

FUNDING FOR THIS PROGRAM IS
PROVIDED BY...

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
SOFT 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
MEIN 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 RELATION
SHIPS 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. FEDERICA 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 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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