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# Basic Concepts in Occupational Medicine

# Aims & Objectives

## Aim:

To be able to apply the basic principles of occupational medicine to professional practice as doctors

## Objectives:

1. Know what questions to ask in order to take an appropriate and relevant occupational history
2. Identify factors or patterns in a patient's history that may indicate a work related contribution to ill health
3. Consider a work related health dilemma and reach a conclusion with reasons
4. List causative agents and related work activities for occupational diseases.
5. Specify what information is necessary to make a fully informed assessment of an individual's medical fitness for work



# OCCUPATIONAL HEALTH

- The modern definition of Occupational Health (ILO and WHO) is:



*“The promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations – total health of all at work”*

# Occupational Health/Therapy

## Occupational Medicine/Health

a branch of medicine  
concerned with the  
interaction between  
health and *work*  
(“*occupation*”)

## Occupational Therapy

assessment & treatment  
to enable maximum  
independent function  
in daily living, using  
*purposeful activity*  
(“*occupation*”)

# Presentation of Occupational Disease

- Pathology
- Timing of symptoms
- Possible causes
- Elicit relevant history

# Taking An Occupational History

Needs to be comprehensive and specific.

## Time

### Include the following

- From school until present
- Have there been any periods of military service?
- Jobs held from school until present
- (Recent) changes in production processes
- Describe a typical working day/week

## Space

- Exact name and address of the workplace
- The layout of the workplace (make a diagram)

# The Occupational History

- What is your job? What do you do for a living?
- What do you do at work? What do you work with? What is a typical working day?
- How long? What else?
- Any known hazards? Anyone else with similar symptoms?
- Hobbies? (DIY, pets, gardening, chemicals)

# Investigation of a case of suspected Occupational Disease

## History

- Symptoms
- Associated symptoms
- Duration
- Work history
- Is patient aware of exposure to any respiratory sensitisers at work?
- Timing of symptoms (immediate /delayed)
- Improvement away from work
- Adult onset
- Smoking history
- History of atopy



# Outline

- Review history of occupational disease over time
  - Prevention
  - Diagnosis and management
  - Compensation
- Reflection

# Definitions – ILO 1993

- Occupational diseases
  - Having a specific or a strong relation to occupation generally with only one causal agent and recognized as such
- Work-related diseases
  - With multiple causal agents, where factors in the work environment may play a role, together with other risk factors, in the development of such diseases, which have a complex etiology
- Diseases affecting working populations
  - Without causal relationship with work but which may be aggravated by occupational hazards to health

# ILO List of Occupational Diseases

- Diseases caused by agents
  - Chemical, physical, biological
    - e.g. Beryllium
- Diseases by target organ system
  - Respiratory, skin, musculoskeletal
    - e.g. Pneumoconioses
- Occupational cancer
  - Cancer caused by the following agents
    - e.g. Asbestos

# Ancient times

- Egypt, Greece and Rome
  - Mining one of the oldest industries
  - miners – slaves, criminals
  - work = punishment
  - manual trades – inferior
  - miners used bags, sacks, animal bladders as masks to decrease dust exposure

# Middle Ages

- Central Europe – mining a feudal enterprise
  - Serf labour – unskilled
- Growth of trade - increased need for money and capital – mines of Central Europe
  - Need for skilled labour
  - Mines deeper, conditions worsened

# 16<sup>th</sup> & 17<sup>th</sup> centuries

- Mining, metal work and other trades flourished
- Some improvement in ventilation
- Shift from feudalism to capitalism
- Guilds – artisans – sickness benefits, funeral benefits

# 16<sup>th</sup> & 17<sup>th</sup> centuries

- Awareness of health hazards
  - Agricola
    - Town physician in Bohemia
    - 1556 – De Re Metallica – hazards of metal mining
  - Paracelsus
    - Town physician in Austria
    - 1567 – occ diseases of mine & smelter workers
  - 1572 – lead
  - 1575 – carbon monoxide
  - 1630 - arsenic

## 18<sup>th</sup> century

- Bernardino Ramazzini
  - Physician, professor of medicine in Modena and Padua
  - “Diseases of Workers” – 1700
    - Systematic study of trade diseases
  - Father of Occupational Medicine
  - “what is your occupation?”





**Bernardino Ramazzini *De Morbis Artificum Diatriba***

**Diseases of Workers. The Latin text of 1713 revised with translation and notes by Wilmer Cave Wright. Chicago: The University of Chicago Press, 1940 - New York: The Classics Medicine Library, Division of Gryphon Editions, 1983**

**Bernardino Ramazzini (1633-1714)**

***De Morbis Artificum Diatriba***

First book on occupational diseases – 1700 in Italy



## **Bernardino Ramazzini**

**The Father  
of Occupational Medicine**

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# 19<sup>th</sup> century

- Statutory medical service for factory workers
  - Factory Inspectors
  - Medical certification for children
  - Certifying Surgeons
  - Workers with exposure to lead, white phosphorus, explosives, rubber – periodic exams
  - Notification of industrial disease – lead, phosphorus, arsenic, anthrax
  - 1898 – Thomas Legge – Medical Inspector of Factories

# 20<sup>th</sup> century

- Workers' compensation
  - Quickly moved from wage loss to clinical ratings, “meat chart”
  - Many enquiries
  - Continual modifications, additional benefits & coverage
  - Occupational disease
    - 1913 – industrial disease – 6 listed in Schedule 3
    - 1926 – silicosis, pneumoconiosis
    - 1932 – cancer
    - 1944 – exposure length removed
    - WCB could add to Schedule 3

## Mid 20<sup>th</sup> century

- Occupational Health and Safety legislation
- EU directive
  - General duty
  - Evaluation of risk
  - Program of prevention
  - Establishment of preventive services
  - Worker rights
    - Knowledge
    - Participation
    - Refuse unsafe work and freedom from reprisals

## RSF Schilling

- Wide variation in occupational health standards & practice
  - Humanity of a society
  - Wealth of society
  - Social status of worker
  - Political organization of workers and their representation in government
  - Pioneers advocating improvements by revealing facts about loss of life and sickness caused by workplace
  - Improvements in the future will depend on medical and technological skills being



# OCCUPATIONAL HAZARD:

``Source or situation with a potential for harm in terms of injury or ill health, damage to property, damage to the workplace environment, or a combination of these``

# Safety and Health Legislations :

## THE FACTORIES ACT, 1948



11 Chapters

120 Sections

3 Schedules

Chapter- III - Covers Health

Chapter- IV - Covers Safety

Chapter- Iva - Provision-related-to  
Hazardous Processes

Chapter- V - Welfare

Chapter- VI - Working hrs-adults

Chapter- IX - Special provisions  
- Dangerous operations  
- Notifications







# Safety and Health Legislations : **THE FACTORIES ACT, 1948**

## **SCHEDULES**

**First schedule-** List of Factories  
Hazardous processes (29)



**Second schedule-** Permissible levels of  
certain chemical substances in work  
environment.

**Third schedule-** List of notifiable diseases.  
(29 categories)



# **OCCUPATIONAL HEALTH HAZARDS**

## **TYPES OF OCCUPATIONAL HEALTH HAZARDS**

- A. Physical**
- B. Chemical**
- C. Biological**
- D. Mechanical**
- E. Psychosocial**



# PHYSICAL HAZARDS

- ★ *Temperature - Heat / Cold*
- ★ *Illumination*
- ★ *Noise*
- ★ *Vibration*
- ★ *Radiation*
- ★ *Atmospheric pressure*

# DISEASES DUE TO PHYSICAL AGENTS

**Heat** - Heat hyperpyrexia, Heat Exhaustion  
Heat Syncope, Heat Cramps, burns,  
Prickly heat

**Cold** - Frost bite,

**Light** – Occupational Cataract,

**Atmospheric-pressure**-Caisson disease, air  
embolism, explosion.

**Noise** - Occupational deafness,

**Radiation** -Cancer,Leukemia,aplastic  
anemia, Pancytopenia

**Electricity** - Burns, Shocks,



# Human Heat Balance Equation

$$M+R+-C+-CV-E=+-S$$

Basic equation can be used for any adjustment in relation to existing Environmental condition to keep body in thermo neutral in that particular environment

**HEAT=** Evaporative cooling will be more

**COLD=** Process of conserving heat from conductive, radiative & convective heat will be more so that the body will remain in thermo-neutral e.g. it will neither gain or loss heat irrespective of environment heat or cold change.



# Heat Illness

- Predisposing Factors
  - Physical activity
  - Extremes of age, poor physical condition, fatigue
  - Excessive clothing
  - Dehydration
  - Cardiovascular disease
  - Skin disorders
  - Obesity
  - Drugs
    - Phenothiazines, anticholinergics, B and Ca channel blockers, diuretics, amphetamines, LSD, cocaine, MAOIs



# Heat Stroke

## SYMPTOMS

- True emergency
- Altered LOC
- Any neurological finding
- **And** elevated temperature
- May still be sweating initially
- Syncope
- History is critical

## PREVENTION

- ★ Awareness
- ★ Adaptation of behavioral and physical activity
  - Clothing
  - Activity
- Appropriate hydration
- ★ Education



# Frost Bite

## SYMPTOMS

Caused by freezing conditions which cut off circulation, usually in extremities (hands, feet, ears, nose), which may be permanently affected. Frost-bitten areas are cold, pale or marbled-looking, solid to the touch, and painless (until circulation is restored).

## TREATMENT

Giving warm drinks, and covering with blankets. Warm the injured part with body heat only-put a hand under an armpit, for example. Do not rub the skin or apply direct heat to the injured area.



# CHEMICAL HAZARDS



- Routes of entry - Inhalation, Ingestion, skin absorption. (inhalation is the main route of entry)
- Chemical agents can be **classified** into-
  - 1) **Metals** - Lead, TEL, As, Hg, Cd, Ni , Co etc.
  - 2) **Aromatic Hydrocarbons** - Benzene, Toluene, phenol etc.
  - 3) **Aliphatic Hydrocarbons** - Methyl alcohol
  - 4) **Gases** -
    - \* **Simple asphyxiants** :  $\text{N}_2$ ,  $\text{CH}_4$ ,  $\text{CO}_2$
    - \* **Chemical asphyxiants** :  $\text{CO}$ ,  $\text{H}_2\text{S}$ ,  $\text{HCN}$
    - \* **Irritant gases** : Ammonia,  $\text{SO}_2$ ,  $\text{Cl}_2$ ,
    - \* **Systemic poison** :  $\text{CS}_2$



# DUSTS (Pneumoconiosis)

## Inorganic Dust

- Coal Dust - Anthracosis
- .. Silica - Silicosis
- .. Asbestos - Asbestosis

## Organic Dusts

- .. Cane Fiber - Bagassosis (Bronchi gets affected)
- Cotton dust - Byssinosis (In Textile industries)
- .. Tobacco - Tobaccosis, Lung Cancer
- .. Grain Dust - Farmer's Lungs

# *Biological Hazards*



**Bacteria**-Tetanus, Tuberculosis, Anthrax, Brucellosis (Milkmen), Gonorrhea (Sex-workers-Genital organs get affected).

**Virus** - Hepatitis, AIDS

**Protozoal & Parasitic**-Malaria, Hydatid (Dog handlers), Hookworms, tapeworms (Agri-workers), etc.

**Fungi-(Agri-workers)**-Tinea-infections, Coccidiomycosis, Psittacosis, ornithosis, etc.



# MECHANICAL HAZARDS

## Injuries-

Falls, cuts, abrasions, concussions, contusions, etc.

## Ergonomic Disorders-

Musculo-skeletal disorders (MSDs), Cumulative-trauma-Disorders (CTDs) etc.

## Ergonomics: ``Adjustment of Man & Machine``/

Application of human biological sciences with engineering science to achieve optimum mutual adjustment of man & his work, the benefit being measured in terms of human efficiency and well being

Tool / machine design to fit to work. Ergo tools/ ergofriendly tools : Tools which reduce the stresses or problems resulting in CTD's / MSD's.)

# Principles of Control of Workplace Hazards

- Identify
- Evaluate
- Control
  - Eliminate
  - Substitute
  - Enclose/separate
  - PPE/vaccinate



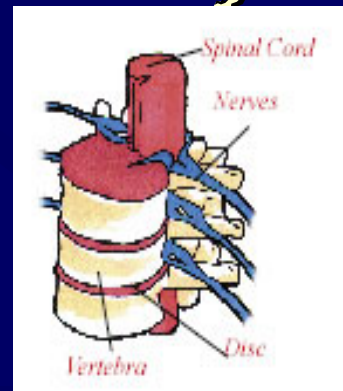
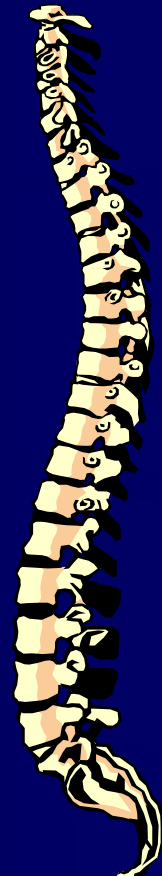
# Manual Handling - Back Injuries

All forces which come down the spine compresses discs and as a result of Continuous squeezing they can rupture and bulge causing severe pain.

Most back injuries are built over along period of time by repetitive pounding on discs caused by improper methods. After sometime some minor lift can produce such rupture

``Straight back rule``

‘Thinking before lifting’





# Manual Handling - Back Injuries

- \*CONTROL any risk by **reducing necessity for manual handling** by using alternative means of handling
- \*consider the load; size, awkward shape, etc
- \*consider need for mechanical or manual assistance
- \*position legs apart - one foot level with the load
- \*keep back straight, look up





# Manual Handling - Back Injuries

- \*bend from the hips, avoid 'twisting' the body
- \*tighten the stomach muscles, but don't hold breath
- \***BEND THE KNEES**
- \*keep the load close to the body
- \*lift with the legs, not the back
- \*keep carrying distance short
- \*avoid changing grip or 'jerking' the load
- \*deposit the load by bending the knees and keeping the back straight







# VDT USER'S-ERGONOMIC GUIDELINES

## SEATING POSITION

- \*Seat height to be adjusted so that thighs are horizontal & feet are resting flat on the floor
- \*Thigh-torso angle is not less than 90 degrees, with 100 degrees as preferable
- \*Chair should have ``Backrest`` with support for curvature in lumbar area



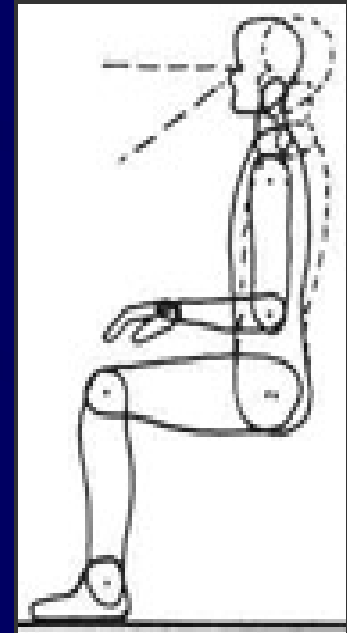
**Natural S-curve of the spine**



# VDT USER'S-ERGONOMIC GUIDELINES

## WORKING POSTURE

- \*Wrist and forearm-held in straight line to reduce tendon & nerve stress
- \*Upper & lower arm-at 90 degree angle
- \*Elbows to be kept close to the sides
- \*Head-Screen distance=25-48 inches(min 12 ``) from the VDT users eye
- \*Optimal viewing angle is 20 degrees below the horizontal line from the eyes





# *VDT USER'S-ERGONOMIC GUIDELINES*

## VISION & LIGHTING

- \*NO GLAIR

- \*VDT to be placed 90 degrees to the light source, adjust screen angle

- \*Use screen filters to reduce glare

- \*Screen intensity needs to be adjusted

- \*Frequent breaks from the screen to reduce stress on eyes

- \*Optical illusion



# VDT USER'S-ERGONOMIC GUIDELINES

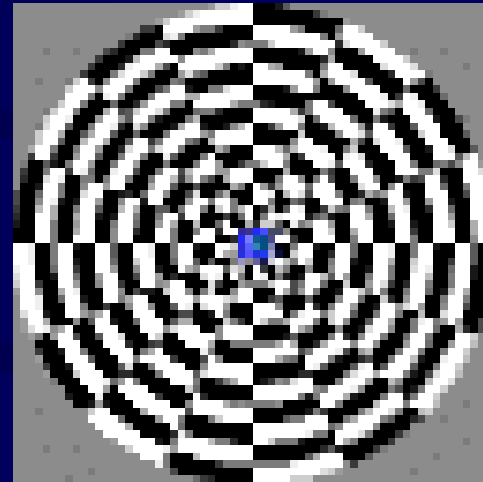
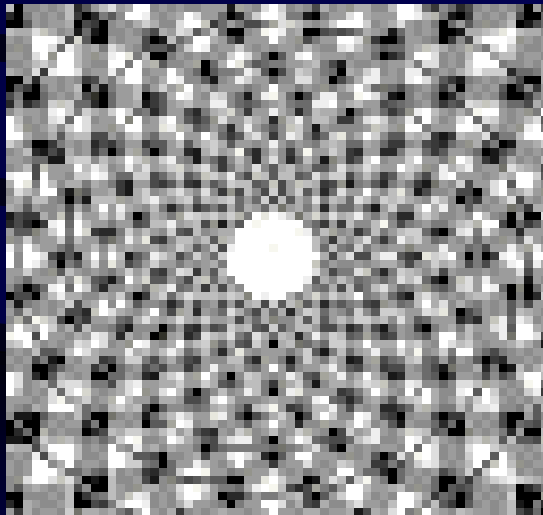
## GENERAL GUIDELINES

- \*Change positions, Stretch or walk around if feeling tiredness
- \*`LIGHT TOUCH` on Keyboard to reduce hand stress or developing CTD`s
- \*Look at `Optical Illusion` for 1-2 minutes after every 20 minutes of work with vdt to reduce eye stress
- \*Rotate eye ball and also concentrate on a distant object & near object alternatively to reduce eye stress
- \*Keep the vdt screen and eyeglasses clean



# *VDT USER'S-ERGONOMIC GUIDELINES*

## OPTICAL ILLUSIONS





# PSYCHOSOCIAL HAZARDS

- ⑩ ❖ Lack of job satisfaction, insecurity, poor interpersonal relations, work pressure, ambiguity, etc.
- ⑩ ❖ Psychological & behavioral changes – hostility, aggressiveness, anxiety, depression, alcoholism, drug addiction, sickness absenteeism.
- ⑩ ❖ Psychosomatic disorders- Hypertension, headache, body-ache, peptic ulcers, asthma, diabetes, heart disorders, etc.



# TYPE OF CONTROL MEASURES

**Medical** (required to monitor effectiveness of Engg. Controls)

**Engineering** (Best Engg. Control is to reduce exposure)

**Administrative / Legal.** (Emphasis given to reduce the exposure)



# ENGINEERING CONTROLS

- A Designing-building, Work station.
- B Good Housekeeping.
- C Ventilation
- D Mechanization
- E Substitution.
- F Enclosure
- G Isolation
- H Local Exhaust Ventilation.
- I Personal Protective Devices.
- J Work Environment Monitoring
- K Statistical Monitoring.





# *Thank You!*



# Carbon-Dioxide



- Has no odor.
- Heavier than air.
- TLV exposure limit is 5,000 ppm.
- IDLH 50,000 ppm
- Can cause death by asphyxiation

# Ammonia



- Odor detection limit 1-5 ppm
- Irritating 50 ppm (eyes), 100 ppm (respiratory tract)
- TLV 25 ppm
- IDLH 500 ppm
- Lethal 10,000 ppm
- Irritant in nature