The Bhopal Gas Disaster 1984 – Children’s Acute and Chronic Exposure to Toxic Substances

5th ICCHE, Bangalore 2 February 2010

Ingrid Eckerman, MD, MPH

International Medical Commission on Bhopal, 1994

Swedish Doctors for the Environment (LfM)

www.lakareformiljon.se, www.eckerman.nu

ingrid@eckerman.nu
Bhopal is the capital of Madhya Pradesh, and a railway junction. In 1984, it had 700,000 inhabitants. Today, there are about 1.2 millions.
1969: UCIL plant, Bhopal

At midnight Dec 3, 1984 water entered the tank 610, containing 43 tonnes of methyl isocyanate (MIC).

A run away reaction started.
$\text{MIC} + H_2O \rightarrow \text{MMA} + \text{CO}_2$

HCN, MIC-trimers, Phosgene, CO, NO\textsubscript{x}
NOT EVERYONE AFFECTED BY THE CARBIDE GAS LEAK IN BHPAL DIED.
Magnitude of the disaster

Exposed:
• 520,000
• > 200,000 were below 15 years of age
• > 3,000 were pregnant women

Dead:
• > 8,000 (16,000?) during first weeks
• > 3,000 below 15 years
• 8,000 (?) died since

Permanent injuries:
• 100,000 – 200,000
Affected

- The poorest, who lived closest to the plant, were hit hardest.
- The shortest (the children) were hit hardest.
Reported acute health effects

- **Eyes**
  Intense irritation, blepharospasm, eyelid oedema, corneal ulcerations.

- **Respiratory tract**
  Rhinitis, pharyngitis, coughing, respiratory distress, breathlessness, choking, pulmonary oedema, pneumothorax, emphysema, fistulas, secondary infections etc.

- **Neurological system**
  Cerebral oedema, partial paralysis

- **Kidneys**
  Tubular necrosis

- **Liver**
  Fatty degeneration

- **Gastro-intestinal tract**
  Necrotising enteritis
Acute health effects on children

- Same as for adults
- Stillbirth rate increased by 300 %
- Peri- and neonatal mortality 200 %
- Spontaneous abortions 300-400 %
- Congenital malformations
Dispute 1994: Long term health effects?

- UCC, GoI and GoMP denied
- International Medical Commission on Bhopal (IMCB) was established
- Result: Long term health effects were generally accepted
Studied and reported long term effects on health

• **Eyes**
  Chronic conjunctivitis, scars on cornea, corneal opacities, early cataracts

• **Respiratory tract**
  Obstructive and/or restrictive disease, pulmonary fibrosis, aggravation of TB and chronic bronchitis

• **Neurological system**
  Impairment of memory, finer motor skills, numbness etc.

• **Psychological problems**
  PTSD
Long Term Health Effects on Children

- In 1989, the still-birth rate, the crude birth rate, the perinatal death rate, the neonatal death rate and the infant mortality rate were still high in severely affected areas.

- Higher incidence of psychiatric illnesses, febrile illnesses, acute respiratory infections, gastrointestinal infections, superficial infections of the skin, eyes and ears.

- Intellectual impairment and epilepsy.

- Failure-to-grow, delay in gross motor and language sector development in children born a considerable time after their mothers’ gas exposure.
Missing fields

- Female reproduction
- Chromosomal aberrations
- Immune deficiency
- Neurological sequelae
- Post traumatic stress disorder (PTSD)
- Children born after disaster
Late cases that might never be highlighted

- Respiratory insufficiency
- Cardiac insufficiency (cor pulmonale)
- Cancer
- Tuberculosis

Photo: Christian Saltas
Conclusions

• Although the quality of the epidemiological and clinical research varies, the different reports support each other.

• The findings are also supported by animal experiments.

• Thus, the gas exposure has caused permanent health effects.
Dispute 2010:
Contaminated Groundwater?

- Centre for Science and Environment 2009:
  Contamination of UCC chemicals that must come from the UCC area

- Gandhi Medical College 2008:
  UCC chemicals not present in groundwater.
  No toxic substances in toxic doses.
Dispute 2010: Health Effects of Groundwater?

• Sambhavna Trust: Definitely increased rate of congenital malformations

• Dr Susan Katz: Lead poisoning?

• Gandhi Medical College 2008: Higher self reported morbidity among under 24

No cause relationship with water contamination.
My questions:

• Which substances can be expected in the groundwater?
• What are the effects on foetus and child of a chemical cocktail of "non toxic doses"?
• Effect of cousin marriages in muslim society?
References:

www.en.wikipedia.org

"Bhopal disaster"
The Bhopal Saga – Causes and Consequences of the World’s Largest Industrial Disaster

www.eckerman.nu

ingrid@eckerman.nu