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Lead in Uruguay: A Multidisciplinary Approach

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CTHA
CÁTEDRA DE TOXICOLOGÍA E HIGIENE AMBIENTAL

REPUBLICA ORIENTAL DEL URUGUAY- Montevideo


MONTEVIDEO

Medical Geology in Uruguay

"Lead contamination in Uruguay has been taken into account as a Medical Geology issue"

Dr. J. Centeno Round Table comments in Montevideo, 2005

Background

- Lead is ubiquitous in the environment as a result of mining and industrialization.
- This metal has no known physiologic value and children are the most sensitive population with high health risks.
- Blood lead level (BBL, B-Pb) is a recommended biological marker to environmental lead exposure.
- Our group at the Dept. of Toxicology and Environmental Hygiene has a 15-year-research-experience on lead monitoring on different Uruguayan populations.
- Other University Research Teams have also been studying metals from differents points of view

Background

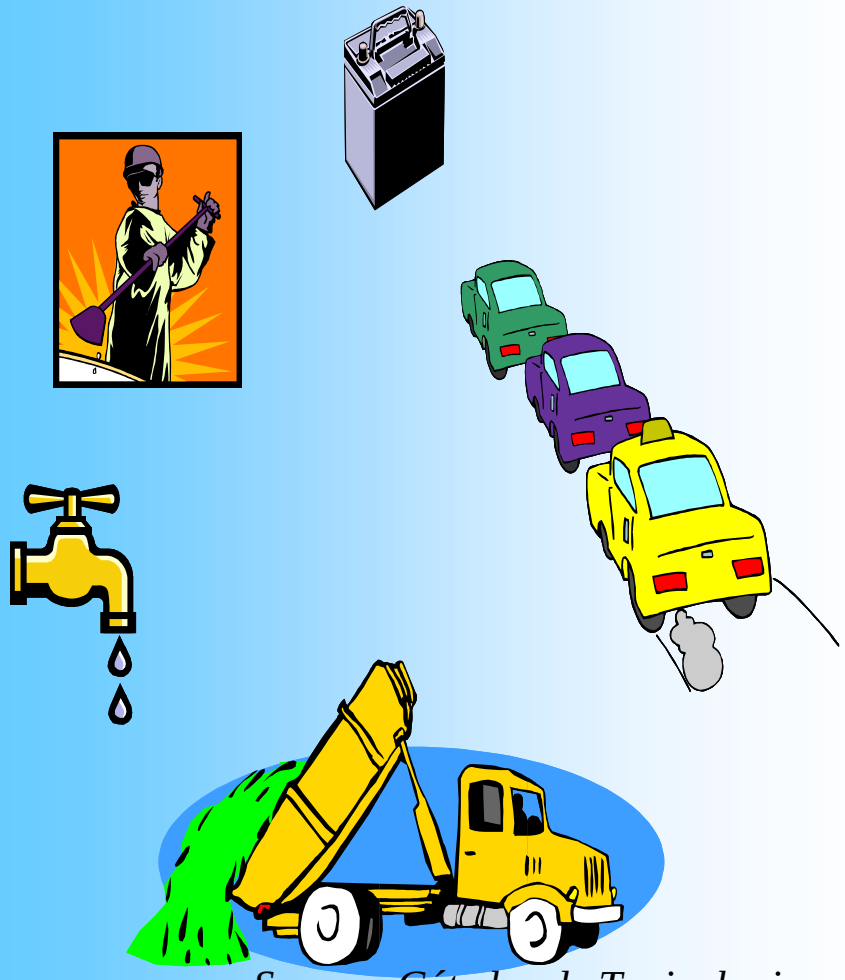
Foto: prensa gráfica, El pais

- In 2001 lead pollution first received official attention in Uruguay, with the episode of “La Teja” with high B-Pb in children
- Health and Environmental authorities had our toxicology studies as the only background scientific available data from Uruguay.

Ministerio de Salud Pública

DINAMA
Dirección Nacional de Medio Ambiente

Lead contamination sources



- Industries (metallurgies, manufacture of batteries, wires, pipes, etc)
- Recycling (foundries)
- TEL additive to gasoline up to Dec. 2003
- Lead pipes for water supply in old houses
- Solid wastes (smelters scaps)
- Others

Source: Cátedra de Toxicologia e Higiene Ambiental- Facultad de Química

Toxicology & Environmental Hygiene Dept: Faculty of Chemistry

This Toxicology Team has been studying metals exposure in uruguayan populations being lead, its main research line since 1986 with QA/QC analytical results.

Source: Cátedra de Toxicologia e Higiene Ambiental

Studied Populations: WORKERS

Source: Cátedra de Toxicologia e Higiene Ambiental- Facultad de Química

Studied Populations
ADULTS & CHILDREN

Source: Cátedra de Toxicologia e Higiene Ambiental- Facultad de Química

Studied Populations
DOGS & BOVINES

Source: Cátedra de Toxicologia e Higiene Ambiental- Facultad de Química

Results
B-Pb µg/dL

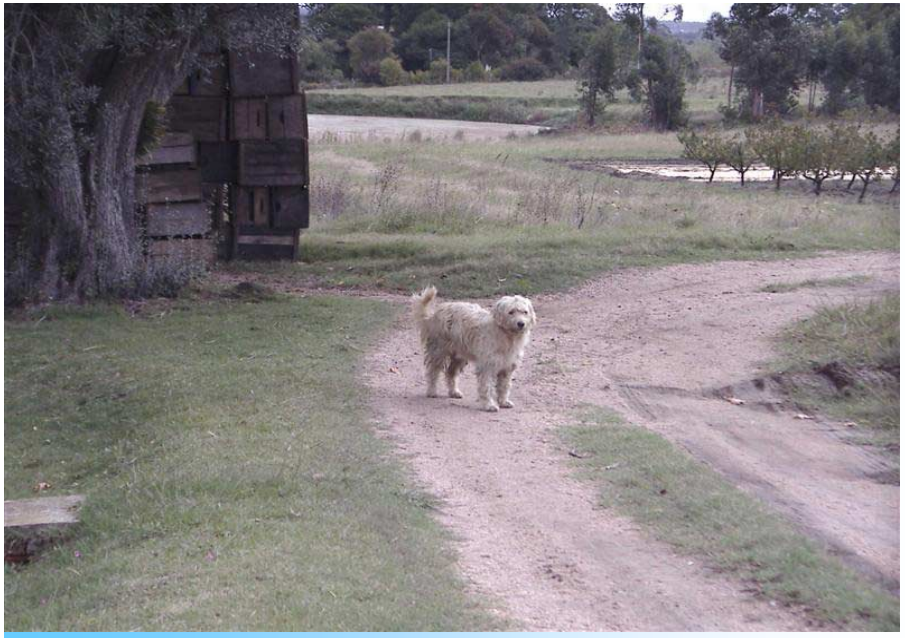
Human Population	n	B-Pb	Year	Publication	Observations
adults	23	9,8	1987	*Mañay et al., 1987*	young adults 20-30 y
adults	29	9,1	1992	*Schutz et al, 1994*	teachers/civil servan
workers	47	54,1	1987-8	*Mañay et al., 1989*	Several Industries
workers	31	49,7	1992	*Pereira et al., 1996*	Several Industries
workers	60	48,2	1997	*Pereira et al., 1998*	Batteries Industry
children<14 ys	34	10,0	1992	*Schutz et al., 1994*	urban area
children<14 ys	49	11,8	1995	*Cousillas et al., 1997*	industrial area
children<14 ys	96	9,6	1992/1994	*Schutz et al 1997*	Volunteers patients
children<14 ys	2251	14,5	2001	*Mañay et al., 2001*	Polluted area
Pregnant women	45	9,1	2001	*Mañay et al.,2001*	Polluted area
Animal Population					
stray dogs	98	15,5	1992/1994	*Mañay et al,1994*	Zoonosis Dpt.
domestic dogs	151	12,1	1994	*Mañay et al,1998*	Veterinary Facul
bovines	55	4,1	1999		Rural Area

Source: Cátedra de Toxicologia e Higiene Ambiental- Facultad de Química

CEQUIMTOX
Certified Managment by UNIT- ISO 9001/2000

"Development of analytical methologies for metals in biological matrices. Analysis of lead in blood and chromium in urine"

Source: Cátedra de Toxicologia e Higiene Ambiental- Facultad de Química



® El Observador

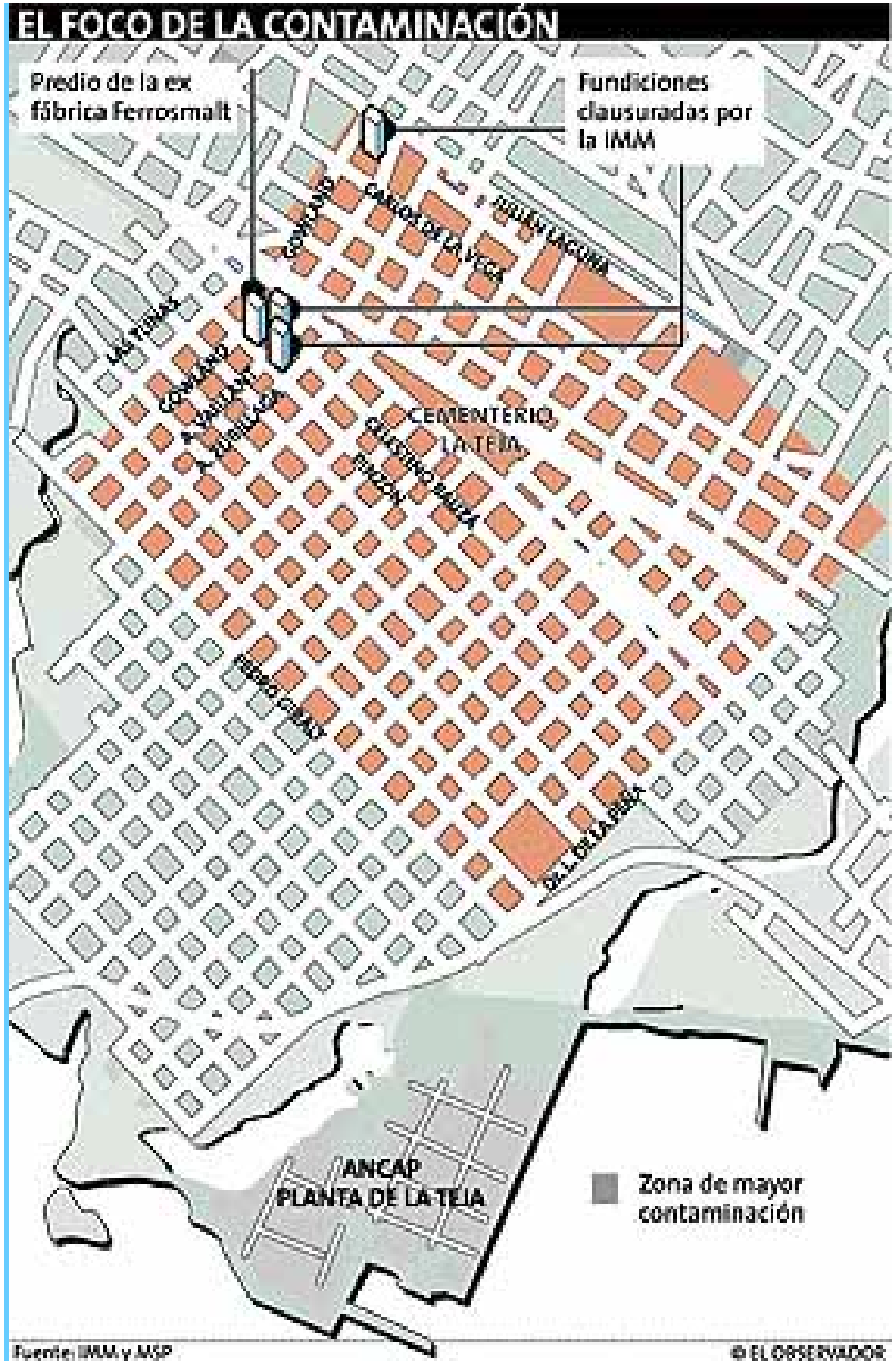
Montevideo: Environmental Contamination

® El Observador

® El Observador

Source: "El Observador

Non occupational lead exposure is usually due to living in manufacturing areas or by inadequate handling of lead containing materials and solid wastes which represents an important health risk for children.



"La Teja"area Pb-Soil Contamination

Montevideo, 2001

Source:

El Tejano

Lead Contamination (La Teja, Canelones & other areas)

- A child from “La Teja” had a B-Pb > 20 ug/dL and other cases appeared afterwards.
- Health effects caused by the environmental ground polluting metallic agents exposure installs a debate in the society.
- Affected community began a broad mobilization demanding solutions from the Health and Environmental authorities.
- They claimed to know and to solve the situation of the contaminated sites in the whole country.

- The Health Ministry especially established a Interinstitutional and multidisciplinary committee, including delegates from health, environmental, labor, educational, social security institutions and community NGOs, among others.

- The University of the Republic was the main responsible for technical advice and support.

Multidisciplinary & Interinstitutional Commitee

- MSP: Ministerio de Salud Pública (Health Ministry)
- MVOTMA: Ministerio de Vivienda, Ordenamiento Territorial y Medio Ambiente (Environmental Ministry)
- MTSS: Ministerio de Trabajo y Seguridad Social (Work Ministry)
- MIEM_DINATEN/DINAMIGE: Ministerio de Industria, Energía y Minería; Direccion Nacional de Tecnología Nuclear/Dirección de Mineralogía y Geología (Industry, Energy & Mineralogy Ministry)
- IMM : Intendencia Municipal de Montevideo (Municipality of Montevideo)
- UNIVERSIDAD DE LA REPÚBLICA:Facultades de Química, Medicina; Ciencias & Agronomía. (Research University Delegates)
- ANCAP: Administración de Combustibles, Alcohol y Portland (Petrol Refinery)
- OSE: Obras Sanitarias del Estado. (Potable Water State Administration)
- BPS: Banco de Previsión Social. (Social Security & Health Care Center)
- BSE: Banco de Seguros del Estado (State workers Insurance)
- OPS/OMS: Organización Panamericana de la Salud (PAHO in Uruguay)
- CVSP: Comisión Vivir sin Plomo ("Lead Community" Commitee)

Community Request for B-Pb analysis

PLOMO EN LA TEJA

Dignidad abajo, lentitud arriba

CON LOS PADRES DE JOAQUÍN

"Nos angustia no saber de dónde viene el plomo"

SOCIEDAD

Página 13

Doscientos vecinos reclamaron respuestas a contaminación con plomo

La Teja no aguanta más

SOCIEDAD

Técnicos de la Intendencia tomaron muestras en viviendas de La Teja

Procuran establecer el origen de la intoxicación con plomo

Plomo: la IMM se demoró 5 meses

► Informe oficial de quienes combaten la contaminación por plomo que afecta a vecinos de La Teja, sembró dudas y preocupaciones entre los legisladores.

Primeros análisis sin resultados; la IMM investigará a más fábricas de La Teja

Intoxicados con plomo serán asistidos en el Pereira Rossell

- La TEJA & Other Populations, Montevideo URUGUAY, 2001

Reference Values used in Uruguay

- Blood Lead Levels (B-Pb)
  - Adults / exposed workers: < 30 ug/dl (ACGIH)
  - Adults/non exposed: < 25 ug/dL (ACGIH)
  - Children (<15ys): <15 ug/dL (WHO)
  - Children (<15 ys): < 10 ug/dL (CDC)
  - Women (fertil age): < 10 ug/dL (ACGIH)

- Lead in soil
  - Residential, playing yards: < 140 mg/kg (CCME)
  - Residential, playing yards: < 400 mg/Kg (EPA)
  - Industrial areas: < 740 mg/kg (CCME)

Source: *Dr. Ponzo, MSP 2002 ; IMM, 2003*

Some Examples:

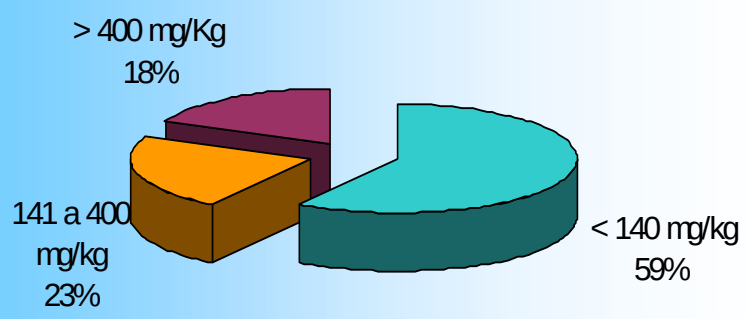
1) B-Pb Analytical Data in **Uruguay (2001-2002)**

- Studied population: 7786
- 6574 Children
- 1212 Adults (45 pregnant women included)
- 65 % children with B-Pb>10 µg/dL(CDC, 1991)
- 30% children with B-Pb>15 µg/dL (OMS).
- Occupationally exposed Adults (B-Pb: 22.9 µg/dL)
- Without occupationally data Adult (B-Pb: 11.6 µg/dL)
- Pregnant women (B-Pb: 9,1 µg/dL)

"Uruguay has to take actions to mitigate or eliminate lead contamination sources considering children as the most affected population"

Source:Cátedra de Toxicologia e Higiene Ambiental, Alvarez et. al 2003

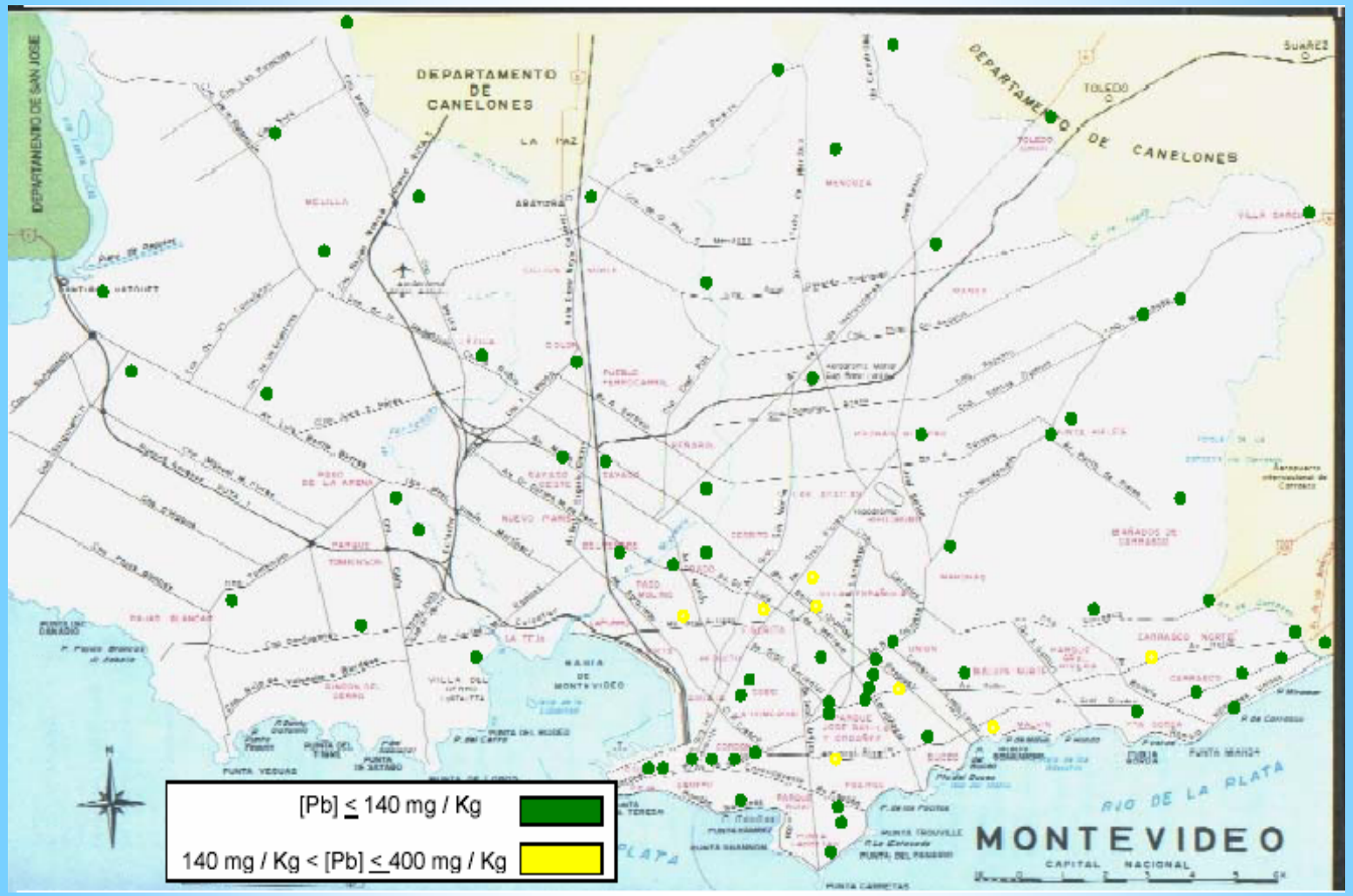
3) Soil samples from Settlement Areas (LHA-IMM)



- Studied Settlements
  n=57
- Soil samples Analised
  n=354
- Pb < 140 mg/kg
  n=209
- Pb 140 < Pb < 400 mg/kg
  n=80
- Pb > 400 mg/kg
  n=65
- Settlements with at least one sample Pb> 400 mg/Kg
  n=19

Source: IMM, 2003

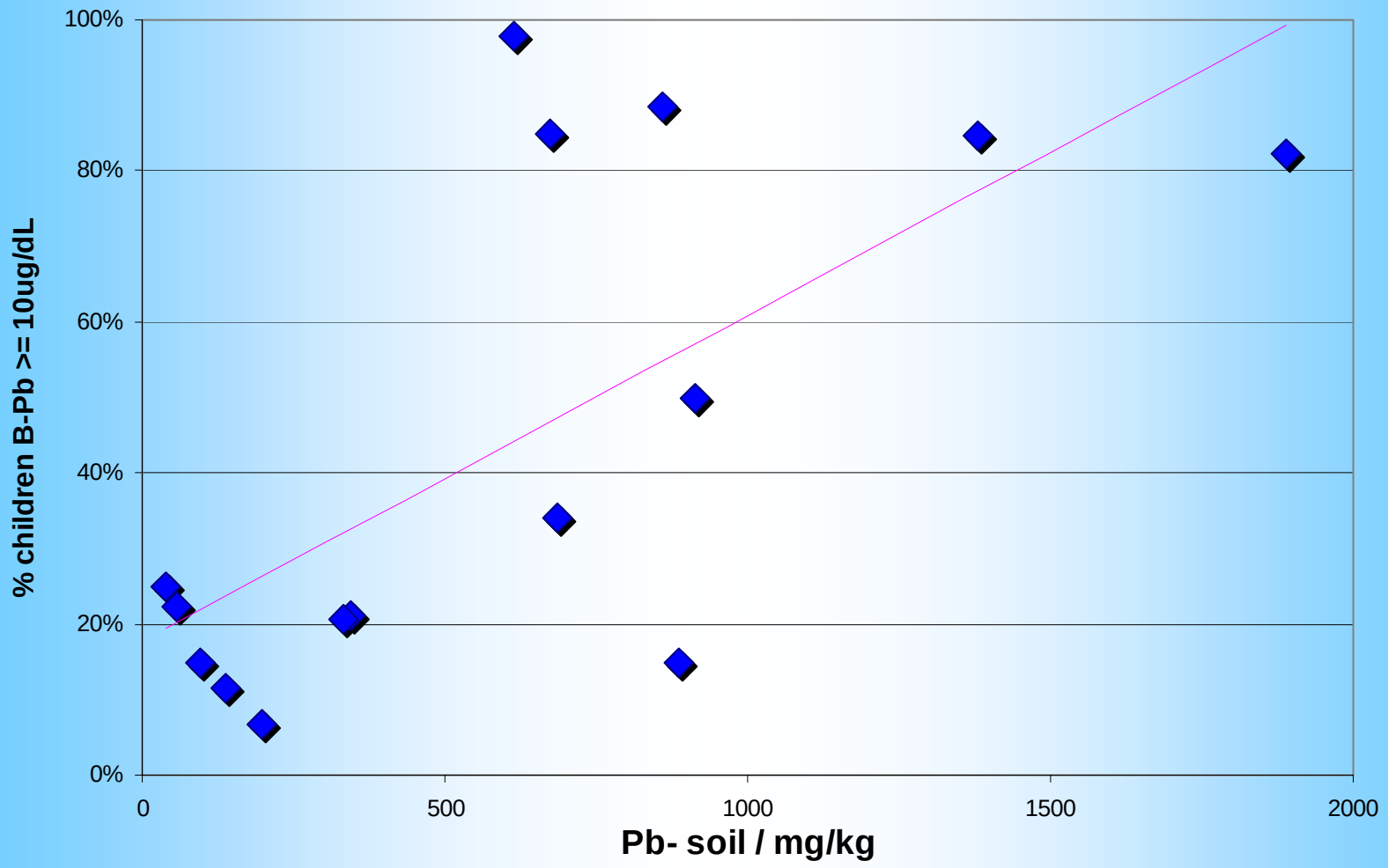
4)Lead from traffic sources in Montevideo (2001-03) n=78



Source: IMM, 2003

5) Pb-Soil Vs. B-Pb Children

n=15 settlements



Source:Dol, I et. al 2004

Lead in Uruguay: Current Situation

- TEL is not used any more as a gasoline additive
- Sanitary & Environmental Interinstitutional & Multidisciplinary joint actions.
- B-Pb > 15 µg/ dL must be always declared to the health risk survaillance authorities
- Many new laws, and laws projects debates
  - Ej. Pb-workers must be lead controlled, children might be lead controlled up to 4 ys, adults may have a pre-occupational lead control
- Many justice cases are in process
- Systematic surveillance B-Pb screening program in children will be done in the future
- New Research Studies developing

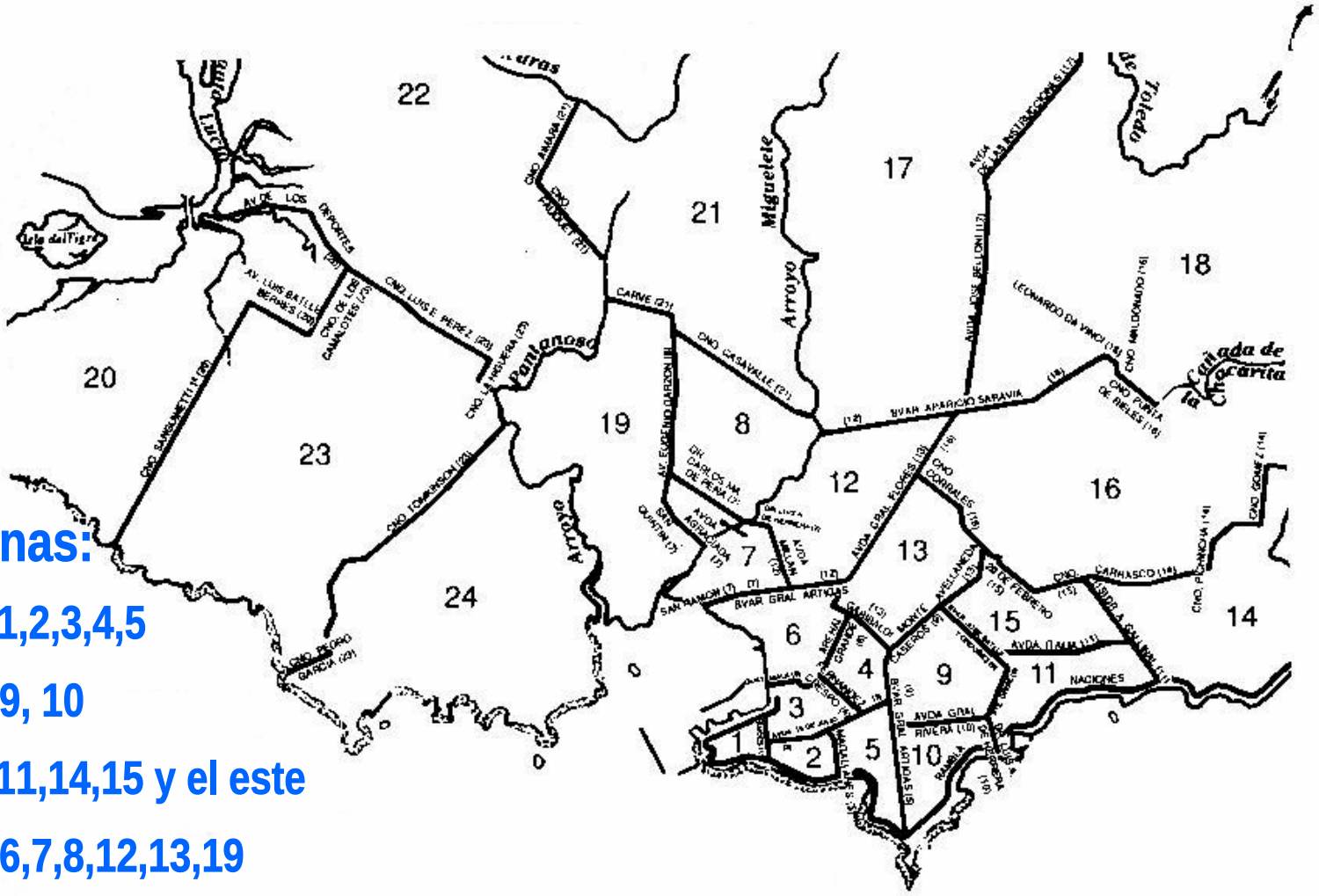
Lead Biomonitoring on Dogs as Sentinels for Environmental Risk Assesment

Aims:

- Demonstrate that dogs are more susceptible than children at similar conditions of lead exposure
- Assess the risk of environmental lead pollution by biological monitoring of B-Pb on dogs.
- Work up a scientific basis for a B-Pb dog screening program as a lower cost methodology for lead pollution to prevent health effects in children.

Source:Cátedra de Toxicologia e Higiene Ambiental: *Manay N et al.,2003*

Montevideo Studied Zones



Zonas:

a: 1,2,3,4,5

b: 9, 10

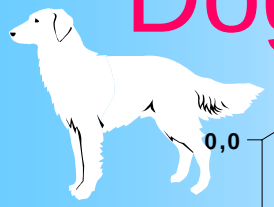
c: 11,14,15 y el este

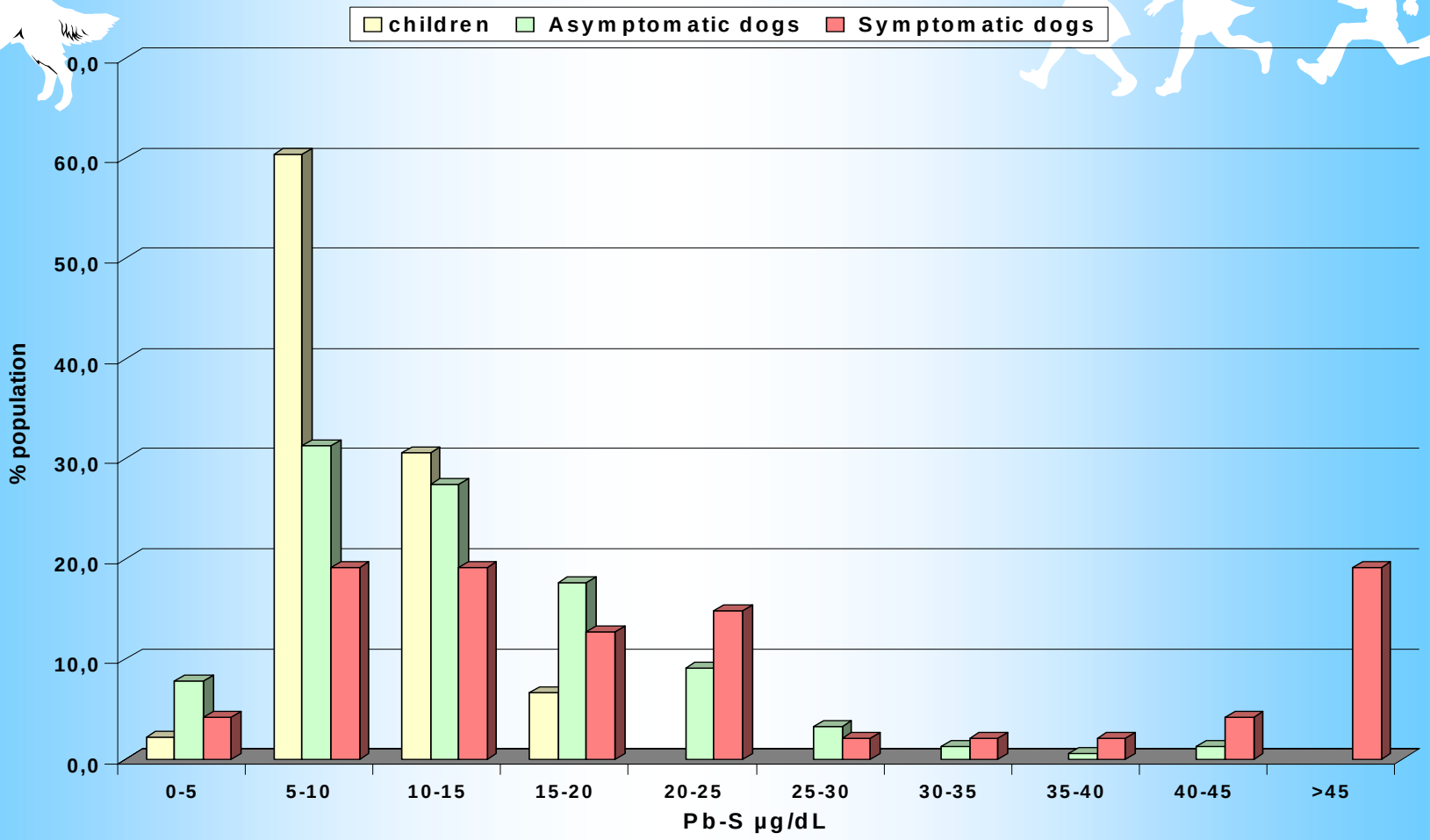
d: 6,7,8,12,13,19

e: 16,17,18,20,23,24

Source: Mañay N. 2001

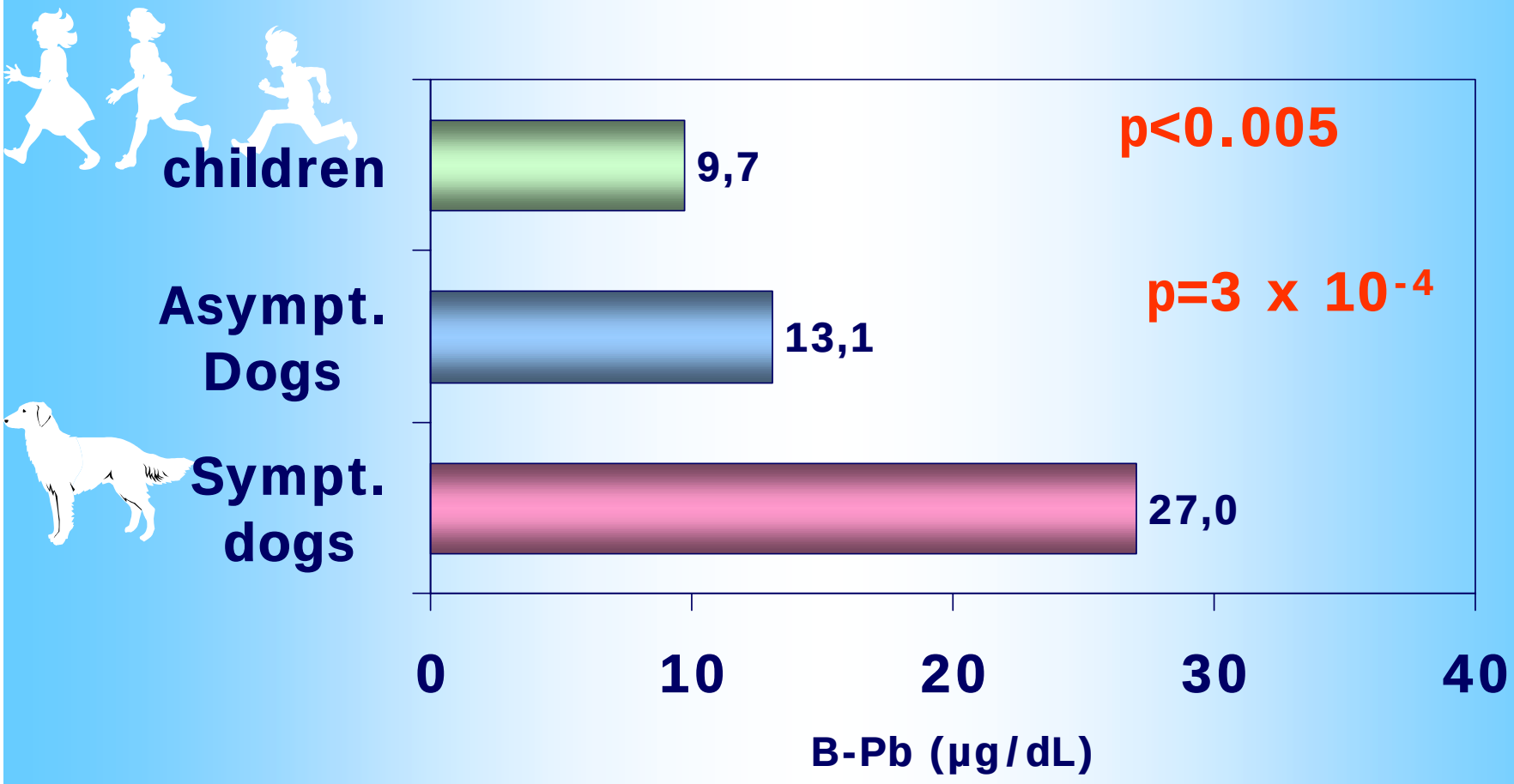
B-Pb Distribution
Dogs (200) vs. Children (134)





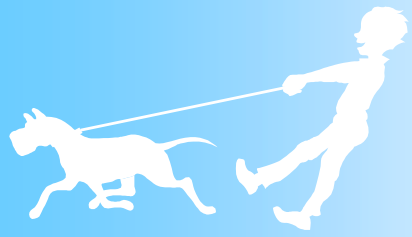
Source Mañay, N et al 2003

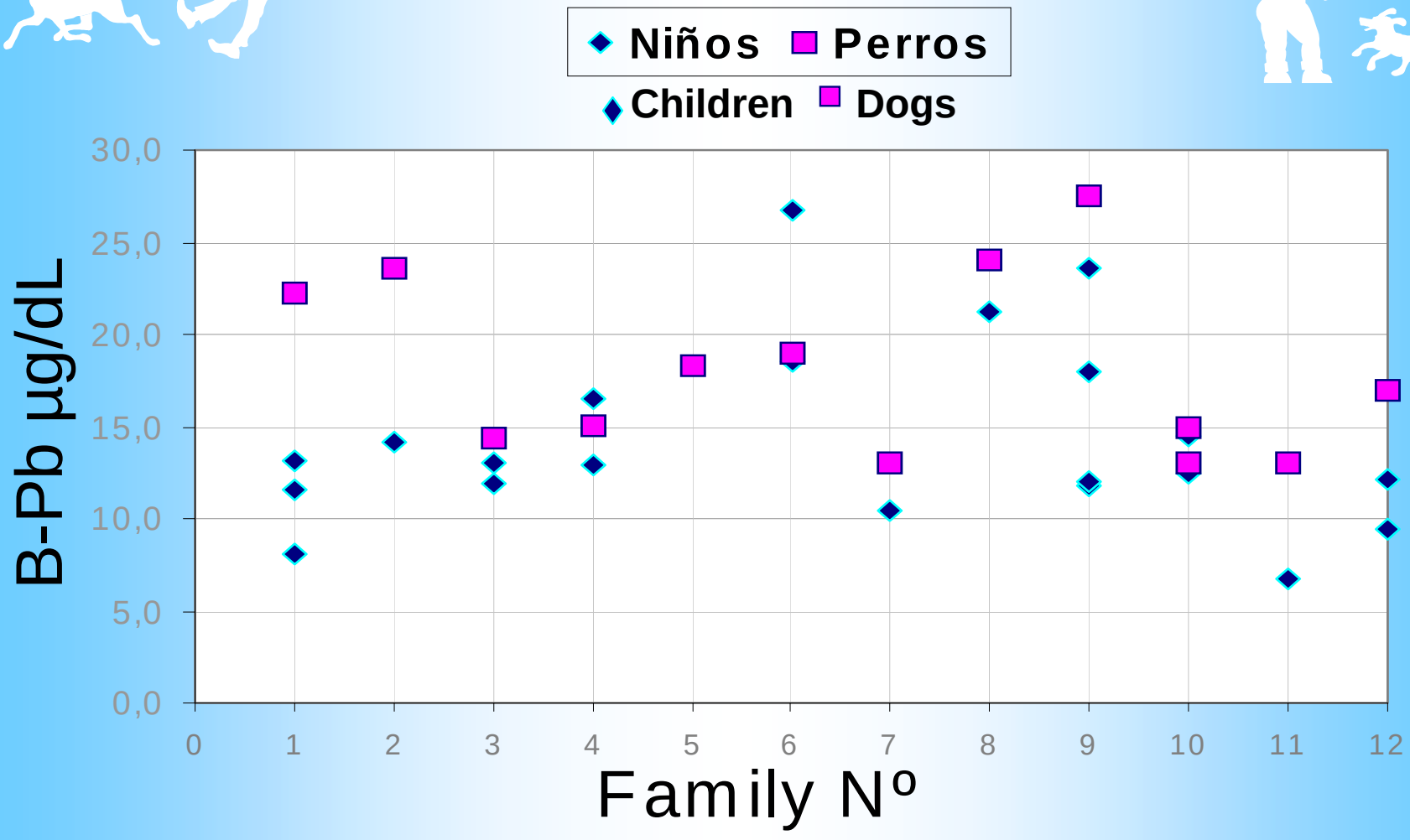
Dogs(n=200) vs. Children (n=134)



Source Mañay, N et. al 2003

Families living in a lead polluted area B-Pb (µg/dL)





(*)Source Mañay, N et al. 2003

Conclusions

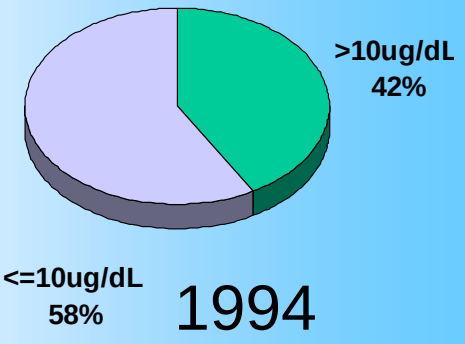
- Dogs are very useful as sentinels for environmental lead pollution
- They showed statistically significant higher B-Pb than children population and higher probability to develop early symptoms associated with lead intoxication with lower B-Pb than those observed from little children.
- Dogs may be used as as risk assessment tool as a first step in lead pollution diagnosis and control.
- It is a low costs and quickly way of establishing environmental screening programs with the advantage that dogs only “measure” biologically active lead .
- Finally, ethic aspects have been considered as another advantage of this proposal.

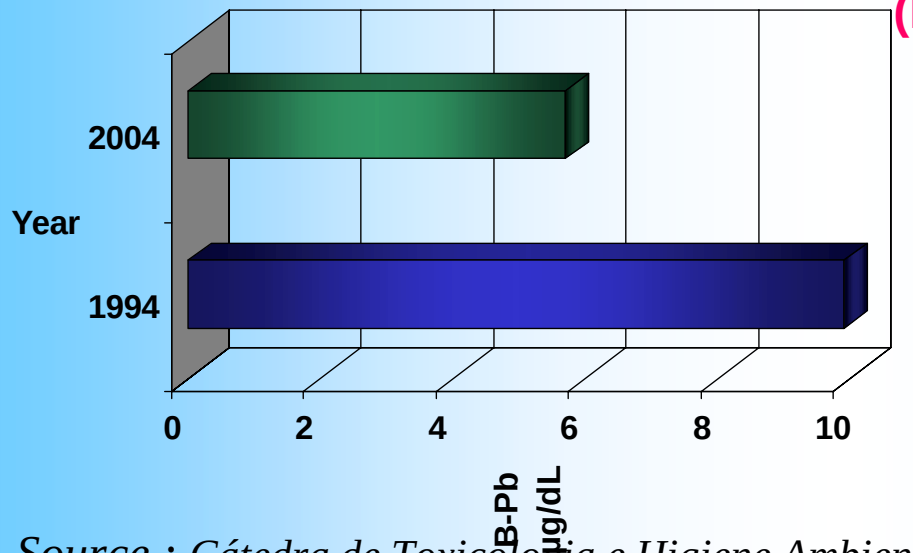
Source Mañay, N et. al 2003

B-Pb in uruguayan children 1994 Vs 2004

- Studied population and results ($\bar{X}$)

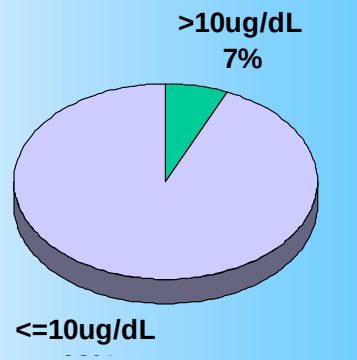
Y	N	B-Pb (µg/dL)	% B-Pb > 10µg/dL
1994	60	9.9	41.7
2004	180	5.7	6.7





(B-Pb) 2004<1994

$p < 10^{-3}$



2004

Source : Cátedra de Toxicología e Higiene Ambiental. Cousillas et. Al 2005

Considerations

- There is a lot of information from multidisciplinary aproach.
- Medicine, Sociology, Chemistry, Geology, and other scientific disciplines worked together
- Integration of the University activities with social and political actions has been very important for the managment of health risk situation
- Uruguay must develop Medical Geology as one of its aims to improve the knowledge and performance in environmental and health issues

References

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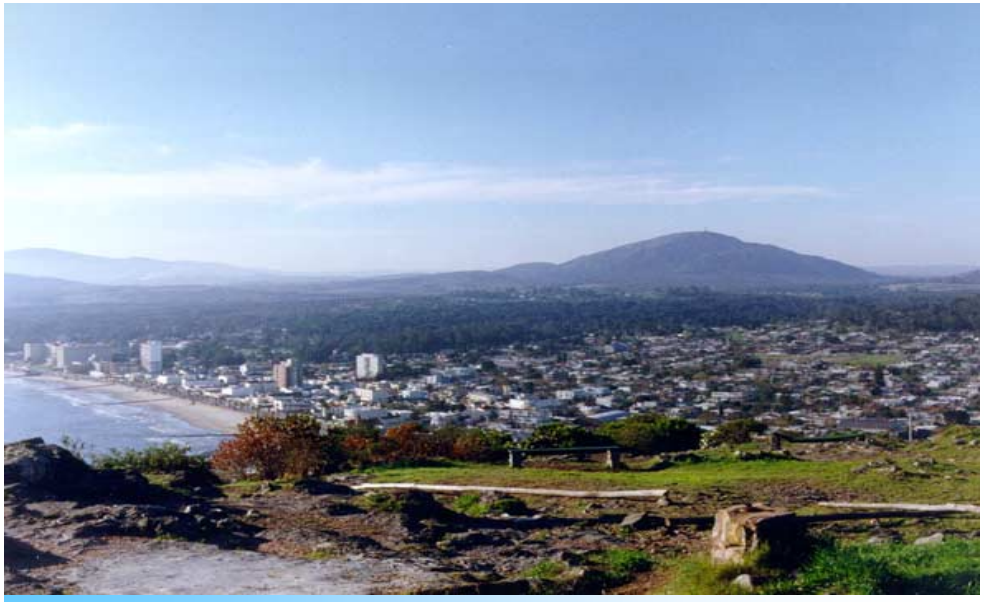
Source: Cátedra de Toxicologia e Higiene Ambiental- Facultad de Química



Thank you !!