# Chemicals found in children's bodies and their health effects











#### Contactos

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## **CHAMACOS Study Objectives**

- •To measure environmental exposures in pregnant women and children.
- To determine the relationship between Environmental Exposures and:
  - neurodevelopment
  - growth
  - respiratory disease
- To reduce exposure to children and pregnant women with interventions and community outreach.
- To learn about policies to reduce the incidence of diseases related to the environment.



## Many Factors Influence Maternal and Child Health





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## Children at Higher Risk of Exposure





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## Enrollment: 1999-2000

601 pregnant women living in the Salinas Valley:

- They received prenatal care in 5 prenatal care clinics that serve low-income residents
- They planned to give birth at Natividad Medical Center
  - 92% Spanish-Speaking
  - 85% Born in México
  - 54% <a></a> 5 years in USA
  - 44% 6<sup>th</sup> grade education or less
  - 44% worked in agriculture during pregnancy
  - 84% other agricultural workers in home



\*\* Primarily Mexican immigrants from low-income households\*\*



### **Exposures**

#### Pesticides

- Organophosphates
- Pyrethroids
- Manganese Fungicides
  Ethylene bisdithiocarbamates (EBDCs)
- Another current use of pesticides
- Organochlorines

- Flame retardants
- Bisphenol A
- Phthalates
- Allergens (pollen / mold)
- Housing quality
- Social factors (race, nationality, income)





## Outcomes

- Birth outcomes (duration of pregnancy, birth weight, etc.)
- Neurobehavioral development
- Respiratory functioning
- Obesity and child metabolic syndrome
- Puberty onset
- Thyroid hormone





# <sup>10</sup> California, The Leading Agricultural State





**Salinas** 

Valley



### Areas With High OP Use















### Prenatal and child OP metabolites in CHAMACOS and NHANES\*





\* National Health and Nutrition Examination Survey Bradman et al. EHP, 2005, 2011



# ORGANOPHOSPHATE PESTICIDES





### Length of Gestation was Shorter for Infants of Women with Higher OP Pesticide Exposures



For every 10 fold increase in OP metabolites in the later half of pregnancy, there was a half week decrease in



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gestation Eskenazi et al., EHP, 2004

Photo by Julie Fisher



- Higher use of some fumigants, (ex. methyl bromide and chloropicrin) also associated with slightly lower developmental scores.
- Like OPs, methyl bromide at high levels can be bad for children's brains. We are working to learn more about fumigants.
- Methyl bromide is no longer used in the Salinas Valley or CA!





#### Representative drawings of 4-year-old Yaqui children from the valley and foothills of Sonora, Mexico.





Guillette 1998



### Child Behavior Checklist 1½ - 5 year old DSM-Oriented Scale

- Afraid to try new things
- Avoids looking others in the eye
- Can't stand having things out of place
- Disturbed by any change in routine
- Doesn't answer when people talk to him/her
- Doesn't get along well with other children
- Repeatedly rocks head or body
- Shows little affection towards people
- Speech problem (describe)
- Strange behavior (describe)
- Upset by new people or situations (describe)
- Withdrawn, doesn't get involved with others



Pervasive Developmental Disorder





## **Prenatal OPs and Behavior**

Children born to moms with higher levels of OPs while pregnant tended to score:

↑ PDD at 24 months (maternal report)
 ↑ ADHD at 5 years (maternal report)
 ↑ ADHD at 5 years (CPT)





### Nearby OP Use and Child Development

- When more OPs were used near homes during pregnancy, children had lower developmental scores at 7 years.
- This is similar to what we saw when there were higher levels of OPs in the urine.
- Detections in urine probably come from pesticides in food and less from pesticide drift. Using maps, we are better able to see that living near where pesticides are used can increase drift exposure.



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### Prenatal OPs and Neurodevelopment

Children born to moms with higher levels of OPs while pregnant tended to score:

- $\blacktriangleright$   $\downarrow$  neurodevelopment at 24 months
- Verbal skills at 3 ½ years
- Ineurodevelopment at 7 years





# Organophosphate pesticides and asthma



We wanted to know:

Is there a link between exposure to organophosphate pesticides (OP) and asthma symptoms in CHAMACOS study?



## Prenatal and childhood (0-5Y) OP metabolites related to respiratory symptoms at school age





momscleanairforce.org

#### Prenatal Postnatal OP metabolites OP metabolites



Child's gender, age, Maternal smoking, ETS, Season of birth, PM2.5, Breastfeeding, Mold, Traffic, Cockroaches



Raanan et al., EHP, 2015.

Models adjusted for:

## In our CHAMACOS families

We measured OP pesticides in the urine of:

- Mothers during pregnancy
- Children between 6 months and 5 years of age

We asked mothers if their child had asthma symptoms at 5 and 7 years of age





# Results of exposure to OP pesticides and asthma

We found more asthma symptoms in:

- Children whose mothers were exposed to higher levels of OP pesticides during the second half of pregnancy
- Children who were exposed to higher levels of OP pesticides in childhood





### OP use has also decreased!



### Certified Organic Cropland in California





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Source: United States Department of Agriculture, 2010



### Pesticides (fungicides) containing manganese



- Widely used in Salinas
- Manganese is an important element of our diet, but is toxic in high amounts
- We wanted to know if use of pesticides with manganese:
  - Increases manganese levels in homes
  - Increases manganese levels in children's teeth
  - It is related to children brain development



### Manganese in home dust and teeth



Like tree rings





- We measured manganese levels in home dust and children's <u>teeth</u>
- We found higher levels of manganese when:
  - Pesticides with manganese were used in agricultural fields near home
  - Farm workers clothes or shoes were stored inside home
  - There was not a doormat at house entrance



# Manganese in teeth and brain development

- Children with highest manganese levels in their teeth had a small decrease in motor development at 6 months
- These effects disappeared when children grew up
- So far, we have not seen lasting effects of manganese exposure to levels we found in CHAMACOS' children







- When stress was higher, children had slightly lower developmental scores at 7 years.
- For families with more stress, pesticides had a higher effect on the child's development.
- In families with less stress and a positive learning environment, pesticides had a minor impact on the child's development.





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# FIRE RETARDANTS PBDE's





## PBDEs

PBDEs are added to household items to reduce flammability.











### California Technical Bulletin 117



## NOTICE

THIS ARTICLE MEETS ALL FLAMMABILITY REQUIREMENTS OF CALIFORNIA BUREAU OF HOME FURNISHINGS BULLETINS 116 AND 117. CARE SHOULD BE EXERCISED NEAR OPEN FLAME OR WITH BURNING CIGARETTES.







### California Technical Bulletin 117-2013



**BEST** NOTICE THIS ARTICLE MEETS THE FLAMMABILITY REQUIREMENTS OF CALIFORNIA BUREAU OF ELECTRONIC AND APPLIANCE REPAIR, HOME FURNISHINGS AND THERMAL INSULATION TECHNICAL BULLETIN 117-2013. CARE SHOULD BE EXERCISED NEAR OPEN FLAME OR WITH BURNING CIGARETTES.

The upholstery materials in this product: contain added flame retardant chemicals X contain NO added flame retardant chemicals

The State of California has updated the flammability standard and determined the fire safety requirements for this product can be met without adding flame retardant chemicals. The State has identified many flame retardant chemicals as being known to, or strongly suspected of, adversely impacting human health or development.



new flame retardant label

Look for the labels marked "contain NO added flame retardant chemicals"





### High PBDEs dust levels in California


## Do PBDE levels increase over time in US MOTHERS?



# It was found that Mexican children have much *lower* levels of flame retardants





Levels in Mexican-American children in US were 7x higher than Mexican children



## Children in <u>California</u> have higher PBDE levels







# **Health Effects**

Scientists and doctors still do not know if PBDEs can affect our health. Current research is examining whether PBDEs are related to:

- Infertility problems
- Learning delay in children









# WHAT YOU CAN DO



- Repair or replace upholstered items with torn covers or exposed foam.
- Frequently clean dust with a wet rag and mop.
- Use a vacuum with HEPA filter
- Open windows to let in fresh air
- Choose baby products and furniture that contain polyester, wool or cotton, they are less likely to have flame retardants.





## **BISPHENOL A or BPA**





### BPA is used in hard plastics, some food cans, and receipts from stores













### **BPA FREE PLASTICS**

Symbol	Description	
	Clear tough plastic such as soft drink, juice and water bottles.	
ADPE	Common white or coloured plastic such as milk containers and shampoo bottles.	
ঞ	Hard rigid clear plastic such as cordial bottles.	
	Soft flexible plastic e.g. squeezable bottles such as sauce bottles.	
<u>کے</u>	Hard but flexible plastic such as microwave ware, takeaway containers, some yoghurt/ ice cream/jam containers, hinged lunch boxes.	Crame 6
<u>ک</u> PS	Rigid, brittle plastic such as small tubs and margarine/butter containers.	
CTHER OTHER	All other plastics, including acrylic and nylon. Examples include some sports drink bottles, sunglasses, large water cooler bottles.	

Seleccione productos plásticos más seguros:<sup>1</sup>









# RECOMMENDATIONS

- Avoid heating food in plastic containers
- Avoid heating foods wrapped in plastic in the microwave
- Reduce the amount of food you eat from plasticlined packages
- Do not wash plastic containers in dishwasher
- Use alternatives like glass, metal or plastic # 1 containers
- Buy products labeled BPA-Free, Bisphenol A Free or Phthalate Free





### Endocrine Disruptors in Personal Care Products



#### Fragrances





#### Phthalates (fragrances)

Use: Make fragrances last longer and make nail polish smoother.

Found in: Perfumes, scented soaps, shampoos, lotions and other beauty products. Air fresheners and scented household cleansers. Nail polish.

Health effects: Linked to behavior problems and allergies in children. May effect reproductive development in males.

How it's listed on the label: "Fragrance" or "perfume"

**Buy instead:** Unscented or naturally scented products.







#### preservative

#### Parabens



**Use:** A preservative to prevent growth of mold or bacteria

Found in: Foundation, mascara, eye liner, eye shadow, and other cosmetics



Health effects: Mimics estrogen. Has been linked to breast cancer, but little is known about how it affects our health

How it's listed on the label: Methyl paraben, ethyl paraben, propyl paraben.



Buy instead: Mineral based make-up made without parabens



#### **Antibacterial**



#### Triclosan

Use: To kill bacteria

Found in: Antibacterial or antimicrobial soaps and cleansers. Colgate Total toothpaste



Health effects: Linked to changes in estrogen and thyroid hormone. Long term health effects not known

How it's listed on the label: Triclosan, "antibacterial"

Buy instead: Regular soap or toothpaste eliminate germs just as well





#### Oxybenzone



Use: To block UV radiation

Found in: Sunscreens, foundation, blush, and other cosmetics

Health effects: Associated with decreases in sperm production in animal tests (rats) and with birth weight changes in humans

How it's listed on the label: oxybenzone, BP-3

**Buy instead:** Zinc oxide or titanium dioxide base sunscreens





## Future directions ...



We want to learn more about how chemical exposures can affect health at older ages and find out what we can do to make sure our children grow up healthy. We hope to follow children passed 18 years of age, paying special attention to changes in neurodevelopment and behavior!





## **18-Year Visits**

•We are starting an exciting new project that will allow us to see how a person's brain reacts as they perform different thinking tasks during the 18-year visit

• They will use a cap with special sensors that show us which parts of the brain are being used to complete certain tasks

•We will use this data to help determine if there is a relationship between altered brain function and chemical exposures







# **Housing Quality**











# Household food insecurity 2005-2006







Rosas et al., JADA, 2009

# Background

- Many youth in the United States are overweight.
- Healthy food and exercise are important for our health.
- It can be difficult to obtain healthy foods, cook fresh foods, or find the time or place to exercise.
- The scientists want to know if the chemicals in the environment increase the chances of becoming overweight.





# Tips to stay healthy

There is a lot we can do to stay healthy:

- Eat healthy food
- > Exercise
- ➤ Sleep well
- ➢ Read
- Do not smoke or abuse
  - alcohol or drugs
- Talk to friends / family when you need help
- Spend time with family





# Projects to Reduce Pesticide Exposure





## **Field Intervention**

Farm workers received gloves



Method developed to provide hot water in the field. Trained crew leaders to use the system. The crew leaders filled tanks.





Lightweight coverall developed and provided

Workers left their work clothes at the fields to be washed







5 field-based education sessions



## Gloves reduced pesticides on hands And in the body





Bradman et al., JESEE, 2009

# Farm Worker Education

- 42% had no pesticide safety training.
- 52% didn't know when pesticides were applied
- 92% didn't know names of pesticides
- 62% worry that pesticides could hurt their <u>family's health</u>





# Over 30,000+ people reached !



# Home Intervention

We also acted to reduce take-home pesticide exposures







# We developed a curriculum in home for families



- 3 sessions with farmworker households
- Developed action plan to reduce pesticide exposure
- Identified barriers to action



Salvatore et al., submitted.



# CHAMACOS **Solution** Community Outreach



# **CHAMACOS Advisory Structure**





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**Community Advisory Board** 



We work with the entire community







# **Reflections From Youth Council**

### Belonging:

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"I (now) feel like I fit into a whole other clique...a spark of hope for future generations... its given me the power to believe I can change things..."

#### Teamwork:

"I learned to collaborate with my team (on) amazing adventures, ones that I'll never forget."

### Capacity Building:

- "My skills... were enhanced: team building, data collection, kit cleaning, data entry, team communication, public speaking, respect towards adults, (and) interviewing..."
- "I now wont be afraid to speak out (loud) to my classmates or future bosses."





### Pilot and Collaboration with California Migrant Education



#### Training of Trainers Project (La Semilla):

- Trained volunteers
- Provided them with a curriculum, presentation, educational activities, handouts
- Each volunteer trained more parents to protect their families from pesticides





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## New Collaboration with Migrant Education



- Aim to reach 5 sites in 5 counties/regions across California
- Provide pesticide exposure prevention and Worker Protection Standards training
- Help attendees learn how to be strong
  presenters
- Provide community members with educational resources
- Hold a series of educational puppet
  shows for children of farmworkers























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### Stay informed...



# For more information about the CHAMACOS study visit us online:

# www.cerch.berkeley.edu

and sign up for our e-newsletter





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