

poison

substance which when administered / inhaled or ingested, is capable of acting deleteriously on human body

Toxicology

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POISON VS MEDICINE

legally

⇒ with what intend the thing is given to a person

⇒ if u give a poison to save the life → its medicine

⇒ e.g. morphine (opium's active ingredient)

(a poison)

can be given to a cardiac patient for pain (but in therapeutic doses)

Medically,

it is

the

DOSE

⇒ when same morphine is taken by the addicts, may cause toxicity to the body

OR
may be given by another person with the intend to harm

↓
becomes "poison"

Toxicology

It is the science which deals with poisons with reference to their sources, properties, mode of action, symptoms which they produce, lethal dose, nature of fatal results, treatment, methods of their detection & estimation and autopsy findings.

Forensic toxicology

it deals with the medical & legal aspects of the harmful effects of poisonous substances on human body.

Paracelsus

considered to be the father of modern toxicology

said:-

"It is the dose which decides

btw medicine
& poison."

History

Toxon:

ترسان
(toxon)
toxon
(ترسان)

Toxeuma:

arrow

Toxon:

a poison which was
applied on the tip of
arrow
to
kill animals/humans

Imp

Classification of Poisons

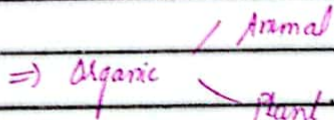
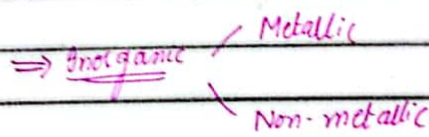
Based on

1) Nature of Poison

① Corrosives :- cause corrosion / ulceration (when come on contact with skin or mucus membranes)

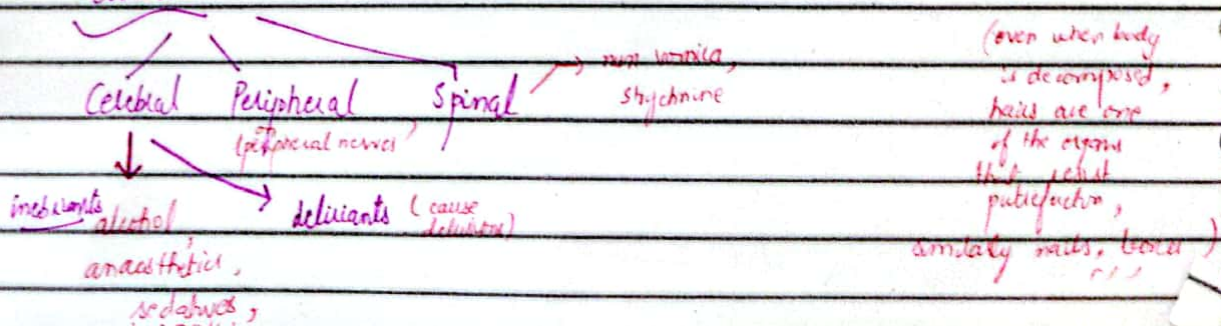
- Mineral acids (sulphuric acid, nitric acid, HCl, HF)
- Mineral alkalis (Na, K, hydroxides, carbonates)
- Organic acids (carbonic acid, oxalic acid, acetic acid, vegetable acids, salicylic acid, hydrocyanic acid)

② Irritants :- cause redness, irritation, inflammation of the tissues



⇒ Mechanical → diamond dust, chopped hairs → to cause blockage of intertices, dried sponge

③ Neurotics :- act on the nervous system



④ Cardiac poisons:-

digitalis, stramonium,
aconite, nicotine

⑤ Asphyxiants:- gases

CO₂, CO, war gases,
tear gases,
sewer gases

⑥ Miscellaneous:-

pharmacological agents: paracetamol,
barbiturates, anti-depressants

② Manner of use:-

① Stupefying poisons → for purpose of robbery...
biscuits etc given on buses/stands
↓
become unconscious

② For malingering (कठोर) symptoms (1)
(रोगी को चलाकर) →
plague
karma
for medical leave...

opium ① Suicidal
cardiac poisons, hydrocyanic acid,
cyanide, phosphorus

② Homicidal

③ Accidental

ideal suicidal poison: cheap, easily available,
capable of being administered in any
food/drink,
pleasant taste, no repulsive
smell,

Storage ---
Animal bites ---
Chemicals in industry ---

small lethal dose,
short lethal period,
preferably painless

ideal homicidal poison:-

cheap, easily available,
colourless, odourless,
tasteless,

capable of being administered in
any food, drink or drug without
causing any suspicion ... PTD

(opium is
ideal
suicidal
poison
↓
v. painless
(death
becomes
unconscious &
death in
fitting...)

hydrocyanic acid → v small fatal period, in minutes

opium → addicts know toxic dose less well, use chronically, slightly more than therapeutic dose to have euphoric effects etc...

The symptoms should resemble any natural disease or serious illness. Lethal dose should be small, latent period sufficiently long to permit the poisoned to escape safely.

There should be no antidote & no possibility of its detection either at autopsy or by laboratory methods

(arsenic → v common)

③ Source of Poisons:

① Household poisoning (used for domestic purposes)
e.g. phenol, rat pills, aluminium phosphide pills in wheat (eggs)

② Industrial poisons

③ Agricultural poisons

④ Drugs & medicines

causes diarrhoea (don't make any suspicion) → for treatment of obesity
↓
job & no job to death to job
↓
no medicine is effective

Causes of Accidental Poisoning

(Domestically, industrially)

- ① Carelessness in the storage, (keeping poisonous & nonpoisonous substances together)
- ② Greater use of chemicals in industry & for household purposes
- ③ quack remedies

TYPES OF POISONING

1) Acute poisoning:-

when someone takes an excessive dose

(first attempt hai hi poisoning ho gai)

small doses over short period of time (max. 2-3 days)

2) Chronic poisoning:-

repeated, small doses, over long period of time

e.g. heroin

(at the end multi-system failure & death)

(months, year or years)

3) Subacute poisoning:-

it includes both types of poisoning symptoms

(acute + chronic)

- diff. types of poisons are there in which subacute type of poisoning is common

4) Fulminant poisoning:-

An excessive large dose of a poison that may result in death even without producing any symptoms

TOXICITY RATING

Rating of poisons which is based on the quantity of poisons required to cause fatality/death.

(minimum quantity)

↳ upto 6

6 → super poison / super toxic

5 → extremely toxic

4 → v. toxic

3 → moderately toxic

2 → slightly toxic

1 → non-toxic.

(1/2) → standard

eg. cyanides
quantity of poisons less than 5 mg/kg body weight

toxicity of water occurs when it is taken more than 15g/kg body weight

water intoxication

↳ but relatively non-toxic

5 → extremely toxic

5 to 50 mg/kg

4 → v. toxic

50 to 500 mg/kg

3 → moderately toxic (500 mg to 5 g/kg)

2 → slightly toxic (5 g to 15 g/kg)

1 → non-toxic (more than 15 g/kg)

Routes of Administration:

1) Enteral:- (mouth / anus)
expose to enteral mucosa

2) Parenteral:-

- by injection (IV / SC / intracerebral / intradermal)
- by inhalation (through resp. tract)
- by external application
- natural orifices (eyes, nose, vagina.....)
- sublingual route

Actions of the poisons

1) Local action:- e.g. (acids, alkalis) → wherever come in contact with body, cause damage, visible to naked eye examination

acids → local, non-specific,
local & remote combined

(corrosion/ulceration / irritation / redness / erythema / hyperemia)

2) Remote action:- ^{but specific}

"when the poison gets absorbed in the body / into the system, it then acts on various systems."

e.g. strychnine acts on the spinal cord (remote action)

(phosphorous acts specifically on the liver)

- cardiac poisons
- opium -- on brain
- asphyxiant (like gas)

(various poisons have diff. affinity diff. systems)

irritants → act locally on GIT

3) General action / Non-specific action:

some poisons .. not specific action → non-specific effect

e.g. do shock (generalized)

4) Local & remote combined action:

some poisons effect locally e.g. detoxification in liver .. so action damage, kidneys sei excretion .. " " "

e.g. carbonic acid, phenol, malic acid .. remote + local

when ingest locally damages

(localized remote)

5) General action:

"when a poison acts on 2 or more systems (poor body ko target)"

e.g. arsenic, lead, phosphorous, antimony, mercury (metallic poisons)

then absorption distant organs ko bn. involve .. blood, liver, kidneys etc.

Lead leads 200 yrs back made of lead, now they are made of graphite not poisonous

-chronic lead poisoning skin, resp. system, excretory, reproductive, eyes

Factors Modifying Actions of Poisons.

1) Dose :-

"smaller the dose, the effect is therapeutic"

&

"larger dose will cause toxicity"

However, there are certain exceptions to this rule :-

① Idiosyncrasy (inherited intolerance)

eg. mushrooms, eggs, milk
quinine, opium,
severe symptoms appear at once
severe diarrhoea, fever, rigor, chills

② Allergy / hypersensitivity rxn

alk dafa exposure ho jai,
next time phir hoto

(cauz of previous exposure of the substance)
on next exposure, more intense symptoms

③ Habit cigarette smoking

diminishes the effects of poison

Habit vs Addiction → physical + psychological dependence

کارت ... نہی
کرت اور نہی
efunction kar sakta)

کرت نہی
functions ni hon gai,
withdrawal
symptoms appear

alcohol → addiction

① Synergism

two things which potentiate / augment the effect of each other & produce toxic symptoms

e.g. alcohol & barbiturates

if taken in non-toxic doses simultaneously, they produce toxic effects

② Additive effect

when the total response is more than the sum of individual actions

e.g. $2 + 2 = 8$

(SYNERGISM)

total response

is equal to

the sum of individual actions

$2 + 2 = 4$

③ Cumulative poisons

some poisons are excreted from the body v. slowly, tend to accumulate inside the body & when reach up to a specific threshold, poisoning occurs.

slow poisoning

arsenic is v. common

non-toxic doses mean these these details

↳ they show symptoms slowly, no suspicion arises

abrupt, adverse action

2) Form of poison:-

• Physical state:-

- Poisons ^{are} given in liquid / fluid form,
gaseous (vapours)
IV etc...
kann slow
work v. early ... inhale & action starts

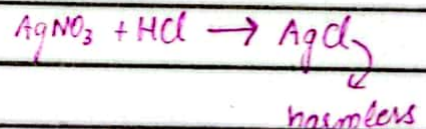
- Solids (fine powder, coarse powder)
sub set slow

• Chemical combination:-

(Synergism)

+
some poisons when chemically combined, effect is
nullified
e.g. acids + alkalis ... neutralize

• Mechanical combination:-



(acids + alkalis)
strong acids / alkalis diluted in
water

now acid ... irritant ... (ulceration / erosion starts)

dilute ... so only irritation / inflammation ...

- All alkaloidal poisons (strychnine, morphine)

when combined with activated charcoal
become inert

3) Method of Administration :

⇒ most speedy route is inhalation / IV

↓
slower is IM, S/C, oral ingestion

↓
more slower → application on intact skin

⇒ some poisons when given through diff. routes, act differently

snake venom

snake bite... S/C injed → tonicity

if ingest → harmless ... GIT → aids digest it

cocaine

→ addicts snuff / inhale

apply on skin /
eat, ingest

→ tonic effects
(delirious, convulsions)

if injected
for

therapeutic
purposes

works as local anaesthetic

4) Condition of the body:

1) Age:

→ in children & old, effect of poison is more.

as children → not good immune system,

BBB not developed enough,

drug metabolizing enzymes not
completely developed

2) State of health:-

eg. cardiac patient (CAD)

cannot stand any suffocative environment

agee 50% bhi CO hi conc. in blood

causes death of the patient

healthy adult
can tolerate
up to 50-70%
% conc. of CO

opium

cause of death → resp failure

asthmatic patients mein bahut jaldi effect

small amount can cause the death

mercury

patients with kidney disease

3) Sleep:- (rest ... metabolism is at its lowest rate)

if someone ingests poison & then sleeps ...

toxicity will come
a bit late

as
slow
absorption

effects will come slowly.

Fate of the Poisons in Body:

"Naturally, any poison (unless it is in small amounts)
(or given in diluted form)
NATURAL RESPONSE → majority of the poisons lost in the stools
(diarrhea) or in vomiting."
some of the times

ONCE ABSORBED:

① Excreted: After absorption, it may also get lost from the body in diarrhea or ~~it~~ through stools

② Metabolized: either partially or completely metabolized inside the body.

③ Biotransformation: poison gets converted into active form inside the body then affects the body.

e.g. lead carbonate ... not poisonous

when ingested - in stomach reacts with

HCl
converted to active form & causes toxicity

OR
AFTER ABSORPTION CHANGES COME

⇒ some is partly metabolized, some remains in original form
intermediate products

✓ excretions in urine / bile can be detected

(4) Stored in the bones :

sometimes poisons e.g. arsenic

when they're eliminated from rest of the body

can be found in

skin, nails, hairs
(appendages)

or
In The Bones

(metallic
poisons can
be
found
long
time
after the
episode of
poisoning)

Diagnosis of Poisoning

⇒ LIVING

• Acute :

⇒ SYMPTOMS appear sudden after the ingestion of
suspected food / fluid / medicine.

e.g. nausea, vomiting, diarrhoea, pain abdomen,
flushing of the face,
congestion in eyes,

pinpoint pupils / dilated pupils,
froth can come,
cyanoosis,
unconsciousness,
delirium,
coma,
CNS affected ... wrist or foot drop

⇒ **SEVERITY**

all symptoms may increase in severity &
either the death of patient
occurs or he recovers.

⇒ **DETECTION**

when the patient is presented with poisoning symptoms
in casualty, stomach wash is performed
↓
the fluid extracted is sent for the chemical examination
to detect poison

⇒ Also in urine & blood & stools, poison can be detected.

- Chronic :

⇒ **SYMPTOMS**

slow, gradual symptoms

↓
e.g. GIT irritation,

whenever takes suspected food / fluid / medicine, episode
of nausea, vomiting, diarrhoea, abdominal pain

↓
if not given for sometimes, symptoms disappear

undiagnosed episodes of nausea, vomiting, diarrhea, abdominal pain
gradual deterioration of health

⇒ **SEVERITY** always exacerbation & severement of symptoms occurs when the suspected food is taken & in b/w the periods patient is completely healthy.

⇒ **DETECTION** can be detected in urine, blood, vomit.

⇒ gastric lavage is not done in chronic poisoning.

⇒ **DEAD**

① Hx ② Examination ③ Investigation

① **Hx**: (circumstances in which poison was given or taken)

① was there any Hx of purchase of the poison by victim or not.

② was there any Hx of quarrel

③ any financial worries

② Autopsy / PM examination :

① SMELL most of poisons emit diff. types of smells.

when the
Dr. enters
the
mortuary
where
the body
is lying,

immediately
he can
feel
that smell...

especially on
opening the body

e.g. organophosphorus → garlic smell /
kerosene like smell

potassium cyanide → bitter almond like
smell
↳ deadly
bitter taste

H_2S → rotten egg like smell

alcohol → sweetish smell

paraldehyde → fishy smell

② ORIFICES

mouth, rectum, vagina... all these should be checked...
some poison may be detected.

③ FROTH (v. common symptom of poisoning)

↳ any poison which affects resp. tract, secretions ↑
mucus ↑

come out of
mouth & nose

④ PM Lividity

discoloration of skin after death

body after death fixed position mein pati rahay

Normal colour of lividity is bluish purple
(CO_2 ki wajah se)

usually develops in 3-4 hrs after death

In poisonous cases, colour changes

eg. opiate poisoning → black
phosphorus " → yellowish
cyanide " → pink
CO " → bright red

⇒ Internal examination:

① Smell

② - changes in resp. tract

" GI tract ... ulceration

⇒ stomach contents

→ sent to lab for examination

Colour of mucous membranes changes

usually acids... greyish color then becomes black

nitric acid → orangish color

⇒ Chemical analysis:

Presence / detection of poison in the
parenchyma of the organs of deceased

the MOST ROBUST
INVESTIGATION THAT
CONFIRMS THE
DIAGNOSIS

Duties of Doctor In case of Poisoning

① Preliminary Particulars:

(must be noted by the doctor)

- Name
- Age
- Sex
- Address
- Brought by whom
- Date & time of examination of victim/dead

② Treat the patient

PRIVATE CLINIC

→ if came alive, & the Dr. is certain that it is suicidal/accidental poisoning

↓
not required to inform the authorities (like police/magistrate)

(can treat)

BUT "PROPER RECORD KEEPING"

COLLECTION OF SAMPLES

for chemical examination.

stool, blood, stomach wash
urine, vomit
jo us hi presence
mein paas ho
ghai sa
na k hain

if it is confirmed that it is a case of homicidal poisoning

then the duty of the Dr. is to inform the police

phir zyada hai doctors treat ni karhay

refer to tertiary care
hospital for treatment

but it
becomes a
police case

⇒ if the patient is dying

duty of Dr. is to record the

DYING DECLARATION

جس زبان میں کہے گا
نوٹ لے گا

what the patient says about his
cause of death,
circumstances of his death

sealed & sent to the magistrate or police

⇒ if death occurs,

don't issue

DEATH CERTIFICATE

⇒ after the PM examination, if
confirm report comes
from lab --
then cause of
death "illud"

duty of Dr.
to inform police /
magistrate.

⇒ IN PUBLIC HOSPITAL

each & every case
(suicide / homicide / accidental)

police is informed,
to come & investigate
& treat.

Usually
emergencies to treat
hai itay... & police aa hai
investigations haihi..

Law Sections:

① 284 PPC

Negligent conduct w.r.t. poisonous substance
(gla)

in storage of poison; may pose danger to human life
public to expose

6 months
imprisonment OR fine
OR BOTH

② 336A PPC

Hurt caused by corrosive substance

LIFE
IMPRISONMENT
OR

eg. acid throwing

336 B PPC → Punishment

14 years imprisonment & 2 million fine

③ 337-J PPC

(disease/death/injury)
causing hurt by mean of poison

اس کی سزا الگ

poson دینے کی سزا

10 yrs. imprisonment