

# EVALUATING HEALTH RISKS IN WORKPLACES

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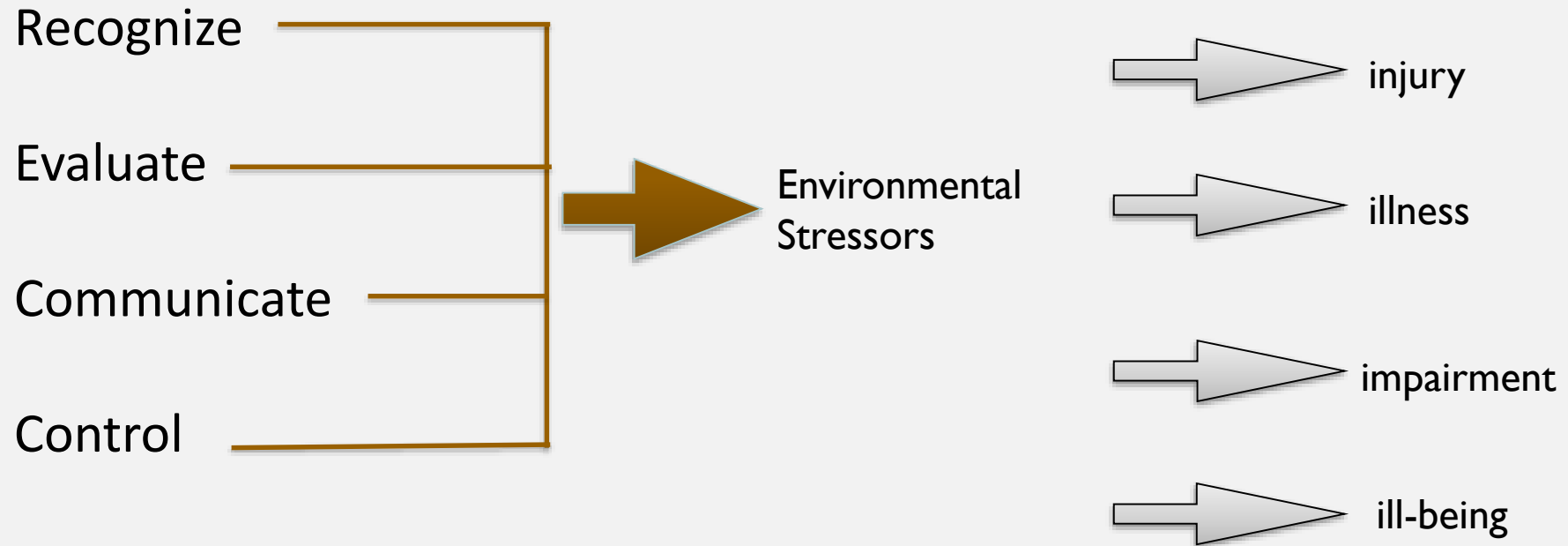
## TODAY'S KEY POINTS

- What is **industrial hygiene** sampling?
- Identify how we get workplace information on exposure:
  - **background information**
  - **monitoring data** from the site or company.
  - **clinical data.**
- How to learn more about **industry chemicals and risks.**
- Discussion, questions & answers

# INDUSTRIAL HYGIENE

- Referred to “occupational hygiene” outside of the U.S.
- Credentials for practicing industrial hygienists include the “IHIT” and the “CIH”, both issued by the American Board of Industrial Hygienists and recognized worldwide.
- International Occupational Hygiene Association (IOHA).
- Industrial (or occupational) hygiene focus is on exposure assessment.
  - Historically within only the occupational environment
  - Expanded to home and community

# Industrial Hygiene



*Stressors: biological, chemical, physical, ergonomic, and psychosocial.*

# EXPOSURE ASSESSMENT QUESTIONS

- **Who** is being exposed?
- What is the **route** of exposure?
- How **much** exposure is occurring?
- How **often** and **for how** long does exposure occur?
- Representative monitoring is preferred over models.
- Findings can be compared to exposure limits (TLV, PEL, OEL, etc.) and relates to Biological Exposure Indices.
- Important to use qualified analytical laboratories for non-direct reading instruments and samples.



# SAMPLING STRATEGIES



- Purpose of sampling: to evaluate a person's exposure to a chemical or physical agent, generally in their "breathing" zone.
- Two types of sampling strategies include:
  - "worst-case" sampling (more subjective)
    - Advantages: fewer samples required so it is less costly and less time consuming, and statistical skills aren't required.  
Limitation: requires industrial hygienist to recognize the "worst-case" exposure and relies on judgement.
  - random sampling
    - Advantages: avoids judgement in sample selection and more "defensible"
    - Limitations: expensive and time consuming.

# BACKGROUND WORK

## REVIEW COMPANY OCCUPATIONAL SAFETY AND HEALTH PLANS AND PROGRAMS

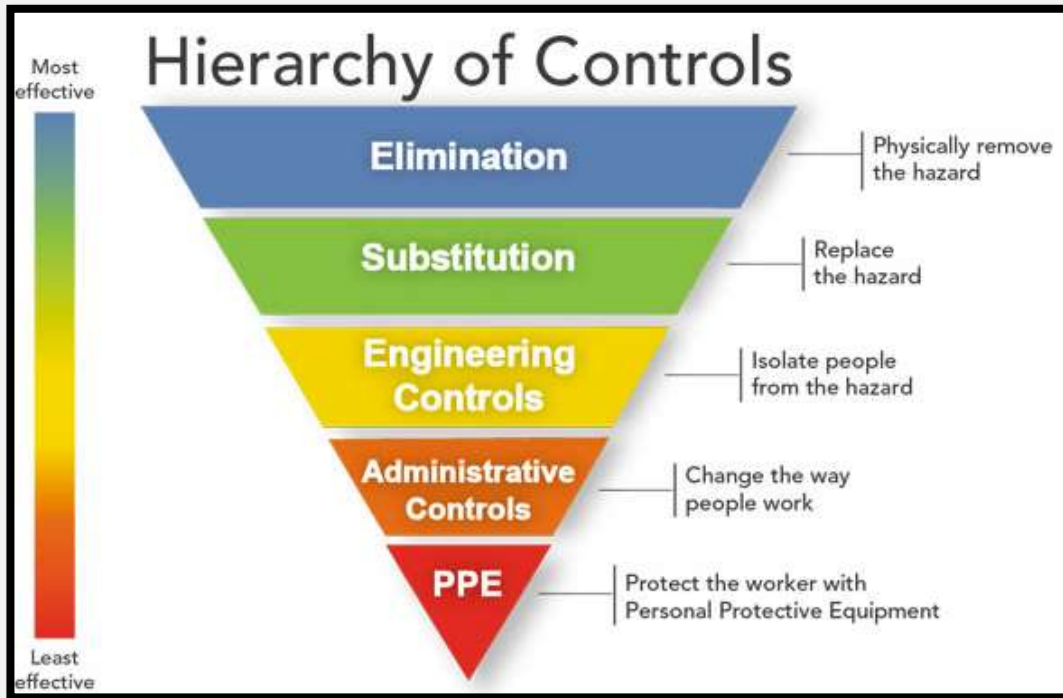
- Nature of Industry and job tasks
- Job hazard analyses
- Hazard communication (“Worker Right to Know”) and chemical inventory
- Worker injury and exposure data
- Hearing conservation/protection program



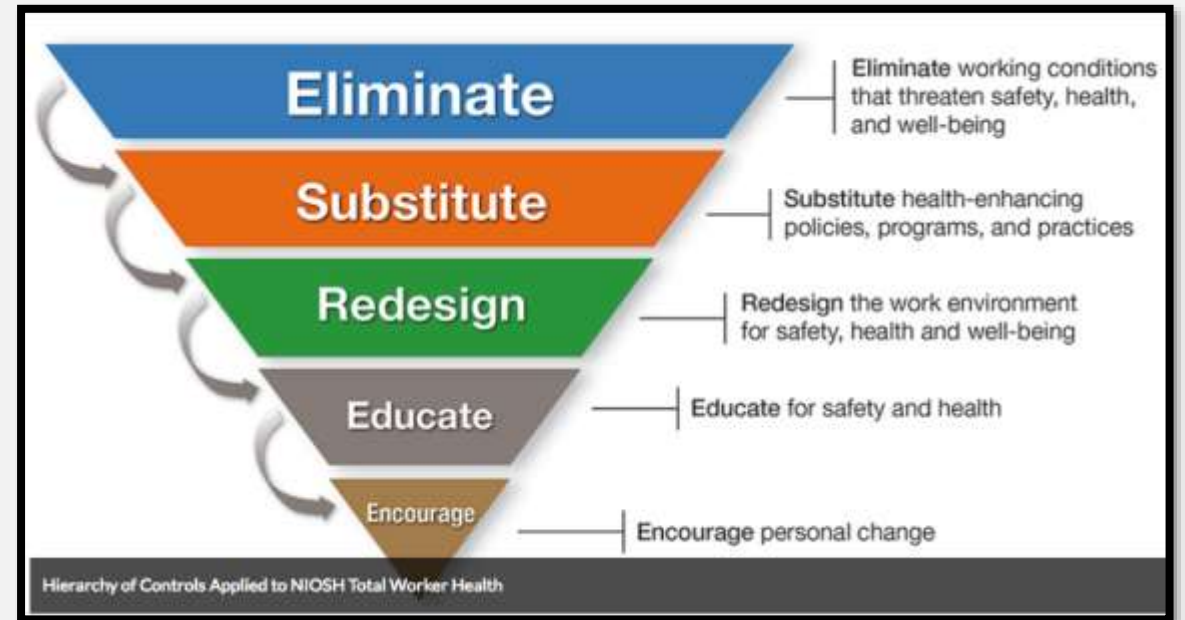
# NATURE OF INDUSTRY AND JOB TASKS



# NIOSH COMPANION HIERARCHY OF CONTROLS



Traditional Hierarchy of Controls –  
NIOSH 2015



The Hierarchy of Controls Applied to NIOSH  
Total Worker Health®

# JOB HAZARD ANALYSES



# HAZARD COMMUNICATION & CHEMICAL INVENTORY

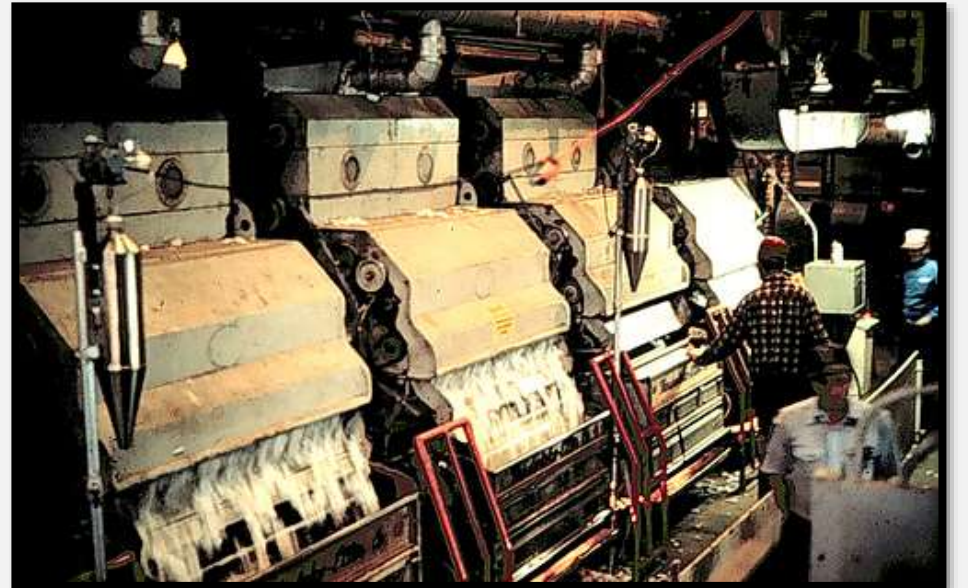


# WORKER INJURY & EXPOSURE DATA



# HEARING CONSERVATION PROGRAM

- High risk jobs
- Baseline and annual audiometry
- Use of hearing protection
- Training
- Off the job?



**MONITORING DATA**

## MONITORING DATA

- Noise exposure dosimetry and measurements
- Onsite area and personal air sampling





CLINICAL DATA

# ASSESS CLINICAL DATA OR PRESCRIBE TESTS


- Blood/urine/exhaled breath per chemical exposures, standards or regulatory required
  - ACGIH air sampling parameters and guidance
  - NIOSH, EPA or other
  - Additional qualitative data from exams or questionnaires
  - Medical first aid reports, medical removal, emergency exposures

ADOPTED BIOLOGICAL EXPOSURE DETERMINANTS			
Chemical [CAS No.] (Documentation date)	Determinant	Sampling Time	BE <sup>®</sup>
* ETHYLENE OXIDE [75-21-8] (2018)	N-(2-hydroxyethyl)valine (HEV) hemoglobin adducts	Not critical	5000
	S-(2-hydroxyethyl)mercapturic acid (HEMA) in urine	End of shift	5 µg
	** Applies to workers having representative Ethylene oxide exposure during the previous 120 days.		
* N-ETHYL-2-PYRROLIDONE [2687-91-4] (2018)	5-Hydroxy-N-ethyl-2-pyrrolidone (5-HNEP) in urine**	End of shift	—
FLUORIDES (2011)	Fluoride in urine	Prior to shift	2 mg
	Fluoride in urine	End of shift	3 mg
FURFURAL [98-01-1] (2006)	Furoic acid in urine*	End of shift	200
1,6-HEXAMETHYLENE DIISOCYANATE [822-06-0] (2014)	1,6-Hexamethylene diamine in urine*	End of shift	15 µg
* n-HEXANE [110-54-3] (2018)	2,5-Hexanedione in urine**	End of shift	0.5 µg
LEAD AND INORGANIC COMPOUNDS [7439-92-1] (2016)	Lead in blood	Not critical	200

Note: Persons applying this BE<sup>®</sup> are encouraged to counsel female workers of child-bearing age about the risk of delivering a child with a Pbt (CDC: Guidelines for the identification and management of lead exposure in pregnant and lactating women, 2010.)

# INDUSTRY CHEMICALS & RISKS

## MANUFACTURING: TOP HAZARDS

- Chemicals
  - Falls
  - Heavy machinery (exposure to moving parts, guarding, caught between)
  - Fire
  - Confined spaces
  - Musculoskeletal disorders
- 
- Chemicals depend on processes and operations. Safety data sheets and chemical inventories can be used to learn more, along with understanding the type of manufacturing process.

## PETROLEUM REFINING: TOP HAZARDS

- Fire and Explosion
- Health Hazards (hydrocarbon vapors, sulfur dioxide, carbon monoxide, hydrogen sulfide, particulates, chlorine, ammonia)
- Shutdown and maintenance work times: require careful planning and procedures to make sure that unanticipated exposures don't occur.
- Confined space work and tank cleaning: concern about hydrogen sulfide exposure. Processes may use hydrofluoric acid and other "washes." (use permit system, emergency warning systems and procedures).

# AUTOMOBILE MANUFACTURING

- For skilled trades and material handling jobs: high risk for traumatic injuries (uncontrolled release of energy, heavy machinery, falls, noise.)
- For fixed production operations (strains, sprains and overexertion, noise).
- Production service occupations and skilled trades (chemical exposures, especially solvent and other volatile vapors, confined space entry, noise).
- Foundry operations (molten metal spills and explosions, carbon monoxide, eye contact, contusions and burns, increased lung cancer risk).
- Machining (chemical coolants – some that may be carcinogens, cause occupational asthma or other respiratory symptoms)



## AUTOMOBILES CONTINUED

- Pressed metal operations (crushing and amputation injuries from power presswork, lacerations.)
- Hardware and electroplating (cancer risk when exposed to chromic and sulfuric mist exposures).
- Vehicle assembly (cumulative trauma disorders).

# OIL AND GAS EXTRACTION

- Top causes of fatalities: vehicle accidents, struck by/caught-in/caught-between. Explosions and fires, falls, entering confined spaces, chemical exposures.
- Top health and chemical hazards
  - Hydrogen sulfide
  - Silica
  - Noise
  - Diesel particulate matter
  - Other hazardous chemicals used during processes
  - Naturally occurring radioactive matter
  - Temperature extremes
  - Noise
  - Diesel exposures





# ELECTRIC POWER

- Electrocution
- Falls
- Confined spaces
- Fires and explosions
- Sprains, strains, and fractures

## WHAT DO WE LEARN FROM THE HRA? (OR FROM “LET’S GET HEALTHY”)

- Alcohol
- Smoking
- Seat belt and Helmet use
- Existing medical problems
- Illness days
- Impulsivity
- Life satisfaction
- Perception of health
- Physical activity
- Stress



# Discussion & Questions?

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