International Symposium on Ethics of Environmental Health

Connecting the Dots with Ethics to Enhance Public Health

Steven G. Gilbert, PhD, DABT

September 10, 2018

Inheriting The Future

- Global Warming
- Burning Coal
- Coal Waste
- Mercury from Coal to Fish
- Nuclear waste
- Chemical body burden
- Chemical use
- LEAD !! (2018)

Motivating Issues For Me

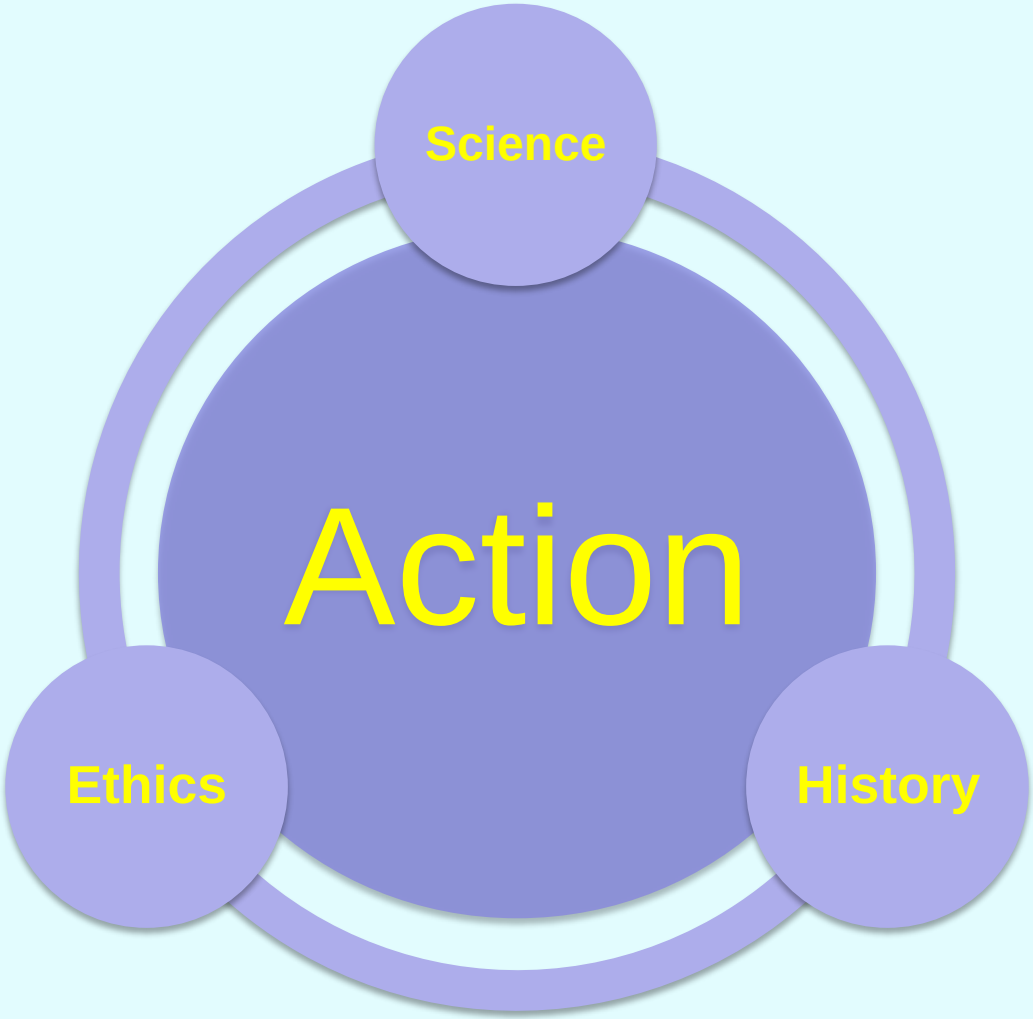
- Ethics not included / not discussed
- NO required discussion of ethics
- Framed in terms of monetary constraints
- How do we get people to listen?

Communicate to the public and policy makers

Strategies

- **Health and toxicology provide a common language**
- **Make ethics a fundamental part of decision making**
- **Create practical and flexible communication tool that can be used by everyone**

Connect the Dots



Why Connect the Dots?

- Broadens understanding of science
- Provides historical perspective
- Incorporates values and ethics
- Uses knowledge we have
- Supports critical thinking
- Refines action items
- Helps communicate to wide audience
- Adaptable
- Facilitates communication to policy makers

Connecting the Dots Fact Sheets

Connecting the Dots for Health – *Toxic issue*

No more that 3 pages – 4th page is connecting the dots diagram

Introduction

Subject – justify action

Action

One sentence action statement

Science

Brief over of science – exposure, health – vulnerable

History

Key elements of history of issue

Ethics

Justify action - autonomy, justice

Current Regulation

References and Web sites

Basic Dots – Lead Kids

Connecting the Dots for Health
Childhood Lead Exposure

Action
Reduce childhood lead exposures so that blood lead levels are less than 1 µg/dL

Science & Facts
- CDC – "NO safe level of exposure"
- Harms Nervous system – decreases IQ
- Lead substitutes for calcium
- Children Absorb 50% adults only 10%

Science

Action

Ethics History

Ethics
- Right to lead free environment
- Kids should be able to reach and maintain their full potential
- Add "community" to ethical constructs related to health

History
- 2000 BC "lead makes the mind give way"
- 1920's – lead added to gasoline
- 1922 – lead paint banned Europe
- 1978 – lead paint banned in US
- 2012 CDC Action level 5 µg/dL

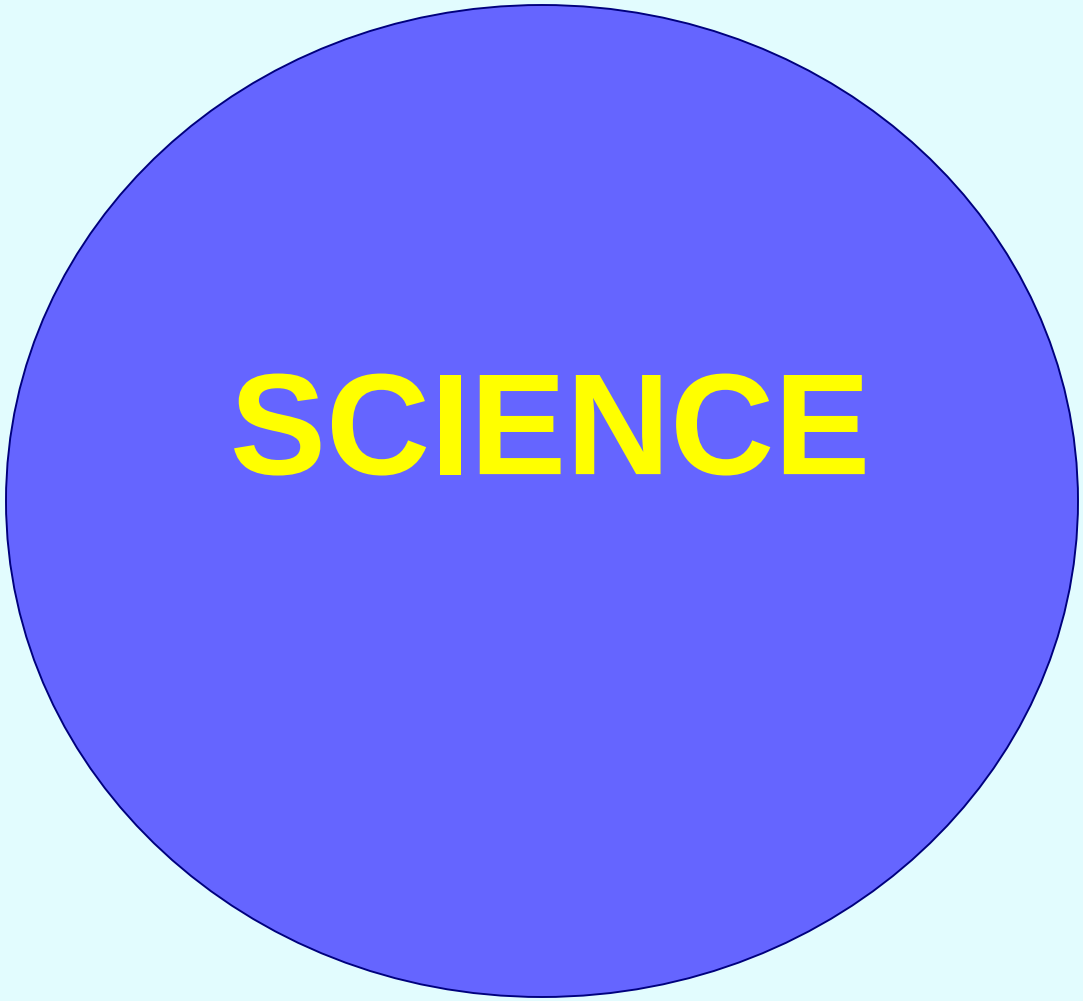
Action

Brief Action Statement

Action – Child lead levels

Reduce childhood lead exposure so that blood lead levels are less than 1 μg/dL

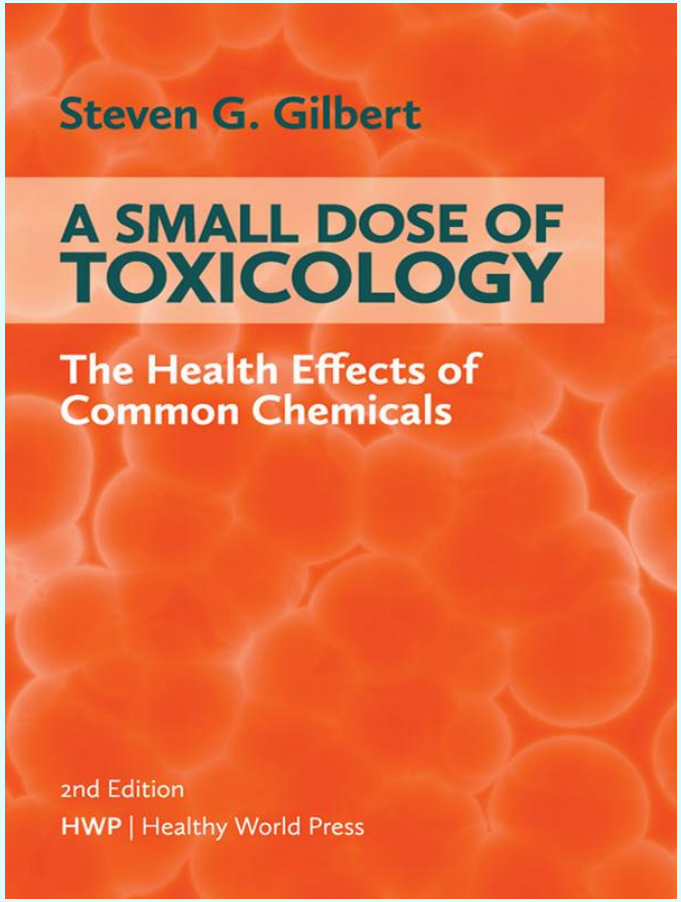
Science



Scientific Evidence

- Research
- Books
- Scientific Papers
- Reports
- Web sites

A Small Dose of Toxicology 2nd Edition



Free e-book
Healthy World Press

PowerPoint slides for each chapter Including Lead

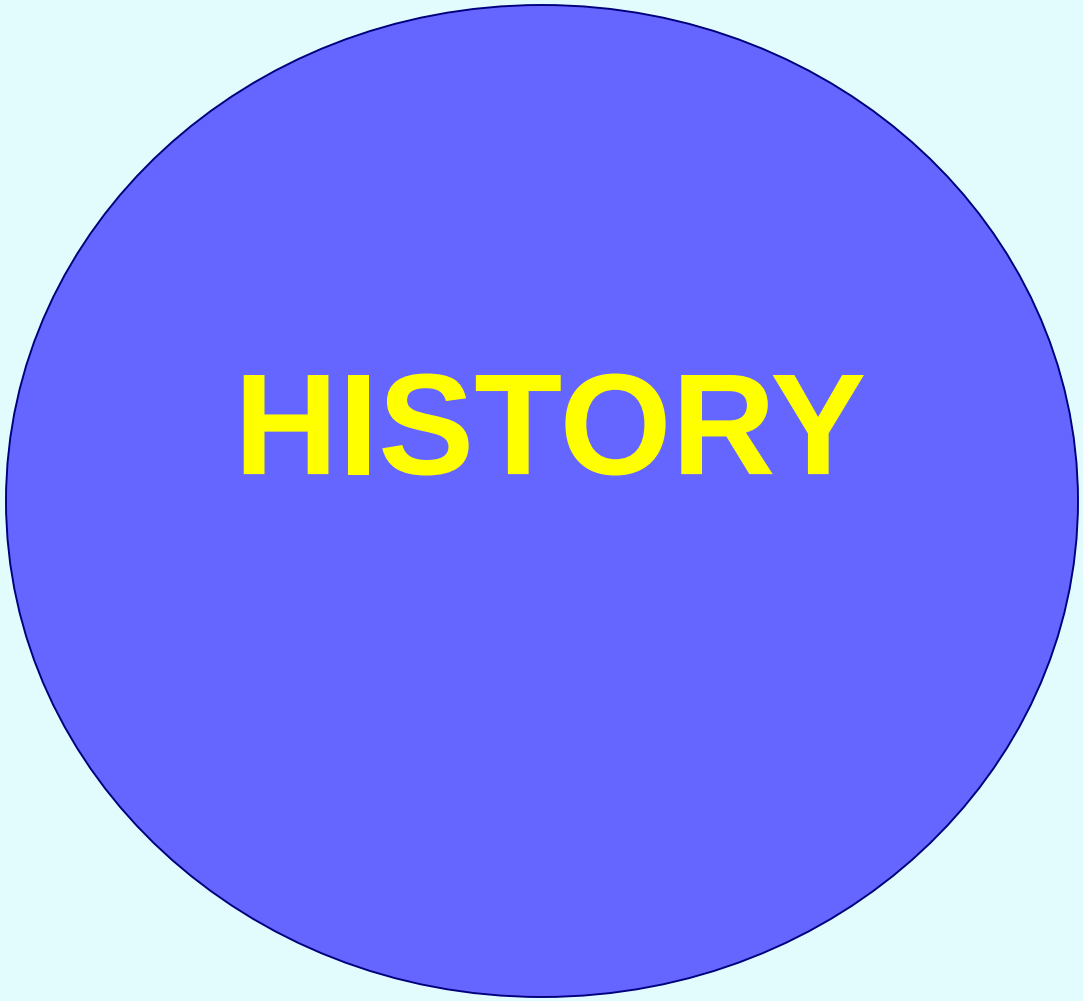
See: www.asmalldoseoftoxicology.org

Lead - Science & Facts

Science & Facts

- CDC – “NO safe level of exposure”
- Harms Nervous system – decreases IQ
- Lead substitutes for calcium
- Children Absorb 50% adults only 10%

History



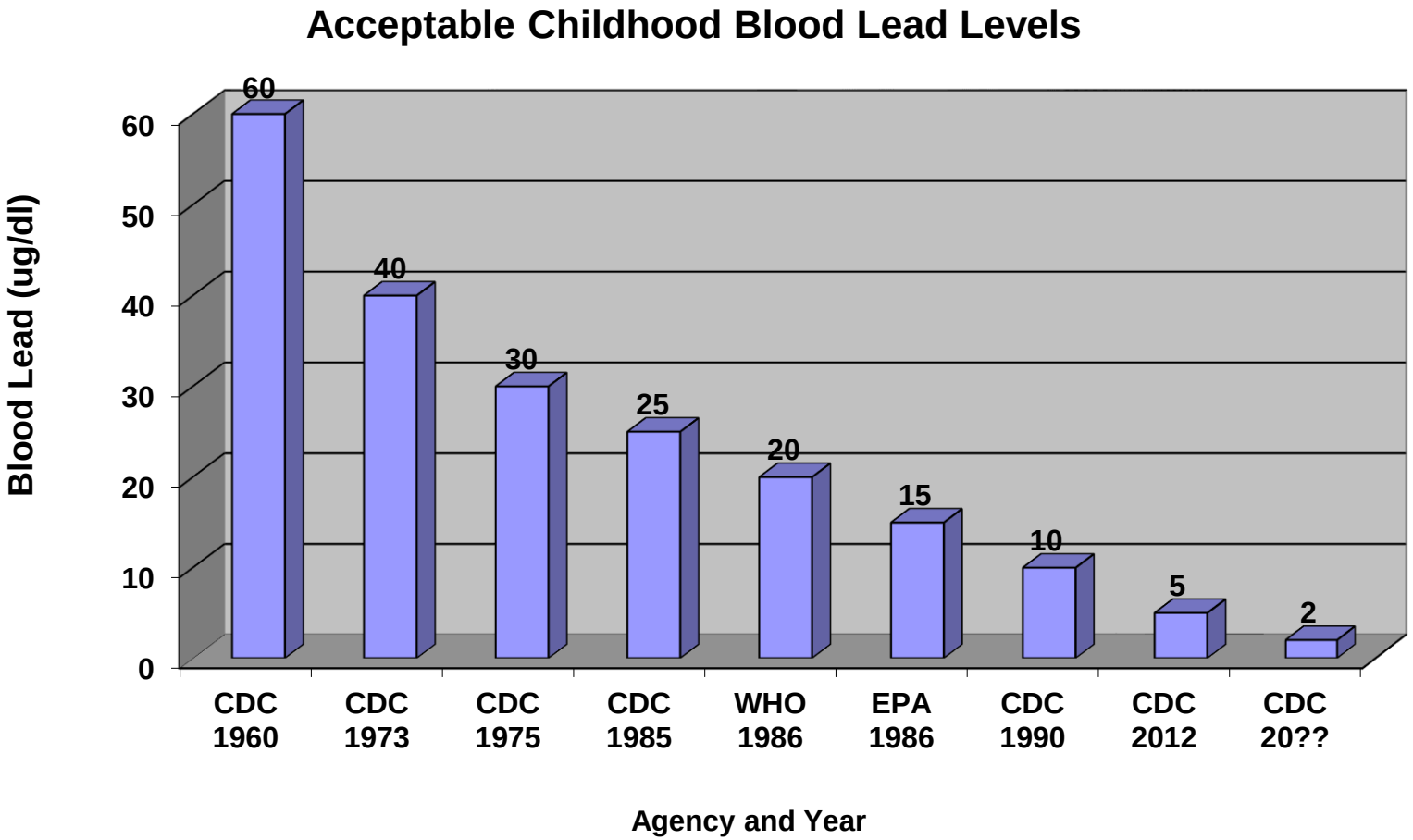
History informs

Historical events shape our ethical thinking and actions

For example

- Nuremburg trials
- Tuskegee syphilis experiment
- Lead mining

Agency Blood Lead Levels



Lead – Selected history

History

- 2000 BC “lead makes the mind give way”
- 1920’s – lead added to gasoline
- 1922 – lead paint banned Europe
- 1978 – lead paint banned in US
- 2012 - CDC - Action level 5 μg/dL

Ethics

Human & Environmental Health

“Conditions that ensure that all living things have the best opportunity to reach and maintain their full genetic potential.”

Steven G. Gilbert, 1999

Gilbert SG. Ethical, legal, and social issues: our children's future. Neurotoxicology. 2005;26:521-30.

Precautionary Principle

“When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.”

Wingspread Conference, 1998.

Traditional Ethical Foundation

Focus on the individual

- Respect for autonomy
- Beneficence
- Nonmaleficence
- Justice

Beauchamp and Childress, 1994

Alternative Ethical Foundation

Expanded ethical construct

- Dignity
- Veracity
- Sustainability
- Justice (environmental justice)

Emphasis on community.

[Gilbert, SG. EHP (2006)]

Emphasize doing Good

- Not just no harm - good
  - What is good?
- Positive contribution to human health and the environment
- Beneficial to health or well-being

Epigenetics – biology of good

Epi, means “upon”, "above", "in addition to".

Epigenetics is the study of changes in gene expression caused by mechanisms other than changes in the genetic (DNA) code.

Epigenetics Changes

Caused by environmental hazards

- cigarette smoke
- arsenic
- alcohol
- phthalates
- BPA
- other chemicals

- nutrition
- methy content of diet
- intake of folic acid
- vitamins
- social and maternal behavior toward the offspring

Ethics of Epiprecaution

- Moving “above” or “beyond” precautionary approach
- Doing good
- Loving & supportive environment
- Doing no Harm is not doing enough
- Ensure children can reach and maintain their full potential
- Biological support epigenetics

Ethics child lead exposure

Ethics

- Right to lead free environment
- Kids should be able to reach and maintain their full potential
- Add ‘community’ to ethical constructs related to health

Regulation and References

Current Regulation

References and Web sites

Childhood Lead Exposure - P1

Connecting the Dots for Health
Childhood Lead Exposure

Action
Reduce childhood lead exposures so that blood lead levels are less than 1 µg/dL

Science & Facts
- CDC – "NO safe level of exposure"
- Harms Nervous system – decreases IQ
- Lead substitutes for calcium
- Children Absorb 50% adults only 10%

Science

Action

Ethics History

Ethics
- Right to lead free environment
- Kids should be able to reach and maintain their full potential
- Add 'community' to ethical constructs related to health

History
- 2000 BC "lead makes the mind give way"
- 1920's – lead added to gasoline
- 1922 – lead paint banned Europe
- 1978 – lead paint banned in US
- 2012 – CDC Action level 5 µg/dL

Childhood Lead Exposure – P2

Connecting the Dots for Health – Childhood Lead Exposure

Introduction

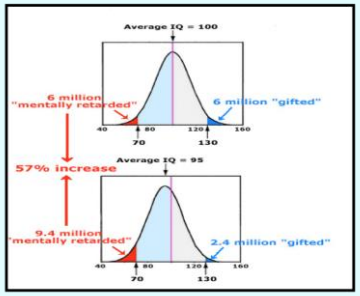
There are many children around the world who have elevated blood lead levels, despite the accepted fact that there is no safe level of lead exposure for children. The mean blood lead level (BLL) in children in the US is about 1.3 µg/dL. Any level above 1.3 µg/dL can be considered elevated and most likely is the result of environmental lead exposure. Human research indicates that even the smallest amount of lead exposure results in a degradation of intellectual abilities.

Action

Eliminate childhood lead exposures so that individual blood lead levels are less than 1 µg/dL.

Science

The most recent research documents that BBL as low as 2 µg/dL causes intellectual impairment and decreased IQ. It is now widely accepted that there is no safe level of lead exposure and that children are uniquely susceptible to harm from lead exposure. There are several reasons for this. First, their small size results in a bigger dose by body weight. Second, kids eat more, breathe more, and drink more than adults by body weight. Third, they are more likely to put things in their mouths, increasing the potential for lead exposure. Fourth, they absorb more ingested lead (approximately 50% of the lead they ingest is absorbed whereas adults absorb only 10% of what they ingest). Fifth, lead substitutes for calcium that is necessary for rapidly growing bones. Lead deposited in the bones may have other long-term effects. A girl exposed to lead during childhood stores that lead in her bones, which may be released to a fetus should she get pregnant negatively impacting fetal health. Finally, a child's developing nervous system and other organs are more susceptible to lead exposure. Review of multiple research studies finds that the developing nervous system is particularly susceptible to the lowest levels of lead exposure; there is greater IQ loss as BLL increase from 0 to 10 µg/dL, even more than as BLL rise from 10 to 20 µg/dL.



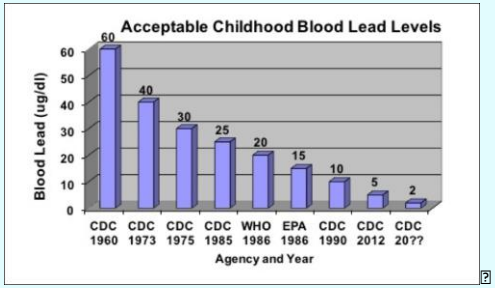
IQ Shift due to Lead Exposure (Gilbert 2006)

History

Lead was mined in Turkey as early as 6500 BCE and was used for its low melting point and durability. The Romans mined and smelted lead from 500 BCE to 300 CE, which resulted in a spike in the lead released into the atmosphere, which was not eclipsed until the industrial

Childhood Lead Exposure – P3

revolution. The Greek physician, Dioscerides, noted the human health consequences of lead exposure over 2000 years ago when he said: "'lead makes the mind give way''. Widespread commercial use of lead soared with the use of lead in gasoline and the recognition that lead-based paint was both highly protective and durable. In Europe the hazards of lead-based paint were soon recognized and it was banned by the League of Nations in 1922.



Regulatory history of Blood Lead Levels (Gilbert 2006)

Lead-based paint was banned in the US in 1978. Lead was removed from gasoline in the US in about 1990, which resulted in a substantial drop in average BLL. The 'Acceptable BLL' (AKA 'Actionable BLL') was gradually lowered as regulatory agencies responded to growing research data on the health effects of lead. In 2012 the Actionable BLL was lowered to 5 µg/dL. It should be noted that no Safety Factor to protects sensitive populations has ever been applied in the regulation of BLL. Also to be addressed are efforts to regulate occupational lead exposure to reduce the potential for exposure to children due to 'take home' lead exposures.

Ethics

The ethical underpinnings supporting a reduction in lead exposure to children are based on a child's right to a safe environment and one in which they have the best opportunity to reach and maintain their full potential. For years, the consequences of childhood lead exposure were recognized in terms of clinical presentations of acute lead poisoning. Now the understanding and recognition of the exquisite sensitivity of the developing nervous system to low, and even very low, levels of lead exposure argues for an inclusion of a full range of human potential when setting regulatory levels. Beauchamp and Childress focus on protecting the individual when outlining their four basic constructs: respect for autonomy, beneficence, nonmaleficence, and justice. We have matured beyond the individual when contemplating an ethical framework. A more inclusive ethical construct should pertain not just to the individual, but also to the community with dignity, veracity, sustainability, and justice (environmental justice) being part of the ethical guidance.

Conclusion

The developmental hazards of lead are no longer disputed. The question confronting us is how to translate this information into health policy and to provide public health professionals and the public with guidance necessary to protect child health and development. It is a question that requires the contemplation of the intersections of science, history, and ethics when setting regulatory policy.

Childhood Lead Exposure – P4

Current Regulation (USA)

CDC – no safe lead exposure but action levels set at 5 µg/dL

OSHA – lead in air: 0.5 mg/m3 (milligrams per cubic meter); Worker removal at BLL 60 µg/dL

EPA maximum level for lead in public drinking water systems is 15 µg/L (15 ppb)

EPA air lead standard 0.15 µg/m3 rolling 3-month average

The EPA's standard for lead in bare soil in play areas is 400 ppm by weight and 1200 ppm for non-play areas [EPA 2000a]. This regulation applies to cleanup projects using federal funds.

OSHA standards for regulating worker exposure to lead:

OSHA	Blood	40 µg/dL	cause for written notification, medical exam,
		60 µg/dL	cause for medical removal from exposure

https://www.atsdr.cdc.gov/csem/csem.asp?csem=34&po=8

References and Web Sites

Centers for Disease Control and Prevention. Lead. https://www.cdc.gov/nceh/lead/; 2017.

Newman N., Jones C., Page E., Ceballos D., Dza A. Investigation of childhood lead poisoning from parental take-home exposure from an electronics scrap recycling facility—Ohio, 2012. MMWR Morb Mortal Wkly Rep 2015;64:743-745.

Gilbert, S.G. and Weiss, B.A. "Rationale for Lowering the Blood Lead Action Level From 10 to 2 µg/dL". Neurotoxicology 27, 5 (2006): 693-701.

Gilbert, S.G., Ethical, legal, and social issues: our children's future. Neurotoxicology, Vol 26/4 pp 521-530, 2005. (doi 10.1016/j.neuro.2004.12.006).

Needleman, H.L. "The removal of lead from gasoline: historical and personal reflections". Environ Res 84, 1 (2000): 20-35.

Hipkins, K.L., Materna, B.L., Payne, S.F., Kirsch, I.C. Family lead poisoning associated with occupational exposure. Clin Pediatr (Phila) 2004;43(9):845-9.