

INTRODUCTION TO LECTURE NOTES ON BIO-CHEMICAL TEST AS
TOOL FOR INDUSTRIAL EXPOSURE EVALUATION

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American Industrial Hygiene Association
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This outline was prepared for lecture notes to medical students who would mainly be in general practice.

If properly used, both air and urine tests provide essentially the same information - the severity of exposure to the poison in question. Industrial hygienists and physicians alike have been slow to make use of many advantages offered by chemical urine analysis.

These advantages are: Under normal conditions, they picture accurately employees' exposure to many toxic substances as well as does atmospheric analyses; they represent total absorption from all sources (inhalation, ingestion and skin absorption); the effects of solubility in body fluids is gauged by urinary excretion of many elements; and exposure in many cases can be evaluated after it has ceased by delayed urinary excretion of toxic substance. Last, but not least, only the absorption of a chemical element can cause an increase in excretion of that same element in body fluids.

The chief disadvantages are: Toxic substances may cause injury in passing through the body in chemically detectable amounts; excreted poison is only approximately proportioned to excreted concentrations and often there is a delayed response in increased excretion with start of absorption or exposure because chemicals may be partly stored in body to some extent. The variation in urinary concentration caused by varying fluid intake can be reduced by adjusting the specific gravity to a median value. Many industrial chemicals have not been studied relative to ratio of excreted amounts and atmospheric exposure. All such data should be published to expand the industrial hygienist's ability to use this valuable tool in exposure evaluation.

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INDUSTRIAL HYGIENE PROBLEMS IN A REFINERY AND
SERVICES RENDERED BY AN INDUSTRIAL HYGIENIST
TO THE MEDICAL DEPARTMENT

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INDUSTRIAL HYGIENE PROBLEMS IN A REFINERY AND
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TO THE MEDICAL DEPARTMENT

To make your industrial hygiene program effective you need at least three forms, or types, of services:

1. MEDICAL - (Physician and Nurse)
2. ENGINEERING - (Industrial Hygienist)
3. SAFETY - (Safety Engineers and First-aiders)

If all the members of this team work together on a health program, established according to the particular needs of the plant, you can depend on obvious, practical results by: (1) decreasing illness, injuries, and labor turnover; (2) saving on compensation, insurance premiums, wage losses to the employees and cost of illness; and (3) improving efficiency and promoting morale.

The industrial hygienist of this team has the "know-how" to determine the sanitary, mechanical and chemical causes of occupational diseases, communicable diseases, and inefficiency from marked discomfort and nuisances.

The most important occupational hazards to be evaluated are:

1. Exposure to poisonous fumes, dust and gases
2. Contact with chemicals, oils and solid irritants
3. Excessive heat, cold, humidity, noise and pressure
4. Poor illumination, ventilation and sanitary facilities

The industrial hygienist will determine through a company-wide survey:

1. The exposure of each worker to hazardous materials
2. Extent of exposure and rating of the hazards and sanitary conditions
3. Appraisal of preventive measures and recommendations for improved controls, always basing these on sound practical engineering
4. Design of controls based on tests both in the field and the laboratory

The industrial hygienist can support the Medical Department on the following problems which are outstanding or have recently been controlled, by determining the:

1. Heat and Humidity Maximum in Hot Vessels and About Hot Pumps and Machinery:

A. For continuous work:

1. Type of heat transfer - sensible and/or radiant
2. Dry bulb, wet bulb and effective temperature
3. Most practical control:
 - a. Ventilation requirement - air volume, velocity and method and place of air supply
 - b. Utilization of protective shields, clothing and other personal protective measures

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3. Most practical control (cont.).

- c. Practical methods of rapid cooling of vessel by mechanical means
- d. Health education of workers in personal protective hygiene and work habits

B. Maximum temperature for short exposure:

- 1. Determine all the above
- 2. Length of exposure and rest period between exposures

2. Methyl Chloride:

A. Maximum exposure:

- 1. Number of employees
- 2. Acute effects

B. Average daily exposure:

- 1. Number of employees
- 2. Chronic effects
- 3. Laboratory examination of body fluids

C. Methods of control:

- 1. Mechanical control
- 2. Protective equipment

D. Methods of atmospheric testing:

- 1. Accuracy and sensitivity
- 2. Ease of test

3. Catalytic Cycle Oils:

A. Number and location of employees exposed

B. Type and frequency of exposure

- 1. Preparation of survey forms

C. Washing facilities and methods of removal from skin

D. Mechanical methods of elimination of skin contact

E. Personal hygiene education

F. Possibilities and extent of community exposure to industrial waste

4. Dust Exposure:

A. Sources of dust

- 1. Sand blasting operation

- a. Silica dust
- b. Toxic metal dust

- 2. Catalytic dust

- a. Operators of Contact Lube Plant
- b. "Turnaround" crews
- c. Machine shop employees
- d. Yardmen and waste handlers
- e. Community

- 3. Rubber plant and other affiliated plants

- a. Talc exposure in Rubber Plant

5. Light and Noise:

A. Cause of many complaints (Headaches, inefficiency, etc.)

Note: Survey not made (June-1946, Health & Sanitation Report)
because of the lack of a qualified person

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6. Sulfur Dioxide and Other Acid Gases:

A. Acid Plant

1. Number of workers exposed
 - a. Acid plant operators and maintenance crews
 - b. Burning acid sludge and yardmen
 - c. Sludge Agitator (Cause of nausea among operators not known)
2. Method of control
 - a. Vent and exhaust ventilation
 - b. Isolation
 - c. Respiratory protection

7. Heavy Metal Exposure:

A. Lead:

1. Number of workers
 - a. Lead burners and helpers
 - b. Workers in vicinity of lead, dust and fumes generation
 - c. Yardmen and waste handlers (Especially incinerator workers)
 - d. Knock test laboratory
 - e. Pilot plant workers

B. Mercury:

1. Instrument men, janitors, laboratory workers
2. Isolation and enclosure
3. Housekeeping and physical factors
4. Utilization of chemicals to remove or to neutralize spilled mercury
5. Study of work methods
6. Follow-up study to appraise instigated controls

C. Chromates:

1. Laboratory workers
2. Welders
3. Janitors

D. Zinc, cadmium, iron and others

1. Welders and helpers
2. Steel and iron burners

8. Volatile Solvents:

A. Aromatics

1. Benzene and homologs
2. Aniline and homologs
3. C. S. (compound closely related to aniline and highly toxic L.A.C. = 5 p.p.m.)

B. Chlorinated hydrocarbons

1. Carbon tetrachloride
2. Trichlorethylene and other degreasing agents

C. Aliphatic or petroleum

D. Alcohols, esters, ketones, aldehydes, etc.

1. M. E. K. lube plant
2. Laboratories
3. Bottle washers

9. Carbon Monoxide Hazard:

- A. Location and number of potential exposures
 - 1. Top of stills
 - 2. Knock fuel laboratory

10. General Industrial Sanitation:

- A. Water supply
 - 1. Fountains
 - 2. Valves, submerged outlets, cross connections, etc.
 - 3. Identification of drinking supply from industrial supply
 - 4. Sterilization of system following repairs
- B. Washing and toilet facilities
 - 1. Buildings
 - a. Location
 - b. Size for adequate fixtures and facilities
 - c. Materials and designs that permit sanitary cleanliness
 - d. Screening against pests, insects and rodents
 - e. Ventilation and heating
 - 2. Facilities
 - a. Toilets
 - b. Lockers
 - c. Washbasins and showers
 - d. Detergents, disinfectants, and hot water supply
- C. Waste disposal
- D. Mosquito, fly, rodent and pest control
 - 1. Poisoning and safety in its usage
 - 2. Insect repellents
 - a. Safety for continuous use
 - b. Effective lasting qualities
 - c. Effective materials
 - d. Method of application

11. Industrial Waste Disposal Methods:

- A. Atmospheric pollution and its evaluation
- B. Control measures
- C. Stream and sea pollution
 - 1. Toxic materials
 - 2. Pathogenic bacteria contamination
- D. Compilation with Public Health and Other regulatory agencies' codes

12. Correlation of Workers' Exposure with Clinical Data:

- A. Basic standards for control of hazards
 - 1. Based on clinical data
 - 2. Based on good engineering practice

13. Serve as Secretary of the Toxicity Committee:

This committee to be composed of representatives from the following departments:

Production	Industrial Relations
Medical	Sales
Research & Development	Safety

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