Environment and Health Strategy
Technical Working Group (TWG)
Research Needs
Proposal for Actions

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TWG Research Needs

• Over 40 experts

• Very tight time-table
  (October 2003-February 2004)

• Very broad range of topics
INPUT FOR THE PROPOSED ACTION PLAN

• Research priorities identified by the other WGs

• Directly from TWG Research Needs members

• All input followed the Reporting Format provided by the Commission and appears as such in the Annex of the Action Plan

• All proposals were considered but not necessarily adopted. Most are reflected in the Action Plan in their original or a modified form, as appropriate
Objectives of Research in Environment and Health

- Evidence based environmental policy decisions have at least two prerequisites: knowledge of the exposure distribution and of the exposure-health outcome association.

- Research in Environment and Health is essential for providing or improving the information mainly on the exposure-response association, but also on exposure and other related issues.
Possible approaches in environment and health research

- Health outcome → Exposure
- Exposure → Health outcome
• Important to remember:
  
  - Complex exposures (mixtures)
  - Multi-causal outcomes
  - Emphasis on “real life” (low dose) exposures
Key instruments in addition to Research Projects

- Thematic Networks for better communication and exchange of know-how
- Networks for communication and exchange between National Plans on Environment and Health
- Harmonization of data bases and research protocols
• In Environment and Health Research include:
  - Integrated exposure assessment to characterize population exposure and develop tools

• ... and take advantage of
  - The variability encountered in Europe with respect to cultural, environmental, climatic, social conditions and, possibly, genetic susceptibility, as well as in exposure and health outcome distribution
Research Priorities are organised:

- **SCALE priorities**
  - Childhood respiratory diseases
  - Neurodevelopmental disorders
  - Childhood cancer
  - Endocrine disrupter effects
  - Endocrine disrupter exposure
  - Heavy metals
  - PCBs and dioxins

- **Further research priorities**

- **Overarching (horizontal) issues**
Research Priorities
A. SCALE Priorities: specific outcomes and exposures

• Childhood respiratory disorders (allergy and asthma):

  ➢ indoor air (including exposure to chemicals, ETS, allergens, microorganisms)
  ➢ outdoor air (including traffic exhaust and allergens) for short but also for long-term exposures
  ➢ possibly protective environmental and lifestyle exposures
  ➢ individual susceptibility on the development of allergy
Research Priorities
A. SCALE Priorities: specific outcomes and exposures

• Neurodevelopmental disorders

- several chemical compounds, in particular heavy metals, dioxins, PBDEs, organophosphorous, organochlorine pesticides (low levels, mixtures)
- take advantage of existing mother-child cohorts
- other factors such as diet, noise
Research Priorities
A. SCALE Priorities: specific outcomes and exposures

- Childhood cancer

  - ETS (parental smoking), infections, benzene at current exposure levels, traffic exhaust, polycyclic aromatic hydrocarbons (PAHs), agrochemicals, non-ionizing radiation, chemicals disrupting the endocrine systems
  - work on mechanisms and biomarkers of exposure and effect
  - population-based cohort studies to assess childhood cancer risks and the role of prenatal exposure and early events in cancer incidence
Research Priorities
A. SCALE Priorities: specific outcomes and exposures

• Endocrine disrupter effects
  - mechanistic pathways (hormonal carcinogenesis, reproductive outcomes; immune system functioning)
  - endocrine disrupter intake through food
  - “real life” mixtures of endocrine disrupters (food, pollution)
  - windows of susceptibility in males and females
  - cell based and animal models

• Endocrine disrupter exposure
  - integrated exposure assessment
  - biomarkers/biosensors addressing “real life exposure” (mixtures, combined ED sources, food intake)
  - Improve and harmonize tools for test guidelines
Research Priorities
A. SCALE Priorities: specific outcomes and exposures

• Heavy metals

- Hg, Pb, Cd
- As and Ni
- Sb, Cr, Tl, Pt, Pd, Rh, Se
- low-level and chronic exposures
- age-specific exposure/response factors (behavioural aspects, time of playing indoors/outdoors, ETS)
- genetic susceptibility
- non-invasive biomarkers for Pb and new metals (Pt, Rd, Ni, Sn, Sb, Cr, Tl, Se)
Research Priorities
A. SCALE Priorities: specific outcomes and exposures

• Dioxins and PCBs

  ➢ **European** dimension (not solely Baltic region)
  ➢ relation between emission sources and appearance in the food chain (**congener** profiles)
  ➢ **time series** studies in different environmental compartments (sediment, biota)
  ➢ health outcomes in **high exposure** populations
  ➢ tools for **risk/benefit** analysis and communication.
Research Priorities
B. Further priority issues (1)

• Environmental determinants of cardiovascular disease
  ➢ long-term effects of air pollution
  ➢ joint assessment of effects of air pollution and noise

• EMF
  ➢ radiofrequency (blood brain barrier, heat shock proteins, hypersensitivity)
  ➢ epidemiology on mobile phone users
  ➢ extremely low frequency exposure parameters
  ➢ potential higher sensitivity and vulnerability of children
  ➢ emerging technologies
  ➢ combined exposure at any frequency and modulation
Research Priorities
B. Further priority issues (2)

• Climate change and climate variability (extreme weather events)

  ➤ methods for quantifying the potential impact of climate change on human health (effect modification, health impact assessment, scenario development and evaluation of uncertainties)
  ➤ effects of heat waves and floods
  ➤ impact of climate on air quality, particularly tropospheric ozone
  ➤ potential effect of climate change on current and emerging vector-borne diseases
  ➤ improve surveillance
  ➤ develop risk management strategies
  ➤ change in risk of infectious diseases in the water supply and in food
  ➤ evaluate the health benefits and costs of measures for adaptation and mitigation
Research Priorities
B. Further priority issues (3)

• Water
  ➢ long term exposure to contaminants
  ➢ influence of water quality on pregnant women (risk of abortion), babies (food preparation) and children
  ➢ emergent and re-emergent pathogens and related diseases especially for immuno-compromised people
  ➢ effects of lead and other materials used in the distribution system on drinking water quality, including biofilm formation, vapour inhalation (VOCs), *Legionella* in potable water systems, air conditioning systems and cooling towers, and pharmaceuticals in natural waters
Research Priorities

B. Further priority issues (4)

- Stress in children
  - prevalence and exposure-response relationship of multiple exposures to environmental stressors (including noise, malodour, air pollution and population density)
  - combined with behavioural and socio-economic factors
  - focus on immuno-compromised populations

- Adult cancer and other adult diseases as a result of intrauterine and childhood environmental exposures
Research Priorities
C. Overarching (horizontal) issues (1)

- Biomonitoring + biobanks
  - new technologies and methods for biomonitoring (less invasive, ‘genomics’, ‘proteomics’)
  - relationships between biomarker outcome with emission and imission data by eg modelling
  - information strategies
  - problems associated with use of cord blood (ethical, stem cells, disruption of the birth environment)
Research Priorities
C. Overarching (horizontal) issues (2)

• Exposure assessment
  ➢ development of exposure assessment methodology
  ➢ validation sub-studies
  ➢ personal monitoring
  ➢ combined exposures
  ➢ traffic exhaust
  ➢ endocrine disrupters
  ➢ heavy metals
  ➢ pesticides
  ➢ male and female pre-conception, in-utero and neonatal exposure
Research Priorities

C. Overarching (horizontal) issues (3)

• Risk assessment
  - traffic exhaust
  - heavy metals
  - food contaminants
  - EMF
  - SCALE priorities
  - development and standardization of methodology (for low dose, long term exposure, combined effects, behaviour, lifestyle, susceptible groups etc)
  - improve methods for uncertainty evaluation
Research Priorities

C. Overarching (horizontal) issues (4)

• Health impact assessment (HIA), cost benefit analysis (CBA), externalities and other decision tools

  ➢ extend methods and applications
  ➢ standardisation of all stages of the CBA
  ➢ assessing uncertainty
  ➢ monetary valuation and other methods of assessing health impacts (e.g. QALYs)
  ➢ identify key drivers of the final results with aim to reduce costs
  ➢ improvement of application tools and software
Research Priorities
C. Overarching (horizontal) issues (5)

• Environmental health genomics and biomarkers

  - development, validation and exploitation of mechanistically based biomarkers, using transcriptomics, proteomics and metabolonomics, for exposure and early biological effects
  - identification of functional genetic variants that increase the susceptibility to environmentally related adverse health effects
  - assessment of the functional impact of the genetic variants on dose response
  - integration of the molecular markers in epidemiological studies
Research Priorities
C. Overarching (horizontal) issues (6)

• **Child/mother cohorts**
  - Establishment of baseline data (including bio-banks), addressing various exposures and outcomes e.g. immunological disorders, obesity, respiratory disease and cancer

• **Susceptibility**
  - Studying genetic and acquired (through conditions such as medical treatment or situations described by socioeconomic factors) susceptibility
Research Priorities

C. Overarching (horizontal) issues (7)

- Comparative evaluation of environmental management measures
  - evaluation of the effectiveness of environmental management decision implementation on the exposures regulated as well as on their health impact

- Evaluation of scientific evidence
  - Further development and tuning of criteria to evaluate causality of exposure response relationships in environmental health
Research Priorities
C. Overarching (horizontal) issues (8)

• Ethical, social and legal issues related to environmental health research in children

• Risk perception and communication
  
  - effective use of the knowledge accumulated by the environment and health
  
  - research and better understanding of the factors determining response of the society to public health messages with aim to introduce more effective public health interventions
## Summary

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