Occupational Cardiovascular Diseases

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Leading causes of death in Iran

- **Cardiovascular diseases % 45**
- **Accidents % 17.5**
- **Cancers %14**
- **Neonatal disease %6**
- **Respiratory disease %6**

Problems in identification of occupational etiologies of CVD

- Common in society
- Multifactorial etiology
- Long latency
- No accurate noninvasive tests for early disease
- Clinical expressions are similar whether the disease has an occupational or non-occupational cause

Cardiovascular risk factors

Modifiable risk factors

- Hypertension
- Smoking
- Hypercholesterolemia
- Diabetes Mellitus
- Overweight & Obesity
- Physical Inactivity
- Nutritional habits

Non – Modifiable risk factors

- Family history
- Increasing age
- Male sex

OCCUPATIONAL TOXICOLOGY

- Cardiac arrhythmia
- Coronary artery disease
- Hypertension
- Non atheromatous ischemic heart disease
- Myocardial injury
- Peripheral arterial occlusive disease

- Arsenic, CFC, Solvents
- CS2 , CO, Lead
- Cadmium,CS2, Lead
- Organic nitrate, ethylene glycol dinitrate
- Antimony , Arsine , Cobalt , Arsenic , Lead
- Arsenic , Lead

Occupational Cardiovascular Toxicology

- **CARBON MONOXIDE(CO)**
- **CARBON DISULFIDE(CS2)**
- **NITRATES**
- **SOLVANTS**
- **HEAVY METALS**

Carbon monoxide (CO)

Sources of incomplete combustion:

- Furnaces, boilers

Internal combustion engine (warehouses, auto plants)

Hazards increased in cold weather with closed doors and windows

Carbon monoxide Acute Poisoning

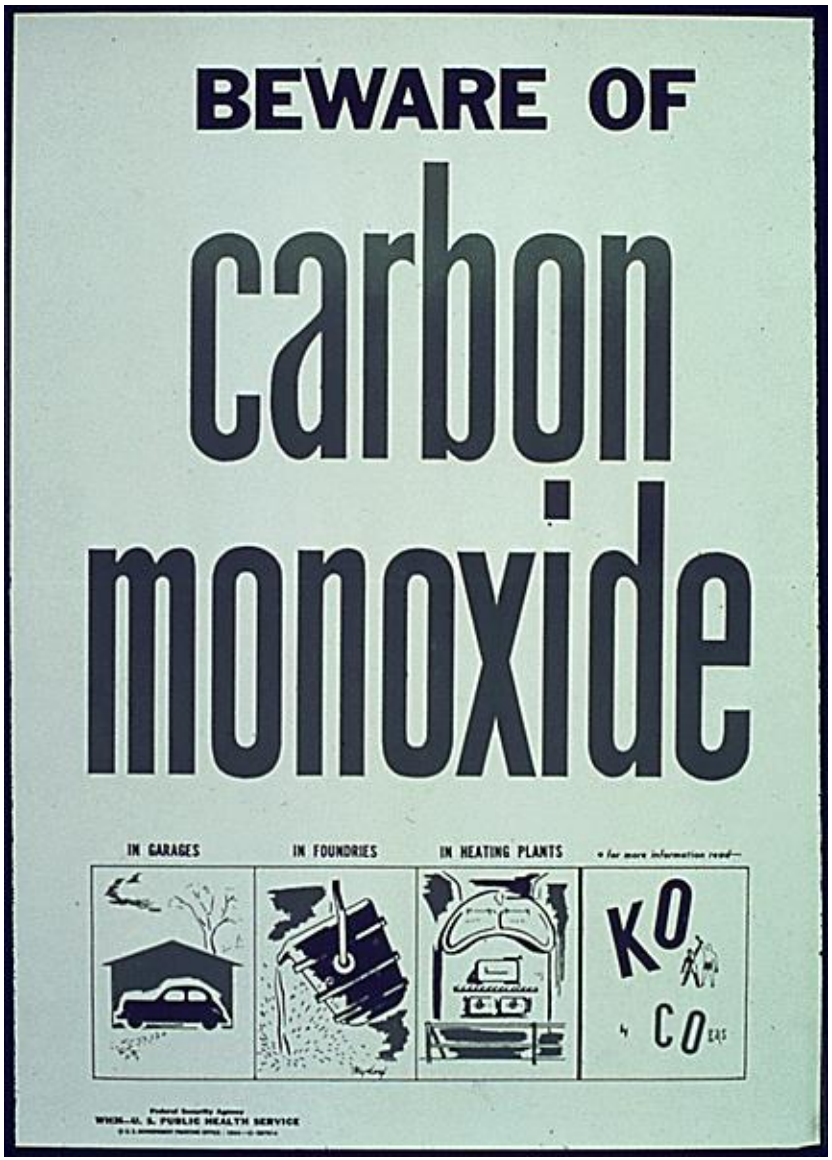
- Binds to hemoglobin more avidly than O2 (CO has 200x oxygen's affinity)
- Shifts oxygen dissociation curve to "left": Tissue anoxia the result

CARBON MONOXIDE(CO)
Chronic Exposure

Chronic exposure to CO associated with cardiovascular mortality

CARBON MONOXIDE(CO)

- Binds mitochondrial enzymes and myoglobin
- Increases platelet stickiness
- Decreases arrhythmia threshold



Carbon disulfide (CS2)

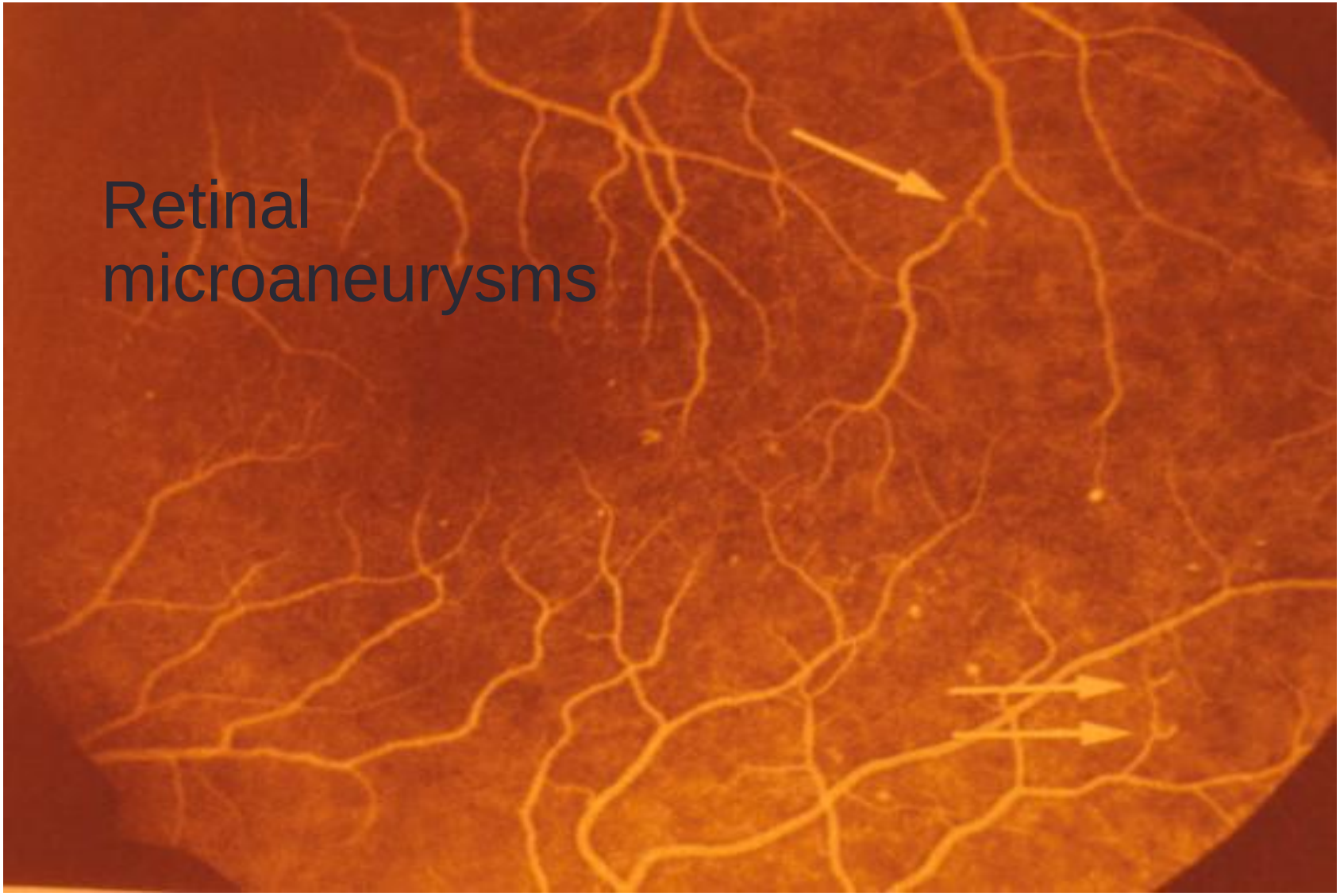
- Cellulose-derived materials
  - Rayon
  - Cellophane
- Solvent for rubber, oils
- Pesticides
- Fumigant for grain, books
- Microelectronics industry

Carbon Disulfide and Atherogenesis

RR of 2 to 5x for death from CAD

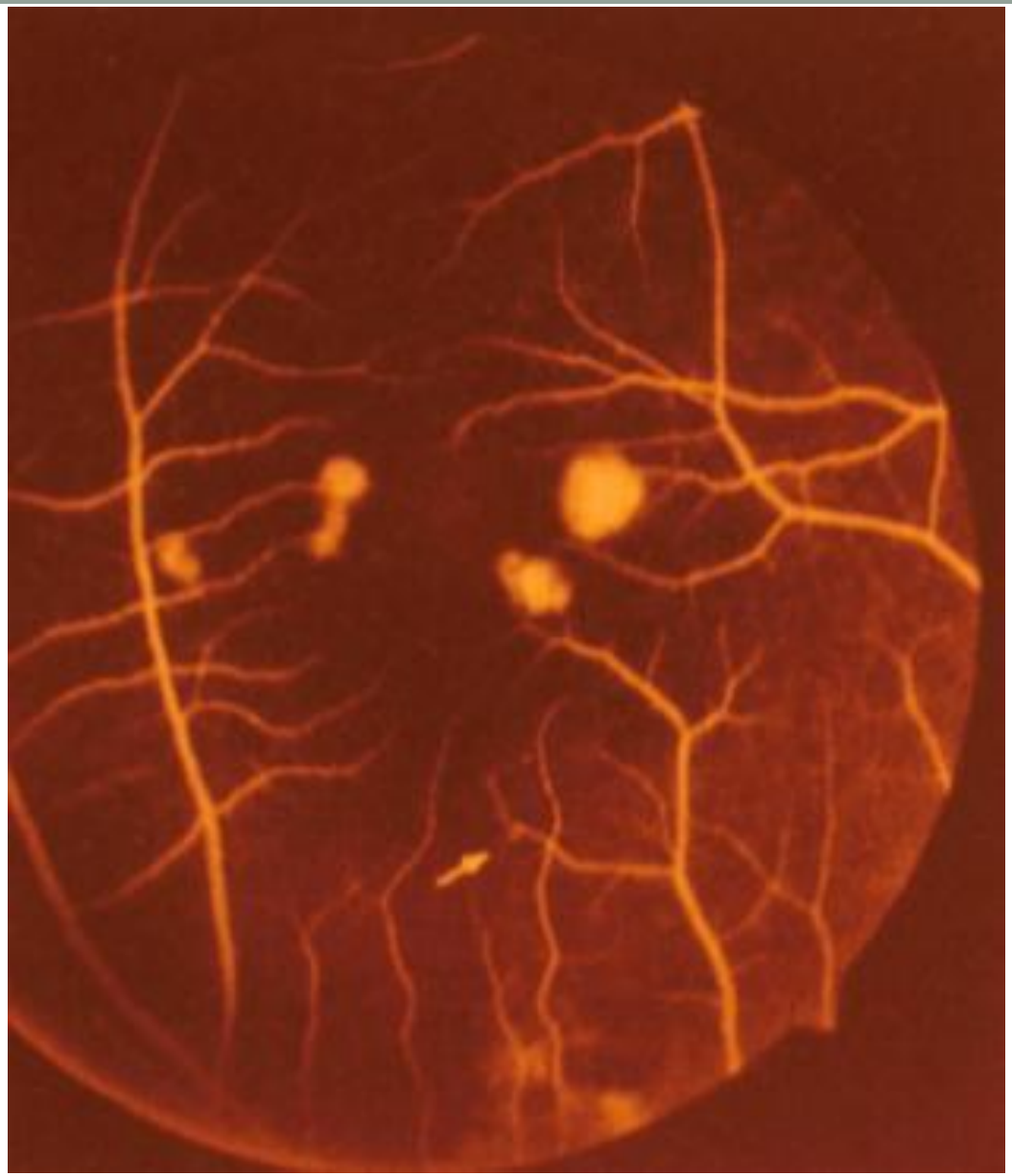
Epidemiologic evidence suggests a direct role in atherogenesis in blood vessels

CS_2



CS_2

Retinal hemorrhages



Angina: Nitrates

- Noted to have vasodilatory effects in explosives workers
- Tolerance to absorbed nitrate symptoms (headaches, tachycardia, diastolic HTN) develops quickly

NITRATES

Acute effects in workers

Sudden death:

24-96 hours after exposure ceased (weekends/holidays)

"Monday Morning Angina":

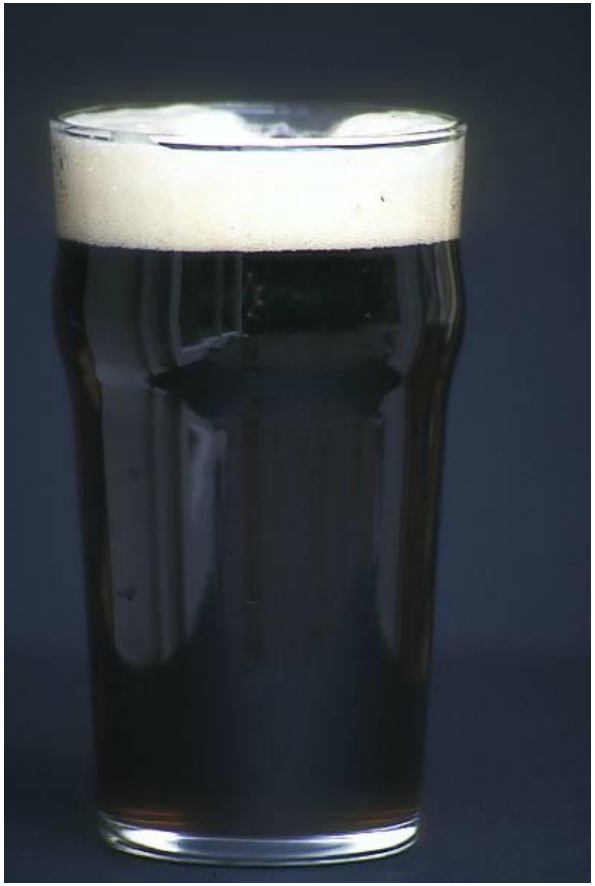
Relieved by RTW, nitrate meds: coronary spasm in absence of CAD

Three-fold increase in acute deaths in younger men from ischemic CHD

Dysrhythmias

- Chlorofluorocarbons (Freon® etc)
  - ✓Refrigeration, air conditioning, propellants
  - ✓May sensitize myocardium to catechol effects
- Other solvents implicated in sudden death:
  - ✓Trichloroethylene, toluene, benzene

Cardiomyopathy



- Cobalt: used to stabilize beer foam (1960's: Canada, Belgium)
- Cardiomyopathy reported in beer drinkers several months afterward

Occupational Cardiovascular Diseases

- **Noise**
- **Hot & Cold environment**
- **Vibration**
- **Psychosocial Factors at work**
- **Physical inactivity**

Hypertension

Associations with several occupational exposures and agents

Mechanisms are varied and depend on action of agent

Hypertension

Lead

- Probable mechanism is via renal injury
- May also increase vascular tone and resistance
- Chelation may improve HTN in acute Pb intoxication, but will not reverse if longstanding renal damage is present

Cadmium

possibly associated with HTN; noted to occur at levels below nephrotoxic dose

Hypertension

Carbon disulfide

- Vascular nephropathy and accelerated atherogenesis appear to be mechanisms

Noise, Shift work

- Postulated effects mediated by stress response (increase sympathetic and hormonal mediator release)

Job Strain and Cardiovascular Diseases

Body of evidence suggests relationship between job strain and cardiovascular mortality

Return-to-Work After MI, CABG, PCI

Patients impact of being out of work

- **Have reduced confidence and self esteem**
- **Have increased morbidity and mortality - particularly mental health**
- **Have disability greater than underlying impairment**

Return-to-Work after MI

- **Over 80% of workers are generally able to return to work after initial MI or CABG**
- **Reinfarction and death NOT more frequent at work**

Cardiovascular effects: Return-to-Work after MI

Medical Factors

Major predictors of RTW:

- LV dysfunction
- persistent ischemia / angina after treatment

Non-Medical Factors

- Coping styles
- Perception of work (demands, satisfaction)
- Age, gender, education
- Benefits/incentives

Any Question?