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.

REPORTER'S TRANSCRIPT OF PROCEEDINGS

FEBRUARY 2, 2022

(DAY 3)

STENOGRAPHICALLY REPORTED BY:
JEANESE JOHNSON, CSR NO. 11635
OFFICIAL PRO TEMPORE

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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ALSO PRESENT:

CHRISTOPHER CLEE, TECHNICIAN

IAN ANDRYSZAK, TECHNICIAN

I N D E X

WITNESS: HANNAH GARDENER, PH.D.

E X H I B I T S

LOS ANGELES, CALIFORNIA;

WEDNESDAY, FEBRUARY 2, 2022; 1:30 P.M.

BEFORE: HON. AMY D. HOGUE DEPARTMENT 7;

SUPERIOR COURT OF THE STATE OF CALIFORNIA

--OOO--

THE COURT: GOOD AFTERNOON. PLEASE PROCEED.

THE CLERK: MS. GARDENER, CAN YOU PLEASE RAISE YOUR RIGHT HAND.

DO YOU SOLEMNLY STATE THAT THE TESTIMONY YOU MAY GIVE IN THIS CAUSE NOW PENDING BEFORE THIS COURT SHALL BE THE TRUTH, THE WHOLE TRUTH, AND NOTHING BUT THE TRUTH SO HELP YOU GOD?

THE WITNESS: I DO.

THE CLERK: PLEASE STATE AND SPELL YOUR FIRST AND LAST NAME FOR THE RECORD.

THE WITNESS: MY FIRST NAME IS HANNAH, H-A-N-N-A-H. AND MY LAST NAME IS GARDENER, G-A-R-D-E-N-E-R.

THE CLERK: THANK YOU.

DIRECT EXAMINATION

MR. WISNER:

Q GOOD AFTERNOON, DR. GARDENER.

A GOOD AFTERNOON.

Q THANK YOU VERY MUCH FOR BEING WITH US HERE.

THE COURT HAS ALREADY HEARD A BIT FROM DR. RITZ

AS WELL AS DR. SHAPIRO, SO WE'RE GOING TO TRY TO TARGET YOUR TESTIMONY TODAY SPECIFICALLY ON ARSENIC AND MERCURY AND FOCUS ON HOW YOU CAME TO THE OPINIONS YOU DID IN YOUR REPORT AND EXPLORE SOME OF THOSE CONCEPTS, OKAY?

A OKAY.

Q BEFORE WE DO THAT, I WANT TO BRIEFLY GO OVER YOUR BACKGROUND.

I'M SHOWING HERE EXHIBIT 2.

DO YOU SEE THIS IS A COPY OF YOUR C.V.

DO YOU SEE THAT?

A I JUST NEED TO FIX THIS SO I CAN -- IS THERE A WAY WHERE I CAN SORT OF SEE WHATEVER THEY ARE SHOWING BIGGER, I'M SORRY?

Q YOU SHOULD HAVE MY FACE PINNED SO IT'S THE BIGGEST SCREEN AND IT SHOULD SHOW THAT.

A THANK YOU.

YES, NOW I CAN SEE IT.

Q OKAY. GREAT.

ALL RIGHT. JUST BRIEFLY, IT LOOKS YOU HAVE AN UNDERGRADUATE DEGREE IN PSYCHOLOGICAL AND BRAIN SCIENCES FROM DR. DARTMOUTH; IS THAT RIGHT?

A THAT'S RIGHT.

Q WHY DID YOU DECIDE TO STUDY PSYCHOLOGICAL AND BRAIN SCIENCES IN UNDERGRAD?

A I WAS ALWAYS REALLY INTERESTED IN PSYCHOLOGY AND PARTICULARLY SORT OF THE NEUROSCIENCE SIDE OF PSYCHOLOGY. AND FRESHMAN YEAR I TOOK AN INTRODUCTION TO PSYCHOLOGY CLASS AND I LOVED IT AND WENT FROM THERE.

Q ALL RIGHT. I SEE AFTER THAT YOU ATTENDED HARVARD SCHOOL OF PUBLIC HEALTH AND GOT A DOCTOR OF SCIENCE IN EPIDEMIOLOGY WITH A MINOR IN BIOSTATISTICS.

DO YOU SEE THAT?

A I DO. THAT'S CORRECT.

Q WHAT IS A DOCTOR OF SCIENCE, DOCTOR?

A SO IT'S BASICALLY HARVARD'S EQUIVALENT TO THE PH.D., SO DIFFERENT UNIVERSITIES DO IT A LITTLE BIT DIFFERENTLY. HARVARD ONLY GIVES PH.D.'S IN THE, LIKE, SCHOOL OF LIBERAL ARTS OR ARTS AND SCIENCES, SO THE OTHER GRADUATE SCHOOLS GIVE, LIKE, M.D.'S OR JD'S AND THE SCHOOL OF PUBLIC HEALTH GIVES DOCTORATES IN SCIENCE.

Q NOW, IT SAYS HERE THAT -- AND I JUST WANT TO MAKE SURE I'M LOOKING AT THIS RIGHT -- YOU HAD A GPA OF 3.98; IS THAT RIGHT?

A THAT'S CORRECT.

Q DOES THAT MEAN YOU WERE STRAIGHT A'S BASICALLY? YOU HAVE A MINUS SOMEWHERE?

A I GOT ONE A MINUS.

Q OKAY. WELL, VERY IMPRESSIVE, DOCTOR.

DID YOU DO A DOCTORAL THESIS AS PART OF YOUR DOCTOR OF SCIENCE?

A I DID.

Q AND WHAT WAS THAT SUBJECT MATTER?

A SO I LOOKED AT PRENATAL AND EARLY LIFE RISK FACTORS FOR THREE NEUROLOGICAL DISEASES, AUTISM, MULTIPLE SCLEROSIS AND PARKINSON'S DISEASE.

Q WHY DID YOU FOCUS YOUR DISSERTATIONAL WORK ON

THOSE DISEASES?

A SO I WAS ALWAYS -- OH, WELL, I WAS IN THE NEUROLOGY EPIDEMIOLOGY TRACK. I HAD CHOSEN NEUROLOGICAL DISEASES AS SIMPLY THE DISEASES THAT I WAS MOST INTERESTED IN, AND THE SORT OF EARLY LIFE PRENATAL AND NEONATAL AND EARLY LIFE MORE GENERALLY UNDERPINNINGS WERE SORT OF AN INTEREST AND PASSION OF MINE STARTING REALLY AS SOON AS I STARTED AT HARVARD.

Q NOW, I SEE AFTER YOU ATTAINED YOUR DOCTOR OF SCIENCE FROM HARVARD, IT LOOKS LIKE YOU BEGAN WORKING WITH THE UNIVERSITY OF MIAMI SCHOOL OF MEDICINE; IS THAT RIGHT?

A YEAH. SO I -- IT SAYS THAT I GRADUATED IN NOVEMBER, OR I THINK IT MAY SAY THAT I GRADUATED TECHNICALLY IN 2008 OR NOVEMBER OF 2007, BUT I DEFENDED MY DISSERTATION IN AUGUST OF 2007; SO IN SEPTEMBER I MOVED TO MIAMI AND STARTED AS A POST-DOC IN THE NEUROLOGY DEPARTMENT AT THE UNIVERSITY OF MIAMI.

Q AM I SHOWING THAT PORTION OF YOUR C.V. ON THE SCREEN RIGHT NOW?

A YES.

Q OKAY. GREAT.

AND I TAKE IT YOU SPENT MOST OF YOUR ACADEMIC CAREER AFTER HARVARD AT THE UNIVERSITY OF MIAMI SCHOOL OF MEDICINE; IS THAT RIGHT?

A THAT'S CORRECT.

Q AND HAVE YOU FOCUSED SPECIFICALLY IN THE AREAS OF NEUROLOGY AND EPIDEMIOLOGY WHILE YOU'VE BEEN THERE?

A YES. THERE WAS A PERIOD OF TIME WHEN I HAD A DUAL APPOINTMENT IN PEDIATRICS AND IN NEUROLOGY, BUT I'VE BEEN IN NEUROLOGY THE WHOLE TIME.

Q AND THAT WAS GOING TO BE MY NEXT QUESTION.

SO NOT ONLY HAVE YOU FOCUSED ON NEUROLOGY FOR MOST OF YOUR ACADEMIC CAREER, YOU'VE ALSO FOCUSED SPECIFICALLY IN THE PEDIATRIC COMPONENT OF NEUROLOGY; IS THAT RIGHT?

A FOR A PERIOD OF TIME, YEAH, I WAS IN THE PEDIATRICS DEPARTMENT.

Q OKAY.

NOW, I KNOW YOU CURRENTLY LIVE IN BOSTON.

A I DO.

Q BUT YOU STILL WORK AT THE UNIVERSITY OF MIAMI. HOW DOES THAT WORK?

A IT'S VERY, VERY UNUSUAL, AND IT WAS NOT -- IT WAS NOT INTENTIONAL OR WHAT I THOUGHT WOULD HAPPEN.

BUT I MOVED BACK TO -- I MOVED TO BOSTON OR BACK TO BOSTON IN 2012 AND I FIGURED I WOULD WORK REMOTELY FOR A SHORT PERIOD OF TIME WHILE I LOOKED FOR A POSITION AT A ACADEMIC INSTITUTION IN BOSTON AND WHILE MY COLLEAGUES AT THE UNIVERSITY OF MIAMI FOUND SOMEONE TO FILL MY SHOES THERE, AND WE QUICKLY REALIZED THAT IT WORKED REALLY WELL. WE REALIZED WHAT EVERY -- THE REST OF THE WORLD HAS REALIZED IN 2020 THAT REMOTE WORK CAN BE REALLY GREAT AND VERY EFFECTIVE.

SO, YEAH. SO THE PLAN NEVER CHANGED. I'VE BEEN AT UNIVERSITY OF MIAMI SINCE THEN.

Q NOW, AS WE GO THROUGH YOUR C.V. HERE, WE SEE THAT YOU HAVE NUMEROUS PUBLICATIONS UNDER JURIED OR REFEREED JOURNAL ARTICLES.

DO YOU SEE THAT?

A YES.

Q AND THAT'S JUST ANOTHER WAY OF SAYING PEER-REVIEWED LITERATURE?

A THAT'S CORRECT.

Q OKAY.

AND AS WE GO THROUGH HERE, I MEAN, WE'VE SEEN YOUR NAME POP UP ON VARIOUS STUDIES AND REFERENCES SO FAR. BUT IS IT FAIR TO SAY THAT YOU HAVE PUBLISHED SPECIFICALLY ON AUTISM AND ITS CAUSES IN THE PEER-REVIEWED LITERATURE?

A I HAVE.

Q AND IT WOULD BE FAIR TO SAY THAT YOU PUBLISHED IN THIS AREA BEFORE YOU WERE EVER RETAINED IN ANY SORT OF LITIGATION CAPACITY FOR THIS CASE?

A CORRECT.

Q I NOTICE DOWN HERE UNDER INVITED BOOK CHAPTERS -- I'M POPPING IT OUT -- THERE IS A PUBLICATION CALLED "THE COMPREHENSIVE GUIDE TO AUTISM," AND IT LOOKS LIKE YOU HAD A BOOK CHAPTER TITLED "PRE, PERI AND NEONATAL FACTORS IN AUTISM ETIOLOGY."

DO YOU SEE THAT?

A I DO.

Q AND CAN YOU JUST BRIEFLY EXPLAIN WHAT THAT CHAPTER IS ABOUT AND WHAT YOU WERE DOING IN THAT

CHAPTER?

A SURE.

SO I WAS CONTACTED BY THE EDITORS OF THIS BOOK AROUND 2011, ASKING ME TO WRITE A BOOK CHAPTER ABOUT PRE, PERI AND NEONATAL RISK FACTORS FOR AUTISM, AND I CONTACTED AN OLD A STUDENT, SOMEONE WHO I HAD GONE TO SCHOOL WITH AT HARVARD, KRISTIN LYLE, WHO WAS ALSO INTERESTED IN AUTISM AND I ASKED HER IF SHE WOULD LIKE TO WRITE IT WITH ME.

AND I THINK WE FINISHED IT AROUND 2012. I'M NOT SURE WHEN THE BOOK WAS PUBLISHED, BUT THAT WAS AROUND WHEN WE WROTE OUR CHAPTER.

Q AND JUST FOR OUR OWN SORT OF THE EDIFICATION, IS IT FAIR TO SAY THAT THE SCIENCE INVOLVING THE ETIOLOGY OF AUTISM HAS EVOLVED EVEN IN THE LAST TEN YEARS SINCE YOU WROTE THAT BOOK CHAPTER?

A YES. YEP.

Q OKAY.

NOW, THAT WE'VE SORT OF COVERED YOUR QUALIFICATIONS, I JUST WANT TO SORT OF TOUCH ON SOME OF THE HIGHLIGHTS. I WANT TO GO STRAIGHT INTO YOUR METHODOLOGY. AND I SPECIFICALLY WANT TO FOCUS IN ON THE BRADFORD HILL FACTORS, OKAY?

A OKAY.

Q SO HERE I AM SHOWING A DEMONSTRATIVE.

THIS IS EXHIBIT 145.

AND THESE ARE A LIST, SORT OF SHORTHAND, OF THE HILL FACTORS.

DO YOU SEE THOSE, DOCTOR?

A I DO.

Q AND IN THE BRIEFING AND IN THE DISCUSSIONS WITH THE COURT AND WHILE WE'RE HERE, THERE'S BEEN A LOT OF CONTENTIONS ABOUT HOW YOU DID CERTAIN FACTORS, AND I JUST WANT TO SORT OF GO THROUGH WHAT YOU DID GENERALLY FOR ALL THE METALS, AND THEN AFTER THAT, WE'RE GOING TO GET INTO SPECIFICALLY MERCURY AND ARSENIC, OKAY?

A OKAY.

Q ALL RIGHT. LET'S START OFF WITH THE STRENGTH -- WELL, BEFORE WE START OFF WITH THE FIRST ONE, WILL YOU AGREE WITH ME THAT THERE IS A DISTINCTION WITHIN THE SCIENTIFIC COMMUNITY FOR THE FORMAL APPLICATION OF THE BRADFORD HILL FACTORS VERSUS SORT OF THE BRADFORD HILL FACTORS AS YOU'RE THINKING ABOUT ALL THE LITERATURE?

A I'M NOT SURE I UNDERSTAND YOUR QUESTION.

Q SURE.

WHAT ARE THE BRADFORD HILL FACTORS, YOUR UNDERSTANDING OF THEM?

A SO THEY ARE NINE FACTORS THAT ARE USED TO HELP SORT OF GUIDE THE WAY EPIDEMIOLOGISTS THINK ABOUT WHETHER ASSOCIATIONS IN THE MEDICAL LITERATURE ARE CAUSAL. IT'S SORT OF LIKE A FRAMEWORK OR A GUIDE OF -- OR A LIST OF ALL OF THE THINGS THAT WE ARE THINKING ABOUT WHEN WE'RE TRYING TO INFER CAUSALITY.

Q NOW, THERE'S BEEN A CONTENTION THAT THERE MUST BE A STATISTICALLY SIGNIFICANT AND UNCONFOUNDED ASSOCIATION OBSERVED BEFORE YOU EVEN BEGIN THINKING

ABOUT THE HILL FACTORS.

PUTTING ASIDE WHAT YOU DID HERE, DOCTOR, IS THAT SOMETHING THAT YOU GENERALLY THINK IS TRUE AND HOW YOU THINK WITH THE HILL FACTORS?

A SO IN TERMS OF WHETHER THERE'S A SPECIFIC -- WE THINK OF SPECIFIC ASSOCIATES IN STUDIES OF BEING STATISTICALLY SIGNIFICANT OR NOT. WHEN WE THINK ABOUT THE HILL FACTORS, WE REALLY THINK ABOUT THE LITERATURE AS A WHOLE AND THAT WILL INCLUDE MANY STUDIES. AND SOME OF THOSE STUDIES WILL BE STATISTICALLY SIGNIFICANT AND SOME OF THOSE STUDIES WILL NOT BE STATISTICALLY SIGNIFICANT.

I MEAN, THIS GOES TO THE SECOND HILL FACTOR, "CONSISTENCY." IT WOULD BE SORT OF IMPLAUSIBLE TO EXPECT THAT EVERY SINGLE STUDY AS BEING A STATISTICALLY SIGNIFICANT ASSOCIATION.

BUT WHEN -- WE THINK ABOUT THE HILL FACTORS WHEN WE'RE WRITING PAPERS, WE THINK ABOUT THE HILL FACTORS WHETHER WE HAVE OBSERVED A STATISTICALLY SIGNIFICANT ASSOCIATION IN OUR SPECIFIC STUDY OR NOT.

BUT WHEN WE THINK ABOUT THE HILL FACTORS IN RELATION TO THE BODY OF LITERATURE, FIRST, WE THINK ABOUT IS THERE AN ASSOCIATION?

SO I THOUGHT -- IN THIS SITUATION, I THOUGHT ABOUT IS THERE AN ASSOCIATION BETWEEN THESE HEAVY METALS AND AUTISM?

AND THEN I THINK ABOUT THESE HILL FACTORS AS A FRAMEWORK.

BUT WE STILL SORT OF THINK ABOUT THESE HILL FACTORS WHEN WE WRITE THE DISCUSSION SECTIONS OF OUR JOURNAL ARTICLES, WHETHER WE HAVE FOUND A STATISTICALLY SIGNIFICANT POSITIVE OR A NEGATIVE ASSOCIATION OR A NULL ASSOCIATION.

Q I'D LIKE TO SHOW YOU EXHIBIT 2.

THIS IS A PORTION OF YOUR REPORT. AND I'LL ZOOM IN SO YOU CAN SEE IT.

YOU SEE UNDER THE HEADING "OPINIONS" HERE IN YOUR REPORT?

A YES.

Q AND HERE YOU START WITH YOUR DISCUSSION ABOUT LEAD AND ASD.

DO YOU SEE THAT?

A I DO.

Q AND THE FIRST THING YOU DO IS YOU SORT OF DISCUSS ALL THE NUMBERED STUDIES AND KIND OF WHAT THEY ARE SHOWING AND WHETHER OR NOT THERE'S AN ASSOCIATION THAT YOU OBSERVED; IS THAT RIGHT?

A CORRECT.

Q AND AS WE GO THROUGH THIS, YOU BEGIN DISCUSSING DIFFER BIOMARKERS. YOU TALK ABOUT META ANALYSIS.

DO YOU SEE THAT, DOCTOR?

A I DO.

Q AND IT GOES ON FOR SEVERAL PAGES.

AND THEN AFTER YOU'VE DONE A FULL REVIEW OF ALL OF THE LITERATURE, AT THE VERY END HERE YOU STATE:

"HAVING REVIEWED THE LITERATURE AND ASSESSED

THE QUALITY OF THE STUDIES, I TURN TO THE HILL CRITERIA TO CONSIDER THE BURDEN OF EVIDENCE TO SUPPORT CAUSALITY."

DO YOU SEE THAT?

A I DO.

Q AND THEN AFTER THIS YOU HAVE A CHART THAT IT LITERALLY LISTS THE CRITERIA AND THEN YOU KIND OF TALK ABOUT THE EVIDENCE THAT RELATE TO EACH CRITERIA; IS THAT RIGHT?

A CORRECT.

Q ALL RIGHT.

AND I GUESS THE REASON I POINT THIS OUT IS, WHY DID YOU SPEND SO MUCH TIME DISCUSSING ALL THE LITERATURE AND THE STRENGTHS AND THE WEAKNESSES AND THE BIASES AND THE CONSIDERATIONS AND ALL THAT STUFF BEFORE YOU STARTED FORMALISTICALLY APPLYING THE HILL CRITERIA?

A I THINK IT REPRESENTS MY THOUGHT PROCESS.

SO FIRST WHAT I DO IS I COLLECT THE EVIDENCE. I LOOK TO SEE WHAT THE DIFFERENT STUDIES HAVE SHOWN. HAVE THEY SHOWN A POSITIVE ASSOCIATION, A NEGATIVE ASSOCIATION, A NULL ASSOCIATION. AND THEN I THINK ABOUT WHY THEY MAY HAVE FOUND THOSE ASSOCIATIONS OR DIDN'T FIND THOSE ASSOCIATIONS. ARE THERE CONFOUNDING FACTORS THAT WOULD HAVE BIASSED THE RESULTS IN A POSITIVE DIRECTION SORT OF AWAY FROM THE NULL OR TOWARDS THE NULL IN EITHER DIRECTION AND I THINK ABOUT METHODOLOGICAL LIMITATIONS OR CHALLENGES AND HOW THOSE COULD HAVE AFFECTED THE RESULTS.

AND THEN I -- SO I SORT OF SYNTHESIZE THE RESULTS TO FIRST DETERMINE IS THERE A -- IS THE ASSOCIATION POSITIVE? IS THE ASSOCIATION NEGATIVE OR IS THE ASSOCIATION NULL? AND IF SO, WHY COULD THAT -- WHY WOULD THAT BE.

SO AFTER DETERMINING WHAT I THINK THE ASSOCIATION IS, THEN I TURN TO THE HILL CRITERIA TO THEN INFER CAUSALITY BECAUSE THE HILL CRITERIA DON'T REFLECT WHETHER THERE IS AN ASSOCIATION OR NOT, THEY REFLECT WHETHER THAT ASSOCIATION IS CAUSAL.

Q SO I WANT TO GO BACK TO THIS DEMONSTRATIVE THAT WE WERE TALKING ABOUT, THE HILL FACTORS, AND I JUST KIND OF WANT TO TALK GENERALLY ABOUT HOW YOU APPLY THESE IN YOUR ANALYSIS.

SO SPECIFICALLY "STRENGTH OF ASSOCIATION."

WHAT FACTORS DID YOU THINK ABOUT IN THE STUDIES IN THINKING ABOUT AND UNDERSTANDING WHETHER OR NOT THERE WAS A STRONG ASSOCIATION FOR ANY PARTICULAR METAL AND ASD OR ADHD?

A SURE.

SO WHEN I THINK ABOUT THE STRENGTH OF THE ASSOCIATION, I THINK OF HOW IS THE ASSOCIATION BEING PORTRAYED IN THE STUDY? IS IT A RELATIVE RISK OR A RISK RATIO? IS IT A RISK DIFFERENCE? ARE THEY COMPARING THE MEANS OF THE HEAVY METALS BETWEEN CASES AND CONTROLS? SO HOW ARE THEY SHOWING THE ASSOCIATION IN THE STUDY?

AND THEN I THINK ABOUT THE UNITS OF MEASUREMENT BECAUSE THE EFFECT MEASURE, WHICH IS WHAT WE WOULD --

HOW WE WOULD CALL IT -- REALLY DEPENDS ON THE UNIT OF MEASUREMENT.

SO IF YOUR UNIT OF MEASUREMENT IS ONE MILLIGRAM PER DECILITER VERSUS TEN MILLIGRAMS PER DECILITER, THE EFFECT MEASURE WILL VARY. AND THEN I THINK ABOUT THE BACKGROUND LEVELS; SO THE STRENGTH OF THE ASSOCIATION MIGHT VARY BASED ON SORT OF WHAT THE BACKGROUND LEVEL IS. AND IF WE'RE THINKING ABOUT STATISTICALLY SIGNIFICANT ASSOCIATIONS, I THINK ABOUT SORT OF THE SIZE OF THE STUDY AND WHAT IS REQUIRED TO GET A STATISTICALLY SIGNIFICANT ASSOCIATION.

SO IN MY NORMAL WORK I WORK WITH DATA SETS OF HUNDREDS OF THOUSANDS OF PEOPLE OR TENS OF THOUSANDS OF PEOPLE SO A SMALL DIFFERENCE WILL BE STATISTICALLY SIGNIFICANT.

IN THIS BODY OF LITERATURE, THE SAMPLE SIZES ACROSS STUDIES WERE VERY SMALL; YOU KNOW, ALMOST ALWAYS LESS THAN HUNDRED, OFTEN LESS THAN 50, SO YOU ACTUALLY NEED A PRETTY STRONG ASSOCIATION TO ACHIEVE STATISTICAL SIGNIFICANCE.

Q AND THE FACT THAT YOU WERE SEEING LARGE DIFFERENCES BETWEEN KIDS WITH AUTISM OR ADHD IN NORMAL -- NEURO-TYPICAL KIDS AND THE FACT THAT YOU WERE SEEING STATISTICALLY SIGNIFICANT RESULTS IN REALLY SMALL STUDIES, DOES THAT LEND ANY STRENGTH TO YOUR OBSERVATION THAT THERE IS IN FACT A STRONG ASSOCIATION?

A YEAH. IT'S REALLY HARD TO OBSERVE SIGNIFICANT ASSOCIATIONS IN SMALL STUDIES. THERE'S ALWAYS -- YOU

KNOW, THERE'S ALWAYS GOING TO BE A LOT OF VARIABILITY REACHING A STATISTICAL SIGNIFICANCE, THAT'S P LESS THAN .05 IS CHALLENGING WITH FEW PARTICIPANTS, WHICH IS WHY, YOU KNOW, WE ALWAYS TRY TO DO STUDIES WITH HUNDREDS OF THOUSANDS OF PEOPLE.

AND THEN WE RUN INTO THE OPPOSITE PROBLEM.

Q THE NEXT ONE IS "CONSISTENCY."

I WANT TO PUT A PIN IN THAT. WE'RE GOING TO COME BACK TO IT WHEN WE'RE ACTUALLY LOOKING AT THE STUDIES BECAUSE I THINK IT'S EASIER TO DO THAT IN THE CONTEXT OF THE DATA.

A OKAY.

Q "SPECIFICITY."

DO YOU THINK SPECIFICITY APPLIES HERE?

A IT DOESN'T.

SPECIFICITY OFTEN -- OR I SHOULD SAY IN MY CAREER IN NEUROLOGICAL DISEASES IN LIFESTYLE AND ENVIRONMENT RISK FACTORS ALMOST NEVER APPLY.

SO ENVIRONMENTAL HEALTH FACTORS VERY, VERY RARELY WILL ONLY CAUSE ONE OUTCOME IN THE BODY. THEY WILL TYPICALLY CAUSE ACTUALLY MANY BECAUSE THERE'S A LOT OF SORT OF SYMP PATHWAYS THAT ARE SIMILAR ACROSS NEUROLOGICAL OUTCOMES AND ACROSS, YOU KNOW, LIKE THE OUTCOMES MORE BROADLY.

Q AND GENERALLY IN YOUR AREA OF EPIDEMIOLOGY, DO YOU OFTEN OR REALLY EVER SEE THAT KIND OF SPECIFICITY IN DISEASE RELATIONSHIP?

A I CAN'T REALLY THINK OF -- NONE -- THERE'S

NOTHING IN THE WORK THAT I DO OR THE RISK FACTORS THAT I LOOK AT THAT ARE EVER SPECIFIC TO ONE OUTCOME AND NOR DO WE ASSUME THAT THEY WOULD BE.

Q NOW, IF WE LOOK AT EXHIBIT 159.

THIS IS ACTUALLY THE HILL PAPER.

AND ON PAGE 3 WHEN HE SPECIFICALLY DISCUSSES SPECIFICITY, HE SAYS -- OH, SORRY -- I'LL CALL IT OUT RIGHT HERE.

HE SAYS, "WE MUST NOT, HOWEVER, OVEREMPHASIZE THE IMPORTANCE OF THE CHARACTERISTIC."

AND THEN IF WE GO DOWN, HE GOES ON TO TALK ABOUT TOBACCO SMOKE.

AND HE SAYS, "COMING TO MODERN TIMES, THE PROSPECTIVE INVESTIGATIONS OF SMOKING AND CANCER OF THE LUNG HAVE BEEN CRITICIZED FOR NOT SHOWING SPECIFICITY. IN OTHER WORDS, THE DEATH RATE OF SMOKERS IS HIGHER THAN THE DEATH RATE OF NON SMOKERS FOR MANY CAUSES OF DEATH."

DO YOU SEE THAT, DOCTOR?

A YES.

Q AND DO YOU --

A YEAH, THAT -- SMOKING IS A PERFECT EXAMPLE OF THAT, AND IT'S SOMETHING THAT WE, YOU KNOW, IN MY LECTURES, WE TALK ABOUT A LOT BECAUSE IT'S AN IMPORTANT EPIDEMIOLOGY CONCEPT THAT THIS LACK OF SPECIFICITY SO OFTEN APPLIES. IT'S THE -- IT'S REALLY MORE THE RULE THAN THE EXCEPTION.

Q EXACTLY.

AND HE GOES ON TO SAY HERE, "WE MUST ALSO KEEP IN MIND THAT DISEASES MAY HAVE MORE THAN ONE CAUSE."

HE GOES ON TO SAY HERE IN FACT, "I BELIEVE THAT MULTI-CAUSATION IS GENERALLY MORE LIKELY THAN SINGLE CAUSATION."

DO YOU SEE THAT?

A I DO.

Q AND WOULD YOU AGREE WITH THAT?

I MEAN, THIS WAS WRITTEN 50 YEARS AGO, AND HAS EPIDEMIOLOGY SHIFTED AWAY FROM THAT GENERAL PERSPECTIVE?

A IT'S ABSOLUTELY TRUE. YOU KNOW, I'VE NEVER MET AN EPIDEMIOLOGIST WHO DOESN'T MAKE THIS ASSUMPTIONS.

Q OKAY.

ALL RIGHT. SO LET'S LOOK AT THE "TEMPORALITY."

NOW, ONE THE BIG CRITICISMS HERE IN THIS BODY OF LITERATURE IS THAT A LOT OF THE EXPOSURE ASSESSMENTS OCCURRED AFTER DIAGNOSIS. AND WE'RE GOING TO GET INTO THAT SPECIFICALLY WITH MERCURY AND ARSENIC IN A MINUTE BECAUSE WE HAVE STUDIES TO HELP ELUCIDATE THAT.

BUT I GUESS, GENERALLY SPEAKING, FOR YOUR OPINIONS, DOCTOR, DID YOU TAKE INTO CONSIDERATION WHETHER OR NOT THE STUDIES THAT WE WERE SEEING THESE RESULTS FOR WERE ACTUALLY CAPTURING PRIOR EXPOSURES OR NOT?

A THAT WAS ABSOLUTELY SOMETHING THAT I THOUGHT A LOT ABOUT AND I REALLY THOUGHT ABOUT CAREFULLY WITH EVERY STUDY THAT I READ BECAUSE THE HILL FACTOR -- THIS

HILL FACTOR IS REALLY IMPORTANT IN THAT THE EXPOSURE OF INTEREST HAS TO OCCUR BEFORE THE OUTCOME OF INTEREST. THAT DOESN'T MEAN THE DATA COLLECTION ON THAT EXPOSURE OF INTEREST NECESSARILY HAS TO COME BEFORE THE OUTCOME, BUT YOU CAN'T BE TALKING ABOUT AN EXPOSURE THAT HAPPENED AFTER THE OUTCOME HAS OCCURRED EVEN THOUGH THE EXPOSURE ASSESSMENT, YOU KNOW, WHEN YOU RECORD IT, WHEN YOU COLLECT DATA ON IT, THAT OFTEN HAPPENS AFTER THE EXPOSURE -- AFTER THE OUTCOME HAS OCCURRED.

Q AND I GUESS, DOCTOR, WHEN YOU EXAMINE WHETHER THESE RESULTS SHOWING THAT, YOU KNOW, CHILDREN DIAGNOSED WITH ASD HAD HIGHER HEAVY METAL BURDENS, WHEN YOU SAW THAT AND YOU ANALYZE WHETHER OR NOT THAT -- THOSE RESULTS OF THOSE HEAVY METAL BURDENS WERE LIKELY TEMPORALLY RELATED, DID YOU, FOR EACH METAL, THINK ABOUT WHETHER OR NOT IT WAS PLAUSIBLE THAT THOSE WERE BEING CAUSED BY THE DISEASE VERSUS THE DISEASE CAUSING THE BURDEN?

A YES.

I MEAN, SO THAT WAS MY CHARGE IS TO JUST SORT OF UNDERSTAND IF THESE METALS WERE CAUSING AUTISM, AND SO I WAS ABSOLUTELY THINKING ABOUT WHETHER THIS APPLIED AND WHETHER HAVING AUTISM, FOR EXAMPLE, COULD MAKE YOU BE EXPOSED TO MORE MERCURY OR MORE ARSENIC. AND THAT WAS A REALLY -- THAT'S A REALLY IMPORTANT CONSIDERATION.

Q OKAY. "BIOLOGICAL GRADIENT," IS THAT ALSO KNOWN AS DOSE RESPONSE?

A IT IS.

Q AND WAS THERE ANY DOSE RESPONSE DATA IN THIS BODY OF LITERATURE?

A SO THERE WAS DATA THAT SUGGESTS A BIOLOGICAL GRADIENT, THAT AT HIGHER LEVELS OF HEAVY METALS, THE RISK OF AUTISM MIGHT BE HIGHER, AND SPECIFICALLY THERE WAS COMPELLING DATA THAT AT INCREASING LEVELS OF HEAVY METALS, THE AUTISM SYMPTOMS, WHICH IS WHAT WE REALLY CARE ABOUT, ARE HIGHER.

SO I FOUND THOSE STUDIES, LOOKING AT AUTISM SYMPTOMS IN RELATION TO HEAVY METALS, TO BE PARTICULARLY COMPELLING WHEN I WAS THINKING ABOUT BIOLOGICAL GRADIENT.

AND ALSO THE FACT THAT THESE STUDIES WERE CONDUCTED IN REALLY DIVERSE POPULATIONS, WHICH ISN'T A PLEASURE THAT WE ALWAYS HAVE IN ALL FIELDS OF EPIDEMIOLOGY THAT THIS LITERATURE IS REALLY DIVERSE IN TERMS OF COUNTRY OF ORIGIN AND RACES AND ETHNICITIES AND THE TIME WHEN THE DATA WAS COLLECTED BECAUSE THE POPULATIONS VARY IN TERMS OF THEIR BACKGROUND EXPOSURE LEVELS TO THESE METALS.

AND SO THE FACT THAT THE ASSOCIATION WAS OBSERVED IN DIFFERENT POPULATIONS WITH DIFFERENT BACKGROUND LEVELS ACTUALLY ALSO SPEAKS TO THIS BIOLOGICAL GRADIENT.

Q "PLAUSIBILITY." AND I KNOW WE'VE TALKED A LOT ALREADY ABOUT THIS. WE'RE GOING TO HEAR A LOT ABOUT IT TOMORROW FROM DR. ASCHNER.

BUT, I MEAN, PUT SIMPLE IS THERE PLENTY OF

BIOLOGICAL PLAUSIBILITY FOR THESE METALS IN ASD AND ADHD?

A ABSOLUTELY.

YOU KNOW, THESE ARE ALL KNOWN NEUROTOXINS.

AND IN THE EPI LITERATURE WE OFTEN DO INFER CAUSALITY BEFORE WE ACTUALLY HAVE THE BIOLOGICAL MECHANISM REALLY WELL UNDERSTOOD. BUT IN THIS CASE THE BIOLOGICAL MECHANISM WAS REALLY THE IMPETUS FOR ALL OF THIS WORK.

Q ALL RIGHT. THESE LAST THREE, I THINK WE CAN GET THROUGH THEM QUICKLY.

"COHERENCE," WHAT IS THAT AND IS THE DATA HERE COHERENT?

A SO THERE'S A LITTLE BIT OF OVERLAP BETWEEN THESE.

SO BASICALLY -- SO THERE'S SOME OVERLAP BETWEEN THE COHERENCE CRITERIA AND THE PLAUSIBILITY.

BUT BASICALLY COHERENCE REFERS TO, DOES THE LITERATURE -- DOES THE DIFFERENT TYPES OF LITERATURE ON THIS MAKE SENSE? YOU KNOW, INVIVO, IN VITRO, ANIMAL STUDIES, HUMAN STUDIES, YOU KNOW, THE STUDIES ON AUTISM SEVERITY AND AUTISM DIAGNOSIS, DO THE DIFFERENT TYPES OF STUDIES WHEN THEY ALL COME TOGETHER, IS THERE COHERENCE THERE? OR IS THERE CONSISTENCY?

Q ALL RIGHT. AND I GUESS, WAS THERE COHERENCE IN THIS DATA?

A THERE WAS. ABSOLUTELY.

Q OKAY. ALL RIGHT.

"EXPERIMENT," WHAT IS THAT, AND DID YOU REALLY HAVE THAT DATA AVAILABLE TO YOU IN THIS DATA SET?

A SO NOT FROM HUMAN. SO EXPERIMENT REFERS TO WHETHER, LIKE, RANDOMIZED CONTROLLED TRIALS ARE EXISTENT. AND IT'S NOT ETHICAL TO -- WE KNOW THAT ARSENIC AND MERCURY AND LEAD ARE NEUROTOXINS. IT WOULD BE HIGHLY UNETHICAL TO PURPOSEFULLY EXPOSE SOME CHILDREN TO THESE AND NOT OTHERS.

AND SO WE WOULDN'T EXPECT TO SEE HUMAN EXPERIMENTAL DATA FOR THIS LINE OF ANALYSIS, BUT THERE HAS BEEN SOME EXPERIMENTAL DATA IN ANIMALS, WHICH IS CHALLENGING, YOU KNOW, FOR THE ANIMAL MODEL OF AUTISM, BUT WHAT DOES -- WHAT IS THERE IS, LIKE, CRITERIA NUMBER 7 "COHERENCE."

Q OKAY. GREAT.

AND THEN FINALLY, "ANALOGY," WHAT IS THAT AND DID IT APPLY HERE?

A YEAH. SO THE ANALOGY REFERS TO IF A SIMILAR CHEMICAL OR COMPOUND HAS ALREADY BEEN SHOWN TO BE CAUSALLY ASSOCIATED WITH THE OUTCOME, THEN YOU SORT OF NEED LESS OF A BURDEN OF PROOF FOR A VERY SIMILAR COMPOUND.

SO THE FACT THAT THERE ARE MULTIPLE NEUROTOXIC HEAVY METALS THAT HAVE BEEN ASSOCIATED WITH THESE OUTCOMES SORT OF DECREASES THE BURDEN FOR OTHER ONES BECAUSE IT WOULD MAKE SENSE IF WE ALREADY KNOW, YOU KNOW THAT THESE TOXIC HEAVY METALS ARE CAUSALLY RELATED WITH DEVELOPMENTAL DISABILITIES, THEN IT MAKES MORE SENSE

BASED ON A SMALLER BODY OF LITERATURE FOR THE NEXT ONE TO ALSO BE CAUSALLY RELATED.

Q I JUST WANT TO FINISH ON ONE THING HERE.

AND IF WE LOOK BACK TO THE HILL ARTICLE, AT THE VERY END OF HIS DISCUSSION OF THESE FACTORS AND THE CRITERIA, HE WRITES, STARTING RIGHT HERE, "WHAT I DO NOT BELIEVE, AND THIS HAS BEEN SUGGESTED, IS THAT WE CAN USEFULLY LAY DOWN SOME HARD AND FAST RULES OF EVIDENCE THAT MUST BE OBEYED BEFORE WE ACCEPT CAUSE AND EFFECT. NONE OF MY NINE VIEWPOINTS CAN BRING INDISPUTABLE EVIDENCE FOR OR AGAINST THE CAUSE AND EFFECT HYPOTHESIS AND NONE CAN BE REQUIRED AS A SINE QUA NON. WHAT THEY CAN DO, WITH GREATER OR LESS STRENGTH, IS TO HELP US MAKE UP OUR MIND TO THE FUNDAMENTAL QUESTION; IS THERE ANY OTHER WAY OF EXPLAINING THE SET OF FACTS BEFORE US? IS THERE ANY OTHER ANSWER EQUALLY OR MORE LIKELY THAN CAUSE AND EFFECT."

DO YOU SEE THAT?

A I DO.

Q I GUESS MY QUESTION, DOCTOR, IS TO WHAT EXTENT DOES YOUR EXPERIENCE AND JUDGMENT AS AN EPIDEMIOLOGIST PLAY INTO HOW YOU APPLY THESE WIDELY RECOGNIZED CRITERIA?

A IT'S VERY IMPORTANT.

SO THIS SENTIMENT WAS ECHOED IN THE SURGEON GENERAL'S REPORT IN 1964 REGARDING SMOKING AND LUNG

CANCER.

YOU KNOW, DIFFERENT PEOPLE -- DIFFERENT EPIDEMIOLOGISTS CAME TO THE CONCLUSION THAT SMOKING CAUSES LUNG CANCER AT SLIGHTLY DIFFERENT TIME PERIODS OR TIME POINTS, AND THERE WERE PEOPLE WHO, YOU KNOW, EVEN IN 1964, YOU KNOW, WEREN'T QUITE SURE.

BUT WHAT -- MY TRAINING IN EPIDEMIOLOGY HAS PROVIDED ME A BACKGROUND TO VIEW THE LITERATURE AND UNDERSTAND IT IN RELATION TO ALL NINE OF THESE CRITERIA AND UNDERSTAND WHEN THEY HAVE BEEN MET TO THE POINT WHERE WE WOULD EXPECT THEM TO BE MET UNDER AND INFER CAUSALITY.

Q IS IT APPROPRIATE IN YOUR MIND TO TREAT THEM AS A CHECKLIST OF YES/NO, YES/NO AND THEN COUNT UP THE NUMBER OF FACTORS AND THAT ANSWERS THE QUESTION FOR YOU?

A NO. NEVER. THAT'S NOT WHAT I -- THAT'S NOT WHAT I TAUGHT MY STUDENTS YESTERDAY AND THAT'S NOT WHAT -- THAT'S NOT WHAT I WAS TAUGHT AT HARVARD, SO ABSOLUTELY NOT.

Q ALL RIGHT.

SO LET'S GET STRAIGHT INTO SOME OF THE DATA SO WE CAN SORT OF UNPACK THIS A LITTLE BIT.

I'M GOING TO SHOW YOU -- WE'RE GOING TO START OFF WITH ARSENIC.

AND SO THIS IS A CHART THAT I PREPARED, BUT THANKFULLY, DID YOU HAVE A CHANCE TO ACTUALLY LOOK AT THE STUDIES ON THIS MAKE SURE I'M NOT A COMPLETE BOZO?

A I SPENT MUCH OF THE WEEKEND LOOKING AT THIS

CHART AND CHECKING IT.

Q OKAY. GREAT.

NOW, AND TO BE CLEAR, ARE ALL STUDIES RELATED TO ARSENIC AND ASD ON HERE, OR IS IT JUST POST-NATAL DATA?

A I BELIEVE JUST POST-NATAL DATA.

Q AND CAN YOU EXPLAIN WHAT THE DIFFERENCE BETWEEN POST-NATAL AND PRENATAL DATA IS?

A SURE.

SO PRENATAL DATA REFERS TO THE MEASUREMENT OF ARSENIC DURING PREGNANCY, EITHER FROM THE MOTHER'S BLOOD OR FROM THE -- BASICALLY FROM THE MOTHER'S BLOOD.

AND POST-NATAL WOULD BE FROM THE BABIES THEMSELVES AFTER THEY ARE BORN.

Q AND SO HERE IN ARSENIC, I KNOW, FOR EXAMPLE, THE DOHERTY STUDY RIGHT HERE, I CAN CALL IT UP. THE DOHERTY STUDY RIGHT HERE, THAT'S A STUDY THAT INCLUDES BOTH PRENATAL AND POST-NATAL, BUT IT'S ON HERE BECAUSE IT HAS SOME POST-NATAL; IS THAT RIGHT?

A THAT'S RIGHT.

Q OKAY. ALL RIGHT.

SO THIS IS THE DATA.

AND I JUST WANT TO FIRST GET TO THIS CONSISTENCY CONCEPT JUST OFF THE BAT.

WHEN YOU SEE DATA HERE LIKE THIS WHERE YOU HAVE ALL THESE POSITIVE AND STATISTICALLY SIGNIFICANT DATA AND YOU HAVE ALL THESE NON SIGNIFICANT RESULTS AND THEN YOU HAVE THIS ONE NEGATIVE STATISTICALLY SIGNIFICANT

RESULT, HOW CAN YOU AS AN EPIDEMIOLOGY CLAIM THAT THIS DATA IS CONSISTENT?

A SO, YOU KNOW, I THINK WE NEED -- YOU KNOW, IT -- FOR ME IT INVOLVES HAVING A REALITY CHECK AND HAVING BEEN AN EPIDEMIOLOGIST AND KNOWING THAT WE CAN'T -- WE NEVER SEE COMPLETE CONSISTENCY.

IN A LOT OF THE ANALYZES THAT I HAVE DONE, YOU KNOW, SMOKING HASN'T BEEN ASSOCIATED WITH HEART ATTACK OR STROKE. I MEAN, THERE -- YOU KNOW, YOU DON'T HAVE A SUFFICIENT SAMPLE SIZE, OR IF THERE ARE METHODOLOGICAL ISSUES, THAT CAN IMPACT ASSOCIATIONS OR THERE ARE SO MANY REASONS WHY IN A STUDY A TRUE CAUSAL ASSOCIATION MIGHT NOT REACH STATISTICAL SIGNIFICANCE.

SO, BUT WHAT YOU ALSO WANT TO THINK ABOUT IS WHAT ARE THE CHANCES IF THE ASSOCIATION WAS NOT CAUSAL THAT WE WOULD SEE SO MANY DIFFERENT ASSOCIATIONS USING DIFFERENT TYPES OF BIOMARKERS USING DIFFERENT PERIODS OF TIME IN HISTORY AND IN DIFFERENT COUNTRIES AND POPULATIONS.

Q AND THAT'S WHERE I WAS GOING TO GET AT.

SO WHEN WE LOOK AT THE STATISTICALLY SIGNIFICANT DATA, DO YOU HAVE DIFFERENT COUNTRIES AND DIFFERENT BIOMARKERS AND DIFFERENT TIME PERIODS?

A YES.

Q I MEAN, FOR EXAMPLE, YOU MENTIONED DOHERTY A MINUTE AGO. I MEAN, THAT HAS PRENATAL DATA; RIGHT?

A YEP.

Q AND YOU KNOW, WE HAVE BLOOD MARKERS AND HAIR

MARKERS. AND WHEN YOU HAVE THIS SORT OF DIFFERENT PEOPLE, DIFFERENT LOCATIONS, DIFFERENT TIME PERIODS, DIFFERENT EXPOSURE PERIOD, DIFFERENT STUDY DESIGNS, DOES THAT LEND ITS WEIGHT TO THERE BEING CONSISTENCY OF THE DATA?

A YEAH. BECAUSE WHAT YOU WOULD -- I MEAN, YOU WOULD -- IF YOU SAW THIS NUMBER OF STUDIES, BUT THEY WERE ALL CONDUCTED IN, YOU KNOW, 2018 AMONG CHILDREN, YOU KNOW, LIVING IN THE WEST COAST AND THE EAST COAST OF THE UNITED STATES, BUT THEN YOU SAW THE SAME NUMBER OF STUDIES, BUT THOSE WERE ALL DIVERSE, AND THOSE WERE, YOU KNOW, HAD SOME STUDIES WERE CONDUCTED IN THOSE POPULATIONS, BUT SOME WERE IN EUROPE AND SOME WERE IN ASIA AND SOME WERE IN AFRICA, THEN YOU WOULD REALLY START TO THINK ABOUT, IS THERE SOMETHING -- IS THERE SOMETHING ABOUT, YOU KNOW, SOME AREAS THAT MIGHT BE INVOLVED.

BUT WHEN YOU START SEEING CONSISTENCY ACROSS DIFFERENT AREAS -- AND THE LATTER SITUATION THAT I JUST DESCRIBED, THAT WOULD NOT MEAN THAT IT WOULD NOT BE CAUSAL. I SHOULD BE VERY CLEAR ABOUT THAT.

BUT WHEN YOU SEE -- BUT WHAT YOU WOULD START TO THINK IS, LIKE, MAYBE THERE IS SOMETHING GOING ON IN THOSE POPULATIONS THAT, YOU KNOW, MIGHT BE MODIFYING THE EFFECT OR MIGHT BE MAKING IT CAUSAL IN THOSE SITUATIONS.

BUT IT WOULD BE SO UNLIKELY IF YOU LOOKED IN DIFFERENT STUDY DESIGNS AND DIFFERENT POPULATIONS AND DIFFERENT SAMPLE SIZES AND DIFFERENT TIME PERIODS AND WE

CONTINUOUSLY SEE AN ASSOCIATION, THEN IT BECOMES LESS LIKELY THAT IT'S DUE TO, YOU KNOW, DESIGN ISSUES OR IT'S JUST DUE TO, YOU KNOW, HAVING TOO LARGE SAMPLE SIZES OR -- WHICH IS NOT A PROBLEM IN THIS LITERATURE.

SO WHEN YOU START -- WHEN YOU SEE SOMETHING LIKE THIS, YOU WANT TO THINK, ALL RIGHT. IS A EFFECT MODIFICATION GOING ON HERE? IS THERE A REASON WHY SOME STUDIES ARE SIGNIFICANT AND OTHERS AREN'T? OR ARE SOME STUDIES NOT SIGNIFICANT DUE TO CHANCE BECAUSE THAT ALWAYS COMES INTO PLAY OR DUE TO SMALL SAMPLE SIZES.

Q AND ALL THOSE CONSIDERATIONS THAT YOU'RE TALKING ABOUT AND THAT SORT OF SYSTEMIC REVIEW OF EACH STUDY AND UNDERSTANDING IT, IS THAT WHAT YOU DID HERE FOR EACH ONE OF THESE STUDIES AS IT RELATES TO ARSENIC?

A ABSOLUTELY.

SO WHAT I DID, I DIDN'T CREATE -- I DIDN'T SEE SUCH A BEAUTIFUL CHART UNTIL THIS WEEKEND, BUT THE EQUIVALENT OF THAT CHART WAS IN MY HEAD AS I WAS LOOKING AT THE LITERATURE AND LOOKING AT, YOU KNOW, STUDY AFTER STUDY SHOWING SIGNIFICANT ASSOCIATIONS AND OTHER STUDIES NOT SHOWING SIGNIFICANT ASSOCIATIONS, I HAD TO SORT OF KEEP TRACK IN MY MIND OF SORT OF WHERE WE WERE IN RELATION TO THIS CONSISTENCY AND HOW AND WHY SOME STUDIES MIGHT NOT BE SIGNIFICANT.

Q NOW, ARE YOU FAMILIAR WITH SOMETHING CALLED A META ANALYSIS?

A YES.

Q ARE META ANALYSIS ONE WAY OF TRYING TO

SYNTHESIZE MULTIPLE DIFFERENT STUDIES TO SEE IF THERE'S A CONSISTENT OUTCOME?

A YEP.

Q ALL RIGHT. LET'S LOOK AT A META ANALYSIS FROM 2019. THIS IS THE WANG STUDY. WE ACTUALLY HAD A CHANCE TO TALK ABOUT THIS BRIEFLY YESTERDAY AS IT RELATES TO LEAD. OBVIOUSLY WE'RE GOING TO TALK ABOUT ARSENIC.

ARE YOU FAMILIAR WITH THIS STUDY, DOCTOR?

A I AM.

Q AND FOR THE RECORD, THIS IS EXHIBIT 126.

SO IN THIS STUDY I KIND OF WANT TO START OFF -- WELL, IN THIS STUDY, AS YOU CAN SEE HERE, THIS A LONG -- THERE'S A CHART, IT STARTS ON TABLE 1 SUMMARIZING -- OH, SORRY, THERE'S A CHART HERE AND IT SAYS IT'S SUMMARIZING THE RELEVANT STUDIES ON ARSENIC EXPOSURE AND ASD.

DO YOU SEE THAT?

A YES.

Q AND AS YOU GO THROUGH IT FOR A FEW PAGES, THE AUTHORS ARE DESCRIBING THE STUDIES, THE HAIR, THE BODY, THE EXPOSURE MEASURE, THE OUTCOME, THE FINDINGS AND THE ASSOCIATION GROUPS, ET CETERA; RIGHT?

A YEP.

Q OKAY. ALL RIGHT.

SO THEN IF WE GO DOWN HERE, THEY ACTUALLY HAVE A TABLE OF THEIR RESULTS OF THEIR META ANALYSIS. I WANT TO WALK THROUGH THAT.

SPECIFICALLY, I WANT TO LOOK AT THE ARSENIC HERE, AND IT LOOKS LIKE THEY DID A META ANALYSIS FOR

BLOOD AND HAIR; IS THAT RIGHT?

A CORRECT.

Q WHAT DOES THIS MEASURE HERE REFLECT? IT SAYS "MEAN SD CASE." WHAT IS THAT REFERRING TO?

A SO THAT IS THE MEAN OF THE ARSENIC LEVELS IN THE AUTISM CASES, AND IN THE PARENTHESES IS THE STANDARD DEVIATION. AND NEXT TO IT IS THE MEAN AND STANDARD DEVIATION OF THE ARSENIC LEVELS IN THE CONTROL OR COMPARISON GROUP.

Q IS ONE WAY TO THINK ABOUT THIS IS THE CASES, THESE ARE THE KIDS WITH AUTISM AND THIS IS THE AMOUNT OF ARSENIC THEY GET WHEN THEY POOLED IT ALL TOGETHER?

A CORRECT, YES.

Q AND THE TOP ONE IS FOR BLOOD AND THE BOTTOM ONE IS FOR HAIR?

A YES.

Q AND THEN IT LOOKS LIKE IF WE COMPARE THEM, JUST EYEBALLING IT, FOR BLOOD IT LOOKS LIKE ALMOST FOUR OR FIVE OR SIX TIMES GREATER AMOUNTS OF ARSENIC IN THE AUTISTIC CHILDREN BLOOD THAN THE NEUROTYPICAL CHILDREN; IS THAT RIGHT?

A CORRECT. YES.

Q AND THEN FOR HAIR IT LOOKS TO BE ABOUT FIVE TIMES AS MUCH?

A YES.

Q AND THESE ARE ALL STATISTICALLY SIGNIFICANT; RIGHT?

A THEY WERE, YES, HIGHLY STATISTICALLY

SIGNIFICANT.

Q AND YOU WOULD AGREE WITH ME THAT WHEN YOU PULL THE DATA TOGETHER AND YOU HAVE A LOT MORE OBSERVATIONS, IT'S EASIER TO FIND STATISTICAL SIGNIFICANCE; IS THAT RIGHT?

A YEAH, BECAUSE ONE OF THE BIGGEST CHALLENGES TO FINDING STATISTICAL SIGNIFICANCE FOR STRONG ASSOCIATIONS IS SMALL SAMPLE SIZE. IN THE REALM OF EPIDEMIOLOGY THESE ARE ACTUALLY, EVEN ONES POOLED, THEY ARE NOT HUGE SAMPLE SIZES, BUT THEY ARE -- COMPARED TO THE INDIVIDUAL STUDIES IN THIS LITERATURE, YOU HAVE A LOT MORE STATISTICAL POWER.

Q NOW, IF WE LOOK AT THE ACTUAL DISCUSSION HERE, THIS IS ON PAGE 12, THERE IS A DISCUSSION HERE ABOUT ARSENIC. I'LL BLOW IT UP.

AND IT SAYS, "ARSENIC IS ABLE TO GAIN ACCESS TO THE DEVELOPING BRAIN AND PRODUCE ADVERSE EFFECTS ON NEURODEVELOPMENT, AND IN TURN, DEFICITS IN NEUROBEHAVIORAL AND COGNITIVE FUNCTIONS IN CHILDREN."

DO YOU SEE THAT?

A I DO.

Q AND THIS IS ESSENTIALLY A DISCUSSION ABOUT BIOLOGICAL PLAUSIBILITY AND IT MAKING SENSE THAT IT COULD BE A NEUROTOXIN?

A CORRECT.

Q AND IT GOES ON TO SAY, "STUDIES FOUND A SIGNIFICANT ASSOCIATION BETWEEN HIGHER URINARY

ARSENIC CONCENTRATIONS AND POORER SCORES ON TEST MEASURING VISUAL/SPACIAL REASONING, LANGUAGE AND VOCABULARY, MEMORY AND INTELLIGENCE AS WELL AS HYPERACTIVE BEHAVIOR IN CHILDREN."

DO YOU SEE THAT?

A YES.

Q AGAIN, THE FACT THAT YOU SEE THESE SIGNIFICANT ASSOCIATIONS BETWEEN ARSENIC AND CLOSELY RELATED NEURODEVELOPMENTAL PROBLEMS, SUCH AS ASD, DOES THAT HAVE ANY EFFECT ON YOUR OPINION?

A ABSOLUTELY.

SO IF THERE -- AS LONG AS THERE'S, YOU KNOW, BIOLOGICAL PLAUSIBILITY, IT MAKES MORE SENSE WHEN WE SEE STUDIES -- WHEN WE SEE ASSOCIATIONS IN THE EPI LITERATURE BECAUSE THE EPI LITERATURE DOESN'T SHOW WHETHER -- DOESN'T SHOW THE UNDERLYING MECHANISMS TYPICALLY. IN THIS FIELD IT DOESN'T SHOW THE UNDERLYING MECHANISMS.

HOPEFULLY, YOU KNOW, IN SOME FIELDS THE EPI LITERATURE CAN SHOW BIOLOGICAL MECHANISMS, BUT WE RELY ON OTHER TYPES OF STUDIES TO EITHER BE CONSISTENT OR INCONSISTENT, AND THEREFORE, HELP US INFER WHETHER THE ASSOCIATIONS ARE CAUSAL.

Q NOW, DOCTOR, WE HAVE THIS KNOWN DATA ABOUT ARSENIC AND NEUROTOXICITY AND ALL THESE OUTCOMES.

WOULD IT BE FAIR TO SAY THAT IT'S SORT OF LOGICAL AND EXPECTED TO SEE THESE HIGH LEVELS OF ARSENIC

IN THE EPI BASED ON WHAT WE KNOW ALREADY?

A YES. IT MAKES SENSE. IT'S THE UNDERLYING HYPOTHESIS THAT DROVE ALL OF THESE EPIDEMIOLOGISTS TO SPEND TIME AND SIGNIFICANT MONEY TO DO THESE STUDIES.

Q AND EVEN THE AUTHORS IN THIS STUDY RIGHT HERE SAY, "THE POTENTIAL LINK BETWEEN ARSENIC AND LEAD EXPOSURE AND AN INCREASED RISK OF ASD IS THUS LOGICAL AND HIGHLY EXPECTED."

DO YOU SEE THAT?

A I DO.

Q IS IT REFRESHING TO SEE THAT THESE INDEPENDENT SCIENTISTS DOING THESE STUDIES ARE ESSENTIALLY SAYING THE SAME THING THAT YOU'RE SAYING HERE?

A ABSOLUTELY.

Q ALL RIGHT.

NOW, I KNOW THERE WAS SOME CONCERNS AND THERE'S BEEN SOME CONCERNS RAISED BY COUNSEL ON THE DEFENSE ABOUT TEMPORALITY, RIGHT, AND REVERSE CAUSATION.

ARE THESE CHILDREN HAVING HIGH LEVELS OF AUTISM OR BECAUSE THEY HAVE AUTISM OR IS IT CAUSING THE AUTISM ITSELF.

YOU UNDERSTAND THOSE CONCEPTS, I'M SURE.

A I DO.

Q ALL RIGHT.

IN YOUR REPORT YOU SQUARELY ADDRESS THIS. AND I KIND OF WANT TO WALK THROUGH THE EVIDENCE THAT YOU MARSHALLED IN YOUR ANALYSIS OF IT.

SO ON PAGE 32 OF YOUR REPORT, YOU HAVE A

SECTION HERE.

YOU WRITE, "A SECOND LIMITATION IN THE CURRENT BODY OF LITERATURE IS THE FACT THAT ARSENIC IN CHILDREN'S BODIES WERE MEASURED AFTER THE DIAGNOSIS HAD ALREADY OCCURRED CHALLENGING ASSUMPTIONS ABOUT TEMPORALITY AND CAUSALITY; HOWEVER, AS EXPLAINED ABOVE WITH RESPECT TO LEAD, REVERSE CAUSATION, SUCH THAT ASD CHARACTERISTICS WOULD INCREASE ARSENIC EXPOSURE IS NOT -- AN UNLIKELY EXPLANATION OF THE OBSERVED ASSOCIATION."

DO YOU SEE THAT?

A I DO.

Q WHY DO YOU SAY THAT? WHAT'S YOUR THINKING?

A BECAUSE IT'S JUST -- IT'S SO HIGHLY IMPROBABLE THAT THE DEFINING CHARACTERISTICS OF AUTISM WOULD LEAD CHILDREN TO BE MORE EXPOSED TO ARSENIC. ARSENIC EXPOSURE IS NOT RELATED TO THE BEHAVIORS THAT ARE TYPICAL OF CHILDREN WITH AUTISM COMPARED TO CHILDREN WITHOUT AUTISM.

Q I MEAN, COULDN'T THEY GET ARSENIC FROM PUTTING LIKE TOYS IN THEIR MOUTH OR PAINT CHIPS OR SOMETHING LIKE THAT?

A SO, NO, THAT'S NOT REALLY AN EXPOSURE FOR ARSENIC. TOYS ARE NOT EXPOSURE SOURCES FOR ARSENIC. THEY ARE EXPOSURE SOURCES FOR OTHER ENVIRONMENTAL TOXINS, BUT NOT FOR ARSENIC, WHICH IS WHY, YOU KNOW, SORT OF I THOUGHT ABOUT THIS, YOU KNOW, CHEWING ON THEIR

SWEATSHIRTS OR ON THEIR HAIR OR ON THEIR CLOTHING OR ON THEIR TOYS, THAT MOUTHING IS NOT AN EXPOSURE ROUTE FOR ARSENIC.

Q YOU ALSO DISCUSS SOME DATA THAT HELPS SUPPORT THIS REASON.

THE FIRST ONE HERE IS YOU IDENTIFY A SERIES OF PRENATAL EXPOSURE STUDIES --

A YES.

Q -- THAT LINKED PRENATAL EXPOSURE TO ARSENIC TO LATER ASD DEVELOPMENT.

DO YOU SEE THAT?

A I DO.

Q YOU TALK ABOUT THE SKOGHEIM STUDY AND THE LONG STUDY HERE.

DO YOU SEE THAT?

A YES.

Q I GUESS, DOCTOR, WHAT RELEVANCE DOES LOOKING AT PRENATAL EXPOSURES HELP YOU IN UNPACKING THE TEMPORALITY PUZZLE?

A SO THEY HELP -- IT HELPS ALLEVIATE OUR CONCERNS BECAUSE WHEN WE SEE ASSOCIATIONS WITH EXPOSURE LONG BEFORE THE OUTCOME HAS OCCURRED, WE ALLEVIATE ANY CONCERNS THAT WE MIGHT HAVE ABOUT REVERSE CAUSATION. EVEN THOUGH IT DOESN'T ACTUALLY MAKE SENSE THAT REVERSE CAUSATION WOULD BE AT PLAY HERE, IT'S ALWAYS HELPFUL TO SEE ACTUAL EVIDENCE ALLEVIATE THOSE CONCERNS TOO.

Q IN YOUR REPORT YOU GO ON TO FURTHER EXPLAIN THAT THE ABILITY FOR EARLY LIFE ARSENIC EXPOSURE TO

CAUSE ASD-LIKE BEHAVIOR HAS BEEN SUPPORTED IN EXPERIMENTAL RESEARCH IN ANIMALS.

DO YOU SEE THAT?

A I DO.

Q DOES THAT ALSO HELP ALLEVIATE CONCERNS ABOUT REVERSE CAUSALITY?

A ABSOLUTELY, BECAUSE IT'S CERTAINLY NOT HAPPENING IN RATS OR RODENTS OR ANY OTHER ANIMAL MODEL.

Q OKAY.

SO I GUESS THE QUESTION, THEN, IS IN COMING TO YOUR CONCLUSION THAT ARSENIC EXPOSURE AT EARLY LIFE IN CHILDREN IS A LIKELY SUBSTANTIAL FACTOR IN CAUSING THE DEVELOPMENT OF ASD, DID YOU CONSIDER AND WORK THROUGH ALL THESE CONCEPTS OF TEMPORALITY BEFORE ARRIVING AT THAT OPINION?

A ABSOLUTELY. I WOULD SAY TEMPORALITY WAS THE BIGGEST THING THAT I WAS THINKING ABOUT.

ANYTIME YOU HAVE LITERATURE WHERE A LOT OF IT COMES FROM STUDIES WHERE THE EXPOSURE WAS ASSESSED AT THE TIME OR AFTER DIAGNOSIS EVEN THOUGH, YOU KNOW, WE'RE TALKING ABOUT THE EXPOSURE HAPPEN -- THE EXPOSURE -- WE KNOW THE EXPOSURE OCCURS BEFORE THE TIME OF DIAGNOSIS.

IF WE HADN'T GOTTEN TO THAT POINT -- IF THAT WASN'T POSSIBLE, WE WOULDN'T EVEN BE HERE, I WOULDN'T BE HERE, AT LEAST, BUT WHENEVER IT'S ASSESSED, EITHER, YOU KNOW, CONCURRENT OR AFTER THE TIME OF DIAGNOSIS, THEN WE HAVE TO REALLY THINK HOW CONSISTENT ARE THESE EXPOSURES OVER TIME, HOW LIKELY IS IT THAT IT RELATES ON A

POPULATION-WIDE LEVEL TO THE EXPOSURES BEFORE THE DIAGNOSIS BECAUSE EVEN IF IT RELATES ON A POPULATION-WIDE LEVEL, YOU KNOW, THAT DOESN'T NECESSARILY REQUIRE THAT IT DOES SO ON EVERY SINGLE INDIVIDUAL.

AND HOW LIKELY IS IT THAT THE CHARACTERISTICS OF THE OUTCOME ITSELF INCREASES THAT EXPOSURE?

Q WELL, LET'S MOVE ON TO MERCURY. AND I WANT TO ASK YOU POINT BLANK, DOCTOR.

YOU KNOW, I'VE HEARD THIS ARGUMENT ABOUT MERCURY AND AUTISM BEFORE AND THAT VACCINE STUFF AND WE KNEW THAT WAS GARBAGE, SO WHY ISN'T WHAT WE'RE DOING HERE ALSO GARBAGE?

A WELL, BECAUSE THIS FIELD IS SUPPORTED BY THE EVIDENCE. THERE HAVE BEEN MANY STUDIES THAT HAVE LOOKED AT VACCINES IN RELATION TO AUTISM AND THEY HAVEN'T SUPPORTED AN ASSOCIATION, NOT EVEN CLOSE. YOU KNOW, THERE WERE RUMORS A LONG TIME AGO. AND VACCINE RESEARCH IS SORT OF RIPE FOR RUMORS, AS WE'VE ALL BEEN ABLE TO SEE OVER THE PAST TWO YEARS. IT'S HIGHLY SUSCEPTIBLE TO BAD ACTORS AND TO PEOPLE WITH ULTERIOR MOTIVES THAT IS -- THAT'S REALLY DISTINCT FROM THIS LINE OF RESEARCH.

Q TO BE CLEAR, DOCTOR, THE MERCURY IN VACCINES, IS THAT THE SAME MERCURY THAT WE'RE TALKING ABOUT HERE WHEN WE TALK ABOUT MERCURY IN ASD?

A NO. SO THE TYPE OF MERCURY IN VACCINES IS SOMETHING CALLED THIMEROSOL, IT'S ETHYLMERCURY WITH IS NOT AS -- IT'S READILY CLEAR, IT'S NOT AS TOXIC AS

METHYLMERCURY WHICH IS THE CONCERN HERE.

Q OKAY. ALL RIGHT. WELL, LET'S GET INTO THE DATA.

SO WE HAVE ANOTHER CHART HERE FOR MERCURY.

AGAIN, I PREPARED THIS, BUT YOU HAD A CHANCE TO SPEND A FEW HOURS GOING THROUGH THESE TO MAKE SURE THEY WERE IN THE RIGHT COLUMNS; RIGHT?

A YEP.

Q AND IF THERE'S ANY DATES WRONG HERE, I APOLOGIZE. I TOOK NOTES WHEN YOU GAVE ME ALL YOUR COMMENTS, BUT I DON'T KNOW IF I CAUGHT ALL OF THEM, IT WAS A LATE NIGHT.

SO THAT SAID, DOCTOR, GOING THROUGH THIS, I WANT TO TALK ABOUT THE DATA GENERALLY.

NOW, WE HAVE A LOT MORE STUDIES HERE IN MERCURY.

DO YOU SEE THAT?

A YES.

Q AND, AGAIN, WE SEE THAT THERE IS A VERY LARGE NUMBER OF POSITIVE AND STATISTICALLY SIGNIFICANT RESULTS.

DO YOU SEE THAT?

A I DO.

Q AND ONE OF THE THINGS THAT'S SORT OF UNIQUE HERE IS WE HAVE URINE, BLOOD, HAIR, TEETH, NAILS AND AIR POLLUTION.

DO YOU SEE THAT?

A I DO.

Q WHAT IS THE RELEVANCE OF SEEING ALL THESE DIFFERENT BIOMARKERS, DIFFERENT STUDY DESIGNS, AND DIFFERENT, FRANKLY, RESULTS -- ALL HAVING STATISTICALLY SIGNIFICANT RESULTS, WHAT IS THE SIGNIFICANCE OF THAT?

A SO IN THE FIELD OF EPIDEMIOLOGY, THAT IS A LOT OF STUDIES SHOWING A POSITIVE AND STATISTICALLY SIGNIFICANT ASSOCIATION, SO MANY SO THAT IT MAKES IT -- IT WOULD MAKE IT MUCH HARDER IF I WERE DESIGNING A STUDY RIGHT NOW AND ASKING FOR NIH FUNDING ON THIS TOPIC OR IF I WAS TRYING TO PUBLISH ON THIS. I MEAN, THIS IS A LARGE BODY OF LITERATURE SHOWING A POSITIVE AND STATISTICALLY SIGNIFICANT ASSOCIATION IN DIFFERENT TYPES OF BIOMARKERS OVER DIFFERENT PERIODS OF TIME IN DIFFERENT STUDY POPULATIONS.

Q AND HAVE YOU OBSERVED IN THE EPIDEMIOLOGIC COMMUNITY A LITTLE BIT OF HOSTILITY TO DOING STUDIES ON MERCURY BECAUSE IT COULD BE PUT INTO THE SAME BUCKET AS THE VACCINE STUFF?

A I HAVEN'T HEARD OF THAT PERSONALLY, BUT MY ASSUMPTION IS THAT THAT WOULD BE TRUE IF I WERE WANTING TO CREATE A STUDY LIKE THAT, THAT IT WOULD BE -- I THINK IT'S REALLY IMPORTANT TO DISTINGUISH THE TWO SOURCES OF MERCURY AND ALLAY ANY CONCERNS THAT YOU'RE TRYING TO EXTRAPOLATE ONE TO THE OTHER.

Q ALL RIGHT. WELL, HERE'S WHAT I'D LIKE TO DO TO GO OVER THIS. FIRST I WANT TO GO OVER A COUPLE OF META ANALYSIS BECAUSE OBVIOUSLY THAT'S EASIER TO DO THAN LOOKING AT A HUNDRED STUDIES, AND THEN I WANT TO LOOK AT

THIS RYU STUDY RIGHT HERE OR THE RYU STUDY, I'VE PROBABLY BEEN PRONOUNCING THAT WRONG. WE ALWAYS CALLED IT RY-U WHEN I PLAYED STREET FIGHTER BACK AS A KID, SO I COULD HAVE BEEN SAYING IT WRONG.

BUT I WANT TO TALK ABOUT THAT ONE BECAUSE IT'S A PROSPECTIVE STUDY AND HOW IT HELPS US UNDERSTAND STUFF.

A SURE.

Q SO LET'S START OFF WITH SULAIMAN, WHICH IS EXHIBIT 121.

THIS IS A META ANALYSIS TITLED "EXPOSURE TO ALUMINUM, CADMIUM AND MERCURY AND AUTISM SPECTRUM DISORDER IN CHILDREN, A SYSTEMATIC REVIEW AND META ANALYSIS."

DO YOU SEE THAT?

A I DO.

Q ALL RIGHT. AND IT LOOKS AS THOUGH WHAT THEY ARE TRYING TO DO -- AND I'LL JUST TRY TO CALL OUT WHAT THEY ARE TRYING TO SAY HERE.

I'LL JUST READ IT TO YOU.

IT SAYS, "PREVIOUSLY WE PERFORMED A META ANALYSIS OF EXISTING LITERATURE TO EXAMINE THE POTENTIAL LINK BETWEEN INORGANIC ARSENIC AND LEAD EXPOSURE IN ASD."

DO YOU SEE THAT?

A NO, I ACTUALLY WAS TRYING TO FIND IT AS YOU WERE READING.

OH, I SEE.

YES, NOW I SEE IT.

Q ALL RIGHT. IT IS A CONTINUATION OF THAT STUDY IN INVESTIGATING THE ASSOCIATION OF THE EXPOSURE OF ALUMINUM, CADMIUM AND MERCURY IN ASD AND ADHD.

DO YOU SEE THAT?

A I DO.

Q "THESE METALS WERE CHOSEN BECAUSE THEY ARE ABUNDANT IN OUR ENVIRONMENT, ARE KNOWN TO CAUSE NEUROLOGICAL PROBLEMS IN HUMANS, AND HAVE MULTIPLE PUBLISHED STUDIES EXAMINING THE POTENTIAL LINKS WITH ASD."

DO YOU SEE THAT?

A I DO.

Q AND IS THAT TYPICALLY WHAT YOU DO META ANALYSIS ON WHEN YOU HAVE A BUNCH OF DATA AND PLAUSIBILITY?

A YES.

Q OKAY.

ALL RIGHT. LET'S GO STRAIGHT TO THE RESULTS ON PAGE 15. THERE IS A CHART OF THE META ANALYSIS.

DO YOU SEE IT?

A I DO.

Q AND AT THE BOTTOM HERE, WE HAVE THE DATA AS IT RELATES TO THREE BIOMARKERS, BLOOD, HAIR AND URINE AND MERCURY.

DO YOU SEE THAT?

A I DO.

Q AND HERE IT LOOKS LIKE WE HAVE THE MEAN SD FOR THE CASES IN CONTROL.

IS THAT THE SAME SORT OF THING AS WE SAW IN THE WANG STUDY A MINUTE AGO?

A EXACTLY, YEAH. SO LIKE 7.6 WOULD BE THE MEAN ACROSS THE -- LIKE, THE POOLED MEAN -- ACROSS THE STUDIES FOR THE BLOOD MERCURY LEVELS IN THE AUTISM CASES, AND IN PARENTHESES IS THE STANDARD DEVIATION. AND THEN 4.8 WOULD BE THE MEAN BLOOD MERCURY LEVELS IN THE CONTROL OR THE COMPARISON, THE NON AUTISM GROUP.

Q NOW, DOCTOR, HERE EACH ONE OF THESE BIOMARKERS BLOOD, HAIR, AND URINE SEEMS TO BE A STATISTICALLY SIGNIFICANT RESULT; IS THAT RIGHT?

A CORRECT.

Q IT'S NOT AS SEVERE AS WE SAW WITH ARSENIC.

IT SEEMS ABOUT TWICE AS MUCH MERCURY IS BEING FOUND IN THE AUTISTIC CHILDREN THAN THE NEUROTYPICAL CHILDREN; IS THAT RIGHT?

A YEAH, ALTHOUGH, IT'S HARD -- LIKE, YOU CAN'T REALLY COMPARE THE, YOU KNOW, THE DIFFERENCE ACROSS THE TWO DIFFERENT BIOMARKERS BECAUSE THEY ARE -- I MEAN, THE BACKGROUND LEVELS ARE VERY DIFFERENT SO I WOULDN'T NECESSARILY SAY THAT THIS WAS LESS SEVERE.

Q FAIR ENOUGH.

GOOD POINT. AND I THINK THAT WHAT I'M TRYING TO SAY IS WHAT WE'RE SEEING HERE AT LEAST IN THIS META ANALYSIS, THERE'S ABOUT TWICE AS MUCH MERCURY IN THE AUTISTIC KIDS THAN IN THE NON ONES; IS THAT RIGHT?

A YES. CORRECT.

Q AND JUST TO BE CLEAR, THEY -- WELL, IT'S NOT

DESIGNS. IT'S NOT THE STUDY. ALL RIGHT. THAT'S FINE.

SO I WANT TO GO TO ANOTHER META ANALYSIS THAT HAS SLIGHTLY DIFFERENT RESULTS, JUST SORT OF COMPARING.

A OKAY.

Q SO THIS IS EXHIBIT 1 -- I'M SORRY -- EXHIBIT 78. AND THIS IS ANOTHER META ANALYSIS CALLED "THE ASSOCIATION BETWEEN MERCURY LEVELS AND AUTISM SPECTRUM DISORDERS, A SYSTEMIC REVIEW OF META ANALYSIS" BY DOCTORS JAFARI, ET AL.

DO YOU SEE THAT?

A I DO.

Q AND THIS ONE WAS PUBLISHED IN 2017 SO THIS IS ACTUALLY A OF COUPLE YEARS BEFORE THE SULAIMAN ONE THAT WE JUST SAW; IS THAT RIGHT?

A CORRECT.

Q OKAY. SO IN THIS STUDY ON PAGE 3 THEY BEGIN DISCUSSING THE RESULTS AND THIS IS JUST ABOUT MERCURY; RIGHT?

SORRY, LET ME BACK UP.

A YEAH.

Q THIS STUDY IS JUST ABOUT MERCURY. I MEANT TO ASK YOU THAT, IT'S NOT ABOUT THE OTHER METALS.

A SORRY, I DIDN'T REALIZE THAT WAS A QUESTION.

YES, IT'S JUST ABOUT MERCURY.

Q OKAY.

PAGE 3 THEY START GOING OVER THE RESULTS.

AND THE FIRST ONE THEY LOOK AT -- SORRY -- THE FIRST ONE THEY LOOKED AT IS HAIR.

DO YOU SEE THAT?

A I DO.

Q AND THEY ACTUALLY DIDN'T OBSERVE IN THIS META ANALYSIS A STATISTICALLY SIGNIFICANT DIFFERENCE BETWEEN THE AUTISTIC CHILDREN AND THE NON AUTISTIC CHILDREN OF THE AMOUNT OF MERCURY IN THEIR HAIR; RIGHT?

A YES.

Q OKAY.

AND THEN, SAME THING WITH URINE. THEY LOOKED AT AUTISTIC CHILDREN'S URINE VERSUS NON AUTISTIC CHILDREN, AND AGAIN, HERE THEY DIDN'T ACTUALLY FIND A STATISTICALLY SIGNIFICANT DIFFERENCE, DID THEY?

A YOU'RE GOING FAST, SO I HAVE TO READ THIS TO MAKE SURE.

Q SORRY.

A YES. YEP.

Q I'LL HIGHLIGHT IT FOR YOU TO HELP YOU IDENTIFY IT. SORRY. I'M TRYING TO GO FAST BECAUSE I'M TRYING TO GET YOU OFF IN THE NEXT TEN MINUTES.

ALL RIGHT. SO THEN WE HAVE WHOLE BLOOD.

AND HERE THEY DID FIND A STATISTICALLY SIGNIFICANT RESULT; RIGHT?

A YES.

Q AND AGAIN, THEY LOOKED AT RBC.

WHAT IS RBC?

A RED BLOOD CELLS.

Q OKAY. SO IT'S A SUBCOMPONENT OF THE BLOOD; IS THAT RIGHT?

A CORRECT.
Q OKAY.
AND HERE THEY ALSO FOUND A STATISTICALLY SIGNIFICANT RESULT IN THE ASD PATIENTS?
A YES.
Q ALL RIGHT. AND THEN THEY ACTUALLY HAD THIS INTERESTING AREA, A BIOMARKER OF BRAIN.
DO YOU SEE THAT?
A YES.
Q I'M JUST CURIOUS, HOW DO YOU MEASURE THE AMOUNT OF MERCURY IN A BRAIN? HOW DOES THAT WORK?
A IF I RECALL CORRECTLY, THESE WERE POST-MORTEM SO THESE WERE ON BRAINS AFTER THE PEOPLE HAD DIED.
Q OKAY.
AND SO HERE THEY FOUND IN THE BRAINS STATISTICALLY -- DEMONSTRATED THE CONCENTRATION OF MERCURY WAS SIGNIFICANTLY HIGHER IN ASD PATIENTS THAN HEALTHY CELL PATIENTS.
DO YOU SEE THAT?
A I DO.
Q ALL RIGHT.
SO WE DON'T HAVE SIGNIFICANT RESULTS FOR HAIR AND URINE BUT WE DO FOR BLOOD AND BRAIN, AND I WANT TO SHOW YOU WHAT THE CONCLUSION OF THE AUTHORS WAS NOTWITHSTANDING THOSE RESULTS.
THEY STATE RIGHT HERE: "THE RESULTS OF OUR CURRENT META ANALYSIS REVEALED THAT MERCURY IS A CAUSAL FACTOR IN THE ETIOLOGY OF ASD."

THAT'S WHAT THESE AUTHORS CONCLUDE; DO YOU SEE THAT?

A I DO.

Q NOW, IS THAT APPROPRIATE THAT YOU CAN CONDUCT A META ANALYSIS AND ACTUALLY SEE, YOU KNOW, NO RESULTS IN ONE BIOMARKER BUT SEE IT IN OTHER BIOMARKERS AND STILL REACH A CAUSALITY DETERMINATION?

A I WOULDN'T SAY THAT THEM THINKING THAT WOULD BE SO UNUSUAL BASED ON WHAT THEY SAY. BUT WRITING THAT IN A PAPER IS HIGHLY UNUSUAL. EVEN IF EVERYTHING HAD BEEN COMPLETELY CONSISTENT, IT'S JUST NOT TYPICAL THAT WE WRITE THAT WORD "CAUSAL FACTOR" IN EPI STUDIES.

IT'S -- WE TEND TO BE -- WHEN WE WRITE EPI STUDIES, WE TEND TO BE -- I DON'T KNOW IF HUMBLE IS THE RIGHT WORD OR MORE CONSERVATIVE. WE TEND TO ERR ON THE SIDE OF LETTING OTHER PEOPLE, YOU KNOW, SAY THAT OUR RESULTS WERE STRONG. IT'S SORT OF AN OCCUPATIONAL, LIKE, TREND OR, LIKE, A, I DON'T KNOW WHAT THE RIGHT WORD IS.

BUT EVEN WHEN WE ARE VERY CONFIDENT THAT THE ASSOCIATION IS CAUSAL, WE TYPICALLY DON'T SAY THAT WORD BECAUSE REVIEWERS, YOU KNOW, REVIEWERS LIKELY JUMP AT IT, AND SO IT'S SAFER NOT TO SAY THAT.

SO THE FACT THAT THEY SAID IT AND REVIEWERS AND THE EDITORS SUPPORTED THEM SAYING THAT IS -- I WOULD CALL THAT UNUSUAL. NOT BECAUSE OF THE DATA. BUT JUST BECAUSE OF OCCUPATIONAL NORMS OR FIELD NORMS.

Q SO A GOOD EXAMPLE IS WE GO BACK TO THE SULAIMAN

PAPER THAT WE WERE JUST LOOKING AT.

THIS IS EXHIBIT 121.

AT THE END OF THIS PAPER -- WHOOPS -- THEY SAY, "ALTHOUGH FURTHER RESEARCH, ESPECIALLY COHORT STUDIES, EVEN IN RETROSPECTIVE DESIGN, WILL HELP EXAMINE THE EFFECTS OF THE EXPOSURES OVER TIME AND DELINEATE THIS CRITICAL OF DEVELOPMENT PERIOD FOR ASD."

DO YOU SEE THAT?

A I DO.

Q AND, YOU KNOW, I GUESS MY QUESTION IS EVEN THOUGH THEY FOUND STATISTICALLY SIGNIFICANT RESULTS IN EVERY BIOMARKER THEY LOOKED AT, THEY ARE STILL SAYING, OH, WE NEED MORE RESEARCH.

IS THAT A COMMON PRACTICE IN YOUR WORK AS AN EPIDEMIOLOGIST?

A ABSOLUTELY. UNLESS YOU'RE HOPING TO RETIRE AFTER YOU SUBMIT THE PAPER.

YEAH, I MEAN, YOU KNOW, WE -- THAT'S JUST SORT OF PART OF NORM. WE WANT TO, YOU KNOW, MOTIVATE FURTHER RESEARCH, WHETHER IT'S OUR OWN PAPERS, OUR OWN GRANT. WE WANT TO UNDERSCORE THE IMPORTANCE OF THE FIELD AND PART OF THE REASON -- PART OF THE WAY THAT WE GET PAPERS PUBLISHED IN JOURNALS IS TO CONVINCING THE EDITORS AND THE REVIEWERS THAT THIS IS A REALLY IMPORTANT FIELD AND NOT ONLY DESERVES THE ATTENTION OF THE STUDY THAT WE'RE WRITING BUT MORE STUDIES FOLLOWING IT.

Q ALL RIGHT. DOCTOR, I WANT TO TALK QUICKLY

ABOUT TEMPORALITY WITH MERCURY AND ASD.

WE HAVE THE BENEFIT IN THIS CASE OF HAVING A PRETTY ROBUST COHORT STUDY ON MERCURY, DON'T WE?

A CAN YOU REPEAT THE QUESTION?

Q SURE.

LET'S TALK ABOUT TEMPORALITY AND MERCURY.

A UH-HUH.

Q LET'S LOOK AT THE RYU STUDY FIRST. LET'S JUST DO THAT AND BRING IT UP IN CONTEXT IN TEMPORALITY.

A OKAY. I DIDN'T KNOW IF YOU WERE REFERRING TO THE META ANALYSIS OR TO THE A DIFFERENT --

Q OH, I'M SORRY. IT WAS A BAD QUESTION. I'M SORRY ABOUT THAT.

SO WE'RE LOOKING HERE AT THE RYU STUDY, AND THIS IS EXHIBIT 114, AND THIS IS LOOKING AT THE ASSOCIATIONS OF PRENATAL AND EARLY CHILDHOOD MERCURY EXPOSURE WITH AUTISTIC BEHAVIORS AT AGE FIVE, AT FIVE YEARS OF AGE, THE MOTHERS AND CHILDREN, ENVIRONMENTAL HEALTH STUDY.

DO YOU SEE THAT?

A I DO.

Q AND IF WE LOOK DOWN HERE, WE ACTUALLY HAVE THIS NICE LITTLE GRAPHIC WALKING US THROUGH THE STUDY DESIGN.

DO YOU SEE THAT?

A YES.

Q AND IT LOOKS LIKE THEY FOLLOWED MOTHERS IN EARLY PREGNANCY, LATE PREGNANCY, THEY TOOK CORD BLOOD, THEY TOOK MERCURY LEVELS AT AGE TWO, AT PAGE THREE AND

THEN THEY ASSESSED AUTISTIC BEHAVIORS AT AGE FIVE.

DO YOU SEE THAT?

A YES.

Q WHEN YOU SEE A STUDY DESIGN LIKE THIS, ARE YOU REALLY WORRIED ABOUT REVERSE CAUSALITY AT ALL?

A I MEAN, I THINK ABOUT REVERSE CAUSALITY IN EVERY SINGLE STUDY NO MATTER WHAT. BUT WHAT I THINK WHEN I READ THIS IS THAT THE DESIGN OF THIS STUDY IS REALLY GREAT TO ALLEVIATE CONCERNS ABOUT REVERSE CAUSALITY DEPENDING ON WHAT THEY SEE.

Q AND THIS PROCESS OF LOOKING AT MOTHERS AND THEIR CHILDREN AND FOLLOWING THEM ALONG AND MEASURING THEIR MERCURY AT VARIOUS PARTS AND THEN ASSESSING AUTISTIC BEHAVIORS AT AGE FIVE, IS THAT A SOLID DESIGN FOR SAYING, OKAY, IS MERCURY REALLY A TEMPORALLY CAUSAL AGENT HERE?

A IT'S AN EXTREMELY WELL CONDUCTED DESIGN. IT IS THE DESIGN THAT THE REST OF THE INVESTIGATORS WOULD HAVE WANTED TO DO. IT JUST REQUIRES MORE TIME AND MONEY.

Q ALL RIGHT. WELL, LET'S LOOK AT THE RESULTS OF THIS STUDY.

NOW, LET'S START OFF WITH THE FIRST HALF. I UNDERSTAND THIS IS A LITTLE COMPLICATED AND SO YOU MIGHT HAVE TO WALK US THROUGH IT A LITTLE BIT.

A SURE.

Q BUT IT LOOKS LIKE THEY HAD -- OH, ACTUALLY LET ME CALL IT OUT BIGGER SO YOU CAN SEE IT -- BUT IT LOOKS LIKE THERE WAS FOUR DIFFERENT MODELS.

DO YOU SEE THAT?

A YEP.

Q AND THIS IS OBVIOUSLY USING SRS T SCORES.

WHAT ARE THOSE, DOCTOR?

A SO THOSE ARE COMPARING -- SO THE SRS -- I, YOU KNOW, I THINK I'M CORRECT, I HAVEN'T READ THIS PAPER IN THE PAST 24 HOURS, BUT UNLESS I'M WRONG THAT THE SRS THAT THEY ARE -- THAT THE ABBREVIATION HERE IS FOR THE SOCIAL RESPONSIVE SCALE, WHICH IS A MEASURE OF AUTISM BEHAVIORS, AND IT'S A VALID AND RELIABLE MEASURE OF SORT OF AUTISM BEHAVIORS, BASICALLY. THE T SCORE IS A MEASURE -- IS A WAY TO LOOK AT THE LEVEL OF THOSE MEASURES ACROSS DIFFERENT GROUPS.

Q AND BECAUSE IT'S A CONTINUOUS SCALE, IT'S NOT A BINARY, YES/AUTISTIC, NO/AUTISTIC, THE AUTHORS HERE WERE ACTUALLY ABLE TO RUN REGRESSIONS OF THE AMOUNT OF MERCURY AT DIFFERENT AGE TIMES AND THE LIKELIHOOD OF THEM HAVING AN INCREASE IN THE SRS SCORE.

DO YOU SEE THAT?

A I DO.

Q AND THE MOST FULLY ADJUSTED MODEL IS HERE AT THE BOTTOM AND THIS IS LOOKING AT ALL THE CHILDREN IN THE COHORT, AND IT LOOKS TO BE THAT LEAD EXPOSURE -- I'M SORRY, NOT LEAD -- MERCURY EXPOSURE AT TWO YEARS OF AGE HAD A 2.2 ODDS RATIO -- 2.12 ODDS RATIO THAT WAS NOT STATISTICALLY SIGNIFICANT.

DO YOU SEE THAT -- OR I'M SORRY -- THAT WAS STATISTICALLY SIGNIFICANT.

DO YOU SEE THAT?

A YES. IS THAT AN ODDS RATIO? I THINK THAT'S A BETA EFFECT ESTIMATE, ACTUALLY.

Q OH, I'M SORRY. I THOUGHT THIS WAS --

A UNLESS IT'S -- I'M NOT POSITIVE, IT COULD -- IT SORT OF LOOKS LIKE IT. YEAH, IT WOULD NOT BE AN ODDS RATIO BECAUSE YOU CAN'T HAVE A NEGATIVE ODDS RATIO.

SO IT IS -- BUT IT IS -- IT'S THE ESSENCE. IT'S AN EFFECT ESTIMATE. IT'S THE BETA VALUE.

Q OKAY.

SO YOU HAVE THIS BETA VALUE OF 2.12 AND THAT APPEARS TO BE STATISTICALLY SIGNIFICANT AT TWO YEARS OF AGE.

LET ME BLOW IT UP SO YOU CAN SEE IT. IT'S A LITTLE BIT HARD TO READ.

A YEAH.

Q THERE YOU GO.

A YES. SO IT'S STATISTICALLY SIGNIFICANT.

SO HERE, IF IT WERE AN ODDS RATIO, WE WOULD BE LOOKING FOR A VALUE OF ONE TO INCLUDE THE NULL HERE, BUT BECAUSE IT'S A BETA, THAT VALUE WOULD BE ZERO.

SO IT'S STATISTICALLY SIGNIFICANT FOR LATE PREGNANCY CORD BLOOD, TWO YEARS OF AGE AND THREE YEARS OF AGE.

Q WELL, WHEN YOU SEE THIS CONSISTENT RESULT ON, YOU KNOW, THE SRS RATINGS AT THESE DIFFERENT PERIODS OF EXPOSURE, WHAT DOES THAT TELL YOU IN ASSESSING CAUSALITY?

A BASICALLY, IT ALLEVIATES CONCERNS ABOUT REVERSE CAUSALITY. IT SHOWS THAT THIS HEAVY METAL IS HIGHLY ASSOCIATED WITH AUTISM SEVERITY DURING EXPOSURE VERY EARLY ON, SO LATE PREGNANCY AS WELL AS THROUGH THE THIRD YEAR OF LIFE.

Q NOW, THEY ALSO DID AN ANALYSIS JUST LOOKING AT CHILDREN THAT HAD SRS SCORES OF GREATER THAN 60.

DO YOU SEE THAT?

A YES.

Q AND HERE -- I THOUGHT -- THIS IS WHY I THOUGHT IT WAS A RISK RATIO BECAUSE I THOUGHT I SAW RR, SO MAYBE IT SAYS RELATIVE RISK, SO HERE WE HAVE RELATIVE RISK.

A YEAH, THIS IS A DIFFERENT EFFECT ESTIMATE.

SO THE RR HERE FOR THESE ANALYZES WHAT WE'RE LOOKING FOR, LIKE, THE NULL VALUE WOULD BE A VALUE OF ONE FOR STATISTICAL SIGNIFICANCE, SO THIS IS SIMILAR TO AN ODDS RATIO, IT'S THE RELATIVE RISK IN THE 95 PERCENT CONFIDENCE INTERVAL AROUND IT.

Q OKAY.

AND AS YOU SEE HERE AS YOU LOOK AT THE SECOND AND THIRD YEARS OF LIFE MERCURY LEVELS, ALTHOUGH THERE ARE ELEVATED RISK RATIOS OR RELATIVE RISKS, THEY DO NOT -- THEY ARE NOT EXACTLY STATISTICALLY SIGNIFICANT.

DO YOU SEE THAT?

A RIGHT.

SO THEY ARE STATISTICALLY SIGNIFICANT FOR LATE PREGNANCY AND CORD BLOOD, IF I REMEMBER FROM THE PREVIOUS BLOWUP, AND THEY ARE NOT STATISTICALLY

SIGNIFICANT FOR TWO YEARS, AND THEN I WOULD SAY THEY ARE VERY -- THEY ARE VERY JUST SHY OF STATISTICALLY SIGNIFICANT AT THREE YEARS. I MEAN, IT WOULD BE HARD TO ARGUE THAT IT'S NOT THERE AT THREE YEARS, BUT IT IS THERE EARLIER ON BECAUSE THAT'S REALLY JUST SHY OF STATISTICAL SIGNIFICANCE, AND WE OFTEN SORT OF GIVE THAT WIGGLE ROOM OF, YOU KNOW, UP TO .10.

Q SO WHEN YOU LOOK AT THESE TWO DATA SETS, THESE GROUPS OF CONTINUOUS SRS T SCORES AND THEN THE SCORES FOR THE HIGHER SCORED CHILDREN WHO MORE LIKELY HAVE AUTISM, WHAT IS THIS TELLING YOU WITH REGARDS TO TEMPORALITY?

A SO WHAT IT SHOWS IS THAT MERCURY EXPOSURE AT MULTIPLE TIME POINTS, I MEAN, THIS IS A WIDE DEVELOPMENTAL WINDOW AND IT IS CONSISTENT WITH WHAT WE WOULD EXPECT, THAT THIS MERCURY IS A NEUROTOXIN, THAT IT WOULD HAVE -- IT WOULD BE ASSOCIATED WITH DEVELOPMENTAL CONSEQUENCES WHEN THE EXPOSURE IS DURING PREGNANCY AS WELL AS DURING, LIKE, THE INFANCY/TODDLER EARLY LIFE YEARS.

Q DOCTOR, WHEN YOU TAKE A LOOK AT THIS PROSPECTIVE STUDY AND YOU LOOK AT IT THE CONTEXT OF THE OVERALL DATA -- OH, THERE WE GO.

A CAN I ACTUALLY FINISH? I WANTED TO SAY ONE MORE THING.

Q OH, YEAH. SORRY.

A SO WHAT IS REALLY VALUABLE ABOUT THAT PREVIOUS ANALYSIS IS THAT WE SAW THE ASSOCIATION WITH AUTISM

SEVERITY AND WE ALSO SAW THE ASSOCIATION WITH, LIKE A DICHOTOMOUS OUTCOME WITH LIKE WHETHER, YOU KNOW, AUTISM LIKE CRITERIA ARE DICHOTOMOUS CATEGORIZED OUTCOMES, AND WHAT'S VALUABLE THERE IS IT SORT OF TAKES AWAY ANY SORT OF WORRIES ABOUT EXTREME VALUES THAT COULD HAVE BEEN INFLUENCING A CONTINUOUS RESULT THAT WOULDN'T HAVE THE ABILITY TO HAVE THAT INFLUENCE, SO IT'S LOOKING AT IT IN TWO DIFFERENT WAYS AND IT PROVIDES A, I WOULD SAY, MORE CONFIDENCE ABOUT THE ASSOCIATION.

Q AND IF WE ACTUALLY LOOK AT THE RESULTS, THE CONCLUSION IN THE STUDY, I MEAN, THEY STATE, "WE OBSERVED THAT HIGHER BLOOD MERCURY LEVELS AT LATE PREGNANCY CORD BLOOD AND AT TWO AND THREE YEARS OF AGE WERE POSITIVELY ASSOCIATED WITH AUTISTIC BEHAVIORS AMONG PRESCHOOL CHILDREN." DO YOU SEE THAT?

A I DO.

Q I MEAN, I THINK THE QUESTION I HAVE HERE, DOCTOR, IS CONSIDERING THAT THEY ARE SPECIFICALLY IDENTIFYING THAT TWO TO THREE YEARS OF AGE, YOUR CONCERNS ABOUT WHETHER OR NOT THIS DATA ON MERCURY IS ACCURATELY AT THAT ETIOLOGICAL WINDOW THAT WE'RE REALLY FOCUSING ON IN THIS CASE, DO YOU HAVE CONCERNS ABOUT THAT IN LIGHT OF THAT DATA?

A I -- NO, I THINK THESE RESULTS ALLAY THOSE CONCERNS BECAUSE IT SHOWS IN THE COHORT THAT IT'S ASSOCIATED AT MULTIPLE -- AT MULTIPLE TIME POINTS.

Q ALL RIGHT. DOCTOR, AND THEN WE TAKE THAT STUDY

AND WE PUT IT BACK INTO THE SCOPE OF THIS DATA SET, THIS IS ALL POST-NATAL OBVIOUSLY, BUT WE PUT IT IN THIS CONTEXT.

DO YOU HAVE ANY REAL HESITATION IN CONCLUDING TO A REASONABLE DEGREE OF SCIENTIFIC CERTAINTY THAT MERCURY AT EARLY LIFE IS A CAUSATIVE SUBSTANTIAL CONTRIBUTING FACTOR TO THE DEVELOPMENT OF ASD?

A WHEN I -- AFTER REVIEWING ALL THE LITERATURE AND THINKING ABOUT IT IN RELATION TO NOT JUST THE EPI LITERATURE, BUT ANIMAL STUDIES AND SORT OF STUDIES ON THE BIOLOGICAL PLAUSIBILITY, THE CONCLUSION I CAME TO WAS THAT BASED ON MY TRAINING AND MY UNDERSTANDING, THAT THIS -- THAT WE HAVE THE DATA TO SAY THAT MERCURY EXPOSURE IS CAUSALLY ASSOCIATED WITH AUTISM.

Q AND I GUESS THE RIGOR BY WHICH YOU APPROACH THIS STUDY ON LOOKING AT THESE HUNDREDS AND HUNDREDS OF STUDIES, WOULD YOU APPLY THE SAME INTELLECTUAL RIGOR THAT YOU DO IN YOUR WORK AS AN EPIDEMIOLOGIST EVERY DAY?

A ABSOLUTELY. A STRONGER RIGOR BECAUSE, I MEAN, THE WEIGHT, YOU KNOW, THE IMPLICATIONS, THE WEIGHT HERE, IT'S REALLY DIFFERENT THAN WRITING A PAPER OR WRITING A GRANT. YOU KNOW, THIS HAS REALLY STRONG IMPLICATIONS, SO THE DEGREE TO WHICH I REALLY THOUGHT ABOUT THE -- MY CHARGE HERE, THE DEGREE TO WHICH I REALLY THOUGHT ABOUT THE QUESTION AT HAND AND WHAT EVIDENCE WE HAVE IS JUST AS STRONG IF NOT STRONGER THAN ANYTHING ELSE I'VE EVER DONE AS AN EPIDEMIOLOGIST AND CONSISTENT WITH WHAT I LEARNED IN GRADUATE SCHOOL.

MR. WISNER: THANK YOU VERY MUCH, DOCTOR. I REALLY APPRECIATE YOUR TIME. WE ARE EXACTLY ON TIME.

I PASS THE WITNESS, YOUR HONOR. THANK YOU.

THE COURT: THANK YOU.

MR. BOEHM: YOUR HONOR, JUST AS A HOUSEKEEPING MATTER, WOULD THE COURT BE INTERESTED AND PERHAPS THE WITNESS BE INTERESTED IN A BREAK NOW, IF YOU THINK WE'RE AT THE HALFWAY MARK, OR WOULD THE COURT PREFER THAT I PROCEED FOR SOMETIME AND THEN WE TAKE A BREAK AFTER A SHORT PERIOD?

THE COURT: WHY DON'T WE TAKE A BREAK UNTIL 3:00 O'CLOCK. THANK YOU.

MR. BOEHM: VERY GOOD. THANK YOU.

(RECESS)

THE COURT: LOOKS LIKE WE'RE READY TO PROCEED.

ARE YOU READY, MR. BOEHM?

MR. BOEHM: I AM YOUR, HONOR THANK YOU.

CROSS EXAMINATION

MR. BOEHM:

Q DR. GARDENER, IT'S VERY NICE TO SEE YOU. HOW ARE YOU?

A NICE TO SEE YOU AGAIN TOO.

FOR SOME REASON I DON'T SEE YOU ON MY SCREEN SO I'M WONDERING IF THERE'S SOMETHING I NEED TO DO.

Q YOU MIGHT HAVE PINNED MR. WISNER. YOU CAN KEEP LOOKING AT HIM, HE'S A MORE ATTRACTIVE GUY.

MR. WISNER: I WISH EVERY DAY, SIR. I WISH

EVERY DAY.

THE WITNESS: OH, NO. I THINK YOU SWITCHED IT BACK. OH, OKAY. ALL RIGHT. WHOEVER IS TALKING WILL POP UP.

MR. BOEHM:

Q LET'S SEE IT IF YOU WORKS.

DID I POP UP?

A YES. YOU POPPED UP. GOOD TO SEE YOU AGAIN.

Q GREAT.

I JUST WANTED TO GIVE YOU A LITTLE BIT OF AN OVERVIEW OR A ROADMAP OF WHAT I'M GOING TO BE ASKING YOU ABOUT TODAY SO THAT YOU KIND OF ARE READY FOR THAT AND KIND WHERE WE'RE GOING.

DOES THAT SOUND OKAY?

A READY AS EVER.

Q OKAY.

YOU PREPARED A REPORT IN THIS CASE AND I KNOW THAT THE COURT HAS, IF I UNDERSTOOD CORRECTLY, HAS REVIEWED THAT REPORT.

I WANT TO START BY SHOWING YOU A PARAGRAPH ON PAGE 13 OF YOUR REPORT IN THIS CASE THAT DESCRIBES WHAT YOU WERE FOCUSED ON IN REVIEWING THE SCIENTIFIC LITERATURE.

THIS IS PAGE 13 WHERE YOU DESCRIBED YOUR METHODOLOGY.

AND, YOUR HONOR, JUST TO MAKE SURE, ARE YOU ABLE TO SEE THIS CLEARLY AND OKAY?

THE COURT: SURE.

MR. BOEHM: OKAY. GOOD.

Q LET'S LOOK IN THE MIDDLE OF THIS PARAGRAPH WHERE YOU HAVE GENERALLY DESCRIBED YOUR APPROACH AND WHAT YOU FOCUSED ON.

YOU WRITE THAT YOU FOCUSED ON STUDIES THAT MEASURED HEAVY METALS FROM THE POST-NATAL PERIOD THROUGH CHILDHOOD.

DO YOU SEE THAT?

A I DO.

Q AND POST-NATAL, THAT MEANS AFTER A BIRTH?

A THAT IS CORRECT.

Q OKAY. AND THEN YOU SAY THROUGH CHILDHOOD.

AND I WANT TO -- BEFORE -- I'M GOING TO SHOW YOU WHAT YOU SAY IN YOUR REPORT ABOUT THAT, BUT BEFORE WE DO THAT, CAN YOU VERY BRIEFLY SAY WHY YOU FOCUSED ON THE POST-NATAL PERIOD?

A BECAUSE MY UNDERSTANDING WAS THAT THE PURPOSE OF THIS STUDY -- OR I'M SORRY, NOT OF THIS STUDY -- OF THIS CASE WAS EVENTUALLY TO BE CONSIDERING THESE EXPOSURES FROM BABY FOOD, WHICH IS A POST-NATAL EXPOSURE RATHER THAN A PRENATAL EXPOSURE.

BUT AS YOU CAN SEE IN THE SECOND HALF OF THIS SENTENCE, I ALSO DID --

Q RIGHT.

A -- LOOK AT PRENATAL HEAVY METAL EXPOSURES.

Q RIGHT.

YOU REVIEWED PRENATAL STUDIES, BUT YOU FOCUSED ON STUDIES THAT MEASURED HEAVY METALS FROM POST-NATAL

THROUGH CHILDHOOD; CORRECT?

A THAT'S CORRECT.

Q OKAY.

LET'S LOOK AT PAGE 23 OF YOUR REPORT TO ILLUMINATE THE CHILDHOOD PART OF THAT.

YOU SAY IN YOUR REPORT AT PAGE 23 THAT FOR AUTISM THE PRESUMED ETIOLOGICALLY RELEVANT PERIOD IS PRENATALLY TO THE FIRST YEAR -- OR WITHIN THE FIRST YEAR OF LIFE.

DO YOU SEE THAT?

A I'M READING IT.

YES. SO, AGAIN, THAT -- WHAT I WAS REFERRING TO I BELIEVE HERE IS THAT THE PERIOD THAT THIS CHARGE REFERS TO IN TERMS OF BABY FOOD WAS WITHIN THE FIRST YEAR OF LIFE. THE ETIOLOGICALLY RELEVANT PERIOD GOES BEFORE THEN, BUT IT CAN ALSO EXTEND AFTER THAT FIRST YEAR OF LIFE.

Q DR. GARDENER, WHAT YOU'RE REFERRING TO HERE ACTUALLY IS RELATED TO STUDY DESIGNS THAT YOU HAD AVAILABLE TO YOU.

DO YOU SEE THE SENTENCE ACTUALLY SAYS THAT A LIMITATION IS THE FACT THAT THE CASE CONTROL AND CROSS-SECTIONAL STUDIES MEASURED, IN THIS CASE LEAD -- I KNOW YOU WERE TALKING ABOUT ARSENIC AND MERCURY TODAY -- BUT LEVELS DURING CHILDHOOD RATHER THAN AT INFANCY AFTER THE ASD DIAGNOSES HAD BEEN MADE AND FOLLOWING THE PRESUMED ETIOLOGICALLY RELEVANT PERIOD, PRE-NATAL AND WITHIN THE FIRST YEAR OF LIFE.

DID I READ THAT CORRECTLY?

A YOU DID READ THAT CORRECTLY.

Q OKAY.

AND YOU'RE SAYING THAT THE PRESUMED ETIOLOGICALLY RELEVANT PERIOD THAT THE PERIOD WE'RE TALKING ABOUT THAT'S ETIOLOGICALLY RELEVANT RELATES IN THIS CASE TO ASD, WHICH MEANS AUTISM SPECTRUM DISORDER; CORRECT?

A ASD MEANS AUTISM SPECTRUM DISORDER.

WHAT THIS IS REFERRING TO IS THE PRESUMED ETIOLOGICALLY RELEVANT PERIOD WHICH IS PRIOR TO DEVELOPING AUTISM.

Q OKAY.

A WHICH CAN ACTUALLY EXTEND BEYOND THE FIRST YEAR OF LIFE, BUT THERE'S MUCH OF CHILDHOOD THAT HAPPENS AFTER THE DEVELOPMENT OF AUTISM.

Q ETIOLOGY IS A WORD THAT MEANS THE CAUSE OF SOMETHING, CORRECT, IT'S CAUSAL?

A THAT IS CORRECT.

Q SO AN ETIOLOGICALLY RELEVANT PERIOD MEANS THE PERIOD WHEN SOMETHING IS CAUSED; CORRECT?

A THAT IS CORRECT.

Q OKAY. YOU CAN TAKE THAT DOWN.

I WANT TO DIRECT YOUR ATTENTION NEXT TO ANOTHER SECTION OF YOUR REPORT ON PAGES 14 AND 15.

ANOTHER GROUND RULE OF YOUR ANALYSIS AS YOU WRITE IN YOUR REPORT LOOKING AT THE BOTTOM OF PAGE 14 AND CARRYING OVER TO 15: "A PRIMARY WEAKNESS IN THIS

FIELD RELATES TO THE TIMING OF ASSESSMENT OF EXPOSURES TO HEAVY METALS."

DO YOU SEE THAT?

A I DO.

Q OKAY.

AND WHEN YOU SAY "IN THIS FIELD," YOU'RE REFERRING TO THE PARAMETERS OF YOUR REPORT OR DO YOU HAVE SOMETHING ELSE IN MIND?

A SO WHAT I'M REFERRING TO IS THE BODY OF LITERATURE ON METALS AND AUTISM.

Q OKAY.

A AND --

Q SO WHEN --

A -- THE FACT THAT IN A LOT OF STUDIES THEY WERE ASSESSED EITHER AROUND THE SAME TIME OR AFTER THE DIAGNOSIS HAS ALREADY OCCURRED.

Q RIGHT. OKAY. PERFECT.

AND YOU SAY, "A PRIMARY WEAKNESS IN THIS FIELD" -- AND THAT REFERS TO THIS QUESTION OF WHETHER OR NOT THERE IS AN ASSOCIATION BETWEEN EXPOSURE TO HEAVY METALS AND AUTISM, THAT'S THE FIELD WE'RE TALKING ABOUT?

A THAT IS THE FIELD WE'RE TALKING ABOUT.

Q OKAY.

"A PRIMARY WEAKNESS IN TERMS OF ASSESSING WHETHER THERE'S AN ASSOCIATION BETWEEN HEAVY METALS AND ASD OR AUTISM SPECTRUM DISORDER RELATES TO THE TIMING OF THE ASSESSMENT OF EXPOSURE TO HEAVY METALS."

CORRECT?

A THAT IS CORRECT.

Q OKAY.

AND WHAT YOU'RE TALKING ABOUT HERE IS THE TYPES OF STUDIES THAT ARE AVAILABLE TO YOU AND OTHERS IN ASSESSING THAT QUESTION; CORRECT?

A IT'S NOT NECESSARILY THE TYPES OF STUDIES BUT THE WAY THAT THE EXPOSURES WERE ASSESSED, WHICH CAN BE -- THAT MANNER OF EXPOSURE ASSESSMENT CAN OCCUR IF ANY TYPE OF STUDY.

Q WELL, LET'S LOOK AT THE REST OF YOUR PARAGRAPH HERE.

YOU SAY THAT, "IN AN IDEAL WORLD" -- YOU CAN WAIT FOR ME TO GET THERE, IAN -- YOU SAY THAT, "IN AN IDEAL WORLD, WE WOULD ASSESS HEAVY METAL EXPOSURE IN VERY EARLY LIFE WHEN THERE WERE NO CLEAR SIGNS OF ASD/ADHD DIAGNOSIS AND THEN FOLLOW CHILDREN UP UNTIL THE TIME OF DIAGNOSIS WITH REPEATED HEAVY METAL ASSESSMENTS."

THAT'S WHAT YOU'D DO IN AN IDEAL WORLD; IS THAT RIGHT?

A THAT'S RIGHT. LIKE, THE STUDY THAT WE WERE LOOKING AT, THE RYU OR RU, I DON'T KNOW HOW YOU PRONOUNCE IT EITHER, STUDY. LIKE THAT. THAT IN AN IDEAL WORLD ALL STUDIES WOULD BE CONDUCTED LIKE THAT STUDY.

Q GREAT. WE'RE DEFINITELY GOING TO TALK ABOUT RYU, BUT FOR RIGHT NOW I JUST WANT TO GO THROUGH THIS

PARAGRAPH.

YOU SAY, "IN AN IDEAL WORLD YOU'D BE ABLE TO ASSESS HEAVY METAL EXPOSURE IN VERY EARLY LIFE WHEN THERE ARE NO CLEAR SIGN OF ASD AND ADHD AND THEN FOLLOW CHILDREN UP UNTIL THE TIME OF DIAGNOSIS WITH REPEATED HEAVY METAL ASSESSMENTS."

AND THEN YOU SAY, "SUCH STUDIES, TO THE EXTENT THEY COULD BE ACCURATELY CONDUCTED, WOULD BE EXTREMELY EXPENSIVE AND TIME-CONSUMING AND WOULD REQUIRE VERY LARGE SAMPLES DUE TO THE RARITY OF THESE OUTCOMES."

DO YOU SEE THAT?

A I DO.

Q OKAY.

SO YOU'RE REFERRING HERE TO THE NATURE OF THE STUDIES YOU HAVE AVAILABLE AND SPECIFICALLY ONE STUDY THAT WE WISH WE COULD HAVE, AS YOU SAY IN YOUR REPORT ON A ANOTHER PAGE, ARE RANDOMIZED CONTROLLED TRIALS, "WE WISH WE COULD HAVE THOSE TO ANSWER QUESTIONS ABOUT CAUSATION;" RIGHT?

A WELL, THEY WOULD BE UNETHICAL, SO.

Q NO, I UNDERSTAND --

A I DON'T KNOW ABOUT SAYING WE WISH WE COULD HAVE THEM, BUT THEY ARE -- THEY WOULD BE UNETHICAL.

Q I UNDERSTAND YOUR POSITION HERE THAT THEY ARE NOT ETHICAL OR POSSIBLE.

THE FACT IS WE DON'T HAVE ANY TO HELP US ANSWER

THE QUESTION IN THIS FIELD, AS YOU SAY, OF WHETHER HEAVY METALS ARE ASSOCIATED WITH AUTISM. WE DON'T HAVE ANY RANDOMIZED CONTROLLED TRIALS; IS THAT CORRECT?

A THAT'S CORRECT. WE DON'T HAVE ANY.

Q AND YOU REFER TO RANDOMIZED CONTROLLED TRIALS AS THE GOLD STANDARD WHEN TRYING TO ASSESS CAUSAL ASSOCIATIONS; CORRECT?

A CORRECT.

Q OKAY.

HERE YOU SAY IN THE NEXT SENTENCE, "MOST STUDIES RELATING HEAVY METAL EXPOSURE TO AUTISM ASD/ADHD, IN FACT, ASSESSED HEAVY METALS EXPOSURE SIMULTANEOUSLY WITH ASD/ADHD ASSESSMENT IN CASE CONTROL AND CROSS-SECTIONAL DESIGN."

DO YOU SEE THAT?

A I DO.

Q OKAY.

AND YOU SAY THAT THAT RAISES A CONCERN ABOUT TEMPORALITY.

DO YOU SEE THAT?

A I DO.

Q BECAUSE CASE CONTROL AND CROSS-SECTIONAL DESIGNS ARE NOT CONSIDERED PROSPECTIVE; CORRECT?

A NO, THAT'S NOT CORRECT. THERE ARE PLENTY OF PROSPECTIVE CASE CONTROL DESIGNS.

Q OKAY. WELL, LET'S JUST LOOK AT YOUR LANGUAGE HERE.

"MOST STUDIES RELATING HEAVY METAL EXPOSURE TO ASD/ADHD ASSESSED HEAVY METAL EXPOSURE SIMULTANEOUSLY WITH ASD/ADHD ASSESSMENT IN CASE CONTROL AND CROSS-SECTIONAL DESIGN."

IS THAT A TRUE STATEMENT?

A THAT SENTENCE THAT'S HIGHLIGHTED IN YELLOW?

Q YES.

A YES.

Q AND THOSE STUDIES WOULD NOT BE CONSIDERED PROSPECTIVE?

A SO IF THE EXPOSURE AND THE OUTCOME ARE ASSESSED SIMULTANEOUSLY OR THE EXPOSURE IS ASSESSED AFTER THE OUTCOME HAS OCCURRED, THEN IT WOULD NOT BE CONSIDERED PROSPECTIVE.

Q IT WOULD NOT BE CONSIDERED PROSPECTIVE WHICH WOULD RAISE CONCERNS ABOUT TEMPORALITY; CORRECT?

A THAT'S CORRECT.

Q OKAY.

"SPECIFICALLY WHETHER THE EXPOSURE OCCURRED PRIOR TO THE DISEASE" IS WHAT YOU WRITE NEXT.

DO YOU SEE THAT?

A YES. ACTUALLY SHOW ME.

YES.

Q OKAY.

NOW, THESE CASE CONTROL AND CROSS-SECTIONAL DESIGN ARE A SPECIFIC TYPE OF OBSERVATIONAL STUDY THAT IS SOMETIMES USED IN RESEARCH; CORRECT?

A CORRECT.

Q THERE ARE ALSO STUDIES CALLED COHORT STUDIES; CORRECT?

A CORRECT.

Q AND COHORT STUDIES ARE VERY DIFFERENT FROM CASE CONTROL AND CROSS-SECTIONAL STUDIES WHEN IT COMES TO THE QUESTION OF TEMPORALITY BECAUSE COHORT STUDIES CAN ADDRESS THIS WHAT YOU CALL PRIMARY WEAKNESS IN THIS FIELD RELATED TO THE TIMING OF THE ASSESSMENT OF EXPOSURE; CORRECT?

A INCORRECT.

SO CASE CONTROL STUDIES CAN BE PROSPECTIVE OR RETROSPECTIVE. COHORT STUDY CAN ALSO BE RETROSPECTIVE OR PROSPECTIVE OR -- AND IN PROSPECTIVE COHORT STUDIES, A LOT OF THE ANALYZES WITHIN THEM CAN BE CROSS-SECTIONAL, SO IT'S NOT CORRECT AT ALL TO CLASSIFY -- TO THINK OF JUST COHORT STUDIES AS JUST BEING PROSPECTIVE AND CASE CONTROL STUDIES AS JUST BEING RETROSPECTIVE. YOU REALLY HAVE TO SORT OF LOOK AT THE -- LOOK AT HOW THE EXPOSURE WAS IS ASSESSED IN EACH OF THOSE STUDY DESIGNS.

Q OKAY. LET ME SAY IT THIS WAY FOR YOU.

COHORT STUDIES -- IN COHORT STUDIES THE STUDY POPULATION, YOU CONTRACT THE STUDY POPULATION, WHO IS NOT ALREADY BEEN DIAGNOSED WITH THE DISEASE OR DISORDER, THAT IS THE OUTCOME OF THAT STUDY; CORRECT?

A CORRECT.

Q AND THAT MAKES IT POSSIBLE TO ESTABLISH THAT THE EXPOSURE OCCURRED BEFORE THE DISEASE. THAT'S ONE OF

THE BENEFITS OF THOSE KINDS OF STUDIES; CORRECT?

A THAT'S A BENEFIT OF PROSPECTIVE COHORT STUDY.

SO THERE ARE PROSPECTIVE COHORT STUDIES AND THERE ARE RETROSPECTIVE COHORT STUDIES AND THERE ARE CASE CONTROL STUDIES THAT ARE PROSPECTIVE AND RETROSPECTIVE.

Q OKAY. THAT --

A BUT.

Q -- THAT WOULD BE -- OH, I'M SORRY.

A IT'S OKAY. YOU CAN GO AHEAD.

Q THAT WOULD BE THE BENEFIT OF A STUDY THAT MEASURED EXPOSURE TO A HEAVY METAL PRIOR TO A DIAGNOSIS OF ASD; CORRECT?

A THAT'S CORRECT.

A PROSPECTIVE STUDY, WHETHER IT'S A CASE CONTROL OR A COHORT OR ANY OTHER CASE COHORT DESIGN, IT HAS THE BENEFIT OF LESS UNCERTAINTY ABOUT WHETHER THE EXPOSURE OCCURRED PRIOR TO THE OUTCOME.

Q A CASE CONTROL STUDY IS A STUDY WHERE YOU BEGIN WITH A GROUP THAT ALREADY HAS THE DISEASE OR THE DISORDER THAT YOU'RE STUDYING; CORRECT?

A SO A CASE CONTROL STUDY FROM THE PERSPECTIVE OF THE INVESTIGATOR, THE OUTCOMES HAVE ALREADY OCCURRED.

Q OKAY.

A SO YOU SELECT CASES AND YOU SELECT CONTROLS AND YOU COLLECT THE -- AND YOU IDENTIFY THE EXPOSURE OF INTEREST, BUT IN -- OFTENTIMES THAT EXPOSURE HAS ALREADY BEEN COLLECTED PREVIOUSLY, IT WAS COLLECTED

PROSPECTIVELY IN RELATION TO WHEN THE OUTCOME OCCURRED.

Q OKAY.

AND WE'RE GOING TO LOOK AT SOME OF THE SPECIFIC STUDIES, BUT I JUST WANT TO SET THE PARAMETERS OF WHAT THE LIMITATIONS ARE AND WHAT YOU DESCRIBE, AGAIN, AS THIS PRIMARY WEAKNESS IN THIS FIELD.

AND THEN -- AND I DO WANT TO TALK TO YOU ABOUT THE STUDIES THAT DO TIME THE ASSESSMENT OF THE EXPOSURE PRIOR TO A DIAGNOSIS VERSUS THE STUDIES THAT TIME THE ASSESSMENT OF THE EXPOSURE AFTER THE DIAGNOSIS ALREADY HAS OCCURRED, THEREBY, RAISING CONCERNS ABOUT TEMPORALITY, I.E., WHETHER THE EXPOSURE OCCURRED PRIOR TO THE DISEASE.

SO LET'S TALK ABOUT THAT.

A OKAY.

Q AND SPECIFICALLY, I JUST WANTED TO SUM UP A COUPLE OF POINTS THAT WE JUST COVERED TO KIND OF FRAME WHAT I THINK WILL BE OUR ROADMAP FOR THE REST OF THE PRESENTATION OR THE EXAMINATION.

IF YOU COULD PUT UP EXHIBIT 692.

THIS JUST RECAPS WHAT WE JUST COVERED, DR. GARDENER.

FIRST AS WE READ IN YOUR REPORT AT PAGE 13, YOU WERE FOCUSED ON STUDIES THAT MEASURE HEAVY METALS FROM THE POST-NATAL PERIOD THROUGH CHILDHOOD. I KNOW YOU LOOKED AT OTHERS, BUT THAT'S WHERE YOU WERE FOCUSED, AND THE SECOND BIT WE READ PRIMARY WEAKNESS IN THIS FIELD RELATES TO THE TIMING OF THE ASSESSMENT OF EXPOSURE TO

HEAVY METALS.

OKAY. MY FIRST QUESTION ABOUT ARSENIC IS THIS:

ARE YOU ABLE TO IDENTIFY ANY STUDY OR STUDIES THAT LOOKED AT POST-NATAL EXPOSURE TO ARSENIC THAT WAS MEASURED BEFORE ASD WAS DIAGNOSED?

A CAN YOU SAY THE QUESTION AGAIN?

Q YES. FOR SURE.

ARE YOU ABLE TO IDENTIFY ANY STUDY OR STUDIES THAT LOOKED AT POST-NATAL EXPOSURE TO ARSENIC MEASURED BEFORE ASD WAS DIAGNOSED?

A SO I READ HUNDREDS OF STUDIES. OFF THE TOP OF MY HEAD, I AM NOT SURE -- I CAN'T PULL ONE UP OFF THE TOP OF MY HEAD. THAT DOESN'T MEAN -- BUT I SUMMARIZE THEM IN MY REPORT, SO I'D BE HAPPY TO TAKE A -- YOU KNOW, TO TAKE A READ THROUGH OF ANY SECTIONS OF MY REPORT IF YOU --

Q WELL, THIS IS A SUPREMELY IMPORTANT POINT AND IF YOU, DR. GARDENER, NEED TO LOOK BACK AT YOUR REPORT, I KNOW YOU HAVE IT IN FRONT OF YOU, WE CAN TAKE A MOMENT, BUT I DO WANT TO GET AN ANSWER TO THE QUESTION OF WHETHER OR NOT YOU CAN IDENTIFY ANY STUDY OR STUDIES THAT LOOKED AT POST-NATAL EXPOSURE, THE THING YOU WERE FOCUSED ON, TO ARSENIC THAT WAS MEASURED BEFORE ASD WAS DIAGNOSED?

A I CAN'T THINK OF ANY OFF THE TOP OF MY -- WHICH ONES -- OFF THE TOP OF MY HEAD.

Q YOU -- OKAY. YOU CAN'T THINK OF ANY. OKAY.

I WANT TO PULL UP EXHIBIT 693 WHICH SUMMARIZES

STUDIES.

THIS IS A COMPLETE LIST OF STUDIES THAT MEASURED ARSENIC EXPOSURE PRIOR TO DIAGNOSIS AND THEREFORE ALLOW FOR AN ASSESSMENT OF TEMPORALITY THAT WAS THE ISSUE, THIS PRIMARY WEAKNESS, THAT YOU DESCRIBED IN YOUR REPORT AND THERE ARE FOUR.

OKAY. LONG, ALAMPI, SKOGHEIM, THOSE ARE NOT POST-NATAL STUDIES SO WE CAN'T MEET THAT CRITERIA, OKAY, THOSE ARE -- THOSE ARE ALL PRENATAL STUDIES. OKAY.

DOHERTY, WHICH IS NOT REFERENCED IN YOUR REPORT, YOU DO NOT DISCUSS DOHERTY IN YOUR REPORT. I KNOW MR. WISNER, HE ASKED YOU ABOUT IT, BUT THAT'S NOT ACTUALLY A STUDY YOU DISCUSS AT ALL IN YOUR REPORT --

MR. WISNER: OBJECTION.

MR. BOEHM:

Q -- IS THE ONE THAT MEASURES POST-NATAL AND HAS THIS QUESTION OF WHETHER THERE IS A STATISTICALLY SIGNIFICANT ASSOCIATION AS TO THE POST-NATAL ASSESSMENT.

OKAY. IS THERE ANYTHING ON THIS CHART THAT LOOKS INCORRECT TO YOU, DR. GARDENER?

A I CAN'T VERIFY.

MR. WISNER: OBJECTION IS -- I'M SORRY -- OBJECTION, YOUR HONOR. THAT WAS A VERY COMPOUND AND TESTIFYING QUESTION. I DON'T EVEN KNOW WHAT HE'S "OKAYING" TO.

MR. BOEHM: I WAS JUST TRYING TO -- I'M SORRY, YOUR HONOR, I WAS JUST TRYING TO DESCRIBE WHAT WE'RE WE'VE DONE HERE IN THIS CHART.

THE COURT: THAT'S ALL RIGHT. OVERRULED. PROCEED.

MR. BOEHM: THANK YOU.

Q DR. GARDENER, WOULD YOU JUST TAKE A MOMENT TO LOOK AT THIS CHART THAT'S BEEN MARKED AS EXHIBIT 693 AND TELL US WHETHER OR NOT YOU SEE ANYTHING THAT IS NOT CORRECT.

A SO I CAN'T VERIFY ANY PARTS OF THIS JUST SORT OF BY SIGHT.

IF WHEN A POST -- WHEN A MEASURE IS TAKEN FROM AMNIOTIC FLUID OR FROM MATERNAL BLOOD, THAT WOULD NOT BE CONSIDERED POST-NATAL. I CAN DEFINITELY VERIFY THAT. AND YES, INFANT TOENAILS WOULD BE POST-NATAL.

THEN THE NEXT COLUMN SAYS, "WITH ASD DIAGNOSIS, WHAT WAS EVALUATED." LIKE I SAID, I'VE READ HUNDREDS AND HUNDREDS OF STUDIES SO I ABSOLUTELY CANNOT JUST LOOK AT NAMES AND SAY WAS ASD DIAGNOSIS, WHAT WAS EVALUATED IN THAT STUDY, NOR CAN I SAY WAS THE ASSOCIATION OBSERVED STATISTICALLY SIGNIFICANT.

Q WELL, WHAT WE WANTED TO DO, DR. GARDENER, IS ACTUALLY WE HAVE -- WE WANTED TO HELP A LITTLE BIT BECAUSE YOU HAD SAID YOU WERE FOCUSED ON POST-NATAL STUDIES AND THEN YOU TALKED ABOUT THIS TEMPORALITY ISSUE, THE MEASUREMENT OF THE HEAVY METAL AS BEING ASSESSED PRIOR TO DIAGNOSIS, SO WE TRIED TO PUT THIS CHART TOGETHER TO SEE IF YOU SAW ANY STUDY WE'D LEFT OFF.

THE COURT: MAY I ASK YOU A QUESTION, COUNSEL.

IS THE POINT OF THE CHART --

MR. BOEHM: YES.

THE COURT: -- TO DISTINGUISH BETWEEN A DIAGNOSIS OF ASD, MEANING EVERY -- TICKING EVERY BOX IN THE SPECTRUM OF SYMPTOMS OR JUST THE SYMPTOMS OF ASD? IS THAT --

MR. BOEHM: YEAH.

THE COURT: -- THE DISTINCTION?

MR. BOEHM: IT'S A GREAT QUESTION. THAT'S A GREAT QUESTION. THANK YOU.

THE COURT: SHE DID ALREADY TESTIFY ABOUT THAT SO MAYBE YOU CAN QUESTION HER FURTHER.

MR. BOEHM: YEAH, YOUR HONOR. THANK YOU. THAT'S A VERY GOOD QUESTION AND I'M HAPPY TO EXPLAIN WHAT THIS CHART IS ATTEMPTING TO DO THAT REGARD.

SO YOU SEE IT HAS THE FOUR COLUMNS AND THE FIRST ONE IS THE EASIEST, THAT'S JUST THE NAME THE STUDY AND THE YEAR.

THE SECOND IS A QUESTION OF WHETHER OR NOT THERE WAS ANY MEASUREMENT OR ASSESSMENT OF ARSENIC EXPOSURE POST-NATALLY BECAUSE DR. GARDENER HAS INDICATED IN HER REPORT THAT IT'S THE POST-NATAL EXPOSURE THAT SHE WAS FOCUSED ON, SO WE LOOKED FOR ANY STUDIES THAT WERE POST-NATAL.

THE THIRD COLUMN -- AND THERE'S JUST ONE, DOHERTY, OKAY.

THE SECOND -- THE THIRD COLUMN ASKS, WAS THE STUDY EVALUATING ASD DIAGNOSIS OR SOMETHING ELSE? AND I

THINK THAT'S THE QUESTION YOU'RE ASKING NOW.

LONG AND SKOGHEIM WERE LOOKING AT ASD DIAGNOSIS, BUT ALAMPI AND DOHERTY WERE LOOKING AT BEHAVIORS OR SOMETIMES WHAT'S REFERRED TO AS AUTISTIC BEHAVIORS, BUT AS YOU HEARD FROM DR. SHAPIRO ON MONDAY DURING HIS TESTIMONY, AUTISTIC BEHAVIORS, THESE SCREENS LIKE THE SRS QUESTIONNAIRE, THOSE ARE NOT THE SAME AS AN ASD DIAGNOSIS.

IT'S LIKE YOU HAVE A SYMPTOM OF SOMETHING DOESN'T MEAN YOU HAVE THE DISEASE OR THE DISORDER, IT MEANS YOU NEED FURTHER EVALUATION BECAUSE YOU MAY NEED AN ASSESSMENT. THAT'S WHAT DR. SHAPIRO TOLD US.

SO THIS CHART IS SHOWING IN THAT THIRD COLUMN IS THE OUTCOME OF THE STUDY AN ACTUAL DIAGNOSIS OF ASD OR IS IT AUTISTIC BEHAVIORS? IS IT SOMETHING OTHER THAN AN ACTUAL ASD DIAGNOSIS?

AND THEN THE FOURTH AND FINAL COLUMN IN THE CHART ASKS THE QUESTION, IS THERE A STATISTICALLY SIGNIFICANT ASSOCIATION THAT WAS DETECTED BASED ON THE ASSESSMENT OF THE EXPOSURE?

THE COURT: AND IS IT ANSWERING THE QUESTION WHETHER THERE WAS A STATISTICALLY SIGNIFICANT ASSOCIATION WITH ASD DIAGNOSIS OR WITH WHAT THE RESEARCH WAS INVESTIGATING?

MR. BOEHM: SO THAT DEPENDS ON -- IT'S ANSWERING THE QUESTION AS TO WHATEVER IT WAS THAT THE STUDY WAS ASSESSING.

THE COURT: OKAY.

MR. BOEHM: SO LET'S LOOK AT DOHERTY AS AN EXAMPLE.

THE COURT: THANK YOU. UNDERSTOOD.

MR. BOEHM: OKAY. YES. GOOD.

Q OKAY.

DR. GARDENER, YOU'VE HAD SOME TIME TO LOOK AT THIS, I TAKE IT.

AND LET ME JUST ASK YOU AGAIN:

AS YOU SIT HERE NOW, CAN YOU IDENTIFY ANY STUDIES OR -- STUDY OR STUDIES THAT LOOKED AT POST-NATAL EXPOSURE TO ARSENIC MEASURED BEFORE ASD WAS DIAGNOSED?

A NOT OFF THE TOP OF MY HEAD, NOT WITHOUT REFERRING TO --

Q OKAY.

A -- MY LITERATURE REVIEW.

BUT WHAT I DO NOTICE IS, IF I RECALL CORRECTLY, THERE WAS A SIGNIFICANT ASSOCIATION OBSERVED IN DOHERTY, BUT I DON'T --

Q LET'S LOOK AT THAT.

A -- I DON'T RECALL THE NATURE OF IT.

AND SKOGHEIM, IF I REMEMBER IT CORRECTLY, THERE WAS A NON LINEAR SIGNIFICANT ASSOCIATION, LIKE AN UPSIDE DOWN U SHAPE ASSOCIATION.

Q ALL RIGHT.

WELL, WE CAN LOOK AT EITHER ONE OF THOSE OR BOTH, DR. GARDENER, BUT LET'S START WITH DOHERTY.

DOHERTY IS THE ONE THAT MR. WISNER HIGHLIGHTED FOR YOU, SO IT MAKES SENSE TO PAUSE ON THAT ONE. IT'S

ALSO THE ONLY STUDY THAT MEASURED ARSENIC EXPOSURE PRIOR TO DIAGNOSIS THAT ACTUALLY WAS POST-NATAL THAT HAD A POST-NATAL MEASUREMENT.

AND AS WE INDICATE HERE IN THE CHART, THE POST-NATAL MEASUREMENT WAS INFANT TOENAILS AT SIX WEEKS.

DO YOU SEE THAT?

A I SEE THAT THAT'S WRITTEN THERE, YEAH.

Q OKAY.

LET'S ACTUALLY GO TO THIS STUDY.

IT'S EXHIBIT 630.

IT DOES HAVE SOME PRENATAL EXPOSURES, BUT I ASKED YOU ABOUT POST-NATAL EXPOSURES, SO LET'S LOOK AT THE POST-NATAL EXPOSURE.

I THINK MR. WISNER HAD ACTUALLY PUT THIS ONE IN THE STATISTICALLY SIGNIFICANT POSITIVE ASSOCIATION SO THAT WAS CURIOUS.

LET'S LOOK AT WHAT IT ACTUALLY SHOWS FOR THE POST-NATAL.

I WANT TO GO TO FIGURE 6, WHICH IS THE KIND OF VISUAL DEPICTION OF THESE RESULTS.

AND THE A-S, THAT STANDS FOR ARSENIC; RIGHT?

A THAT'S CORRECT.

Q AND DO YOU SEE THAT THERE'S MATERNAL PRENATAL, MATERNAL POST-NATAL, AND THEN THERE'S INFANT AND THAT'S ACTUALLY THE POST-NATAL MEASUREMENT OF THE CHILD ITSELF; CORRECT?

A CORRECT.

Q OKAY.

AND YOU CAN SEE THE RED DOTS THAT GO DOWN AT THAT -- BASED ON THE SRS -- AGAIN, IT'S NOT AN ASD DIAGNOSIS SO IT HAS THE SURVEY RESPONSE, IT HAS SOME OTHER METRICS.

NOT ONE OF THOSE SHOWS THE STATISTICALLY SIGNIFICANT ASSOCIATION BASED ON THE POST-NATAL MEASUREMENT; CORRECT?

A NO, THAT'S NOT CORRECT.

IF YOU LOOK IN THE SECOND TO BOTTOM ROW AMONG MALE, AND I -- YOU KNOW, I AM NOT VERY FAMILIAR -- I HAVEN'T LOOKED AT THIS CHART IN A LONG TIME, BUT JUST EYEBALLING IT, IT LOOKS LIKE THAT AMONG MALES, THE INFANT TOENAIL EXPOSURES ARE POSITIVELY ASSOCIATED WITH INTERNALIZING PROBLEM.

Q OKAY.

SO WE HAVE AN INTERNALIZING PROBLEM.

LET'S LOOK SPECIFICALLY AT THAT ONE.

YOU SEE OVER IN THE RIGHT HAND SIDE OF THE DOCUMENT THERE'S A KEY THAT TELLS US WHAT THE DOT, THE TRIANGLE AND THE SQUARE MEAN.

DO YOU SEE THAT?

A I DO.

Q OKAY.

AND YES, IT DOES LOOK LIKE THE MALES HAVE A SLIGHTLY HIGHER MARK THERE FOR THAT ONE METRIC.

BUT IF YOU LOOK AT THE ALL, WHEN THEY LOOK AT ALL THE DATA TOGETHER, THAT LOOKS LIKE IT'S BASICALLY RIGHT ON 0.0, MEANING NO ASSOCIATION; CORRECT?

A THAT'S CORRECT. AND WHEN WE SEE DIFFERENCES IN MALES AND FEMALES, IT BECOMES INAPPROPRIATE TO LOOK AT EVERYONE. SO THIS IS OFTEN SOMETHING THAT WE SEE IN THE AUTISM LITERATURE IS WE'LL SEE DIFFERENT ASSOCIATES IN MALES AND FEMALES, AND WHEN WE DO SEE THAT, THEN IT BECOMES INAPPROPRIATE TO LOOK AT THE ALL.

Q OKAY.

WELL, LET'S LOOK AT ALL THE OTHER METRICS.

DO YOU SEE JUST UP AND DOWN, YOU GOT AT SRS TWO, THE BASIC TWO, BEHAVIORAL SYMPTOMS, YOU GOT THE BASICS TWO EXTERNALIZING PROBLEMS.

I HAVE TO TURN MY HEAD A LITTLE BIT TO READ THAT.

INTERNALIZING PROBLEMS. BASIC TWO ADAPTIVE SKILLS.

YOUR EYE WENT -- YOU KNOW, WE CAN DRAW OUR OWN CONCLUSIONS ABOUT WHY YOUR EYE WENT TO THE ONE PLACE.

BUT IF YOU LOOK UP AND DOWN, YOU SEE HOW OF -- IT'S GOING TO BE THREE TIMES FIVE, 15. THERE ARE 15 EITHER CIRCLES, TRIANGLES OR SQUARES, 14 OF THEM ARE VERY CLEARLY NOT STATISTICALLY SIGNIFICANT ASSOCIATION.

DO YOU SEE THAT?

A YEAH, SO, I MEAN, MY -- WHAT'S EASY TO SEE IN THESE VERY, VERY SCRUNCHED GRAPHS LIKE THAT IS WHERE IT IS OBVIOUSLY STATISTICALLY SIGNIFICANT, SO THAT'S WHERE MY EYE JUMPED IS WHERE -- IS THE REALLY STRONG ASSOCIATION, THAT'S SORT OF NATURALLY WHERE ONE'S EYES GO.

Q GOT IT.

A AND IF YOU LOOK UP AND DOWN, YOU SORT OF SEE THAT MALES WERE CONSISTENTLY ABOVE ZERO, AND -- BUT IT LOOKS LIKE IN TERMS OF REACHING STATISTICAL SIGNIFICANCE THAT THAT ONE -- THAT ONE FOR INTERNALIZING BEHAVIOR IS THE ONE THAT REACHES STATISTICAL SIGNIFICANCE AND THE OTHER ONES ARE NOT STATISTICALLY SIGNIFICANT ABOVE THAT ZERO MARK.

Q WELL, SOME EVEN FALL BELOW THE ONE, BUT I WON'T -- THIS IS FINE. THERE'S NO OTHER STATISTICALLY SIGNIFICANT ASSOCIATIONS HERE.

LET ME ASK YOU, DR. GARDENER, DID YOU PUT THIS STUDY IN THE POSITIVE, STATISTICALLY SIGNIFICANT POSITIVE ASSOCIATIONS, BASED ON THAT ONE BOY MARKER FOR THE ONE METRIC OUT OF THE FIVE? IS THAT ARE WHY YOU ALL CATEGORIZED THIS STUDY A POSITIVELY STATISTICALLY SIGNIFICANT ASSOCIATION ON YOUR CHART?

A SO AS YOU MENTIONED BEFORE, AND ACTUALLY I DID NOTICE IT WASN'T IN MY REPORT, SO I WOULD HAVE TO READ THE FULL STUDY --

Q OKAY.

A -- IN TERMS OF WHEN I CHECKED -- MR. WISNER MADE THAT GRAPHIC AND I CHECKED IT, SO I WILL TAKE RESPONSIBILITY FOR CHECKING IT. BUT IN TERMS OF THERE ARE MANY ANALYZES DONE IN THIS STUDY, AND AS YOU CAN SEE IN OTHER AREAS, THERE'S MATERNAL PRENATAL AND MATERNAL POST-NATAL, AND SO THIS WASN'T THE ONLY STATISTICALLY SIGNIFICANT ASSOCIATION, AND SO THERE WERE OTHER REASONS

TO PUT IT IN THE POSITIVE ASSOCIATION AS WELL.

Q I'M LOOKING AT THE POST-NATAL INFORMATION HERE, AND LET'S GO JUST TO CINCH THIS UP, LET'S GO TO YOUR REPORT AT PAGE 35.

YOUR REPORT AT PAGE 35 MAKES IT CLEAR THAT YOUR CONCLUSIONS REGARDING ARSENIC ARE SPECIFICALLY DIRECTED AT THE POST-NATAL PERIOD.

IAN, CAN YOU GO TO PAGE 35 OF DR. GARDENER'S REPORT AND LET'S PULL UP THE PARAGRAPH WHERE YOU SUMMARIZE YOUR ARSENIC CONCLUSIONS.

THIS IS YOUR FINAL CONCLUSION PARAGRAPH OF YOUR ARSENIC SECTION OF YOUR REPORT.

AND YOU SAY:

"A REVIEW OF THE LITERATURE FOLLOWED BY CONSIDERATION OF THE HILL CRITERIA DEMONSTRATES TO A REASONABLE DEGREE OF SCIENCE -- OF DEGREE OF SCIENTIFIC CERTAINTY THAT EARLY LIFE POST-NATAL ARSENIC EXPOSURE CAN CAUSE THE DEVELOPMENT OF ASD."

BUT, DR. GARDENER, YOU HAVEN'T IDENTIFIED A SINGLE STUDY THAT MEASURED ARSENIC EXPOSURE PRIOR TO DIAGNOSIS THAT'S POST-NATAL; ISN'T THAT TRUE?

A THAT'S -- THAT'S -- I DID NOT SAY THAT I DID, NOR WOULD IT BE NECESSARY.

SO WHEN YOU SEE --

Q OKAY.

A -- WHEN YOU SEE THAT ARSENIC IS ASSOCIATED CONSISTENTLY IN THE LITERATURE WHEN IT'S MEASURED AT THE

TIME OF DIAGNOSIS OR AFTER DIAGNOSIS, WHAT YOU HAVE TO SORT OF THINK ABOUT IS CAN REVERSE CAUSALITY EXPLAIN THAT? LIKE IS THERE SOMETHING ABOUT CHILDREN WITH AUTISM THAT'S MAKING THEM BE MORE EXPOSED TO ARSENIC? AND I COULDN'T THINK OF ANY REASON.

IT'S NOT PLAUSIBLE TO THINK THAT THE CHARACTERISTICS OF AUTISM ARE SUCH THAT IT WOULD INCREASE YOUR ASSOCIATION -- SORRY -- YOUR EXPOSURE TO ARSENIC TO THE DEGREE THAT WE SEE IN THIS LITERATURE BETWEEN THAT AND THE FACT THAT PRENATAL ARSENIC EXPOSURE HAS BEEN EXAMINED TO SOME EXTENT.

BUT REALLY WHEN YOU'RE THINKING ABOUT THIS EXPOSURE, YOU REALLY WANT TO THINK HOW PLAUSIBLE IS REVERSE CAUSALITY HERE? AND I COULDN'T THINK OF ANY REASON WHY REVERSE CAUSALITY COULD EXPLAIN THIS CONSISTENT ASSOCIATION IN THE POST-NATAL LITERATURE WHICH IS THAT'S HOW I CAME TO THAT CONCLUSION.

Q WELL, DR. GARDENER, WHEN YOU LOOK AT THE LIST OF STUDIES THAT MEASURED ARSENIC EXPOSURE PRIOR TO A DIAGNOSIS, THE CONSISTENCY IS ON THE NOSE.

LOOK AT THIS CHART. LONG/NO. ALAMPI/NO. DOHERTY, THE ONLY ONE THAT'S ACTUALLY POST-NATAL, THAT'S NO, WE JUST LOOKED AT THAT.

NOW, YOU MENTIONED SKOGHEIM AND I DON'T --

MR. WISNER: OBJECTION, YOUR HONOR, COUNSEL IS TESTIFYING ABOUT RESULTS HE HASN'T SHOWN THE COURT. LACKS FOUNDATION. AND IT'S JUST ACTUALLY WRONG.

THE COURT: SUSTAINED. WE NEED A QUESTION.

MR. BOEHM: YEAH, OKAY. WELL, I JUST WANTED TO GO BACK -- I MEAN, I THINK THE WITNESS HAS ALREADY INDICATED SHE CAN'T THINK OF ANY OTHER STUDIES THAT FIT.

Q LET ME GO TO SKOGHEIM BECAUSE YOU DID MENTION THAT ONE AS WELL.

I KNOW THAT MR. WISNER DIDN'T ASK YOU ABOUT IT. HE MENTIONED IT, BUT HE DIDN'T GET INTO THE DETAILS. I WANT TO JUST VERY QUICKLY ESTABLISH SOMETHING IMPORTANT GIVEN THE NATURE OF YOUR REPORT AND THAT YOUR OPINIONS FOR ARSENIC ARE DIRECTED SPECIFICALLY AT POST-NATAL EXPOSURE.

DO YOU AGREE?

A CAN I -- CAN I SAY ONE THING? JUST THAT I --

Q I'M SORRY, LET ME JUST FINISH MY QUESTION.

A OKAY.

Q SKOGHEIM IS A STUDY THAT DOES NOT ASSESS POST-NATAL ARSENIC EXPOSURE; CORRECT?

A I DON'T KNOW OFF THE TOP OF MY HEAD IF THEY --

Q OKAY. WELL, LET'S GO AND LOOK AT THAT.

LET'S GO TO THE SKOGHEIM STUDY. IT'S EXHIBIT 629.

A AM I -- IS IT OKAY IF I CLARIFY SOMETHING ABOUT THE PREVIOUS SLIDE?

THE COURT: WELL, THE PROTOCOL IS THAT YOUR LAWYER CAN BRING THAT OUT ON REDIRECT AND YOU'LL HAVE TIME TOO CLARIFY.

THE WITNESS: OKAY. THANK YOU.

THE COURT: YOU'RE WELCOME.

MR. BOEHM: YOUR HONOR, I DON'T MIND LETTING THE WITNESS SAY SOMETHING ABOUT THAT. I KNOW THAT THIS IS RELATIVELY INFORMAL AND IT'S MOSTLY FOR YOU, SO IF YOU'D LIKE THE WITNESS TO SAY SOMETHING ABOUT IT, I DON'T MIND GOING BACK.

THE COURT: SURE.

WHAT WOULD YOU LIKE TO SAY, DOCTOR?

THE WITNESS: I JUST WANTED --

MR. BOEHM: LET'S PUT THE -- CAN WE JUST PUT THE SLIDE BACK UP? IT'S -- THERE WE GO. THANK YOU.

THE WITNESS: YEAH, I JUST WANTED TO SAY THAT MY LACK OF DISPUTE OF LONG AND ALAMPI SHOULD NOT BE CONFUSED AS A CONFIRMATION. I DON'T RECALL THOSE TWO OFF THE TOP OF MY HEAD, SO WHETHER I WOULD AGREE WITH THOSE TWO LINES, IT -- I CAN'T SAY.

MR. BOEHM:

Q OKAY. THOSE ARE ACTUALLY REFERRED TO IN YOUR REPORT AS WELL. THE LONG STUDY IS IN YOUR REPORT. AND YOU SAY IN YOUR REPORT THAT THERE'S NO ASSOCIATION.

DO YOU RECALL THAT?

A I DON'T. DO YOU WANT TO PULL IT UP AND I CAN TAKE A LOOK?

Q YEAH. BUT WE'LL COME BACK TO THAT IN A MINUTE.

YOU SAY THAT THIS -- YOU SAY THE SAME THING ABOUT ALAMPI, JUST FOR THE RECORD.

AND, BUT MORE IMPORTANTLY, THE STUDIES THEMSELVES, EXHIBIT 92, EXHIBIT 22, IF MR. WISNER WANTS TO PULL THOSE UP AND SHOW YOU THE CONCLUSIONS OF THOSE

AUTHORS, THEN I'M SURE IF HE COULD SHOW THAT THE ANSWER IS NOT NO, THEN WE CAN GO BACK TO THAT AND THEN WE CAN LOOK AT YOUR REPORT.

MR. WISNER: I'M PRETTY CONFUSED, YOUR HONOR. HE SAID HE WAS GOING TO SHOW HER REPORT AND THEN NOT. I -- HE'S JUST RAMBLING. I DON'T KNOW WHAT WE'RE DOING HERE, YOUR HONOR.

MR. BOEHM: OKAY. LET'S -- YOUR HONOR, GO AHEAD.

THE COURT: LET'S HAVE A QUESTION. THANK YOU.

MR. BOEHM: YES.

Q I WANTED TO GO TO SKOGHEIM, WHICH IS ANOTHER STUDY THAT YOU MENTIONED. IT'S EXHIBIT 629. I ASKED YOU WHETHER OR NOT THIS WAS JUST A PRENATAL, NOT A POST-NATAL STUDY AND YOU SAID YOU WEREN'T SURE SO I JUST WANTED TO CONFIRM THAT WITH YOU.

IF WE GO TO PAGE 3, SECTION 2.3 TALKS ABOUT EXPOSURES.

AND IF YOU KIND OF CUT, IAN, THAT FIRST SENTENCE UNDER 2.3 CARRYING OVER TO THE NEXT PAGE.

WE CAN SEE, "IN THIS STUDY WE USE MATERNAL BLOOD SAMPLES FROM APPROXIMATELY WEEK 17 OF GESTATION."

DO YOU SEE THAT?

A I DO.

Q WOULD THAT BE A POST-NATAL PERIOD OR A PRENATAL PERIOD?

A THAT'S A PRENATAL PERIOD.

Q OKAY.

OKAY. SINCE WE'RE HERE AND YOU SAID WE -- EVEN THOUGH YOU'RE FOCUSED ON THE POST-NATAL, YOU SAID I STILL LOOKED AT THE PRENATAL BECAUSE I THINK YOU SAID THERE WAS SOME U SHAPED.

LET'S LOOK AT WHAT THE RESULTS SHOW.

IF WE CAN GO TO TABLE S-3.

THIS IS THE TABLE THAT KIND OF OUTLINES ALL THE RESULTS WITH RESPECT TO EACH THE METALS, YOUR HONOR, THAT ARE -- THAT WERE MEASURED.

AND A-S, DR. GARDENER, THAT STANDS FOR ARSENIC; CORRECT?

A THAT IS CORRECT.

Q AND THEN WE HAVE FOUR QUARTERS, QUARTER ONE IS THE REFERENCE, SO THAT'S SET AT -- THAT SETS THE O-R AT 1.0.

DO YOU SEE THAT?

A THAT IS CORRECT.

Q AND THEN WE HAVE Q2, AND THAT HAS CONCENTRATIONS OF ARSENIC EXPOSURE FROM 1.01 TO 1.59, AND THEN YOU GO INCREASINGLY HIGHER IN EXPOSURE. Q3 IS 1.59 TO 2.76. Q4 IS 2.77 ALL THE WAY UP TO 54.

DO YOU SEE THAT?

A I DO.

Q OKAY. SO THEN --

A SO 54 WOULD BE THE MAXIMUM OF QUARTILE 4.

Q RIGHT.

THAT'S THE HIGH END OF QUARTILE 4.

SO LET'S LOOK AT THESE RESULTS AGAIN. THIS IS PRENATAL, NOT POST-NATAL.

Q3 -- Q2, EXCUSE ME, HAS AN ODDS RATIO OF 1.77 WITH A CONFIDENCE INTERVAL OF 1.26 TO 2.59. Q3, THAT'S WHERE THE CONCENTRATION OF ARSENIC EXPOSURE IS GOING UP, RIGHT? IT'S GOING UP, RIGHT, DR. GARDENER?

A Q3 IS HIGHER THAN Q2, CORRECT.

Q AND THE ODDS RATIO THERE IS 1.14 WITH A CONFIDENCE INTERVAL OF .8 TO 1.64.

SO THAT'S ACTUALLY GOING DOWN; RIGHT?

A RIGHT. SO WHAT THIS SHOWS IS AN UPSIDE DOWN U ASSOCIATION WHICH IS WHAT I HAD RECALLED AND WHAT THE AUTHORS OF THIS STUDY DESCRIBE AS THE NATURE OF THIS ASSOCIATION WHEN THEY TALK ABOUT PRENATAL ARSENIC EXPOSURE BEING ASSOCIATED WITH AUTISM IN THIS STUDY, THEY ARE TALKING ABOUT THIS UPSIDE DOWN U ASSOCIATION. THAT'S HOW YOU --

MR. BOEHM: YOUR HONOR, I'M JUST GOING TO WAIT FOR HER HONOR TO BE READY TO GO.

THE COURT: YOU CAN CONTINUE.

MR. BOEHM: OH, ARE YOU READY? OKAY.

THE COURT: YES, I'M JUST OFF SCREEN. THANK YOU.

MR. BOEHM: OKAY. GREAT.

Q IN Q4 WE SEE THE CONCENTRATION FROM 2.77 TO 54, AND THE ODDS RATIO THERE, THAT'S AT 0.95.

SO, YOUR HONOR, THAT -- THAT'S AN ODDS RATIO THAT'S BELOW ONE.

SO THAT POINT ESTIMATE IS ACTUALLY IN THE NEGATIVE DIRECTION; CORRECT?

A ARE YOU ASKING ME, OR.

Q YES.

A YOU SAID YOUR HONOR, SO I DIDN'T KNOW WHO YOU WERE ASKING.

Q I WAS JUST KEEPING EVERYBODY -- SINCE SHE WAS COMING BACK TO HER SEAT, I WAS DIRECTING HER BACK TO WHERE WE WERE.

A OH, OKAY.

YEAH. SO LIKE I SAID, IT'S AN UPSIDE DOWN U ASSOCIATION, SO WHERE IT INCREASES AND THEN IT GOES BACK DOWN.

Q SO MY QUESTION IS --

THE COURT: HOW DOES THAT -- LET ME ASK DR. GARDENER, IF IT'S A U SHAPED CURVE, HOW DOES THAT SUPPORT YOUR HYPOTHESIS?

THE WITNESS: SO WHAT IT SUGGESTS IS THAT THERE IS AN ASSOCIATION BETWEEN PRENATAL ARSENIC EXPOSURE AND AUTISM, BUT THAT IT'S -- THERE'S NOT REALLY A -- IT'S NOT LINEAR, SO IT'S NOT LIKE THERE'S A MONOTONIC TREND. AND THE QUARTILES ARE ALL -- THESE QUARTILES ARE ALSO SORT OF NOT REALLY LINEAR IN RELATION TO -- IN RELATION TO MERCURY. THEY ARE -- AS YOU CAN SEE SORT OF QUARTILE 4 IS REALLY BROAD AND WONKY WHICH SORT OF SUGGESTS THAT THERE'S SOMETHING -- THERE'S OTHER THINGS GOING ON IN QUARTILE 4. IF YOU LOOK AT THE LOWER QUARTILES, THERE'S A MUCH LOWER RANGE AND THEN THERE IS SOMETHING HAPPENING

IN QUARTER FILE 4 HAS WHAT WE CALL OUTLIERS.

MR. BOEHM:

Q YEAH, WE'RE GOING TO TALK ABOUT OUTLIERS IN A MINUTE, BUT LET ME JUST KIND OF GO BACK TO THIS 0.95 ODDS RATIO.

WHEN THAT ODDS RATIO IS BELOW 1.1, THAT MEANS THE POINT ESTIMATE IS IN A NEGATIVE DIRECTION, RIGHT, NOT A POSITIVE DIRECTION, IT'S A NEGATIVE?

A THAT IS --

Q YEAH.

A -- THAT IS CORRECT. SO THE NULL FOR AN ODDS RATIO IS ONE.

Q RIGHT.

A SO, YEAH.

Q SO, AND THAT IS ASSOCIATED WITH THE HIGHEST LEVEL OF EXPOSURE TO ARSENIC; RIGHT?

A THAT IS CORRECT. IN THIS --

Q OKAY.

A -- IN THIS QUARTER -- IN THIS VERY WIDE QUARTILE THAT CLEARLY INCLUDES SOME OUTLIERS. EXTREME.

Q ONE OF THE -- ONE OF THE -- OH, I'M SORRY, WERE YOU DONE?

A I WAS JUST SAYING THOSE ARE -- THEY ARE -- IT'S A QUARTILE THAT INCLUDES SOME EXTREME OUTLIERS.

Q ONE OF THE BRADFORD HILL CRITERIA THAT MR. WISNER WAS GOING THROUGH WITH YOU IS THE DOSE RESPONSE CRITERION, RIGHT, SOMETIMES WE CALL IT CALLED BIOLOGICAL GRADIENT, THAT'S THE SAME THING?

A CORRECT.

Q AND A DOSE RESPONSE CRITERIA IN A BRADFORD HILL BASICALLY SAYS YOU WOULD EXPECT THAT IF THERE IS A TOXIC RELATIONSHIP BETWEEN AN EXPOSURE AND AN OUTCOME, THAT THE HIGHER THE LEVEL OF EXPOSURE, THE GREATER THE OUTCOME, THAT THAT WOULD -- THERE WOULD BE A DOSE RESPONSE RELATIONSHIP; CORRECT?

A YEAH. SO WHEN YOU SEE A DOSE RESPONSE RELATIONSHIP, IT IS UNDERSTOOD TO BE SUPPORTIVE OF CAUSALITY. IT IS NOT ONE OF THE CRITERIA THAT IS NECESSARY. WHAT WE OFTEN SEE IN ENVIRONMENTAL HEALTH, ESPECIALLY WITH NEUROTOXINS AND DEVELOPMENTAL TOXINS IS THAT THERE ISN'T A DOSE RESPONSE ASSOCIATION.

BUT WHEN WE DO SEE A DOSE RESPONSE ASSOCIATION, IT DOES SORT OF INCREASE OUR CONFIDENCE, YOU KNOW, NATURALLY SO.

Q AND HERE WE HAVE -- HERE, DR. GARDENER, WE HAVE THE OPPOSITE OF A DOSE RESPONSE RELATIONSHIP. THE GREATER THE EXPOSURE TO ARSENIC, THE LOWER THE ODDS RATIO GETS IN THE SKOGHEIM STUDY; CORRECT?

A INCORRECT. THIS IS NOT THE OPPOSITE OF A DOSE RESPONSE RELATIONSHIP. WHAT THIS IS --

Q OKAY.

A -- IS AN UPSIDE DOWN U ASSOCIATION. WE OFTEN IN EPIDEMIOLOGY WILL SEE UPSIDE DOWN U ASSOCIATIONS.

Q UM-HMM.

A WE'LL SEE REGULAR U ASSOCIATIONS OR J --

Q OKAY.

A -- J SHAPED ASSOCIATIONS, THAT IS TOTALLY DIFFERENT FROM THE OPPOSITE OF A DOSE RESPONSE ASSOCIATION.

Q OKAY.

WE'RE GOING TO TALK ABOUT MERCURY IN JUST A MINUTE, BUT SINCE WE'RE IN THE SKOGHEIM STUDY, I THOUGHT IT WAS WORTH, JUST FOR EFFICIENCY'S SAKE, LET'S JUST TAKE A QUICK LOOK AT WHAT SKOGHEIM SHOWS US WHEN IT COMES TO MERCURY TO SAVE US SOME TIME.

LET'S GO TO PAGE 5 OF SKOGHEIM UNDER 3.2.1, END OF THE FIRST PARAGRAPH WE SEE, "FOR MERCURY" -- THIS IS THE MERCURY RESULTS. WE SAW -- WE JUST SAW THE ARSENIC, AND AGAIN, THIS IS PRENATAL, NOT POST-NATAL. BUT FOR WHATEVER IT'S WORTH.

"FOR MERCURY, ALL THREE QUARTILES HAD SIGNIFICANTLY LOWERED RISK OF ASD COMPARED TO THE QUARTILE 1," WHICH IS THE JUST THE BASELINE; RIGHT?

A I'M SORRY, I'M JUST STARTING FROM THE BEGINNING.

"FOR ASD, A QUARTILE MODEL SHOWED AN ELEVATED RISK FOR CHILDREN IN QUARTILE 2 OF ARSENIC AND WAS" --

Q I'M DIRECTING YOU TO THE MERCURY RESULTS.

A UM.

Q THAT'S THE ONLY SENTENCE THAT TALKS ABOUT THAT.

A YEAH.

OKAY. YES, I AGREE THAT --

Q SO FOR MERCURY --
A YEP.
Q AND THOSE ARE STATISTICALLY SIGNIFICANT IN THE NEGATIVE DIRECTION; CORRECT?
A I WOULD HAVE TO LOOK BACK AT THE TABLE TO -- BUT THAT IS ABSOLUTELY WHAT THE AUTHORS SAY SO I WOULD ASSUME THAT THAT'S TRUE.
Q LET'S LOOK AT IT, JUST TO BE SURE, LET'S GO TO TABLE S3 AND LOOK AT THE MERCURY RESULTS.
HG, THAT'S AN ABBREVIATION FOR MERCURY, DR. GARDENER?
A YES.
Q OKAY.
AND THEN WE HAVE THE SIMILAR --
A AND ALSO AN ABBREVIATION FOR MY NAME.
Q OKAY. FAIR ENOUGH.
WE HAVE A SIMILAR KIND OF SETUP AS WE JUST LOOKED AT FOR THE ARSENIC RESULTS FOR MERCURY. YOU'VE GOT THE CONCENTRATION. THAT'S THE AMOUNT OF MERCURY EXPOSURE --
A UM-HMM.
Q -- THAT WE FOUND. THEN YOU HAVE THE ODDS RATIO, WHICH IS A POINT ESTIMATE OF WHETHER THERE'S AN ASSOCIATION.
AND YOU SEE THAT THEY ARE ALL STATISTICALLY SIGNIFICANT IN A NEGATIVE DIRECTION; CORRECT?
A YEAH, SO THE -- WHAT I -- HOW I WOULD DESCRIBE THIS IS QUARTILE 1, THE PEOPLE WITH THE LOWEST -- THE

LOWEST MERCURY LEVELS HAD AN INCREASED RISK OF AUTISM COMPARED TO QUARTILES 2, 3 AND 4, THOSE DON'T REALLY LOOK DIFFERENT FROM EACH OTHER, BUT THEY ALL LOOK DIFFERENT FROM QUARTILE 1.

Q WELL, YOU DO HAVE A SIMILARITY HERE BETWEEN THE MERCURY AND THE ARSENIC IN THAT IN THE HIGHEST QUARTILE OF EXPOSURE -- AND HERE IT GOES FROM 2 TO 10, NOT ALL THE WAY TO 54 LIKE IT DID FOR ARSENIC, BUT FROM 2 TO 10, YOU DO HAVE THE LOWEST ODDS RATIO. THAT'S ALL THE WAY DOWN TO 4.3.

DO YOU SEE THAT?

A THESE ARE NOT -- I -- THESE ARE NOT DIFFERENT FROM EACH OTHER, SO THESE ARE ALL THE SAME AND THEY ARE ALL DIFFERENT FROM 1, WHICH IS VERY DIFFERENT WITH WHAT WE SAW WITH ARSENIC.

WHAT WE SAW WITH ARSENIC IS THAT QUARTILE 4 WAS NOT DIFFERENT FROM QUARTILE 1.

Q OKAY.

A SO, AGAIN, U SHAPED RELATIONSHIP VERSUS HERE, IT'S MORE OF LIKE A -- I WOULD CALL THIS LIKE A THRESHOLD RELATIONSHIP WHERE QUARTILE 1 WAS HIGHER.

Q LET'S LOOK AT THE WANG STUDY BECAUSE I BELIEVE THAT, DR. GARDENER, YOU AND MR. WISNER DISCUSSED THE WANG STUDY. AND THIS WAS THE META ANALYSIS THAT YOU DISCUSSED.

DO YOU RECALL THAT?

A YES.

Q PUBLISHED IN 2019.

LET ME JUST START WITH WHAT I THINK IS AN IMPORTANT POINT IN CONNECTION WITH YOUR OPINIONS.

NONE OF THE STUDIES, NOT ONE OF THE STUDIES INCLUDED IN WANG 2019 IN THIS META ANALYSIS MEASURED POST-NATAL ARSENIC EXPOSURE PRIOR TO CHILDREN BEING DIAGNOSED WITH AUTISM; CORRECT?

A I DON'T RECALL OFF THE TOP -- I CAN'T CONFIRM OR DENY THAT OFF THE TOP OF MY HEAD.

Q DO YOU KNOW THIS STUDY THAT YOU DISCUSSED WITH MR. WISNER, IT'S EXCLUSIVELY -- IT'S EXCLUSIVELY CASE CONTROL AND CROSS-SECTIONAL STUDIES, THERE ARE NO COHORT STUDIES IN THE WANG META ANALYSIS.

DID YOU KNOW THAT?

A I DO RECALL THAT, YEP.

Q OKAY.

A I AM FAMILIAR WITH THE STUDY.

Q AND I JUST WANT TO LOOK AT SOME OF THE CONCLUSIONS FROM THE WANG AUTHORS, WHAT THEY HAD TO SAY THEMSELVES --

A SURE.

Q -- ABOUT WHAT THE LITERATURE SHOWS AND WHAT THEIR DATA SHOWS.

SO LET'S LOOK AT EXHIBIT 695.

THEY SAY, "THE INCONSISTENT FINDINGS OF THE RESULTS IN THESE STUDIES MAKE IT DIFFICULT TO CONCLUDE THE RELATIONSHIP BETWEEN IAS" -- THAT'S ARSENIC; RIGHT?

A YEAH, IT STANDS FOR INORGANIC ARSENIC.

Q "AND ASD IN CHILDREN."
DID I READ THAT CORRECTLY?
A YOU DID.
Q OKAY.
THEN THEY SAY -- THEY TALK ABOUT THE RESULTS OF IT FOR BOTH LEAD AND -- SORRY -- INORGANIC ARSENIC.
AND THEY TALK ABOUT THE FACT THAT THESE ARE METALS THAT DO HAVE KNOWN NEURODEVELOPMENTAL IMPACTS; RIGHT? DO YOU SEE THAT IN THE FIRST SENTENCE?
A CAN YOU SHOW ME WHICH FIRST SENTENCE ARE YOU --
Q YEAH. I'M JUST LOOKING AT THE FIRST SENTENCE THERE.
THAT PB -- I'LL JUST READ IT.
"BOTH PB" -- THAT'S LEAD; RIGHT?
A YES.
Q "AND INORGANIC ARSENIC ARE KNOWN TO CAUSE NEURODEVELOPMENTAL EFFECTS WHEN THE EXPOSURE OCCURS IN EARLY LIFE."
DO YOU SEE THAT?
A I DO.
Q SO THEY ARE SAYING, YEAH, THEY KNOW THAT THERE ARE AT LEAST SOME NEURODEVELOPMENTAL IMPACTS THAT MIGHT OCCUR.
BUT THEY GO ON TO SAY, "DUE TO A LACK OF CONSISTENCY AMONG THE VARIOUS STUDY FINDINGS, THE EFFECTS OF INORGANIC ARSENIC AND LEAD SPECIFICALLY ON ASD HAVE NOT BEEN ESTABLISHED."
DO YOU SEE THAT THAT'S WHAT THE WANG AUTHORS

SAID ABOUT THE DATA?

A CORRECT.

Q THEY ALSO SAY THAT, "ALL TOGETHER THE DATA FOR INORGANIC ARSENIC" -- AND THEY SAY IT FOR LEAD, BUT I'M FOCUSED ON ARSENIC WITH YOU BECAUSE THAT'S WHAT YOU FOCUSED ON -- "IS CONSIDERED WEAK AND NOT ADEQUATE FOR A CAUSAL DETERMINATION."

DO YOU SEE THAT?

A YEAH. SO THIS SORT OF RELATES TO THE CONVERSATION THAT MR. WISNER AND I WERE HAVING AT THE END OF THE PREVIOUS SECTION, SO THAT IS -- THAT'S TYPICAL IS THAT, YOU KNOW, ANY OBSERVATIONAL STUDY, WHETHER IT'S A META ANALYSIS OR AN INDIVIDUAL OBSERVATIONAL STUDY, FOR THE AUTHORS TO SAY THAT IT'S NOT ADEQUATE FOR A CAUSAL DETERMINATION BECAUSE YOU CAN NEVER DETERMINE CAUSALITY JUST BASED ON EPIDEMIOLOGY.

THIS STUDY WAS AN EPIDEMIOLOGICAL STUDY, SO IN ORDER TO DETERMINE CAUSALITY, YOU NEED TO DO A WHOLE OTHER PROCESS MORE SIMILAR TO THE ONE THAT I DID IN PREPARATION FOR TODAY, WHICH WAS TO LOOK AT ALL THE STUDIES IN RELATION TO THEIR STRENGTHS AND WEAKNESSES AND LOOK AT THE ANIMAL LITERATURE, LOOK AT THE BASIC SCIENCE.

SO IT WOULD BE EXPECTED AND APPROPRIATE, AND I HAVE DONE THE SAME, YOU KNOW, IN ANY ONE OF MY OBSERVATIONAL STUDIES TO CONCLUDE AT THE END THAT IT IS NOT ADEQUATE FOR A CAUSAL DETERMINATION.

Q YOU WOULD HAVE SAID THAT YOURSELF?

A IN ANY OBSERVATIONAL STUDY THAT YOU WRITE --
Q YEAH.
A -- BECAUSE IT'S A DIFFERENT PROCESS FROM AN EXERCISE LIKE HERE WHERE WE'RE NOT JUST DOING AN EVALUATION OF THE EPI WHERE WE'RE REALLY LOOKING AT THE TOTALITY OF THE EVIDENCE, THERE IS NO -- YOU CAN'T JUST DETERMINE CAUSALITY JUST FROM THE EPI LITERATURE.
Q AND THEY SAID NOT JUST THAT IT COULDN'T -- THAT IT WASN'T ADEQUATE FOR A CAUSAL DETERMINATION, THEY SAID IT WAS WEAK.

DO YOU SEE THAT WORD?

A UM.
Q IT'S RIGHT THERE. WE HIGHLIGHTED IT IN YELLOW IN THE LAST PART. WEAK.

DO YOU SEE THAT?

A YEAH, BUT IT IS RELEVANCE -- I MEAN, THE RELEVANCE OF THE A-S AND... FOR THE PATHOGENTIC...

(READING)

YEAH, SO, I MEAN, THEY ARE -- THEY ARE -- I MEAN, WHAT THEY ARE SAYING IS THAT HOW RELEVANT THIS IS IN TERMS OF THE PATHOGENESIS HAS NOT CONSIDERED TO BE CAUSAL AND IT MAY BE WEAK, ALTHOUGH, YOU KNOW, THE LITERATURE -- THE LITERATURE DOES SUGGEST THAT IT'S ACTUALLY PRETTY STRONG AND THIS STUDY ACTUALLY LEFT OUT A LOT OF STUDIES THAT WERE MUCH STRONGER.

I MEAN, YEAH.

Q THIS WAS THE ONLY ARSENIC META ANALYSIS THAT YOU AND MR. WISNER DISCUSSED DURING YOUR DIRECT

EXAMINATION.

AM I WRONG?

A I DON'T RECALL WHETHER IT WAS THE ONLY ONE -- THE ONLY META ANALYSIS POSSIBLY, YEAH.

Q OKAY.

A BUT THE INDIVIDUAL STUDIES HAVE SHOWN -- IF YOU LOOK AT THE INDIVIDUAL STUDIES, THIS META ANALYSIS --

Q CAN YOU PULL UP 692.

A -- DOESN'T INCLUDE ALL OF THE INDIVIDUAL STUDIES AND THEY WERE OFTEN QUITE STRONG. AND FOR MANY OF THEIR INDIVIDUAL ONES, THE STUDIES THAT WERE NOT INCLUDED IN THE META ANALYSIS PORTION WERE ACTUALLY THE STRONGER ASSOCIATIONS.

Q OKAY. THANK YOU, DR. GARDENER.

FOR THE SAKE OF TIME, LET'S MOVE TO MERCURY.

YOU DID GET SOME QUESTIONS TODAY ABOUT MERCURY. I WANT TO SPEND SOME TIME ON THAT AS WELL.

A SURE.

Q MR. WISNER SHOWED YOU A SLIDE AND HE SHOWED THE SAME SLIDE TO THE COURT IN HIS OPENING ON MONDAY AND I JUST WANT TO PUT THAT BACK UP.

WE'VE MARKED IT AS EXHIBIT 697 JUST FOR THE RECORD.

AND YOU SAID YOU DIDN'T CREATE THIS, MR. WISNER DID, BUT YOU DID CHECK IT FOR ACCURACY; IS THAT RIGHT?

A THAT'S CORRECT.

Q OKAY. ALL RIGHT.

NOW, I WANT TO JUST DIRECT YOUR ATTENTION

SPECIFICALLY TO IN THE UPPER RIGHT HAND CORNER DO YOU SEE A KEY THAT KIND OF IS TRYING TO SHOW US WHICH STUDIES FIT INTO WHICH CATEGORIES? DO YOU SEE THAT IN THE UPPER RIGHT?

A I DO.

Q AND THEN YOU HAVE THE LETTER H. THAT STANDS FOR COHORT.

DO YOU SEE THAT?

A I DO.

Q OKAY.

AND AS OPPOSED TO THE CROSS-SECTIONAL AND CASE CONTROL STUDIES THAT YOU TALKED ABOUT AT PAGES 14 AND 15 OF YOUR REPORT THAT WE WENT OVER, THIS IS -- H STANDS FOR COHORT.

SO LET'S JUST LOOK AT THE COHORT STUDIES. I THINK WE'VE KIND OF --

A SO ONE OF THEM IS NOT INDICATED, BUT EVERYTHING ELSE IS -- THERE IS LIKE ONE X AND IT'S PRETTY CASE CONTROL STUDIES, WHICH AS I EXPLAINED EARLIER IS THE --

Q UH-HUH.

A -- SORT OF THE HEART OF THIS LITERATURE.

Q SO WHAT WE'RE SHOWING YOU HERE ARE THE -- JUST THE CASE -- JUST THE COHORT STUDIES SO THESE ARE ADDRESSED -- THE ONES THAT ARE CAPABLE OF ADDRESSING THIS PRIMARY WEAKNESS THAT YOU DESCRIBED IN YOUR REPORT AND WE'RE LEFT WITH RYU --

A NO.

Q -- 2017 AND ABDULLAH.

DID WE -- SO LET'S TALK ABOUT RYU BECAUSE I THINK THAT YOU AND MR. WISNER SPENT A LITTLE BIT OF TIME ON THAT.

BUT BEFORE WE DO THAT, I WANT TO SHOW YOU SOME ADDITIONAL STUDIES THAT WE FOUND THAT ARE NOT ON THIS CHART AND ASK YOU, DR. GARDENER, WHETHER OR NOT YOU THINK THAT THEY BELONG, OKAY.

SO LET'S PUT UP SOME ADDITIONAL STUDIES.

A CAN I MAKE A COMMENT? AM I ALLOWED TO MAKE A COMMENT?

THE COURT: YES, PLEASE.

THE WITNESS: BECAUSE YOU -- YOU STATED SOMETHING THAT I REALLY DISAGREE WITH.

YOU HIGHLIGHTED RYU AND ABDULLAH AND YOU SAID THOSE ARE THE ONLY TWO STUDIES THAT COULD -- THAT COULD OVERCOME THE -- WHAT I TALKED ABOUT IN MY REPORT, THE WEAKNESS. BUT CASE CONTROL STUDIES CAN ALSO ADDRESS -- CAN ALSO BE PROSPECTIVE, SO IT'S NOT REALLY FAIR TO SAY THAT ONLY COHORT STUDIES. AND COHORT STUDIES CAN ALSO BE RETROSPECTIVE.

MR. BOEHM:

Q ARE THERE ANY -- DR. GARDENER, TO THAT POINT, WOULD YOU HIGHLIGHT ANY ADDITIONAL PROSPECTIVE CASE CONTROL STUDIES ON THIS CHART?

A NOT OFF --

Q CAN YOU IDENTIFY ANY OF THOSE?

A NOT OFF THE TOP OF MY HEAD.

Q OKAY.

A BUT THERE COULD BE. YOU KNOW, IT'S A LOT OF NAMES AND A LOT OF YEARS, AND I HAVEN'T MEMORIZED IT.

Q OKAY. FAIR ENOUGH.

BUT WE'RE NOT GOING TO -- NONE THAT YOU SEE RIGHT NOW THAT YOU CAN THINK OF; RIGHT?

A CORRECT.

Q OKAY.

SO LET'S TALK ABOUT RYU.

BUT BEFORE I DO THAT, I WANT TO GET TO THE QUESTION. WE ADDED SEVERAL STUDIES THERE AT THE BOTTOM.

DO YOU SEE THAT?

A I DO.

Q YAU. ALAMPI, VAN WIJNGAARD, SKOGHEIM, GOLDING AND MCKEAN.

ARE YOU FAMILIAR WITH THOSE STUDIES?

A SO WE WERE JUST TALKING ABOUT THE SKOGHEIM ONE, AND THE REASON WHY IT WASN'T ON THIS CHART IS BECAUSE IT WAS JUST PRENATAL. SO THE ONES THAT WERE INCLUDED HERE, IF I RECALL CORRECTLY, WERE ONES THAT HAD POST-NATAL ANALYZES, SO I DON'T KNOW THE OTHER NAMES AND DETAILS OFF THE TOP OF MY HEAD TO EXPLAIN WHY THEY WEREN'T ON THERE. I CAN ONLY EXPLAIN THE SKOGHEIM ONE.

SO, I MEAN, MAYBE THESE WERE ALL, YOU KNOW, MAYBE THESE WERE ALL PRENATAL ONES.

Q OKAY. ALL RIGHT. LET'S GET TO IT.

THE OPINION THAT YOU EXPRESS ABOUT MERCURY AND AUTISM, JUST AS IT WAS WITH ARSENIC AND AUTISM, IS SPECIFICALLY ABOUT EARLY LIFE POST-NATAL EXPOSURE.

DO YOU SEE THAT? OR DO YOU RECALL THAT? I CAN SHOW YOU. DO YOU RECALL THAT?

A I DON'T KNOW EXACTLY WHAT YOU'RE REFERENCING SO IF YOU COULD SHOW ME, THAT WOULD BE REALLY HELPFUL.

Q SURE.

IAN, LET'S GO TO DR. GARDENER'S REPORT AT PAGE 45.

THIS IS YOUR FINAL PARAGRAPH ABOUT MERCURY WHERE YOU GIVE US THE UPSHOT OF YOUR CONCLUSIONS.

AND YOU SAY, "IN CONCLUSION," YOU TALK ABOUT WHAT YOU REVIEWED, "I CONCLUDE TO A REASONABLE DEGREE OF SCIENTIFIC CERTAINTY THAT EARLY LIFE POST-NATAL MERCURY EXPOSURE CAN CAUSE THE DEVELOPMENT OF ASD."

DO YOU SEE THAT?

A I DO.

Q OKAY.

I WANT TO SHOW YOU A COMPLETE LIST OF STUDIES THAT ARE POST-NATAL AND THAT MEASURED MERCURY EXPOSURE PRIOR TO DIAGNOSIS, SO GETTING AT THAT TEMPORALITY ISSUE, OKAY?

A OKAY.

Q SO LET'S GO TO EXHIBIT 698.

THIS IS ACTUALLY IN TWO SEPARATE SLIDES. THEY ARE BOTH 698.

NO, LET'S DO THE FIRST ONE FIRST FIRST, IAN, SO PEOPLE CAN SEE. THANK YOU.

SO IN THE LEFT HAND COLUMN WE HAVE THE NAME OF

THE STUDY AND THERE'S EXHIBIT NUMBERS HERE AND THESE WILL BE PROVIDED TO YOUR HONOR OF COURSE.

AND THE SECOND COLUMN, AS WITH ARSENIC IS, WAS THE MEASUREMENT POST-NATAL OR WAS IT PRENATAL BECAUSE YOU'VE BEEN FOCUSED, DR. GARDENER, ON POST-NATAL.

OKAY. THE THIRD COLUMN ASKS THE SAME QUESTION AS WE LOOKED AT FOR ARSENIC, WERE THEY LOOKING AT A DIAGNOSIS OF ASD OR WERE THEY LOOKING AT SOMETHING ELSE?

AND THEN THE FINAL COLUMN ASKS WHETHER OR NOT THEY FOUND A STATISTICALLY SIGNIFICANT ASSOCIATION.

SO THAT'S HOW THIS IS SET UP.

AND, IAN, MAYBE NOW YOU CAN GO TO THE SECOND OF THESE TWO.

AND, DR. GARDENER, I WANT TO GIVE YOU TIME TO LOOK AT THIS AND JUST -- I KNOW YOU MAY SAY YOU NEED TO GO THROUGH YOUR REPORT, UNFORTUNATELY WE DON'T HAVE TIME FOR YOU TO KIND OF CONDUCT A BRAND NEW ANALYSIS.

BUT AS YOU LOOK AT THESE TWO SLIDES, WHICH ARE A LIST OF THESE MERCURY STUDIES THAT MEASURED EXPOSURE PRIOR TO DIAGNOSIS, IS THERE ANY STUDY THAT YOU SEE THAT WE LEFT OFF?

LET'S START WITH THE FIRST PAGE SO THAT DR. GARDENER CAN SEE THE FIRST PAGE.

AND THEN, DR. GARDENER, LET US KNOW WHEN YOU WANT TO SEE THE SECOND.

A I'M READY TO SEE THE SECOND.

Q OKAY.

A (DOCUMENT REVIEWED).

SO I'M NOT SURE IF THERE WAS A QUESTION THAT I'M SUPPOSED TO ANSWERING, BUT --

Q THE QUESTION --

A -- OF ALL OF THESE THE ONE THAT I AM POST FAMILIAR WITH THAT WE TALKED ABOUT WAS THE RYU.

AND WHAT CONCERNS ME HERE IS THAT YOU -- WE WERE JUST LOOKING AT THE DATA REALLY CAREFULLY. WE SAW HOW CLEARLY THE POST-NATAL MERCURY LEVELS, YOU KNOW, WERE ASSOCIATED WITH AUTISM SYMPTOMS AND YOU HAVE -- YOU'VE SHOWN THIS AS A NO.

SO I CAN'T -- I REALLY -- YOU KNOW, THE OTHER -- THE OTHER STUDIES I HAVEN'T THOUGHT ABOUT OR TALKED ABOUT TODAY SO I'M NOT AS FAMILIAR, BUT I REALLY COULD NOT CONFIDENTLY AGREE WITH YOUR ASSESSMENT WITH ANY OF THE REST OF THEM CONSIDERING THE ONE THAT I AM FAMILIAR WITH I DEFINITELY DO NOT AGREE WITH YOUR ASSESSMENT HERE.

Q MY FIRST QUESTION -- WE'RE GOING TO TALK ABOUT RYU NEXT, SO WE'LL GET TO THAT IN JUST A MINUTE, BUT BEFORE WE GET TO RYU, MY QUESTION ACTUALLY WAS WHETHER OR NOT YOU BELIEVE WE'VE LEFT OFF ANY STUDIES THAT YOU CAN THINK OF THAT WE SHOULD PUT ON THIS CHART THAT MEET THE CRITERIA OF MEASURED MERCURY EXPOSURE POST-NATALLY PRIOR TO A DIAGNOSIS.

A I DON'T KNOW.

Q OKAY. SO LET'S TALK ABOUT RYU. THAT'S EXHIBIT 114.

FIRST OF ALL, THIS A STUDY THAT DID NOT INVOLVE

AUTISM DIAGNOSIS; CORRECT?

A SO WHAT THEY USE AS THEIR OUTCOME WAS THE SOCIAL RESPONSIVENESS SCALE, WHICH IS A SCALE THAT MEASURES AUTISM BEHAVIORS AND THEY LOOKED AT IT CONTINUOUSLY AND THEY LOOKED AT IT CATEGORICALLY, WHICH IS WHAT ONE WOULD DO TO IDENTIFY A CHILD WITH MODERATE -- MILD TO MODERATE OR MODERATE TO SEVERE AUTISM SYMPTOMS OR NOT.

Q DR. GARDENER, MY QUESTION WAS SIMPLY WHETHER YOU AGREE THAT THE RYU STUDY DOES NOT HAVE AUTISM DIAGNOSIS AS ITS END POINT.

A SO I DON'T THINK THEY HAD A PHYSICIAN DIAGNOSIS IF THAT'S WHAT YOU'RE ASKING, NO.

Q THAT'S WHAT I'M ASKING.

AND YOU CAN -- ACTUALLY, LET'S GO TO -- WE'LL COME BACK TO RYU IN JUST A SECOND.

BUT ON THAT POINT I WANT TO PUT UP A STUDY FROM 2013.

IT'S EXHIBIT 694.

THIS IS THE VAN WIJNGAARD STUDY. YOU CITE THIS IN YOUR REPORT, I BELIEVE.

AND IT TALKS -- THIS STUDY TALKED ABOUT THIS SRS SCALE.

THEY SAY, "IT CAN BE USED ONLY TO IDENTIFY PERSONS WHO HAVE THE CHARACTERISTICS OF ASD AND REQUIRE A CLOSER EVALUATION. THEY ARE NOT DIAGNOSTIC INSTRUMENTS AND FURTHER EXPERT CLINICAL EVALUATION IS NECESSARY TO CONFIRM A

DIAGNOSIS OF ASD."

DO YOU SEE THAT?

A I DO.

Q OKAY. NOW, YOU'VE NEVER DIAGNOSED WITH ANYBODY WITH ASD? THAT'S NOT WHAT YOU DO; RIGHT?

A NO, I'M AN EPIDEMIOLOGIST, SO I'M NOT A CLINICIAN AND I DON'T DIAGNOSIS PEOPLE WITH ASD, NOR -- YEAH -- NOR WOULD I.

Q AND JUST TO BE CLEAR, YOU'RE NOT PUTTING YOURSELF FORWARD AS AN EXPERT IN THE DIAGNOSIS OF ASD; RIGHT?

A I AM NOT, NO.

Q OKAY. LET'S GO BACK TO RYU.

MR. WISNER: I JUST WANT TO, YOUR HONOR, LODGE AN OBJECTION TO COMPLETENESS. COUNSEL JUST SHOWED A SEGMENT OF A QUOTE AND WE HAVE NO IDEA WHAT'S AFTERWARDS.

THE COURT: OVERRULED.

MR. BOEHM:

Q NOW, LET'S GO TO YOUR REPORT AT PAGE 41.

JUST VERY QUICKLY ON THIS POINT.

I'M GOING TO PULL OUT WHERE YOU TALK ABOUT THE RYU STUDY IN YOUR REPORT IN THE MIDDLE OF THIS -- OF THIS PAGE, AND YOU SAY, "THE STUDY EXAMINED MERCURY EXPOSURE IN EARLY LIFE PRIOR TO ASD DIAGNOSIS."

DO YOU SEE THAT?

A YES.

Q THAT'S A MISTAKE, ISN'T IT?

A I'M NOT SURE. I'D HAVE TO READ THE FULL STUDY. IT WASN'T AFTER ASD DIAGNOSIS, IF THAT'S WHAT YOU'RE ASKING. MY UNDERSTANDING -- YEAH, I WOULD -- I WOULD REALLY HAVE TO READ THE STUDY.

Q ALL RIGHT. LET'S GO BACK TO EXHIBIT 114.

AND, IAN, IF YOU CAN JUST PULL THE ABSTRACT.

THIS IS THE RYU STUDY.

A UM-HMM.

Q AND PULL UP THE PART WHERE IT SAYS "NOT DIAGNOSIS."

IT SAYS, "AUTISTIC BEHAVIORS WERE ASSESSED USING THE SOCIAL RESPONSIVENESS SCALE AT FIVE YEARS OF AGE."

DO YOU SEE THAT?

A YEP.

Q SO THAT WAS THE OUTCOME THEY WERE MEASURING, NOT DIAGNOSIS; CORRECT?

A THAT'S CORRECT.

Q OKAY.

A WELL, THEY -- IT WAS THE AUTISTIC BEHAVIORS AND ALSO THEY WERE USING A WELL ESTABLISHED CUT POINT.

Q OKAY.

A LIKE A DICHOTOMIZED STUDY.

Q DO YOU RECALL THAT THE RYU STUDY ALSO MEASURED TOTAL MERCURY AND NOT JUST METHYMERCURY?

A OH, I DON'T RECALL OFF THE TOP OF MY HEAD.

Q YOU DON'T KNOW. OKAY.

IF IT MEASURED ETHYLMERCURY AND INCLUDED

ETHYLMERCURY IN ITS MEASUREMENT, THAT WOULD BE THE SAME KIND OF MERCURY THAT YOU AND MR. WISNER WERE TALKING ABOUT WITH RESPECT TO MERCURY THAT'S IN VACCINES; RIGHT?

A THAT'S CORRECT. BUT THAT TYPE OF MERCURY IS CLEARED VERY QUICKLY. BLOOD MERCURY TYPICALLY DOESN'T, AS FAR AS I KNOW, ISN'T -- WOULDN'T BE REFLECTIVE OF THAT. I'M NOT CONCERNED ABOUT THIS STUDY MEASURING ETHYLMERCURY, IN OTHER WORDS.

AND THOSE ARE PRETTY SPECIFIC. METHYLMERCURY IS A COMMON EXPOSURE. ETHYLMERCURY FROM VACCINES WOULD BE VERY, VERY UNLIKELY IMPLAUSIBLE EXPLANATION FOR THAT.

Q ALL RIGHT.

A AND, YOU KNOW, I THINK IT SHOULD BE REALLY CLEAR THAT THE LITERATURE HAS BEEN EXTREMELY CLEAR THAT MERCURY -- ETHYLMERCURY THAT -- IN VACCINES IS NOT ASSOCIATED WITH AUTISM.

Q ALL RIGHT. I WANT TO SHOW YOU TABLE 3 OF THE RYU STUDY WHERE IT SHOWS THAT THE ONLY ASSOCIATION THAT WAS DETECTED EVEN USING SRS SCALE, NOT DIAGNOSIS, IT WAS PRENATAL, NOT POST-NATAL, OKAY?

SO LET'S LOOK AT TABLE 3. THAT'S PAGE 255.

IT'S SLIDE -- IAN, IT'S THE FIFTH PAGE OF THE PDF.

AND YOU CAN LOOK AT THE SRS T-SCORES FOR LATE PREGNANCY AND CORD BLOOD, ALL RIGHT. BUT THEN YOU GET DOWN TO THE POST-NATAL SCORES. TWO YEARS, THREE YEARS OF AGE.

THERE WAS NO STATISTICALLY SIGNIFICANT

ASSOCIATION DETECTED FOR THE POST-NATAL MEASUREMENTS, CORRECT, DR. GARDENER?

A SO AT THOSE YEARS OF AGE, LIKE WE DISCUSSED EARLIER, THE MERCURY LEVELS WERE SIGNIFICANTLY ASSOCIATED WITH THE CONTINUOUS CORDS, AND WHEN WE LOOKED AT THEM -- THEY, NOT WE -- WHEN THEY LOOKED AT IT IN A DICHOTOMIZED WAY, THE LEVEL AT THREE YEARS OF AGE WAS REALLY JUST SHY OF STATISTICAL SIGNIFICANCE AND THEY HAD THEY HAD SIGNIFICANT -- IF YOU LOOK AT THE SECOND COLUMN THEY --

Q MY QUESTION -- MY QUESTION -- YOUR HONOR, I DON'T HAVE MUCH -- YOUR HONOR, IF I MAY, WE'RE RUNNING OUT OF TIME AND MY QUESTION IS ACTUALLY MUCH MORE SIMPLE THAN THIS. I WOULD JUST ASK THAT YOU --

THE COURT: WELL, I THINK YOU'VE MADE YOUR POINT. LET'S MOVE ON.

MR. BOEHM: OKAY. WE CAN MOVE ON.

Q LET'S GO -- YOU MENTIONED THE JAFARI STUDY WITH MR. WISNER AND I WANT TO GO TO THAT.

IT'S EXHIBIT 78.

AND I'M GOING TO DIRECT YOUR ATTENTION TO THE CONCLUSIONS OF THAT -- OF THOSE AUTHORS IN THAT PUBLICATION.

IF YOU GO TO PAGE 296, IT'S THE SECOND TO LAST PAGE OF THE PDF, IAN, AND IF YOU HIGHLIGHT -- DO YOU SEE THE TWO BULLET POINTS -- NO, NO, NO -- JUST ABOVE THAT, I'M SORRY. I SAID CONCLUSIONS, BUT IT'S THE END OF RESULTS SECTION. START WITH THE BULLETS.

OKAY.

THIS STUDY SAYS -- THE AUTHORS OF THIS STUDY SAY:

"THE MAJOR PROBLEM WITH CASE CONTROL STUDIES IS THE TEMPORAL RELATIONSHIP BETWEEN EXPOSURE AND OUTCOME. IT'S POSSIBLE, FOR EXAMPLE, THAT OLDER CHILDREN WITH ASD MAY EXHIBIT MORE MOUTHING BEHAVIOR THAN HEALTHY CONTROLS LEADING TO INCREASED LEVELS OF MERCURY AND OTHER POLLUTANTS IN THEIR BIOLOGICAL TISSUES."

DO YOU SEE THAT?

A I DO.

Q I WANT TO DIRECT YOUR ATTENTION TO THE THIRD BULLET.

"MEASUREMENT" -- I'M SORRY, THE FOURTH. I APOLOGIZE.

"MEASUREMENT OF TOTAL MERCURY, BUT NOT INORGANIC OR ORGANIC FORMS SEPARATELY IN THE STUDIES" -- THAT'S A LIMITATION -- "IT'S BELIEVED THAT EXPOSURE TO ORGANIC FORMS OF MERCURY SUCH AS ETHYLMERCURY USED IN VACCINES AS PRESERVATIVES THIMEROSAL AND METHYLMERCURY FOUND PRIMARILY IN SEAFOOD PRODUCTS ARE MOSTLY IMPLICATED IN THE ASD."

THESE AUTHORS -- I AGREE WITH YOU, DR. GARDENER, THERE'S NOT GOOD EVIDENCE ABOUT THIMEROSAL IN CHILDHOOD VACCINES, BUT THESE AUTHORS IN THIS STUDY THAT YOU'RE RELYING ON, THEY DO ESPOUSE THE THEORY THAT

MERCURY IN VACCINE CAUSES ASD.

DO YOU SEE THAT?

A I TOTALLY DISAGREE WITH YOUR FIRST STATEMENT.

SO LET'S -- LIKE, I REALLY APPRECIATE YOU BRINGING THIS UP BECAUSE THEIR FIRST STATEMENT: "THE MAJOR PROBLEM WITH CASE CONTROL STUDIES IS THE TEMPORAL RELATIONSHIP."

CASE CONTROL STUDIES CAN ASSESS TEMPORAL RELATIONSHIPS PROSPECTIVELY, LIKE I KEEP SAYING, IT IS SORT A FALLACY TO THINK THAT CASE CONTROL STUDIES CAN'T BE PROSPECTIVE.

AND I ALSO DISAGREE WITH THIS ASSUMPTION THAT MOUTHING ACTIVITIES INCREASES YOUR RISK FOR MERCURY. IT CAN CERTAINLY INCREASE YOUR RISK FOR MANY ENVIRONMENTAL TOXICANTS, BUT NOT MERCURY.

AND YES, WE ARE IN TOTAL AGREEMENT THAT ETHYLMERCURY USED AS A PRESERVATIVE IN VACCINES AND IN OTHER PRODUCTS AS WELL IS NOT IMPLICATED IN AUTISM.

Q OKAY. FAIR ENOUGH.

MR. WISNER NOTED DURING HIS QUESTIONING OF YOU THAT YOU HAD PUBLISHED SOME ARTICLES PREVIOUSLY IN YEARS PAST ON THE CAUSES OF AUTISM AND YOU INDICATED THAT WAS BEFORE YOU HAD BEEN RETAINED AS AN EXPERT.

DO YOU REMEMBER THOSE QUESTIONS?

A YES.

Q AND HE KIND OF SAID THAT WAS A LONG TIME AGO, HAS THE SCIENCE CHANGED AND YOU SAID YES.

DO YOU REMEMBER THAT?

A YEP.

Q OKAY. I JUST WANT TO JUST PULL UP THOSE STATEMENTS. WE'LL JUST DO THIS REALLY QUICKLY.

IT'S IN THE BRIEFING, YOU HONOR, SO I WILL NOT BELABOR IT.

THIS IS EXHIBIT 701.

THESE ARE JUST A COUPLE OF EXAMPLES.

YOU SAID IN 2014, THE BOOK CHAPTER THAT YOU REFERENCED EARLIER, THAT "THE PERINATAL TIME PERIOD THAT ENCOMPASSES FIVE MONTHS BEFORE THE ONE MONTH AFTER BIRTH IS INCREASINGLY RECOGNIZED AS KEY IN AUTISM'S ETIOLOGY."

AND YOU ALSO SAID "THE PERI AND NEONATAL TIME FRAMES ARE IMPORTANT PERIODS OF NEURODEVELOPMENT WITH KEY RELEVANCE TO AUTISM."

THOSE ARE YOUR WORDS IN YOUR BOOK CHAPTER; CORRECT?

A THOSE ARE CORRECT.

Q AND THEN YOU SAID IN A 2017 FACEBOOK POST THAT AGAIN IS IN THE BRIEFING, AND THIS IS THROUGH YOUR COMPANY, YOUR PRIVATE FOR-PROFIT COMPANY CALLED A GREEN SLATE, "I BELIEVE THAT AUTISM IS PRIMARILY DETERMINED BEFORE A CHILD GETS HIS OR HER FIRST VACCINE."

YOU SAID THAT IN 2017; CORRECT?

A I SAID THAT TO A FRIEND WITH AN UNDERSTANDING THAT WE WERE TALKING BETWEEN FRIENDS, A FRIEND OF MINE WHO WAS VERY, VERY WORRIED ABOUT VACCINATING HER CHILDREN.

I DID NOT BELIEVE AT THE TIME, NOR DO I BELIEVE

NOW THAT AUTISM IS DETERMINED BEFORE A CHILD GETS HIS OR HER FIRST VACCINE. A LOT OF KIDS ARE -- OR I WOULD SAY THE MAJORITY OF KIDS GET THEIR FIRST VACCINE AT BIRTH, THAT IS WHAT IS TYPICAL IS TO GET THE FIRST VACCINE AT BIRTH.

MY -- THE WORK THAT I HAVE DONE IN AUTISM HAS CLEARLY SHOWN THAT I -- THAT NEONATAL RISK FACTORS THAT EXTEND BEYOND THE FIRST DAY OF LIFE ARE IMPORTANT AND RELEVANT SO I DID NOT BELIEVE THAT AT THE TIME.

AND SINCE THAT COMMENT TO A FRIEND ON FACEBOOK, A FRIEND WHO I KNOW AND I KNOW WHAT HER CONCERNS ARE AND WHAT SHE WAS ASKING OF ME, IN THE FIVE YEARS SINCE THEN, MY VIEWS OF AUTISM HAVE ACTUALLY CHANGED TO I BELIEVE THAT EVEN LONGER INTO THE INFANCY AND TODDLER YEARS IS RELEVANT AFTER, YOU KNOW, SORT OF FOLLOWING THE LITERATURE FOR THE PAST FIVE YEARS, BUT I DIDN'T EVEN BELIEVE IT THEN AND I CERTAINLY DON'T BELIEVE THAT NOW.

Q OKAY. THANK YOU FOR YOUR ANSWER, DR. GARDENER. I'M VERY NEARLY DONE.

THIS IS NOT YOUR FIRST TIME WORKING AS AN EXPERT IN A CASE THAT INVOLVES THE CAUSES OF AUTISM; IS THAT CORRECT?

A THIS IS MY FIRST -- THIS WAS MY FIRST TIME BEING DEPOSED AND TODAY IS MY FIRST TIME IN A HEARING, WHICH IS A LOT OF FUN, AND -- BUT I HAVE BEEN RETAINED BEFORE AS AN EXPERT WITNESS, BUT IT'S NEVER GOTTEN TO THE POINT THAT CASES HAVE ALWAYS SETTLED BEFORE A DEPOSITION.

Q YOU TOLD ME WHEN I HAD THE OPPORTUNITY TO VISIT WITH YOU BACK IN DECEMBER THAT YOU HAD WORKED AS AN EXPERT ON BEHALF OF A HOSPITAL, SOME DOCTORS AND SOME NURSES WHO IN THAT COMPLAINT WERE ALLEGED TO HAVE BEEN RESPONSIBLE FOR A CHILD DEVELOPING AUTISM BASED ON WHAT HAPPENED AT THE TIME OF THE BIRTH.

DO YOU REMEMBER TELLING ME ABOUT THAT?

A I DO.

Q OKAY.

AND YOU TOLD ME YOU DIDN'T PREPARE A WRITTEN EXPERT REPORT IN THAT CASE.

IS THAT TRUE?

A THAT IS TRUE.

Q OKAY.

AND IN MARYLAND LIKE IN CALIFORNIA, IT'S NOT REQUIRED TO PREPARE A WRITTEN REPORT, INSTEAD WHAT YOU DO IS YOU SEND A DISCLOSURE THAT SUMMARIZES THE EXPERT'S OPINIONS.

DO YOU RECALL THAT?

A I DON'T RECALL THAT. WHAT I DO RECALL IS THAT THE LAWYERS SENT SOMETHING ON MY BEHALF THAT WAS NOT AN ACCURATE REPRESENTATION, WHICH IS WHY I BACKED OUT OF THAT CASE.

Q OKAY.

A I MEAN, HE SAID SOMETHING WITHOUT PASSING IT BY ME, WITHOUT ANY SORT OF CONFIRMATION.

Q DO YOU REMEMBER AN ATTORNEY BY THE NAME OF CHANTALE CUSTODIA WHO YOU WORKED WITH ON THAT CASE?

A I DO.
Q DID YOU COMMUNICATE WITH HER ABOUT YOUR OPINIONS IN THAT CASE?
A I DID.
Q OKAY.
AND DID YOU TALK TO HER ABOUT WHAT THE SCOPE OF YOUR OPINIONS WERE IN THAT CASE?
A YES.
Q OKAY. WE WENT ON THE PUBLIC DOCKET AND WE FOUND THAT --
THE COURT: WELL, COUNSEL, LET ME JUST INTERRUPT YOU.
MR. BOEHM: YEAH, UM-HMM.
THE COURT: THERE IS -- NONE OF THIS EVIDENCE BEARS ON SARGON. THIS MIGHT BE GOOD IN A TRIAL, BUT I DON'T THINK IT BEARS ON SARGON.
MR. BOEHM: YOUR HONOR, THIS WOULD JUST BE -- IT'S THE LAST THING I'M GOING TO DO. IT'S IMPEACHMENT EVIDENCE BECAUSE IT DIRECTLY CONTRADICTS DR. GARDENER'S STATEMENTS AND OPINIONS THAT SHE'S PROVIDED TO THIS COURT.
THE COURT: ALL RIGHT.
MR. BOEHM: SO IF WE CAN PUT UP EXHIBIT 702, I THINK YOUR HONOR CAN, YOU KNOW JUST WEIGH WHETHER OR NOT IT'S WORTH -- YOU KNOW, WHAT -- HOW IT SHOULD BE CONSIDERED.
THE COURT: OKAY.
MR. BOEHM: WE REDACTED JUST OUT OF COURTESY --

MR. WISNER: YOUR HONOR, I JUST WANT TO ISSUE AN OBJECTION. THIS IS NOT AN INCONSISTENT STATEMENT BECAUSE THIS ISN'T HER STATEMENT. THIS IS JUST SOME LAWYER WHO MISREPRESENTED HER.

THE COURT: YEAH, THAT'S MY CONCERN. IT'S HEARSAY UNLESS SHE'S --

MR. BOEHM: WELL, YOUR HONOR, IT'S NOT HEARSAY AND I'LL TELL YOU WHY. IT'S NOT BEING USED FOR THE TRUTH OF THE MATTER ASSERTED. WE'RE NOT TRYING TO ESTABLISH THAT THE OPINIONS DR. GARDENER HAD IN THAT CASE WERE --

THE COURT: MY CONCERN IS FOUNDATION. I DON'T KNOW THAT THESE ARE HER STATEMENTS. IF THEY -- IF IT'S SIGNED BY AN ATTORNEY, IT'S JUST LIKE A COMPLAINT. THE ATTORNEY SIGNS THE COMPLAINT, IT DOESN'T MEAN, UNLESS IT'S VERIFIED, THAT THE PLAINTIFF HAS SWORN TO IT UNDER OATH. SO IS THE LAST SIGNATURE -- IS THE SIGNATURE PAGE BY THE ATTORNEY? IN OTHER WORDS, SHE DIDN'T SIGN THIS, DID SHE?

THE WITNESS: I'VE NEVER EVEN SEEN THIS.

MR. BOEHM: THIS IS A NOTICE OF -- I CAN EXPLAIN, YOUR HONOR. THIS IS A NOTICE OF SERVICE OF DISCOVERY THAT'S AVAILABLE ON THE PUBLIC DOCKET BY GOING TO THE COURT IN MARYLAND.

THE COURT: I UNDERSTAND.

MR. BOEHM: AND THIS IS THE DISCLOSURE THAT'S ASSOCIATED WITH THAT.

THE COURT: YEAH.

MR. BOEHM: AND IT'S THE SAME THING YOU DO IN CALIFORNIA WHERE YOU PROVIDE A DISCLOSURE.

SO, YOUR HONOR -- IF YOUR HONOR -- I UNDERSTAND YOUR HONOR'S POINT. WHAT OUR POSITION WOULD BE IS WE SHOULD BE ABLE TO ASK DR. GARDENER ABOUT IT. IF SHE WANTS TO SAY THAT SHE DIDN'T BELIEVE THIS, IT WAS A MISTAKE BY THE LAWYERS, THEN THAT'S FINE, AND THE COURT CAN WEIGH IT HOWEVER IT SEES FIT, BUT IT --

THE COURT: IT DOESN'T BEAR ON SARGON. IT'S JUST NOT RELEVANT. AND I DON'T KNOW THAT IT'S HER STATEMENTS. I DON'T THINK IT'S FRUITFUL.

MR. BOEHM: OKAY.

YOUR HONOR, I THINK THAT WITH THAT, I WILL PAUSE, AND I DON'T KNOW IF MR. WISNER IS GOING TO HAVE MORE QUESTIONS, BUT I'LL STOP THERE FOR NOW.

THE COURT: OKAY. THANK YOU.

MR. BOEHM: THANK YOU, DR. GARDENER.

THE WITNESS: THANK YOU.

THE COURT: CAN YOU DO TEN MINUTES, MR. WISNER?

MR. WISNER: OH, YES, I CAN GET THIS DONE. I'M GOING TO GO ROCKET FAST, YOUR HONOR. FAMOUS LAST WORDS.

THE COURT: I WILL CONFESS THAT I DO NOT HAVE A ROCKET DOCKET.

MR. WISNER: ALL RIGHT. THERE WE GO.

OKAY. DR. GARDENER -- YOUR HONOR, MAY I PROCEED?

THE COURT: PLEASE.

MR. WISNER: OKAY.

REDIRECT EXAMINATION

MR. WISNER:

Q DR. GARDENER, YOU KNOW, THERE WAS A LOT OF CHARTS SHOWN TO YOU AND I DON'T HAVE THEM IN FRONT OF ME AND I DON'T HAVE THE TIME TO GO THROUGH THE MERCURY CHART. THERE WAS A LOT OF STUDIES AND A LOT OF INFORMATION THROWN UP THERE.

VERY CLEARLY, ARE YOU TESTIFYING TODAY THAT ANY OF THOSE CHARTS THAT YOU WERE SHOWN TODAY WERE ACCURATE?

A NO.

Q OKAY.

A THE CHARTS THAT -- THAT THE OPPOSING COUNSEL JUST SHOWED ME --

Q YES.

A -- I AM NOT, YEAH, I AM NOT STATING THAT THEY ARE ACCURATE.

Q OKAY.

SO I WANT TO QUICKLY FOCUS ON THE ARSENIC CHART BECAUSE THAT ONLY HAD A COUPLE OF STUDIES THAT I SHOWED QUICKLY, OKAY.

DO YOU REMEMBER HE SHOWED YOU THE DOHERTY STUDY, THE ALAMPI STUDY, THE SKOGHEIM STUDY AND THE LONG STUDY FOR ARSENIC?

A YES.

Q AND HE HAD "NO" FOR ANY STATISTICALLY SIGNIFICANT ASSOCIATIONS IN THERE FOR EACH ONE OF THEM?

A CORRECT.

Q ALL RIGHT.

MR. BOEHM: WOULD YOU LIKE ME TO PUT IT UP? I CAN PUT IT BACK UP.

MR. WISNER: NO, IT'S FINE. IT'S FINE. WE'VE ESTABLISHED THAT IT'S FINE.

Q WELL, LET'S LOOK AT THE STUDIES, DOCTOR.

FIRST LET'S LOOK AT DOHERTY. THIS IS EXHIBIT 50.

AND RIGHT -- WE CAN SEE HERE ON PAGE 5 OF THE STUDY, THERE IS A DISCUSSION OF THE RESULTS.

AND IT SAYS RIGHT HERE, "LINEAR REGRESSION MODELS WERE CONSISTENT WITH ADVERSE ASSOCIATIONS BETWEEN BEHAVIORAL OUTCOMES AND ARSENIC AND MN, INCLUDING MATERNAL POST-NATAL TOENAILS. ARSENIC VAS-C-2 BSI SCORES."

AND IT GIVES A BETA COEFFICIENT AND A STATISTICALLY SIGNIFICANT NUMBER.

DO YOU SEE THAT, DOCTOR?

A I DO.

Q AND THEN IT HAS INFANT TOENAIL ARSENIC AND THEN THE BAS-C-2 ADAPTIVE SKILL SCORE. IT GIVES YOU AGAIN A DATA COEFFICIENT AND A CONFIDENCE INTERVAL.

DO YOU SEE THAT?

A I DO.

MR. BOEHM: YOUR HONOR, I OBJECT. THAT'S NOT -- THAT'S NOT -- THAT'S NOT THE SAME HEAVY METAL. THAT'S MANGANESE. AND THAT'S THE INCORRECT FINDING.

MR. WISNER:

Q DOCTOR, I UNDERSTAND --

THE COURT: JUST A MOMENT. IT LOOKS LIKE ARSENIC AND MANGANESE, BUT THE A-S IS ARSENIC, CORRECT?

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

THE COURT: ALL RIGHT. WELL, YOU CAN INQUIRE ABOUT THE ARSENIC FOR SURE.

MR. BOEHM: YEAH, ABOUT -- BUT HE ASKED ABOUT -- OKAY.

MR. WISNER:

Q AND, DOCTOR, IT SAYS RIGHT HERE, INFANT TOENAIL A-S BAS C-2 ADAPTIVE SKILLS SCORES AND IT GIVES A BETA COEFFICIENT AND A CONFIDENCE INTERVAL FOR ARSENIC; RIGHT?

A YES.

Q OKAY.

WITH THIS STATEMENT BY THE AUTHORS THAT LINEAR REGRESSION MODELS WERE CONSISTENT WITH ADVERSE ASSOCIATION BETWEEN BEHAVIORAL OUTCOMES AND ARSENIC AND MANGANESE, IS THERE ANY WAY YOU CAN SAY THAT THIS STUDY WAS NO FOR NO ASSOCIATION?

A NO, I THINK WE CLASSIFIED IT AS YES FOR THAT REASON.

Q YEAH, BECAUSE THAT'S WHAT THE AUTHORS TOLD US; RIGHT?

A CORRECT.

Q OKAY.

LET'S LOOK AT ALAMPI. THIS WAS ALSO SHOWN TO YOU AS A NEGATIVE STUDY.

THIS IS EXHIBIT 24 IN THE RECORD.

AND LET'S GO TO PAGE 5.

SPECIFICALLY, IN THE RESULTS SECTION, AND THIS IS UNDER THE FREQUENT LIST OF LINEAR REGRESSION ANALYSIS.

DO YOU SEE THAT, DOCTOR?

A YES.

Q AND IT SAYS THE P VALUES FOR LINEAR AND QUADRATIC DEVIATION FROM HOMOSCEDASTICITY WERE PRESENTED IN LEAD TABLE 2.

STOP RIGHT THERE.

WHAT IS HOMOSCEDASTICITY?

A HOMOSCEDASTICITY. THAT RELATES TO -- OH, THAT'S A -- YOU'RE REALLY TESTING ME ON MY EPI RIGHT NOW. BUT IT'S THE RELATIONSHIP OF THOSE VALUES, LIKE THE DISTRIBUTION OF THOSE VALUES.

Q THAT'S RIGHT.

SO WE'RE COMPARING THE CONTROLS VERSUS THE KIDS WITH AUTISM AND THE KIDS WITHOUT AUTISM; RIGHT?

A CORRECT.

Q OKAY.

AND IT SAYS ARSENIC, CADMIUM, LEAD, THAT THING, AND MCCP HAD STATISTICALLY SIGNIFICANT DEVIATIONS.

DO YOU SEE THAT?

A YES.

Q AND THAT'S AFTER ADJUSTING FOR CONFOUNDERS.

DO YOU SEE THAT?

A YES.

Q AGAIN, THAT'S A STATISTICALLY SIGNIFICANT

RESULT; RIGHT?

A YES, BUT I WOULD HAVE TO LOOK -- I WOULD HAVE TO LOOK AT THE PAPER MORE TO UNDERSTAND EXACTLY WHAT THAT'S REFERRING TO.

Q FAIR ENOUGH.

HE SHOWED YOU QUOTES. I'M JUST SHOWING YOU QUOTES. WE'RE DOING THE BATTLE OF QUOTES HERE.

LET'S LOOK AT SKOGHEIM.

AGAIN, THIS IS EXHIBIT 119 AND THERE'S TWO PORTIONS I WANT TO SHOW YOU.

THE FIRST IS THE SECTION AS IT RELATES TO A -- OR I'M SORRY -- ASD. LET ME PULL IT UP THERE.

AND IT SAYS, "FOR ASD THE QUARTILE MODELS SHOWED AN ELEVATED RISK FOR CHILDREN IN QUARTILE 2 OF ARSENIC."

AND IT GIVES YOU AN ODDS RATIO THAT'S STATISTICALLY SIGNIFICANT.

DO YOU SEE THAT?

A I DO.

Q "COMPARED TO A QUARTILE 1 REFERENCE WITH A DECREASING MONOTONIC TREND IN THE NEXT TWO QUARTILES."

DO YOU SEE THAT?

A I DO.

Q NOW, THE AUTHORS HERE ARE REPORTING, QUOTE, "A STATISTICALLY" -- OR NOT QUOTE -- ARE SPECIFICALLY CITING A STATISTICALLY SIGNIFICANT ELEVATED ODDS RATIO.

IS THAT RIGHT?

A YES. FOR QUARTILE 2 VERSUS QUARTILE 1.
Q EXACTLY.
AND THEN LATER ON IN THE LEAD SECTION ON PAGE 9 -- I'M SORRY -- ON THE ARSENIC SECTION IN PAGE 9, THEY SPECIFICALLY SAY, "OUR FINDINGS OF INCREASED RISK OF ASD AND ADHD ASSOCIATED WITH PRENATAL ARSENIC EXPOSURE ARE IN LINE WITH THE EPIDEMIOLOGICAL LITERATURE WITH NUMEROUS STUDIES DOCUMENTING THE DEVELOPMENTAL NEUROTOXIC EFFECT OF ARSENIC."
DO YOU SEE THAT?
A I DO.
Q SO AGAIN, THE SKOGHEIM AUTHORS SURELY AREN'T CHARACTERIZING THERE TO BE A LACK OF AN ASSOCIATION. THEY ARE SAYING IT'S THERE AND THAT IT'S ACTUALLY CONSISTENT WITH THE EPIDEMIOLOGICAL LITERATURE; RIGHT?
A THAT'S WHAT THEY ARE SAYING.
Q WOULD IT BE APPROPRIATE IN YOUR MIND TO CHARACTERIZE THIS AS A "NO" ON A CHART?
A NO.
Q OKAY.
MR. BOEHM: YOUR HONOR, I WOULD JUST -- I DON'T KNOW IF I'M GOING TO HAVE A CHANCE TO EXAMINE THE WITNESS, BUT I JUST NEED TO PUT ON THE RECORD THAT THE SCOGHEIM AUTHORS ACTUALLY SPECIFICALLY REFER TO THE LITERATURE AS INCONSISTENT, AND IF I HAVE AN OPPORTUNITY TO EXAMINE AGAIN, I WOULD BRING THAT OUT.
THE COURT: I PICKED THAT UP. I PICKED THAT

UP.

MR. BOEHM: OKAY. THANK YOU.

THE COURT: YEAH.

MR. WISNER: FAIR ENOUGH. YOUR HONOR, I TRIED MY BEST NOT TO TESTIFY DURING THE CROSS EXAMINATION. IF I KNEW THAT WAS ALLOWED, I PROBABLY WOULD HAVE JUMPED IN WITH ALL THE INACCURACIES I SAW. BUT FAIR ENOUGH, YOUR HONOR.

THE COURT: WELL...

MR. WISNER:

Q ALL RIGHT. LET'S GO TO THE LAST STUDY, THE LONG STUDY.

AND HERE, DOCTOR, THE AUTHORS REPORT -- THIS AGAIN WAS REPRESENTED AS A NO, AND YOU ACTUALLY DISCUSS THIS IN YOUR REPORT, AND I WANT TO SHOW YOU THAT IN JUST ONE SECOND.

BUT HERE'S WHAT THE AUTHORS SAY.

THIS WAS EXHIBIT 92. AND WE'RE ON PAGE 8.

IT SAYS, "HOWEVER, NO SIGNIFICANT" -- IT SAYS, "HOWEVER, ALTHOUGH NO SIGNIFICANT ASSOCIATION BETWEEN TOXIC METALS AND ASD RISK WAS OBSERVED, WE NOTICED THAT ADJUSTED ODD RATIOS WERE 1.496 WITH A CONFIDENCE INTERVAL OF .924 AND 2.424 WITH A P VALUE OF .101 FOR ARSENIC."

DO YOU SEE THAT?

A YEAH, THAT REALLY SORT OF IS SUGGESTIVE OF AN ASSOCIATION.

AND LIKE I SAID EARLIER, ESPECIALLY WITH

SMALLER STUDIES, WE GIVE OURSELVES SOME WIGGLE ROOM. LIKE, THAT HAS A P VALUE OF .10 WITH A LOWER BOUND OF .92. THAT'S REALLY JUST SHY OF STATISTICAL SIGNIFICANCE AND WITH AN ODDS RATIO OF 1.496.

YOU -- THAT -- I REMEMBER THIS. THAT THIS REALLY CONTRIBUTED TO MY -- IN MY HEAD AFTER REVIEWING THE LITERATURE AND THE STRENGTHS AND WEAKNESSES OF THIS STUDY, THIS WAS COMPELLING TO ME DESPITE IT BEING JUST SHY OF FORMAL STATISTICAL SIGNIFICANCE.

Q AND, IN FACT, IN YOUR REPORT, GOING TO EXHIBIT 2, NOW WE'RE ON PAGE 32 OF YOUR REPORT, YOU SPECIFICALLY STATE THAT.

YOU STATE, "MOREOVER, A SMALLER DANISH STUDY PUBLISHED IN 2019 EVALUATED AMNIOTIC FLUID SAMPLES FROM 37 ASD CASES AND 50 CONTROLS BETWEEN FOUR YEAR PERIODS, THEY QUOTE THE LONG STUDY."

DO YOU SEE THAT, DOCTOR?

A I DO. LIKE I SAID, THAT'S A TINY STUDY SO YOU'RE GOING TO STILL SEE A STRONG ASSOCIATION LIKE THAT BEING JUST SHY OF STATISTICAL SIGNIFICANCE BECAUSE IT WAS SO SMALL.

Q YEAH.

AND YOU SAY IN YOUR REPORT, YOU SAID, "THE ASSOCIATION OF ARSENIC AND ASD WAS SHY OF STATISTICAL SIGNIFICANCE WITH AN ADJUSTED ODDS RATIO PER ONE MILLIGRAM LITTER INCREASE IN ARSENIC OF 1.5."

AND YOU GIVE THE CONFIDENCE INTERVAL.

"BUT THE RESULTS DID SUGGEST A CONTRIBUTION OF PRENATAL ARSENIC EXPOSURE IN RELATION TO ASD."

DO YOU SEE THAT?

A I DO.

Q AND, AGAIN, DOCTOR, IN YOUR OPINION, DO YOU THINK PUTTING "NO" ON A CHART WOULD BE APPROPRIATE IN CHARACTERIZING THE NUANCES OF THE DATA?

A NO, I DON'T. I HAD MEANT TO BRING THAT UP ACTUALLY THAT, BECAUSE I REMEMBERED THERE WAS ONE OF THOSE ASSOCIATIONS THAT WAS, LIKE, IN A SMALL STUDY JUST SO SHY OF STATISTICAL SIGNIFICANCE.

MR. WISNER: THANK YOU.

I HAVE NO FURTHER QUESTIONS AT THIS TIME, YOUR HONOR.

THE COURT: ALL RIGHT. WELL, I THINK WE NEED TO ADJOURN, BUT LET'S FIGURE -- THANK YOU, DOCTOR, VERY MUCH. YOU'VE BEEN VERY PATIENT.

THE WITNESS: THANK YOU.

MR. BOEHM: THANK YOU, DR. GARDENER.

THE WITNESS: THANK YOU.

THE COURT: LET'S TALK ABOUT WHAT WE'RE DOING NEXT.

I HAVE -- I THINK WE HAVE TOMORROW OFF.

MR. WISNER: THAT'S RIGHT.

THE COURT: WELL, GOOD. NO ONE IS DISAGREEING WITH THAT.

MR. BOEHM: YES THAT'S CORRECT, YOUR HONOR.

THE COURT: ALL RIGHT. GOOD. AND THEN ON FRIDAY, I HAVE THE DAY MOSTLY BLOCKED OFF FOR YOU. AND WHAT'S THE AGENDA FOR FRIDAY?

MR. WISNER: SO ON FRIDAY, YOUR HONOR, WE'VE TALKED ABOUT IT AND WE'VE DECIDED THAT THE BEST APPROACH WOULD BE TO DO DR. ASCHNER AS SCHEDULED IN THE MORNING. HE WILL BE OFF PROBABLY IN THE MIDDLE OF THE AFTERNOON, AND THEN WE'LL FINISH UP THE DAY ON FRIDAY WITH THE COMPLETION OF DR. RITZ'S EXAMINATION.

THE COURT: OKAY. IS THAT AGREEABLE TO EVERYBODY, I GATHER.

MR. WISNER: YEAH, WE --

THE COURT: ALL RIGHT. AND WHAT TIME WOULD YOU LIKE TO BEGIN ON FRIDAY?

MR. WISNER: 9:30 OR 9:00 A.M., THE EARLIER THE -- AS MUCH TIME AS YOU'RE WILLING TO GIVE US, WE'LL TAKE IT.

THE COURT: OKAY. WELL, LET'S SHOOT FOR 9:00 A.M., THEN.

MR. WISNER: OKAY.

THE COURT: AND I MAY HAVE TO INTERRUPT WITH A COUPLE LITTLE THINGS AROUND 10:00 O'CLOCK. WE'LL SEE IF THEY ARE STILL ON CALENDAR.

MR. WISNER: I WILL ELBOW MY CO-COUNSEL TO TAKE A BREAK AT 10:00 A.M.

THE COURT: YEAH. WELL, THE OTHER THING IS WANT TO MAKE SURE WE FINISH. IF WE CAN FINISH A LITTLE

EARLY, THAT WOULD BE EVEN BETTER SO LET'S SEE WHAT WE CAN DO. I WOULD APPRECIATE THAT.

I SEE MR. PETROSINELLI HAS JOINED US. HI.

MR. PETROSINELLI: HOW ARE YOU, YOUR HONOR?

THE COURT: I'M FINE.

ANY OTHER HOUSEKEEPING TODAY?

MR. WISNER: YEAH, SO THERE'S ONE ISSUE THAT WE SORT OF ARE DISAGREEING ON AND WE KIND OF WOULD NEED YOUR GUIDANCE. AND MAYBE YOU CAN'T TELL US UNTIL FRIDAY.

OUR THINKING WAS WE WOULD DO -- MY THINKING WAS THAT WE DO OUR CLOSINGS 45 MINUTES EACH ON TUESDAY AFTERNOON AT THAT TIME FRAME, THE TIME SCHEDULE THAT YOU TOLD US ABOUT BECAUSE INSTEAD OF THAT TIME THAT WE HAD RESERVED FOR THIS, WE'RE USING DR. RITZ TO FINISH OFF HER TESTIMONY.

WITH THAT SAID, YOUR HONOR, WE WILL -- MR. PETROSINELLI AND I SORT OF HAVE A FUNDAMENTAL THRESHOLD DISAGREEMENT ABOUT WHETHER OR NOT THEY EVEN NEED TO HAPPEN BECAUSE HE BELIEVES THAT HE NEEDS TO CALL IN ALL OF HIS EXPERTS TO TESTIFY IN MARCH AS PART OF THE SARGON RECORD, BUT WE DON'T THINK THAT'S NECESSARY. WE THINK THAT RULE 402 DOESN'T ACTUALLY PROVIDE FOR OFFERS OF PROOF UNLESS THE PARTIES -- THE TESTIMONY IS BEING STRICKEN BECAUSE THEY ARE ATTACKING OUR TESTIMONY, WE -- THEY DON'T NEED TO MAKE A PROFER. WE THINK THE CASE LAW IS PRETTY CLEAR ON THAT.

AND SO WE REALLY WOULD LIKE JUST LIKE TO

FINALLY FINISH THIS UP ON TUESDAY AND GET THE CASE GOING, BUT I THINK WE DISAGREE UPON WHETHER OR NOT THERE'S GOING TO BE NEED FOR FURTHER TESTIMONY.

THE COURT: AND I THINK I'VE KIND OF WAVERED ON IT, BUT LET'S TALK ABOUT IT ON FRIDAY BECAUSE WE NEED TO THINK IT THROUGH. IT SEEMS TO ME THAT THE ATTORNEYS WHO HAVE ALREADY MET WITH THEIR EXPERTS SHAPE THE CROSS EXAMINATION TO DEMONSTRATE, IN ESSENCE, WHAT THEIR EXPERTS ARE GOING TO SAY.

SO I THINK WHAT I WOULD LIKE IS AN OFFER OF PROOF FROM -- ON FRIDAY - WE'LL SQUEEZE IT IT SOMEWHERE. WHAT IS IT YOU THINK THE EXPERTS ARE GOING TO SAY. I'D WANT TO MAKE SURE THAT I THINK I NEED THAT FOR A SARGON RULING. I THINK IT'S A LITTLE DANGEROUS FROM THE DEFENDANTS' POINT OF VIEW TO PRESENT EXPERTS BECAUSE I THINK IT THEN OPENS THE RECORD UP TO AN ARGUMENT THAT THE COURT SOMEHOW BALANCED THE EVIDENCE OR DIDN'T DO ITS JOB PROPERLY, SO YOU MIGHT WANT TO THINK THAT THROUGH CAREFULLY, BECAUSE I THINK THE FUNDAMENTAL RULE, I THINK IS CORRECTLY STATED BY MR. WISNER. THE POINT OF A 402 IS I HEAR WHAT THE EXPERT HAS TO SAY, DOES IT HOLD WATER OR NOT? AND I DON'T KNOW HOW THE EXPERTS ENLIGHTEN THAT OTHER THAN TO TELL ME THAT THE STUDIES, JUST AS A CROSS EXAMINATION HAS ATTEMPTED TO SAY -- OH, YES, I CAN EXCUSE THE WITNESS. YES, THANK YOU.

MR. WISNER: I WAS TEXTING HER AS WE SPOKE.

THE COURT: OH, YEAH. BY THANKING HER, I MEANT TO EXCUSE HER. THANK YOU. ALFREDO IS KEEPING ME

STRAIGHT.

THE WITNESS: OKAY.

MR. PETROSINELLI: YOUR HONOR, WE COULD BE PREPARED TO DO THAT ON FRIDAY.

THE COURT: OKAY.

MR. PETROSINELLI: WE THINK IT'S CRITICALLY IMPORTANT FOR REASONS WE'VE COVERED WITH YOU BEFORE.

THE COURT: YEAH.

MR. PETROSINELLI: BUT ON FRIDAY WE CAN TALK ABOUT WHY EXACTLY WE THINK WE NEED TO DO IT.

THE COURT: OKAY. THAT WOULD BE HELPFUL BECAUSE OBVIOUSLY I KNOW A LOT MORE NOW THAN I DID BEFORE AND SO I HAVE CONTEXT THAT I DIDN'T HAVE BEFORE AND I'M OPEN EITHER WAY, BUT I JUST WANT TO MAKE SURE WE'RE DOING IT APPROPRIATELY.

MR. PETROSINELLI: THANK YOU, YOUR HONOR.

THE COURT: YOU'RE WELCOME. SO I APPRECIATE THAT. AND WE WILL HAVE THE DAY OFF TOMORROW FROM THIS CASE ONLY, AND I'LL SEE YOU ON FRIDAY. I'M GOING TO SHOOT TO GET HERE AT 9:00 O'CLOCK AND START WITH YOU RIGHT AWAY.

MR. WISNER: THANK YOU, YOUR HONOR.

MR. PETROSINELLI: HAVE A GOOD EVENING, YOUR HONOR. THANK YOU.

{TIME NOTED: 4:36 P.M.}

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 6TH DAY OF FEBRUARY, 2022.

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