



Micro Trace Minerals Laboratory

35+ years of clinical & environmental laboratory diagnostics - worldwide

EnvironMental & EleMental Toxins in Neurological Disease

- Metal Exposure in Children with physical and neurological disorders





ثرحييات





-a minimum of 40% of autism cases are likely to have an environmental cause.
- Environ Health Perspect. 2006 July; 114(7): 1119–1125.
- **The CHARGE Study: An Epidemiologic Investigation of Genetic and Environmental Factors Contributing to Autism**





The Environmental Contribution

„Children today are surrounded by thousands of synthetic chemicals. **Two hundred of them are neurotoxic in adult humans**

...fewer than 20% of high-volume chemicals have been tested for neurodevelopmental toxicity.“

Landrigan, Philip J MD, MSC, Dept of Pediatrics, Children’s Environmental Health Center, Mount Sinai School of Medicine, NY, NY. **Current Opinion in Pediatrics 2010, 22:219-225**





Brick Township, N.J. an industrial city in the USA, known for its toxic landfill, has 3x more Autistic Children than other industrial cities

Mercury is one of the toxins deposited in that landfill

Sampling showed elevated levels of cadmium and a low-level presence of volatile organic compounds (VOCs) in groundwater and wells in and around the site.





Common toxicological reactions to metal overexposure

- Enzyme dysfunction
 - Cell death





Autism: CHARGE STUDY 2006

contributing causes are

Genetic and Environmental factors





THE GENETIC CONNECTION

The Detoxification Pathway
(also a form of enzyme dysfunction)

internally regulates

AND PROTECTS

from

TOXIC EXPOSURE





GSTM1 & GSTT1 deletion in Arab populations

GSTM1 deletion

- 49.7% - Bahraini
- 52.5% - Lebanese
- 63.4% - Tunisians

GSTT1 deletion

- 28.7% Bahraini
- 37.6% Lebanese
- 37.1% Tunisians

Combined analysis of both genes revealed

14.4% of Bahrainis,

16.3% of Lebanese

21.0% of Tunisians harbor deletion of both genes





Toxins affect fetal development in the prenatal phases

- Transplacental exposure to heavy metals may affect child growth and cause neuro-developmental delays.
- Efforts should be made to measure and quantify maternal exposure to heavy metals in placenta to estimate environmental prenatal exposure
- Paolo D. Pigatto, Claudio Minoia, Anna Ronchi, Gianpaolo Guzzi, Human Placenta and Markers of Heavy Metals Exposure. *Environ Health Perspect* 120:a10–a10 (2013).





- **A significant, positive correlation was established between the parity of the examined women and the umbilical cord blood contents of lead and mercury.**
- **The obtained results support the opinion that human placenta does not form an effective barrier to toxic metal intake by the fetus.**
- [Ginekol Pol.](#) 1989 Mar;60(3):151-5.
- **The intrapartum content of toxic metals in maternal blood and umbilical cord blood.**
- [Sikorski R](#), [Paszkowski T](#), [Sławiński P](#), [Szkoda J](#), [Zmudzki J](#), [Skawiński S](#).



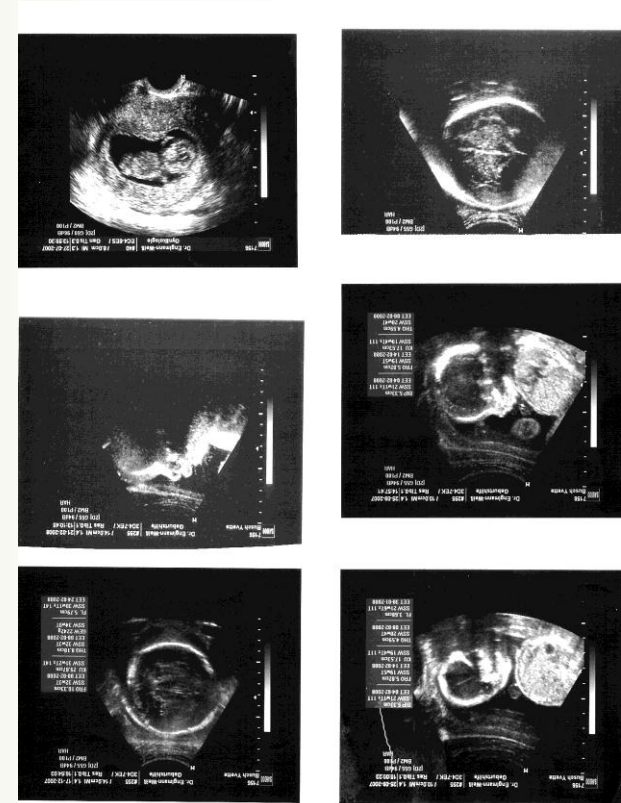


Prenatal Development

Mercury, Lead and Cadmium pass the placenta and damage placenta cells.

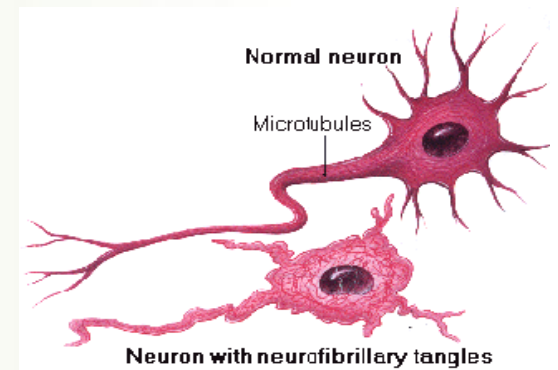
Prenatal exposure correlates with reduced birthweight and developmental problems.

The amount of exposure during the specific time of development determines the extent of the damage.





How toxins influence postnatal development



Brain development continues for an extended period postnatally. The brain increases in size by four-fold during the preschool period, reaching approximately 90% of adult volume by age 6

(Reiss et al. 1996; Iwasaki et al. 1997; Courchesne et al. 2000; Kennedy and Dehay 2001; Paus et al. 2001; Kennedy et al. 2002; Lenroot and Giedd 2006).

During the first year -and rapid brain development- is the best time for corrections.

This is the time when CNS-damaging metals (Aluminum, lead, mercury) should be avoided





Blood Levels of Mercury Are Related to Diagnosis of Autism: A Reanalysis of an Important Data Set

M. Catherine DeSoto, PhD et al cathy.desoto@uni.edu

- We have reanalyzed the data set originally reported by **Ip et al. in 2004** and have found that the original p value was in error and that **a significant relation does exist between the blood levels of mercury and diagnosis of an autism spectrum disorder.**
- Moreover, the **hair sample analysis results offers support that persons with autism may be less efficient and more variable at eliminating mercury from the blood**





Toxic metals in umbilical blood

“Total mercury and [methylmercury](#), [cadmium](#), and iron were higher in cord blood than in maternal blood”

- [Tsuchiya H](#), [Mitani K](#), [Kodama K](#), [Nakata T](#)
- Placental transfer of heavy metals in normal pregnant Japanese women.
- [Archives of Environmental Health](#)[1984, 39(1):11-17]





OTHER DIAGNOSTIC TESTS

Hair Analysis reflects chronic exposure
(= past exposure, usually over longer time)

Urine metal concentration
reflects metal exposure or intake within
72hrs (= immediate exposure)





Chronic Metal Exposure in Children of Rio de Janeiro, Brasil

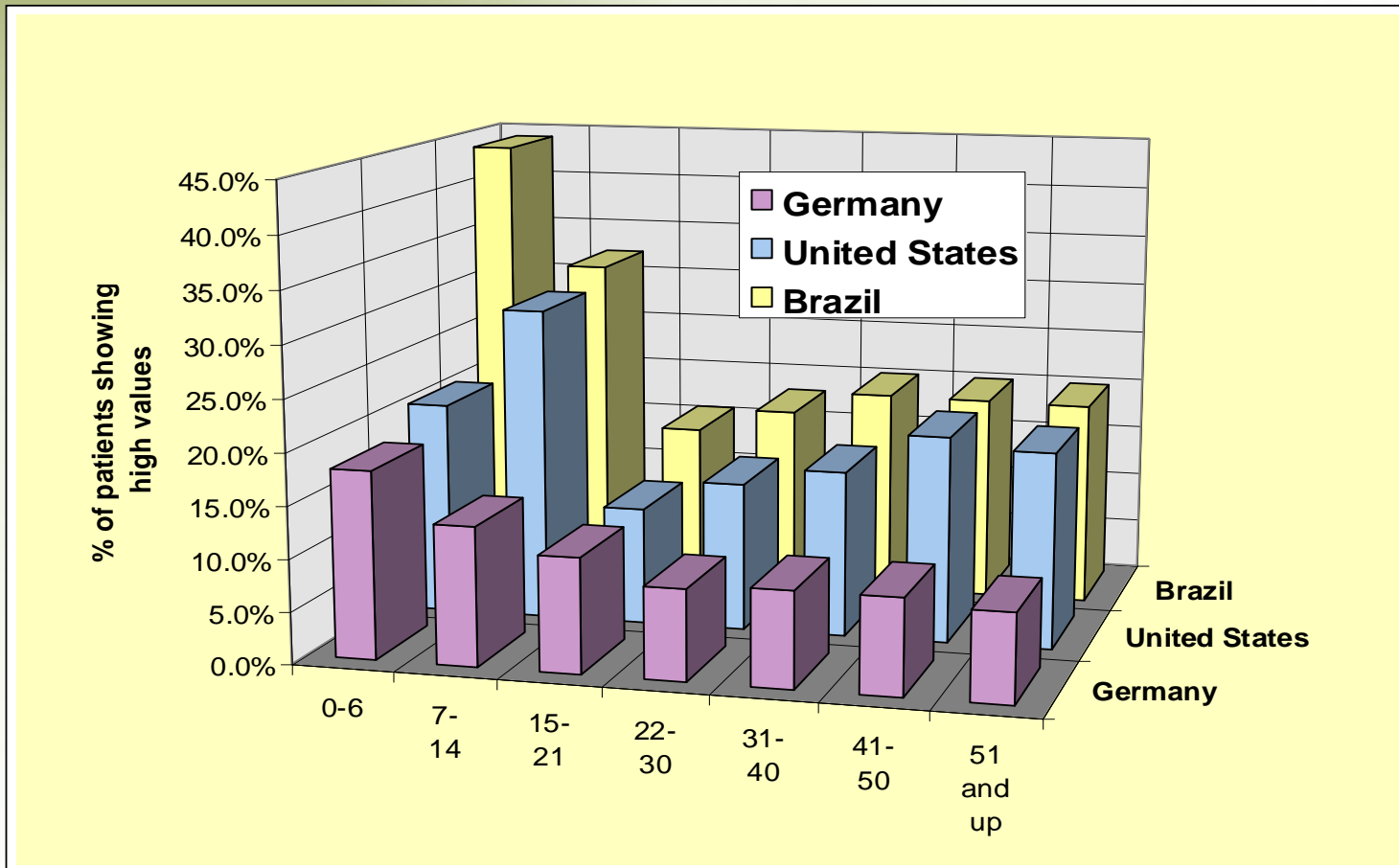
- Data was collected from Brazilian, German and US population of various age groups during **September 1997 to March 1998.**
- Total number of hair samples = >10,000
- **Reason for study:**
- increase in criminal juvenile behaviour





Lead (Pb) levels in hair of Brazilian children

43% of children younger than 6 years showed pathological results, compared with 24% of adults >31 yrs





HAIR Metal Analysis of 149 Punjabi People

% Pathological Test Results

N= number of testpersons	Cadmium	Manganese	Lead	Uranium
All patients N=149	21	55	50	78
Adults age >13 N=34	6	27	29	85
Children <12yrs N=114	13	87	55	88
Children 6-12yrs N=54	4	83	28	87
Cerebral Palsy N=48	21	67	58	77
Down Syndrom N=8	13	25	50	63
Mild Retardation N=20	15	40	30	80





Urine Metal Analysis

Punjabi children age 3-12yrs with healthy renal function

Of the 55 children, 47 showed elevated **baseline urine levels** of one or more toxin-

reflection of an immediate exposure

	Reference Range for Normal Urine mcg/L	Baseline Urine in mcg/g Crea Mean Value	Exceeding Reference value
Barium	<8.22	78	9.5x
Cadmium	<0.2	0.92	4.6x
Manganese	<4.5	17.5	3.9x
Lead	<5	43	8.6x
Uranium	0.06	0.65	10.8x





Urine Metal Analysis before and after DMSA

Punjabi children age 3-12yrs with healthy renal function

Lead detoxification- **yes!**

	Reference Range for Normal Urine mcg/L	Baseline Urine in mcg/g Crea Mean Value	Reference Range for DMSA Urine	DMSA challenge Mean Value	Detox Effect after DMSA > Baseline value
Barium	<8.22	78		37	no
Cadmium	<0.2	0.92	<0.8	0.42	no
Manganese	<4.5	17.5		7.45	no
Lead	<5	43	<10	71	yes
Uranium	0.06	0.65		0.53	no





Metal exposure in the physically and mentally challenged children of Punjab, India

E. BLAUROCK-BUSCH, PhD^a; Albrecht FRIEDLE^b, Dipl.Ing. (FH) Chemistry^b; Michael GODFREY, MD^c; Prof. Claus F.F. SCHULTE-UEBBING, MD^d

^aE. Blaurock-Busch PhD, is research director at Micro Trace Minerals Laboratory and advisor to the International Board of Clinical Metal Toxicology (IBCMT) and the German Medical Association of Metal Toxicology (Deutsche Ärztgesellschaft für Metalltoxikologie).

^bAlbrecht Friedle Dipl. Ing. (FH) Chemistry is founder and CLO of the environmental laboratory Labor Friedle, Regensburg (Germany), specialized in the determination of residues and contaminants in trace levels.

He is a publicly appointed and sworn expert for chemical indoor pollutants.

^cMichael Godfrey, MD, Director, International Board of Clinical Metal Toxicologist, New Zealand.

^dProf. Claus F.F. Schulte-Uebbing, MD, AGE BREAKING CENTER, Praxis Professor (EU), Munich, Germany

ABSTRACT

We collected 149 hair samples at the Baba Farid Centre at Faridkot in Punjab, India to evaluate the trace and toxic metal concentration via ICP-MS. A total of 53 elements were tested. The hair of the children tested showed high values for Ba, Cd, Mn, Pb and U, signifying long-term exposure. Urine baseline testing supported hair analysis findings for all the elements listed above; a DMSA (Dimercapto Succinic Acid) challenge test raised urinary values for lead. Testing of six randomly selected water samples showed concentrations above the European maximum contaminant level for uranium (U) in three samples and lead (Pb) in one.

Research aim:

- a) To evaluate if hair analysis and/or urine provocation confirm or refute long term metal intoxication.
- b) To support or refute that hair mineral analysis confirms urine challenge test results.
- c) To support or refute that a DMSA urine challenge test provides a valuable treatment option for metal exposure in children.

Conclusion:

Our results documented that hair and urine mineral analysis results are supportive of each other, and are both useful diagnostic tools in chelation therapy. We also documented that a DMSA challenge test confirms long term exposure as detected through hair mineral analysis. This indicates that the chelating agent DMSA (Dimercapto succinic acid) provides a safe and valuable treatment option for lead overexposure.

Keywords: barium; cadmium; manganese; lead; uranium; urine analysis; hair analysis; water analysis; DMSA; chelation; Punjab children; India.

Address for correspondence:

E. Blaurock-Busch, PhD, Röhrenstr 20, 91217 Hersbruck, Germany
email address: ebb@microtrace.de or ebb@microtrace.de

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Metal Exposure in the Children of Punjab, India

E. Blaurock-Busch¹, Albrecht Friedle², Michael Godfrey³, Claus E.E. Schulte-Uebbing⁴ and Carin Smit⁵

¹Research Director, Micro Trace Minerals Laboratory, Advisor, International Board of Clinical Metal Toxicology (IBCMT) and German Medical Association of Metal Toxicology (Deutsche Ärztgesellschaft für Metalltoxikologie). ²CEO, Labor Friedle, Regensburg, Germany. ³Director, International Board of Clinical Metal Toxicology, New Zealand. ⁴Age Breaking Center, Professor (EU), Munich, Germany. ⁵Neurotherapist, Synapse Neuro-Nutritional Clinic, Town Square, South Africa. Corresponding author email: ebb.blaurock@gmx.de or ebb@microtrace.de

Abstract: Our test results documented that hair and urine mineral analysis results support each other. This is of interest, because hair analysis evaluates past exposure while urine analysis detects immediate exposure.

We evaluated barium, cadmium, manganese, lead and uranium in hair and urine. Our test results indicate that all of the children show evidence of past and immediate exposure to one or more metals.

Hair mineral test results for the 114 children aged 12 and younger showed some type of toxic metal exposure for each one of the children. 88% exceeded the uranium reference range for hair. This indicates past and chronic exposure.

After renal evaluation, 55 children aged 3–12 years who passed certain criteria were selected for urine baseline testing. Urine baseline concentrations are a direct reflection of immediate exposure. Of the 55 children, 47 showed elevated urine concentrations for one or more of the toxins listed above, demonstrating immediate exposure.

DMSA is recommended as an oral antidote for lead and other metals. We selected 55 children aged 3–12 for a DMSA (Dimercapto succinic acid) urine challenge test. Our results showed that 98% of this group showed lead concentrations above the baseline level, demonstrating lead binding and excretion. The DMSA challenge did not affect barium, cadmium, manganese and uranium, suggesting that for these elements, DMSA may not be the chelating agent of choice.

In summary, hair and urine mineral testing demonstrated that chronic and immediate toxic exposure had affected our test group of Punjabi children. The DMSA challenge test was effective in detoxifying lead, but did not affect barium, cadmium, manganese or uranium.

Keywords: urine analysis, hair analysis, DMSA; barium, cadmium, manganese, lead, uranium, Punjab, India

Clinical Medicine Insights: Therapeutics 2010;2:655–661

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Hair Metal Concentration in KSA Children

	X-value in mg/kg Autistic N=44	Reference Range mg/kg
Arsenic (As)	2.94	< 0.2
Cadmium (Cd)	0.62	< 0.2
Mercury (Hg)	3.35	< 0.3
Lead (Pb)	4.56	< 3.0

Metals in hair tissue reflect chronic exposure to multiple toxic metals





Urine Metal Concentration in KSA Children

	Autistic N=25 X-value in mcg/g creatinine +SD	Reference Range mcg/g creatinine	Test group N=25 X-value in mcg/g creatinine +SD
Arsenic (As)	37.58 +/- 30.12	< 15	32.06 +/- 45.26
Cadmium (Cd)	0.41 +/- 0.26	< 0.80	0.53 +/- 0.38
Mercury (Hg)	2.48 +/- 2.34	< 1.00	1.1 +/- 0.63
Lead (Pb)	8.45 +/- 7.33	< 5.00	3.36 +/- 4.11

Metals in urine reflect immediate exposure
The autistic show multiple exposure (Hg + Pb)





DMSA Detoxification of **KSA** Children

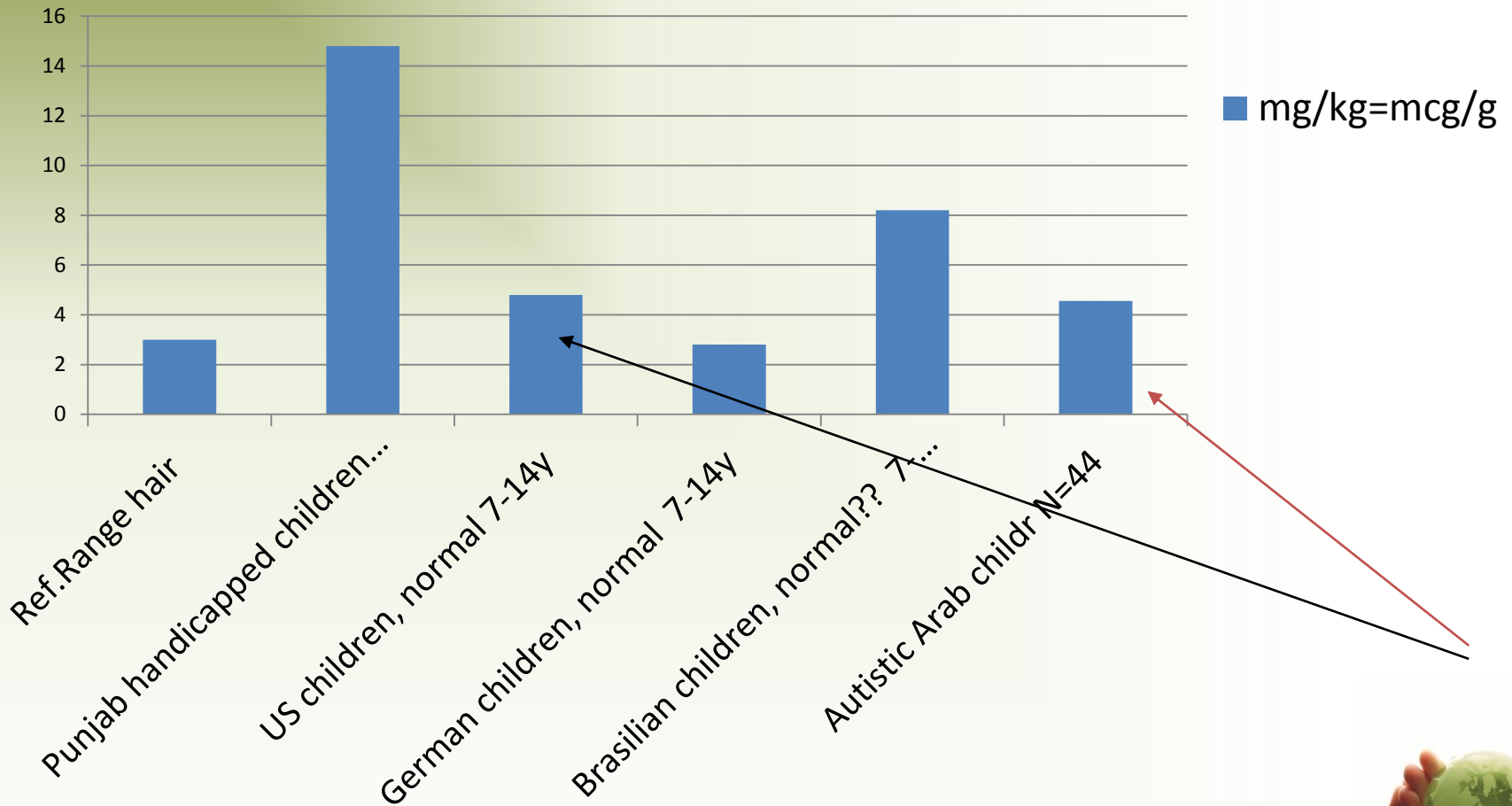
see www.microtraceminerals.com

	Autistic N=44 Baseline Urine Mean + STD mcg/g creatinine	Autistic N=44 DMSA challenge Mean + STD mcg/g creatinine	Reference Range mcg/g creatinine
Arsenic (As)	109 +/- 84	93 +/- 86	< 50
Cadmium (Cd)	0.86 +/-0.04	0.97 +/-0.01	< 0.8
Mercury (Hg)	3.35 +/-3.81	16.12 +/-36.6	< 1.0
Lead (Pb)	31.48 +/-11.5	41.48 +/-11.5	< 5.0





Lead (Pb) levels (mg/kg=mcg/g) in Hair of Children





MULTIPLE EXPOSURE

Where does it come from?





Epidemiology:

July 2002 - Volume 13 - Issue 4 - pp 417-423

Perinatal Risk Factors for Infantile Autism

Hultman, Christina M.; Sparén, Pär; Cnattingius, Sven

Cases were 408 children (321 boys and 87 girls) discharged with a main diagnosis of infantile autism from any hospital in Sweden before 10 years of age in the period 1987-1994, plus 2,040 matched controls.

The risk of autism was *associated with*

- ***daily smoking in early pregnancy***



Conclusion:

- **Our findings suggest that intrauterine and neonatal factors related to deviant intrauterine growth or fetal distress are important in the pathogenesis of autism.**





Water Quality ?

Al-Masry Al-Youm, a top-ranking official from the Cairo Water Authority stated:

- “When water leaves our treatment plants, it is 100 percent clean.”
- **“The problem is not in the treatment plants but rather in old and low-quality pipes that don’t comply with Egyptian and international standards, alongside poorly-maintained water tanks that emit dangerous elements into the water.”**

Egypt Independent, 07/03/2011





Air quality, Cairo

- The 2010 WHO data ranked Cairo as having the **second-highest levels of particulates in the world after New Delhi.**
- Another WHO report, issued a few years earlier, equated living in the city of 7.8 million to smoking a pack of cigarettes a day.
- Citizens are **exposed to high levels of lead every day.**

<http://www.dailyfinance.com/2010/11/29/10-cities-with-worlds-worst-air/>





Fertilizers?!

The presence of heavy metals in **fertilizers** is well established.

- Analytical testing of a wide range of fertilizer products shows that some phosphate and micronutrient fertilizers, and liming materials contain **elevated levels of arsenic, cadmium, and lead** compared to other fertilizer types (e.g., nitrogen, potash, gypsum).
- German law requires **DeCadmiumizing** Phosphatfertilizer





Conclusion- autism + toxic metals

1. Hair analysis confirms long term multiple exposure in AUTISTIC children OF DIFFERENT NATIONALITIES
3. Urine analysis confirms multiple immediate toxic exposure in AUTISTIC children OF DIFFERENT NATIONALITIES
4. Exposure could be result of prenatal exposure. (Mothers should be checked)
5. Multiple Exposure could be result of postnatal exposure. Source : water, soil, food, air?





Conclusion- autism + toxic metals

Research indicates that detoxification ability is reduced in populations worldwide, including Arab populations

Detoxification ability of the metal intoxicated autistic patients should be evaluated. With a limited detoxification potential, the body's detoxification ability must be supported through proper nutrition, chelation or other means.

EXPOSURE MUST BE AVOIDED!





AUTISMUS / ASPERGER SYNDROM/ ADHS

Autism & The Genetic Connection

- Booklet 1:

Beat Autism Now- logically, effectively and inexpensively



Neurotoxic Metals Affecting Autism / Asperger / ADHD

- Booklet 2: Treat Autism logically, effectively and inexpensively

<http://www.microtraceminerals.com/en/books-by-eblaurock-busch/beat-autism-now-ban/>





Recommendation for research

- **A more comprehensive and controlled study should follow, involving metal testing of healthy and sick children.**
(Cooperate with Dr. Omnia Raffat, Pych Dep Cairo University)
- **We recommend testing of Detoxification Enzyme Systems of healthy vs autistic group**
- **We recommend comparing immediate metal exposure (urine or blood analysis) with detoxification ability of healthy vs autistic group**
- To locate main source of exposure, we recommend **comparing urine metal analysis of healthy vs ill children from regions with safe water and/or soil vs regions with contaminated water and/or soil.** Results would indicate information about metal sources and metal absorption.





We have answers and solutions!

- Depending on study outcome, treatment modalities can be developed to counteract and treat chronic or acute intoxications.
- Depending on the metal source, detoxification treatments may involve
 - Provision of clean water
 - Nutritional correction
 - Phytotherapy (stimulation of natural detoxification processes)
 - Detoxification via DMSA chelation





Cooperation

- Detoxification treatments such as chelation therapy are well accepted in Germany and other countries
- Organisations such as KMT (**German Medical Association of Clinical Metal Toxicology**) and IBCMT (**International Board of Clinical Metal Toxicology**) teach detoxification treatment to physicians
- KMT and IBCMT would support Egyptian Efforts to organize similar organisations

- in shaa Allah





THANK YOU!

E.Blaurock-Busch

Micro Trace Minerals / Trace Minerals Intern.

ebb@microtrace.de

www.microtraceminerals.com

www.tracemin.com

