Environmental & Occupational Health Cheat Sheet

by atandi389 via cheatography.com/33968/cs/10621/

Terms

Enviro PH: Study of the impact that enviro exposure plays on health outcomes of the community

Precautionary Principle: If you're unsure about risks, be safe

Causation: Cant be proven

Hill's Criteria of Causation: Temporality, dose response, biological plausability, strength of effect, reverse of effect

Healthy Worker Effect: Ppl in workforce are inherently healthier than non-working

POPs: Persistent organic pollutants - Chemicals that persist in env. & body

Lipophilic: Stored in fat tissue (organic compounds)

Bioaccumulate: Builds up in body, usually lipophilic

Biomagnification: Builds up through the food chain

Heavy Metals: Naturally occurring, common in industry (ie lead, merc, arsenic, cadmium)

Endocrine Disruptors: Substances that either block, mimic, or antagonize normal hormone func.

Teratogenic: Causes mutations

Ionizing: Carcinogenic, causes mutations

Non-ionizing: Non-mutation causing

Terms (cont)

Lead: Metal, affects nerv system (poisonous @ 10 micrograms/liter of blood)

Idiopathic Disease: "Idiots" don't know what's causing it

Sick Building Syndrome: a medical condition in which people in a building suffer from symptoms of illness temporally related to time in the building". (WHO 2005)

Building related symptoms: the acute adverse health effects of building occupants related to time spent in the specific building. Common BRS: headache, fatigue, eye complaints, respiratory problems

Building related illness: diagnosable illness whose cause can be directly attributed to building exposures (doesn't improve when removed from building)
Exs: Toxicity (carbon monox poisoning), Infectious Disease (legionnaires disease, aspergiliosis), Pulmonary (occupational asthma)

Pathoneumonic: visible disease

Chemical half-life: persistence of chems in the body (blood/urine)

Organic & Inorganic: w/ & w/o carbon

Terms (cont)

Organic solvent: organic substance (usually liquid) that dissolves another material (all industries, common in cleaning supplies & cosmetics

Environmental Exposure Heirarchy

Exposure isnt dose, but it is used to calc dose
Co-exposure can confound - need to measure all

Environmental Exposure Heirarchy
Bioactive Dose
Internal Dose
Personal Exposure
Ambient Exposure
From top to bottom: the higher, the better the assessment. Co-exposure can confound (need to measure all)

How to Measure Exposure
Type of Env. chem or phys (i.e. radiation, noise, heat, etc)
Medium of Env. i.e air, water, soil pollution
Location of Env. i.e. ambient, work, residential
Duration of exposure time avg or cross-sectional

Exposure -> Dose depends on...
Chemical half-life (persistence in blood/urine), route of exposure (i.e. ingest vs inhale), genetics, demographics (i.e. babies & old ppl get higher doses, cant metabolize as fast), health status & nutrition, lifestyle/behaviors, geography (proximity to hazards)

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Driving & Traffic Mortality

Traffic Mortality Stats

>1.2 M deaths/yr (Israel 350/yr %25 pedestrians)

-Currently leading cause of ppl yrs lost < 60 (projected as 2nd cause of all deaths/yr by 2020)

-Driving forces, pressures, stresses: econ growth, explosive growth in # of cars

What kills? speed, fatigue, cellphones, mass, alc, young male drivers, pedestrians (young and old)

1993 Israel ↑ speed limit 90 to 100kph -> ↑ death rate

Cases

Lead: 1975 ↓ lead in gas → ↓ in air → ↓ in ppl → ↓ crime & ↑ IQ

Minamata Disease: Minamata Japan neuro disorder from severe merc poisoning: 1950 crazy cat disease → 1955 "An epidemic of an unknown disease of the central nervous system" → 1956 40 cases, 16 dead. → 1958 Vast # children living near water (eat & drink) thought it was food poisoning → 1959 hair samples of children in & out of city. Found kids in city had 3x more heavy metal → 1960 figured out the heavy metal was mercury coming from Chisso Chem Company dumping heavy metal biproduct in bay that bioaccumulated in fish

Synthetic Chemical Compounds - Qs

What chemicals being used?

What actual exposure? (concentrations, amounts, route of exposure)

Are exposure levels health concern?

200k+ can never know toxicity of all

Water Pollution

Definition: Any chem, bio, or phys change in water quality that has a harmful effect on living organisms or makes water unsuitable for desired usage

Composed of:

Organic Chemicals oil, gas, plastics, detergents, industries & cleaners

Plant Nutrients water soluble nitrates, ammonia & phosphates (from sewage), agriculture & urban fertilizers

Sediment soils/silts from land erosion (can disrupt photosynth, destroy spawning grounds, clog rivers & streams)

Inorganic Chems Acids & toxic chems, often from runoff, industries & household cleaners

Oxygen Demanding Wastes: Organic waste that needs oxygen, often from animal waste, paper mills, & food processing

Infectious Agents: bacteria & viruses, often from animal waste

Routes Industrial waste, urban runoff, groundwater contamination

Water Pollution (cont)

How to Measure Water Quality?

Bacterial Counts Fecal coliform counts from animals' intestines

- 0 per 100ml for drinking
- >200 per 100ml for swimming

Sources: humans, birds, animals

Dissolved Oxygen: Bio. O2 Demand (BOD) aka amount of O2 consumed by aquatic decomposers

Chemical Analysis: look for presence of inorganic or organic chems.

Suspended Sediment: water clarity

Drinking Water

-Purify drinking water via heat & UV exposure, fine cloths to filter, small amts of chlorine

-Bottled water may get contaminated by plastics from bottle

Basis Drinking Water Standards Primary source in toxicology & drinking water standards

Pros: control of exposure levels, living conditions, chance 4 followup, pathological testing

Cons: is animal model appropriate for human effects? do exposure conditions reflect real conditions?

Water Pollution (cont)

Groundwater

Why is groundwater pollution a serious problem? Out of sight (underground) - wouldn't necessarily see it, little dilution & dispersion, no way to cleans itself (bacteria that would work to break down pollution needs warmth and movement to move), prime source for drinking, pollutant removal is difficult

Causes: Low flow rates, low O2, few bacteria, cold temps

Prevention: monitor aquifers, find less hazardous subs, leak detection systems, strictly regulate hazardous waste disposal, store hazardous materials above ground so it doesn't seep into groundwater

Ocean Pollution Sources: large amounts of untreated raw sewage, leaking septic tanks, runoff, algae blooms from nutrients (i.e. red tides-create neurotoxins), dead zones, airborne toxins, oil spills

Water Pollution (cont)

Solutions Prevent groundwater contam, greatly ↓ nonpoint runoff, reuse treated wastewater for irrigation, substitutes for toxic pollutants, treat sewage naturally, 4 rs (refuse, reduce, recycle, reuse), ↓ resource waste, ↓ air pollution, ↓ poverty, ↓ birthrates, fertilize w manure or compost instead of inorganic fertilizer, ↓ use of pesticides, never apply fert or pesticides near body of water, organic foods, dont dump chems or meds in drains/toilets

Children Not Little Adults

Different & unique exposures
Dynamic devel physiology
Longer life expectancy
Politically powerless
More surface area to be exposed
Exposed @ home, school, day-care, playground
Exposed to pesticide residues, wood preservatives, dust, etc.
Vast majority of deaths from unintentional injuries globally

Physical Hazards

Noise, Temp., Ergonomics, Vibration, Radiation (*All have waves*)

Most Common Symptom of Occupational Exposures? back injuries from improper lifting

Noise

Noise Induced Hearing Loss (NIHL) Cumulative: 1 in 4 workers over age of 55

Industries @ risk Petroleum, lumber, food processing (~25% workforce maybe exposed > 90dB)

Control Measures 1. Engineering 2. Admin controls 3. Hearing protection

Fields of Toxicology

Descriptive Toxicology testing on lab animals/in vitro, provides info for safety eval/reqs. Used to eval risks for humans & enviro from exposure to specific chems

Mechanic Toxicology ID & undersand cellular, biochem, & molecular mechs by which chemicals exert toxic effects. Useful for showing adverse outcome in lab animals is relevant to humans

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Fields of Toxicology (cont)

Regulatory Toxicology Estab of stnrds for amt of chems permitted in air, food, industrial atmos., & water. Oft integrates sci info from descriptive & mech tox studies w approaches used risk assmt

All used for risk assessment

Environmental vs...

Enviro	Occupational
Larger affected population	Smaller affected population
Smaller concentrations	Higher concentrations
Fewer exposures	More exposures
Regional monitoring	Direct monitoring

Occ. health issues become enviro health issues

Enviro PH	Enviro MD
Recognizing disease in specific community	Recognizing disease in ind.
ID env. exposures in comm.	ID env. exposure of the ind
Make connection btwn exposure & disease	Make connection btwn exposure & disease

Environmental vs... (cont)

Reduce exposure to pollution	Reduce exposure first, treat disease

Radiation

Exposures to Env. Radiation: coal burning (power stations), phosphate industry (middle east phosphates high in uranium), household heating & cooking (less today), gypsum phosphate (industry, less today), radon exposure (basements, underground parking, etc), nuclear energy use, nuclear disasters, watches, fluorescent signs, fire detectors, air travel, industrial use (checking pipes, bottle filling of soft drinks, density measures, ground moister detectors)

Exposures to nonionizing radiation: smart wireless tech, WII games, remote controls, WIFI, cellphones, radars, RF radio equip, radio/tv station workers, security chips

Medical irradiation: *diagnostic radiology* = x-rays, CT, catheterizations, angiography, guided surgery & *nuclear medicine* = RA material injected IV then tracked by Gamma ray cam, heart scan, bone scan

Climate Change

Effects

Gradual inc. in temp

↑ in sea level -> salinated water

tropical region ↑ -> malaria, dengue, etc

↑ air pollution -> cardiopulmonary, morbidity, & mortality

Temp extremes

heat waves -> dehydration & heat stroke

drought -> ↓ crops & drinkable water

↑ fires -> burn injuries, air pollution

Cold events -> frost bite, hypothermia

Extreme climate events

drowning, displacement

↓ drinkable water

↑ infectious diseases

State of research very new & active area, lack of good research (poor outcome & exposure assessment), multiple confounders, delayed effect (need to observe population for decades)

Air Pollution

Definition A complex mixture of gases, particulates, metals (i.e. arsenic, cadmium, merc, zinc, iron), & bioallergens suspended in ambient air

Measures: Personal (expensive) & Ambient (cheaper, use area monitors to estimate personal via map- red=higher exposure & dots where ppl live)

Air Pollution (cont)

Natural sources: pollen, fungi, dust
Anthropogenic sources: point (stays in place, i.e. factory) & mobile (i.e car, cow)

Criteria Air Pollutants: Ozone, nitro dioxide, particulate matter (PM10 & PM 2.5), sulfur dioxide, lead

Particulate Matter
Definition = Shmutz - Mixture of solid & liquid particles suspended in air
Types: UFP (<0.1 microns), PM2.5 (<2.5), PM10 (2.5-10)
Where to? 5-10 micrometers: nasopharynx (nasal pathways)
3-5 Micrometers: trachea
2-3 micrometers: bronchial tubes
1-2 MMs: Bronchioles
0.1-1MMs: alveoli (bloodstream)
-Associated w ↑ pulmonary ER visits, ↓ pulmonary function
-Needs to be 2.5 or smaller to affect heart

Indoor Air Quality
Exposures: biomass (fuel 4 cooking/heat)- carbon monoxide & particulates, enviro tobacco smoke (ETS), radon, VOC (volatile organ compounds), mold
Illness: sick building syndrome (building related symptoms), building related illness

Problem of cooking & heating : approx 50% households worldwide & 90% households utilize solid fuels for cooking & heating
-indoor, contained, higher exp.
-biomass fuels emit particulates, carbon monoxide, nitrogen oxides, benzenes, formaldehyde, 1,3 butadiene, & PAH like benzo(a)pyrene
-2004: indoor smoke from solid fuels was attributable mort. #10 & attributable DALY #9