



## Workplace Health

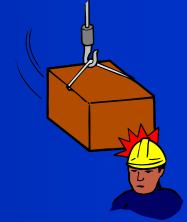
C. David Langlois, CSP

Langlois, Weigand & Associates

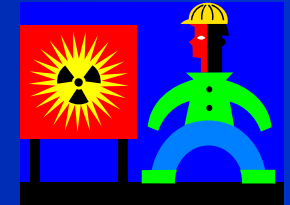


## Workplace Health

**Safety** – usually associated with acute injuries, short-term, traumatic exposures



**Health** – usually directed at chronic exposures, persistent, prolonged, repeated



## Definition

Industrial Hygiene – “that science and art devoted to the anticipation, recognition, evaluation, and control of those environmental factors or stresses, arising in or from the workplace, which may cause sickness, impaired health and well-being, or significant discomfort, and inefficiency among workers or among the citizens of the community”



## Environmental Stresses

**Chemical** – environmental concentrations

**Physical** – noise, heat, ionizing, etc.

**Ergonomic** – man-machine interface

**Biological** – micro living organisms

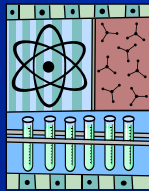


## States of Matter

**Solids** – definite shape and volume

**Liquids** – definite volume but no definite shape

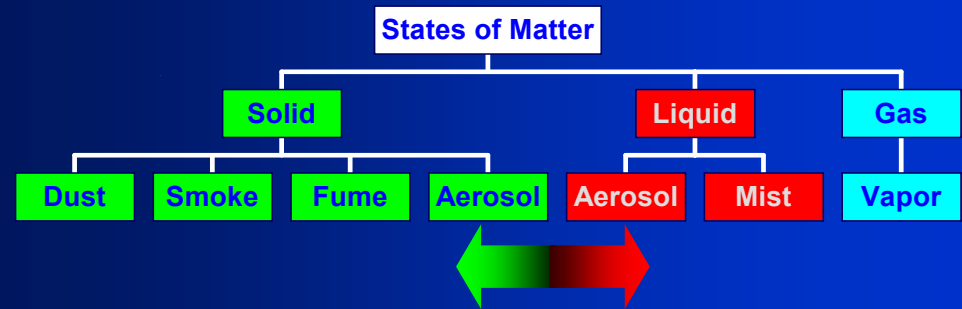
**Gases** – neither definite volume nor shape



5



## Chemical Stresses Chart



6



## Chemical Stresses

**Dusts** – solid particles from handling, grinding, crushing, impact (1-25 microns) (cotton, grain, grinding wheels)

**Smoke** – carbon or soot particles less than .1 microns in size and are the products of incomplete combustion (fire, gas engines)

7



## Chemical Stresses

**Fumes** – solid particles generated by condensation from the gaseous state (welding, soldering, brazing)

**Aerosols** – solid particles or liquid droplets of fine enough size to remain dispersed in air for a prolonged period of time (powder sprays, paint sprays)

8



## Chemical Stresses

**Mists** – suspended liquid droplets generated by condensation of liquids, or by breaking up a liquid into a dispersed state (mixing vats, maintenance degreasers)

**Vapors** – volatile form of a substance normally a liquid or solid at STP (paint thinners, nail polish remover)

9



## Terms to Express Concentrations

**TLV** – threshold limit value - airborne concentration under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect (ACGIH)

**PEL** – permissible exposure limit (OSHA)

10



## Terms to Express Concentrations

**TWA** – time weighted average – average exposure over a workday

**C** – ceiling – level not to be exceeded at any time

**STEL** – short term exposure limit (15 minute exposure not producing harm)

11



## Terms to Express Concentrations

**REL** – recommended exposure limit, NIOSH term to designate agency's maximum concentration

**BEI** – biological exposure index; advisory levels adopted for some substances by ACGIH based on blood, urine, or expired air – TLV-TWA for eight hours

12



## Terms to Express Concentrations

**ppm** – parts per million

**mg/m<sup>3</sup>** – milligrams per cubic meter



13



## Routes of Entry

**Inhalation** – breathing, most common

**Ingestion** – swallowing

**Absorption** – penetration through the skin

**Injection** – forcing by mechanical means

14



## Effects of Exposure

Concentration of substance

Probability of substance to produce injury

Rate of generation of material

Control measures



15



## Toxicity

Capacity of a material to produce injury or harm; Depends on dose, rate, method, site of entry, general health of individual, diet, temperature



16



## Toxic Effects

**Irritants** – inflame surfaces of the body

**Systemic poisons** – attack organs or system

**Depressants** – affect the central nervous system

17



## Toxic Effects

**Asphyxiants** – prevent oxygen from reaching body cells (simple – nitrogen; chemical – carbon monoxide)

**Carcinogens** – cancer causing (benzene)

**Teratogens** – affect the fetus (lead)

**Mutagens** – affect the species (radiation)

18



## Physical Stresses

Noise



Temperature extremes



Ionizing radiation



Non-ionizing radiation



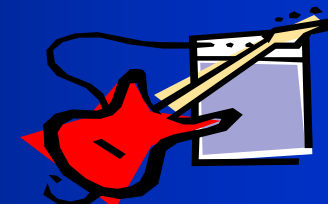
19



## Noise

**Noise** – Unwanted sound

**Sound** – pressure variation in air or other medium, that humans can detect



20





## Noise

**Decibels** – pressure related to 20 micronewtons per square meter ( $20\mu\text{N}/\text{m}^2$ )

**Frequency** – one cycle per second (hertz)

**PEL** – OSHA enforcement 90 dBA/ 8 hrs

21



## Temperature Extremes

Climatic conditions

Work demands

Clothing



22



## Radiation

**Ionizing** – electromagnetic or particulate radiation capable of producing ions, directly or indirectly, by interaction with matter

**Non-ionizing** – magnetic fields, radio-frequency/microwave, optical radiation, lasers

23



## Ergonomics

The study of human characteristics for the appropriate design of the living and work environment

Matching the person to the task, as opposed to matching the task to the person

24



## Ergonomic Stresses

Mental workload  
Physical workload  
Energy cost  
Work classification  
Work/rest cycles



25



## Biological Stresses

**Microorganisms** – bacteria, viruses, fungi, and their products  
**Arthropods** – crustaceans, arachnids, insects; bites and stings  
Allergens and toxins from higher plants, poison ivy, poison oak

26



## Biological Stresses

**Bacteria** – single-cell plants living in soil, water, organic matter, plants, or animals  
**Virus** – microscopic agents able to live only in living cells

27



## Biological Stresses

**Fungus** – parasitic lower plants including molds, mildews, mushrooms  
**Parasite** – organism living in/on another living organism

28



## Biological Stresses

Protein allergens from vertebrate animals; urine, feces, hair, saliva

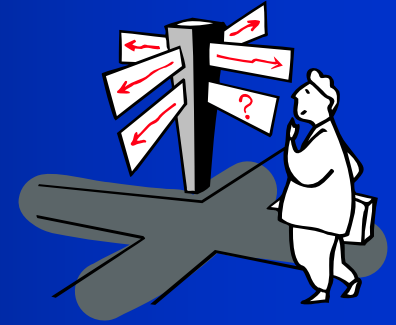
Current topics - OSHA bloodborne pathogens, sick-building syndrome, weapons of mass destruction

29



## Industrial Hygiene Controls

Substitution  
Process change  
Isolation  
Wet methods  
Local exhaust  
General ventilation



30



## Industrial Hygiene Controls

PPE

Personal hygiene

Housekeeping

Waste disposal

Special controls

Medical controls



31



## Conclusion

Questions

Comments

Evaluation form

References



32