

# Environmental Risk Factors of Childhood Leukemia

### CHE Partnership Call – Jan 22, 2014

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## **CIRCLE - Objectives**

To examine the effects of  $\rightarrow$  in utero and early life exposure to chemicals present in homes-pesticides, tobacco, **PCBs**, and **PBDEs**  $\rightarrow$ genetic & epigenetic factors, and their interplay in the development of childhood leukemia (CL).











Model for Chemical Exposure Assessment Step -UC Berkeley Laboratories Statistical Analyses Step 3 Center for Disease Control and Protein Adducts Prevention Laboratories **Biomarkers** (National Cancer Institute) Step 2 Product Inventory Northern California Cancer Center Home Sampling Step 1 Geocoding Personal Interview IIEHS

- Self-reports
- **GIS** studies
- Home dust samples
- **Biomarkers of exposures**



# Highlights

- Parental tobacco smoking
- Parental occupational exposure to pesticides
- Residential exposure to flame retardants















## Critical Windows of Exposures to Tobacco Smoking



Effect on	Parents' germ cells	Fetus' somatic cells	child's somatic cells
From	Active smoking (second hand smoke)	Active smoking (second hand smoke)	Second hand smoke (third hand smoke?)
	COPALITY OF THE OWNER	UNITED STATES	

VIEHS





# Childhood ALL

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	Controls	Cases		
Exposure to tobacco smok	ing <i>N</i> = 975	<i>N</i> = 767	<b>OR</b> <sup>a</sup> (95% CI)	
Multivariable model				
Matemal prenatal smoking <sup>b</sup>				
No	856	661	1.00 (—)	
Yes	118	106	0.83 (0.56–1.24)	
Paternal prenatal smoking <sup>b</sup>				
No	703	498	1.00 (—)	
Yes	222	218	1.17 (0.91–1.50)	
Child's passive smoking at home <sup>c</sup>				
No	798	599	1.00 (—)	
Yes	163	161	1.20 (0.84–1.72)	
Joint effect of maternal prenatal smoking and child's passive smoking <sup>d</sup>				
No exposure during both perio	ods 777	588	1.00 (—)	
Maternal prenatal smoking onl	y 21	11	0.60 (0.27–1.35)	
Child's passive smoking only	67	67	1.11 (0.75–1.65)	
Exposure during both periods	96	94	1.04 (0.74–1.47)	
	<i>P</i> -value for	r interaction	0.35	
Joint effect of paternal prenatal s	smoking and child's	s passive smo	king <sup>d</sup>	
No exposure during both perio	ods 670	498	1.00 (—)	
Paternal prenatal smoking only	y 127	98	0.91 (0.68–1.22)	
Child's passive smoking only	74	46	0.80 (0.51–1.09)	
Exposure during both periods	88	115	1.50 (1.01-2.23)	

Joint effect is subtype-specific Seen for ALL with t(12;21).... but not for those with extra







Source: Metayer et al, Cancer Epidemiology, Biomarkers and Prevention, 2013

0.02

P-value for interaction

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#### Paternal smoking and Childhood AML



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## Paternal Occupational Exposures to Pesticides and Risk of Childhood ALL

Study	Cases	OR (95% CI)	Weight
CLIC studies (except UK)			
France, Escale	634	0.59 (0.34, 1.02)	7.00
New Zealand	84	- 0.78 (0.36, 1.69)	4.91
Australia	327	0.87 (0.48, 1.56)	6.57
France, Adele	211	0.88 (0.21, 3.67)	1.97
US, COG E15	1782	0.94 (0.67, 1.32)	9.64
Italy	558 -	1.12 (0.53, 2.37)	5.09
Canada	787	1.48 (1.05, 2.08)	9.62
US, NCCLS	803	1.50 (1.07, 2.11)	9.65
Greece,1993-4	108	1.55 (0.64, 3.74)	4.11
Germany	702	• 1.80 (1.19, 2.71)	8.69
Greece,1996-2011	872	2.99 (1.93, 4.63)	8.36
Subtotal (I-squared = 69	6%, p = 0.000)	> 1.25 (0.94, 1.66)	75.59
Other published studies			
Keegan,2012	12288	1.00 (0.86, 1.18)	11.79
van Steensel-Moll,1985	519	- 1.00 (0.60, 1.70)	7.33
Kishi,1993	103	1.70 (0.80, 3.40)	5.29
Subtotal (I-squared = 0.0%, p = 0.372)		1.02 (0.88, 1.19)	24.41
Overall (I-squared = 68.3	%, p = 0.000)	1.23 (0.99, 1.53)	100.00
NOTE: Weights are from	random effects analysis		
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## Maternal Occupational Exposures to Pesticides and Risk of Childhood AML





# **Exposure to PBDE** (flame retardants)

- Risk of childhood ALL is associated with levels of specific PBDEs in dust
- Exposure determinants included, furniture with crumbling foam:
  - − ↑ PBDEs in house dust
  - − ↑ PBDEs in case blood
  - − ↑ PBDEs in maternal serum
- PBDEs transferred from furniture to dust by volatilization and weathering/abrasion







*Microscopic image of BDE-209 on dust from a CIRCLE home.* 



<sup>25</sup>Source: Wagner et al. *Environ Int, 2013* 



# Thank you

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- CLIC members
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