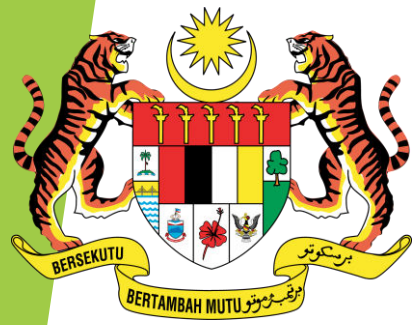


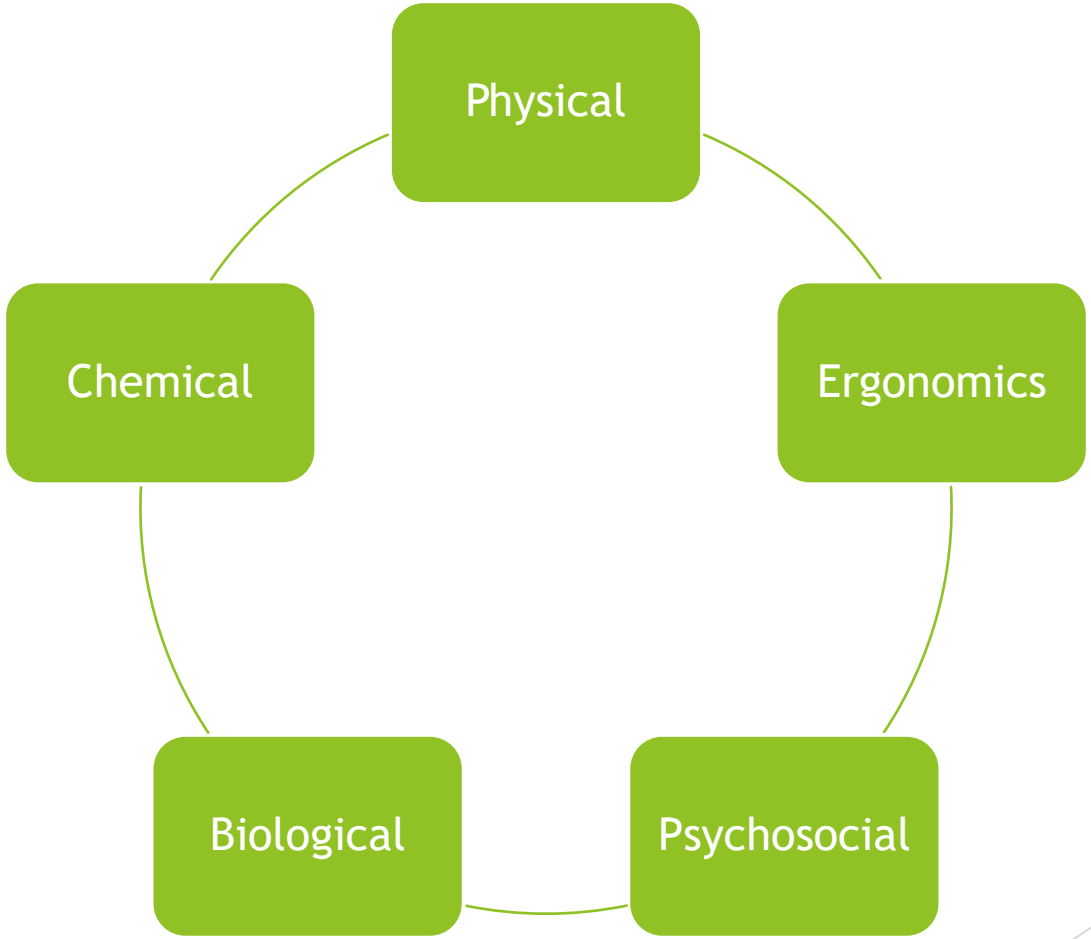
Jabatan Kesihatan Negeri Johor
Bahagian Kesihatan Awam

HAZARD CLASSIFICATION

Hazard

- Source or situation with potential for harm in term of:
  i. Human injury
  ii. Ill health
  iii. Damage to property
  iv. Damage to workplace environment Or
  v. Combination of these

Hazard Classification



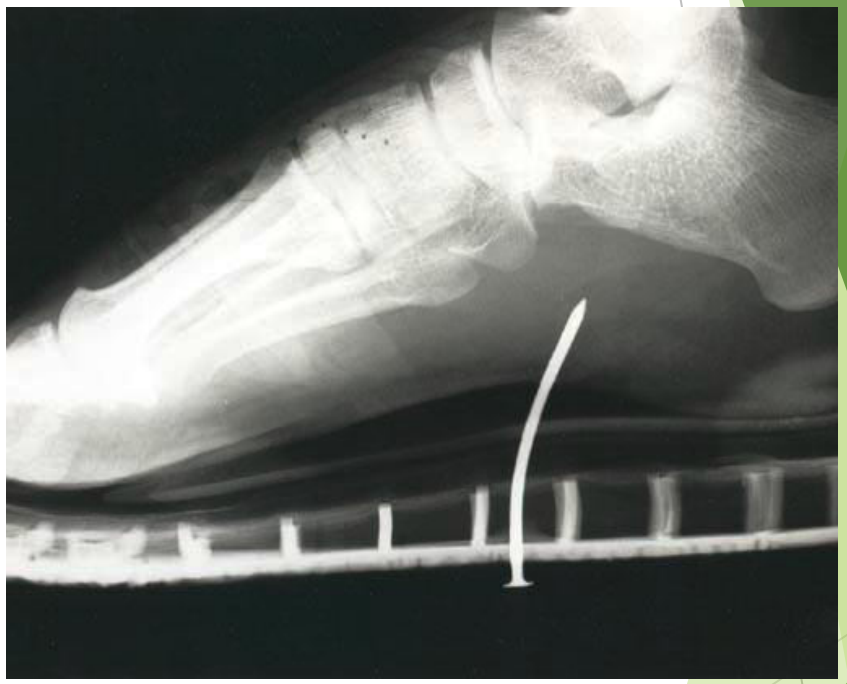
PHYSICAL HAZARD

Introduction

- Physical hazards are things or agents that may come into contact with the body with potential for harm
- Many physical hazards are things that can be seen
- Physical hazards ≈ ‘physical agents’

Protruding Objects

Effects of Protruding Objects



Slip & Trip / Slippery Surfaces Hazard

Effect of Slip & Trip / Slippery Surfaces Hazard

Physical Hazard

- Temperature/heat characteristics
  - External Factors
  - Internal Factors
- Heat Stress
  - Heat stroke
  - Heat exhaustion
  - Heat cramps
  - Heat rash

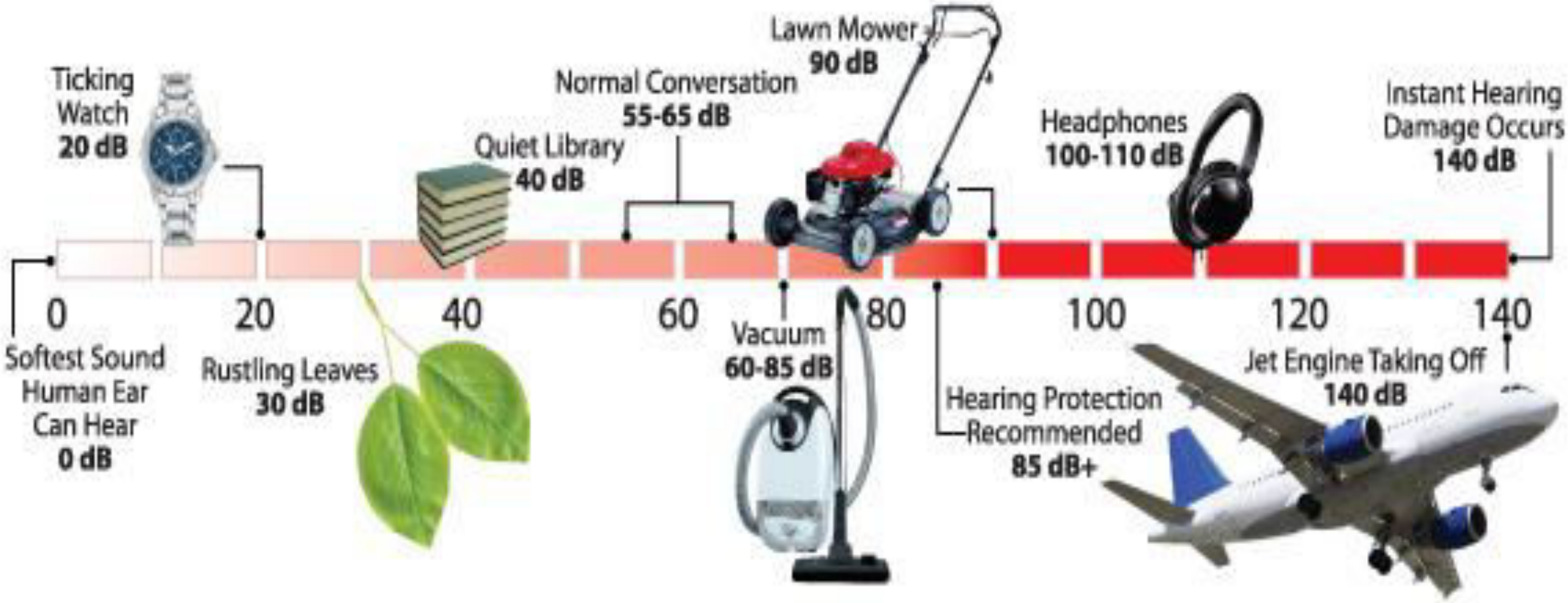
Physical Hazard

- Cold hazards
  - Generalized injuries
  - Localized injuries
- Pressure
  - Low pressure environment
  - High pressure environment

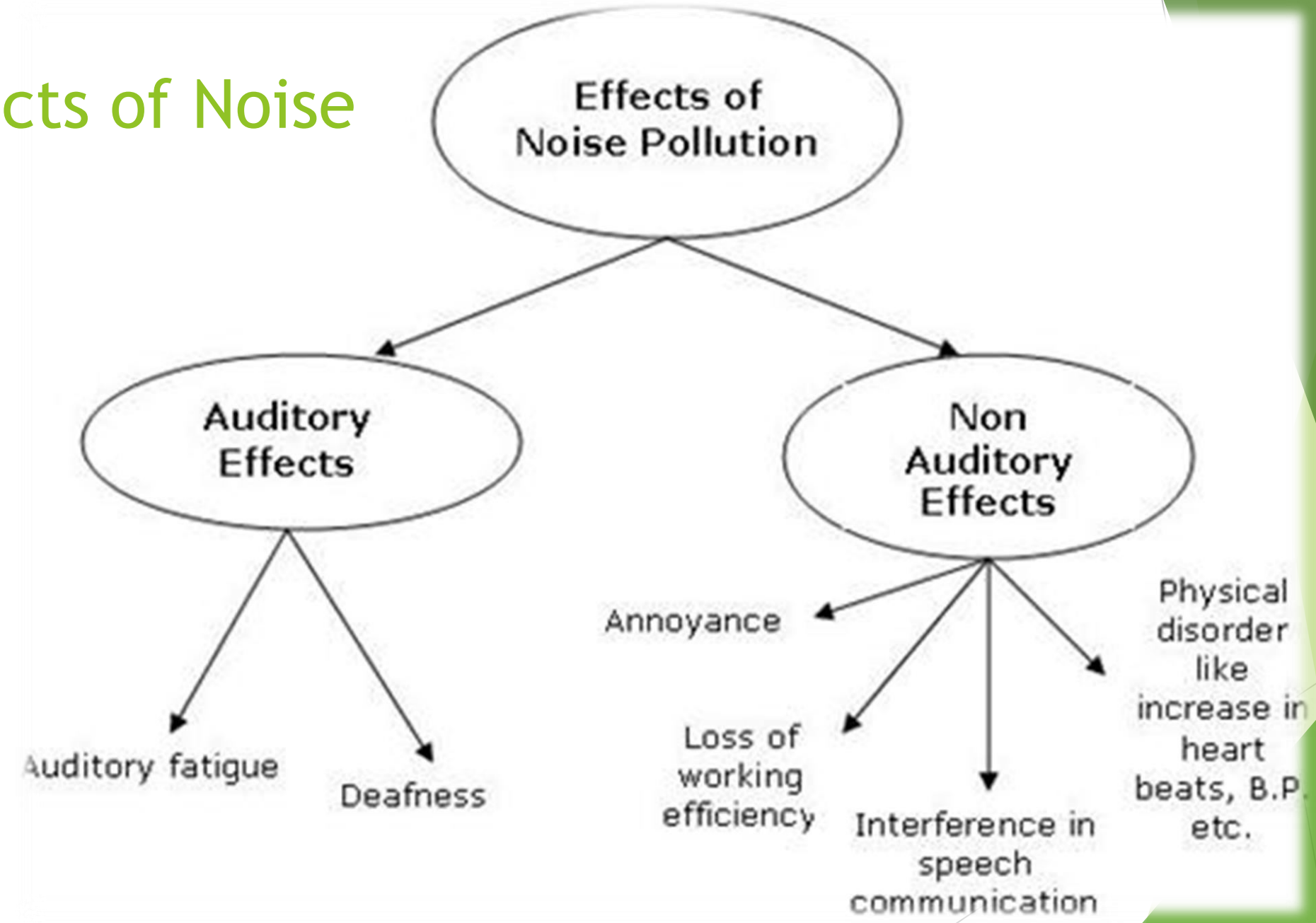
Noise

- Noise is an unwanted sound and its intensity is measured in decibels (dB)
- Factories And Machinery Act 1967 [Act 139] --- Factories And Machinery (Noise Exposure) Regulations 1989

Examples of Noise Level



Effects of Noise



Noise Health Effects

Tinnitus (ringing, whistling, buzzing or humming in the ears

Noise Induced Hearing Loss (NIHL)

Ventilation

- The replacement of noxious air with fresh air
- The mechanical system or equipment used to circulate air to replace noxious air with fresh air
- Ventilation may be deficient in some workplaces or activities
- A poorly ventilated place may become dangerous situation to the workers

Hazard of Poor Ventilation

- Elevated levels of carbon dioxide and low levels of oxygen
- Build up of chemical and biological contaminants
- Extremes in temperature
- Creating low humidity or high humidity contributing to bacterial and mould growth
- Excessive and irritating workplace odors
- Accumulation of dust and dirt

Effects of Poor Ventilation

- Poor indoor air quality
- Fatique, discomfort and distraction
- Dry throat, dry skin and static electricity build up
- Bacterial and mould growth
- Fire and/or explosion
- Sick Building Syndrome (SBS)

Vibration

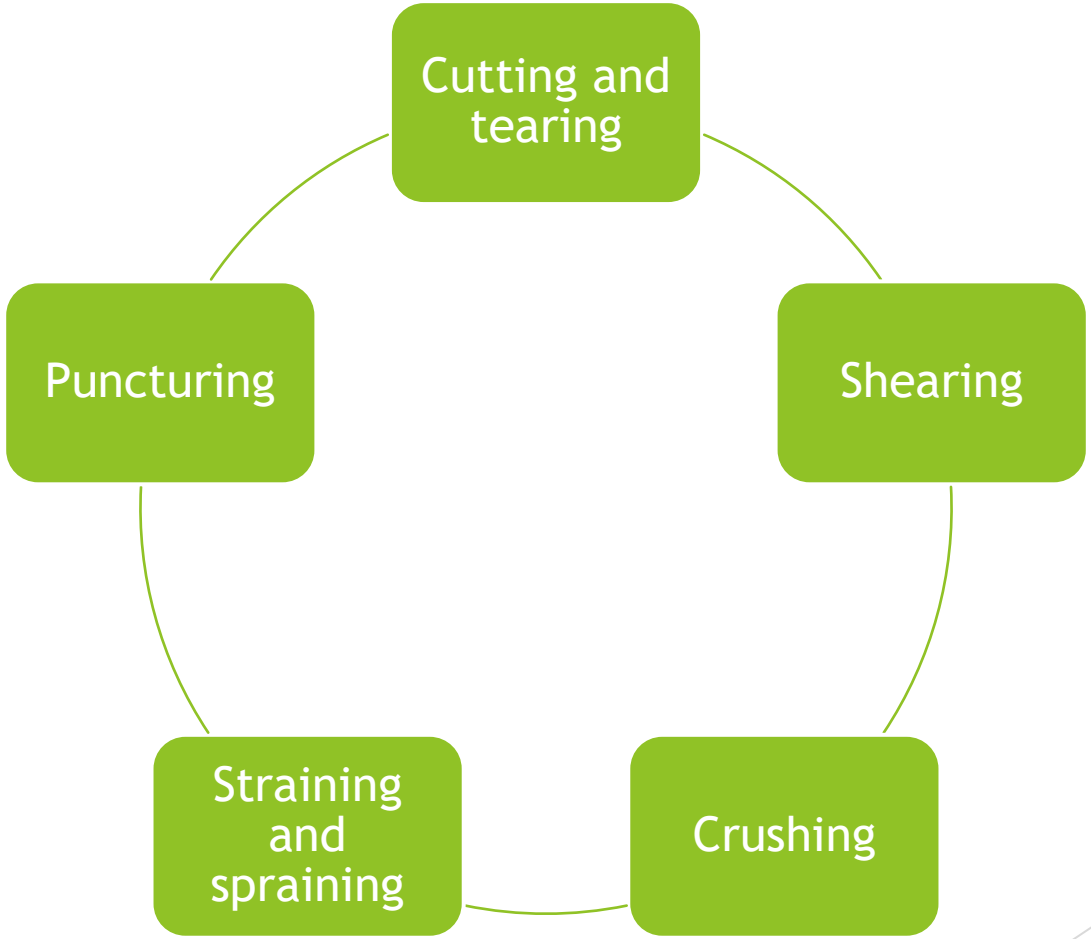
- There are two classifications for vibration exposure:
  - whole-body vibration
  - Hand-arm vibration
- These two types of vibration have different sources, affect different areas of the body and produce different symtoms

- HAV can affect worker who use power tools and cutting equipment
- WBV can affect workers driving or operating heavy plant and vehicle
- Human response to vibration depends on several factors

Mechanical Hazard

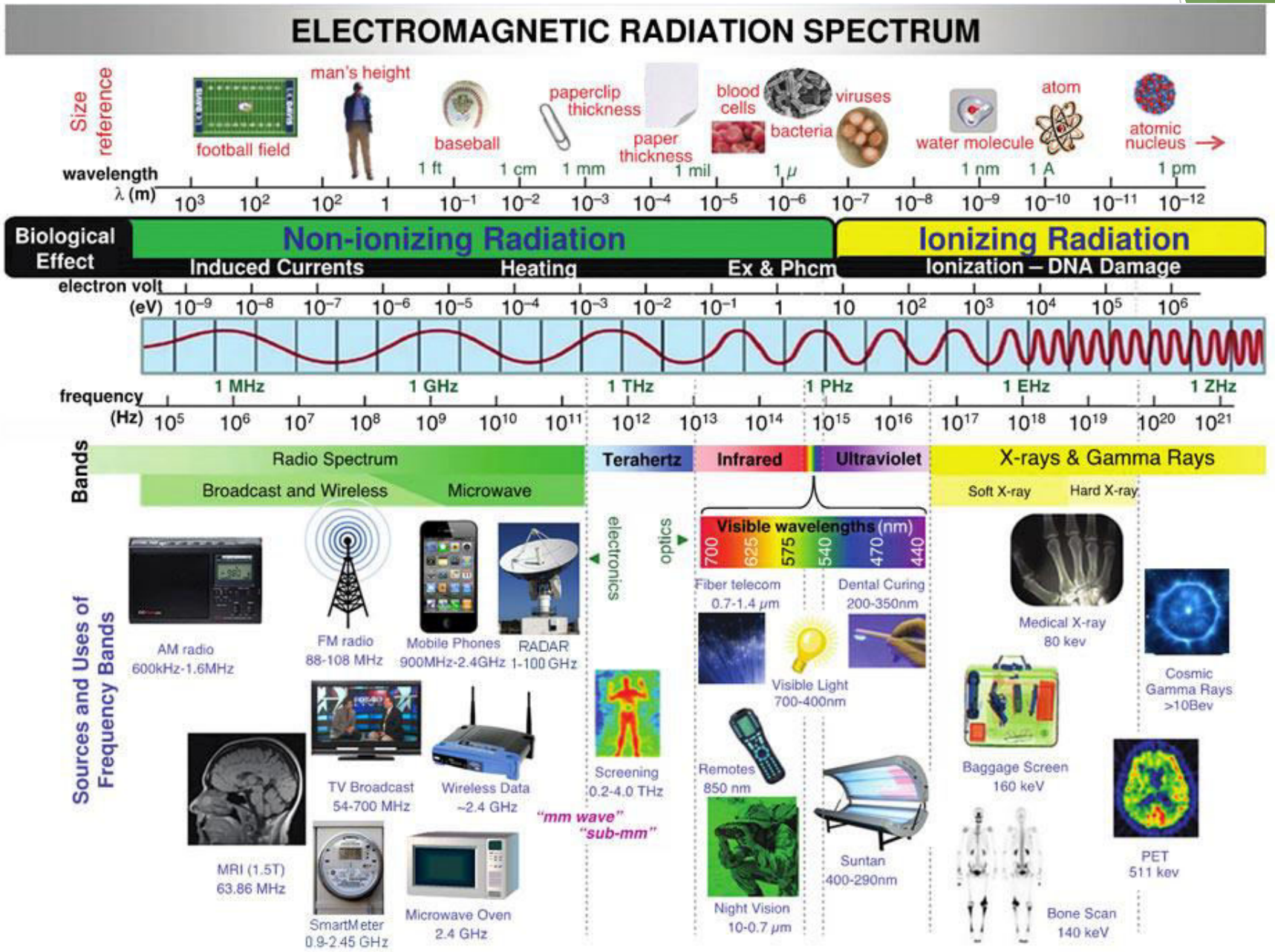
- Mechanical hazards are created by the powers operation of apparatus or tools
- Tools or apparatus have three locations where mechanical hazards can exist:
  - The point of operation
  - The point of power transmission
  - The area of moving parts

Common Mechanical Hazard



Radiation

- Radiation is energy transmitted through space in the form of electromagnetic waves or energetic particles
- Two types of radiation:
  - Ionizing - Non Ionizing


ELECTROMAGNETIC RADIATION SPECTRUM
Size reference
man's height
football field
baseball
paperclip thickness
paper thickness
blood cells
bacteria
viruses
water molecule
atom
atomic nucleus
wavelength λ (m)
1 ft
1 cm
1 mm
1 mil
1 μ
1 nm
1 A
1 pm
Biological Effect
Non-ionizing Radiation
Induced Currents
Heating
Ex & Phcm
Ionizing Radiation
Ionization – DNA Damage
electron volt (eV)
frequency (Hz)
1 MHz
1 GHz
1 THz
1 PHz
1 EHz
1 ZHz
Bands
Radio Spectrum
Broadcast and Wireless
Microwave
Terahertz
Infrared
Ultraviolet
X-rays & Gamma Rays
Soft X-ray
Hard X-ray
Visible wavelengths (nm)
700
625
575
540
470
440
electronics
optics
Sources and Uses of Frequency Bands
AM radio
600kHz-1.6MHz
FM radio
88-108 MHz
Mobile Phones
900MHz-2.4GHz
RADAR
1-100 GHz
Fiber telecom
0.7-1.4 μm
Dental Curing
200-350nm
Medical X-ray
80 kev
Cosmic Gamma Rays
>10Bev
Visible Light
700-400nm
Screening
0.2-4.0 THz
TV Broadcast
54-700 MHz
Wireless Data
~2.4 GHz
"mm wave"
"sub-mm"
Remotes
850 nm
Baggage Screen
160 keV
MRI (1.5T)
63.86 MHz
SmartMeter
0.9-2.45 GHz
Microwave Oven
2.4 GHz
Night Vision
10-0.7 μm
Suntan
400-290nm
PET
511 kev
Bone Scan
140 keV

Radiation Cause Ionizations of:

ATOMS

Which may affect

MOLECULES

Which may affect

CELLS

Which may affect

TISSUES

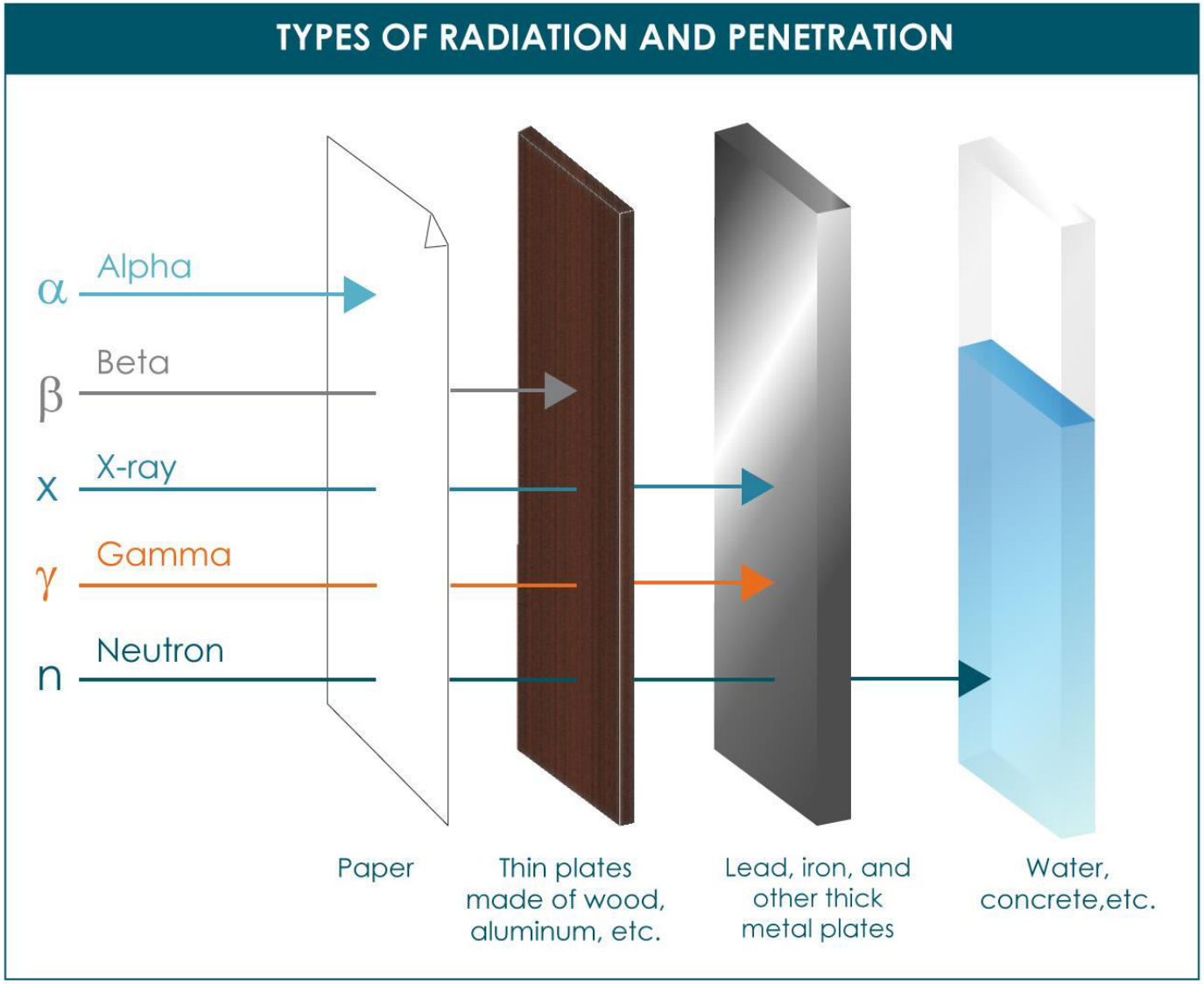
Which may affect

ORGAN

Which may affect

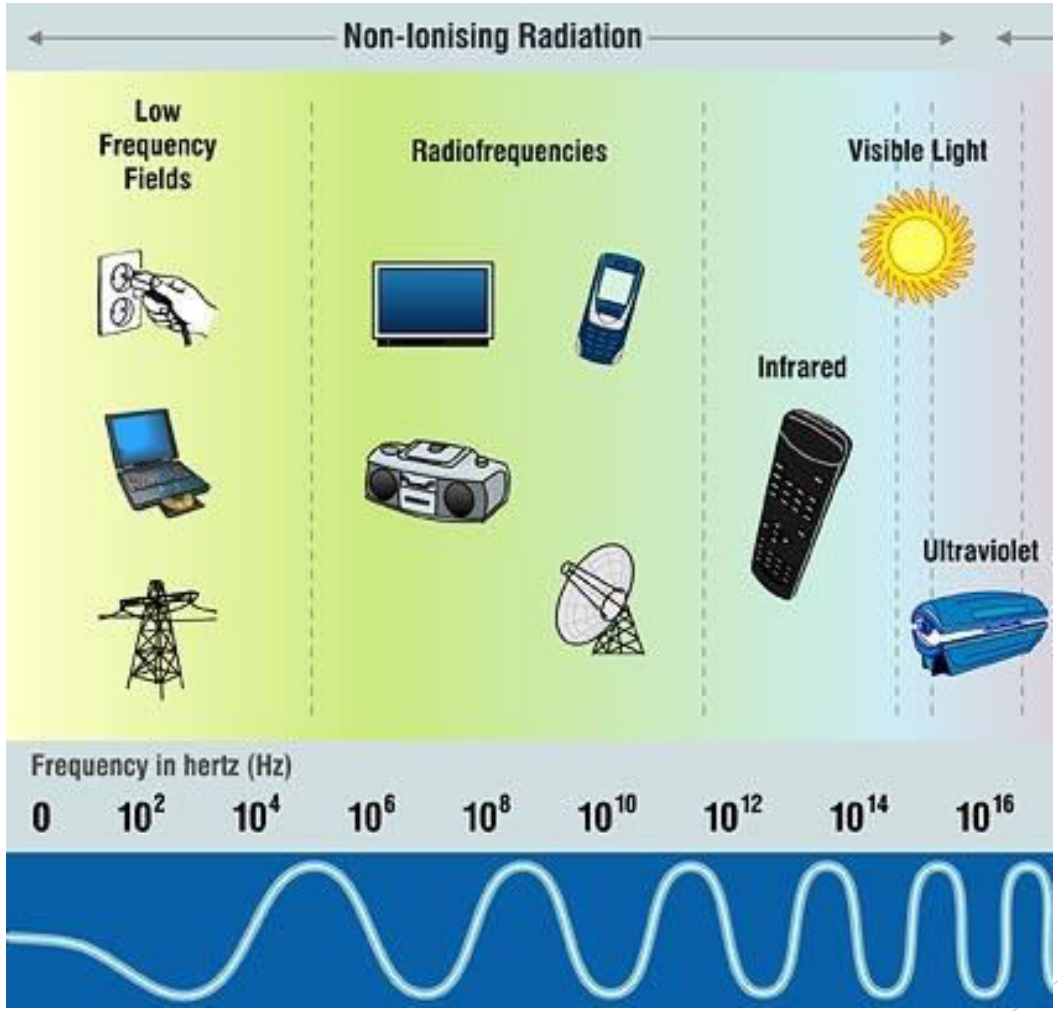
THE WHOLE BODY

Examples of Ionizing Radiation



Jabatan Kesihatan Negeri Johor, Bahagian Kesihatan Awam

Examples of Non-Ionizing Radiation



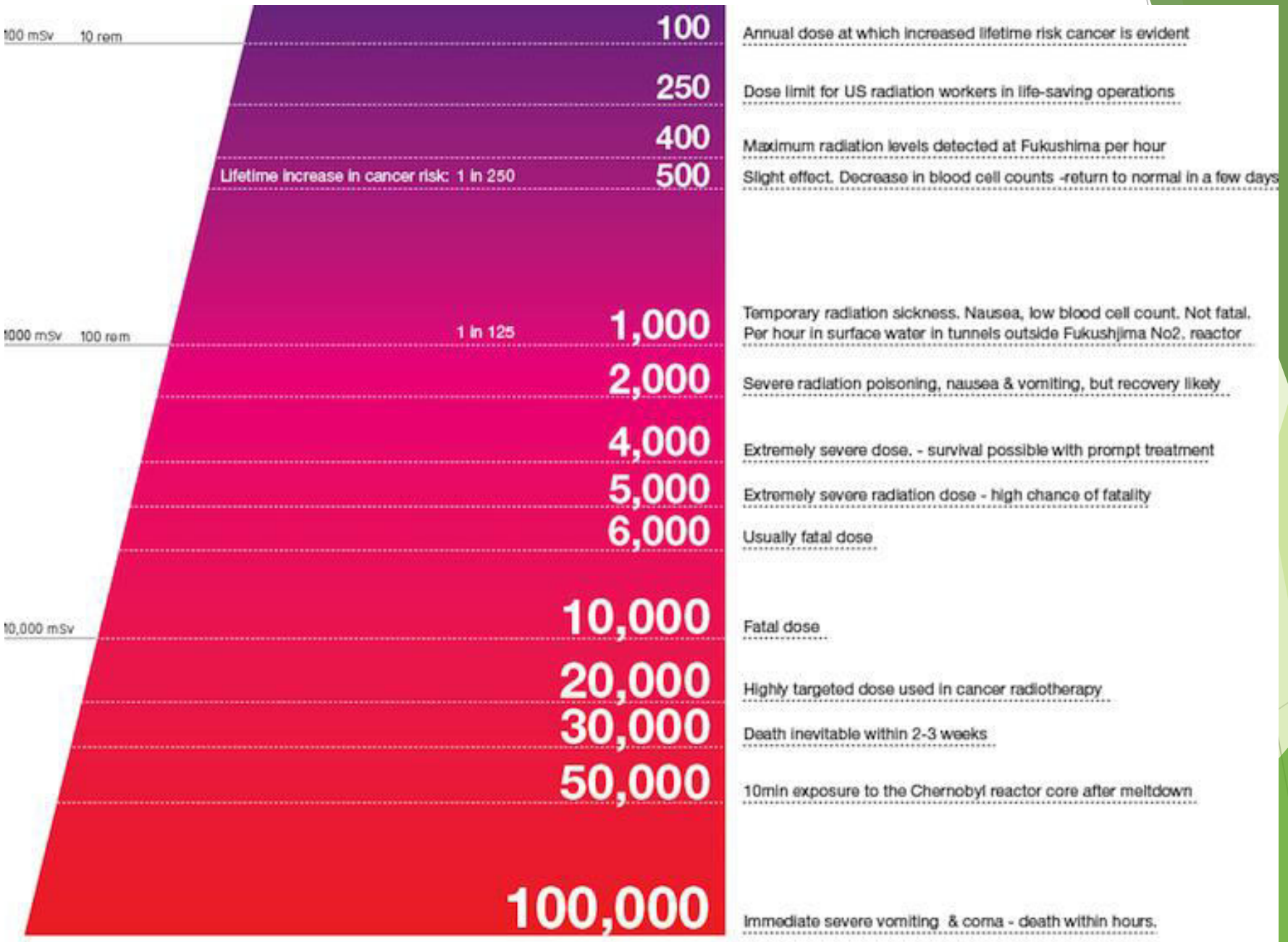


Image courtesy of InformationIsBeautiful.net

ADL for Occupational Exposure

Application	ADL (mSv)
Annual dose limit for the whole body exposure of worker	20
Female pregnant worker	< 1
Partial Body exposure i) Limit for the effective dose-equivalent ii) Limit on average dose in each organ or tissue iii) Limit for lens of the eyes iv) Limit on equivalent dose for the hand and feet	 50 500 150 500

Effects of exposure to Low Dose of Radiation

- Somatic
  - The effect is primarily suffered by the individual exposed
- In utero
  - A genetic consequent of radiation exposure, because the effect suffered by the developing embryo/fetus, is seen after birth

NORM and TENORM

- NORM: Naturally Occurring Radioactive Material
- TENORM: Technologically-Enhanced Naturally Occurring Radioactive Material

NORM and TENORM

- NORM is everywhere and we are exposed to it everyday.
- NORM is found in:
  - Our bodies
  - The food we eat
  - The places where we live and work
  - The ground we live on, and
  - In products we use

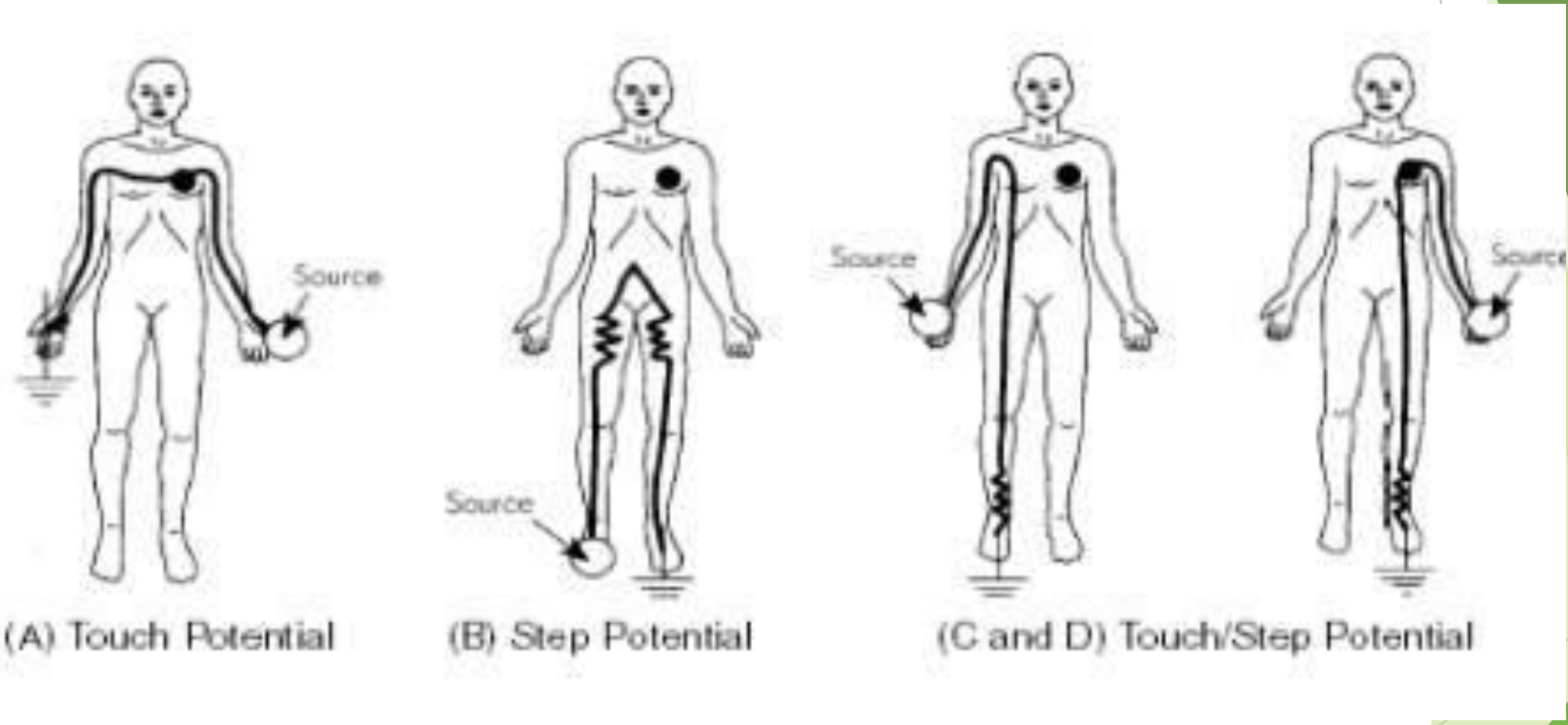
NORM and TENORM

- TENORM is found in many waste streams; for examples scrap metal, sludge, slags, fluids and is being discovered in industries traditionally not thought of as affected by radionuclide contamination

Electrical Hazard

- Electricity can be defined as the flow of electrons through a conductor
- Electrical hazards have always been recognized, yet serious injuries, deaths and property damage occur daily
- Type of electrical faults
  - Overloads
  - Short circuits

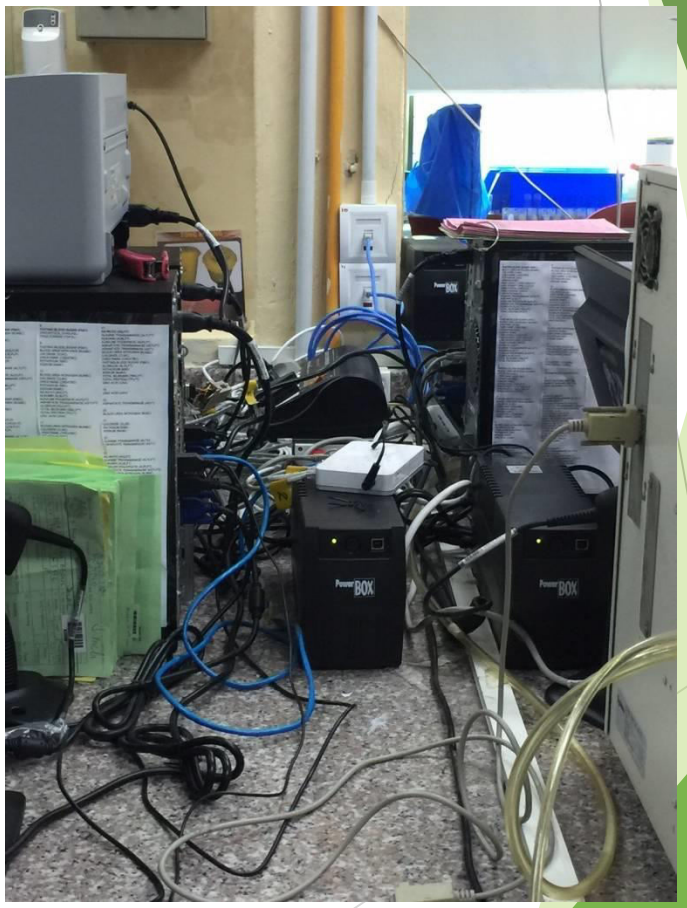
The Path of Current Through The Body



The Electrical Current Condition And Its Effect

Condition	Effects
1 – 3 mA of current	Mild sensation
10 mA of current	Muscles contract, releasing grip may be difficult
30 mA of current	Breathing difficulty, possible loss of consciousness
30 – 75 mA of current	Respiratory paralysis
100 – 200 mA of current	Ventricular fibrillation
50 – 300 mA of current	Shock (potentially fatal)
Over 1500 mA of current	Tissue and organ burn
150°F	Cell destruction
200°F	Skin experiences third degree burns

Exposed To Electrical Energy



Effects Of Exposed To Electrical Energy

Occupations Exposed To Physical Hazards

- Noise …?
- Vibration …?
- Exposure to extreme heat …?
- Radiation …?
- Slippery surface …?
- Poor ventilation …?

CHEMICAL HAZARD

Jabatan Kesihatan Negeri Johor, Bahagian Kesihatan Awam

Chemical Hazard

- What is chemicals?
- Chemicals hazardous to health?
- Potential harm is based on the duration of exposure, the quantum of exposure, individual susceptibility and route of exposure

Chemical Hazard Characteristics

Physicochemical Properties	Health Effect
Explosive	Very toxic
Oxidizing	Toxic
Extremely flammable	Harmful
Highly Flammable	Corrosive
Flammable	Irritant

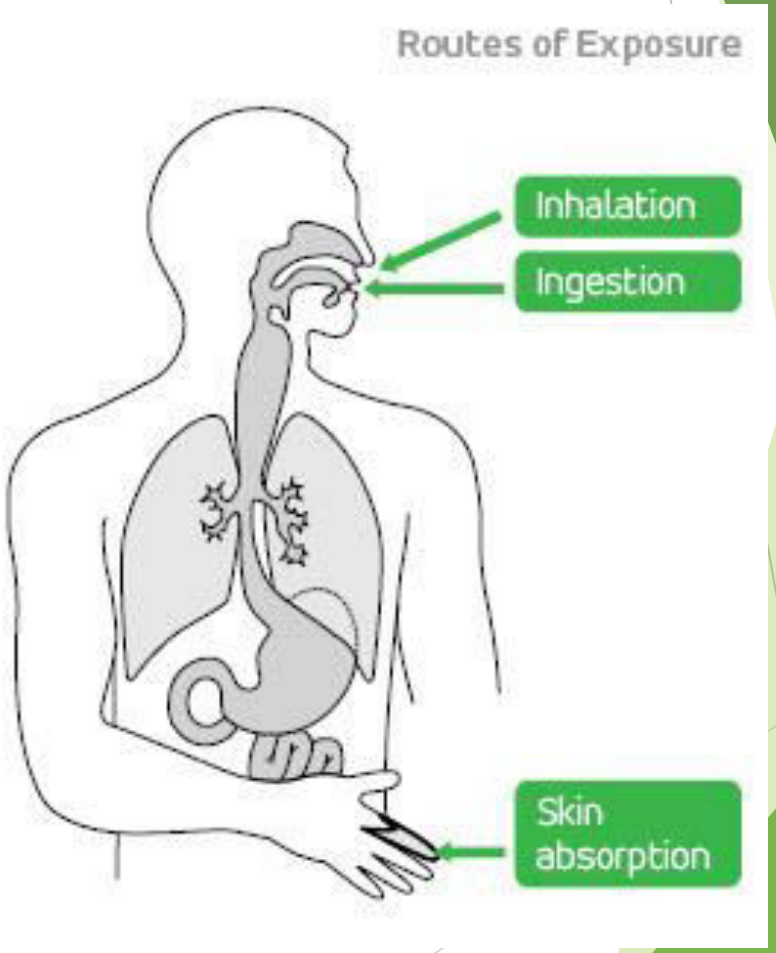
Hazard Pictogram

Health Hazard	Flame	Exclamation Mark
		
• Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	• Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	• Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non Mandatory)
Gas Cylinder	**Corrosion**	**Exploding Bomb**
		
• Gases under Pressure	• Skin Corrosion/ burns • Eye Damage • Corrosive to Metals	• Explosives • Self-Reactives • Organic Peroxides
Flame over Circle	**Environment *(Non Mandatory)**	**Skull and Crossbones**
		
• Oxidizers	• Aquatic Toxicity	• Acute Toxicity (fatal or toxic)

Source: Industry Code of Practice on Chemicals Classification and Hazard Communication (ICoP) 2014

Route Of Entry & Chemical Effects

- Acute Health Effects
- Chronic Health Effect
- Local Health Effects
- Systemic Health Effects



Physiological Classification of Toxic Responses

Class	Physiological Effects
Irritant	Cause the eyes, skin, mouth or lungs to become dry, red, itchy or irritated
Corrosive	Destroy human tissue
Asphyxiant	Deprives tissue oxygen and causes suffocation
Anesthetic	Depresses the central nervous systems; impair body and minf functions
Hepatotoxin	Causes liver damage
Nephrotoxin	Causes kidney damage
Neurotoxin	Affects the nervous system
Hematopoietic Toxin	Affects the cellular components of blood or its ability to function
Pulmonary Toxin	Irritates or damages the lungs

Physiological Classification of Toxic Responses

Class	Physiological Effects
Reproductive Toxin	Causes impotence or sterility in men and women
Carcinogen	A material which can cause cancer
Teratogen	A material which inteferes with the developing embryo when a pregnant female is exposed to that substance
Mutagen	Anything which cause a change in the genetic material of a living cell
Sensitizer	Cause an allergic reaction, such as hives or breathing problems
Narcosis	Feeling no pain, sedation, respiratory depression

Heavy Metals and Health Effects

Heavy Metals	Health Effects
Lead	Severe damage to the blood-forming, nervous, urinary, and reproductive systems
Mercury	Deficits in neurological development, cognitive thinking, memory, language, motor skills
Cadmium	Kidney, lung and interstitial damage
Chromium	Irritation or damage to the nose, throat, and lung, skin and lung cancer

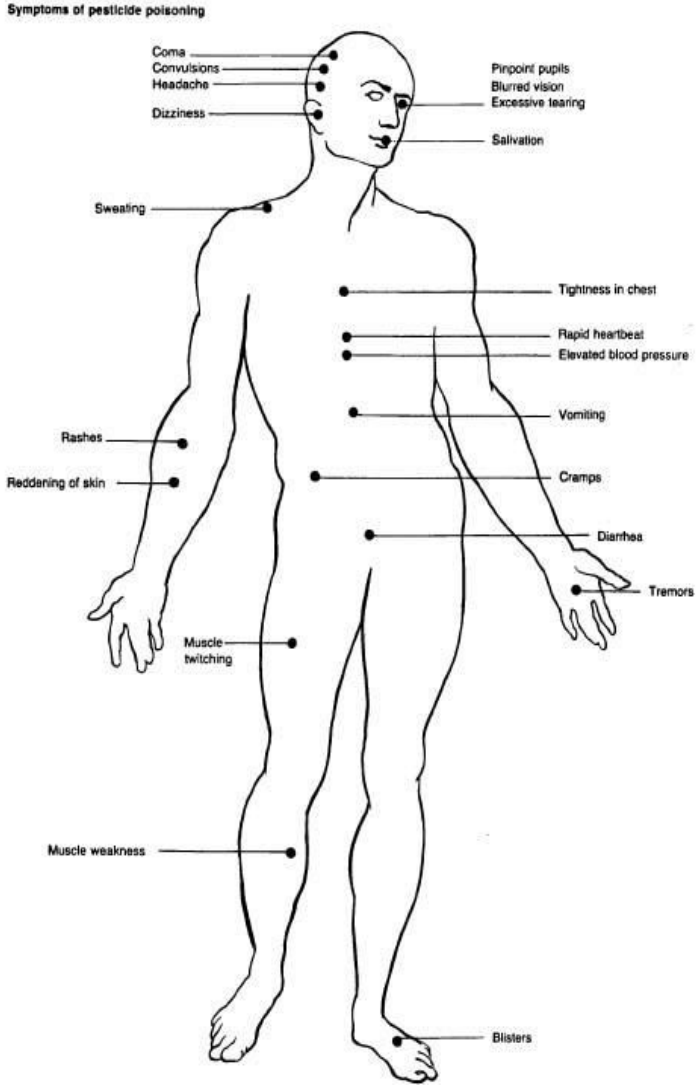
Organic Solvent & Health Effects

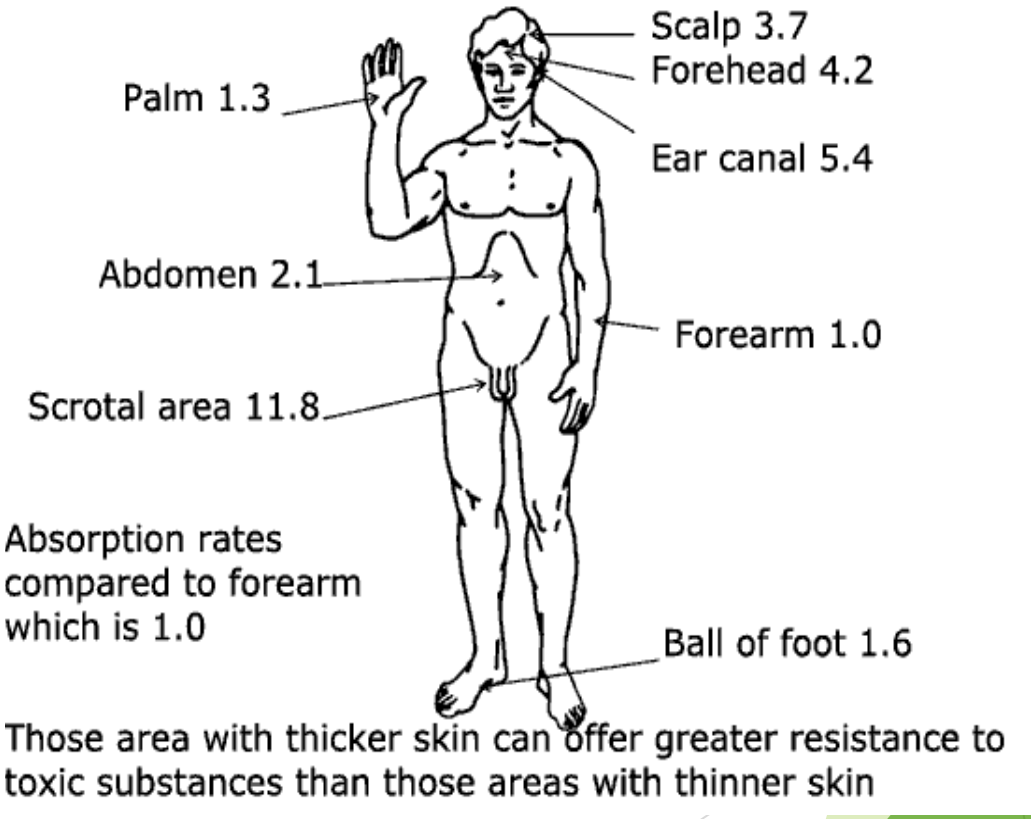
Organic Solvent	Health Effects
Formaldehyde	Irritation of eyes, nose, throat and respiratory system; suspected human carcinogen
n-Hexane	Irritation of the eyes and nose; nausea; headache; damage to the nerves in the extremities; muscle weakness and dermatitis
Methanol	Irritation of the eyes, skin and upper respiratory system; headache; drowsiness; nausea; vomiting; visual disturbance; dermatitis
Toluene	Irritation of the eyes and nose; weakness and exhaustion; confusion; dilates pupils; insomnia; liver & kidney damage; reproductive effects
Turpentine	Irritation of the eyes and upper respiratory system; dermatitis; CNS depression
Xylene	Irritation of the eyes skin, nose and throat; dizziness; excitement; in coordination; corneal vacuolization; loss of

Pesticides – Classification

- Organochlorine
- Organophosphate
- Carbamate
- Pyrethroid

Pesticides Health Effects





Occupations Exposed To Chemical Hazards

- Exposure to pesticides …?
- Exposure to organic solvents …?
- Exposure to heavy metals …?
- Exposure to explosive chemicals …?

ERGONOMICS HAZARDS

Jabatan Kesihatan Negeri Johor, Bahagian Kesihatan Awam

Ergonomic Hazard

- The study of work and the relationship of work to the physical and cognitive capabilities of people
- Fitting the job (tools, tasks, and environment) to the employee, instead of forcing the worker to fit the job.

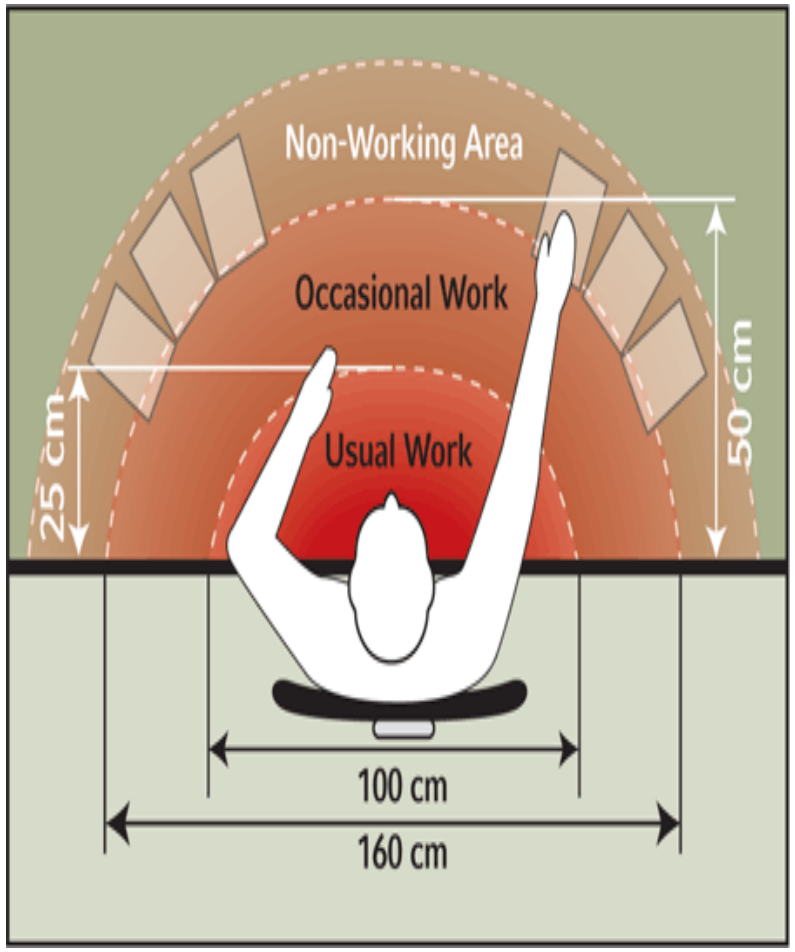
Ergonomic Risk Factors (ERF) Characteristics

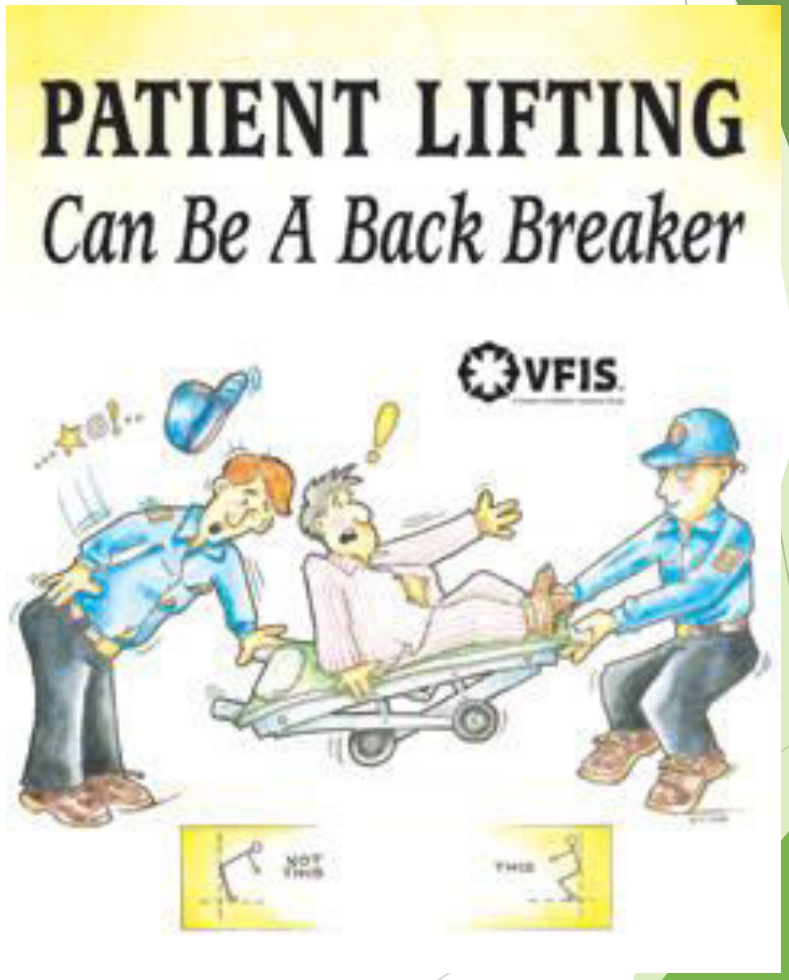
ERF Characteristics	Description
Poor Work Organization	Aspects of how a job is organized such as monotonous tasks and inadequate breaks
Continual Repetition	Performing the same motion over and over
Excessive Force	Forceful body movement which require excessive physical effort
Awkward Posture	Prolonged bending, reaching, twisting, squatting, kneeling
Stationary Positions	Staying in one position too long, causing muscles to contract and fatigue
Excessive Direct Pressure	Contact of the body with hard surface or edge

Others Ergonomic Issues

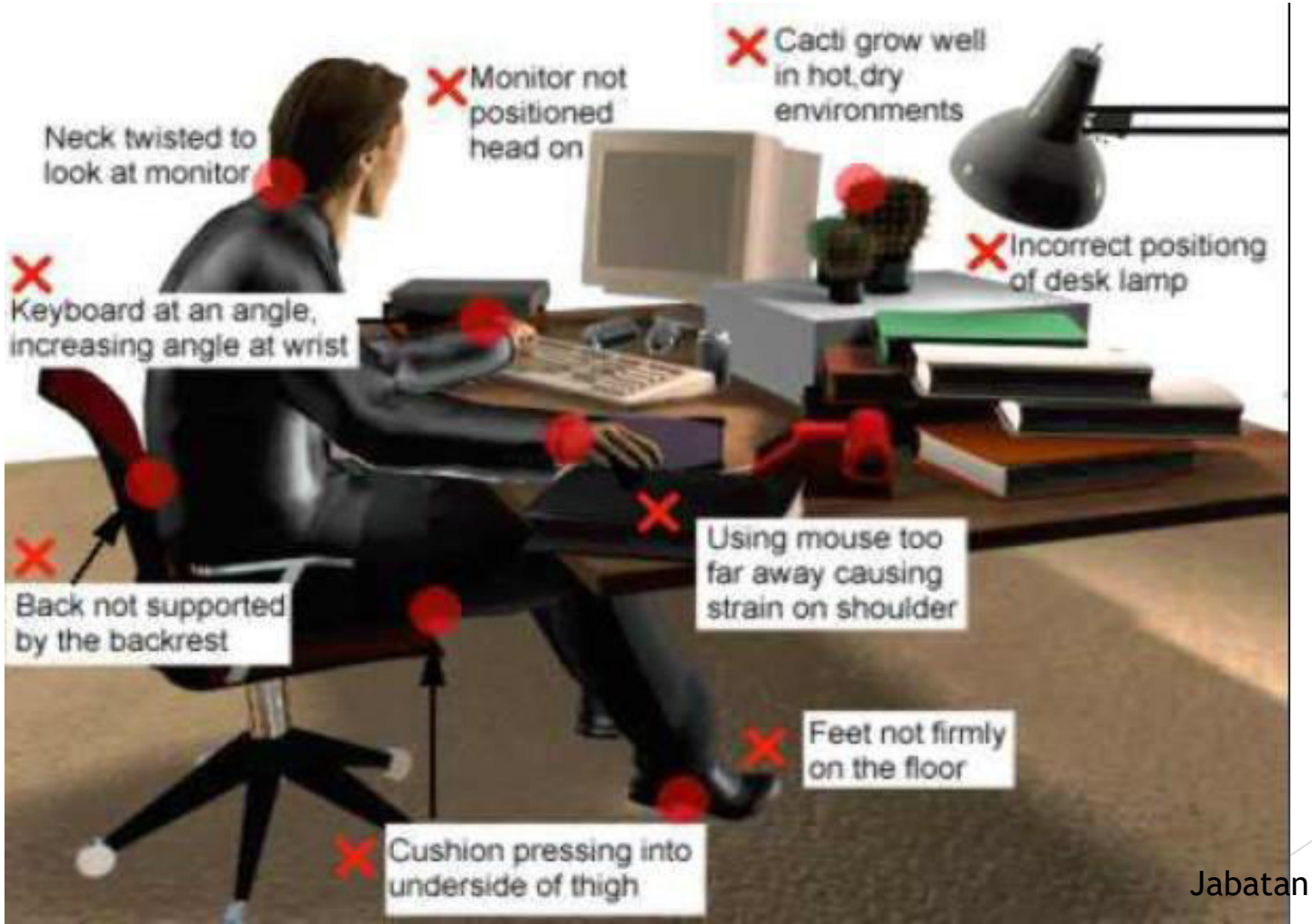
- Illumination
- Vibration
- Excessive vibration from power tools
- Inappropriate or inadequate hand tools
- Lack of adjustable chairs, footrests, body supports, and work surfaces
- Poor grips on handles

Example Of Ergonomic Hazard



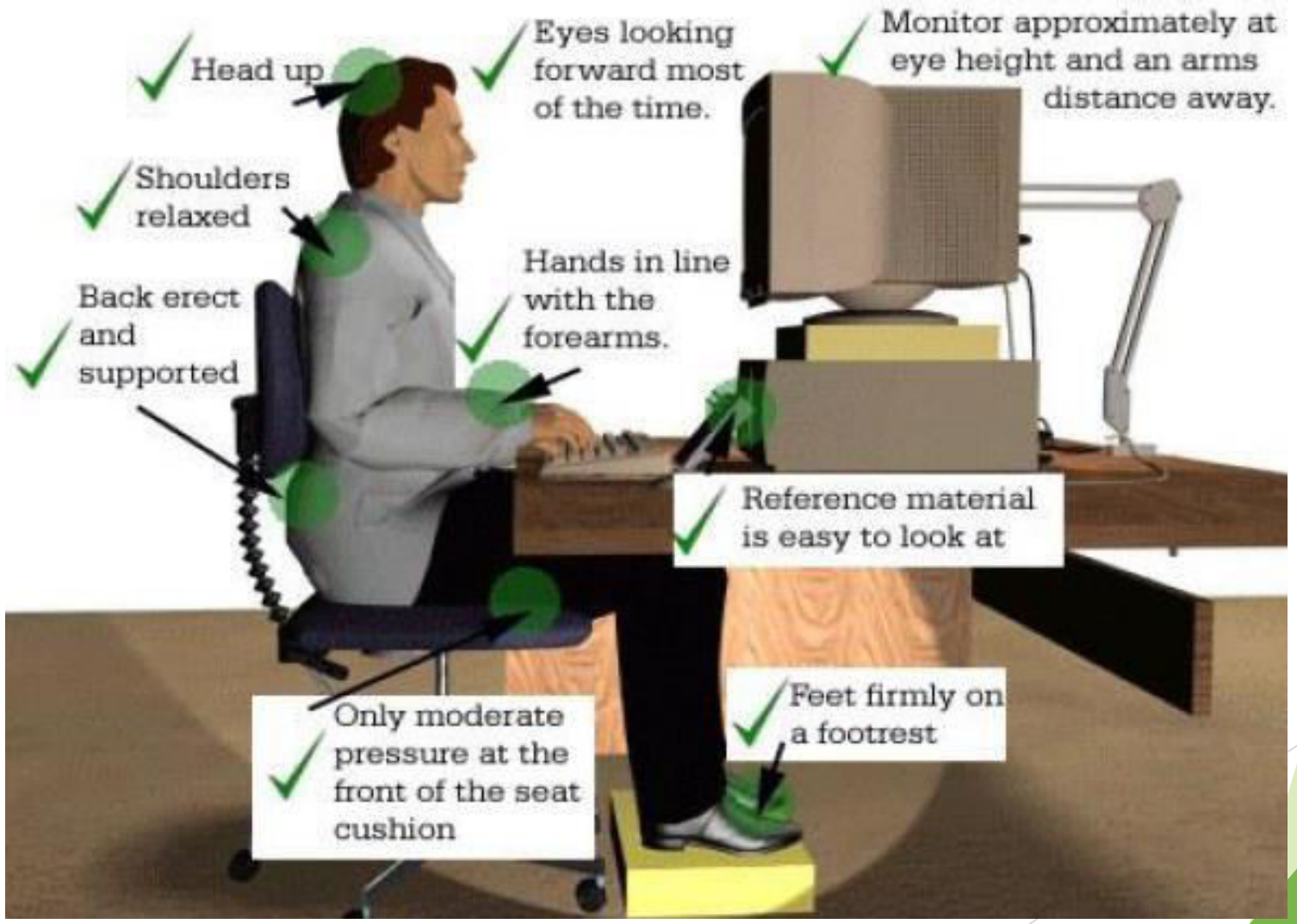


Example Of Ergonomic Hazard



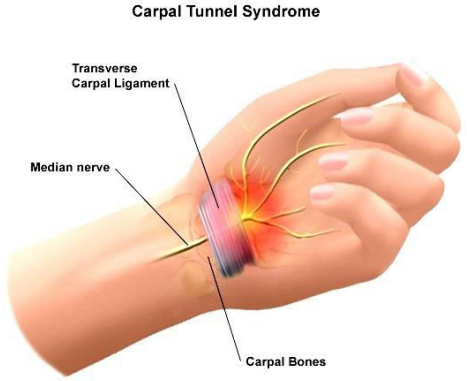
Jabatan Kesihatan Negeri Johor, Bahagian Kesihatan Awam

Example Of Ergonomic Hazard

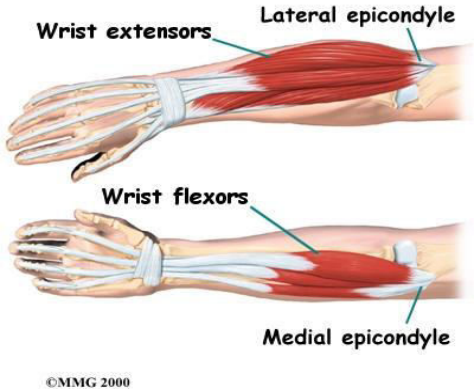


Jabatan Kesihatan Negeri Johor, Bahagian Kesihatan Awam

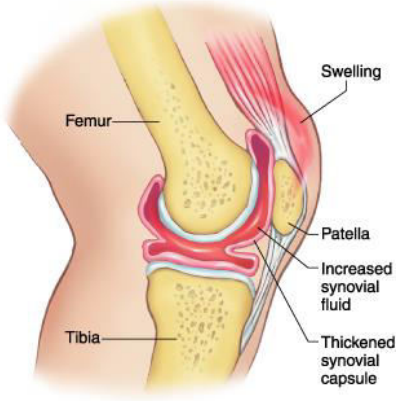
Health Effects (MSD)



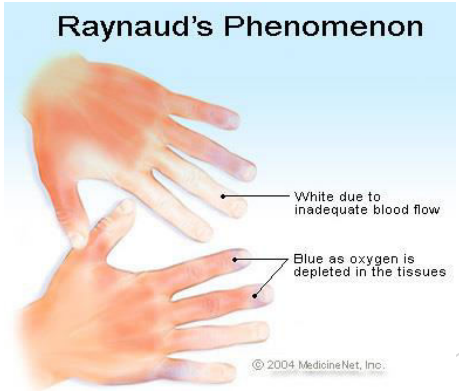
Carpal Tunnel Syndrome



Epicondylitis

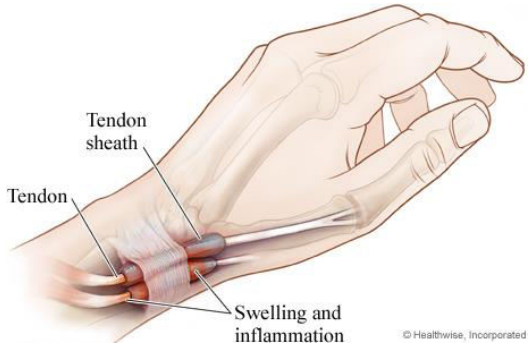


Synovitis

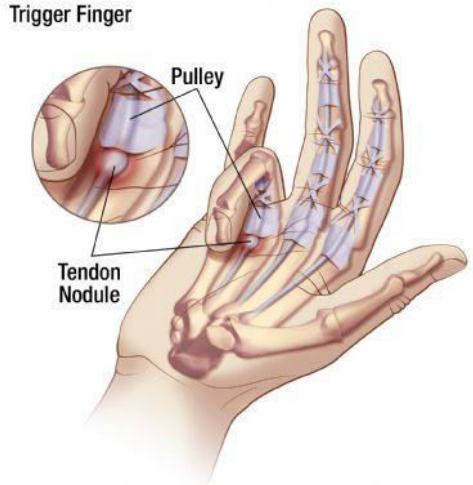


Raynaud's Phenomenon

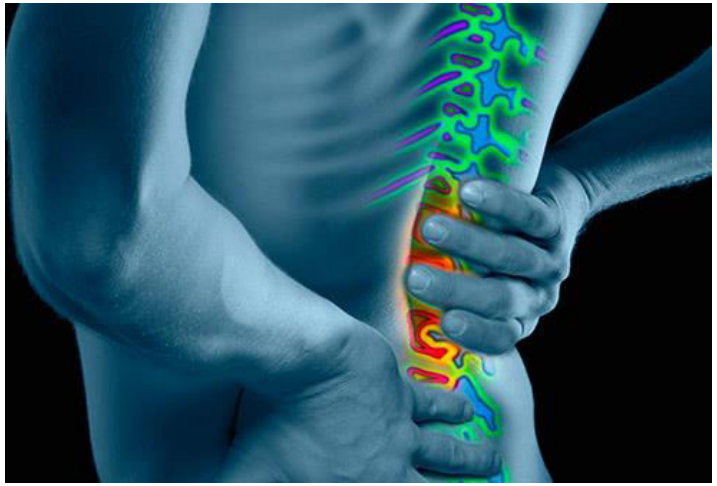
Health Effects (MSD)



De Quervains' Disease



Trigger Finger



Low Back Pain

Occupations Exposed To Ergonomics Health Effects

- Carpal Tunnel Syndrome…?
- Low Back Pain…?
- Trigger Finger…?
- Synovitis…?

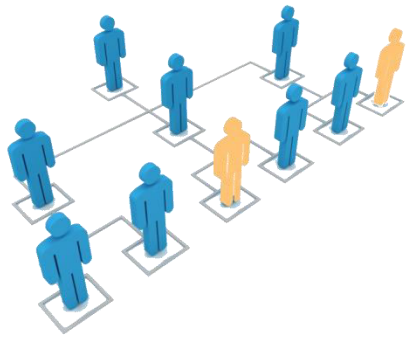
Psychosocial hazards

Jabatan Kesihatan Negeri Johor, Bahagian Kesihatan Awam

Psychosocial Hazards

- Psycho-social hazards can arise out of the many different ways
  - Stress, frustration, lack of job satisfaction
  - Type of work being done
  - Failure to adapt to an alien psychosocial enviroment
  - Attitudes and behaviours
- Have the potential to harm our physical and mental

Examples Of Psychosocial Hazards



Organizational Restructuring

Sexual Harassment

Work Overload

Poor Income

Bullying

Occupations Exposed To Psychosocial Health Effects

- Sexual harassment …?
- Stress …?
- Bullying …?
- Work overload … ?
- Poor Income … ?

BIOLOGICAL HAZARDS

Jabatan Kesihatan Negeri Johor, Bahagian Kesihatan Awam

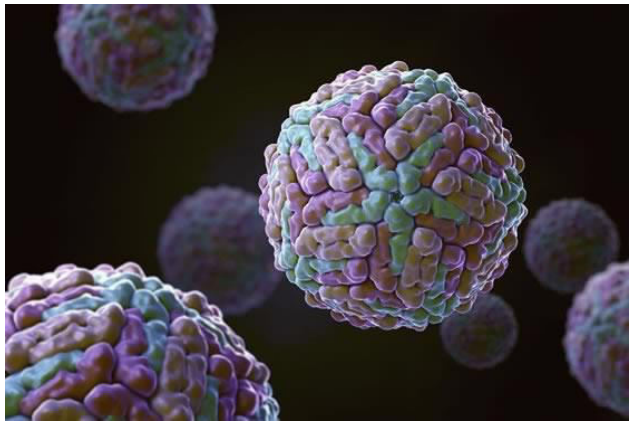
Biological Hazards

- Biological hazards are organic substances that pose a threat to the health to human and other living organisms
- Pathogenic micro-organism
  - Bacteria
  - Viruses
  - Toxins (from biological sources)
  - Spores, fungi and bio-active substances

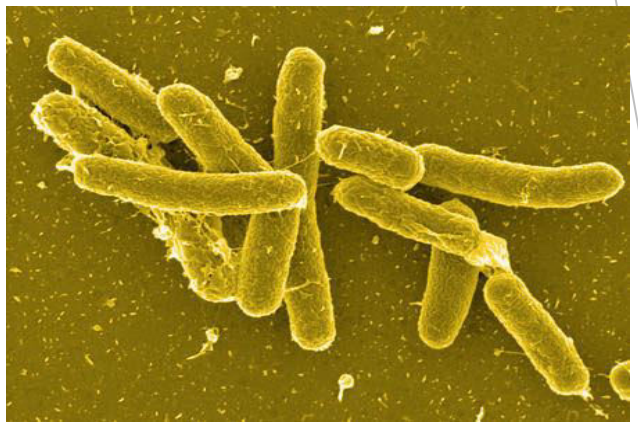
Biological Hazards

- Unprotected exposure to biological hazards can result in a range of infections and illnesses
- The harmful effects posed to human health by these biological hazards are mainly of three types:
  - Infections
  - Allergy
  - Poisoning

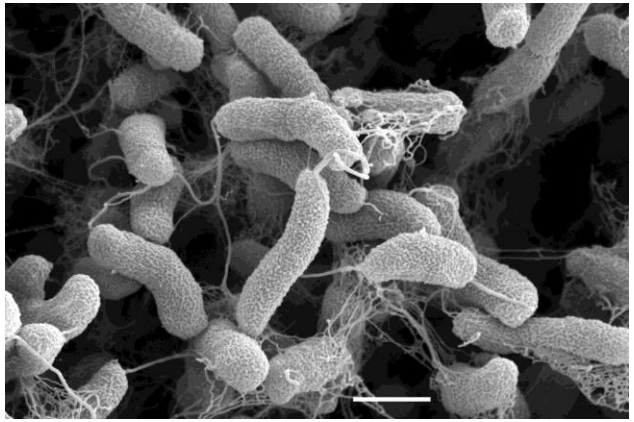
Examples Of Biological Hazards



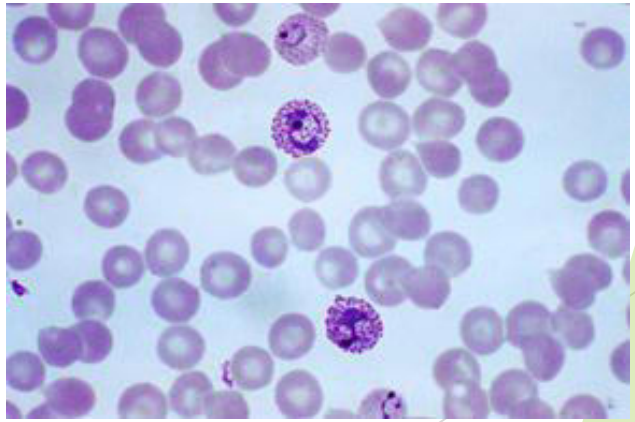
Dengue Virus



Salmonella

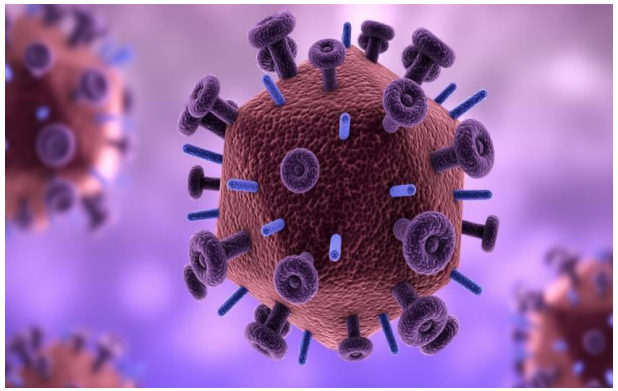


Vibrio Cholera

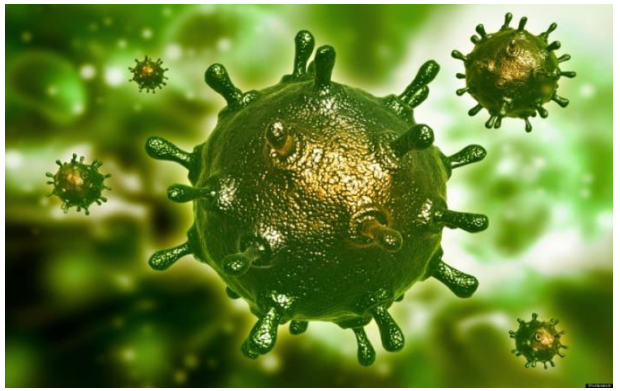


Plasmodium

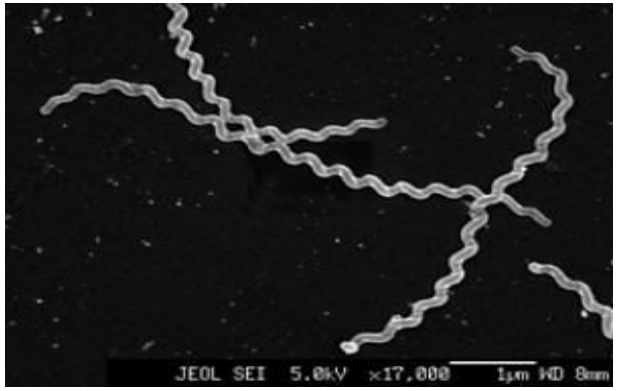
Examples Of Biological Hazards



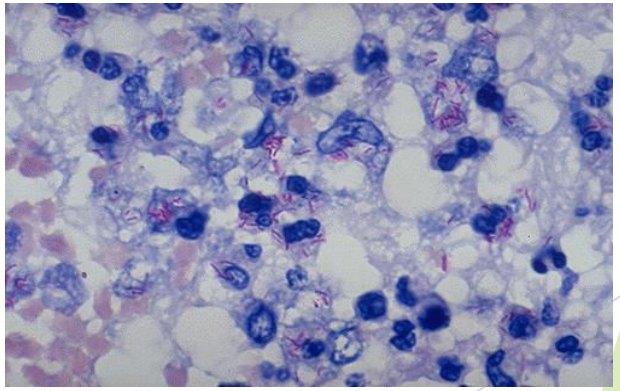
HIV



SARS



Leptospira



Mycobacterium Tuberculosis

Examples Of Biological Hazards

Splash

Cough & Sneeze

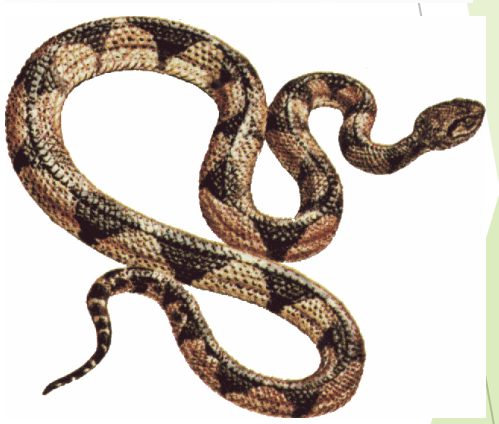
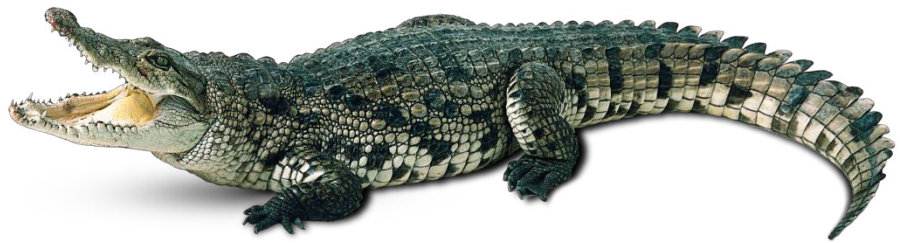
Neddle Stick

Biological Hazard???








Occupations Exposed To Health Effects Of Biological Hazards

- Leptospirosis…?
- Dengue Fever…?
- HIV/AIDS…?
- Malaria…?

HIRARC HAZARD CATEGORY

Categories of Hazard

- The **obvious hazard** is apparent to the senses
- The **concealed hazard** is not apparent to the senses
- The **developing hazard** cannot be recognized immediately and will develop over the time
- The **transient hazard** is an intermittent or a temporary hazard

Examples of Hazard Category

- Developing hazard…?
- Concealed hazard…?
- Developing hazard…?
- Transient hazard…?

THANK YOU