

OCCUPATIONAL CANCER

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Introduction

- ▣ Cancers often result of **multifactor's**
- ▣ **3-6%** of cancers → occupational exposure
- ▣ **Goal:** identify chemical & physical & biologic agents in the workplace that cause cancer in humans.

IARC Classification

- ▣ **Group 1:** Agent is carcinogenic to humans.
- ▣ **Group 2A:** Agent is *probably* carcinogenic to humans.
- ▣ **Group 2B:** Agent is *possibly* carcinogenic to humans.
- ▣ **Group 3:** Agent is not classified carcinogenic to humans.
- ▣ **Group 4:** Agent is not probably carcinogenic to humans.

Carcinogenesis

▣ Tumor Development

Multiple causation & interaction , Multiple stages:

-Initiation(irreversible change in DNA)

-Promotion(stimulating proliferation of altered cells.)

-Progression(metastasis)

Distinction between initiators & promoters

▣ **Initiators**

- *Genotoxic*
- *Carcinogenic alone*

- *Often electrophilic*

- *Covalently bind to nucleophiles,*
Irreversible reaction

▣ **Promoters**

- *Epigenic*
- *Not Carcinogenic alone*
- *Not electrophilic*

- *Not bind to nucleophiles,*
Reversible effect

Distinction between initiators & promoters

▣ **Initiators**

- Threshold dose Cannot be exist*
- Single exposure may be sufficient to induce cancer*

▣ **Promoters**

- Threshold probably exist*
- Repeated exposures required*

Notes:

- ▣ **Induction latency period:** (solid tumor:10-20 yr.
leukemia after radiation:3-5 yr.
mesothelioma:40)
- ▣ **Threshold :**(single exposure can cause a tumor.)
- ▣ **Dose-response relationship:**(larger doses of agent
higher risk of developing cancer.)
- ▣ **Medical surveillance:**(screening tests should
sensitive, easy to perform, detected
pre-malignant stage)

Investigative methods

- ▣ Epidemiologic studies
- ▣ Animal bioassays
- ▣ Short-Term Tests

Problems in testing

- ▣ Prolonged high exposure is uncommon
- ▣ Usually mix of exposures
- ▣ **Epi:** expensive, long, sample size, confoundings
- ▣ **Animal:** high dose, ? Validity in humans
- ▣ **In vitro:** mutagens, not carcinogens

IARC Classification

- ▣ **Group 1:** Arsenic, Benzene, Asbestos, Radium, cadmium, vinyl chloride
- ▣ **Group 2A:** Formaldehyde, silica, Acrylonitrile
- ▣ **Group 2B:** Gasoline, Acrylamid, Chloroform

Some industrial process with cancers:

- ▣ **Al production**
- ▣ **Coke production**
- ▣ **Furniture manufacture**
- ▣ **Rubber industry**
- ▣ **Pesticide production**
- ▣ **Shipyard industry**
- ▣ **Laboratories**
- ▣ **Boot and shoe manufacturing**

Lung cancer

- ▣ Asbestos
- ▣ Arsenic
- ▣ Chromium
- ▣ Nickel
- ▣ Chloro methyl ether
- ▣ Radon

Upper respiratory tract cancer

▣ *Sino nasal cancer*

- *Nickel*
- *Wood dust*
- *Chromium*
- *formaldehyde*

▣ *Laryngeal cancer*

- *Asbestos*

Lympho hematopoietic cancer

- ▣ Ionizing radiation
- ▣ Benzene
- ▣ Pesticides
- ▣ Cytotoxic drugs

Urinary Tract cancer

- ▣ *Benzidine*
- ▣ *Naphtyl amines*
- ▣ *Aniline*
- ▣ *PAHS*
- ▣ *LEAD*
- ▣ *Asbestos*
- ▣ *Uranium*
- ▣ *TCE*

GI CANCER

▣ Esophageal cancer

- Asbestos
- Carbon black
- Pesticides
- Silica dust
- Toluene
- Benzidine
- Phenol

▣ Gastric cancer

- Asbestos
- Lead
- Pesticides
- Nickel /Chromium
- Wood dust
- Coal dust
- Silica dust

GI CANCER

▣ Colorectal cancer

-Grain dust

-Solvents

-Pesticides

-Formaldehyde

-Asbestos

-Arsenic

liver Cancer

- ▣ *Vinyl chloride*
- ▣ *Arsenic*
- ▣ *Solvents*
- ▣ *Pesticides*
- ▣ *Afela toxin*

Female Reproductive Cancer

- ▣ Ionizing radiation
- ▣ Radium
- ▣ TCE
- ▣ Talc

Male Reproductive Cancer

- ▣ Dimethyl form amide
- ▣ Ionizing radiation
- ▣ TCE
- ▣ *Vinyl chloride*

Skin Cancer

- ▣ *UV radiation*
- ▣ *Ionizing radiation*
- ▣ *Arsenic*
- ▣ *Skin trauma*
- ▣ *PAH*

DIAGNOSIS

- ▣ Occupational cancer can be confused with other caused cancer.
- ▣ Therefore, it can be related by patient's occupational past. (e.g. employee, company and insurance records)
- ▣ It may be defined as early diagnosis by regular health surveillance.

TAKING MEASURES

- ❖ First of all, the material which is defined as carcinogen should be **forbidden** in industry.
- ❖
- ❖ Therefore, a **substitute** for this material should be researched.
- ❖ If there is a need of working by carcinogens, taking measures of **decreasing exposure** as minimum is mandatory.

MEASURES THAT REDUCE EXPOSURE

- ❑ Measuring exposures in working atmosphere and worker's biological system,
- ❑ Well working ventilation system if happens an emergency,
- ❑ PPE,
- ❑ Rotation,
- ❑ Prohibiting of smoking cigarettes.

Iceberg

- ▣ Most known occupational carcinogens were discovered **by chance**
- ▣ Is this the tip of an iceberg?
- ▣ Is it likely that there are many more?

