TRAINING FOR THE HEALTH SECTOR

Incidents with Industrial Chemicals

Children's Health and the Environment

CHEST Training Package for the Health Sector

<<NOTE TO USER: Please add details of the date, time, place and sponsorship of the meeting for which you are using this presentation.>>

This first version was drafted by Peter van den Hazel, INCHES

Children and industrial chemicals

LEARNING OBJECTIVES

- Learn about industrial chemical hazards – what lessons did we learn?
- Identify the scenarios – how, where and when are children exposed?
- Know about symptoms and diseases are due to acute and chronic toxic exposures in children
- Know how to assess, prevent and prepare for toxic exposures

<<READ SLIDE>>

Children and industrial chemicals

Environmental Hazards for children are closely associated with unsustainable patterns of industrial production of chemicals:

- ❖ air, water and soil pollution
- ❖ unsafe use of chemicals
- ❖ unadequate solid and hazardous waste management
- ❖ uncontrolled emission of chemicals owing to chemical incidents
- ❖ unawareness of risks
- ❖ lack of interest
- ❖ additional factors: malnutrition, infectious diseases, poverty

Children's environmental health and chemical safety problems are magnified in developing countries and countries in transition and in the poor parts of the world for reasons including the following:

- ❖unsafe use of chemicals – due to lack of information and education on their safe and judicious use and to prevailing illiteracy;
- ❖increasing pollution and uncontrolled use of chemicals – due to lack of appropriate regulatory measures or the impossibility of enforcing them (e.g. because of lack of personnel, controls and surveillance);
- ❖lack of awareness about risks and poor access to information;
- ❖lack of interest because of other urgent, immediate health priorities!
- ❖additional factors such as malnutrition, infectious diseases and poverty; and
- ❖despair at the magnitude of the problem, … that appears to be impossible to solve!

<<NOTE TO USER: if appropriate, provide examples relevant to the area, to illustrate the points made >>

Ref:

•*Goldman, Toxics and poverty: the impact of toxic susbtances on the poor in developing countries, Washington DC, The Wrold Bank, 2002.*

Why are children more vulnerable to industrial chemicals than adults?

- Lower “breathing zones” and more rapid respiratory rates
- Greater skin surface and permeability
- immature organs and higher metabolic rate
- Greater propensity to dehydration, shock
- Need special treatment, management protocols
- “Dependent”

Types of industrial chemicals with adverse impact for children

- pesticides and herbicides
- heavy metals: As, Pb, Cd and Hg, CH_3Hg
- dioxins and PCB's, PBDE's
- endocrine disrupting chemicals: DDT, PCB's, phtalates
- gases: chlorine, ammonia, phosgene

Children and industrial chemicals

- Types of exposure
- Health effects
- Chemical accidents or incidents – some examples
- Disaster preparedness
- Disaster repression
- Disaster after care

A short discussion can be held with participants about accidents or incidents. There might be different criteria in different countries related to accidents or incidents.

The main focus of this module relates to well-known accidents or incidents that has changed either regulations or our knowledge about children's environmental health.

Different ways of exposure to industrial chemicals

- parental exposure
- foetal exposure
- location exposure: indoor, outdoor etc
- accidental exposure

Children can be exposed to industrial chemical due to a range of exposure types.

Parents can take chemicals home after work in the clothes.

Children can be exposed by placental transfer of chemicals when a mother works with chemicals.

Children can be exposed due to the fact that htey live near an industrial plant.

Children can be exposed to industrial chemicals due to an accident. The presentation will focus mainly on this type of exposure.

Human Toxic Epidemic

A toxic epidemic can be defined as a pathological condition characterised by a group of symptoms affecting a particular population, which has been exposed during a certain period of time to a chemical product of previously known or unknown pathogenicity.

Children and industrial chemicals

KINDS OF EXPOSURE

- Unintentional ("accidental")
- Iatrogenic
- Intentional
- Occupational
- Environmental

The potential kinds of exposure to chemicals in children are listed here.

•UNINTENTIONAL – also called "accidental" (although this term should be avoided to reduce the implication of "inevitability“) – is the most common circumstance of exposure in small children, who are "little explorers", naturally curious, ready to touch and taste everything at their "ground-level" microenvironment (e.g. colourful toys, pills, berries and plastic bottles).

•IATROGENIC – observed mainly in the medical setting, when medications are wrongly administered (e.g. overdose or medication error).

•INTENTIONAL – although infrequent in children, this may occur in socially poor environments, when children are in the care of psychologically unstable people or living under circumstances of social unrest. These intentional exposures include:

– Homicide – e.g. children overdosed with pharmaceuticals, intentionally exposed to carbon monoxide or administered toxicants;

– Munchausen syndrome – simulation or induction of disease in children, in this case through the administration of pharmaceuticals or chemicals, usually by psychologically disturbed individuals close to the child (e.g. mother or caregivers);

– “Chemical” battering – a form of child abuse, through the administration of pharmaceuticals and other substances (e.g. sedatives, sleeping pills, table salt or others);

– Solvent abuse (“sniffing”) – a form of recreational drug use and abuse, seen in older children and adolescents;

– Suicide attempt or "gesture" – real or attempted suicides, observed mainly in young, psychologically unstable adolescents;

– Abortifacient – use of abortion-inducing substances by female adolescents frightened by the consequences of unwanted preganancy; and

– Warfare agents – exposure of children to chemicals used in the context of war (e.g. the Kurd population in Hallajba, Iraq, exposed to mustard gas).

•OCCUPATIONAL – young workers being exposed to dangerous and/or unsafely used chemicals in the workplace, and when engaged in child labour.

•ENVIRONMENTAL – a growing cause of concern and relatively "new" approach to children's health, which has gained due recognition in recent decades. It refers to the exposure of children to chemicals or to other environmental stressors present as pollutants or contaminants in their environment. These chemicals may be from anthropogenic or natural sources. Exposure to high levels may lead to poisoning or to effects that are clinically evident. Chronic exposures to low levels of chemicals are difficult to detect and assess, and may be linked to a large number of health and developmental effects.

Children and industrial chemicals

TYPES OF EXPOSURE

- **Acute:**
  Exposure over a short period of time (e.g. 24 hours)
  - **Single**: a single or unique and continuous exposure
  - **Repeated**: multiple exposures; potential accumulation
- **Chronic or long-term**
  Continuous or repeated exposure (e.g. over 24 hours for weeks or months)
- **"Acute on chronic"**
  An acute exposure against a background of chronic exposure to the same agent
- **"Hit and run"**
  Acute exposure leading to delayed effects once the toxicant is gone.

<< NOTE TO USER: for each type of exposure, mention the examples that are pertinent to the region and/or your personal experience on the subject.>>

Acute poisonings

Acute poisonings result from exposure to an agent over a short period of time e.g. 24 hours. Acute poisonings may be:

Single: a single or continuous exposure to an agent over a short period of time e.g. for 24 hours (e.g. carbon monoxide).

Repeated: multiple exposures to an agent over a short period of time e.g. 24 hours, where there may be accumulation (e.g. aspirin overdose).

Chronic exposures

Chronic exposures are continuous or repeated exposures e.g. for several days, for weeks or months, as is the case of lead poisoning.

"Acute on chronic"

“Acute on chronic” is an acute exposure against a background of chronic exposure to the same agent (e.g. organophosphorus pesticide exposure on a chronically exposed child.

"Hit and run"

Acute exposure leading to delayed effects once the toxicant is gone (e.g. thalidomide exposure during gestation leading to phocomelia in the 1950s and 1960s).

Ref:

•*PCS, Authority Lists and Definitions for the INTOX Data Management System, 2000: www.who.int/ipcs/poisons/harmonization/en/*

Children and industrial chemicals

POINTS FOR CONSIDERATION

- Circumstances, sources and type of exposure
- Type of chemicals
- Media: water, air, soil, objects...
- Routes of exposure
- Toxicokinetics: absorption, distribution, metabolism, elimination
- Toxicodynamics: mechanism of action
- Scenarios of different age groups
- Clinical and sub-clinical effects
- Treatment
- Prevention

The slide summarizes the main points to address when considering children's exposure to chemicals.

It may be applied when dealing with chemicals on a one-by-one basis (such as lead, mercury, solvent or pesticides), but this presentation will provide a general overview on how, when and where children are exposed to toxicants, their potential effects and the possible solutions. In large scale accidents with industrial chemicals these considerations have to be taken into account.

<<READ SLIDE >>

Health effects

- Local effects
- Systemic effects
- Affecting specific organs
- Immediate (< 24 hr),
  delayed (< weeks till months)
  or time-lagged (after years)

This slide gives a brief overview of the different ways how health effects can be framed.

Pulmonary Toxicants Effects

- Immediate laryngospasm or asthmatic response
- Pulmonary oedema in 2-24 hours
- Long term:
  - asthma and emphysema
  - anoxic brain effects

This slide gives an example of a organ specific range of effects. The pulmonary effects are important to understand as they are in many industrial accidents the first kind of effects that will show.

Here there are different effects related to the time of onset.

Environmental/Accidental Contamination

- Differential diagnosis:
  - Accidental death or homicide?
  - Compensable injury or carelessness?
  - Background that could confound interpretation
  - Immediate laryngospasm or asthmatic response
- Verify authenticity/natural source or show adulteration
  - How did the mass poisoning occur?
  - Substitution of inferior/contaminated component
- Track source of environmental contamination
  - Environmental justice for underserved?
    - Safeguards not enforced
    - Children often victims
  - Which companies are breaking the law?

Each environmental or accidental contamination in children need to be explained.

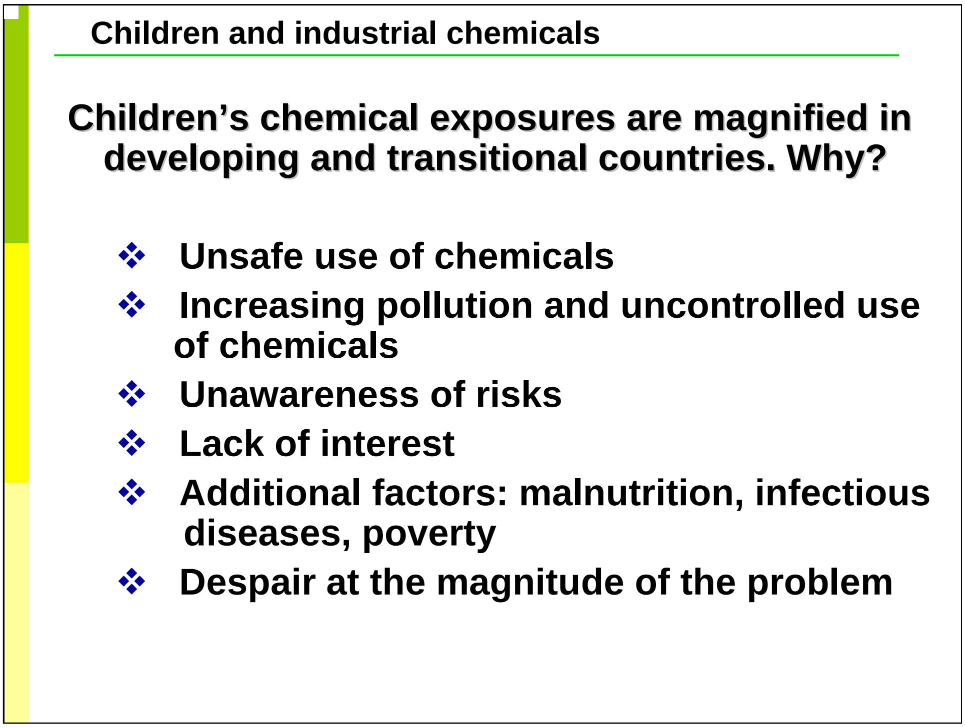
The differential diagnosis has to make clear what has happened to the child.

There could be different reasons for an accident to occur. One needs to collect information on this.

In case of intoxication it is necessary to investigate the source. Are we dealing with a pure substance or adulterated substance? How did the poisoning of the child(ren) occur?

(Adulteration= to make less pure by adding other substance)

The source of the environmental contamination need to be checked as well. In some cases one can speak about environmental injustice when children of the poor are living on sites that are close by to industrial sites or waste sites.



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Examples of accidents in the past

- Several dioxin cases, e.g. Seveso (1976)
- Mercury at Minimata (1953-1960)
- Bhopal (1984)
- Chernobyl (1986)
- Food related accidents

There were several dioxin related accidents in the world. The best known are Seveso (1976),Yusho and Yucheng (1968 and 1978).

Mercury was spilled in a bay in Japan, contaminating the fish and the local population (Minamata).

In Bhopal a chemical release killed the inhabitants near the chemical plant, including many children.

In Chernobyl, Ukraine a nuclear powerplant had a meltdown and caused severe health problems in a vast area around the plant.

Food related problems were seen in Belgium with dioxins (2004) in chicken or in milk in the Netherlands.

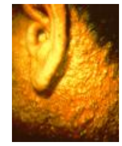
Soil contaminated sites such as the Love Canal chemical waste dump in the USA was another example of long term soil contamination. In Rumania there was the Baia Mare cyanide spill.

There were several industrial contaminations of the surroundings by cadmium plants.

More detailed description of the main industrial environmental problems in the world can be found at:

http://www.lenntech.com/environmental-disasters.htm#Anthropogenic_environmental_disasters

Examples of accidents in the past



- Italy (Seveso) - accident 10 July 1976
- Human populaton under health surveillance 219.128 ➔ Chloracne cases. No human deaths
- Thousands of small domestic animals died in a few weeks
- Source: a runaway reaction during the production of dichlorophenol ➔ discharge of producs containing TCDD over an area of about 2.8 km2

On midday of July 10, 1976 an explosion occurred in a TCP (2,4,5-trichlorophenol) reactor in the ICMESA chemical company in Meda, Italy. A toxic cloud escaped into the atmosphere containing high concentrations of TCDD, a highly toxic form of dioxin. Downwind from the factory the dioxin cloud polluted a densely populated area of six kilometres long and one kilometre wide, immediately killing many animals. A neighbouring municipality that was highly affected is called Seveso. The accident was named after this village. The dioxin cloud affected a total of 11 communities.

The media now mentions Seveso in line with major disasters such as Bhopal and Chernobyl, which have both become international symbols of industrially related disease. However, the Seveso story is remarkably different when it comes to handling the pollution and the victims because earlier accidents had shown dioxin to be an extremely dangerous substance. Polluted areas were researched and the most severely polluted soils were excavated and treated elsewhere. Health effects were immediately recognized as a consequence of the disaster and victims were compensated. A long-term plan of health monitoring has been put into operation. Seveso victims suffered from a directly visible symptom known as chloracne (see picture), but also from genetic impairments.

Picture photolibrary CDC/NIOSH Occupational dermatoses.

Commercial Activity - Mercury

Access photo at website

A neurological affection of unknown origin was observed among fishermen and families

There is is a famous picture (source:AP): a woman holds a victim of "Minamata Disease", or mercury poisoning, in Minamata, Japan, in 1973. The girl has a malformed hand, like many victims of the disease who suffer from physical deformities and mental retardation. Chisso Corporation, a Japanese fertilizer, petrochemical and plastics company, dumped an estimated 27 tons of mercury compounds into Minamata Bay between 1932 and 1968. Up to 10,000 people were affected by eating seafood from the bay.
Many sources of mercury exist, either natural (fish) as intermediate source orsources associated with human activity (chloralkali plants, gold mines, effluent from power plants).
The elemental form of mercury is methylated by micro-organisms in the environment.

Picture for single use at presentations can be found at:

http://www.mercurypolicy.org/new/documents/MinamataVictimsReceiveFinancialAid040805.pdf

Methyl mercury

Two ways in which organic mercury can penetrate the alimentary chain

(1) When mercury compounds are poured into waterways, they are trapped by sediment and undergo microbial transformation to monomethyl and dimethyl compounds, which are released into the water and ingested and concentrated by fish or shellfish which are eaten by men

(2) Grain seeds are treated with mercurial fungicides and these are eaten by human populations

Two ways of mercury contamination in the food chain:

-mercury release in environment ends up in fish/shellfish which are consumed;

-mercurial fungicides are used to treat grain seeds, which are consumed.

Children and industrial chemicals

Minamata disease (methyl mercury)

JAPAN 1953

In 1956 there were 52 cases and 17 deaths

Initial epidemic listed 121 cases

Minamata is a small town in Japan. The town faces the Shiranui Sea, and Minamata Bay is part of this sea. In the town there was a company called Chisso. The Chisso Corporation was once a fertilizer and carbicle company, and gradually advanced to a petrochemical and plastic-maker company. From 1932 to 1968, Chisso Corporation, a company located in Kumamoto Japan, dumped an estimated 27 tons of mercury compounds into Minamata Bay. Kumamoto is a small town about 570 miles southwest of Tokyo. The town consists of mostly farmers and fisherman. When Chisso Corporation dumped this massive amount of mercury into the bay, thousands of people whose normal diet included fish from the bay, unexpectedly developed symptoms of methyl mercury poisoning. The illness became known as the "Minamata Disease".

Not until the mid-1950's did people begin to notice a "strange disease". Victims were diagnosed as having a degeneration of their nervous systems. Numbness occurred in their limbs and lips. Their speech became slurred, and their vision constricted. Some people had serious brain damage, while others lapsed into unconsciousness or suffered from involuntary movements. Furthermore, some victims were thought to be crazy when they began to uncontrollably shout.

Reference: The outbreak of a Neurologic Disorder in Minamata, Japan, and its relationship to the Ingestions of Seafood Contaminated by Mercuric Compounds. Leonard T. Kurland, Stanley N. Faro, Howard Siedler. World Neurology, 1960

Children and industrial chemicals

Chernobyl (1986)

- Accident at nuclear reactor releases radioactive dust/aerosols
- Spreads over eastern Europe and eventually detected throughout much of Northern Hemisphere

The fallout of the nuclear reactor pollutes the soil and agriculture areas in Europe and USSR.

Levels of risk to health focussed in former USSR and North Europe. Following accident many products from Europe were banned in EU.

On April 26, 1986 tests were conducted in nuclear reactor 4 of the Chernobyl nuclear power plant in Ukraine, located 80 miles from Kiev. These tests required part of the security system to be shut down. Errors in the reactor design and errors in judgment of the personnel of the power plant caused cooling water to start boiling. This caused reactor stress, resulting in energy production increases to ten times the normal level. Temperatures reached more than 2000 °C, causing fuel rod melting and further cooling water boiling.
Extreme pressures in cooling water pipes resulted in cracks, which caused steam to escape. At 1:23h in the middle of the night the escaped steam caused an explosion slamming off the roof of the building, starting a major fire and simultaneously forming an atmospheric cloud containing approximately 185 to 250 million curies of radioactive material.

Additional source:
http://www.iaea.org/NewsCenter/Features/Chernobyl-15/timeline.shtml with reports from UNEP about the Chernobyl disaster.

Children and industrial chemicals

Photo Anatoly Kleschuk

Chernobyl

600,000 'significantly exposed'; long-term cancer/mutagenic implications

31 dead

Thyroid cancer

Fire and explosion instantly killed 31 people. Two days after the explosion, the Swedish national radio reported that 10,000 times the normal amount of cesium-137 existed in the atmosphere, prompting Moscow to officially respond. The following day over 135,000 people were evacuated from within an 30 km radius of the accident. This area was labelled the 'special zone'. The evacuation of the special zone was permanent, as the high levels of radioactivity have been predicted to exist for several centuries.
The radioactive cloud was blown north and northwest by wind, causing the first mention of the accident to be after radioactivity measurements in Sweden. The cloud covered a large area in Europe. On May 2, the cloud even reached the Netherlands, causing fresh fruit and vegetable consumption to be prohibited.

There are many estimates concerning the number of victims that suffer from symptoms induced by radiation. Reliable data is still lacking. The World Health Organization (WHO) stated that approximately 800,000 people have worked on fire extinguishing, restoring the reactor and cleaning up pollution in the first year after the accident. These people only remained in the area for short periods of time to prevent health problems. Ukrainian government figures show that more than 8.000 Ukrainians have died as a result of exposure to radiation during the first cleanup operation. It is stated that the eventual death toll resulting from the nuclear explosion ranges from 30 to 300,.000 and many unofficial sources put the toll over 400,000.

The people that have lived in the Chernobyl area during the accident suffer from various health problems. Immediately following the accident, hundreds of people were diagnosed with radiation sickness. Particularly in Belarus, there has been a dramatic increase in the number of thyroid cancers (2,400%) and leukaemia (100%).
Children of Chernobyl victims suffer from birth defects (250% increase), causing cancer and heart diseases. Approximately 64% of all Ukrainian children under 15 suffering from cancer lived in the most contaminated areas. Genetic defects often result in mutations causing missing limbs.

Dr. Demidchik of the Thyroid Tumour Clinic in Minsk (capital of Belarus) has conducted the most comprehensive study of the incidence of thyroid cancer in Belarus. His findings are widely accepted and make for shocking reading:

•There has been a 2,400% increase in the rates of thyroid cancer in Belarus

•In the Gomel region of Belarus, the region closest to Chernobyl, there has been a 100-fold increase in thyroid cancer.

This increase is almost certainly due to the population’s exposure to Iodine 131. Thyroid cancer is normally an extremely rare disease. Before Chernobyl, Dr. Demidchik’s study shows that, on average, there was less than one case of thyroid cancer per year in Belarus.

Reference source for content and pictures: http://www.chernobyl-international.com/aboutchernobyl/thyroidcancer.asp

Bhopal

- Methyl Isocyanate escapes from Union Carbide pesticide plant
- Heavier than air; settles over neighbouring densely populated area (> ½ Million people)
- Kills up to 8,000 people over 3 days; affects 1-300,000.

December 3, 1984 has become a memorable day for the city of Bhopal in Madya Pradesh county, India. Shortly after midnight, a poisonous gas cloud escaped from the Union Carbide India Limited (UCIL) pesticide factory. The cloud contained 15 metric tons of methyl isocyanate (MIC), covering an area of more than 30 square miles. The gas leak killed at least 4.000 local residents instantly and caused health problems such as oedema for at least 50.000 to perhaps 500.000 people. These health problems killed around 15.000 more victims in the years that followed. Approximately 100.000 people still suffer from chronic disease consequential to gas exposure, today. Research conducted by the BBC in 2004 pointed out that this pollution still causes people to fall ill, and ten more die every year. This event is now known as the worst industrial environmental disaster to ever have occurred.

Source to add pictures to this presentation for single use: www.greenpeace.it by Raghu Rai (1942)

ALIMENTARY EPIDEMICS BY PESTICIDES

- Contamination during transport or storage
- Ingestion of seed dressed for sowing
- Use of pesticides in food preparation because of their organoleptic similarity to alimentary products
- Presence of pesticides in water or food owing to misuse near harvesting time, misuse of containers, contamination of groundwater and use of excessively high doses in agriculture.

Several possibilities how food products get contaminated or mixed with pesticides.

(organoleptic = involving the use of sense organs)

Children and industrial chemicals

Accidental Food Contamination

Spain 1981

11,000 people hospitalized, >500 died

Industrial rapeseed oil from France containing refined aniline.

Refining process produced toxic components.

Resold as cooking oil (59 tons) after mixing olive oil.

Adulteration of vegetable oils (soybean/canola in olive) frequent practice.

Case on contaminated olive oil in Spain. Source: Morbidity and Mortality Weekly Report by Centers for Disease Control and Prevention; accessed at: http://www.cdc.gov/mmwr/preview/mmwrhtml/00000211.htm

In May and June 1981, an extensive outbreak of severe respiratory illness occurred in Spain, primarily in Madrid and the northwest regions of the country (1,2). Patients initially had the clinical and radiographic findings of atypical pneumonia, but other common findings were fever, rash, myalgia, and marked eosinophilia. About 1% of patients died. Autopsies showed interstitial pneumonitis and widespread vasculitis (3). Convalescence was prolonged in many cases and was characterized by diffuse myalgia, non-pitting edema of the limbs, liver-enzyme abnormalities, and sustained eosinophilia (4).

Beginning in August, it was recognized that substantial numbers of previously ill patients were developing neuromuscular problems. Clinical manifestations included muscle atrophy, weight loss, weakness, symmetrical sensory loss, and hyporeflexia. Many patients developed keratoconjunctivitis sicca (decreased tearing and salivation) and scleroderma-like changes of the skin. By that time, chest X rays had become normal. Eosinophilia continued, but at somewhat diminished levels. Moderate elevations of liver enzymes persisted (5). Electromyograms showed terminal axonal death, with denervation atrophy on muscle biopsy. Some patients had severe muscle weakness that led to failure of respiratory muscles. Most deaths among patients with neuromuscular illness have largely resulted from complications associated with prolonged maintenance on mechanical ventilation. It is estimated that the epidemic to date has affected about 17,000 persons (about 70% in Madrid). As of December 24, 1981, 13,222 patients had been hospitalized, and 246 had died. Morbidity and case-fatality ratios have been somewhat higher for females than for males, especially among persons between the ages of 10 and 50 years (6).

References

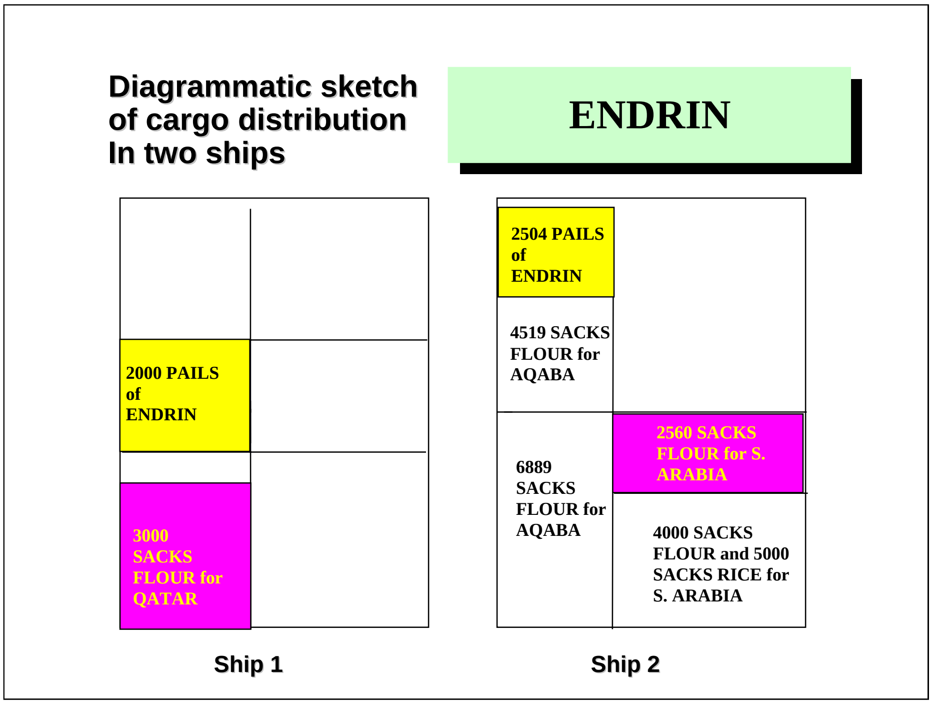
1. CDC. Atypical pneumonia--Spain. MMWR 1981;30:237-8.
2. CDC. Follow-up on toxic pneumonia--Spain. MMWR 1981;30:436-8.
3. Direccion General de Salud Publica, Ministerio de Trabajo, Sanidad y Seguridad Social (MTSS). Informe por la comision de patologos, 6 de Agosto de 1981. Boletin Epidemiologico Semanal 1981: no. 1486:161-2.
4. Tabuenca JM. Toxic-allergic syndrome caused by ingestion of rapeseed oil denatured with aniline. Lancet 1981;2:567-8.
5. Comision Clinica (MTSS). Informe del 13 de Octubre de 1981.
6. Canada-Royo LM. Estudio de afectacion diferencial por sexos y edades en la provincia de Madrid entre el 1 de May y el 5 de Octubre de 1981 como consecuencia del "sindrome toxico." 7 de Octubre de 1981.

Endrin

- Qatar and Saudi Arabia (four outbreaks)
- Epidemic period : June-July 1967
- Clinical picture: convulsions
- Affected population : 874 hospitalized
- Number of deaths : 26
- Analyses ===> Endrin in flour (2000-3500 ppm), bread (40-1800 ppm) and blood (0,007-0,0032 ppm) from affected people.
- Source: Bread ➔ all the implicated bakeries had used the same brand of flour shipped in the same hold of a freighter.

Endrin is a solid, white, almost odourless substance that was used as a pesticide to control insects, rodents and birds. In most countries it has been banned.

(ppm = parts per million)



Here you can see the diagrammatic sketch of cargo distribution in the two implicated ships.

The containers with endrin were loaded above some containers with flour. The pails with endrin had leaked and penetrated the sacks of flour.

Endrin

- Measures to stop the outbreak: Destruction of the suspected flour
- Measures to prevent future episodes: regulation of international transport of dangerous goods and foodstuffs

The International Maritime Dangerous Goods (IMDG) Code was developed as a uniform international code for the transport of dangerous goods by sea covering such matters as packing, container traffic and stowage, with particular reference to the segregation of incompatible substances.

Children and industrial chemicals

Hexachlorobenzene (HCB)

- Country : Turkey
- Epidemic period : 1956-1959
- Clinical picture: cutaneous porphyria
- Affected population : 5000 cases
- Number of deaths : around 10%
- Source: grain for sowing treated with HCB

Hexachlorobenzene (C(6)Cl(6), HCB) is a chemical that has been associated with significant immediate and long term adverse health effects in humans. It has been associated with both porphyria cutanea tarda and spontaneous abortions among survivors of widespread exposure in the 1950s in southeastern Turkey.

Porphyria Cutanea Tarda (PCT)

This disease is the most common of the porphyrias. It may result from a deficiency of the enzyme, uroporphyrinogen decarboxylase (UROD). PCT is an acquired disease, but some individuals have a genetic (autosomal dominant) deficiency of UROD that contributes to its development. These individuals are referred to as having "familial PCT". Most individuals with the inherited enzyme deficiency remain latent and never have symptoms.

In Turkey from 1956 to 1961, there were reports of an epidemic of PCT. Apparently, in 1954 the Turkish government distributed a supply of wheat seed that was treated with fungicides containing 10% Hexachlorabenzine (HCB). It was originally intended for planting, but the shipment arrived too late in the season to plant. Because there was a limited food supply in the Turkish provinces of Dijarbakir, Mardin, and Urfa, the seed was unintentionally diverted for food production. It was difficult to quantify the extent and duration of HCB exposure from existing surveys, because the HCB-treated seed appeared no different from untreated supplies.

As many as 5000 individuals were reported to have been affected by the HCB treated seeds. They exhibited PCT-like syndromes as early as 1956. The government discontinued using the HCB-containing fungicide in 1959, but it was not until around 1961 that the PCT outbreak waned. Researchers from clinics near the areas began to trace the dietary histories of the affected individuals and discovered that it appeared as if the HCB had caused the acquired form of PCT.

Methyl mercury

- Country : Iraq
- Epidemic period : December 1971-March 1972
- Clinical picture : Neurological affectation similar to Minamata disease
- Affected population : 6530 hospitalized
- Number of deaths : 459
- Source: grain for sowing treated with organic mercury fungicides distributed to 3,3% of the population

Iraq 1972

More than 6,000 people hospitalized, approxiamately 10% died. Seed grain donated with methyl mercury antifungal agent.

Distributed 100,000 tons to farmers, improperly identified. Grain (wheat, barley) was mistakenly used to make bread.

Children and industrial chemicals

Planting Seed with Mercury

Children and industrial chemicals

Disaster preparedness

- Data to combat industrial incidents
- Public information sites
- After the incident: Population study? Biomonitoring?
- Interpretation of study

Public health services or other health care providers can advise in the prevention of health effects in children due to industrial accidents.

Data on the chemicals or hazardous substances at different industrial sites need to be collected. More and more countries prepare themselves by making disaster preparedness plans. In these plans locations near industrial sites where children are spending their time should be known.

On public information sites data on chemical hazards can be found. In addition, information on specific hazards for chldren are missing in many cases.

It is warranted to have plans ready in case an incident happens. These plans should carry information about possible antidota, possible population studies, including biomonitoring. These plans should also have information about repression of accidents when occurring.

The results of population studies after accidents need to be interpreted by experts in environmental health or toxicology together with specialists in public health.

Data information

- Handbooks
- Poison centres
- Material Safety Data Sheets
- Reliable Internet sites

There are many websites and handbooks with information on chemical hazards.

The folowing website of EPA is useful: IRIS http://www.epa.gov/iris/

This database was developed by the US Environmental Protection Agency in response to a demand for consistent human health risk information on chemicals for use in decision-making and regulatory activities. IRIS contains records formore than 700 chemicals. In addition to basic information on chemical and physical properties and toxicity, the database is a unique resource for human health assessment information, such as reference doses, carcinogenicity assessments, drinking water health advisories and US EPA regulatory actions.

In addition the American Conference of Governmental Industrial Hygienists (ACGIH), the Agency for Toxic Substances and Disease Registry (ATSDR) or World Health Organisation are providing a lot of information on chemicals hazards and human health.

Poison centres, see *Reference: www.who.int/ipcs/poisons/centre/directory/en/*

Information on hazard management: http://www.atsdr.cdc.gov/hazmat-emergency-preparedness.html

Disaster plans and children

- Disaster plans should keep in mind that children might be more vulnerable
- Disaster plans should have information about settings where children spend their time
- Schools and other child settings should have plans on disaster preparedness

In many schools there are no disaster provisions for children with special needs, nor do they have a plan for post-disaster counseling.

This is an emerging field of concern.

Disaster plans and children

- Preparedness Planning and Readiness Assessment
- Surveillance and Epidemiology Capacity
- Laboratory Capacity – Biologic Agents
- Laboratory Capacity - Chemical Agents
- Health Alert Network/Communications and Information Technology
- Risk Communication and Health Information Dissemination
- Education and Training

Recommendations for Chapters of a disaster plan provided by the American Academy of Pediatrics (AAP) to address children's needs in Bioterrorism Preparedness Plans.

This slide is of importance to those health care providers that are involved in disaster preparedness planning.

Source: Disaster Preparedness to Meet Children's Needs

Accessed March 2006 at: http://www.aap.org/terrorism/topics/TFOT-Checklist.final.pdf

Environmental injustice

- Children with lower socioeconomic status live more frequently near polluted sites

People of colour (in the USA) are found to be more likely to live near industrial sources of air pollution in two recent separate investigations looking at 1990 data on toxic air pollutants. African Americans were found to be more likely than Whites to live in census tracks with higher total modelled toxic air pollutants in every large metropolitan area in the country. In studies of three specific industrial areas, researchers found that a higher percentage of African Americans than Whites lived closer to industrial sources of air pollution, including toxic emissions, and were more likely to live near multiple sources such emissions.

Ref.:Lopes R. Segregation and Black/White Differences in Exposure to Air Toxics in 1990. Environ Health Perspective 110: Supplement 2:April 2002:289-295.
Perlin SA, Sexton K, Wong DW. An examination of race and poverty for populations living near industrial sources of air pollution. J Expo Anal Environ Epidemiol. 1999, Jan-Feb; 9(1):29-48; Perlin SA, Wong DW, Sexton K. Residential proximity to industrial sources of air pollution: interrelationships among race, poverty, and age. J Air Waste Management Association. 2001 March; 51(3); 406-21.

Environmental injustice

- Risk communication and Health information dissemination
- Crisis centre for questions and complaints
- Biomonitoring
- Population study

This slide can be used to incorporate some discussion with the participants about the needs, possibilities and difficulties of performing additional study after an accident.

After accidents or incidents the question pops up if the population needs to be screened. Depending on the exposure, the number of exposed persons/children and the technological possibilities the experts need to make a decision about performing a population study. Part of such a study could be a questionnaire to assess the exposure. History taking is another important step.

Biomonitoring could be a tool to support a population study.

Possibilities are human biomonitroing, eg. blood, urine, hair.

Also monitoring of environmental media could be considered: eg. water, food.

Cohort studies are an important possibility.