EnvironMental & EleMental Toxins in Neurological Disease

• Metal Exposure in Children with physical and neurological disorders
ترحيبات
• .....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.

• 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.


• 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.

Prenatale 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 toxines 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

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

<table>
<thead>
<tr>
<th></th>
<th>Reference Range for Normal Urine mcg/L</th>
<th>Baseline Urine in mcg/g Crea Mean Value</th>
<th>Exceeding Reference value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barium</td>
<td>&lt;8.22</td>
<td>78</td>
<td>9.5x</td>
</tr>
<tr>
<td>Cadmium</td>
<td>&lt;0.2</td>
<td>0.92</td>
<td>4.6x</td>
</tr>
<tr>
<td>Manganese</td>
<td>&lt;4.5</td>
<td>17.5</td>
<td>3.9x</td>
</tr>
<tr>
<td>Lead</td>
<td>&lt;5</td>
<td>43</td>
<td>8.6x</td>
</tr>
<tr>
<td>Uranium</td>
<td>0.06</td>
<td>0.65</td>
<td>10.8x</td>
</tr>
</tbody>
</table>
Urine Metal Analysis before and after DMSA
Punjabi children age 3-12yrs with healthy renal function

Lead detoxification- yes!

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

MTM Micro Trace Minerals Laboratory
Clinical Medicine Insights: Therapeutics

Metal Exposure in the Children of Punjab, India

E. Blaurock-Busch, Albrecht Friedle, Michael Godfrey, Claus E. Schulte-Uebbing and Carin Stin

1Research Director, MTM Micro Trace Minerals Laboratory, Berlin, Germany. 2International Board of Clinical Metal Toxicology (IBCMET). 3German Medical Association of Metal Toxicology (Deutsche Arztekammer für Metallopathologie). 4CEO, Labor Friedle, Regensburg, Germany. 5Director, International Board of Clinical Metal Toxicology, New Zealand. 6Associate Professor, University of Technology, Sydney, Australia. 7Corresponding author email: ebb.blaurock@mtm-lab.com or ebb@microtrace.de

Abstract: We tested 149 hair samples from children aged 12 and younger in Punjab, India, to evaluate their exposure to heavy metals. We found that hair analysis is a reliable method for assessing metal levels in children. The data showed that children aged 12 and younger had higher levels of lead, cadmium, and manganese in their hair compared to adults.

Keywords: heavy metals, hair analysis, children, Punjab, India

Clinical Medicine Insights: Therapeutics 2010: 2 655-661

This article is available from http://www.la-press.com.

© the author(s), publisher and licensee Libertas Academica Ltd.

This is an open access article. Unrestricted non-commercial use is permitted provided the original work is properly cited. The authors grant exclusive rights to all commercial reproduction and distribution to Libertas Academica. Commercial reproduction and distribution rights are reserved by Libertas Academica. No unauthorised commercial use permitted without express consent of Libertas Academica. Contact tom.hall@la-press.com for further information.

Clinical Medicine Insights: Therapeutics 2010: 2 655
Hair Metal Concentration in KSA Children

<table>
<thead>
<tr>
<th></th>
<th>X-value in mg/kg</th>
<th>Reference Range mg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic (As)</td>
<td>2.94</td>
<td>&lt; 0.2</td>
</tr>
<tr>
<td>Cadmium (Cd)</td>
<td>0.62</td>
<td>&lt; 0.2</td>
</tr>
<tr>
<td>Mercury (Hg)</td>
<td><strong>3.35</strong></td>
<td>&lt; 0.3</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>4.56</td>
<td>&lt; 3.0</td>
</tr>
</tbody>
</table>

Metals in hair tissue reflect chronic exposure to multiple toxic metals.
Urine Metal Concentration in KSA Children

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

Metals in urine reflect immediate exposure
The autistic show multiple exposure (Hg + Pb)
## DMSA Detoxification of KSA Children

See [www.microtraceminerals.com](http://www.microtraceminerals.com)

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

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!
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

Recommendation for research

• A more comprehensive and controlled study should follow, involving metal testing of healthy and sick children. (Cooperate with Dr. Omnia Raffat, Psych 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