

# **CHAPTER SEVEN**

## **FOOD POISONING, DRUGS OF ABUSE AND ENVIRONMENTAL TOXINS**

# Outline

- Objectives
- Drug abuse
- Food-born toxin
- Environmental toxin

# Objectives

At the end of this chapter the student will be able to:

- Describe the drug abuse
- Discuss the food-born toxin
- Understand the environmental toxin

# 1. Drug Abuse

## Drug related deaths & drug abuse

- The main classes of misused drugs are:
  - Minor tranquilizers (benzodiazepines, e.g. Diazepam (Valium), Temazepam)- reduces anxiety and tension
  - Stimulants (amphetamines, cocaine)-
  - Opiates (morphine, heroin, methadone, dihydrocodeine)
    - reduces anxiety and tension
  - Depressants (barbiturates)

# Drug abuse cont'd

## Benzodiazepines

### ☐ Acute intoxication

#### ■ Psychological:

- Relief of anxiety, Relaxation
- Impaired memory
- Paradoxical aggression -intense anxious or fearful feelings
- Uncharacteristic criminal behaviour (shoplifting & indecent exposure)
- Uncontrollable emotions (giggling & weeping)
- Inability to concentrate & impairment of skilled tasks

# Drug abuse cont'd

## Benzodiazepines ...

- Physical:
  - Dizziness-Inner ear problems(sense organ incoordination)
  - Sedation -a state of calm or sleep
  - Incoordination
  - Sexual dysfunction
  - Weight gain
  - Hypotension
  - Coma with high dose

## Drug abuse cont'd

### Benzodiazepines...

- **Chronic effects:**
  - Tolerance: Physical & psychological dependence
  - Slurred speech
  - Poor concentration
  - Impaired comprehension
  - Impaired memory
  - Emotional liability
  - Irritability
  - Depressed mood

# Drug abuse cont'd

## Amphetamines

- Amphetamines are synthetic stimulants
- Amphetamines act by stimulating the release of catecholamines, particularly adrenaline within the body

## Acute intoxication:

- Psychological:
  - Euphoria( extreme happiness)
  - Self-confidence and self-esteem
  - Feeling of calm, peace and friendliness towards strangers (the 'hug drug')



## Drug abuse cont'd

- Heightened sense of awareness & concentration
- Increased energy
- Desire and ability to dance for long periods
- Irritability & restlessness
- Irrational behaviour
- Confusion
- Hallucinations- apparent perception of something not present
- Delusions, paranoia, psychosis(an idiosyncratic belief, misinterpretation)
- Psychological dependence

# Drug abuse cont'd

## ■ Physical:

- Tachycardia (fast pulse)
- Hypertension (high blood pressure)
- Tachypnea (rapid breathing)
- Loss of appetite
- Dilated pupils
- Brisk reflexes
- Dry mouth, sweating,
- Blurred vision, dizziness, flushing or pallor
- Teeth grinding (bruxism), repetitive actions (stereotypy)

# Drug abuse cont'd

- Acute adverse effects
  - Disturbances in the electrical rhythm of the heart (cardiac arrhythmias)
  - Stroke -intracerebral haemorrhage
    - subarachnoid haemorrhage
  - Hyperpyrexia: heat production by amphetamines and reduced heat loss by the skin result in a dangerous rise in body temperature

# Drug abuse cont'd

- Chronic adverse effects
  - Chest pains
  - Muscle spasms
  - Anorexia - an eating disorder
  - Malnutrition
  - Weight loss
  - Diarrhoea & vomiting
  - Damage to the heart muscle (cardiomyopathy)
  - Aggression, fatigue, insomnia, Depression
  - Chronic paranoid psychosis, schizophrenia(breakdown in the relation between thought)

# Drug abuse cont'd

## Cocaine

### Acute intoxication:

- Short acting & dose dependent
- It causes the body to secrete adrenaline in a similar fashion to amphetamines
- The detrimental and agreeable effects are more florid

# Drug abuse cont'd

## Cocaine...

- Physical:
  - Tachycardia
  - Hypertension
  - Tachypnea
  - Dilated pupils
  - Increased mental excitement
  - Hyperpyrexia

# Drug abuse cont'd

## Cocaine

- Psychological:
  - Euphoria (extreme happiness) & well-being
  - Irritability & confusion
  - Hallucinations
  - Formication (sensation of like insects crawling over the skin)
  - Depression
  - Paranoia as effects wear off

# Drug abuse cont'd

## Cocaine

- Chronic effects & External signs of cocaine abuse:
  - Intense psychological dependence
  - Chest pains, muscle spasms
  - Weight loss
  - Male impotence & female orgasm problems
  - Nasal septum may become ulcerated and perforated due to ischemia and blood vessel spasm
  - Eyes may exhibit "crack keratitis" due to the local anaesthetic effect allows excessive rubbing of the eyes
  - Teeth may show acid erosion of the surface enamel



# Drug abuse cont'd

## Cocaine

- Cocaine has serious detrimental effects both acutely and chronically on the :
  - Coronary arteries
  - Heart muscle
  - Central nervous system

# Drug abuse cont'd

## Cocaine

- The coronary arteries
  - Proliferation and thickening of the inner lining
  - Reduces blood flow
  - Premature hardening and narrowing (atherosclerosis)
  - Myocardial infarction
  - Increased incidence of coronary artery thrombosis

# Drug abuse cont'd

## Cocaine

- The heart muscle
  - Myocarditis
  - Cardiomyopathy
- As a result of this myocardial damage there is a risk of sudden death due to cardiac arrhythmia which is most likely to occur during acute intoxication

# Drug abuse cont'd

## Cocaine

- Brain:

- Stroke
  - intracerebral haemorrhage or subarachnoid haemorrhage
- In addition blood vessels may undergo spasm → causing ischaemic infarction of the brain

## Drug abuse cont'd

- Causes of cocaine-induced death are:
  - Convulsions-sudden violent shaking
  - Respiratory arrest
  - Cardiac arrhythmia
  - Coronary artery spasm
  - Stroke
- Although cocaine itself is quite short lived in the body it can be detected in the brain and blood within a short time of a hit
- The cocaine metabolites are detectable for longer periods in nasal swabs, urine, hair and saliva

## Drug abuse cont'd

### Opioids

- Opioids include:
  - The opiate alkaloids morphine & codeine
  - Synthetic (pethidine)
  - Semi synthetic (heroin); properties with morphine like effect
- Opioids exert their effect by acting to the opiate receptors located within the CNS resulting in analgesia & euphoria
- Opioids are used to treat cough, diarrhea, dyspnea (congestive heart failure), and sometimes anxiety as well as pain

# Drug abuse cont'd

## Opiate Abuse

- Main drugs:
  - Morphine
  - Heroin (Diamorphine)
  - Methadone
  - Dipipanone (*Diaconal* ), Pethidine, Pentazocine (*Foetal* ),
  - Buprenorphine (*Temgesic*)
- Medical uses are:
  - Pain relief (analgesia)
  - Cough suppressants & Anti diarrhoeal agents

# Drug abuse cont'd

## Opiate Abuse

### Acute intoxication

- Psychological:
  - Rush of euphoria ( **extreme happiness**) & contentment
  - Relief of anxiety, inability to concentrate
- Physical:
  - Constricted pupils
  - Suppression of cough reflex, Nausea & vomiting
  - Decreased heart & breathing rate, Unconsciousness
  - Respiratory arrest and death



# Drug abuse cont'd

## Opiate Abuse

### ▪ **Chronic effects:**

- Tolerance
- Physical & psychological dependence
- Constipation
- Loss of libido(loss of sexual desire)
- Complications of intravenous injection

# Drug abuse cont'd

## Opiate Abuse

### Withdrawal syndrome

- Symptoms (easily fabricated by the addict wanting more drugs):
  - Craving for the drug
  - Anxiety, restlessness, irritability, insomnia
  - Alternate sweating and shivering
  - Generalised aches
  - Pains and cramps in the back, legs and abdomen
  - Nausea & vomiting

# Drug abuse cont'd

## Opiate Abuse

withdrawal syndrome

- Physical signs:
  - Dilated pupils
  - Watering of the eyes (lacrimation)
  - Tachycardia, hypertension
  - Cold clammy skin with goose flesh
  - Loudly audible bowel sounds (borborygmy)
  - Diarrhoea

# Drug abuse cont'd

## Opiate Abuse

- Local complications of injecting
  - Skin abscesses and ulceration
  - Skin scarring and the needle track marks
  - Fat necrosis due to injection beneath the skin
  - Myositis (inflammation of the muscle)
  - Thrombosis following repeated injection into veins
  - Lymph channels become blocked and lymph nodes enlarged  
resulting in swelling or oedema of the limb

# Drug abuse cont'd

## Opiate Abuse

- General complications of injecting:
  - Pulmonary granulomas (foreign body granulomas)
  - Liver granulomas
  - Blood vessel and nerve cell damage in the brain
  - Hepatitis B infection and HIV

# Drug abuse cont'd

## Barbiturates

- Barbiturates comprise sedative-hypnotic drugs with abuse potential & a recognized withdrawal syndrome
- Toxic manifestations of barbiturates vary with the amount of ingestion, type of drug and length of time since ingestion
- Lower doses of short acting barbiturates (E.g. pentobarbital) cause toxicity than the long-acting barbiturates (e.g. Phenobarbital)
- But fatalities are more common in Phenobarbital than pentobarbital
- Mild intoxication resembles alcohol intoxication
- Moderate intoxication is characterized by greater depression of mental status and severe intoxication causes coma

## 2. Food poisoning

### Food – born toxins

- A microbial toxin is a compound produced by a microorganism that acts to cause disease.
- Food poisoning syndromes result after ingestion of a wide variety of foods contaminated with pathogenic microorganisms or microbial toxins.
- They are *Clostridium perferinges*, *Bacillus cereus*, *Escherichia coli*, *Clostridium botulinium* , *Vibrio cholera* , *s.aureus*, *salmonella* and *shigella* are some of pathogenic organisms that causes food poisoning.

## Food poisoning cont'd

- Preformed toxins are from *Staphylococcus aureus*, *B.cereus* and *C.botulinum*
- The illnesses produced usually are not associated with fever or blood, pus, or mucus in the stools because it doesn't have tissue involvement
- Most of them produce GI symptoms
- Except for botulism and cholera, the clinical course of most of these food-borne toxin related illnesses is self-limiting



## Food poisoning con.....

- The bacterial food poisoning should be clearly distinguished from toxic reaction to:
  - Contaminant Metals such as Arsenic, Lead, or Tin
  - Toxic Vegetable and Substances such as Muscarine or Amanitin from Fungi or Myelotoxin from Mussels
  - Allergic Reaction to food

### **3. Environmental toxin**

#### **Carbon monoxide poisoning**

- Carbon monoxide (CO) is a colorless, odorless gas that is ubiquitous because it is produced by the incomplete combustion of carbon compounds
- The possibility of carbon monoxide poisoning is fire and smoke inhalation; but accidental and suicidal exposures are also common
- The gas is readily absorbed across the alveolus and combines with hemoglobin with high affinity than oxygen

## Environmental toxin cont'd

- The displacement of oxygen from hemoglobin leads to a decrease in oxygen transport and causes tissue hypoxia
- Elimination of carbon monoxide is predominantly respiratory; only about 1% is metabolized to carbon dioxide
- Patients with mild to moderate CO poisoning often complain of headache, dizziness and nausea and vomiting
- Severe poisoning may result in chest pain, dyspnea, syncope, seizures and coma

# ANTIDOTE

# Antidote

- Antidotes are substances which counteract the effect of poison
- They are divided into:
  - Mechanical (Physical)
  - Chemical
  - Physiological
  - Specific receptor antagonists

# Physical or Mechanical Antidote

- It prevents the action of poison mechanically without destroying or inactivating the damaging actions of the poisons

Examples:

- Adsorbents like activated charcoal
- Demulcents like egg albumin, starch or milk
- Diluents like water or milk, bulky food like boiled rice or vegetables

# Chemical Antidotes

- They are Substances which disintegrate and inactivate poisons by undergoing chemical reaction with them.
- Examples:
  - Weak acids and alkali
  - Common salt
  - Egg albumin
  - $\text{KMNO}_4$

# Physiological Antidote

- They have their own action producing signs and symptoms opposite to that produced by the poison

Examples:

- Naloxone for morphine
- Neostigmine for datura or hyoscin group
- Barbiturate for strychnine

# Serological Antidote

Anti-snake venom serum for snake bites poisoning



# Universal Antidote

- It is a combination of physical and chemical antidotes
- When the exact nature of poison is not known then universal antidote is used which acts against a wide range of poisons

## Constituents:

- Activated charcoal            2 parts
- Magnesium oxide            1 part
- Tannic acid                    1 part
- Dose: 1TSF (15gms) in a glass water (can be repeated)
- Activated charcoal → for its adsorbent action
- Magnesium oxide → neutralizes acids poisons
- Tannic acid → precipitates alkaloids

# Household Antidotes

- Strong liquid tea (contains tannic acid) precipitate alkaloid and metallic poisons
- Starch for iodine
- Milk and raw egg for mercury, arsenic, heavy metal
- Flour suspension and mashed potatoes can be used in place of activated charcoal
- Milk of magnesia or soap solution for acid poisoning
- Orange, lemon juice or vinegar for alkali poisoning

# Chelating Agents

- They are the substances which act on absorbed metallic poisons
- They have greater affinity for metals as compared to endogenous enzymes
- The complex of agent and metal is more water soluble than metal itself, resulting in higher renal excretion of the complex

Example:

- British anti-lewisite (B.A.L., dimercaprol)
- E.D.T.A. (ethylene diamine acetic acid)
- Penicillamine (Cuprimine)
- Desferroxamine etc

## **B.A.L. (British Anti-Lewisite)**

- It (2-3 dimercaptopropanol) has 2 unsaturated SH radicals which combines with metal in circulation , thus tissue enzymes are spared
- It's Useful in cases of Arsenic, mercury, copper, bismuth, gold etc
- Dose: 3-4 mg/kg BW as a preparation of 10% with 20% Benzyl benzoate in arachis oil given deep intramuscular (may cause embolism on I.V. inj.) 4 hourly for first 2 days followed by twice daily for 10 days

## E.D.T.A.(Ethylene diamine tetra-acetic acid)

- It combines with ( $\text{Na}^+$ ) sodium to form  $\rightarrow$  sodium salt  
and then with ( $\text{Ca}^{++}$ ) calcium to form  $\rightarrow$  disodium calcium edentate  
which combines with free metal and  $\rightarrow$  inactivates it biologically
- It is best chelate for lead
- Dose : for adults 1gm twice daily at 12 hour interval slow I.V.  
Injection mixed with 5% glucose saline

## **Penicillamine**

- It has stable SH radical which combines with free metal
- Dose: 30mg/Kg BW/Day in 4 divide doses for 7 days

## **Desferroxamine**

- It is specific antidote for iron
- Dose: 8-12 gm orally
- For absorbed iron 2gm I.V. with 50% laevulose solution