A SUDDEN
25 AT THE AGE OF THREE HAVE STARTED TO BE VULNERABLE AND
26 NOT BEEN VULNERABLE BEFORE, RIGHT. SO BASICALLY IT'S --
27 IF WE BELIEVE THESE KIDS ARE MORE VULNERABLE AND DON'T
28 DETOXYFY, THEY WOULD DO THAT AT ANY AGE SO THEY WOULD

1 HAVE ALREADY STARTED TO BE VULNERABLE AT BIRTH BECAUSE
2 THEY CAN'T DETOXIFY TOXINS.

3 IF YOU NOW EXPOSE THEM TO TOXINS WELL, THEY
4 CAN'T DETOXIFY, THEY ARE VULNERABLE, THEY HAVE THE
5 REACTIONS -- THEIR BODY WILL HAVE THE REACTIONS THAT WE
6 THEN SEE PLAY OUT IN THESE KIND OF SYMPTOMS.

7 Q ALL RIGHT. DOCTOR, I KNOW THERE'S BEEN SOME
8 ALLEGATIONS THAT YOU HAVE -- THAT YOU VIEW THE BRADFORD
9 HILL CRITERION AS BEING ARBITRARY.

10 LET ME JUST ASK YOU, DOCTOR, IS THAT EVEN
11 REMOTELY TRUE?

12 A NO. IF -- I MEAN, IF WE WOULD -- IF WE WOULD
13 THINK THEY ARE ARBITRARY, WE WOULDN'T BE USING THEM.
14 THEY ARE THE OPPOSITE OF ARBITRARY. THEY ARE ACTUALLY
15 GIVING US THE SCIENTIFIC GUIDE TO HOW WE CAN ARGUE ABOUT
16 CAUSALITY AND STILL UNDERSTAND EACH OTHER, STILL USE
17 FACTS, STILL USE SCIENTIFIC INSIGHT AND BE VERY
18 TRANSPARENT ABOUT IT. THAT'S THE OPPOSITE OF ARBITRARY.

19 Q AND, DOCTOR, JUST TO WRAP THIS UP: DID YOU
20 REACH A DEGREE TO A REASONABLE SCIENTIFIC CERTAINTY
21 ABOUT WHETHER OR NOT EARLY LIFE EXPOSURE TO LEAD CAN
22 CAUSE ASD AND OR ADHD?

23 A ABSOLUTELY. AND I'VE WRITTEN SO IN MY REPORT.

24 Q OKAY. AND THE SCIENTIFIC RIGOR WITH WHICH YOU
25 ARRIVED AT THOSE OPINIONS, IS THAT THE SAME SCIENTIFIC
26 RIGOR THAT YOU WOULD APPLY IN YOUR WORK AS AN
27 EPIDEMIOLOGIST AS YOU HAVE FOR THE LAST FEW DECADES?

28 A ABSOLUTELY. I WOULDN'T DO ANYTHING ELSE.

1 Q SAME QUESTION FOR ARSENIC AND ASD.

2 DID YOU APPLY THE SAME PRINCIPLES AND METHODS
3 THAT YOU USE IN YOUR REGULAR LIFE?

4 A I WOULDN'T KNOW HOW TO DO ANYTHING ELSE.

5 Q AND I GUESS IN THE LAST ONE, MERCURY AND ASD:
6 DID YOU ALSO USE THE SAME SCIENTIFIC RIGOR?

7 A YES. YES AND I LOOKED VERY CLOSELY AT MERCURY.

8 Q THANK YOU.

9 MR. WISNER: AT THIS TIME, YOUR HONOR, I HAVE
10 NO FURTHER QUESTIONS AND I PASS THE WITNESS.

11 THE COURT: OKAY. THANK YOU.

12 CROSS EXAMINATION.

13 MR. PETROSINELLI: THANK YOU, YOUR HONOR. MAY
14 I PROCEED?

15 THE COURT: PLEASE.

16

17 CROSS EXAMINATION

18 MR. PETROSINELLI:

19 Q DR. RITZ, GOOD AFTERNOON. NICE TO SEE YOU
20 AGAIN.

21 A HELLO.

22 Q LET ME JUST JUMP RIGHT TO YOUR BRADFORD HILL
23 ANALYSIS.

24 THAT IS THE FRAMEWORK YOU USED TO REACH AN
25 OPINION ON WHETHER OR NOT THE EXPOSURE TO HEAVY METALS
26 COULD CAUSE ASD OR EXPOSURE TO LEAD COULD CAUSE ADHD; IS
27 THAT CORRECT?

28 A YES.

1 Q AND THE BRADFORD HILL FRAMEWORK INCLUDES NINE
2 FACTORS TO CONSIDER, DOES IT NOT?

3 A IT CON -- YES.

4 Q AND DO YOU AGREE THAT BEFORE APPLYING THE
5 BRADFORD HILL FACTORS TO ASSESS CAUSATION, THERE MUST BE
6 AN ASSOCIATION BETWEEN THE EXPOSURE AND THE OUTCOME THAT
7 IS NOT EXPLAINED BY BIAS OR CONFOUNDING?

8 A I AM NOT SURE THAT I UNDERSTAND WHAT YOU MEAN,
9 BUT BIAS AND CONFOUNDING IS WHAT I ALWAYS CONSIDER AND
10 EVERY SCIENTIST IN MY AREA CONSIDERS, AND OF COURSE WE
11 ARE LOOKING AT EVERY STUDY VERY CLOSELY IN TERMS OF BIAS
12 AND CONFOUNDING.

13 BUT YOU CAN APPLY THE BRADFORD HILL CRITERIA
14 WITHOUT EPIDEMIOLOGIC STUDIES. IT'S ACTUALLY DONE BY
15 THE AGENCY ON RESEARCH OF CANCER ON AND AGAIN, AT IARH,
16 THAT'S THE W-H-O ORGANIZATION THAT BRINGS OUT MONOGRAPHS
17 ON CARCINOGENICITY AND THEY USE CAUSALITY BASED ON
18 ANIMAL STUDIES AND MECHANISTIC STUDIES IF THERE ARE NO
19 EPIDEMIOLOGIC STUDIES, BUT WHEN WE GO TO EPIDEMIOLOGIC
20 STUDIES, YES, WE ARE ALWAYS CONSIDERING BIAS.

21 Q NOW, MY QUESTION PERHAPS, DOCTOR, I -- PERHAPS
22 YOU DIDN'T HEAR ME, MY QUESTION WAS WHEN YOU'RE RELYING
23 ON EPIDEMIOLOGICAL STUDIES, BEFORE YOU APPLY THE
24 BRADFORD HILL FRAMEWORK, DON'T YOU HAVE TO BE SURE THERE
25 IS AN ASSOCIATION THAT IS NOT EXPLAINED BY BIAS OR
26 CONFOUNDING; CORRECT?

27 A I THINK IF YOU SAY IT THIS WAY, IT'S NOT
28 CORRECT, NO. ABSOLUTELY NOT.

1 WE, AS EPIDEMIOLOGISTS, ARE LEARNING TO
2 EVALUATE BIAS IN THE CONTEXT OF EVERY SINGLE STUDY WE
3 LOOK AT. THERE IS NOT ONE STUDY IN THE WORLD THAT YOU
4 CAN SHOW ME, NOT EVEN IN RCT, A RANDOMIZED CONTROL
5 TRIAL, THAT IS COMPLETELY FREE OF BIAS.

6 IT IS A QUESTION OF DEGREE. HOW MUCH BIAS IS
7 THERE AND IS THAT A BIAS THAT ACTUALLY MATTERS; MEANING,
8 THAT THE EFFECT ESTIMATE I'M SEEING IS REALLY FAR AWAY
9 FROM THE TRUTH, FROM THE UNDERLYING TRUE ASSOCIATION OR
10 TRUE CAUSALITY, AND THAT WE EVALUATE IN EVERY ASPECT.

11 YOU WILL NEVER EVER FIND A STUDY IN THE WORLD
12 THAT IS ABSOLUTELY FREE OF BIAS. AND IF YOU SHOW ME
13 ONE, THEN YOU PROBABLY ARE DESERVING THE NOBLE PRIZE.
14 IT DOESN'T EXIST.

15 WHAT WE DO AS SCIENTISTS IS WE AGREE THAT WE
16 ARE LOOKING AT SCIENCE WITH A CRITICAL EYE, AND THE
17 CRITICAL EYE IN MY SCIENCE MEANS WE HAVE TO BE VERY
18 CAREFUL ABOUT ASSESSING BIASES. AND EVERY SINGLE STUDY
19 HAS BIASES. BUT SOME BIASES ACTUALLY ALLEVIATE EACH
20 OTHER.

21 FOR EXAMPLE, THE PRINCIPLE OF CONFOUNDING, IT
22 IS AN OVERARCHING CONCEPT, BUT THERE ARE CONFOUNDERS
23 THAT PULL THE ESTIMATE IN ONE DIRECTION AND THERE ARE
24 CONFOUNDERS THAT PULL THE ESTIMATE IN THE OPPOSITE
25 DIRECTION. ON AVERAGE THERE IS NO BIAS, OKAY, BUT THAT
26 WHAT WE DO WHEN WE EVALUATE STUDIES, WE LOOK AT EVERY
27 SINGLE ONE AND WE GO THROUGH ALL OF THE BIASES, AND
28 THAT'S ACTUALLY THE CLASS I'M TEACHING CURRENTLY AT UCLA

1 IN BASIC METHODS HOW YOU DO THAT.

2 Q DOCTOR, THAT WAS A VERY LONG ANSWER.

3 I JUST ASKED -- IS YOUR ANSWER NO THAT YOU DO
4 NOT BELIEVE -- AND IT'S FINE IF IT'S NO.

5 YOU DON'T BELIEVE -- LET ME STRIKE THAT.

6 YOU BELIEVE THAT YOU CAN APPLY THE BRADFORD
7 HILL CRITERIA WITHOUT FIRST FINDING AN ASSOCIATION THAT
8 IS NOT EXPLAINED BY BIAS OR CONFOUNDING; YES OR NO?

9 MR. WISNER: OBJECTION; ASKED AND ANSWERED AND,
10 FRANKLY, IMPROPER HYPOTHETICAL.

11 THE WITNESS: I DON'T THINK I UNDERSTAND YOUR
12 QUESTION. I TRIED TO EXPLAIN TO YOU.

13 MR. WISNER: DR. -- DR. RITZ.

14 THE WITNESS: OKAY.

15 THE COURT: JUST A MOMENT. JUST A MOMENT. I
16 ACTUALLY THINK I DON'T UNDERSTAND THE QUESTION EITHER SO
17 PERHAPS YOU WOULD REPHRASE IT JUST A LITTLE BIT.

18 MR. PETROSINELLI: I WILL.

19 Q BEFORE YOU APPLY A BRADFORD HILL ANALYSIS,
20 THERE MUST BE AN ASSOCIATION BETWEEN AN EXPOSURE AND
21 OUTCOME; YOU AGREE WITH THAT?

22 A IF YOU HAVE NO ASSOCIATION, WHAT ARE YOU
23 EVALUATING? THAT'S WHAT I'M ASKING. YES, OF COURSE
24 THERE HAS TO BE ASSOCIATIONS.

25 Q OKAY.

26 AND THEN MY -- SO THEN MY NEXT QUESTION IS
27 BEFORE APPLYING A BRADFORD HILL ANALYSIS DOESN'T THERE
28 HAVE TO BE AN ASSOCIATION THAT IS NOT EXPLAINED BY BIAS

1 OR CONFOUNDING IN THE STUDIES?

2 THAT'S MY QUESTION.

3 A THAT'S WHERE I THINK WE ARE NOT UNDERSTANDING
4 EACH OTHER, BUT MAYBE IT'S ME, I CAN'T EXPLAIN IT WELL.

5 EVERY ASSOCIATION WE LOOK AT IN A STUDY IS MOST
6 LIKELY INFLUENCED BY SOME KIND OF BIAS, BUT --

7 THE COURT: LET ME JUST INTERRUPT BECAUSE I
8 THINK WE'RE GOING AROUND IN CIRCLES. I THINK THE
9 PROBLEM IS THE NEGATIVE PHRASING OF THE QUESTION IS
10 CONFUSING.

11 THE WITNESS: RIGHT.

12 MR. PETROSINELLI: WELL, LET ME TRY THIS, YOUR
13 HONOR.

14 THE COURT: IF -- NO, GO AHEAD. SORRY.
15 MR. PETROSINELLI:

16 Q DO YOU AGREE -- I'LL MOVE ON -- DO YOU AGREE
17 THAT BEFORE APPLYING BRADFORD HILL FACTORS, THERE MUST
18 BE AN ASSOCIATION BETWEEN THE EXPOSURE AND THE OUTCOME
19 THAT IS PERFECTLY CLEAR-CUT AND BEYOND WHAT WOULD BE
20 EXPLAINED BY CHANCE?

21 A CHANCE IS A VERY DIFFERENT CONCEPT FROM BIAS.
22 CHANCE IS A RANDOM CONCEPT OF IS THE STUDY BIG ENOUGH
23 THAT, YOU KNOW, CHANCE DOES NOT EXPLAIN WHAT I'M SEEING?

24 BIAS IS A SYSTEMIC ERROR. CHANCE IS A RANDOM
25 ERROR. SO THESE TWO CONCEPTS ARE COMPLETELY DIFFERENT
26 FROM EACH OTHER.

27 IF YOU SAY CHANCE, THEN YES, IT'S -- WE HAVE
28 STUDIES THAT ARE SO SMALL THAT THEY ARE NOT SHOWING AN

1 EFFECT AND EVERYTHING IS POSSIBLY RANDOM, THEN I DON'T
2 HAVE TO APPLY BRADFORD HILL.

3 Q OKAY.

4 LET'S LOOK AT THE BRADFORD HILL FACTORS.

5 LET ME PULL UP EXHIBIT 679, WHICH IS A
6 DEMONSTRATIVE THAT HAS THE NINE FACTORS.

7 GIVE ME ONE SECOND.

8 A OH, YOU'RE SHOWING ME?

9 Q YES SORRY.

10 A THANK YOU.

11 Q OKAY.

12 DOCTOR, THESE ON THE SCREEN, THESE ARE THE
13 BRADFORD HILL CRITERIA; CORRECT?

14 A YES.

15 Q AND IN CONDUCTING A BRADFORD HILL ANALYSIS, THE
16 SCIENTIST HAS TO CONSIDER ALL NINE OF THESE; CORRECT?

17 A WELL, WE CONSIDER ALL NINE OF THESE, BUT IF YOU
18 READ BRADFORD HILL'S PAPER, IT SAYS THAT, YOU KNOW, IT'S
19 NOT A CHECKLIST AT ALL, IT IS JUST A GUIDELINE OF HOW TO
20 ARRIVE AT A CAUSAL REASONING AND OPINION.

21 SO IT COULD BE THAT ANY ONE OF THESE DOES NOT
22 APPLY TO THE LITERATURE, BUT YOU STILL COME UP WITH A
23 CAUSAL INFERENCE.

24 Q THE ONE BRADFORD HILL FACTOR THAT ABSOLUTELY
25 MUST EXIST IN ORDER TO CONCLUDE THAT THE EXPOSURE TO A
26 SUBSTANCE CAN CAUSE A DISEASE IS TEMPORALITY; CORRECT?

27 A IT DEPENDS ON WHAT YOU MEAN BY TEMPORALITY.

28 GENERALLY, YES. WHEN WE SAY CAUSAL, ARE YOU --

1 WHEN WE MAKE CAUSAL ARGUMENTS, WE WANT THE CAUSE TO
2 PRECEDE THE EFFECT, THAT'S ABSOLUTELY CORRECT. HOW WE
3 DO THAT IN OUR SCIENCE, HOWEVER, IS REALLY DEPENDENT ON
4 WHAT WE'RE LOOKING AT, HOW DO WE ESTABLISH TEMPORALITY
5 IS DIFFERENT FROM DOES IT EXIST OR NOT.

6 Q AND NO MATTER WHAT THE OTHER EIGHT BRADFORD
7 HILL FACTORS WOULD SHOW, IF ONE CONCLUDES THAT
8 TEMPORALITY IS NOT MET, THEN THERE CAN BE NO FINDING OF
9 CAUSATION; CORRECT?

10 A I DON'T THINK I REALLY UNDERSTAND WHAT YOU MEAN
11 BY THIS.

12 MEAN -- DOES IT MEAN THAT I CANNOT ESTABLISH
13 TEMPORALITY AT ALL? OR THAT MY -- THAT I'M CONVINCED
14 THAT THE EFFECT PRECEDED THE CAUSE?

15 Q LET'S TRY THE LATTER. LET'S TRY BOTH OF THOSE.
16 IF YOU -- WELL, MY QUESTION REALLY WAS THE
17 SECOND ONE.

18 IF YOU CONCLUDE THAT TEMPORALITY CANNOT BE MET
19 NO MATTER WHAT THE OTHER EIGHT FACTORS SHOW, YOU CANNOT
20 CONCLUDE CAUSATION; CORRECT?

21 A WELL, IF I CAN -- IF I CAN CLEARLY SHOW THAT
22 THE EFFECT PRECEDED THE CAUSE, YES, THEN I WOULD SAY
23 THERE'S NO CAUSALITY.

24 Q ALL RIGHT.

25 LET ME TALK ABOUT A COUPLE OF THESE FACTORS
26 BEFORE WE TALK ABOUT TEMPORALITY IN A LITTLE MORE
27 DETAIL.

28 ONE OF THE FACTORS IS SPECIFICITY; IS THAT

1 RIGHT?

2 A YES, I SEE IT.

3 Q AND SPECIFICITY, THAT FACTOR MEANS THAT THE
4 EXPOSURE TO THE SUBSTANCE IS ASSOCIATED WITH A SPECIFIC
5 HEALTH OUTCOME; CORRECT?

6 A THAT'S GENERALLY HOW IT'S SEEN, YES.

7 Q AND IF THAT'S TRUE, IF THERE IS SPECIFICITY,
8 THEN IT'S MORE LIKELY THAT THERE'S A CAUSAL
9 RELATIONSHIP; CORRECT?

10 A NO, IT'S JUST ONE OF THE CRITERIA AND ACTUALLY
11 ONE OF THE CRITERIA THAT IS A LITTLE BIT UNFORTUNATE
12 BECAUSE WE KNOW THAT IT'S NOT CORRECT FOR MOST TOXIC
13 AGENTS BECAUSE THEY ARE DIRTY, THEY ARE DIRTY CHEMICALS.

14 SO, FOR EXAMPLE, IF YOU SAID SMOKING COULD ONLY
15 CAUSE LUNG CANCER AND THAT'S SPECIFIC, RIGHT, ONLY ONE
16 TYPE OF LUNG CANCER, AND IF THAT'S ALL YOU WOULD EVER
17 PRESUME, THEN WE WOULD SAY, WELL, THEN, YOU KNOW, WE
18 CAN'T CLAIM THAT SMOKING IS A CAUSE OF LUNG CANCER
19 BECAUSE WE ALSO SEE BLADDER CANCER AND WE SEE CERVICAL
20 CANCER, ET CETERA, ET CETERA.

21 AND ALSO SMOKING CAUSES HEART DISEASE. SMOKING
22 CAUSES STROKE. THERE ARE SO MANY DIFFERENT DISEASES
23 THAT -- MISCARRIAGES, ET CETERA, ET CETERA, SO THERE'S
24 NO SPECIFICITY.

25 UNFORTUNATELY, THIS CRITERIA ON SPECIFICITY IS
26 MORE LIKE IF I SEE IT THAT IT ONLY CAUSES ONE SPECIFIC
27 THING, THAT'S REALLY COOL, AND THEN I'M REALLY HAPPY AND
28 I PARADED AROUND LIKE ASBESTOSIS, I MEAN, THE WHOLE

1 ILLNESS IS CALLED AFTER THE AGENT, NOTHING ELSE CAN
2 CAUSE ASBESTOSIS BECAUSE IT'S ASBESTOS, RIGHT.

3 BUT THAT'S NOT HOW IT WORKS IN THE REAL WORLD
4 FOR MOST TOXINS, UNFORTUNATELY.

5 Q AND ISN'T IT TRUE, DOCTOR, THAT SPECIFICITY IS
6 NOT MET FOR ANY OF THE HEAVY METALS THAT YOU EVALUATED
7 IN ASD OR ADHD; CORRECT?

8 A WELL, SPECIFICITY IS NOT WHAT I WOULD EXPECT
9 FOR MOST OF THESE METALS. I WOULD ACTUALLY EXPECT THAT
10 THEY CAUSE A LOT OF DIFFERENT DAMAGE JUST LIKE SMOKING
11 DOES.

12 SPECIFICITY IS NOT THE CRITERIA TO THROW AT
13 METALS THAT HAVE SO MANY TOXIC EFFECTS ON AN ORGANISM.

14 Q OKAY.

15 A ESPECIALLY A BRAIN ORGANISM.

16 Q DOCTOR, I DIDN'T ASK YOU WHAT YOU EXPECT.

17 IS IT TRUE THAT IT IS NOT MET FOR ANY OF THE
18 HEAVY METALS THAT YOU EVALUATED IN THIS CASE AND ASD OR
19 ADHD? IS THAT TRUE?

20 A IF YOU MEAN SPECIFICITY IN TERMS OF THAT IT
21 ONLY KILLS ONE CELL TYPE, THAT IT ONLY IMPACTS ONE ORGAN
22 IN THE CELL, THAT IT ONLY AFFECTS ONE ORGAN ALONE, THEN
23 THERE IS NO SPECIFICITY BECAUSE WE KNOW THAT LEAD CAUSES
24 NOT ONLY COGNITIVE ISSUES, BEHAVIORAL ISSUES, IT CAUSES
25 KIDNEY DAMAGE, IT CAUSES A LOT OF OTHER DAMAGE IN THE
26 BODY.

27 Q AND LET'S LOOK AT ANOTHER BRADFORD HILL FACTOR;
28 EXPERIMENT.

1 IN THE CONTEXT OF BRADFORD HILL THAT MEANS
2 CLINICAL TRIALS OR TESTS INVOLVING HUMANS; CORRECT?

3 A THAT CAN MEAN THAT IN HUMANS -- EXPERIMENT IS
4 YOU -- NO, EXPERIMENT ACTUALLY MEANS THAT YOU ARE
5 CONTROLLING THE ENVIRONMENT OF THE EXPOSURE.

6 SO EXPERIMENT IS YOU PUT A RAT IN A CAGE, YOU
7 FEED IT A CERTAIN DIET, YOU GIVE IT A CERTAIN NUMBER OF
8 HOURS OF DAYLIGHT AND YOU CONTROL WHAT THIS ANIMAL'S
9 EXPOSURE IS IN EVERY DETAIL. THAT'S AN EXPERIMENT.

10 IN HUMANS WE DON'T DO THIS. THE ONLY
11 EXPERIMENT WE REALLY HAVE IS A RANDOMIZED CLINICAL
12 TRIAL, AND WITH TOXINS WE DO NOT DO THOSE BECAUSE WE
13 WOULD NOT EXPOSE SOMEBODY ON PURPOSE WITH A TOXIN AND
14 WAIT FOR EFFECTS.

15 Q AND SO WHEN YOU APPLY THE BRADFORD HILL
16 FACTORS, THE BRADFORD HILL FACTOR OF EXPERIMENT, YOU
17 INCLUDE ANIMAL STUDIES; DID I HEAR YOU JUST SAY THAT
18 CORRECTLY?

19 A YES, ANIMAL STUDIES DO INCLUDE ABSOLUTELY
20 INCLUDE HERE.

21 Q OKAY.

22 AND IS IT TRUE THAT FOR THE HEAVY METALS AT
23 ISSUE IN THIS CASE AND ASD OR ADHD, THE EXPERIMENT
24 FACTOR OF BRADFORD HILL IS NOT MET?

25 A I DON'T UNDERSTAND WHAT YOU'RE ASKING ME
26 BECAUSE I JUST EXPLAINED THAT THERE ARE NO HUMAN
27 STUDIES.

28 IF I SAY ADHD AND ASD, THOSE ARE HUMAN

1 DISEASES, VERY SPECIFIC DISEASES TO THE BRAIN THAT HAVE
2 NO ANIMAL MODEL THAT IS COMPLETELY LIKE THE HUMAN, SO IF
3 WE'RE TALKING ABOUT HUMANS, THEN WE WOULDN'T HAVE
4 EXPERIMENTS, HOWEVER, WE DO HAVE EXPERIMENTS IN ANIMALS.

5 Q OKAY.

6 I'M JUST TRYING TO FIND OUT, DOCTOR, IN YOUR
7 BRADFORD HILL ANALYSES THAT YOU DID IN THIS CASE, DID
8 YOU FIND THAT THE EXPERIMENT FACTOR WAS MET OR NOT MET?

9 A NOT IN HUMANS. BUT IT'S NOT MET OR NOT MET.
10 EXPERIMENTS HOPEFULLY DON'T EXIST. IF YOU WOULD SEE
11 THEM IN HUMANS, I THINK THAT'S -- YOU KNOW THAT WOULD BE
12 A CRIME.

13 Q OKAY. LET'S TALK ABOUT CONSISTENCY.

14 SO AS I UNDERSTOOD YOUR TESTIMONY YESTERDAY AND
15 TODAY, YOU AGREE THAT THE DEFINITION OF CONSISTENCY FOR
16 PURPOSES OF A BRADFORD HILL ANALYSIS IS THAT THE
17 ASSOCIATION YOU'RE EVALUATING HAS BEEN REPEATEDLY
18 OBSERVED BY DIFFERENT PERSONS IN DIFFERENT PLACES,
19 CIRCUMSTANCES AND TIMES; CORRECT?

20 A CORRECT.

21 Q ALL RIGHT.

22 AND DO YOU AGREE THAT FOR PURPOSES OF JUDGING
23 THE BRADFORD HILL FACTOR OF CONSISTENCY, DIFFERENT
24 STUDIES THAT EXAMINE THE SAME EXPOSURE-DISEASE
25 RELATIONSHIP GENERALLY SHOULD YIELD SIMILAR RESULTS?

26 A THAT IS MUCH TOO GENERAL BECAUSE NO TWO STUDIES
27 ARE THE SAME. YOU HAVE STUDIES -- I MEAN, WE'RE NOT --
28 THE COURT: SOMEONE NEEDS TO MUTE THEIR AUDIO.

1 MAYBE MR. WILLIAMS. I CAN'T TELL.

2 THE WITNESS: IT'S ACTUALLY INTERESTING THAT
3 YOU TALK ABOUT CONSISTENCY AFTER WE JUST TALKED ABOUT
4 EXPERIMENTS BECAUSE IT IS EXPERIMENTS WHERE WE ARE
5 CONTROLLING THE EXPOSURE IN THE WAY THAT YOU ARE
6 EXPECTING IT TO HOLD FOR CONSISTENCY IN HUMAN STUDIES.
7 IT'S NOT THE CASE. THAT'S WHY OBSERVATIONAL
8 EPIDEMIOLOGY AND OBSERVATIONAL HUMAN STUDIES ARE VERY
9 DIFFERENT.

10 OBSERVATION STUDIES ARE OBSERVATIONAL BECAUSE
11 WE CANNOT CONTROL THE EXPOSURE. THAT MEANS THAT THE
12 LEVELS OF EXPOSURE ARE VERY DIFFERENT IN DIFFERENT
13 POPULATIONS. IT ALSO MEANS THAT WE ARE HITTING
14 DIFFERENT POPULATIONS WITH DIFFERENT LEVELS OF EXPOSURE
15 AND THESE POPULATIONS MAY BE MORE OR LESS SENSITIVE AT
16 THE TIME OF THEIR LIVES TO THESE EXPOSURES.

17 SO CONSISTENCY REALLY MEANS SOMETHING DIFFERENT
18 THAN THE WAY YOU'RE TRYING TO TELL ME IT SHOULD BE
19 INTERPRETED BECAUSE IT'S NOT AN EXPERIMENT, IT'S AN
20 OBSERVATIONAL STUDY IN AN OBSERVATIONAL ENVIRONMENT.

21 CONSISTENCY MEANS, DOES THE STUDY THAT HAS LOW
22 LEVEL OF LEAD SHOW ONE THING AND THE STUDY THAT HAS HIGH
23 LEVELS OF LEAD SHOW SOMETHING ELSE? OR DOES THE STUDY
24 WHERE LEAD EXPOSURE IS OUTSIDE A VULNERABLE PERIOD SHOW
25 SOMETHING DIFFERENT FROM THE STUDY WHERE THE LEAD
26 EXPOSURE HAPPENS DURING A VERY SENSITIVE TIME PERIOD?

27 SO THAT IS THE SCIENTIFIC AND CAUSAL
28 CONSISTENCY THAT WE WOULD BE EXPECTING.

1 MR. PETROSINELLI:

2 Q WELL, LET ME JUST SHOW YOU, DOCTOR, THE
3 STATEMENT WHERE I JUST -- THE REFERENCE YOU JUST READ IT
4 FROM.

5 LET ME PULL UP A DEMONSTRATIVE. THIS IS FROM
6 WHAT WE CALL THE REFERENCE MANUAL ON SCIENTIFIC
7 EVIDENCE.

8 SO LET ME ASK YOU IF YOU AGREE WITH SOME OF
9 THESE STATEMENTS. THIS IS FROM PAGE 604 OF THE
10 REFERENCE MANUAL.

11 THE FIRST HIGHLIGHTED STATEMENT SAYS: "IT IS
12 IMPORTANT THAT A STUDY BE REPLICATED IN
13 DIFFERENT POPULATIONS AND BY DIFFERENT
14 INVESTIGATORS BEFORE A CAUSAL RELATIONSHIP IS
15 ACCEPTED BY EPIDEMIOLOGISTS AND OTHER
16 SCIENTISTS."

17 DO YOU SEE WHERE I'M READING?

18 A YES.

19 Q AND DO YOU AGREE WITH THAT STATEMENT?

20 A IT'S A VERY GENERAL STATEMENT, AND AS GENERAL
21 AS IT IS, I CAN AGREE WITH IT.

22 Q OKAY.

23 NOW, LET ME GO DOWN TO THE STATEMENT I JUST
24 READ TO YOU.

25 "CONSISTENCY IN THESE FINDINGS IS AN IMPORTANT
26 FACTOR IN MAKING A JUDGMENT ABOUT CAUSATION.
27 DIFFERENT STUDIES THAT EXAMINE THE SAME
28 EXPOSURE-DISEASE RELATIONSHIP GENERALLY SHOULD

1 YIELD SIMILAR RESULTS."

2 DO YOU SEE WHERE I JUST READ?

3 A YES.

4 Q DO YOU AGREE WITH THAT?

5 A YES. GENERALLY SHOULD YIELD. IF IT'S THE SAME
6 EXPOSURE-DISEASE RELATIONSHIP.

7 BUT AS I JUST EXPLAINED, IT WILL IN HUMAN
8 STUDIES NEVER BE THE SAME EXPOSURE BECAUSE THE EXPOSURE
9 IS NOT GIVEN AS A TREATMENT IN AN EXPERIMENT, IT IS
10 OBSERVED.

11 Q OKAY.

12 DOCTOR, DO YOU AGREE THAT -- WE CAN TAKE THAT
13 DOWN -- DO YOU AGREE THAT IN THIS CASE FOR -- LET'S TALK
14 ABOUT LEAD BECAUSE THAT'S WHAT YOUR TESTIMONY FOCUSED
15 ON. FOR LEAD AND ASD, WE HAVE SOME STUDY SHOWING A
16 POSITIVE ASSOCIATION, SOME STUDIES SHOWING NO
17 ASSOCIATION AND SOME STUDIES SHOWING A NEGATIVE
18 ASSOCIATION.

19 DO YOU AGREE WITH THAT?

20 A WELL, THAT'S VERY GENERAL, AND AS GENERAL AS
21 YOU STATED, THAT'S CORRECT. BUT THAT'S, YOU KNOW, THAT
22 MEANS NOTHING.

23 Q AND --

24 A I DON'T HAVE COUNT THE STUDIES. I NEVER
25 RECOMMENDING COUNTING STUDIES.

26 Q AND --

27 A I WOULD ACTUALLY BE SURPRISED IF THERE WEREN'T
28 STUDIES ON EACH END OF THE SPECTRUM BECAUSE, YOU KNOW,

1 IF YOU DO SCIENCE, YOU COME UP WITH DIFFERENT RESULTS.

2 Q AND THAT'S WHAT WE HAVE HERE: DIFFERENT
3 RESULTS; CORRECT?

4 A CAN YOU PUT THAT IN CONTEXT AGAIN?

5 Q YOU JUST SAID TO ME, IF WE HAVE SCIENCE, WE
6 HAVE DIFFERENT RESULTS. AND HERE WE HAVE DIFFERENT
7 RESULTS.

8 DO WE NOT?

9 A WHAT IS "HERE"?

10 Q THE RELATIONSHIP BETWEEN THE STUDIES STUDYING
11 LEAD AND ASD.

12 A THERE ARE SOME STUDIES SHOWING NO ASSOCIATION.
13 THERE ARE VERY FEW STUDIES SHOWING THE OPPOSITE OF AN
14 ASSOCIATION; MEANING, LEAD BEING, YOU KNOW, GOOD FOR
15 YOU. AND THERE ARE A MULTITUDE OF STUDY SHOWING
16 POSITIVE ASSOCIATIONS. YES, CORRECT.

17 Q NOW, LET ME --

18 A IF YOU CONSIDER THAT INCONSISTENT, THAT'S UP TO
19 YOU.

20 Q WELL, THAT'S WHAT I WANT TO ASK YOU ABOUT.

21 ISN'T IT A FACT, DOCTOR, THAT IN MANY OF THE
22 STUDIES THAT YOU RELIED ON, THE AUTHORS THEMSELVES
23 DESCRIBE THE STATE OF THE SCIENCE AS TO LEAD AND ASD AS
24 INCONSISTENT; CORRECT?

25 A NO AUTHOR OF A STUDY OF ONE SINGLE STUDY WHO
26 HASN'T DONE A VERY CAREFUL META ANALYTIC SUMMARY SHOULD
27 EVER SAY SOMETHING LIKE THAT, EXCEPT FOR POINTING OUT
28 WHERE THEIR STUDY BELONGS BECAUSE THEY ARE -- FOR ANY

1 ONE STUDY, THEY ARE NOT USUALLY DOING WHAT I'M DOING
2 HERE, WHICH IS GO WITH A FINE-TOOTHED COMB THROUGH THE
3 WHOLE LITERATURE AND COMING UP WITH A VERY THOROUGH AND
4 THOUGHTFUL REVIEW OF THIS LITERATURE.

5 GENERALLY, WHAT ANY ONE STUDY AUTHOR DOES IS
6 THEY LOOK INTO THE LITERATURE, THEY FIND REASONS TO MAKE
7 THEIR OWN STUDY SOUND LIKE IT WILL SOLVE A PROBLEM, AND
8 THEY SAY IN THEIR INTRODUCTIONS, THIS IS WHAT I DO MY
9 STUDY, I DO IT BECAUSE I IDENTIFIED THIS GAP IN THE
10 LITERATURE AND THERE ARE STILL INCONSISTENCIES AND NOW
11 I'M DOING THIS EXPERIMENT, I'M JUSTIFYING WHY I'M DOING
12 THIS STUDY AND WHY I'M TELLING YOU YOU SHOULD BE READING
13 MY REPORT. AND THAT'S ALL THEY DO. THEY ARE NOT DOING
14 A BRADFORD HILL. THEY ARE NOT TELLING YOU THAT, YOU
15 KNOW, THEY HAVE AN EXPERT OPINION. THEY ARE JUST
16 POINTING OUT WHY THE READER SHOULD BE INTERESTED IN
17 THEIR MATERIAL.

18 Q LET'S LOOK AT SOME OF THESE STUDIES, DOCTOR.

19 LET ME SHOW YOU A DEMONSTRATIVE OF THIS SOME OF
20 THESE STUDIES. ALL OF THESE ARE MARKED AS EXHIBITS.
21 HOLD ON ONE SECOND.

22 LET'S -- I'VE ARRANGED THESE STUDIES -- I'VE
23 PICKED FIVE OF THEM CHRONOLOGICALLY. LET'S START AT THE
24 TOP.

25 THERE'S A STUDY CALLED ABDULLAH.

26 YOU'VE READ THAT STUDY, DID YOU NOT, DOCTOR?

27 A YES, I DID.

28 Q AND THIS IS A STUDY OF BABY TEETH WHERE THE

1 AUTHORS LOOKED AT SHED BABY TEETH AND THEY LOOKED AT
2 EXPOSURES TO LEAD AND MERCURY THAT WOULD HAVE OCCURRED
3 BEFORE THE DIAGNOSIS OF ASD; CORRECT?

4 A THEY LOOKED AT BABY TEETH AND ASD, YES.

5 Q YEAH. OKAY.

6 AND THIS IS -- EXHIBIT 14 IS THE ABDULLAH
7 STUDY, AND THIS IS A QUOTE FROM PAGE 933 TO 934.

8 "THESE NULL FINDINGS ADD TO THE CONTRADICTORY
9 EVIDENCE REGARDING LEAD AND MERCURY EXPOSURE IN
10 ASD."

11 DO YOU SEE THAT?

12 A YES, I SEE THAT.

13 Q AND DO YOU AGREE THAT AS OF -- THIS STUDY IS
14 FROM 2012 -- DO YOU AGREE THAT AS OF 2012 THERE WAS
15 CONTRADICTORY EVIDENCE IN THE LITERATURE REGARDING LEAD
16 AND MERCURY EXPOSURE IN ASD?

17 A I ALSO RECALL THAT THEY ARE THEN GOING ON TO
18 SAY THAT THEIR STUDY JUST TELLS YOU WE NEED MORE STUDIES
19 AND DOES NOT CONTRADICT THE CAUSAL -- ANY CAUSAL
20 RELATIONSHIP BETWEEN THESE AGENTS AND ASD. AND IF YOU
21 WOULD LIKE, WE CAN GO TO THAT PART OF THEIR DISCUSSION
22 WHERE THEY ACTUALLY PUT THAT IN CONTEXT.

23 Q I'M JUST ASKING, DO YOU AGREE WITH THIS
24 STATEMENT, DR. RITZ, THAT'S ON THE SCREEN?

25 A I CANNOT AGREE. WITHOUT THE CONTEXT, I DON'T
26 AGREE WITH IT. I AGREE WITH IT THE WAY THE AUTHORS
27 ACTUALLY FORMULATED IT, WHICH WAS IN THE CONTEXT OF OUR
28 STUDY IS JUST ONE STUDY, WE SEE WHAT WE SEE, WE NEED

1 MORE -- WE NEED MORE STUDIES.

2 AND I'M SURE THEY WANTED MONEY TO DO MORE
3 STUDIES. AND THEY ARE CORRECT. WE SHOULD BE DOING MORE
4 STUDIES.

5 Q AND ONE OF THE THINGS YOU SAID EARLIER WHEN MR.
6 WISNER WAS ASKING YOU QUESTIONS IS THAT THESE STATEMENTS
7 WERE, I THINK YOU SAID THEY ARE IN THE INTRODUCTION AND
8 AUTHORS PUT THEM THERE TO SET THINGS UP WAS I THINK THE
9 PHRASE YOU USED. WAS THAT CORRECT?

10 A THEY SET THE STAGE FOR WHAT THEY ARE GOING TO
11 TELL THE READER, YES.

12 Q ALL RIGHT.

13 THIS STATEMENT BY ABDULLAH, THIS IS NOT IN THE
14 INTRODUCTION. THIS IS IN THE DISCUSSION, IS IT NOT?

15 A YOU NEED TO SHOW ME. I DON'T KNOW.

16 Q OKAY. LET'S --

17 A I JUST SEE ONE SENTENCE.

18 Q ALL RIGHT. WE'LL LOOK AT THAT. WE'LL PULL UP
19 EXHIBIT 14.

20 A AM I SUPPOSED TO LOOK UP SOMETHING?

21 Q OH, WE'RE GOING TO HAVE IT ON THE SCREEN IN A
22 SECOND. AND WE'RE GOING TO GO TO PAGE 933.

23 OKAY. AND IF YOU SEE AT THE -- WE'RE GOING TO
24 BLOW IT UP -- THE BOTTOM PARAGRAPH ON THE RIGHT SIDE.
25 THIS IS IN THE DISCUSSION SECTION.

26 DO YOU SEE WHERE IT SAYS "DISCUSSION," DOCTOR?

27 A YES, I DO.

28 Q OKAY.

1 AND RIGHT AT THE BOTTOM AND THEN RUNNING OVER
2 TO PAGE 934.

3 "THESE NULL FINDINGS" -- WELL, LET ME START AT
4 THE BEGINNING OF THE PARAGRAPH SO WE GET THE RESULTS OF
5 THE STUDY.

6 IN THIS STUDY THEY FOUND NO SIGNIFICANT
7 DIFFERENCES IN LEAD OR MERCURY CONCENTRATIONS IN THE
8 PRE- OR POST-NATAL REGION FOR CHILDREN WITH ASD'S OR
9 TYPICAL DEVELOPMENT.

10 DO YOU SEE THAT?

11 A YES.

12 Q AND THAT WAS THE RESULT OF THE STUDY. IT WAS A
13 NO ASSOCIATION FOUND; CORRECT?

14 A THAT'S CORRECT.

15 Q AND THEN THEY SAY, "THESE NULL FINDINGS ADD TO
16 THE CONTRADICTIONARY EVIDENCE REGARDING LEAD AND
17 MERCURY AND EXPOSURE IN ASD'S."

18 AND THEN THEY CITE A NUMBER OF STUDIES.

19 DO YOU SEE THAT?

20 A YES.

21 Q OKAY.

22 A BUT LET'S -- LET'S READ ON.

23 "THE MIXED CONCLUSIONS MAY BE ATTRIBUTABLE TO
24 DIFFERENCES IN SAMPLE TYPE, MEANS OF EXPOSURE
25 AND TIMING OF EXPOSURE; GIVEN THAT THERE ARE
26 MANY KNOWN ADVERSE DEVELOPMENTAL CONSEQUENCES
27 OF EXPOSURE OF LEAD, FURTHER INVESTIGATION OF
28 HEAVY METALS IN DIFFERENT BIOMARKERS AND TIMING

1 OF EXPOSURE MAY PROVIDE VALUABLE INFORMATION IN
2 THE ETIOLOGY OF DISPARATE NEUROBEHAVIORAL
3 DEVELOPMENTS."

4 SO THIS IS EXACTLY THE CONTEXT THAT I WAS
5 REFERRING TO. THESE AUTHORS ARE NOT SAYING, WE ARE THE
6 END-ALL OF THIS RESEARCH. THEY ARE SAYING, WELL, THIS
7 IS WHAT WE SEE, BUT THEY EVEN SAY THERE ARE OTHER
8 STUDIES OUT THERE, THERE ARE OTHER STUDIES SHOWING LEAD
9 IS NO GOOD FOR NEURODEVELOPMENT AND WE DEFINITELY NEED
10 TO KNOW MORE AND WE ARE WORRIED ABOUT IT.

11 THAT'S WHAT THIS SAYS TO ME.

12 Q OKAY.

13 LET'S GO BACK TO THE DEMONSTRATIVE THAT WE JUST
14 HAD ON THE SCREEN TO THE NEXT STUDY.

15 THIS IS KIM, ET AL.

16 YOU RELIED ON THE KIM STUDY, DID YOU NOT?

17 A KIM -- IF IT'S THE KIM STUDY FROM KOREAN ON
18 LEAD IN 8 YEAR OLDS.

19 Q YES.

20 A YES.

21 Q AND WHAT THE AUTHORS IN KIM SAID WAS: "THE
22 ASSOCIATION BETWEEN LEAD EXPOSURE AND
23 AUTISM SPECTRUM DISORDER IS INCONCLUSIVE.
24 PREVIOUS STUDIES EVALUATING THE ASSOCIATION
25 BETWEEN LEAD EXPOSURE AND AUTISM SPECTRUM
26 DISORDER HAVE REPORTED INCONCLUSIVE RESULTS
27 WITH EVIDENCE FOR POSITIVE, NULL AND NEGATIVE
28 ASSOCIATIONS."

1 DO YOU SEE THAT?

2 A YES.

3 Q AND DO YOU AGREE WITH THAT STATEMENT?

4 A CAN YOU SHOW ME THIS STATEMENT IN CONTEXT?

5 Q OF COURSE. THIS IS EXHIBIT 87.

6 AND WE'LL PULL THAT UP IN A SECOND.

7 WE'LL GO TO THE SECOND PAGE OF THE STUDY.

8 AND THAT FIRST FULL PARAGRAPH ON THE LEFT.

9 A YEAH, THAT'S THE INTRODUCTION. THAT'S EXACTLY

10 WHAT I TRIED TO EXPLAIN BEFORE THAT'S WHERE AUTHORS SET

11 UP THE STAGE AND TELL YOU WHY YOU, AS A READER, SHOULD

12 REALLY KEEP READING.

13 Q RIGHT.

14 AND MY QUESTION TO YOU IS DO YOU AGREE WITH THE

15 FIRST SENTENCE?

16 A I AGREE THAT THIS IS A REALLY GREAT WAY TO MAKE

17 ME WANT TO SEE WHAT THEY ARE SHOWING. BUT THIS IS NOT

18 AN EVALUATION OF EVERYTHING THAT'S OUT THERE IN THE

19 LITERATURE. THIS IS JUST A TEASER.

20 Q OKAY. IT'S A TEASER.

21 DOCTOR, THIS WAS A PEER-REVIEWED STUDY, WAS IT

22 NOT?

23 A OF COURSE.

24 Q AND YOU EXPLAINED YESTERDAY THE IMPORTANCE OF

25 PEER-REVIEW IN I THINK YOU SAID YOU ONLY LOOKED AT

26 PEER-REVIEWED -- OR ONLY RELIED ON PEER-REVIEWED

27 STUDIES; CORRECT?

28 A CORRECT.

1 Q AND PEER-REVIEW MEANS THAT INDEPENDENT EXPERTS
2 IN THE FIELD HAVE REVIEWED THE MANUSCRIPT BEFORE
3 PUBLICATION TO ENSURE THAT THE CONCLUSIONS BEING DRAWN
4 AND THE STATEMENTS BEING MADE IN THE ENTIRE MANUSCRIPT
5 ARE APPROPRIATE; CORRECT?

6 A YES. AND I, AS A REVIEWER, WOULD NOT HAVE A
7 PROBLEM WITH THIS BECAUSE ALL IT SAYS IS, OKAY, THE
8 LITERATURE IS NOT AT A POINT WHERE, YOU KNOW, WE WOULD
9 -- WHERE OUR STUDY WOULDN'T CONTRIBUTE MORE INFORMATION.
10 THAT'S WHAT THIS SAYS.

11 IT SAYS IF WE HAVE SATURATED TO A POINT WHERE
12 ANY OTHER STUDY WOULD NOT GIVE ME ANY ADDITIONAL
13 INFORMATION ANYMORE, THEN I SHOULDN'T BE READING THIS
14 ANYMORE. THAT'S ALL THAT THEY ARE TRYING TO SAY HERE,
15 AND THAT'S FINE. THEY ARE NOT -- THEY ARE NOT SAYING,
16 YOU KNOW, THERE IS ABSOLUTELY NOTHING WE DON'T KNOW --
17 WE KNOW ABOUT ASD. THEY ARE JUST SAYING, WELL, THERE
18 ARE STUDIES AND THERE ARE ACTUALLY MORE STUDIES SHOWING
19 POSITIVE RESULTS THAN THERE ARE STUDIES SHOWING NO
20 RESULTS OR MAYBE NEGATIVE ASSOCIATIONS, BUT OUR STUDY IS
21 GOING TO BE BIG BECAUSE THEY ARE ALSO SAYING IN THE NEXT
22 SENTENCE, THESE STUDIES EMPLOY CASE CONTROL DESIGNS, VIA
23 A COHORT STUDY, THESE STUDIES HAD SAMPLE SIZES OF 105
24 CHILDREN OR LESS. OUR STUDY IS THOUSANDS OF CHILDREN.

25 ALL OF THIS IS TO SET THE STAGE FOR THIS STUDY
26 TO BE ONE THAT I WANT TO KEEP READING. THAT'S ALL.

27 Q OKAY. LET'S GO TO THE NEXT STUDY.

28 A DIDN'T YOU HAVE SOMETHING ELSE IN THIS STUDY

1 YOU WANTED TO SHOW ME?

2 Q NO. I'M GOING TO DO ONE MORE.

3 ARORA, THAT IS A STUDY YOU TALKED ABOUT QUITE
4 AT LENGTH YESTERDAY.

5 DO YOU REMEMBER TALKING ABOUT THE ARORA STUDY?

6 A OF COURSE, YES.

7 Q OKAY.

8 AND THE ARORA STUDY, THE ONE WITH THE TWINS AND
9 THE BABY TEETH THAT YOU TALKED ABOUT YESTERDAY, THESE
10 AUTHORS SAID, "STUDIES OF TOXIC METALS AND NUTRITIONAL
11 ELEMENTS OF ASD HAVE YIELDED MIXED RESULTS
12 ALTHOUGH SEVERAL STUDIES REPORTED HIGHER
13 CONCENTRATIONS FOR TOXIC METALS IN ASD,
14 INCLUDING THE NEUROTOXIN LEAD, OTHERS FOUND NO
15 ASSOCIATION."

16 DO YOU SEE THAT?

17 A YES.

18 Q AND DO YOU AGREE THAT AS OF 2017, THE STUDIES
19 OF TOXIC METALS IN ASD YIELDED MIXED RESULTS?

20 A CAN YOU PUT THIS IN CONTEXT? WHERE THEY --

21 Q YOU'D LIKE TO LOOK AT --

22 A YEAH, I WANT TO SEE WHERE THEY --

23 Q OKAY.

24 A -- SAY THAT.

25 Q THIS IS EXHIBIT 27. WE'LL PULL THAT UP.

26 IT'S THE FIRST TWO SENTENCES OF THIS PARAGRAPH
27 ARE THE ONES I JUST SHOWED YOU.

28 AND THEN IT TALKS ABOUT -- ACTUALLY, THE

1 CONTEXT IS -- IT TALKS -- THE NEXT SENTENCE IS SAYING:

2 "PREVIOUS RESEARCH SHOWED METHODOLOGICAL
3 SHORTCOMINGS THAT LIMITED INTERPRETATION AND
4 GENERALIZE ABILITY OF THE FINDINGS."

5 AND THEN IT TALKS FURTHER ABOUT THOSE
6 SHORTCOMINGS.

7 DO YOU AGREE WITH THESE STATEMENTS, DOCTOR?

8 A WELL, CAN YOU SHOW ME IN WHAT PART OF THE PAPER
9 THIS IS?

10 Q THIS IS IN THE INTRODUCTION OF THE PAPER.

11 A EXACTLY. MY POINT.

12 THEY ARE, AGAIN, JUST, YOU KNOW, SETTING IT UP
13 AS THE STAGE FOR WHY THEIR STUDY IS SO MUCH BETTER THAN
14 EVERYTHING ELSE THAT WE HAVE IN THE LITERATURE AND YOU
15 SHOULD PLEASE READ THIS BECAUSE WE ARE GOING TO NOW HELP
16 SOLVE THIS GAP IN THE SCIENCE AND WE ARE GOING TO BE
17 BETTER THAN ALL THESE OTHERS.

18 THAT'S WHAT THEY ARE SAYING.

19 Q OKAY. BUT MY QUESTION TO YOU IS DO YOU AGREE
20 WITH THE AUTHORS THAT THERE'S A GAP IN THE SCIENCE?

21 A WELL, THAT'S WHAT THE AUTHORS ARE SAYING, BUT
22 THEY ARE SAYING THIS VERY GENERALLY, AND YOU KNOW, IT
23 DOESN'T MATTER WHETHER I AGREE WITH THEM OR NOT. IT'S
24 NOTHING BUT A TEASER. AND THEY ARE CALLING LEAD A KNOWN
25 NEUROTOXIN BY THE WAY.

26 Q YOU TALKED WITH MR. WISNER ABOUT THE SKOGHEIM
27 -- LET'S GO BACK TO THE DEMONSTRATIVE ONE MORE TIME --
28 YOU TALKED TO HIM ABOUT THE SKOGHEIM STUDY TODAY.

1 DO YOU RECALL THAT?

2 A YES.

3 Q OKAY.

4 AND THIS IS THE QUOTE FROM THE SKOGHEIM STUDY
5 TALKING ABOUT INCONSISTENCIES REGARDING STUDY DESIGNS
6 AND FINDINGS.

7 DO YOU SEE THAT?

8 A YEAH.

9 Q OKAY.

10 AND IS IT YOUR TESTIMONY, DOCTOR, THAT THESE
11 STATEMENTS BY THE AUTHORS, THAT THEY DON'T HONESTLY
12 BELIEVE?

13 A NO, BUT THEY MIGHT BE FORMULATED TOO GENERALLY.
14 BECAUSE IF YOU, FOR EXAMPLE, READ SKOGHEIM VERY
15 CAREFULLY, WHAT THEY ARE SAYING IS ALL TOGETHER THERE'S
16 STILL LIMITED KNOWLEDGE ON PRENATAL EXPOSURE TO METALS,
17 SO THIS IS ACTUALLY MUCH MORE CAREFULLY FORMULATED THAN
18 SOME OF THE OTHER SENTENCES WHERE THEY ARE SAYING, OH,
19 IN GENERAL, WE DON'T KNOW ENOUGH.

20 NO, THAT'S NOT RIGHT. IN GENERAL WE KNOW A
21 LOT. BUT SPECIFICALLY WE DON'T KNOW ENOUGH YET. AND
22 EVERY -- EVERY SPECIFIC STUDY ADDS TO THE BIGGER
23 SCIENTIFIC PICTURE BECAUSE THEY GO INTO DETAIL AND THEY
24 ARE ADDING TO THE LITERATURE IN ONE SPECIFIC WAY.

25 THIS SKOGHEIM STUDY IS ABOUT PRENATAL
26 EXPOSURES, AND THAT'S WHAT THEIR CONTRIBUTION TO THE
27 LITERATURE IS, AND IN THAT AREA THEY WANT TO MAKE THEIR
28 OWN ENTRE INTO, YOU KNOW, WHAT IS KNOWN ABOUT THIS. AND

1 THAT'S WHAT THEY ARE SAYING THERE. THEY ARE ACTUALLY
2 MUCH MORE CAREFUL THAN THESE OTHER STATEMENTS.

3 Q ALL RIGHT. DOCTOR, LET'S LOOK AT YOUR EXPERT
4 REPORT. THIS IS EXHIBIT 4. AND WE'RE GOING TO LOOK AT
5 PAGE 30 TO YOUR REPORT WHICH IS YOUR BRADFORD HILL
6 ANALYSIS ON LEAD AND ASD.

7 AND I WANT TO LOOK AT YOUR ANALYSIS OF
8 CONSISTENCY, WHICH IS NEAR THE BOTTOM OF THE PAGE WHICH
9 WE'RE GOING TO BLOW UP IN A SECOND.

10 ALL RIGHT. THIS IS -- IN YOUR BRADFORD HILL OF
11 CONSISTENCY ON LEAD AND ASD, YOU SAID: "THIS CRITERION
12 IS MET SINCE POSITIVE ASSOCIATIONS HAVE BEEN
13 REPORTED FOR DIFFERENT POPULATIONS AND IN
14 DIFFERENT GEOGRAPHIC REGIONS AND DIFFERENT TIME
15 PERIODS AS WELL AS DIFFERENT BIOLOGIC MATRICES
16 WHICH STRENGTHENS THE LIKELIHOOD OF A TRUE
17 EFFECT."

18 DO YOU SEE THAT?

19 A YES, I DO.

20 Q AND ISN'T THE SAME EXACT THING TRUE OF STUDIES
21 THAT FOUND NO ASSOCIATIONS BETWEEN LED AND ASD?

22 IN OTHER WORDS, STUDIES THAT HAVE FOUND NO
23 ASSOCIATIONS HAVE BEEN REPORTED FOR DIFFERENT
24 POPULATIONS AND IN DIFFERENT GEOGRAPHIC REGIONS AND
25 DIFFERENT TIME PERIODS AS WELL AS DIFFERENT BIOLOGIC
26 MATRICIS; ISN'T THAT TRUE?

27 A I AM NOT SURE WHAT YOU'RE ASKING ME.

28 Q WELL, I'M ASKING YOU, YOU SAID HERE THAT THERE

1 WERE STUDIES THAT FOUND POSITIVE ASSOCIATIONS THAT HAD
2 THE CHARACTERISTICS I JUST READ ABOUT, THE DIFFERENT
3 POPULATIONS, AND SO ON.

4 A RIGHT.

5 Q MY QUESTION IS, ISN'T IT TRUE THAT THERE ARE
6 STUDIES FINDING NO ASSOCIATIONS BETWEEN LEAD AND ASD IN
7 DIFFERENT POPULATIONS AND IN DIFFERENT GEOGRAPHIC
8 REGIONS AND DIFFERENT TIME PERIODS AS WELL AS DIFFERENT
9 BIOLOGIC MATRICES; ISN'T THAT TRUE?

10 A WELL, IF THERE ARE STUDIES, AND THERE ARE
11 STUDIES, THAT ARE SHOWING NO ASSOCIATIONS OR NEGATIVE
12 ASSOCIATIONS, THEN THIS STATEMENT IS ALSO CORRECT
13 BECAUSE IT'S MORE THAN ONE STUDY, SO THEY HAVE TO HAVE
14 BEEN IN DIFFERENT POPULATIONS OR IN DIFFERENT REGIONS OR
15 AT DIFFERENT TIME PERIODS.

16 WHETHER THEY ARE IN DIFFERENT BIOLOGIC
17 MATRICES, I DON'T KNOW RIGHT NOW OFF THE TOP OF MY HEAD,
18 BUT I IMAGINE YES, BECAUSE WE JUST LOOKED AT THE TOOTH
19 STUDY AND I KNOW THERE ARE SOME ON URINE OR HAIR AS
20 WELL.

21 Q OKAY.

22 A BUT THAT DOESN'T MEAN THERE'S NO ASSOCIATION.
23 THAT'S JUST SOMETHING YOU WOULD EXPECT TO BE
24 CORRECT IF THERE'S MORE THAN ONE STUDY THAT DOESN'T SHOW
25 AN ASSOCIATION.

26 AND IF -- THE MORE STUDIES YOU HAVE -- THE MORE
27 STUDIES YOU HAVE IN SCIENCE, THE MORE INFORMATION YOU
28 GENERATE, THE MORE KNOWLEDGE YOU GENERATE, THE MORE

1 STUDIES YOU ALSO WILL HAVE THAT JUST RANDOMLY DON'T SHOW
2 AN EFFECT, THAT ARE TOO SMALL TO SHOW AN EFFECT, THAT
3 USE METHODS THAT ARE INAPPROPRIATE THAT HAVE LOWER
4 LIMITS OF DETECTION THAT ARE NOT, YOU KNOW, SENSITIVE
5 ENOUGH, ET CETERA, ET CETERA, ET CETERA.

6 SO, YES, THE MORE YOU ACTUALLY DO SCIENCE, THE
7 MORE YOU MIGHT ALSO GENERATE SOME BAD STUDIES.

8 Q OKAY. WE CAN TAKE THAT DOWN.

9 DOCTOR, LET ME TALK TO YOU ABOUT THE
10 TEMPORALITY FACTOR OF BRADFORD HILL.

11 AND PARTICULARLY I WANT TO ASK YOU, YESTERDAY
12 WHEN YOU WERE DOING YOUR EPI 101, I THINK YOU CALLED IT,
13 PRESENTATION, YOU TALKED ABOUT SOME DIFFERENT TYPES OF
14 STUDY DESIGNS.

15 DO YOU REMEMBER THAT?

16 A YES.

17 Q AND YOU TALKED ABOUT, AS I RECALL, THREE TYPES
18 OF STUDIES; COHORT STUDIES, CASE CONTROL STUDIES AND
19 CROSS-SECTIONAL STUDIES.

20 DO YOU REMEMBER TALKING ABOUT THOSE STUDIES
21 YESTERDAY?

22 A YES.

23 Q AND DO YOU AGREE WITH ME THAT ALMOST ALL OF THE
24 STUDIES ON AUTISM SPECTRUM DISORDER TO DATE RELY ON CASE
25 CONTROL OR CROSS-SECTIONAL DESIGNS?

26 A NO, NOT ALMOST ALL.

27 Q OKAY. LET'S LOOK AT YOUR REPORT. THIS IS
28 EXHIBIT 4. AND PAGE 17 AT THE TOP. RIGHT AT THE TOP,

1 DOCTOR.

2 YOU SAID IN YOUR REPORT, "RATHER, ALMOST ALL
3 STUDIES OF ASD AND MOST ADHD STUDIES TO DATE
4 RELIED ON THE MUCH MORE EFFICIENT CASE CONTROL
5 OR CROSS-SECTIONAL DESIGN."

6 CORRECT?

7 A YEAH, CASE CONTROL, NOT CROSS-SECTIONAL.
8 I MEAN, YES, WE HAVE A TON OF CASE CONTROL
9 STUDIES.

10 SO WHAT IS YOUR QUESTION? WHAT IS YOUR
11 QUESTION? I DON'T GET IT.

12 Q OKAY.

13 MY QUESTION WAS SIMPLY, ISN'T IT TRUE THAT
14 ALMOST ALL OF THE STUDIES OF ASD TO DATE RELY ON THE
15 CASE CONTROL OR CROSS-SECTIONAL DESIGN; CORRECT?

16 A WHAT I'M SAYING HERE IS THAT THEY ARE RELYING
17 ON A MUCH MORE EFFICIENT DESIGN, WHICH IS THE CASE
18 CONTROL STUDY, THAN THE COHORT STUDY BECAUSE THE COHORT
19 STUDIES ARE REALLY, REALLY INEFFICIENT FOR RARE
20 DISORDERS LIKE ASD.

21 ADHD, WE HAVE A LOT MORE COHORT STUDIES. BUT
22 FOR ASD WE MOSTLY HAVE CASE CONTROL STUDIES FOR A GOOD
23 REASON BECAUSE THEY ARE THE MOST EFFICIENT STUDY DESIGN
24 WE HAVE WHEN IT COMES TO A REALLY RARE DISORDER WHICH
25 ASD IS.

26 Q OKAY. WE CAN TAKE THAT DOWN.

27 THANK YOU, DOCTOR.

28 ONE ADVANTAGE OF A -- LET'S TALK ABOUT THE

1 COHORT STUDY.

2 THE ADVANTAGE OF THE -- ONE ADVANTAGE OF A
3 COHORT STUDY IS THAT IT CAN BE USED TO ESTABLISH
4 TEMPORALITY; THAT IS, THE RESEARCHERS KNOW THAT THE
5 EXPOSURE IN QUESTION OCCURRED BEFORE THE OUTCOME THAT
6 YOU'RE STUDYING; CORRECT?

7 A THAT'S ONE ADVANTAGE, YES.

8 Q AND IN A CASE CONTROL STUDY, I THINK YOU
9 EXPLAINED THIS YESTERDAY, YOU BEGIN WITH A GROUP OF
10 INDIVIDUALS WHO HAVE THE DISEASE HERE, LET'S SAY ASD,
11 AND THEN YOU COMPARE THEM TO PEOPLE WHO DON'T HAVE THE
12 DISEASE.

13 THOSE ARE THE CASES AND THE CONTROLS; CORRECT?

14 A THAT'S -- YEAH, THAT'S USUALLY HOW WE DESCRIBE
15 IT.

16 Q YEAH.

17 AND THEN WHEN -- THEN SOMETIME AFTER THE CASES
18 AND THE CONTROLS ARE SELECTED, THE RESEARCHER WILL
19 MEASURE LEVELS OF, IN THIS CASE, HEAVY METALS AND
20 COMPARE THE GROUPS; CORRECT?

21 A I'M NOT SURE WHAT YOU MEAN BY "SOMETIME AFTER"
22 BECAUSE CASE CONTROL STUDIES, THE ONLY REASON WHY
23 TEMPORALITY COMES IN HERE, IT DOESN'T MATTER WHEN THE
24 RESEARCHER DECIDES TO MEASURE; IT MATTERS WHAT THE
25 RESEARCHER MEASURES AND WHEN THAT MEASURE WAS ACTUALLY
26 TAKEN.

27 SO, FOR EXAMPLE, IF I HAVE A CASE CONTROL STUDY
28 WITH BLOOD SAMPLES STORED IN THE CALIFORNIA BIO BANK AND

1 I GO BACK TO THE BIO BANK AND FIND A BLOOD SPOT FROM A
2 CHILD AND I MEASURE EXPOSURE IN THAT BLOOD SPOT, I KNOW
3 THAT TEMPORARILY THAT BLOOD SPOT'S EXPOSURE IS PRIOR TO
4 THE ONSET OF ANYTHING THAT HAPPENED AFTER BIRTH, AND
5 THAT'S A PERFECT TEMPORALITY I CAN ESTABLISH IN A CASE
6 CONTROL STUDY. IT DOESN'T MATTER WHEN THE RESEARCHER
7 DOES THAT. IT MATTERS WHEN THE EXPOSURE OR THE SAMPLE
8 IN WHICH I MEASURE THE EXPOSURE WAS ACTUALLY TAKEN.

9 Q ISN'T IT TRUE THAT, DOCTOR, IN THE CASE
10 CONTROLS -- ALMOST ALL OF THE CASE CONTROL STUDIES THAT
11 YOU RELIED ON IN CONNECTION WITH LEAD AND ASD, THE
12 EXPOSURE TO LEAD THAT'S BEING MEASURED OCCURRED AFTER
13 THE CHILDREN DEVELOPED ASD? ISN'T THAT CORRECT?

14 A THAT'S AN ASSUMPTION YOU'RE MAKING. NO. THE
15 SAMPLE WAS COLLECTED AFTER THE -- AFTER THE CASE WAS
16 DIAGNOSED. THAT WE KNOW.

17 SO THE BLOOD SAMPLE, THE HAIR SAMPLE, THE URINE
18 SAMPLE MAY HAVE BEEN TAKEN FROM THE CHILD OR WILL HAVE
19 BEEN TAKEN FROM THE CHILD AFTER THE CHILD WAS DIAGNOSED
20 AND AT THE SAME TIME A CONTROL SAMPLE WAS TAKEN. WHAT
21 THAT SAMPLE REPRESENTS DEPENDS ON WHAT IT ACTUALLY --
22 WHAT IT GIVES YOU.

23 IN TERMS OF LEAD, THE BLOOD SAMPLE GIVES YOU
24 RELATIVELY RECENT EXPOSURE UNLESS THERE WAS NO RECENT
25 EXPOSURE. WHAT DO I MEAN BY THIS? WE KNOW LEAD IS
26 STORED IN THE BODY. LEAD IS STORED IN THE BONE. SO THE
27 CHILD CAN HAVE BEEN EXPOSED IN UTERO, CAN HAVE BEEN
28 EXPOSED IN THE FIRST, SECOND, THIRD YEAR OF LIFE, THE

1 LEAD GETS STORED IN THE BONE.

2 WHAT DOES LEAD DO? IT HAS AN EQUILIBRIUM WITH
3 THE BLOOD. SO WHAT YOU MEASURE IN THE BLOOD OF A THREE
4 YEAR OLD MAY ACTUALLY REFLECT THE EXPOSURE AT AGE ONE
5 BECAUSE UNLESS AT THREE YEARS OLD THE KID ALSO GETS
6 EXPOSED.

7 SO WHAT WE ARE MEASURING IN ONE BLOOD SAMPLE
8 MEANS VERY DIFFERENT THINGS DEPENDING ON WHETHER THERE'S
9 CURRENT EXPOSURE OR NOT. IF THERE'S NO CURRENT EXPOSURE
10 IN THE CASE, THEN IT ACTUALLY REFLECTS PAST EXPOSURE,
11 HISTORICAL EXPOSURE, BECAUSE THE LEAD LEECHES OUT THE
12 BONE OF THE CHILD INTO THE BLOOD, AND THAT'S WHAT I'M
13 MEASURING.

14 Q WELL, LET ME ASK YOU SOME QUESTIONS ABOUT THAT.
15 FIRST LET'S SEE WHAT YOUR TESTIMONY WAS ON THIS
16 TOPIC. LET'S LOOK AT YOUR DEPOSITION AGAIN WHICH IS
17 EXHIBIT 7 AT PAGE 38.

18 AND IF YOU LOOK STARTING WITH THE QUESTION AT
19 LINE 9.

20 LET'S BLOW THAT UP. AND THE ANSWER.

21 I ASKED YOU, DOCTOR, THE QUESTION I JUST ASKED
22 YOU:

23 "IN CASE CONTROL STUDIES THAT YOU RELY ON IN
24 YOUR REPORT, FOR MOST OF THE STUDIES, THE
25 MEASUREMENT OF THE EXPOSURE OCCURRED AFTER THE
26 DIAGNOSIS OF ASD; CORRECT?"

27 YOU SAID, "FOR MOST OF THE STUDIES, NOT FOR
28 ALL."

1 IS THAT TRUE?

2 A IT'S WHAT'S WRITTEN HERE, SO I IMAGINE IT'S
3 TRUE, YES.

4 Q OKAY.

5 NOW --

6 A WHAT I MEANT IS WHAT I JUST EXPLAINED.

7 Q YOU MENTIONED SOMETHING ABOUT BONE.

8 THERE'S NO STUDIES -- NONE OF THE STUDIES YOU
9 RELY ON MEASURED LEAD LEVELS OF BONE IN CHILDREN;
10 CORRECT?

11 A NO, NONE OF THE STUDIES DID BECAUSE YOU COULD
12 DO THAT, HOWEVER, YOU HAVE TO MAKE A CHILD SIT STILL FOR
13 HALF AN HOUR. THAT'S A REALLY HEAVY -- HARD THING TO DO
14 ESPECIALLY IN AN AUTISTIC CHILD OR IN AN ADHD CHILD.

15 Q RIGHT.

16 SO WHEN YOU GAVE -- YOU JUST TESTIFIED A WHILE
17 AGO THIS COULD BE LEVELS OF LEAD THAT SEEPED OUT OF THE
18 BONE AND THEN WAS LATER REFLECTED IN THE BLOOD.

19 THERE'S NO STUDIES OF THAT THAT YOU RELIED ON
20 HERE; CORRECT?

21 A WELL, THAT IS WHAT WE KNOW ABOUT HOW LEAD
22 BEHAVES.

23 LEAD IS RARELY -- IT IS EXCRETED IN THE URINE.
24 IT DOES GET INTO THE HAIR. WE KNOW THAT. BUT WHAT IT
25 MOSTLY DOES IS IT IS -- IT BEHAVES LIKE CALCIUM AND IT
26 GETS STORED IN THE BONE, IT GETS STORED IN THE TIBIA IN
27 THE PATELLA. AND THEN WHILE THE CHILD IS GROWING, THE
28 BONE REMODELS, AND DURING THIS BONE REMODELLING, THE

1 LEAD GETS ACTIVATED AND THE LEAD GETS OUT INTO THE
2 BLOODSTREAM AGAIN.

3 SO IT'S A CONSTANT BALANCE BETWEEN WHAT'S IN
4 THE BONE AND WHAT'S IN THE BLOOD.

5 IF THE CHILD IS EXPOSED AT AGE ONE AND HAS NO
6 OTHER EXPOSURES AFTERWARDS, WHAT YOU ARE MEASURING AT
7 AGE 5 IS ACTUALLY WHAT HAPPENED AT AGE 1 BECAUSE OF THAT
8 BALANCE BETWEEN THE BONE LEAD AND THE BLOOD LEAD.

9 Q DOCTOR, NONE OF THE AUTHORS, NONE OF THE
10 AUTHORS OF THE STUDIES ON WHICH YOU RELY THAT USE
11 BIOMARKERS OF EXPOSURE IN CASE CONTROL STUDIES LIKE
12 BLOOD OR URINE SUGGESTED THAT THE LEAD LEVEL WAS FROM
13 LONG-TERM EXPOSURE FROM BONES; ISN'T THAT TRUE?

14 MR. WISNER: OBJECTION -- OBJECTION. OVERBROAD
15 AS TO EVERY STUDY, EVERYTHING HE SAID.

16 THE COURT: OVERRULED.

17 THE WITNESS: YEAH, I MEAN, WE WOULD NEED TO
18 LOOK AT HOW THEY --

19 THE COURT: DR. RITZ --

20 THE WITNESS: YEAH.

21 MR. WISNER: I'M SORRY, THIS ISN'T A
22 DEPOSITION. I'VE OBJECTED. THE COURT HAS TO RULE.

23 THE COURT: I'M SORRY. I SAID OVERRULED.

24 MR. WISNER: OKAY. THANK YOU.

25 MR. PETROSINELLI:

26 Q GO AHEAD, DOCTOR. WOULD YOU LIKE ME TO REPEAT
27 THE QUESTION?

28 A OH, YES. PLEASE.

1 Q OKAY.

2 ISN'T IT TRUE THAT IN NONE OF THE STUDIES IN
3 WHICH YOU RELIED, THE CASE CONTROL AND CROSS-SECTIONAL
4 STUDIES, WHERE LEAD WAS MEASURED IN BLOOD OR URINE OR
5 HAIR, DID THE AUTHORS SAY THAT THAT MEASUREMENT WAS
6 REFLECTIVE OF EARLIER LEAD EXPOSURE THAT CAME FROM
7 BONES; CORRECT?

8 A ACTUALLY, I CAN'T ANSWER THIS QUESTION IN THIS
9 GENERAL WAY, BUT I DO RECALL THAT QUITE A FEW AUTHORS DO
10 SAY, WHILE WE KNOW THAT THESE MATRICES HAVE DIFFERENT
11 LENGTHS OF TIMING OR THEY REFLECT DIFFERENT LENGTHS OF
12 TIMING, WE KNOW THAT TEETH OF COURSE REFLECT VERY EARLY
13 LIFE, BUT WE ALSO KNOW THAT HAIR REFLECTS GIVEN THE
14 LENGTH OF THE HAIR MONTHS OR YEARS OF EXPOSURE, AND YES,
15 I'M PRETTY CERTAIN THAT ONE REASON WHY THEY TOOK BLOOD
16 LEAD IS BECAUSE OF COURSE WE KNOW THAT BIOMARKERS AREN'T
17 JUST BIOMARKERS OF WHAT'S HAPPENING YESTERDAY, THEY ARE
18 BIOMARKERS OF WHAT HAPPENED HISTORICALLY IF THERE IS A
19 STORAGE ORGAN.

20 AND WE ALL WHO DO LEAD STUDIES KNOW THE STORAGE
21 ORGAN IS THE BONE. AND OF COURSE THERE IS COMMUNICATION
22 BETWEEN THE BONE AND THE BLOOD. AND IF THERE IS NO
23 CURRENT EXPOSURE, THEN LEAD IN THE BLOOD REFLECTS PAST
24 EXPOSURES.

25 Q NO. MY QUESTION WAS -- I UNDERSTAND THAT
26 THAT'S YOUR THEORY.

27 MY QUESTION WAS --

28 A NOT MY THEORY. IT'S A FACT.

1 THE COURT: COUNSEL, I THINK SHE ANSWERED THE
2 QUESTION. SHE SAID SHE DIDN'T KNOW AND SHE TOLD YOU
3 WHAT SHE RECALLED AS BEST SHE COULD.

4 MR. PETROSINELLI: OKAY. OKAY. THANK YOU,
5 YOUR HONOR.

6 Q DOCTOR, IT'S ANOTHER TYPE OF A STUDY IS A
7 CROSS-SECTIONAL STUDY AND YOU RELIED ON SOME OF THOSE IN
8 FORMULATING YOUR OPINIONS; CORRECT?

9 A YES.

10 Q AND DO YOU AGREE THAT IN CROSS-SECTIONAL
11 STUDIES IT'S NOT POSSIBLE TO ESTABLISH THE TEMPORAL
12 RELATION BETWEEN EXPOSURE AND DISEASE THAT WOULD BE
13 NECESSARY FOR DRAWING A CAUSAL INFERENCE?

14 A IT'S ACTUALLY THE SAME SITUATION THAT WE HAVE
15 IN THE CASE CONTROL STUDY. IT'S ONLY -- IT'S ONLY ON A
16 -- ON A -- HOW DO I SAY THIS? WE HAVE -- IN A
17 CROSS-SECTIONAL STUDY, WE ARE AT THE SAME TIME
18 ESTABLISHING EXPOSURE LEVEL AND THE OUTCOME.

19 SO THE OUTCOME BY DEFINITION IS A PREVALENT
20 OUTCOME, MEANING, WE DON'T KNOW WHEN THE CHILD WAS
21 DIAGNOSED WITH THE DISORDER. IT COULD HAVE BEEN FIVE
22 YEARS AGO. IT COULD HAVE BEEN FIVE DAYS AGO. AND WE
23 ARE TAKING A BLOOD SAMPLE OR A HAIR SAMPLE OR A URINE
24 SAMPLE AT THAT TIME, THE SAME TIME THAT WE ARE
25 INVESTIGATING THE OUTCOME.

26 HOWEVER, WE CAN SAY THAT, FOR EXAMPLE, FOR THE
27 CHILDREN THAT WERE DIAGNOSED YESTERDAY, THE BLOOD LEAD
28 PROBABLY REFLECTS A FEW MONTHS PRIOR BECAUSE IT'S, YOU

1 KNOW, IT'S A CUMULATIVE MEASURE IN THE SAME WAY THAT I
2 JUST EXPLAINED.

3 AND HAIR DEFINITELY GOES BACK.

4 SO THEORETICALLY, YOU COULD HAVE A
5 CROSS-SECTIONAL STUDY THAT LIMITS TO THE DIAGNOSIS
6 WITHIN A CERTAIN NUMBER OF MONTHS THAT TAKES HAIR
7 SAMPLES AND THE HAIR SAMPLES THEN WOULD REFLECT EXPOSURE
8 OF PRIOR TO THE ONSET OF THIS DISEASE BECAUSE OF WHAT WE
9 KNOW ABOUT THE BIOLOGY.

10 HOWEVER, YES, WE ARE WORRIED ABOUT
11 CROSS-SECTIONAL STUDIES NOT BEING VERY CLEAR ABOUT
12 EXACTLY WHEN THE DIAGNOSIS WAS MADE, AND THEREFORE, THE
13 TEMPORALITY ISSUE IS NOT AS EASILY RESOLVABLE, BUT IT IS
14 RESOLVABLE IF YOU PAY ATTENTION.

15 Q OKAY. WELL, LET ME SHOW YOU ONE MORE EXCERPT
16 FROM WHAT WE CALL THE REFERENCE MANUAL ON SCIENTIFIC
17 EVIDENCE AND SEE IF YOU AGREE WITH WHAT THEY SAY ABOUT
18 CROSS-SECTIONAL STUDIES.

19 ONE SECOND, DOCTOR.

20 OKAY. THIS IS FROM THE REFERENCE MANUAL ON
21 SCIENTIFIC EVIDENCE PAGES 560 TO 6 IS AND ON
22 CROSS-SECTIONAL STUDIES.

23 AND, DOCTOR, I'M GOING TO READ TO YOU THE FIRST
24 SENTENCE THAT'S HIGHLIGHTED: "BECAUSE BOTH EXPOSURE AND
25 DISEASE ARE DETERMINED IN AN INDIVIDUAL AT
26 THE SAME POINT IN TIME, IT IS NOT POSSIBLE TO
27 ESTABLISH THE TEMPORAL RELATION BETWEEN
28 EXPOSURE AND DISEASE; THAT IS, THAT THE

1 EXPOSURE PRECEDED THE DISEASE WHICH WOULD BE
2 NECESSARY FOR DRAWING ANY CAUSAL INFERENCE."
3 DO YOU SEE WHERE I JUST READ FROM?
4 A YES.
5 Q DO YOU AGREE WITH THAT STATEMENT?
6 A IT IS SO BROAD AND SO NON SPECIFIC. IT IS
7 CORRECT IF REALLY WHAT YOU DO IN A CROSS-SECTIONAL STUDY
8 IS ESTABLISH EXPOSURE AT THAT POINT IN TIME; HOWEVER, IF
9 YOU ASK SOMEBODY TODAY, DID YOU SMOKE WHEN YOU WERE AGE
10 15, AND THAT PERSON DEVELOPED THEIR CANCER AT AGE 50,
11 AND THEY ANSWER YES, I ALREADY SMOKED AT AGE 15. I HAVE
12 TEMPORALITY, RIGHT.
13 SO A CROSS-SECTIONAL STUDY IS VERY MUCH CAPABLE
14 OF ESTABLISHING TEMPORALITY, BUT IF YOU ASK QUESTIONS
15 LIKE, ARE YOU A SMOKER NOW, AND YOU ASSESS WHETHER OR
16 NOT SOMEBODY HAS CANCER NOW, THEN YOU CAN'T ESTABLISH
17 TEMPORALITY. AND THAT'S WHAT THIS SAYS AND I AGREE WITH
18 THAT.
19 IF YOU ARE GOING ABOUT IT A LITTLE SMARTER AND
20 YOU SAID -- SAY -- YOU ASK WHEN DID YOU START SMOKING,
21 WHAT WAS YOUR AGE, AND THE AGE IS PRIOR TO THE ONSET
22 OF DISEASE, YOU HAVE ESTABLISHED TEMPORALITY. IT MAKES
23 TOTAL SENSE, RIGHT.
24 Q OKAY.
25 AND THEN LET ME ASK YOU ABOUT THE -- BEFORE I
26 MOVE TO A DIFFERENT TOPIC, MAYBE WE'LL TAKE A BREAK
27 AFTER THIS. THE LAST SENTENCE IN THE REFERENCE MANUAL.
28 THIS IS ON -- THIS WOULD BE ON PAGE 561.

1 "CROSS-SECTIONAL STUDIES ARE INFREQUENTLY USED
2 WHEN THE EXPOSURE OF INTEREST IS AN
3 ENVIRONMENTAL TOXIC AGENT, BUT THESE STUDIES
4 CAN PROVIDE VALUABLE LEADS FOR FURTHER
5 DIRECTIONS -- TO FURTHER DIRECTIONS FOR
6 RESEARCH."

7 DO YOU SEE THAT?

8 A YES.

9 Q DO YOU AGREE WITH THAT?

10 A ABSOLUTELY NOT BECAUSE WE HAVE A FEDERAL
11 GOVERNMENT THAT SPENDS MILLIONS OF DOLLARS EVERY YEAR TO
12 CONDUCT THE LARGEST CROSS-SECTIONAL STUDY IN THE NATION
13 CALLED NHNES, NATIONAL HEALTH AND NUTRITION EXAMINATION
14 SURVEY, AND ALL THEY DO IS ESTABLISH ENVIRONMENTAL
15 TOXINS. THERE'S A WHOLE LAB OF ANTONIO KALIFAT AT THE
16 CDC THAT MEASURES EVERY TOXIN, EVERY PESTICIDES, EVERY
17 METAL IN THESE INDIVIDUALS EXACTLY FOR THE PURPOSE OF
18 FOR THESE KIND OF VERY INFORMATIVE CROSS-SECTIONAL
19 STUDIES.

20 WE WOULDN'T BE SPENDING SO MUCH MONEY AT CDC
21 AND AT THE FEDERAL LEVEL TO CONDUCT THESE NHNES SURVEYS
22 IF WE THOUGHT THEY WERE USELESS. THEY ARE NOT. THEY
23 ARE VERY, VERY INFORMATIVE AND VERY WELL SUPPORTED BY
24 NIH.

25 MR. PETROSINELLI: OKAY. DOCTOR, WE CAN TAKE
26 THAT DOWN.

27 YOUR HONOR, I KNOW WE WERE GOING TO TAKE A
28 BREAK AT ABOUT 3:00. WE'RE JUST BEFORE 3:00. I'M ABOUT

1 TO MOVE TO A DIFFERENT TOPIC. WOULD THIS BE A GOOD
2 TIME?

3 THE COURT: YES, IT WOULD.

4 LET'S BREAK, PLEASE, UNTIL 3:15.

5 MR. PETROSINELLI: THANK YOU.

6 THE COURT: OKAY. THANK YOU.

7 THANK YOU, DOCTOR.

8 THE WITNESS: THANK YOU.

9 (RECESS)

10 THE COURT: LET'S MOVE ON FOR TODAY AND KEEP
11 GOING.

12 MR. PETROSINELLI: OKAY. THANK YOU, YOUR
13 HONOR.

14 Q DR. RITZ, LET ME SHOW YOU AGAIN YOUR REPORT
15 WHICH IS EXHIBIT 4 ON PAGE 30.

16 I WANTED TO SHOW YOU, THIS IS YOUR TEMPORALITY
17 ANALYSIS ON LEAD AND ADHD.

18 AND YOU SEE IT ON THE SCREEN HERE.

19 YOU RECOGNIZE THIS, DO YOU NOT?

20 A YES.

21 Q OKAY.

22 AND YOU SAY THAT -- YOU CITE THREE STUDIES TO
23 SUPPORT TEMPORALITY. THE FIRST ONE SAYS, EARLY INFANCY
24 AND BABY TEETH.

25 THAT'S THE ARORA STUDY; CORRECT?

26 A YES.

27 Q AND THEN THE KOREAN CHILD COHORT STUDY, THAT'S
28 THE KIM 2016 STUDY; CORRECT?

1 A YES, WHERE THEY MEASURED LEAD AND AGE 8 AND THE
2 AUTISTIC BEHAVIOR AT AGE 12.

3 Q RIGHT.

4 AND THEN THE THIRD STUDY, IT SAYS NORWEGIAN
5 MOBA COHORT, THAT'S THE STUDY WHERE THE FIRST AUTHOR IS
6 SKOGHEIM; CORRECT?

7 A CORRECT.

8 Q OKAY.

9 A THAT'S THE PRENATAL EXPOSURE STUDY.

10 Q OKAY. SO WHAT I WANT TO DO IS I WANT TO PUT UP
11 THE CHART THAT YOU USED IN YOUR DIRECT YESTERDAY OF THE
12 STUDIES ON LEAD AND ASD.

13 THIS IS THE CHART THAT YOU USED DURING YOUR
14 TESTIMONY YESTERDAY.

15 DO YOU RECALL THAT?

16 A YEAH, THAT'S NOT MY CHART, BUT THAT'S THE CHART
17 I WAS ASKED TO GO OVER, YES.

18 Q OH, I WAS JUST GOING TO ASK YOU. THAT WAS --
19 YOU YOU'VE ANTICIPATED MY FIRST QUESTION.

20 DID YOU PREPARE THIS CHART?

21 A NO.

22 Q DID YOU REVIEW IT FOR ACCURACY BEFORE YOU
23 TESTIFIED ABOUT IT?

24 A NO, I WAS SHOWN THIS AS KIND OF AND AN AIDE TO
25 WHAT'S OUT THERE.

26 Q OKAY. SO LET'S LOOK AT IT.

27 NOW, IN TERMS OF THE THREE STUDIES ON
28 TEMPORALITY THAT YOU CITED FOR LEAD AND ASD, I WANT TO

1 LOOK FOR THOSE ON THIS CHART AND SO WE'RE GOING TO DO
2 SOME ANIMATION. THERE'S KIM AND THERE'S ARORA.

3 DO YOU SEE THOSE TWO?

4 A YES, UM-HMM.

5 Q AND WHERE IS SKOGHEIM?

6 A I DON'T KNOW.

7 Q IN FACT, SKOGHEIM IS NOT ON THIS CHART; ISN'T
8 THAT TRUE?

9 A WELL, I -- I CAN'T SEE THE REST SO I DON'T
10 KNOW.

11 Q ALL RIGHT. WE'LL -- I'LL REPRESENT TO YOU JUST
12 TO PUSH THIS ALONG THAT SKOGHEIM WAS NOT ON THIS CHART.

13 SKOGHEIM SHOULD BE ON THIS CHART, RIGHT? THIS
14 A STUDY ON LEAD AND ASD IN THE PEER-REVIEWED LITERATURE;
15 TRUE?

16 A CORRECT.

17 Q AND IF WE PUT SKOGHEIM ON THIS CHART, WHICH
18 WE'LL DO RIGHT NOW, IT WOULD BE HERE BECAUSE WITH
19 RESPECT TO LEAD AND ASD, THE SKOGHEIM STUDY CALCULATED
20 ODDS RATIOS THAT WERE NEGATIVE BUT NOT STATISTICALLY
21 SIGNIFICANT; CORRECT?

22 A I CAN'T REMEMBER. WE HAVE TO GO OVER THE
23 STUDY.

24 BUT WHAT I RECALL IS, I MEAN, THE DETAILS WE
25 HAVE TO GO TO THE STUDY FOR. BUT WHAT I RECALL IS THAT
26 THEY DESCRIBED A INVERSE U SHAPED RELATIONSHIP THAT YOU
27 JUST CITED BEFORE IN ONE OF YOUR OWN SLIDES WHERE LOWER
28 LEVELS AND HIGH LEVELS HAD POSITIVE ASSOCIATIONS;

1 WHETHER THAT'S STATISTICALLY SIGNIFICANT OR NOT, I CAN'T
2 RECALL.

3 Q ALL RIGHT. WELL, LET'S LOOK AT THAT STUDY AND
4 NOT LEAVE ANY QUESTION ABOUT IT.

5 THE SKOGHEIM STUDY IS EXHIBIT 629.

6 WHICH WE'LL PULL UP -- HERE IS THE ACTUAL
7 STUDY.

8 AND LET'S GO TO -- FIRST OF ALL, LET ME JUST --
9 LET'S JUST SET UP WHAT THIS STUDY IS.

10 THEY MEASURED MATERNAL BLOOD, IN OTHER WORDS,
11 FOR THE WOMEN WHO WERE PREGNANT, THEY MEASURED METAL
12 LEVELS IN THEIR BLOOD; CORRECT?

13 A I BELIEVE SO, BUT WE HAVE TO GO TO THE METHODS
14 TO LOOK THAT UP.

15 Q OKAY.

16 AND LET'S LOOK AT FIGURE 2 WHICH IS ON PAGE 7
17 OF THE STUDY.

18 NOW, YOU RECALL, DO YOU NOT, DOCTOR, THAT WHAT
19 THEY DID HERE IS THEY DIVIDED THE LEVELS OF EXPOSURE TO
20 THE METALS INTO QUARTILES; CORRECT?

21 A THAT'S WHAT IT LOOKS LIKE BECAUSE THE Q
22 PROBABLY MEANS QUARTILES AND THERE ARE FOUR, SO THAT
23 WOULD BE CORRECT.

24 Q ALL RIGHT. AND THE WAY TO READ THIS CHART, AND
25 WE'VE HIGHLIGHTED THE FINDINGS ON LEAD.

26 YOU SEE THE ABBREVIATION FOR LEAD PB; CORRECT?

27 A YES.

28 Q ALL RIGHT.

1 AND THE WAY TO READ THIS CHART IS THAT THE
2 FIRST QUARTILE IS THE REFERENCE LEVEL OF THE METAL IN
3 THE MOTHER'S BLOOD, SO THAT'S AT THE LINE THAT'S EXACTLY
4 AT ONE; CORRECT?

5 A YES.

6 Q AND THEN THE SUBSEQUENT THREE QUARTILES,
7 QUARTILES TWO, THREE AND FOUR, THOSE ARE INCREASING
8 LEVELS OF LEAD IN THE MOTHER'S BLOOD; CORRECT?

9 A CORRECT.

10 Q AND WHAT WE SEE FOR LEAD IN QUARTILES TWO,
11 THREE AND FOUR, THOSE INCREASING LEVELS OF LEAD IN THE
12 MOTHER'S BLOOD, IS THAT THE ODDS RATIO WHICH YOU TALKED
13 ABOUT YESTERDAY FOR ALL THREE QUARTILES IS BELOW ONE;
14 CORRECT?

15 A CORRECT.

16 Q AND THE CONFIDENCE INTERVALS WHICH ARE THOSE, I
17 THINK YOU CALLED THE WHISKERS YESTERDAY, AROUND EACH OF
18 THE POINT ESTIMATES, FOR EACH OF THOSE QUARTILES CROSS
19 ONE; CORRECT?

20 A CORRECT.

21 Q AND SO WHAT YOU WOULD SAY IS THAT THIS STUDY
22 SHOWED A NEGATIVE ASSOCIATION BETWEEN LEAD AND THESE
23 QUARTILES OF -- THESE QUARTILES OF LEVELS OF LEAD IN THE
24 MOTHER'S BLOOD AND ASD THAT WAS NOT STATISTICALLY
25 SIGNIFICANT; CORRECT?

26 A ACCORDING TO THIS ONE GRAPH, YES, BUT THAT'S
27 NOT THE ONLY GRAPH THEY SHOWED.

28 Q ALL RIGHT.

1 LET'S GO BACK TO THE -- OR LET ME SHOW YOU ONE
2 MORE THING IN THE SKOGHEIM STUDY WHERE THEY DISCUSS WHAT
3 THEIR RESULTS WERE. THIS IS ON PAGE 9 OF THE STUDY.
4 AND THE FIRST -- THIS IS THE FIRST PARAGRAPH OF THE
5 DISCUSSION SECTION OF THE STUDY.

6 THEY SAID, "IN THIS LARGE PROSPECTIVE STUDY" --
7 BY THE WAY, LET ME BEFORE I READ FURTHER, THIS WAS A
8 LARGE PROSPECTIVE STUDY; CORRECT?

9 A IT WAS A PROSPECTIVE STUDY, YEAH, A BIRTH
10 COHORT OR BETTER PREGNANCY COHORT.

11 Q RIGHT.

12 "IN THIS LARGE PROSPECTIVE STUDY, WE FOUND
13 ASSOCIATIONS INDICATING INCREASED RISK OF ASD
14 IN CHILDREN WITH INCREASED MATERNAL LEVELS OF
15 ARSENIC, CADMIUM AND MANGANESE AND INCREASED
16 RISK OF ASD WITH INCREASED MATERNAL LEVELS OF
17 CADMIUM AND MAGNESIUM."

18 CORRECT?

19 A YES.

20 Q AND THEY DID NOT FIND INCREASED RISK OF ASD OR
21 ADHD WITH LEAD ACCORDING TO THIS SENTENCE?

22 A IN THIS SENTENCE, NO. BUT WE CAN GO TO WHERE
23 THEY DESCRIBE THEIR LEAD EXPOSURES.

24 Q OKAY.

25 LET'S GO BACK TO THE DEMONSTRATIVE CHART.

26 MR. WISNER: YOUR HONOR, I'M GOING TO HAVE TO
27 ISSUE AN OBJECTION. THE STUDY CLEARLY SAYS IT'S AN
28 ASSOCIATION WITH LEAD IN THE LEAD SECTION. THIS IS

1 CLEARLY MISLEADING.

2 THE COURT: OVERRULED.

3 MR. PETROSINELLI:

4 Q NOW, WE JUST DISCUSSED YOU HAD CITED THESE
5 THREE STUDIES; KIM, ARORA AND SKOGHEIM IN YOUR SUPPORT
6 FOR TEMPORALITY WITH LEAD.

7 I WANTED TO ASK YOU, DOCTOR, DO YOU AGREE WITH
8 ME THAT THERE ARE OTHER STUDIES OF LEAD AND ASD WHERE
9 THE LEAD MEASUREMENTS WERE TAKEN BEFORE ASD DEVELOPED SO
10 TEMPORALITY IS ESTABLISHED?

11 DO YOU AGREE WITH THAT?

12 A WELL, THESE WERE EXAMPLES, AND THAT'S HOW I
13 QUOTE MYSELF, RIGHT. THESE ARE EXAMPLES OF WHERE
14 TEMPORALITY IS WELL ESTABLISHED. IT DOESN'T MEAN THAT
15 YOU CAN'T COME TO THE CONCLUSION THAT TEMPORALITY CAN BE
16 ESTABLISHED IN OTHER STUDIES.

17 Q RIGHT.

18 I WAS JUST --

19 A YES, YOU CAN DO THAT IN OTHER STUDIES TOO, YES.

20 Q RIGHT. THAT'S EXACTLY WHAT I WAS ASKING YOU.

21 AND I'M GOING TO SHOW YOU -- AND WE COUNTED
22 FIVE OTHER STUDIES OF LEAD AND ASD WHERE TEMPORALITY
23 COULD BE ESTABLISHED; DOHERTY, FRYE, LONG, ALAMPI AND
24 ABDULLAH, WHICH ARE SHOWED HERE.

25 DO YOU SEE THAT?

26 A YES.

27 Q AND DO YOU AGREE WITH ME -- LET ME PUT UP
28 ANOTHER DEMONSTRATIVE SO WE CAN FOCUS ON THESE STUDIES,

1 THESE TEMPORALITY STUDIES.

2 NO, THE OTHER. EXHIBIT 682. WE HAVE IT.
3 WE'RE GOING TO MARK IT.

4 OKAY. SO THESE ARE EIGHT STUDIES THAT WE JUST
5 TALKED ABOUT. LET'S LOOK AT THE CHARACTERISTICS OF
6 THESE STUDIES.

7 DO YOU AGREE WITH ME WITH RESPECT TO THESE
8 EIGHT STUDIES THAT FIVE OF THEM HAD AUTISM SPECIFICALLY
9 AS AN END POINT AND THREE OF THEM HAD AUTISTIC
10 BEHAVIORS?

11 A I BELIEVE YOU'RE CORRECT. I'M NOT RECALLING
12 ALAMPI, BUT I BELIEVE YOU. BUT YOU CAN SHOW ME.

13 Q OKAY.

14 A I CAN'T REMEMBER IF WHETHER IT'S ASD OR ASD
15 BEHAVIORS IN THAT STUDY.

16 THE REST I THINK, YES, THERE IS A DIAGNOSIS
17 BECAUSE FRYE, LONG, ARORA, ABDULLAH, THOSE ARE CASE
18 CONTROL STUDIES SO THEY WOULD BE ESTABLISH. AND
19 SKOGHEIM WE JUST LOOKED AT.

20 Q OKAY.

21 AND LET'S LOOK AT THE NEXT COLUMN ON THIS
22 CHART.

23 THESE ARE THE BIOMARKERS IN THESE STUDIES. YOU
24 CAN -- THEY RANGE FROM BABY TEETH TO AMNIOTIC FLUID TO
25 MATERNAL BLOOD TO MATERNAL AND INFANT TOENAILS.

26 IS IT CORRECT THAT THESE ARE THE BIOMARKERS
27 THAT THESE STUDIES MEASURED?

28 A AS FAR AS I RECALL, YES. I WOULD IMAGINE YOU

1 DID THIS CORRECTLY.

2 Q OKAY.

3 AND THIS IS WHY THESE STUDIES CAN SHOW
4 TEMPORALITY BECAUSE WHEN YOU MEASURE MATERNAL BLOOD OR
5 AMNIOTIC FLUID OR BABY TEETH AND THINGS LIKE THAT, THE
6 EXPOSURE THAT YOU'RE MEASURING PRE-DATES THE DEVELOPMENT
7 OF AUTISM; CORRECT?

8 A IT DEPENDS ON WHEN THEY ARE TAKEN AND HOW THE
9 MEASURES ARE DONE. AMNIOTIC FLUID IS CERTAINLY PRIOR TO
10 THE DIAGNOSIS. BABY TEETH PROBABLY ALSO MATERNAL BLOOD,
11 DEPENDS ON WHEN IT WAS TAKEN. MATERNAL TOENAILS,
12 DEPENDS ON WHEN THEY WERE TAKEN. CHILD BLOOD, DEPENDS
13 ON WHEN IT WAS TAKEN.

14 BUT YES, IF WE KNOW MORE ABOUT THESE STUDIES,
15 WE CAN PROBABLY AGREE THAT WE CAN ESTABLISH TEMPORALITY.

16 Q OKAY.

17 AND THEN LET ME SHOW YOU THE FINAL COLUMN.

18 WHETHER -- THE QUESTION IS WHETHER THERE WAS --
19 THESE STUDIES SHOWED A SIGNIFICANT ASSOCIATION -- A
20 STATISTICALLY SIGNIFICANT ASSOCIATION THE EXPOSURE AND
21 EITHER THE ASD DIAGNOSIS OR THE ASD BEHAVIORS.

22 DO YOU AGREE WITH ME THAT SKOGHEIM, FRYE, LONG,
23 ABDULLAH, ALAMPI, DOHERTY DID NOT FIND A STATISTICALLY
24 SIGNIFICANT ASSOCIATION BETWEEN EXPOSURE TO LEAD IN THE
25 BIOMARKER THAT WAS MEASURED AND ASD?

26 A I TRIED TO EXPLAIN TO YOU IN MY DEPOSITION THAT
27 THE LAST -- THE LAST THING AN EPIDEMIOLOGIST IS TAUGHT
28 TO USE IS THE CRITERIA OF STATISTICAL SIGNIFICANCE. WE

1 LOOK AT THE DATA AS A WHOLE. WE LOOK AT EFFECT
2 ESTIMATES, CONFIDENCE INTERVALS AND BIASES.

3 I DO NOT LOOK AT STATISTICAL SIGNIFICANCE AS A
4 CRITERIA FOR EVALUATING STUDIES. IF YOU WANT ME TO LOOK
5 AT EVERY SINGLE ONE OF THESE, I'M HAPPY TO DO SO AND I'M
6 HAPPY TO TELL YOU WHAT I THINK ABOUT THE RESULTS.

7 Q DO YOU -- CAN YOU TELL ME -- YOU READ ALL THESE
8 STUDIES AND DISCUSSED THEM IN YOUR REPORT, DID YOU NOT?

9 A YES.

10 Q OKAY. AND CAN YOU -- AND I'LL TALK TO YOU
11 ABOUT STATISTICAL SIGNIFICANCE IN A MOMENT AND I
12 APPRECIATE YOUR POSITION ON THAT.

13 MY QUESTION IS SIMPLY, CAN YOU TELL ME THAT YOU
14 AGREE THAT THE STUDIES -- SIX OF THESE EIGHT STUDIES DID
15 NOT FIND A STATISTICALLY SIGNIFICANT ASSOCIATION BETWEEN
16 LEAD EXPOSURE AND ASD?

17 A I WOULD HAVE TO LOOK AT EVERY SINGLE STUDY AND
18 TELL YOU WHAT IT -- WHAT IT SHOWS. I CAN'T RECALL
19 STATISTICAL SIGNIFICANCE BECAUSE THAT'S NOT A CRITERION
20 I WOULD EVER USE.

21 Q ALL RIGHT.

22 WELL, LET'S LOOK -- WE'RE NOT GOING TO LOOK AT
23 ALL THESE STUDIES, BUT LET'S JUST DO A COUPLE OF THEM
24 JUST TO -- JUST AS A CHECK.

25 BY THE WAY, LET'S GO BACK TO THE DEMONSTRATIVE
26 WE JUST HAD ON THE SCREEN WHILE WE -- SO THAT WE CAN GO
27 THROUGH A COUPLE OF THESE.

28 BUT I JUST WANT TO ASK A QUESTION.

1 THIS DEMONSTRATIVE YOU SHOWED YESTERDAY DURING
2 YOUR TESTIMONY, IT DID NOT HAVE ON IT ALAMPI, DOHERTY,
3 FRYE, LONG OR SKOGHEIM; CORRECT?

4 A I DON'T RECALL. I ONLY SAW THIS ON THE SCREEN
5 ONCE.

6 Q OKAY.

7 AND YOU AGREE THAT ALAMPI, DOHERTY, FRYE, LONG
8 AND SKOGHEIM BELONG ON THIS CHART, THEY ARE LEAD --
9 STUDIES OF LEAD IN ASD IN THE PEER-REVIEWED LITERATURE;
10 CORRECT?

11 A YES, THEY ARE.

12 Q OKAY.

13 SO LET'S LOOK AT JUST ONE OF -- MAYBE ONE OR
14 TWO OF THESE.

15 LET'S LOOK AT DOHERTY.

16 OH, BY THE WAY, BEFORE WE DO THAT, LET ME JUST
17 ASK YOU ONE OTHER THING.

18 DO YOU SEE WHERE IT SAYS ARORA AND IT SAYS H?

19 A YES.

20 Q AND DO YOU SEE THE LEGEND, H IS COHORT STUDY?

21 A WHERE IS THAT?

22 Q UP ON THE TOP RIGHT, I'M SORRY.

23 A OH. OH, I NEVER LOOKED AT THAT. I WASN'T SURE
24 WHAT H MEANT. I THOUGHT IT WAS --

25 Q OKAY. THAT'S WRONG. ARORA IS NOT A COHORT
26 STUDY. ARORA IS A CASE CONTROL STUDY?

27 A YES.

28 Q OKAY.

1 A IT'S ACTUALLY A TWIN STUDY. IT'S A VERY
2 SPECIAL DESIGN.

3 Q RIGHT.

4 BUT IT'S A CASE CONTROL DESIGN?

5 A YES, IT'S A SPECIAL KIND OF CASE CONTROL DESIGN
6 THAT'S USUALLY REFERRED TO AS A TWIN STUDY, YES.

7 Q RIGHT. OKAY.

8 SO THAT'S A MISTAKE ON THIS CHART. THAT SHOULD
9 NOT BE LABELED AS A COHORT STUDY; CORRECT?

10 A IF H MEANS COHORT, THEN NO. I THOUGHT IT WAS
11 TEETH.

12 Q ALL RIGHT.

13 LET'S LOOK AT THE LONG STUDY WHICH IS
14 EXHIBIT 92.

15 YOU READ THIS STUDY, DOCTOR, DID YOU NOT?

16 A I KNOW THIS GROUP VERY WELL BECAUSE I WORK WITH
17 THEM.

18 Q RIGHT.

19 THAT'S WHAT I RECALLED, I THINK, FROM YOUR
20 DEPOSITION.

21 A UM-HMM.

22 Q AND THIS IS A STUDY WHERE THEY MEASURE METALS
23 AND OTHER THINGS, CHEMICALS, IN AMNIOTIC FLUID OF
24 MOTHERS; CORRECT?

25 A I SEEM TO RECALL, YES.

26 Q ALL RIGHT.

27 AND ONE OF THE METALS THEY DETECTED IN AMNIOTIC
28 FLUID WAS LEAD; CORRECT?

1 A YES.

2 Q ALL RIGHT.

3 AND LET'S LOOK AT WHAT THEY FOUND.

4 ON PAGE 7 OF THE STUDY -- AND I'M GOING TO
5 DIRECT YOU, DOCTOR, UNDER THE HEADING UNDER "RESULTS,"
6 THE HEADING IS "LEVELS OF ELEMENTS AND HEAVY METALS,"
7 AND THEY FOUND, "SIMILAR METALS OF ELEMENTS IN HEAVY
8 METALS BETWEEN ASD CASES AND CONTROLS WERE OBSERVED."

9 DO YOU SEE THAT?

10 A YES.

11 Q AND THEN WE'LL GO -- WE'LL LOOK AT THE TABLE
12 JUST SO WE HAVE THE NUMBERS IN FRONT OF US.

13 IF YOU GO TO PAGE 10 OF THE STUDY, THIS IS
14 WHERE THEY LAY OUT THE RESULTS OF THESE VARIOUS METALS
15 THAT ARE ON THE LEFT AND THE LEVELS IN THE CASES AND THE
16 CONTROLS; CORRECT?

17 A YES.

18 Q AND THE LAST ONE IS LEAD; TRUE?

19 A CORRECT. UM-HMM.

20 Q AND WHAT THEY FOUND WAS NO STATISTICALLY
21 SIGNIFICANT DIFFERENCE BETWEEN THE CASES, THE KIDS WITH
22 ASD, AND THE CONTROLS, THE KIDS WITHOUT ASD, IN TERMS OF
23 LEAD; TRUE?

24 A YES. AND IN THIS CASE THEY HAVE 37 CASES AND
25 51 CONTROLS AND THEIR ODDS RATIO, OR 50 CONTROLS WITH
26 ADJUSTMENT, THEIR ODDS RATIO IS 1.3, THAT INDICATES A
27 30 PERCENT INCREASE IN RISK ACCORDING TO LEAD, HIGHER
28 LEAD, AND THEIR CONFIDENCE INTERVAL INCLUDES THE ONE,

1 BUT CLEARLY THE POINT ESTIMATE POINTS INTO THE DIRECTION
2 OF AN EFFECT; HOWEVER, WHEN YOU KNOW WHERE THESE KIDS
3 LIVE AND HOW LOW THE LEVELS ARE, YOU WOULD NEED 3,000
4 CHILDREN TO MAKE THIS ODDS RATIO STATISTICALLY
5 SIGNIFICANT IF THE TRUE ODDS RATIO WAS 1.3 INDICATING AN
6 INCREASE.

7 SO IT'S A COMPLETELY UNDERPOWERED STUDY.

8 Q BUT IT'S -- YOU AGREE -- MY QUESTION WAS YOU
9 AGREE THAT THERE'S NO STATISTICALLY SIGNIFICANT
10 DIFFERENCE BETWEEN THE CASES AND THE CONTROLS?

11 A WHICH IS COMPLETELY IRRELEVANT WHEN YOU HAVE A
12 STUDY THAT IS SO UNDERPOWERED THAT IT COULDN'T SEE
13 ANYTHING EVEN IF YOU TRIED.

14 Q OKAY.

15 LET'S LOOK AT ONE MORE OF THE STUDIES, A STUDY
16 CALLED DOHERTY, WHICH IS EXHIBIT 630.

17 THIS IS A STUDY -- THIS IS ACTUALLY ONE OF THE
18 FEW COHORT STUDIES OF LEAD AND ASD; ISN'T THAT TRUE?

19 A IT IS SIMILAR TO THE SKOGHEIM, BUT MUCH
20 SMALLER.

21 Q IT'S A --

22 A A PRENATAL EXPOSURE STUDY, YES.

23 Q YES.

24 THIS IS WAS DONE IN NEW HAMPSHIRE; DO YOU
25 RECALL THAT?

26 A YES.

27 Q AND THE STUDY WAS FUNDED BY NIH, THE NATIONAL
28 STATUTES OF HEALTH, AND EPA; CORRECT?

1 A YES, AND IT WAS INTERESTED IN ARSENIC.

2 Q AND IT'S -- THIS STUDY HAD -- YOU'D
3 CHARACTERIZE THIS AS A MEDIUM SIZE STUDY, WOULDN'T YOU?
4 IT HAD 371 PARTICIPANTS?

5 A YEAH, FOR -- NO, ACTUALLY, FOR A COHORT STUDY,
6 IT'S VERY SMALL.

7 Q OKAY.

8 LET'S SEE HOW YOU CHARACTERIZE IT IN YOUR
9 DEPOSITION JUST FOR ONE SECOND.

10 LET'S GO TO -- THIS IS YOUR EXHIBIT 7, WHICH IS
11 YOUR DEPOSITION ON PAGE 169.

12 AND IF YOU LOOK AT LINES -- FROM LINES 10 TO 18
13 WHEN I ASKED YOU ABOUT THE DOHERTY STUDY, THE
14 PROSPECTIVE COHORT STUDY, IT'S 371 PARTICIPANTS.

15 AND I SAID: "AND SO WOULD YOU CHARACTERIZE
16 THAT AS A SMALL, MEDIUM OR A LARGE STUDY?"
17 YOU SAID "MEDIUM."

18 DO YOU SEE THAT, DOCTOR?

19 A YEAH.

20 Q IT'S A MEDIUM SIZED STUDY; DO YOU AGREE?

21 A WELL, I SAID MEDIUM THEN, BUT HONESTLY, WHEN
22 YOU COMPARE IT TO SKOGHEIM, IT SEEMS RATHER SMALL.
23 SKOGHEIM WAS A HUNDRED THOUSAND CHILDREN.

24 Q ALL RIGHT. WE'LL GO BACK TO THE STUDY AND
25 LET'S LOOK AT THE RESULTS.

26 IN THIS STUDY WHAT THEY DID BASICALLY IS TAKE
27 MEASURES OF LEAD AND OTHER METALS IN THE TOENAILS OF
28 MOTHERS, BOTH BEFORE OR AFTER BIRTH, AND THE CHILDREN

1 RIGHT AFTER BIRTH; CORRECT?

2 A I SEEM TO RECALL THAT. CAN YOU POINT OUT WHERE
3 YOU SEE THIS?

4 Q I SURE CAN.

5 THIS IS AT -- IF YOU LOOK AT THE METHODS IN THE
6 STUDY ON PAGE 2, IN THE BOTTOM LEFT IT SAYS EXPOSURE TO
7 METALS AND THEN WE CAN BLOW THAT UP.

8 AND DO YOU SEE RIGHT IN THAT FIRST SENTENCE
9 THEY MEASURED CONCENTRATIONS OF METALS IN TOENAIL
10 SAMPLES COLLECTED AT THREE TIME PERIODS, INCLUDING
11 MATERNAL TOENAILS AT A MEDIAN OF 27 GESTATIONAL WEEKS
12 AND A MEDIAN OF 4 WEEKS POST-PARTUM AND INFANT TOENAILS
13 COLLECTED AT A MEDIAN OF 6 WEEKS OF LIFE.

14 DO YOU SEE THAT?

15 A YES. UM-HMM.

16 Q ALL RIGHT. SO THAT'S HOW THEY DID THE STUDY.
17 AND THEY MEASURED FOR METALS IN THOSE TOENAILS;
18 TRUE?

19 A YES.

20 Q AND THEN THEY SAW WHICH OF THE CHILDREN
21 DEVELOPED ASD AND WHICH CHILDREN DID NOT DEVELOP ASD;
22 CORRECT?

23 A IT WASN'T REALLY ASD. IT WAS ASD BEHAVIORS,
24 RIGHT.

25 Q ASD BEHAVIORS. YOU'RE RIGHT. THANK YOU FOR
26 THAT CLARIFICATION.

27 BUT THEY COMPARED THOSE TO CHILDREN; CORRECT?

28 A THEY COM --

1 Q TO TWO SETS OF CHILDREN?

2 A THEY COMPARED CHILDREN WITH MORE OR LESS
3 ASD-LIKE BEHAVIORS. THEY COMPARED THE EXPOSURES IN
4 CHILDREN WITH MORE OR LESS ASD-LIKE BEHAVIORS, YES.

5 Q RIGHT.

6 AND SO -- AND WHEN THEY LOOKED AT LEAD, THEY
7 FOUND NO RELATIONSHIP BETWEEN THE EXPOSURES IN ANY OF
8 THESE TIME PERIODS, ANY OF THE TOENAIL SAMPLE TIME
9 PERIODS AND THESE ASD OR AUTISTIC BEHAVIORS; TRUE?

10 A YOU HAVE TO SHOW ME THE RESULTS.

11 Q ALL RIGHT.

12 A AND WE ARE TALKING PRENATAL BASICALLY, RIGHT.

13 Q WELL, DIDN'T THEY TAKE THE INFANT TOENAILS AT
14 SIX WEEKS OF LIFE?

15 A YEAH, BUT THEY ARE SAYING THAT IT REFLECTS
16 REALLY 6 TO 12 MONTHS IN ADULTS, AND IT PROBABLY
17 REFLECTS THE LAST TRIMESTER AND THE FIRST MONTH OF LIFE
18 IN CHILDREN.

19 Q ALL RIGHT.

20 AND WE'LL GO TO THEIR FINDINGS ON PAGE 6 OF THE
21 STUDY.

22 YOU SEE, I'M NOT GOING TO MAKE YOU READ THOSE
23 GRAPHS WHICH HAVE THE FINDINGS, BUT LET'S LOOK AT THE
24 TEXT AND SEE WHAT THEY SAY.

25 IN THE LEFT COLUMN STARTING WITH THE PARAGRAPH
26 I GUESS SAYING, "HOWEVER."

27 A YES, I SEE IT.

28 Q OKAY.

1 OKAY. AND DO YOU SEE IT SAYS, "IN ADDITION TO
2 THESE FINDINGS, WE ALSO OBSERVED ASSOCIATIONS
3 THAT ARE NOT SUPPORTED BY THE PRIOR LITERATURE,
4 INCLUDING THE LACK OF ADVERSE ASSOCIATIONS OF
5 LEAD."

6 DO YOU SEE THAT?

7 A YES. AND THEY WONDER WHY.

8 Q RIGHT.

9 SO WOULD YOU -- YOU WOULD AGREE WITH ME THAT
10 THIS IS A NULL STUDY?

11 A WELL, THEY ARE SAYING -- THEY ARE REALLY
12 WONDERING WHY THEY ARE NOT SEEING IT AND THEY ARE THEN
13 GOING INTO RESIDUAL CONFOUNDING BECAUSE THEIR STUDY WAS
14 REALLY AN ARSENIC STUDY AND SO THEY WONDERED WHETHER IT
15 WAS CONFOUNDED BY ARSENIC, I GUESS; AND "ADDITIONALLY,
16 SUCH RESULTS MAY BE OWING TO CHANCE AS WE DID NOT
17 CORRECT FOR MULTIPLE TESTING OWING TO THE DEPENDENCE
18 AMONG THE OUTCOMES."

19 SO THEY ARE SAYING, WELL, BASICALLY WE ARE
20 DOING A LOT OF TESTING HERE, STATISTICAL TESTING, AND
21 JUST BY CHANCE WE COULD SEE NO ASSOCIATION EVEN IF THERE
22 WAS ONE.

23 Q BUT YOU WOULD CHARACTERIZE THIS AS A NULL
24 STUDY; TRUE?

25 A YES.

26 Q OKAY. LET'S GO BACK TO THE DEMONSTRATIVE.

27 AND SO, DOCTOR, ARE YOU AWARE OF -- IF YOU LOOK
28 AT THESE EIGHT STUDIES THAT ARE HIGHLIGHTED HERE THAT

1 PROVIDE TEMPORALITY IN THEIR MEASUREMENTS OF LEAD, ARE
2 YOU AWARE OF -- I'LL STRIKE THAT.

3 ISN'T IT TRUE THAT THE RESULTS OF THE STUDIES
4 THAT -- ON LEAD AND ASD WHERE LEAD IS MEASURED BEFORE
5 THE DEVELOPMENT OF ASD ARE TOTALLY INCONSISTENT; ISN'T
6 THAT TRUE?

7 A THERE'S STRONG INCONSISTENCY BETWEEN THIS
8 RESULT -- BETWEEN THESE STUDIES IN MANY WAYS; FOR
9 EXAMPLE, LONG SHOULD HAVE NEVER TRIED TO EVEN ESTIMATE
10 ANY DIFFERENCES GIVEN THEIR SAMPLE SIZE, SO THAT STUDY
11 IS COMPLETELY UNINFORMATIVE.

12 DOHERTY WONDERED THEMSELVES WHAT THEY HAD DONE
13 WRONG, SO I WONDER TOO WHAT THE PROBLEM IS WITH THE
14 STUDY.

15 ABDULLAH, I NEVER FIGURED OUT HOW THEY ACTUALLY
16 DREW THEIR CONTROLS. I TRIED VERY HARD, FOR THE TEETH,
17 AND I HAVE NO IDEA WHETHER THEIR CONTROL SELECTION WAS
18 ADEQUATE.

19 THEY ALSO EVEN IF -- IF WE ASSUME THAT THEIR
20 CONTROL SELECTION WAS ADEQUATE, THEY DIDN'T DO WHAT
21 ARORA DID WHICH WAS GO WAY BEYOND AND CONTROL FOR
22 GENETICS.

23 SO IF WE ALL AGREE THAT GENETICS INTERACT WITH
24 THE ENVIRONMENT, THEN ARORA IS THE STUDY YOU WANT TO
25 INTERPRET. ABDULLAH, YOU QUESTION WHAT THEY DID.

26 BUT YES, IT IS A NEGATIVE STUDY.

27 Q AND IS IT TRUE THAT WHEN YOU LOOK AT THESE
28 EIGHT STUDIES, THEY WERE DONE IN DIFFERENT GEOGRAPHIES

1 USING DIFFERENT BIOMARKERS AND DIFFERENT STUDY DESIGNS;
2 TRUE?

3 A YES.

4 Q BY THE WAY, I THINK YOU JUST SAID ABOUT THE
5 LONG STUDY, THEY SHOULDN'T HAVE DONE THE STUDY BECAUSE
6 IT WAS TOO SMALL OR SOMETHING TO THAT EFFECT.

7 DID YOU SAY THAT?

8 A WELL, THE COMPARISONS THEY TRIED TO DO IN THE
9 WAY THEY DID IT, AND I KNOW THIS GROUP VERY WELL. AND
10 IF YOU LOOK AT THE AUTHORSHIP LIST, THEY WORKED WITH THE
11 BEST EPIDEMIOLOGISTS IN THE COUNTRY AND HIS NAME IS NOT
12 ON THIS. THAT'S YAN OLSEN. HE WAS PART OF THE STUDY
13 GROUP. SO YOU WONDER WHY HE'S NOT ON IT. PROBABLY
14 BECAUSE HE DISAGREED ON HOW THIS ANALYSIS WAS DONE AND
15 HOW IT WAS PRESENTED.

16 IT WAS A BUNCH OF TOXICOLOGISTS TRYING TO DO
17 EPIDEMIOLOGY AND PRESENTING RESULTS THAT, YOU KNOW, I
18 WOULD QUESTION IN THE WAY THEY ARE PRESENTED.

19 Q WELL, LET'S LOOK AT WHAT YOU SAID ABOUT THE
20 LONG STUDY IN YOUR REPORT.

21 LET'S GO TO EXHIBIT 4 AGAIN AT PAGE 23.

22 A I KNOW WHAT I SAID ABOUT IT. I SAID IT IS
23 SMALL AND IT HAS, YOU KNOW, WHATEVER IT HAS.

24 IT'S INTERESTING BECAUSE OF THE MARKERS. BUT
25 IT ISN'T PRESENTED IN THE WAY THAT I AS AN
26 EPIDEMIOLOGIST WOULD HAVE LIKED THEM TO DO IT.

27 Q LET'S LOOK AT EXACTLY WHAT YOU SAID. IT LOOKS
28 LIKE AT THE FIRST -- IT'S THE VERY FIRST STUDY YOU

1 DISCUSSED UNDER YOUR ANALYSIS OF LEAD AND ASD, AND SO
2 LET'S LOOK AT WHAT YOU SAID ABOUT IT.

3 "A CASE CONTROL STUDY OF AUTISM NESTED WITHIN
4 THE HISTORIC BIRTH COHORT AT STATENS SEREM
5 INSTITUTE IN DENMARK IS PARTICULARLY NOTEWORTHY
6 IN TERMS OF ACCURACY OF TIMING OF EXPOSURE AND
7 ESTIMATING EXPOSURE LEVELS DURING THE MOST
8 IMPORTANT AND SENSITIVE NEURODEVELOPMENTAL
9 PERIODS FOR ASD."

10 DO YOU SEE THAT?

11 A CORRECT.

12 Q AND WHEN YOU SAID, "DURING THE MOST IMPORTANT
13 AND SENSITIVE NEURODEVELOPMENT PERIODS FOR ASD," THE
14 MEASUREMENTS THAT WERE DONE OF THE AMNIOTIC FLUID, THE
15 AVERAGE WAS AT 15 WEEKS OF GESTATION; CORRECT?

16 A I THOUGHT IT WAS LATER, BUT I DON'T REMEMBER.

17 Q WHATEVER IT WAS, THAT PERIOD YOU VIEWED AS THE
18 MOST IMPORTANT AND SENSITIVE NEURODEVELOPMENTAL PERIOD
19 FOR ASD, CORRECT; THAT'S WHAT YOU SAID?

20 A THAT'S WHAT THIS SAYS. BUT I DON'T KNOW WHAT
21 THE TIMING WAS IN THAT STUDY. WE HAVE TO GO BACK TO IT.

22 Q ALL RIGHT. WELL, WE'LL TAKE A LOOK AT IT.

23 LET'S GO BACK TO EXHIBIT 92. AND WE'LL GO TO
24 PAGE 7. AND WE'LL GO UNDER "RESULTS," THE FIRST
25 PARAGRAPH, "CHARACTERISTICS OF THE STUDY POPULATION."

26 AND YOU SEE THE SECOND -- THE THIRD SENTENCE:

27 "THE MAJORITY OF AMNIOTIC FLUID SAMPLES WERE
28 OBTAINED IN GESTATIONAL WEEK 15."

1 DO YOU SEE THAT?

2 A YES.

3 Q AND SO THAT IS THE PERIOD THAT YOU SAID WAS THE

4 MOST IMPORTANT AND SENSITIVE NEURODEVELOPMENTAL PERIOD

5 FOR ASD; CORRECT?

6 A THAT'S WHAT I SAID.

7 Q ALL RIGHT.

8 OKAY. AND YOU -- YOU AGREE --

9 A BUT I DIDN'T SAY 15 WEEKS. I DIDN'T SAY 15

10 WEEKS. I SAID THAT THE PRENATAL PERIOD IS THE MOST

11 SENSITIVE.

12 Q THE -- IN FACT, THE -- YOU AGREE THAT THE

13 PRENATAL PERIOD -- PRENATAL PERIOD IS STRONGLY

14 IMPLICATED IN AUTISM ETIOLOGY; CORRECT?

15 A IN NEURODEVELOPMENT. WHETHER YOU -- FOR

16 AUTISM, I -- ACTUALLY, NO.

17 Q OKAY.

18 A I MISSPOKE.

19 IT IS VERY, VERY IMPORTANT FOR

20 NEURODEVELOPMENT. NOBODY WOULD ASK THAT -- WOULD

21 QUESTION THAT BECAUSE YOU HAVE THE NEURAL TUBE DEFECTS

22 THAT ARE ACTUALLY HAPPENING IN THE FIRST TRIMESTER.

23 THEN YOU HAVE THE BRAIN BEING SET UP STRUCTURALLY IN A

24 MAJOR WAY AND THEN YOU HAVE SYNAPTIC FORMATION.

25 SO IT REALLY DEPENDS ON WHAT WE'RE TALKING

26 ABOUT HERE. ARE WE TALKING ABOUT STRUCTURAL DEFECTS OR

27 ARE WE TALKING ABOUT ASD AS A SPECTRUM?

28 AND I HAVE TO SAY I SHOULD -- I PROBABLY SHOULD

1 HAVE SAID AUTISM, NOT ASD, BECAUSE ASD IS A SPECTRUM AND
2 WE KNOW THAT NEURONS MATURE PRIOR TO BIRTH AND THEY
3 MATURE AFTER BIRTH, AND ON THE SPECTRUM THAT BRAIN
4 DEVELOPMENT GOES FAR INTO EARLY CHILDHOOD.

5 Q LET'S LOOK AT ONE OF YOUR PUBLICATIONS ON
6 AUTISM. IT'S EXHIBIT 683. IT'S THE LEAD AUTHOR IS
7 SOMEONE NAMED TRACY BECERRA.

8 DO YOU REMEMBER THAT PUBLICATION?

9 A YES.

10 Q OKAY. LET'S PULL THAT UP. THIS IS CALLED
11 "AUTISM SPECTRUM DISORDERS AND RACE, ETHNICITY AND
12 NATIVITY, A POPULATION BASED STUDY."

13 DO YOU SEE THAT?

14 A YES.

15 Q AND YOU'RE ONE OF THE AUTHORS ON THE STUDY.
16 INDEED YOU'RE THE SENIOR AUTHOR ON THE STUDY; CORRECT?

17 A YES, IT LOOKS LIKE IT, UM-HMM.

18 Q AND LET'S LOOK AT THE SECOND PAGE OF THAT
19 STUDY. THE PARAGRAPH ON THE LEFT COLUMN THAT STARTS
20 WITH "THE PRENATAL PERIOD."

21 AND WHAT YOU AND YOUR CO-AUTHORS SAID IN THIS
22 STUDY IS WHAT I JUST ASKED YOU: "THE PRENATAL PERIOD IS
23 STRONGLY IMPLICATED IN ASD ETIOLOGY;" CORRECT?

24 A YES, AND I'M QUOTING THOSE CITATIONS.

25 Q RIGHT.

26 BUT IT'S IN YOUR -- IT'S IN YOUR -- THE STUDY
27 THAT YOU PUBLISHED IN A PEER-REVIEWED JOURNAL; CORRECT?

28 A WELL, THIS IS WHERE I REVIEWED THE LITERATURE

1 AND I QUOTE THE LITERATURE 9 TO 11 THAT SAYS THE
2 PRENATAL PERIOD IS STRONGLY IMPLICATED.

3 ACTUALLY, LATER IF YOU WOULD LOOK AT MY PAPERS,
4 THE EPIDEMIOLOGISTS WHO ACTUALLY THEN STARTED STUDYING
5 ASD AND ENVIRONMENT AND ACTUALLY FOR THE FIRST TIME WERE
6 ABLE TO LOOK AT DIFFERENT DEVELOPMENTAL PERIODS BECAUSE,
7 YOU KNOW, SCIENCE DEVELOPS.

8 YOU BELIEVE THAT, YOU KNOW, CERTAIN PERIODS ARE
9 MORE IMPORTANT THAN OTHERS, BUT PEOPLE HAVE REALLY NOT
10 COLLECTED ENOUGH DATA ON IT. NOW THAT WE HAVE COLLECTED
11 A LOT MORE DATA, YOU KNOW, THIS WAS, YOU KNOW, 20 --
12 WHAT WAS IT -- '13 OR 2014.

13 Q 2014.

14 A YEAH.

15 SO IN THE MEANTIME I'VE DONE A LOT OF OTHER
16 STUDIES. I'VE LOOKED AT WHEN THE EXPOSURES WERE MOST
17 AFFECTING THE INCIDENCE OF ASD. AND WHEN I LOOK AT
18 THOSE, MY OWN STUDIES THAT CAME LATER, THE AIR POLLUTION
19 STUDIES, I ACTUALLY REVISED MY OPINION TO IT'S MORE
20 LIKELY LATE PREGNANCY AND EARLY CHILDHOOD.

21 AND IF YOU LOOK AT MY DANISH STUDY WHERE I HAD
22 THE BEST DATA TO EVALUATE THAT BECAUSE IT WAS A LOT --
23 IT WAS THOUSANDS OF ASD CHILDREN, IT WAS CLEARLY LATE
24 PREGNANCY AND DEFINITELY EARLY LIFE AND NOT -- NOT THIS
25 VERY EARLY PERIOD.

26 SO I CORRECTED MYSELF.

27 Q OKAY.

28 LET'S SEE WHO YOU SAID -- YOU MENTIONED THAT

1 YOU CITED FOOTNOTE REFERENCES 9 TO 11 --

2 A YES.

3 Q -- FOR THIS PROPOSITION.

4 LET'S SEE WHO WOULD HAVE SAID SUCH A THING.

5 LET'S GO TO THE FOOTNOTES, WHICH ARE ON PAGE,
6 IT'S LABELED E70, I DON'T KNOW HOW TO -- IT'S THE SECOND
7 TO LAST PAGE OF THE STUDY AND LOOK AT FOOTNOTE
8 REFERENCES 9 TO 11.

9 ONE SECOND, DOCTOR.

10 A ARE YOU SHOWING ME THIS?

11 Q JUST ONE SECOND.

12 FOOTNOTE REFERENCE 10 IS HANNA GARDENER, ET
13 AL., THAT'S ONE THE STUDIES YOU CITED FOR THE
14 PROPOSITION THAT THE PRENATAL PERIOD IS STRONGLY
15 IMPLICATED IN ASD ETIOLOGY; CORRECT?

16 A YES.

17 Q ALL RIGHT.

18 WE CAN TAKE THAT DOWN.

19 A BUT AS I SAID --

20 Q YOU --

21 A -- THIS WAS 2014, AND YOU KNOW, SCIENCE GOES IN
22 LEAPS AND SPURTS, AND ALL OF SCIENCE ON AUTISM SPECTRUM,
23 THE EPIDEMIOLOGY OF AUTISM SPECTRUM HAS REALLY DEVELOPED
24 AFTER THE 2000S AND AFTER, YOU KNOW, THAT PERIOD.

25 I MEAN, MY FIRST STUDY WAS IN 2012. THIS ONE
26 YOU'VE JUST CITED WAS IN 2014. I HAVE A LOT MORE
27 PUBLICATIONS AFTERWARDS, AND YOU'RE NOT CITING THOSE,
28 WHERE I'M ACTUALLY CLEARLY SAYING IT IS LATE PREGNANCY

1 AND EARLY CHILDHOOD THAT THE EPIDEMIOLOGICAL DATA IS
2 POINTING TO NOW. WE ARE SURPRISED TO SEE THAT, BUT
3 THAT'S WHAT ALL OUR DATA SAYS. AND WE CORRECTED OUR
4 OPINION ACCORDING TO WHAT THE DATA SAYS, NOT WHAT OUR
5 PRIOR -- WHAT OUR PRIOR OPINION IS.

6 Q DIDN'T YOU COME TO BELIEVE, DOCTOR, THAT THE
7 THE ETIOLOGY OF ASD LIKELY ORIGINATES IN EARLY
8 PREGNANCY?

9 A THERE IS SOME AUTISM THAT DEFINITELY ORIGINATES
10 AT CONCEPTION EVEN BECAUSE WE KNOW THAT, YOU KNOW, THERE
11 ARE MONOGENIC FORMS, FRAGILE X SYNDROME IS ONE OF THEM,
12 GENETIC AUTISM IS CAUSED AT CONCEPTION OR THE CAUSE GOES
13 BACK TO CONCEPTION, AND THEN OF COURSE THE WHOLE
14 PREGNANCY NEURODEVELOPMENT THAT IS BASED ON THAT GENETIC
15 BLUEPRINT IS HAPPENING IN, YOU KNOW, IN FETAL
16 DEVELOPMENT EARLY ON AND THERE'S STRUCTURAL BRAIN
17 DEFECTS, THERE ARE CHILDREN WITH MICROCEPHALY WHO HAVE
18 AUTISM. THAT MEANS THEY HAVE A VERY SMALL BRAIN.
19 THAT'S A STRUCTURAL DEFECT THAT GOES BACK TO VERY EARLY
20 PREGNANCY.

21 THESE KIND OF THINGS DEVELOP -- AS I SAID, IN
22 2000 YOU COULD HAVE ASKED ME AND I WOULD HAVE SAID, OH,
23 AUTISM IS ALL GENETIC. BECAUSE THE ONLY STUDIES WE HAD
24 WERE GENETIC STUDIES. AND THAT'S WHAT GENETIC STUDIES
25 TOLD US.

26 IN THE MEANTIME, WE HAVE LEARNED MORE. WE HAVE
27 MOVED ON. WE HAVE DONE EPIDEMIOLOGIC STUDIES AND WE
28 HAVE LEARNED THAT THERE ARE MANY DIFFERENT SENSITIVE

1 PERIODS, AND DEPENDING ON WHAT AGENT WE ARE TALKING
2 ABOUT, THESE SENSITIVE PERIODS ARE DIFFERENT ONES. AND
3 FOR AIR POLLUTION I NOW STRONGLY BELIEVE IT'S LATE
4 PREGNANCY AND EARLY CHILDHOOD.

5 FOR OTHER AGENTS WE HAVE TO DISCUSS. FOR LEAD,
6 IT PROBABLY DEPENDS ON WHEN THE LEAD EXPOSURE IS THE
7 HIGHEST. AS I TOLD YOU EARLIER, IF WE HAVE REALLY HIGH
8 LEAD EXPOSURE IN A MOTHER VERY EARLY IN PREGNANCY, SHE
9 PROBABLY LOSES THE BABY. SHE PROBABLY HAS A MISCARRIAGE
10 OR A STILLBIRTH, SO WE WON'T EVEN SEE THE AUTISM.

11 Q LET'S LOOK AT ONE OF YOUR LATER PUBLICATIONS.
12 IT'S A PUBLICATION WITH THE FIRST AUTHOR IS NAMED VIRK,
13 V-I-R-K.

14 DO YOU RECALL THAT PUBLICATION?

15 A YES, I --

16 Q ALL RIGHT.

17 A -- THAT'S HERE, IF THAT'S WHAT YOU'RE ASKING.

18 Q OKAY. THIS IS EXHIBIT 684.

19 IT'S CALLED "PRECONCEPTIONAL AND PRENATAL
20 SUPPLEMENTARY FOLIC ACID AND MULTI VITAMIN INTAKE AND
21 AUTISM SPECTRUM DISORDERS."

22 AND AGAIN, YOU'RE THE SENIOR AUTHOR ON THE
23 ARTICLE; CORRECT?

24 A YES, SHE WAS MY POST DOC.

25 Q ALL RIGHT. AND LET'S LOOK AT THE VERY FIRST
26 SENTENCE OF THE ARTICLE UNDER "INTRODUCTION."

27 "THE ETIOLOGY OF AUTISM SPECTRUM DISORDERS
28 LIKELY ORIGINATES EARLY IN PREGNANCY, A TIME

1 WHEN FOLATE, THYROID HORMONES SUCH AS IODINE
2 AND OTHER VITAMINS, HORMONES AND/OR OTHER TRACE
3 ELEMENTS ARE CRITICAL FOR NEURODEVELOPMENT."

4 DO YOU SEE THAT?

5 A YES. AND THIS IS ONE OF THOSE EXAMPLES WHERE
6 I'M TELLING YOU, YES, ASD IS CAUSED BY MANY, MANY
7 DIFFERENT THINGS. ONE OF THEM IS PROBABLY FOLATE
8 DEFICIENCY. AND LIKE WITH GENETIC CAUSES, THESE CAUSES,
9 THESE OTHER CAUSES HAVE THEIR TIMING. AND THE TIMING
10 FOR FOLATE IS EARLY IN PREGNANCY. THE TIMING FOR
11 THYROID HORMONES CAN BE EITHER EARLY, AND IF THEY ARE
12 VERY EARLY, THEY MIGHT CONTRIBUTE TO STRUCTURAL DEFECTS
13 JUST LIKE FOLATE IN THE BRAIN.

14 IF THEY ARE LATE, THEN IT'S THE ASD SPECTRUM ON
15 THE OTHER SIDE WHERE IT'S REALLY JUST SYNAPSE FORMATION
16 -- NOT JUST -- IT'S SYNAPSE FORMATION, IT'S PRUNING
17 AFTER BIRTH, ET CETERA.

18 SO THE TIMING IS SEVERE WHEN IT'S EARLY AND
19 MAYBE LESS SEVERE WHEN IT'S LATE OR IT IS OTHER TYPES OF
20 STRUCK -- OF EFFECTS IT HAS ON THE BRAIN.

21 SO, IN ESSENCE, THE BRAIN IS AN ORGAN THAT
22 DEVELOPS OVER MANY, MANY, MANY YEARS, AND DEPENDING ON
23 WHEN YOU HIT IT WITH WHAT, YOU GET DIFFERENT TYPES OF
24 AUTISM.

25 AND HERE WE WERE INTERESTED IN FOLATE, AND WE
26 KNOW THAT ONE PLACE WHERE FOLATE IS REALLY IMPORTANT IS
27 EARLY IN PREGNANCY AND THAT'S WHY THIS FIRST SENTENCE
28 POINTS TO EARLY IN PREGNANCY BECAUSE THAT IS THE TIME WE

1 ARE INTERESTED IN NOW BECAUSE FOLATE IS RESPONSIBLE FOR
2 METHYLATION AND THE METHYLATION IN EARLY PREGNANCY, THE
3 METHYLATION OF THESE -- OF THE BRAIN IS REALLY IMPORTANT
4 EARLY IN PREGNANCY AND THAT'S WHAT THIS POINTS OUT.

5 Q OKAY.

6 A BUT THAT DOESN'T MEAN THERE ARE NO REASONS TO
7 THINK THAT, YOU KNOW, OTHER AGENTS MAY AFFECT THE BRAIN
8 LATER IN TIME.

9 THERE'S NOT ONLY ONE TIME.

10 Q OKAY. DOCTOR, BUT THANK YOU FOR THAT ANSWER.

11 LET'S -- I WANT TO ASK YOU ABOUT THE ARORA
12 STUDY WHICH YOU'VE REFERRED TO SEVERAL TIMES IN THE TWIN
13 TEETH STUDY THAT YOU REFERRED TO SEVERAL TIMES IN YOUR
14 TESTIMONY YESTERDAY AND A COUPLE OF TIMES TODAY.

15 AND YOU -- THIS STUDY YOU SAID GREATLY
16 INFLUENCED YOUR CONCLUSIONS ABOUT METALS AND AUTISM
17 DEVELOPMENT; ISN'T THAT TRUE?

18 A YES.

19 Q AND AS YOU DESCRIBED YESTERDAY, THIS STUDY THAT
20 GREATLY INFLUENCED YOUR CONCLUSIONS MEASURED LEVELS OF
21 METALS IN SHED TEETH OF WHAT ARE CALLED DISCORDANT TWIN
22 PAIRS IN SWEDEN; CORRECT?

23 A YES, THEY WERE BOTH. THEY WERE CONCORDANT AND
24 DISCORDANT.

25 Q RIGHT.

26 AND I WANT TO ASK YOU ABOUT SOME OF THE
27 STATEMENTS THAT THE AUTHORS MADE IN THIS STUDY.

28 LET'S GO TO THE SECOND PAGE.

1 THE PARAGRAPH THAT BEGINS WITH "STUDIES OF
2 TOXIC METALS."

3 SO WE TALKED ABOUT THE FIRST COUPLE OF
4 SENTENCES OF THIS PARAGRAPH. I WANTED TO ASK YOU ABOUT
5 A COUPLE OF THE OTHER SENTENCES.

6 THE THIRD SENTENCE SAYS, "PREVIOUS RESEARCH
7 SHOWS METHODOLOGICAL SHORTCOMINGS THAT LIMIT
8 INTERPRETATION AND GENERALIZABILITY OF THE
9 FINDINGS; FIRST, ELEMENTAL EXPOSURE HAS
10 FREQUENTLY BEEN ESTIMATED USING CONCENTRATIONS
11 IN BLOOD OR OTHER BIOMARKERS POST DIAGNOSIS."
12 DO YOU SEE THAT?

13 A YES. HE'S CITING 11. WHO IS THAT?

14 Q WELL, LET ME -- BEFORE I SHOW YOU THAT, LET ME
15 ASK YOU A QUESTION.

16 THAT -- WHAT THAT SENTENCE IS REFERRING TO IS
17 THE TEMPORALITY PROBLEM, THAT ELEMENTS HAVE BEEN
18 MEASURED USING CONCENTRATIONS IN BLOOD OR OTHER
19 BIOMARKERS POST DIAGNOSIS OF THE DISEASE; CORRECT?

20 A I DON'T KNOW WHETHER I WOULD INTERPRET IT IN
21 THIS WAY. I SAW IT MORE AS HIM WORRIED ABOUT THE TOOTH
22 BEING A LONGER TERM, MORE TIME-DEFINED MEASURE THAN
23 BLOOD.

24 Q OKAY.

25 THEY SAY DOWN LATER, "ASSESSING" -- IN THE
26 THIRD -- "ASSESSING THE CONTRIBUTION OF ENVIRONMENTAL
27 FACTORS IN THE ETIOLOGY OF ASD NEEDS CONTROL
28 FOR GENETIC FACTORS."

1 DO YOU SEE THAT?

2 A WHERE IS THAT?

3 Q I'M SORRY, IT SAYS THAT RIGHT THERE.

4 A OH, YEAH. UM-HMM, YES.

5 Q AND DO YOU AGREE WITH THAT?

6 A WELL, THAT'S HIS OPINION. AND YES, GENERALLY,
7 IT IS A GOOD IDEA TO CONTROL FOR GENETIC FACTORS BECAUSE
8 WE KNOW THAT THERE'S DIFFERENCE SUSCEPTIBILITIES.
9 WHETHER YOU CAN DO THAT IN EVERY STUDY IS
10 ANOTHER QUESTION.

11 SO GENERALLY WHAT THAT MEANS IS IF YOU CANNOT
12 CONTROL -- AND THEY COULD CONTROL. THAT'S WHY HE SAYS
13 OUR STUDY IS SO MUCH BETTER THAN ALL THE OTHERS, AND I
14 WOULD AGREE WITH THAT -- THE PROBLEM IS WHEN YOU CAN'T
15 CONTROL FOR GENETIC FACTORS, THEN YOU ARE MIXING TYPES,
16 AND WHEN YOU'RE MIXING TYPES, IT'S THAT SIGNAL TO NOISE
17 RATIO.

18 SO IF YOU CANNOT CONTROL FOR GENETIC FACTORS,
19 MOST LIKELY YOU WON'T SEE ANYTHING, AND THAT'S THE
20 PROBLEM WITH MOST ENVIRONMENTAL STUDIES. THAT'S
21 ACTUALLY WHY IN THE LAST 20 YEARS I HAVE ALSO PIVOTED
22 TOWARDS WHAT IS CALLED GENE ENVIRONMENT INTERACTION
23 STUDIES SO I CAN CONTROL FOR GENES WHEN I'M MEASURING
24 ENVIRONMENTAL FACTORS, BUT THAT'S REALLY EXPENSIVE AND
25 NOT POSSIBLE IN EVERY CASE.

26 Q ALL RIGHT. AND THE WAY THAT THEY TRIED TO
27 CONTROL FOR GENERIC FACTORS HERE, ONE WAY TO DO IT AS IT
28 SAYS IN THE NEXT SENTENCE WOULD BE HAVING MONOZYGOTIC

1 TWINS, IN OTHER WORDS, IDENTICAL TWINS THAT ARE
2 DISCORDANT FOR ASD; MEANING, ONE HAS ASD AND ONE
3 DOESN'T; CORRECT?

4 A YES.

5 Q OKAY.

6 NOW, DOCTOR, ISN'T IT TRUE THAT IN THIS STUDY
7 THEY ONLY HAD THREE DISCORDANT MONOZYGOTIC TWIN PAIRS?

8 A CAN YOU SHOW ME?

9 Q SURE.

10 THE NEXT PAGE, ACTUALLY, THERE'S A CHART WHICH
11 IS A FLOW CHART OF THEIR NUMBERS AND METHODS.

12 AND DO YOU SEE AT THE BOTTOM AND UNDER --

13 A UM-HMM.

14 Q -- WHEN THEY DESCRIBE WHAT NUMBER OF ASD
15 DISCORDANT TWINS THEY HAD, THEY ONLY HAD THREE
16 DISCORDANT MONOZYGOTIC TWINS; CORRECT?

17 A YES, BUT THEY ALSO HAD FIVE CONCORDANT
18 MONOZYGOTIC TWINS AND THEN NINE MONOZYGOTIC TWINS WITH
19 -- PAIRED WITH SOMEONE ELSE; SO THEY ARE NOT JUST
20 COMPARING MONOZYGOTIC TWINS TO EACH OTHER, THEY ARE
21 ACTUALLY DOING A MUCH BROADER COMPARISON WHICH IS VERY,
22 VERY USEFUL BECAUSE IT TELLS YOU SOMETHING ABOUT
23 GENETICS AS WELL AS THE ENVIRONMENTS AND WHAT IT DOES
24 TOGETHER.

25 Q RIGHT.

26 A AND THAT'S WHY ACTUALLY THIS IS ACTUALLY SUCH A
27 BRILLIANT STUDY AND WAS PUBLISHED IN A GOOD JOURNAL.

28 Q RIGHT.

1 AND IN TERMS OF THE NUMBER OF TWIN PAIRS WHERE
2 THE ONE TWIN HAD ASD -- THE NUMBER OF IDENTICAL TWIN
3 PAIRS WHERE ONE HAD ASD AND ONE DIDN'T IS A TOTAL OF
4 THREE?

5 A THAT'S WHAT IT LOOKS LIKE, YES.

6 Q ALL RIGHT.

7 AND THEY FOUND BETWEEN THOSE SEVEN DISCORDANT
8 TWIN PAIRS THAT ARE SHOWN THERE, THE THREE MONOZYGOTIC
9 PLUS THE FOUR DIZYGOTIC, THAT MEANS NON IDENTICAL TWINS;
10 CORRECT?

11 A YES, THEY SHARE THE UTERUS, BUT NOT THE GENES
12 -- THEY ARE LIKE SIBLING.

13 Q JUST LIKE SIB --

14 A YEAH, IN THAT SENSE THEY ARE ACTUALLY ARE
15 CONTROLLING FOR GENETICS BECAUSE SIBLINGS ARE SO MUCH
16 CLOSER IN THEIR GENETICS THAN ANYONE ELSE IN THE WORLD
17 EXCEPT FOR THE PARENTS.

18 Q AND THEY FOUND AN ASSOCIATION BETWEEN -- IN
19 THESE SEVEN TWIN PAIRS, THE THREE MONOZYGOTIC AND THE
20 TWO DIZYGOTIC -- I MEAN, FOUR DIZYGOTIC TWIN PAIRS --
21 THEY FOUND AN ASSOCIATION BETWEEN LEAD LEVELS AND THE
22 AUTISM -- THE TWIN THAT HAD AUTISM ONLY -- ONLY AT THE
23 TIME 10 TO 20 WEEKS POST-NATALLY; CORRECT?

24 A NO. THEY LOOKED AT THE WHOLE TIME PERIOD AND
25 IT WASN'T ALWAYS STATISTICALLY SIGNIFICANT, BUT WHEN YOU
26 LOOK AT THE PATTERNS, THE HIGHER LEAD LEVEL WAS FAIRLY
27 CONSISTENT THROUGHOUT. BUT FOR SOME REASON THERE WAS --
28 YOU CAN GO TO THE FIGURES -- FOR SOME REASON IT WASN'T

1 ALWAYS STATISTICALLY SIGNIFICANT, SO THEY WERE VERY
2 CAREFUL IN THEIR DESCRIPTIONS.

3 Q WELL, LET'S SEE HOW THE AUTHORS DESCRIBED THEIR
4 OWN RESULTS.

5 LET'S GO TO PAGE 4 OF THE STUDY.

6 THIS IS UNDER THE "RESULTS" SECTION WHERE THE
7 AUTHORS SAY WHEN THEY COMPARED DISCORDANT TWINS WITH
8 NON, THEY FOUND LEAD LEVELS WERE CONSISTENTLY HIGHER IN
9 ASD CASES FROM 20 WEEKS BEFORE BIRTH TO 30 WEEKS AFTER
10 BIRTH; HOWEVER, AFTER ADJUSTING FOR INTER-TWIN
11 CORRELATIONS, THIS ASSOCIATION WAS ONLY EVIDENT BETWEEN
12 10 TO 20 WEEKS POST-NATALLY; CORRECT?

13 A YES.

14 Q NOW, DOCTOR, IF YOU THINK ABOUT THE 30 WEEKS
15 POST-BIRTH IN THIRDS, THEY FOUND NO STATISTICALLY
16 SIGNIFICANT ASSOCIATION BETWEEN BIRTH AND WEEK 10, NO
17 STATISTICALLY SIGNIFICANT ASSOCIATION BETWEEN WEEKS 20
18 AND 30, AND ONLY A STATISTICALLY SIGNIFICANT ASSOCIATION
19 BETWEEN WEEKS 10 AND 20; IS THAT CORRECT?

20 A WELL, WHEN YOU HAVE THESE KIND OF NUMBERS AND
21 YOU ADJUST, LIKE THEY SAY HERE FOR ALL THE THESE
22 CORRELATIONS, THAT IS WHAT I WOULD EXPECT TO HAPPEN
23 BECAUSE YOU NEEDED A LARGER SAMPLE SIZE TO MAKE THE
24 OTHER DIFFERENCES.

25 IF WE GO TO THE FIGURES, YOU'LL SEE THEY ARE
26 ALL ABOVE. THE TWIN WITH ASD ALWAYS HAS HIGHER LEAD
27 LEVELS, BUT THEY DON'T REACH THE LEVEL OF STATISTICAL
28 SIGNIFICANCE WHEN YOU DO ALL THIS CO-ADJUSTMENT.

1 IT DOESN'T MEAN IT'S NOT MEANINGFUL. IT
2 DOESN'T MEAN IT'S NOT CONSISTENT. IT JUST MEANS I WISH
3 WE HAD MORE NUMBERS, MORE NUMBERS OF THESE KIDS TO
4 COMPARE.

5 Q AND BY THE WAY, EVEN THE SIGNIFICANT THING THEY
6 SAW, IF YOU LOOK AT THE NUMBERS THERE, THE 95 PERCENT
7 CONFIDENCE INTERVAL IS .0.9 TO 2.5 SO IT CROSSES ONE.

8 EVEN THAT IS NOT STATISTICALLY SIGNIFICANT;
9 CORRECT?

10 A I DON'T KNOW WHAT YOU'RE TALKING ABOUT. CAN
11 YOU SHOW ME THAT?

12 Q IT'S RIGHT ON THE SCREEN.

13 IT SAYS WITH THE GREATEST DIFFERENCE WAS
14 OBSERVED AT 15 WEEKS POST-NATALLY WHEN LEAD LEVELS IN
15 ASD CASES WERE 1.5 TIMES HIGHER AND THEN THEY HAD THE
16 95 PERCENT CONFIDENCE INTERVAL .9 -- 0.9 TO 2.5.

17 DO YOU SEE THAT?

18 A YES. BUT AGAIN, YOU KNOW, IT INDICATES THERE
19 IS QUITE A LOT -- A 1.5 FOLD HIGHER, AND YOU KNOW, WHEN
20 YOU HAVE THESE NUMBERS, I'M REALLY AMAZED THAT THEY CAN
21 SEE ANYTHING.

22 SO THE MOST LIKELY RESULT FROM A STUDY LIKE
23 THIS WOULD BE SEEING ABSOLUTELY NOTHING. AND THAT THEY
24 SEE A 1.5 FOLD HIGHER AND THAT THEY CAN EVEN BON-FERRONI
25 CORRECT AND THE CONFIDENCE INTERVAL IS .9, THAT'S PRETTY
26 CLOSE TO ONE, I FIND QUITE SURPRISING.

27 SO THIS TO ME IS RELATIVELY STRONG DATA GIVEN
28 WHAT YOU JUST SAID.

1 Q ALL RIGHT.

2 WELL, LET'S SEE HOW THE AUTHORS CHARACTERIZE
3 THEIR CONCLUSIONS IN THIS STUDY.

4 LET ME START ON PAGE 7 OF THE STUDY.

5 A WELL, THEY SAID UP THERE "CONSISTENTLY HIGHER,"
6 RIGHT.

7 Q I WAS LOOKING AT PAGE 7 OF THE STUDY. AT THE
8 FIRST PARAGRAPH THERE.

9 A YES.

10 Q LET ME ASK YOU SOMETHING.

11 THE AUTHORS SAY, "EARLY SIGNS OF ASD FIRST
12 MANIFEST 6 TO 12 MONTHS AFTER BIRTH SUGGESTING
13 A NARROW WINDOW FOR ENVIRONMENTAL FACTORS TO
14 CONTRIBUTE TO ASD RISK."

15 DO YOU SEE THAT?

16 A YES. AND THEY ARE CITING A REFERENCE .9 FOR
17 THAT. WHAT'S THAT?

18 Q I -- WELL, LET ME -- BEFORE I SHOW YOU THE
19 REFERENCE, DO YOU AGREE WITH THE AUTHORS THAT EARLY
20 SIGNS OF ASD FIRST MANIFEST 6 TO 12 MONTHS AND THAT
21 SUGGEST A NARROW WINDOW FOR ENVIRONMENTAL FACTORS TO
22 CONTRIBUTE TO ASD RISK?

23 A WELL, WE PROBABLY AGREE THAT ASD IS A SPECTRUM
24 DISEASE AND THAT THERE ARE VERY DIFFERENT AGES AT FIRST
25 MANIFESTATION; AND YES, THERE ARE CHILDREN WHO FIRST
26 MANIFEST EARLY, VERY EARLY IN LIFE.

27 THERE ARE CERTAINLY CHILDREN WHO ALSO MANIFEST
28 MUCH LATER IN LIFE. AND YOU KNOW, THAT NARROW WINDOW

1 BECOMES QUITE WIDE IF WE'RE LOOKING AT KIDS WHO HAVE ASD
2 FIRST DIAGNOSED LATER, THEN, YOU KNOW, THE WINDOW ISN'T
3 AS NARROW. BUT FOR THE KIDS WHO MANIFEST THIS EARLY
4 YES, IT'S NARROW. I AGREE.

5 Q OKAY.

6 AND THEN LET'S LOOK AT THE CONCLUSION SECTION
7 OR THE CONCLUSION PARAGRAPH.

8 THIS IS ON PAGE 8 OF THE STUDY RIGHT AT THE TOP
9 PARAGRAPH WHERE THEY TALK ABOUT STRENGTHS AND
10 WEAKNESSES.

11 SO ONE LIMITATION OF THIS STUDY WAS A RELATIVE
12 -- IT WAS A RELATIVELY SMALL NON RANDOM SAMPLE; CORRECT?

13 A YES. WHY THEY SAY NON RANDOM, I HAVE NO IDEA
14 WHAT THEY MEAN BY THAT.

15 Q OKAY.

16 A IT'S SMALL. IT'S RELATIVELY SMALL. I AGREE
17 WITH THAT.

18 Q AND THEN IF YOU GO DOWN IN THAT PARAGRAPH WITH
19 -- STARTING WITH THE WORDS "NEVERTHELESS," THIS IS WHAT
20 AT AUTHORS SAY ABOUT THEIR FINDINGS.

21 "NEVERTHELESS, CAUTION SHOULD BE EXERCISED WHEN
22 GENERALIZING OUR FINDINGS AND ADDITIONAL
23 STUDIES ARE NEEDED IN DIFFERENT POPULATIONS,
24 PARTICULARLY LARGER NON TWIN ASD SAMPLES TO
25 CORROBORATE OUR FINDINGS AND DIFFERENTIATE
26 GENETIC AND NON GENETIC CONTRIBUTIONS IN
27 UNDERSTANDING THE RELATION BETWEEN METALS AND
28 ASD."

1 DO YOU SEE THAT?

2 A YES, I SEE THAT.

3 Q AND DO YOU AGREE WITH THE AUTHORS'
4 INTERPRETATION OF THEIR HOW THEIR FINDINGS SHOULD BE
5 USED?

6 A YES, AND I REALLY APPLAUD THEM FOR THIS VERY,
7 VERY CAUTIOUS STATEMENT BECAUSE THAT'S WHAT WE WOULD
8 LIKE TO SEE AUTHORS DO, THAT THEY ARE, YOU KNOW,
9 ENTHUSIASTIC ABOUT THEIR RESULTS, BUT SAY, WELL, WE'D
10 BETTER BE CAUTIOUS. THAT'S GREAT. AND OF COURSE IF WE
11 WANT TO DIFFERENTIATE GENETICS FROM NON GENETICS, WE
12 NEED MUCH LARGER STUDIES BECAUSE IT IS REALLY HARD.

13 AS SOON AS YOU GO INTO DIFFERENTIATING BETWEEN
14 DIFFERENT CAUSES AND YOU ARE TARGETING MORE THAN ONE
15 CAUSE IN ONE STUDY, YOU NEED AT LEAST FOUR TIMES THE
16 SAMPLE SIZE, AND THAT'S BASICALLY WHAT THEY ARE
17 ACKNOWLEDGING HERE.

18 SO FOR THESE --

19 Q AND --

20 A -- DIFFERENTIATIONS, WE NEED LARGER SAMPLE
21 SIZE, BUT THAT --

22 Q AND WHEN I --

23 A -- BUT THAT DOESN'T MEAN THEY DIDN'T SHOW THAT
24 ENVIRONMENT CONTRIBUTED.

25 Q AND WHEN I ASKED YOU ABOUT THIS VERY STATEMENT
26 IN YOUR DEPOSITION, DIDN'T YOU TELL ME THAT MANISH ARORA
27 PUT THE STATEMENT IN THERE BECAUSE HE WANTED MORE MONEY
28 FOR MORE STUDIES? ISN'T THAT WHAT YOU TOLD ME?

1 A I DON'T RECALL THIS. MAYBE I DID. BUT THAT'S
2 USUALLY WHAT WE ARE SAYING WHEN WE ARE PROMOTING OUR
3 SCIENCE, WE WANT MORE BECAUSE WE'RE NEVER, YOU KNOW,
4 WE'RE NEVER HAPPY JUST WITH ONE STUDY. AND THIS IS A
5 NEW METHOD THAT HE'S USED ON THESE TEETH. IT'S AN
6 EXCITING METHOD.

7 AND YES, I WISH HAD HE GOTTEN MORE MONEY SO HE
8 COULD DO THIS AGAIN AND DO IT IN MORE CHILDREN AND, YOU
9 KNOW, FIND OUT MORE AND TELL US MORE.

10 Q ALL RIGHT. WELL, LET'S -- WE HAVE ONLY A FEW
11 MINUTES REMAINING. LET'S SEE EXACTLY WHAT YOU SAID AND
12 THEN I WANT TO ASK YOU ONE MORE QUESTION ABOUT THE
13 STUDY.

14 LET'S GO TO YOUR DEPOSITION, EXHIBIT 7 ON
15 PAGE 222.

16 MR. WISNER: YOUR HONOR, I'M JUST GOING TO
17 OBJECT TO THE RELEVANCE OF ANY OF THIS.

18 THE COURT: OVERRULED.

19 MR. WISNER: OKAY.

20 MR. PETROSINELLI:

21 Q AND SO WHEN I READ YOU THIS STATEMENT, WHICH IS
22 AT THE TOP, AND THE QUESTION, AND I ASKED YOU IF YOU
23 AGREED WITH IT, RIGHT AT THE BOTTOM STARTING AT LINE 13,
24 YOU SAID, "THAT'S WHAT WE ALWAYS TEACH OUR STUDENTS TO
25 SAY, RIGHT. YOU NEVER CONCLUDE ANYTHING FROM
26 JUST ONE STUDY. YOU ALWAYS ASK FOR MORE
27 RESEARCH AND YOU ASK FOR MORE STUDIES AND NON
28 TWINS. AND GUESS WHAT, MANISH" -- THAT'S

1 MANISH ARORA -- "WANTED MORE MONEY FOR MORE
2 STUDIES AND THIS IS ONE THE ARGUMENTS YOU
3 MAKE."
4 YOU TESTIFIED -- THAT'S WHAT YOU SAY?
5 A YEAH, THAT'S EXACTLY WHAT I JUST SAID.
6 Q OKAY.
7 A AND I WISH HE HAD GOTTEN MORE MONEY BECAUSE I
8 WISH HE WOULD DO MORE OF THOSE.
9 Q LAST QUESTION I WANT YOU TO ASK YOU ABOUT THE
10 ARORA STUDY ON THAT SAME WE WERE AT; AGAIN, THIS IS
11 PAGE 8 IN THE CONCLUSIONS OF THE STUDY,
12 "FURTHERMORE," THIS IS WHAT THE AUTHORS SAID --
13 "WHILE THE DIFFERENCES WE OBSERVE BETWEEN CASES
14 AND CONTROLS PRECEDE THE ONSET OF ASD SYMPTOMS"
15 -- IN OTHER WORDS, THEY HAVE ESTABLISHED
16 TEMPORALITY -- "THESE DATA DO NOT ESTABLISH
17 CAUSALITY."
18 DO YOU SEE THAT?
19 A YES.
20 Q AND YOU CERTAINLY AGREE WITH THAT?
21 A NO ONE STUDY ESTABLISHES CAUSALITY, NO.
22 Q OKAY.
23 A AND THAT'S WHY I'M SAYING THESE AUTHORS ARE
24 VERY CAREFUL IN HOW THEY INTERPRET THEIR RESULTS AND I
25 REALLY APPLAUD THEM FOR IT. AND I WISH WE HAD MORE
26 CAREFUL -- CAREFULLY DONE STUDIES BY PEOPLE WHO ARE SO
27 HUMBLE AND STATE WHAT THEY SAID.
28 Q OKAY.

1 THERE WAS ONE MORE STUDY YOU MENTIONED
2 YESTERDAY THAT I THINK I'LL CONCLUDE WITH FOR TODAY, AND
3 THAT IS A STUDY CALLED FILON, F-I-L-O-N, WHICH IS
4 EXHIBIT 57.

5 DO YOU RECALL TALKING ABOUT THAT STUDY
6 YESTERDAY?

7 A I THINK WE DID, YES.

8 Q ALL RIGHT. AND I WANT TO -- THIS IS A CASE
9 CONTROL STUDY FROM ONE REGION IN POLAND; TRUE?

10 A LET ME SEE. YELINSTOCK, YES.

11 Q OKAY.

12 AND I WANT TO ASK YOU ABOUT SOME OF THE
13 STATEMENTS THAT THE AUTHORS MAKE IN THIS STUDY STARTING
14 ON PAGE 2.

15 IN THE BOTTOM PARAGRAPH, THIS IS IN THE
16 BACKGROUND SECTION.

17 IT SAYS, "ASD IS A NEURODEVELOPMENTAL DISORDER
18 THIS SUGGESTS A POSSIBLE ROLE OF HEAVY METALS
19 IN ITS UNDERLYING CAUSE CONDUCTION; HOWEVER,
20 INVESTIGATIONS ON ASSOCIATIONS BETWEEN ASD AND
21 NEUROTOXIC HEAVY METALS ARE INCONCLUSIVE. OVER
22 THE LAST DECADES, NUMEROUS STUDIES HAVE
23 REPORTED A RELATIONSHIP BETWEEN ASD AND LEAD
24 AND ARSENIC EXPOSURE, HOWEVER, THERE ARE ALSO
25 SOME REPORTS THAT CONCLUDE THAT HEAVY METAL
26 EXPOSURE IS NOT A RISK FACTOR FROM ASD,
27 THEREFORE, AN ACCURATE EVALUATION OF THE
28 RELATIONSHIP BETWEEN ASD AND HEAVY METALS NEEDS

1 MORE SPECIFIC RESEARCH."

2 DO YOU SEE THAT?

3 A YES.

4 Q AND THIS STUDY THAT WE'RE LOOKING AT WAS
5 PUBLISHED IN THE YEAR 2020; TRUE?

6 A CAN WE LOOK AT THAT? WHERE IS THIS --

7 Q SURE.

8 A -- PARAGRAPH FROM? THE INTRO, RIGHT?

9 Q YEAH. YOU CAN LOOK AT, I GUESS, RIGHT AT THE
10 TOP AND THE TOP LEFT.

11 A YES.

12 Q DO YOU SEE THE CITATION? "2020"?

13 A YEAH, ACTUALLY THEY ARE DOING EXACTLY WHAT I
14 TOLD YOU EVERY AUTHOR DOES WHO WANTS HIS ARTICLE IN A
15 GOOD JOURNAL, AND BMC IS A GOOD JOURNAL. THEY SAY,
16 WELL, THERE'S STILL SOMETHING WE NEED TO ADDRESS. WHAT
17 IS IT? WELL, THERE ARE LOTS AND LOTS STUDIES SHOWING
18 THESE EFFECTS, BUT GUESS WHAT, THERE ARE ALSO SOME WHO
19 DON'T. SURPRISE. SURPRISE. NOBODY WOULD BE SURPRISED
20 ABOUT THAT.

21 BUT THEN THE NEXT SENTENCE THEY SAID THAT IF
22 YOU DIDN'T READ WAS THAT THERE IS NO STUDY IN POLAND,
23 AND THAT IS ACTUALLY AN ARGUMENT THAT IS MADE AGAIN AND
24 AGAIN, WHERE, YOU KNOW, PEOPLE SAY, OKAY, THIS HAS BEEN
25 SHOWN IN THIS PART OF THE WORLD, BUT THAT DOESN'T APPLY
26 TO US, SO THEIR NEXT ARGUMENT THERE WAS WE REALLY NEED A
27 POLISH STUDY BECAUSE IN ORDER TO SET STANDARDS IN POLAND
28 WE NEED TO POLISH DATA AND THAT'S WHAT THEY WERE TRYING

1 TO SAY HERE.

2 Q OKAY. WELL, LET'S SEE -- AFTER THEY DID THE
3 STUDY, LET'S SEE WHAT THEY SAID ABOUT THE RESULTS.

4 LET'S GO TO PAGE 6 OF THE STUDY.

5 IN THE LEFT COLUMN, IT'S RIGHT AT END OF THE
6 DISCUSSION SECTION UNDER THE WORD -- THE PARAGRAPH
7 "DESPITE."

8 A YEAH.

9 Q WE'LL HIGHLIGHT THAT FOR YOU FOR A SECOND.
10 "DESPITE A NUMBER OF STUDIES AND ANALYSES,
11 AUTISM IS STILL NOT UNDERSTOOD BY SCIENTISTS
12 BECAUSE NO SPECIFIC FACTOR CAUSING THIS
13 CONDITION HAS BEEN FOUND. EACH EXPERIMENT
14 PROVIDES NEW VALUABLE DATA BUT FAILS TO
15 DELIVER AN EXPLANATION FOR SYMPTOM OCCURRENCE."
16 DO YOU SEE THAT?

17 A YEAH. THAT IS SO NON SPECIFIC AND SO WRONG
18 THAT I DON'T EVEN KNOW WHAT TO SAY ABOUT THIS BECAUSE WE
19 HAVE SPECIFIC CAUSES, THEY ARE CALLED GENES, MONOGENETIC
20 GENETIC DISORDERS CAUSE AUTISM AND NOT ONLY DO THEY --
21 DO WE KNOW THIS, WE ALSO KNOW THAT THOSE GENES HAVE
22 CERTAIN EFFECTS ON THE BRAIN, AND YOU KNOW, STRUCTURAL
23 EFFECTS ON THE BRAIN. AND THAT IS ONE TYPE OF AUTISM.

24 HOWEVER, AS WE ALSO AGREED, AUTISM IS A
25 SPECTRUM DISORDER, AUTISM SPECTRUM DISEASE; MEANING,
26 THERE ARE VERY SEVERE FORMS, STRUCTURAL DEFECTS, AND
27 THERE ARE VERY MINOR FORMS WITH AUTISM-LIKE SPECTRUM
28 BEHAVIOR. AND THEY HAVE DIFFERENT CAUSES. AND YES, WE

1 DON'T KNOW ALL THE CAUSES.

2 BUT SPECIFICITY, I THINK I ARGUED AGAINST THAT
3 BEFORE.

4 Q SO YOU SAY YOU DON'T KNOW WHERE TO BEGIN
5 BECAUSE IT'S SO WRONG. BUT THIS IS A STUDY THAT YOU
6 DISCUSSED YESTERDAY IN YOUR DIRECT TESTIMONY.

7 DO YOU REMEMBER THAT?

8 A YES, BUT I CAN, NEVERTHELESS, DISAGREE WITH A
9 SENTENCE IN THE DISCUSSION, RIGHT. I CAN EVEN STRONGLY
10 DISAGREE --

11 Q OKAY.

12 A -- WITH A SENTENCE IN THE DISCUSSION, BUT THE
13 DATA IS ALWAYS VALUABLE. I'M NOT -- I WOULD NEVER THROW
14 OUT ANY DATA. THE DATA THEY ARE GIVING ME IS VALUABLE
15 EVEN IF I DISAGREE WITH THE SENTENCE IN THE DISCUSSION.

16 Q OKAY. WE CAN TAKE THAT DOWN.

17 YOUR HONOR, I'M ABOUT TO MOVE TO A DIFFERENT
18 TOPIC. I SEE IT'S 4:25. SHALL WE BREAK FOR THE DAY AND
19 THEN MR. WISNER AND I CAN TALK ABOUT SCHEDULING WITH DR.
20 RITZ?

21 THE COURT: OKAY. LET'S EXCUSE THE WITNESS FOR
22 NOW.

23 THANK YOU VERY MUCH, DOCTOR. I APPRECIATE YOUR
24 PATIENCE.

25 AND LET'S JUST TALK AMONG THE THREE OF US FOR A
26 MINUTE ABOUT SCHEDULING.

27 HOW MUCH MORE DO YOU THINK YOU HAVE?

28 MR. PETROSINELLI: I WOULD SAY, I MEAN, THE

1 ANSWERS HAVE BEEN QUITE LONG, BUT I WOULD SAY, AS I
2 THINK YOUR HONOR HAS SEEN, I WOULD SAY WITH REASONABLY
3 RESPONSIVE ANSWERS, 30 MINUTES AT THE -- PROBABLY 30
4 MINUTES OR SO.

5 THE COURT: OKAY. GOOD. SO THAT SOUNDS
6 MANAGEABLE. IT'S SORT OF LIKE WHAT FELL OVER/LEFT OVER
7 -- WAS LEFT OVER FROM MR. WISNER.

8 SO THE NEXT TIME THAT I HAVE SET ASIDE IS WHEN?
9 TODAY IS TUESDAY. DO I HAVE TOMORROW AFTERNOON WITH YOU
10 AS WELL?

11 MR. PETROSINELLI: YES.

12 THE COURT: OKAY. SO IF WE START WITH -- BUT
13 DR. RITZ CANNOT DO TOMORROW, THAT'S THE ISSUE.

14 MR. WISNER: THAT'S CORRECT.

15 MR. PETROSINELLI: WE HAVE ANOTHER WITNESS -- I
16 THINK MR. WISNER HAS HIS OTHER EPIDEMIOLOGIST TOMORROW.

17 THE COURT: RIGHT.

18 MR. PETROSINELLI: AND I THINK WE COULD GO
19 FORWARD WITH HER. AND THEN THE QUESTION WOULD BE IS DR.
20 RITZ AVAILABLE ON FRIDAY MORNING OR SOMETIME FRIDAY TO
21 FINISH UP HER TESTIMONY.

22 THE COURT: OKAY. THANK YOU. THE OTHER
23 POSSIBILITY BECAUSE I HAVE NOTHING AT ALL NEXT WEEK AND
24 THEN I'M --

25 MR. WISNER: THE TRIAL WENT OFF.

26 THE COURT: WE THINK.

27 MR. WISNER: OH, OKAY.

28 THE COURT: I'D BETTER CHECK. WAIT. I'D

1 BETTER CHECK. I AM JUST BARELY ABOVE WATER FROM
2 DAY-TO-DAY HERE LET ME TELL YOU.

3 MR. WISNER: I CAN IMAGINE, YOUR HONOR.

4 THE COURT: THE NEXT WEEK, YEAH, THAT TRIAL IS
5 GOING OFF, YES, BUT ANYWAY, THEN I'M -- THE COURTROOM IS
6 DARK AND I'M GONE UNTIL THE DAY AFTER PRESIDENTS' DAY
7 WHICH IS THE 22ND AND ON THAT DAY I HAVE A JURY TRIAL
8 RIGHT NOW. IT'S SET TO GO.

9 ANYWAY, SO I SUPPOSE AS A DEFAULT WHAT THE
10 PARTIES COULD DO IS RECORD THE LAST HOUR -- HALF-HOUR OF
11 HER TESTIMONY WHEN IT'S CONVENIENT TO YOU AND THEN PLAY
12 IT TO THE COURT OR GIVE IT TO THE COURT TO PLAY SOMETIME
13 CONVENIENT TO ME SINCE WE HAVE SO LITTLE LEFT. THAT
14 SEEMS LIKE IT WOULD BE GOOD ENOUGH. WHAT DO YOU THINK?

15 MR. WISNER: THAT'S FINE WITH ME, YOUR HONOR.
16 I'M SURE WE CAN WORK SOMETHING OUT. IF YOU ARE
17 AVAILABLE NEXT WEEK --

18 THE COURT: OKAY.

19 MR. WISNER: -- I HAVE TO CHECK WITH DR. RITZ,
20 BUT MAYBE WE CAN -- YOU -- OH, YOU'RE NOT AVAILABLE.

21 THE COURT: NO, NEXT WEEK IS CRAZY.

22 MR. WISNER: OH, I'M SORRY. I MISHEARD YOU.
23 I'M SORRY, YOUR HONOR.

24 THE COURT: OKAY. THE TRIAL WENT AWAY. WELL,
25 NO, ACTUALLY, I MAY BE SPEAKING TOO STRONGLY HERE. LET
26 ME JUST LOOK FOR A MINUTE. OKAY. LET'S SEE. YEAH, I'M
27 -- YEAH, I -- IT'S NOT AS BAD AS I THOUGHT BECAUSE,
28 YOU'RE RIGHT, A LOT OF THE MARKS ARE FOR THE TRIAL THAT

1 I THINK IS GOING AWAY.

2 OKAY. SO IT WOULD BE AGAIN AFTERNOONS. OR THE
3 10TH IS A PRETTY GOOD DAY.

4 MR. WISNER: OKAY. LET ME CHECK WITH DR. RITZ
5 AND MAKE SURE THE TIME WORKS FOR HER. OBVIOUSLY THE
6 SOONER THE BETTER BECAUSE IT'S STILL FRESH AND THERE'S
7 STUFF I WANT TO REDIRECT ON AND EVERYTHING, SO, AND
8 OBVIOUSLY I DON'T WANT TO BE TALKING WITH HER WHILE
9 SHE'S STILL UNDER THE RUBRIC OF CROSS, BUT I DO HAVE TO
10 INTERACT WITH HER QUITE A BIT BECAUSE SHE'S ONE OF OUR
11 EXPERTS IN OUR CASE AND WE'RE STILL MOVING ALONG. SO
12 WE'LL NAVIGATE THAT ACCORDINGLY.

13 SO LET GET BACK TO THE COURT. I'LL MEET AND
14 CONFER WITH COUNSEL. I'M SURE WE CAN GET YOU A TIME AND
15 MAKE SURE TO CLEAR IT WITH THE COURT TOMORROW MORNING OR
16 TOMORROW AFTERNOON WHEN WE MEET.

17 THE COURT: YEAH. SO I WILL JUST SEE YOU
18 TOMORROW AFTERNOON AND THE WITNESS IS GOING TO BE DR.
19 GARDENER.

20 MR. WISNER: THAT'S CORRECT, YOUR HONOR.

21 THE COURT: OKAY. ALL RIGHT. VERY GOOD.
22 THANK YOU VERY MUCH. I APPRECIATE THAT YOU'RE ALL
23 WORKING VERY HARD.

24

25

26 {TIME NOTED: 4:29 P.M.}

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STENOGRAPHIC REPORTER'S CERTIFICATION

I, JEANESE JOHNSON, CERTIFIED SHORTHAND
REPORTER, OFFICIAL REPORTER PRO TEMPORE, IN AND FOR THE
STATE OF CALIFORNIA, DO HEREBY CERTIFY:

THAT THE FOREGOING PROCEEDINGS WERE
REPORTED STENOGRAPHICALLY BY ME;

THAT THE FOREGOING IS A TRUE RECORD OF THE
PROCEEDINGS TAKEN AT THAT TIME.

I FURTHER CERTIFY THAT I AM NOT ATTORNEY
OR COUNSEL OF ANY OF THE PARTIES, NOR AM I A RELATIVE OR
EMPLOYEE OF ANY ATTORNEY OR COUNSEL OF ANY PARTY
CONNECTED WITH THE ACTION, NOR AM I FINANCIALLY
INTERESTED IN THE ACTION.

IN WITNESS WHEREOF, I HAVE SUBSCRIBED MY NAME THIS
3RD DAY OF FEBRUARY, 2022.



JEANESE JOHNSON, CSR NO. 11635, CLR
CERTIFIED STENOGRAPHIC REALTIME REPORTER
OFFICIAL REPORTER PRO TEMPORE

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