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Narrator: WE ALL TAKE RISKS.

BUT SOME RISKS ARE NOT TAKEN BY CHOICE.
BY SIMPLY BREATHING AIR OR DRINKING WATER
WE CAN EXPOSE OURSELVES TO SERIOUS HEALTH HAZARDS.
THIS IS ESPECIALLY TRUE IN A SMALL MIDWEST COMMUNITY WHERE HOWARD HU AND HIS TEAM ARE DISCOVERING ENVIRONMENTAL DANGERS UNEARTHED FROM OVER 60 YEAR SOF MINING.

BUT DANGEROUS EXPOSURES ARE FOUND EVERYWHERE.
IN NEW YORK'S INNER CITY ROBIN WHYATT IS RESEARCHING THE EFFECTS SOME COMMON HOUSEHOLD CHEMICALS MAY BE HAVING ON US AND OUR CHILDREN.
TWO STUDIES IN TWO VERY DIFFERENT PLACES
BOTH MEASURING HAZARDOUS EXPOSURES PROVIDE A BETTER UNDERSTANDING OF THE UNSEEN RISKS THAT WE ALL TAKE EVERY DAY AND THE CONSEQUENCES THOSE RISKS HAVE ON OUR HEALTH.

LOCATED IN THE FAR NORTHEASTERN CORNER OF OKLAHOMA THE TOWN OF Picher HAS A UNIQUE LANDSCAPE. JUST STEPS AWAY FROM HOMES, SCHOOLS, AND PLAYGROUNDS SIT MAN-MADE MOUNTAINS.

SINCE THE TURN OF THE LAST CENTURY THROUGH THE 1970s THE ABUNDANT UNDERGROUND RESOURCES OF LEAD AND ZINC ORE WERE MINED TO SUPPLY, AMONG OTHER THINGS MATERIAL FOR AMMUNITION USED DURING WORLD WAR II. BUT ALONG WITH THE LEAD AND ZINC CAME TONS OF MINING WASTE CREATING THESE MOUNDS, CALLED CHAT PILES
THAT HAVE ALWAYS BEEN A FIXTURE IN THIS COMMUNITY.
Woman: I'VE LIVED HERE MY ENTIRE LIFE AND THE CHAT PILES WERE OUR FRIENDS. THAT'S WHEREY OUR BIRTHDAY PARTIES WERE WHERE YOU HAD WIENER ROASTS. WHERE YOU HAD HIGH-SCHOOL FOOTBALL BONFIRES. ALL THOSE KINDS OF ACTIVITIES WERE WHERE WE GATHERED.

Narrator: BUT THESE CHAT PILES CONTAIN HIGH LEVELS OF HEAVY METALS -- NOT ONLY THE LEAD AND ZINC BUT ALSO CADMIUM, COPPER, AND NICKEL.

AND THE CHAT IS NOT JUST IN THE PILES. IT HAS BEEN USED TO MAKE ASPHALT FOR ROADS AND AS FILLER BETWEEN HOUSES IN NEIGHBORHOODS LIKE THE ONE WHERE C.C. FREDERICH HAS LIVED FOR 17 YEARS. HERE, SEE, THAT'S ALL CHAT DOWN IN THE ALLEYS.
IT'S LEAD-CONTAMINATED. YOU KNOW THAT.
Narrator: TAR CREEK, FLOWING THROUGH PICHER IS ALSO HIGHLY CONTAMINATED.
Woman: IT IS A POLLUTED CREEK. IT'S A CREEK THAT IS LOADED WITH LEAD
BUT IT'S ALSO LOADED WITH A LOT OF OTHER METALS AND THINGS THAT CAN CONTAMINATE AND HARM PEOPLE.
WE NEED TO GET THE WORD OUT.
Narrator: REBECCA JIM IS THE DIRECTOR OF L.E.A.D. A COMMUNITY-ACTION AGENCY.
THROUGH THE YEARS SHE HAS WITNESSED FIRST HAND THE EFFECTS OF TOXINS IN PICHER.
Jim: I WAS AN EDUCATOR HERE IN THIS COMMUNITY FOR OVER 25 YEARS.
AND WHAT I FOUND WHEN I FIRST GOT HERE WAS CHILDREN THAT WERE READY TO LEARN, AND THEY WERE ABLE TO AND THEY WERE EAGER, AND THEY WERE EXCITED AND THEY COULD LEARN EASILY.
AND THROUGH THOSE YEARS THOSE CHILDREN BECAME MORE EXPOSED AND, I THINK, BECAME DAMAGED. 

Man: REBECCA JIM CONTACTED ME IN THE MID-1990s AND ASKED ME WHETHER I COULD MEASURE SOME OF THE TEETH THAT SHE HAD COLLECTED FROM SCHOOL-AGE CHILDREN FOR LEAD. WE MEASURED THOSE TEETH. THE LEVELS WERE RELATIVELY HIGH. 

Narrator: THE TESTS FURTHER CONFIRMED REBECCA JIM’S SUSPICIONS -- THAT THE CHILDREN WERE BEING AFFECTED BY LEAD POISONING. MANY OF THE PROBLEMS LEAD CAUSES IN THE HUMAN BODY APPEAR TO BE ASSOCIATED WITH ITS ABILITY TO MIMIC OR INHIBIT THE ACTION OF ANOTHER METAL -- CALCIUM. 

CALCIUM CAN ONLY ENTER THE BODY’S CELLS BY BINDING TO A SPECIFIC PROTEIN. 

ONCE IN THE CELLS
IT PLAYS AN IMPORTANT ROLE IN THE CONDUCTION OF NERVE IMPULSES VITAL FOR NORMAL BRAIN FUNCTION.

LEAD BINDS ITSELF TO THE SAME PROTEIN AS CALCIUM INTERFERING WITH THESE PROCESSES.

THIS INTERFERENCE CAN HAVE LASTING EFFECTS ON THE DEVELOPING BRAIN OF A CHILD SUCH AS LOSS OF I.Q. AND SPEECH, LANGUAGE, AND BEHAVIORAL PROBLEMS.

Jim: IT CHANGES THE WAY THE WHOLE CLASS LEARNS. IF YOU HAVE HALF OF YOUR CLASS OR A THIRD OF YOUR CLASS LEAD-POISONED WHICH IS A REAL POSSIBILITY YOU CAN ALMOST CHASE OFF A TEACHER. [ LAUGHS ] IT CHANGES HOW THINGS WORK.

Narrator: BUT LEAD IS NOT THE ONLY METAL THIS COMMUNITY IS BEING
EXPOSED TO.
IN 2004
A TEAM OF RESEARCHERS FROM
THE HARVARD SCHOOL OF PUBLIC
HEALTH
BEGIN TO ASK DIFFERENT, MORE
COMPLEX QUESTIONS
ABOUT THE EXPOSURES HERE.

Hu: THE FUNDAMENTAL
RESEARCH QUESTION WE'RE
ADDRESSING IS
WHAT ARE THE HEALTH EFFECTS
OF MIXTURES OF METALS --
IN THIS CASE, THE MIXTURES OF
LEAD, MANGANESE
CADMIUM, AND ARSENIC THAT
EXIST IN MINING WASTE?

WE HAVE VERY GOOD IDEAS
OF WHAT INDIVIDUAL TOXICANTS
CAN DO TO PEOPLE.
HOWEVER, YOU CANNOT PREDICT
WHAT THE ULTIMATE HUMAN
HEALTH IMPACTS MIGHT BE
FROM SIMPLY KNOWING WHAT
THE INDIVIDUAL TOXICANTS CAN
DO.
MIXTURES CAN, IN THE MOST
EXTREME CASES
INTERACT IN WAYS THAT ARE
UNFORESEEN
AND GIVE YOU TOXIC RAMIFICATIONS THAT ARE MUCH GREATER THAN WHAT COULD BE PREDICTED FROM THE SINGLE EXPOSURES.
ON THE OTHER HAND, IN SOME MIXTURES TOXICANTS CAN CANCEL OUT THE EFFECTS OF EACH OTHER. SO THIS JUST HAS TO BE STUDIED WELL AND PROPERLY FOR US TO UNDERSTAND WHAT THE REAL RISKS ARE.
ONE OF THE STUDIES IS LOOKING AT METAL LEVELS IN THE IMMEDIATE LIVING ENVIRONMENT OF THE PEOPLE IN THE STUDY -- THEIR AIR, THEIR FOOD, THEIR WATER, THEIR HOUSE DUST -- SO THAT WE HAVE A BETTER IDEA OF HOW THESE METALS MAY TRAVEL FROM THESE MINING SITES TO THE ACTUAL PEOPLE THEMSELVES.

Narrator: WIND AND HUMAN ACTIVITY KICK UP CONTAMINATED DUST OFF THE CHAT PILES
WHICH IS THEN BLOWN INTO THE COMMUNITY.
THE RESEARCHERS SET UP AIR MONITORS THROUGHOUT THE AREA
AND TAKE DUST AND WATER SAMPLES WITHIN PEOPLE'S HOMES.
THEY CAN COMPARE THESE SAMPLES TO BLOOD TAKEN FROM STUDY PARTICIPANTS TO GAIN A MUCH BETTER UNDERSTANDING OF HOW PEOPLE ARE BEING EXPOSED WHAT THE DIFFERENT EXPOSURE LEVELS ARE AND WHAT EFFECT THOSE EXPOSURES MAY HAVE ON RESIDENTS' HEALTH.
AMI ZOTA HAS BEEN WORKING ON THE STUDY FOR OVER THREE YEARS.
THEY'RE BOTH ABOUT THE SAME.
THEY'RE BOTH 97.
Woman: WE'RE ATTEMPTING TO STUDY METALS AS THEY EXIST IN THE REAL ENVIRONMENT SO WE'RE ATTEMPTING TO STUDY MIXTURES
WHICH ARE A BIT MORE MESSY, BUT CAN HAVE MONUMENTAL IMPACT FOR THE WAY WE UNDERSTAND ENVIRONMENTAL EXPOSURES AND POLLUTION PROBLEMS.

SOME OF THE METALS WE'RE STUDYING HAVE MULTIPLE RELATIONSHIPS WITH HUMANS WHERE THEY CAN BE BOTH NUTRIENTS BUT THEY CAN ALSO BE TOXIC. SO YOU WANT TO STAY WITHIN A CERTAIN RANGE. BUT THE THING IS, WITH A LOT OF THESE METALS IN TERMS WITH ENVIRONMENTAL CONDITIONS WE DON'T KNOW WHAT, EXACTLY, IS TOO MUCH. SO WE DON'T KNOW EXACTLY WHERE THAT TOXIC LINE BEGINS.

Narrator: AFTER COLLECTING SAMPLES AMI TAKES THEM BACK TO THE LAB IN BOSTON, MASSACHUSETTS FOR ANALYSIS. THE MAIN THING WE CAN SEE RIGHT NOW IS THAT THERE IS A RANGE OF
RESULTS.
AND THIS IS INTERESTING FROM A SCIENTIFIC PERSPECTIVE BECAUSE IT GIVES YOU SOMETHING TO STUDY. IT'S NOT LIKE EVERYONE IS EXPERIENCING THE SAME THING AND BEING EXPOSED THE SAME WAY AND THERE'S NOT JUST ONE BLANKET PROBLEM THAT'S AFFECTING EVERYONE IN THE AREA THE SAME WAY. WE'RE JUST RIGHT ON THE PEAK OF REALLY GETTING A LOT OF DATA TO REALLY BE ABLE TO START UNDERSTANDING WHAT'S GOING ON.

Narrator: WHILE THIS STUDY IS CONCERNED WITH EXPOSURE LEVELS IN THE COMMUNITY AS A WHOLE THE REAL FOCUS IS ON BABIES AND YOUNG CHILDREN. VOLUNTEER MOTHER-INFANT PAIRS HAVE BEEN ENROLLED SINCE BIRTH SO THE TEAM CAN TRACK EXPOSURE LEVELS IN THEIR BLOOD.
THOUGH IN THE EARLY STAGES OF RESEARCH, SOME OF THE INITIAL RESULTS HAVE BEEN ENCOURAGING. EXPOSURES AREN'T QUITE AS HIGH AS THEY HAD BEEN MEASURED PERHAPS 10 OR 15 YEARS AGO. WE DON'T KNOW YET WHY THAT MIGHT BE TRUE OR WHETHER IT'S TRUE FOR ALL CHILDREN IN THIS AREA BUT WE'RE CERTAINLY HOPEFUL THAT THE RESIDENTS AS THEY GAIN MORE KNOWLEDGE OF THESE EXPOSURES THEIR POTENTIAL EFFECTS, AND HOW TO AVOID THEM MAY BE ACTUALLY REDUCING THEIR OWN EXPOSURES THROUGH SIMPLE COMMON-SENSE MEASURES AND THAT'S MAYBE WHY WE'RE SEEING A REDUCTION. THE OLDEST CHILDREN ARE ONLY AROUND 3 YEARS OLD OR SO. OUR EVENTUAL GOAL IS TO TRY TO FOLLOW THEM AS THEY GET INTO SCHOOL AND UNDERSTAND HOW THEIR EXPOSURES MAY IMPACT HOW WELL THESE CHILDREN CAN
THINK AND PERFORM.
WHAT IS THEIR I.Q.? WHAT IS THEIR COORDINATION?
WHAT IS THEIR ABILITY TO THINK ABSTRACTLY?
IT'S A SUBTLE ISSUE.
BUT ON THE OTHER HAND
IF METALS ACTUALLY LOWER YOUR CHILD'S I.Q.
BY 5 POINTS OR 10 POINTS IT'S NOT SOMETHING YOU'RE EVER GOING TO RECOGNIZE BUT IT'S SOMETHING, OBVIOUSLY THAT WILL BE HUGELY IMPORTANT FOR PARENTS AS WELL AS THE CHILDREN.
Narrator: BUT THIS POPULATION STUDY IS JUST ONE PIECE OF THE PUZZLE.
DR. JIM SHINE IS THE PRINCIPAL INVESTIGATOR FOR ANOTHER STUDY CONCERNED WITH HOW THE METALS ARE BEING TRANSPORTED INTO THE COMMUNITY.

Man: WE REALLY WANT TO BE ABLE TO QUANTIFY WHERE THE METALS ARE COMING FROM.
AND IF WE CAN DO THAT THEN WE CAN FIGURE OUT WHAT'S THE BEST STRATEGY TO PREVENT ADDITION OF METALS INTO THE STREAM WHICH GO DOWN THE RIVER.

Narrator: ONE OF HIS STUDIES IS FOCUSED ON HOW RAINWATER MAY FILTER THROUGH THE CONTAMINATED ROCK IN THE CHAT PILES AND ENTER TAR CREEK.
Man: HERE'S WATER. IT COULD HAVE BEEN RAINWATER OR WHATEVER. FELL ON THE CHAT PILES HERE, PERCOLATED THROUGH AND NOW IT’S COMING OUT THE BOTTOM CARRYING THE CONTAMINATED HEAVY METALS -- WHICH YOU CAN SEE IT RUNNING DOWN RIGHT INTO THE STREAM DOWN THERE. WHEN WE'VE MEASURED SOME OF THE CONCENTRATIONS OF CADMIUM, LEAD, AND ZINC IT'S HIGHLY ELEVATED LEVELS OF HEAVY METALS IN THIS WATER THAT'S RUNNING OUT FROM
UNDERNEATH THE CHAT PILE.
Narrator: BUT CHAT PILES ARE NOT THE ONLY SOURCE OF HEAVY METALS.
BELOW GROUND EXIST HUNDREDS OF MILES OF ABANDONED MINES NOW FILLED WITH CONTAMINATED WATER.

THIS WATER IS NOW BUBBLING UP TO THE SURFACE.

Dr. Shine: THIS IS GROUNDWATER BUBBLING UP FROM UNDERGROUND.
WHAT HAPPENS IS THE IRON WHEN IT'S UNDERGROUND AND THERE'S NO OXYGEN IT CAN STAY DISSOLVED. BUT ONCE IT COMES UP, IT OXIDIZES AND ESSENTIALLY WHAT YOU'RE LOOKING AT IS RUST.
YOU CAN SEE THE MIXING. HERE COMES THE ACID MINE WATER. YOU CAN SEE THE LINE WHERE IT GOES FROM ORANGE TO CLEAR. AND THE QUESTION IS WHAT'S THE AMOUNT OF TOXIC HEAVY METALS THAT ARE COMING ALONG WITH
THAT RUST?

Narrator: TO GAIN A CLEARER UNDERSTANDING OF WHERE THE METALS ARE COMING FROM DR. SHINE AND HIS TEAM TAKE SAMPLES OF WATER AT DIFFERENT POINTS ALONG TAR CREEK.

Dr. Shine: WE WILL PROCESS THESE TAKE THEM BACK TO THE LAB AND ANALYZE THEM FOR HEAVY-METAL CONTENT.

Narrator: BACK AT THE LAB IN BOSTON LAUREL SCHAIDER IS EVALUATING THE SAMPLES TAKEN FROM TAR CREEK USING A MASS SPECTROMETER. Woman: SO WE RUN THE SAMPLE THROUGH AND IT SEPARATES THE METALS BASED ON THEIR ATOMIC MASS. AND THEN WE'RE ABLE TO QUANTIFY THE CONCENTRATION OF THE METALS IN THE SAMPLES. AND SO THIS MACHINE CAN TELL US
LEAD, CADMIUM, ZINC, MANGANESE CONCENTRATIONS ALL AT THE SAME TIME.

Narrator: WHILE THIS RESEARCH IS ONGOING RESULTS FROM SAMPLES COLLECTED DURING ONE TRIP SHOW THE COMPLICATED NATURE OF THIS STUDY.

5% OF TAR CREEK'S OVERALL FLOW RATE WAS COMING FROM THE CHAT PILES AND 40% FROM THE MINES. 90% OF THE CADMIUM ORIGINATED FROM THE CHAT PILES AND 4% FROM THE MINES.

FOR ZINC, THE SPLIT WAS ABOUT 30% FROM THE CHAT PILES AND 50% FROM THE MINES. AND FOR LEAD, IT IS SPLIT ALMOST EQUALLY. THESE TRENDS VARY THROUGHOUT THE YEAR AND ONGOING RESEARCH WILL EXPLORE THE IMPORTANCE OF MINE SEEPAGE AND CHAT-PILE RUNOFF AS SOURCES OF METAL LOADING.
OVER EXTENDED PERIODS.

PRELIMINARY FINDINGS FROM THESE STUDIES ARE GIVING US A BETTER UNDERSTANDING OF THE VERY COMPLICATED HEALTH AND ENVIRONMENTAL PROBLEMS ASSOCIATED WITH MINING.

WHILE THESE FINDINGS WILL HELP THIS COMMUNITY BETTER ADDRESS HEALTH ISSUES THE VALUE OF THE RESULTS IS NOT LIMITED TO PICHER, OKLAHOMA. Hu: MINING IS A PROCESS THAT OCCURS ALL OVER THE WORLD. ONE OF MY GREAT HOPES IS THAT THE DEVELOPING WORLD WILL BE ABLE TO USE THIS INFORMATION DURING THE DEVELOPMENT PROCESS TO LEAPFROG SOME OF THE WORST EXCESSES OF OUR OWN SOCIETY AND GO STRAIGHT TO A CLEANER TECHNOLOGY A CLEANER DEVELOPMENTAL MODEL
THAT WILL ALLOW THEIR POPULATIONS TO REDUCE OR PREVENT THESE EXPOSURES FROM HAPPENING FROM THE BEGINNING.

Narrator: WHILE HOWARD HU IS STUDYING THE HEALTH EFFECTS MINING CAN HAVE ON A COMMUNITY DR. ROBIN WHYATT OF THE COLUMBIA CENTER FOR CHILDREN'S ENVIRONMENTAL HEALTH IS CONCERNED WITH A MORE WIDESPREAD ENVIRONMENTAL PROBLEM -- EXPOSURE TO PESTICIDES. Woman: PESTICIDES ARE DESIGNED TO BE TOXIC. THEY'RE DESIGNED TO KILL. AND A LOT OF THEM CAN KILL HUMANS THROUGH THE SAME MECHANISMS THAT THEY KILL INSECTS. IT'S JUST THAT THE DOSE HAS TO BE LOTS, LOTS HIGHER. SO WHAT YOU WANT TO BE SURE, THEN IS THAT THAT DOSE IS BELOW
ONES
THAT WOULD BE CAUSING ANY
PROBLEMS IN HUMANS.
Narrator: THE LOCATION OF
WHYATT'S STUDY
MAY SEEM UNUSUAL -- NEW
YORK'S INNER CITY.
Dr. Whyatt: PEOPLE DO THINK OF
PESTICIDES AS AGRICULTURAL
ONLY
BUT THAT'S JUST NOT AT ALL
ACCURATE.
ABOUT 10% OF PESTICIDE USE IN
THE UNITED STATES
IS USED IN AND AROUND THE
HOME.
AND THERE WAS A STUDY DONE
IN 1997
THAT SHOWED THAT MORE
GALLONS OF SPECIFIC TYPES OF
PESTICIDES
WERE USED IN MANHATTAN THAN
ANY OTHER PLACE IN NEW YORK
STATE
INCLUDING IN THE AGRICULTURAL
COMMUNITIES.
MY MAIN AREA OF RESEARCH IS
TO LOOK TO SEE WHETHER OR
NOT
THERE ARE ANY HEALTH EFFECTS
FROM PESTICIDE EXPOSURES
AT THE GENERAL LEVEL THAT
MANY PEOPLE ARE EXPOSED TO -- AT THOSE LEVELS, AT THOSE VERY LOW LEVELS WHETHER THERE ARE ANY HEALTH EFFECTS OR NOT DURING FETAL DEVELOPMENT. I GOT INTERESTED IN IT BECAUSE THERE WAS EVIDENCE IN LABORATORY ANIMALS AT MUCH HIGHER LEVELS OF EXPOSURE -- GIVEN DURING PREGNANCY, WHEN THE FETUS WAS DEVELOPING -- THAT THERE WERE LONG-TERM NEUROCOGNITIVE PROBLEMS IN THE OFFSPRING THAT IT SEEMED PRUDENT TO LOOK IN A HUMAN POPULATION. WE HAVE FOUR RESEARCH QUESTIONS THAT WE WERE LOOKING AT IN THIS STUDY. ONE IS, WERE WOMEN USING PESTICIDES DURING PREGNANCY? IF SO, WERE THEY GETTING EXPOSED? AND THOSE ARE TWO DIFFERENT ISSUES. YOU CAN BE USING IT AND IF IT ISN'T COMING INTO
YOUR AIR
OR IT Isn’T GETTING ON YOU, YOU
WON’T HAVE ANY EXPOSURE.
SO THE SECOND QUESTION --
IF THEY WERE USING IT, WERE
THEY BEING EXPOSED?
THIRD WAS, WERE THE
PESTICIDES GETTING TO THE
BABY?
AND THEN FINALLY
WERE THEY CAUSING ANY
HEALTH EFFECTS ON THE BABY?
HOW IS AN APPLE AND A BANANA
ALIKE?
THEY’RE BOTH FRUITS.
Narrator: TO ANSWER THESE
QUESTIONS
WHYATT IS CONDUCTING A STUDY
ON 720 MOTHER-AND-CHILD
PAIRS.
HER RESEARCH BEGAN IN 1998AS
PART OF A MUCH BROADER
STUDY
LOOKING AT TOXIC EXPOSURE
EXISTING IN THE INNER CITY.
DR. FREDERICA PERERA IS THE
DIRECTOR OF THIS LARGER
STUDY.
THERE ARE CONCERNS ABOUT
THE ENVIRONMENT
IN THESE NEIGHBORHOODS
THAT ARE NOT THE SAME
CONCERNS THAT ONE SEES IN A RURAL AREA.

THE EXPOSURES THAT ARE PREDOMINANT HERE INCLUDE AIR POLLUTANTS FROM TRAFFIC EMISSIONS FROM INCINERATORS OR RESIDENTIAL HEATERS TOBACCO SMOKE, AND THEN ALSO THE METALS -- LEAD AND MERCURY AND OTHER METALS -- BECAUSE WE KNOW THESE ARE TOXIC TO THE DEVELOPING FETUS AND THEY MAY ALSO BE PROBLEMS IN THESE COMMUNITIES.

AND BY DOING A WELL-DESIGNED STUDY, A HUMAN-POPULATION STUDY WE CAN GET VERY VALUABLE INFORMATION ON EXPOSURE TO ENVIRONMENTAL AGENTS AS WELL AS ON EARLY SIGNS OF RISK.

Narrator: DESIGN IS KEY TO THE VALIDITY OF THIS AND ANY HUMAN-POPULATION STUDY.
YOUR IDEAL STUDY DESIGN IS THAT YOU HAVE PEOPLE WHO ARE EXPOSED AND NOT EXPOSED TO THE COMPOUND YOU'RE INTERESTED IN THAT ARE IDENTICAL IN ALL OTHER WAYS. NOW, OBVIOUSLY, THAT DOESN'T HAPPEN. AND SO WE THOUGHT A LOT ABOUT THIS WHEN WE WERE DESIGNING THIS STUDY. WE REALIZED WE WERE REALLY BEST OFF STUDYING IT IN JUST THE SAME COMMUNITY BECAUSE EVERYBODY IN THAT COMMUNITY WAS GONNA BE SIMILAR TO EACH OTHER BUT THE EXPOSURES ACROSS THE COMMUNITY VARIED.

Narrator: TO ACCURATELY DETERMINE THE HEALTH EFFECTS OF PESTICIDE EXPOSURE WHYATT AND HER TEAM USE A LARGE NUMBER OF DATA-COLLECTION STRATEGIES INCLUDING AIR MONITORING AND DETAILED QUESTIONNAIRES.
FROM THE TIME A MOTHER IS PREGNANT AND CONTINUING UNTIL THE CHILD IS 11 YEARS OLD, RESEARCHERS COLLECT INDOOR AND OUTDOOR AIR SAMPLES. THEY ALSO CONDUCT MULTIPLE INTERVIEWS WITH BOTH MOTHER AND CHILD. ANDRIA REYES HAS BEEN WORKING ON THE STUDY SINCE ITS INCEPTION.

Woman: I'M PART OF A LARGE RESEARCH TEAM THAT COLLECTS DATA FOR THIS RESEARCH STUDY AND WE'RE THE PEOPLE WHO ARE IN CONTACT ON A DAILY BASIS WITH THE MOTHER-AND-CHILD PAIRS. AT EACH VISIT, THE MOM GETS INTERVIEWED -- WE DO SEVERAL SHORT QUESTIONNAIRES WITH HER -- AND THE CHILD GETS TESTED NEURODEVELOPMENTALLY.

THIS IS ALL DONE THROUGH PLAY AND IT'S PRETTY FUN FOR THE CHILD. WE'RE LOOKING AT MENTAL AND MOTOR SKILLS
AND WE WANT TO SEE IF THERE ARE ANY DELAYS IN THOSE SKILLS.
WE WANT TO SEE HOW THEY RELATE TO ANY EXPOSURES THE CHILD MAY CURRENTLY HAVE OR MAY HAVE HAD IN THE PAST.
WHAT IS A COW?
Narrator: ONE TEST DONE ON 4 1/2-YEAR-OLDs ASKS THEM TO DRAW A PERSON.
THESE DRAWINGS ARE BY CHILDREN NOT EXPOSED TO PESTICIDES. QUITE DIFFERENT FROM THE ONES BY CHILDREN WHO WERE EXPOSED.
BUT ALONE, RESULTS LIKE THESE ARE NOT ENOUGH TO MAKE ANY DEFINITIVE CONCLUSIONS.
Dr. Whyatt: TO MAKE SURE THAT THE EFFECTS YOU'RE SEEING ARE, IN FACT DUE TO THE CONTAMINANT YOU'RE MEASURING YOU HAVE TO TAKE INTO CONSIDERATION MATERNAL AGE OTHER POSSIBLE EXPOSURES, QUALITY OF THE HOME ENVIRONMENT.
BECAUSE AS A SCIENTIST, AS A GOOD SCIENTIST
WHAT YOU DO IS YOU TRY TO MAKE THE FINDING GO AWAY AS HARD AS YOU CAN. AND YOU START TO BELIEVE IT WHEN YOU CAN'T GET THE FINDING TO GO AWAY AFTER A LOT OF WORK.

Narrator: AND MUCH OF THAT WORK IS DONE IN THE LABORATORY.

Dr. Whyatt: YOU CAN GET INFORMATION ABOUT EXPOSURE BY ASKING SOMEBODY. IF I ASKED YOU HOW MANY CIGARETTES DID YOU SMOKE IN THE LAST WEEK, YOU CAN PROBABLY TELL ME.

IF I ASKED YOU HOW MUCH CHLORPYRIFOS WERE YOU EXPOSED TO LAST WEEK YOU PROBABLY DON'T HAVE ANY IDEA. PROBABLY DON'T EVEN KNOW WHAT IT IS.

BUT IF I MEASURE IT IN YOUR BLOOD -- SO I TAKE A BLOOD SAMPLE AND I MEASURE THAT IN YOUR BLOOD I KNOW HOW MUCH EXPOSURE YOU HAD.
THAT MEASUREMENT IN THE BLOOD IS A BIOMARKER OR A BIOLOGIC MARKER. WHAT IT MEANS IS THAT RATHER THAN ASKING YOU ABOUT YOUR EXPOSURES I AM MEASURING THE EXPOSURE OR THE EFFECT OF THE EXPOSURE IN YOUR BODY. AND WHAT WE ARE DOING IS WE ARE MEASURING THE INSECTICIDE IN THE MOTHER'S BLOOD AT BIRTH AND IN THE BABY'S BLOOD AT BIRTH.

Narrator: DR. DELIANG TANG IS IN CHARGE OF THE LAB AT COLUMBIA UNIVERSITY WHERE THE BLOOD SAMPLES ARE TESTED. THESE TESTS PICK UP EVEN THE SMALLEST LEVELS OF EXPOSURE IN THE BLOOD. EACH SPIKE ON THIS GRAPH INDICATES A SEPARATE COMPOUND AND THE AMOUNT FOUND IN THE SAMPLE.

Man: WE'RE MEASURING A VERY, VERY VERY TRACE AMOUNT IN THE BLOOD.
IN ORDER TO DETECT IT AS TRACE AMOUNT WE HAVE TO AVOID THE CONTAMINATION IN ALL PROCESS FROM THE SAMPLE COLLECTION TO THE MEASUREMENT. EVERY SINGLE STEP WE HAVE TO TEST IS ANY CONTAMINATION IN THERE. SO WE ARE VERY, VERY CAREFUL ON THOSE BIOLOGICAL SPECIMENS.

Narrator: BUT THIS LAB IS NOT THE ONLY ONE USED IN THE STUDY. MANY SAMPLES ARE SHIPPED TO OTHER LABS AROUND THE WORLD WITH THE LAB AT COLUMBIA ACTING AS A HUB FOR ALL OF THE SAMPLES.

Dr. Tang: ONCE THE SAMPLE COMES INTO OUR LABORATORY WE WILL SEPARATE THEM INTO DIFFERENT COMPONENTS AND PUT THEM IN DIFFERENT STORAGE CONDITION TO BETTER PRESERVE FOR CURRENT STUDIES AND FOR FUTURE STUDIES.

Narrator: RESULTS FROM THESE SAMPLES COMBINED WITH NEUROLOGICAL TESTING AND AIR MONITORING
HAVE REVEALED A CLEAR CONNECTION BETWEEN EXPOSURE AND DEVELOPMENT.
Dr. Whyatt: THIS ONE INSECTICIDE IN PARTICULAR WHICH WAS THE ONE WE KNEW WAS BEING USED THE MOST WE WERE DETECTING IT IN ABOUT 70% OF THE MOTHERS' BLOOD AND 70% OF THE BABIES' BLOOD. THE LEVEL IN THE MOTHERS' BLOOD AND THE BABIES' BLOOD WAS BASICALLY IDENTICAL. AND THEN WHAT WE FOUND WAS THAT THE BABIES THAT HAD THE HIGHEST LEVEL OF THIS INSECTICIDE HAD SIGNIFICANTLY LOWER WEIGHT AND LENGTH AT BIRTH AND SIGNIFICANTLY POORER MENTAL AND MOTOR DEVELOPMENT AT AGE 3 AND SIGNIFICANTLY GREATER BEHAVIORAL PROBLEMS AT AGE 3 THINGS LIKE ADHD. AND ONE THING THAT WE'RE COMMITTED TO IS AS WE FIND EVIDENCE OF HARM WE IMMEDIATELY LET THE WOMEN
KNOW BOTH ABOUT THAT AND, MORE IMPORTANTLY WHAT THEY CAN DO PERSONALLY TO TRY TO PROTECT THEMSELVES.

SO, CERTAINLY THE RESEARCH THAT WE ARE DOING HERE HAS HAD EFFECTS AT THE LOCAL LEVEL. THERE'S NO QUESTION ABOUT THAT. BUT THE EXPOSURES THAT WE ARE STUDYING HERE ARE UBIQUITOUS EXPOSURES THAT MOST PEOPLE IN THE UNITED STATES HAVE PEOPLE GLOBALLY SO THE RESEARCH FINDINGS HERE ARE GONNA BE APPLICABLE WELL BEYOND THIS PARTICULAR COMMUNITY.

Narrator: OTHER RESEARCH AT COLUMBIA'S CENTER FOR CHILDREN'S ENVIRONMENTAL HEALTH REVEALS JUST HOW GLOBAL THESE HEALTH PROBLEMS ARE.

Dr. Perera: WE'VE BEEN DOING THIS THE VERY SAME -- ALMOST IDENTICAL STUDY, I
SHOULD SAY --
IN KRAKOW, POLAND.
AND WE HAVE FOUND SIMILAR
EFFECTS OF AIR POLLUTANTS
ON FETAL GROWTH AND CHILD
DEVELOPMENT
AS WE'VE SEEN IN NEW YORK
CITY.
WE'VE ALSO DONE A STUDY IN
CHINA
AND THAT STUDY IS LOOKING
SPECIFICALLY
AT COAL-BURNING EMISSIONS
FROM POWER PLANTS.
SO WE HAVE THREE STUDIES
THAT ARE USING SIMILAR
APPROACHES
AND STUDYING PREGNANT
WOMEN AND THEIR NEWBORNS
AND THEN FOLLOWING THESE
GROUPS OF MOTHERS AND
CHILDREN
TO LOOK AT LONGER-TERM
EFFECTS OF EARLY-LIFE
EXPOSURES.
Narrator: ALL OF THESE STUDIES
ARE BEING CONDUCTED
WITH THE HOPE OF GAINING A
FAR BETTER UNDERSTANDING
OF THE HEALTH EFFECTS OF
TOXIC EXPOSURE
BUT, MORE IMPORTANTLY
WITH THE HOPE OF HELPING AFFECTED COMMUNITIES.
Dr. Whyatt: IF YOU IDENTIFY A PROBLEM, YOU CAN ADDRESS A PROBLEM.
AND WE'VE SEEN THAT IN OUR STUDY.
IT'S THE REASON WE ARE DOING THE STUDY.
IT'S ONE OF THE REASONS I DON'T GET DEPRESSED.
BECAUSE IF YOU CAN SHOW THESE THINGS YOU CAN TAKE ACTION TO PREVENT THEM.
I'M A POSITIVE PERSON. I'VE SEEN A LOT OF SUCCESSES.
I DON'T SEE WHY WE CAN'T KEEP MAKING THESE SUCCESSES.

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