Xenobiotics and urban water

R. Aertgeerts
WHO Regional Office for Europe
Email: watsan@ecr.euro.who.int
0. Introduction
1. Interdisciplinary approach
2. International Program on Chemical Safety
3. Water supply, sanitation and health
4. Children, Environment and Health
5. Cooperation possibilities
Water, sanitation, health

- PROTOCOL ON WATER AND HEALTH signed by 34 countries, ratified by 15
- Expert groups (technical) and working groups (political)
- Similar need for coordination of national efforts as promoted by COST
Agenda

0. Definition
1. Interdisciplinary approach
2. International Program on Chemical Safety
3. Water supply, sanitation and health
4. Children, Environment and Health
5. Cooperation possibilities
Interdisciplinary approach

- International Program on Chemical Safety
- Water, Sanitation and Health
- Children, Environment and Health Program
WHO/IL/UNEP IPCS

- CICADS
- EHC
- IARC
- ICSC
- JECFA
- JMPR
- PDS
IFCS Data and research needs

- Link between exposure and health outcome for different age groups, in different settings
- Risk assessment approaches that account for child-specific issues
- Improve understanding of foetal and early childhood exposure and toxicological impact
- Incorporate new scientific information (genomics, proteonomics)
Agenda

1. Interdisciplinary approach
2. International Program on Chemical Safety
3. Water supply, sanitation and health
4. Children, Environment and Health
5. Cooperation possibilities
Guidelines for drinking-water quality

- Credible evidence of occurrence, combined with evidence of actual or potential toxicity
- Of significant international concern
- Included in the WHOPES evaluation program
Two approaches

- Threshold chemicals: those where there is a dose below which no adverse effect will occur
- Non-threshold chemicals: mostly genotoxic carcinogens
- Currently over 200 chemicals in GDWQ
### Some results

<table>
<thead>
<tr>
<th>Substance</th>
<th>Description</th>
<th>GV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>Human carcinogen</td>
<td>0.01</td>
</tr>
<tr>
<td>Lead</td>
<td>Possible human carcinogen</td>
<td>0.01</td>
</tr>
<tr>
<td>Nitrate</td>
<td>Infantile methaemoglobinemia</td>
<td>50</td>
</tr>
<tr>
<td>Nitrite</td>
<td>Short-term exposure</td>
<td>3</td>
</tr>
<tr>
<td>Nitrite</td>
<td>Long-term exposure (provisional)</td>
<td>0.2</td>
</tr>
<tr>
<td>Methyl mercury</td>
<td>Unlikely intake of alkylmercurials through drinking-water. GV for Hg(2+)</td>
<td>0.001</td>
</tr>
</tbody>
</table>
Lead intoxication

Pb intoxication in children

- Wpr-B: IQ gain 13, Lead level in blood 17
- Wpr-A: IQ gain 23
- Sear-D: IQ gain 14, Lead level in blood 17
- Sear-B: IQ gain 12, Lead level in blood 18
- Afr-E: IQ gain 15, Lead level in blood 18
- Afr-D: IQ gain 21, Lead level in blood 24
- Emr-D: IQ gain 24, Lead level in blood 27
- Emr-B: IQ gain 22, Lead level in blood 27
- Eur-C: IQ gain 23, Lead level in blood 28
- Eur-B: IQ gain 18, Lead level in blood 23
- Eur-A: IQ gain 4, Lead level in blood 6
- Amr-D: IQ gain 28, Lead level in blood 34
- Amr-B: IQ gain 28, Lead level in blood 33
- Amr-A: IQ gain 5, Lead level in blood 7
A limited approach, in an increasingly complex environment

- WSH develops GV for appr 30 chemicals from agricultural activities
  ...
- But over 800 pesticides are currently registered in the European Union
Paradigm shift: reaction to precaution

Modern risk factors become more complex, far reaching in geographic and temporal scale, and uncertain in their effects. Science needs to inform policy from a strategy of ‘reaction’ to a strategy of ‘precaution’
Agenda

1. Interdisciplinary approach
2. International Program on Chemical Safety
3. Water supply, sanitation and health
4. Children, Environment and Health
5. Cooperation possibilities
Concern for children

- Review of progress made
- Policy-making tools
- Ministerial declaration
- Children’s environment and health action plan for Europe
- Endorsed by EUR/RC54/R2
Ministerial declaration

- “We are increasingly concerned about the effects on children’s health of unsafe and unhealthy environments. We understand that developing organisms, especially during embryonic and fetal periods and early years of life, are often particularly susceptible, and may be more exposed than adults, to many environmental factors, such as […] chemicals, contaminated and polluted water …. .

- Boys and girls may also differ in susceptibility and be differently exposed.

- Children living in the poorest countries and belonging to the most disadvantaged population groups are at the highest risk.”
Ministerial declaration

- “6. We note that in the European region … about one third of the total burden of disease from birth to 18 years can be attributed to unsafe and unhealthy environments in the home and the broader community, resulting in significant social and economic loss.

- Exposure to contaminated water … can cause gastrointestinal … diseases, birth defects and neuro-developmental disorders, all of these accounting for one sixth of the total burden of disease.”
(d) Finally, there is concern regarding the potential for long-term toxicity, including carcinogenic, neurotoxic, immunotoxic, genotoxic, endocrine-disrupting and allergenic effects of many chemicals. We are particularly concerned about the effects of … persistent organic pollutants (POPs), (and) heavy metals … that contaminate the environment and to which men and women of reproductive age as well as children may be exposed.”
“Regional Priority Goal IV. We commit ourselves to reducing the risk of disease and disability arising from exposure to hazardous chemicals (such as heavy metals), (...) and biological agents ... during pregnancy, childhood and adolescence.”
Children’s special vulnerability

Knowledge
- Greater vulnerability due to greater and longer exposure, and particular susceptibility
- Great influence from social and psychosocial factors

Challenges
- Know more about susceptibility to environmental contaminants during specific development stages
- Multi-factorial approach to causation

Actions
- Provide the evidence base for child-protective policies
- Learn to manage under conditions of uncertainty by applying precaution
Human Development Index - Quintiles
Long-term children health survey

1. Establish core interest group to lead initial planning process
2. Identify potential donors, prepare appropriate materials
3. Draft position paper, develop core protocol
4. Identify basic components to be build into a LTCS
Precautionary principle

- Determine whether an uncertain risks merits a more thorough review
- Define problems to capture root causes of risks
- Consider all relevant evidence (interdisciplinary)
- Examine gaps in information and identify research and other ways to reduce uncertainty
- Identify options to reduce risks
- Determine action based on evidence and public review
- Determine follow-up
CONCLUSIONS

Scientific research needed to:

- Manage under conditions of uncertainty
- Identify priority xenobiotics by impact on human health esp. children and environmental effects
- Sources, upstream management, fluxes
- Risk management methods: assess current and optimize
- Supporting issues (methodology)
THANK YOU