

## FORENSIC MEDICINE

Notes compiled by PJ Louw for LLB from the UNISA Study Guide & other material. Whilst care has been taken to ensure accuracy you are advised to also verify facts independently.

### DROWNING

**Body is recovered from water. Did the person drown or were they killed on shore?**

Study unit 3; study unit 8; study unit 11 (alcohol) also dry drowning.

#### TYPICAL PRESENTATION:

##### 8. Drowning

- » Immersion **without** aspiration → Drowning **with** aspiration
- » (25) Discuss all aspects of drowning – incl. signs of submersion +  
determination of period of submersion

#### DROWNING - NATURAL CAUSES

- **before** falling into water (person suffered heart attack, died & then fell into water)
- **while** in water (person suffered heart attack & died)

#### DROWNING - UNNATURAL CAUSES

- **before** falling into water (gunshot wound)
- **while** in water (multiple injuries after being hit by boat or bitten by shark)

#### SUBMERSION EFFECTS

- **effects of submersion** other than drowning

**Person may die with / without aspiration of water. What are causes of death in 2 groups?**

- » **With aspiration of water** – person inhales water
  - death caused by <sup>1</sup>hypoxia/anoxia or <sup>2</sup>fluid & electrolyte disturbances
  - fluid electrolyte more prominent in fresh water drowning than in salt-/seawater
- » **Without aspiration of water** - possible causes:
  - <sup>1</sup>neurogenic heart arrest / <sup>2</sup>hypothermia / <sup>3</sup>laryngospasm / <sup>4</sup>drowning with breathing apparatus (scuba diving)
  - diving accident incl. carbon-dioxide poisoning / decompression disease & barotrauma

## SIGNS of SUBMERSION

### 1) Maceration of skin

- » Develops rapidly in warm water / longer to develop in cold water.
- » Skin pale / wrinkled “washer-woman's skin” - keratin layers become detached

### 2) *Cutis anserina* (condition non-specific) → skin looks like goose-flesh

### 3) Distribution of post-mortem hypostasis

**Still water:** body floats on abdomen with limbs facing downwards  
lividity present over legs / arms / anterior aspect of abdomen

**Moving water:** body constantly rolled  
hypostasis widespread - often pink in colour

### 4) Foreign material in airways & upper gastro-intestinal system

- » Sand / mud / plants often present

### 5) Partial breaking of rigor mortis

- » can be partially broken by wave movement

## PERIOD of SUBMERSION determination

- » Water temperature MOST IMPORTANT FACTOR determining appearance of body
- » Water pollution plays minor roll - sewage water higher temperature

## POST-MORTEM SIGNS → depends on post-mortem interval

### Some signs will disappear with time

#### 1) Foam in airways → (non-specific feature) – washed away

#### 2) Lung changes

- |                                    |   |  |
|------------------------------------|---|--|
| (a) <u>Pulmonary oedema</u>        | - | inhaled water present in lungs (lungs heavy & congested) |
| (b) <u>“Dry lung” drowning</u>     | - | pulmonary oedema ABSENT                                  |
| (c) <u>Over-inflation of lungs</u> | - | common condition - seen in association with              |

oedema

(d) Haemorrhages in lungs - caused by extreme attempts to inhale

3) **Haemorrhage in middle ear**

» (unreliable sign) - result of pressure of water on middle ear

4) **Stomach content**

» (unreliable sign) – water pressure sufficient to force water into stomach

5) **Cataleptic stiffening / cadaver spasm**

» indication that person was alive when falling into water

6) **Post-mortem trauma**

» Propellers of boats / shells / rocks can cause injury to submerged body

**Difficult to distinguish ante- & post-mortem wounds**

» blood washed from body - wounds appear clean

**CLASSICAL SIGNS of ASPHYXIA - Signs are non-specific**

1) Petechial haemorrhages → pinpoint haemorrhages occur on skin / eyes / thoracic organs

2) Congestion & oedema → foamy fluid in lungs (often seen with drowning)

3) Congestion & dilatation → of right heart chambers & increased fluidity of blood

4) Cyanosis → blue colour change on skin / lips (NOT ind of type of death)

» **NO single sign indicative of asphyxic death**

→ diagnosis depends on circumstantial evidence

**Pulmonary oedema:**

Pulmonary oedema means an excess collection of watery fluid in the lungs. The fluid collects in the many air sacs of the lung, making it difficult to breathe.

**“Dry lung” drowning:** Dry drowning occurs when a person's lungs become unable to

extract oxygen from the air, due primarily to: Muscular paralysis.

Puncture wound to the torso (affecting ability of diaphragm to create respiratory movement) Changes to the oxygen-absorbing tissues. Persistence of laryngospasm when immersed in fluid.

### **Over-inflation of lungs**

Excessive inflation or expansion, as of the lungs; over-inflation.

### **Haemorrhages in lungs**

**Pulmonary haemorrhage** (or "**pulmonary haemorrhage**") is an acute bleeding from the **lung**, especially in the upper respiratory tract and the trachea. When evident clinically, the condition is usually massive, associated with bleeding in other sites as well as more than one third of the **lungs**.

### **Petechial haemorrhages**

A **petechia** is a small (1 - 2 mm) red or purple spot on the skin, caused by a minor bleed (from broken capillary blood vessels).

### **Congestion & oedema / dilatation**

Increased venous pressure leads to congestion and oedema of tissues (especially the face) and marked lividity. - Dilation - the action of dilating a vessel or opening or the process of becoming dilated.

**Lividity** - can be a useful reaction in determining the position of a body at the time of death and even whether a body was moved within the first few hours after death. There are various forms of **lividity**. In a living person, a blow can result in the localized rupturing of cells and the pooling of blood .

**Oedema** - a condition characterized by an excess of watery fluid collecting in the cavities or tissues of the body.

**Cyanosis** - a bluish discoloration of the skin due to poor circulation or inadequate oxygenation of the blood.

## **POST MORTEM CHANGES - DROWNING / DISCARDING CORPSE IN WATER (SU 3)**

### **Specific manifestations of rigor mortis**

## CATALEPTIC STIFFENING (cadaveric spasm)

**rare form of rigidity** sets in when person dies during stressful period & somatic death sets in rapidly

- o Usually affects only 1 muscle group (ex. hand muscles)

**Body of person drowned person retrieved. Tree-branch tightly gripped in hand. How will you interpret this?**

- o EXAMPLE of CATALEPTIC STIFFENING → sometimes occurs when person dies during severe stressful period → **Indication that person was still alive when fell into water** (grabbed branch in survival effort)

**RIGIDITY due to COLD** - sets in when body is exposed to temperatures under 3,5 °C

- o Babies / Young children / Obese people - thick layer of fat → cold rigidity more prominent
- o When body later heats up true rigor mortis will set in

**Body - Bright rose colour** Cold temperature (body in refrigerator/cold water or hypothermic death)

**Oedema:** condition - excess of watery fluid collecting in the cavities or tissues of the body.

## LATER CHANGES POST MORTIM (After Death)

1. **Decomposition (putrefaction)**
2. **Mummification** (Namib desert / Mount Everest)
3. **Adipocere-formation** (Wax-like substance)
4. **Maceration** (process of AUTOLYSIS = spontaneous disintegration)
5. **Skeletisation** (all soft tissue has been destroyed due to exposure to elements – bleaching)

### 1. Decomposition (putrefaction)

- » **Sets in immediately** → Due to breakdown of body by enzymes → condition only visible at later stage

**ENZYMES AUTOLYSIS** can be from body itself.

(**Autolysis** - the destruction of cells or tissues by their own enzymes, especially those released by lysosomes).

**HETEROLYSIS** can be from other organisms

(**Heterolysis** - is the process of a body's soft tissue destruction by micro-organisms (bacteria, fungi and protozoa) and results in the catabolism of tissue into gases, liquids and simple molecules. (apoptosis induced by hydrolytic enzymes from surrounding cells)

» **Environmental temperature plays important role** → refrigerator - suppress process / warmth – accelerate process

warmth – accelerate process

## 2. **Mummification** → Namib desert / Mount Everest)

- Occurs in → dry hot + cold climates / → body lying in environment with high acid content
- Body of new-born - concealed in cardboard box (microbiologically sterile & putrefaction very slow)

## 3. **Adipocere-formation** (*Wax-like substance*)

- Water binds with body fat → transformation of body fat into soap
- Develops over long period & suppresses further decomposition of body → preserve wounds.

## 4. **Maceration** (process of AUTOLYSIS = **spontaneous disintegration**)

- Foetus dies intra-uterine → Contents of uterus is sterile → NO putrefaction

(1) *skin softens*

- (2) large fluid-blisters appear
- (3) skin strips away
- (4) at same time - internal organs soften (5) bones loosen from attachments

**5. Skeletisation** (After all soft tissue has been destroyed due to exposure to elements – bleaching)

- Skeleton useful for identification of deceased & determining how long person has been dead

## DETERMINATION of POST- MORTEM INTERVAL

### TIME OF DEATH

- **ENTOMOLOGY**
- **STOMACH CONTENTS**
- **DECOMPOSITION**
- **PUTREFACTION in SUBMERGED BODY**

#### » **Important to determine time of death**

- Immediately / soon after death often easy
- difficult after putrefaction sets in (many factors come into play)

<b>TABLE = General rules to apply when examining corpse in 1<sup>st</sup> few hours after death.</b>	First 3 hours	Body warm & flaccid (primary muscle flaccidity)
	3 to 8 hours	Body warm & stiff (rigor mortis has set in)
	8 to 36 hours	Body cold & stiff
	After 36 hours	Body cold & soft (flaccid) (2 <sup>nd</sup> dary muscle flaccidity has set in)

### ENTOMOLOGY

- Type of insects & phases of life cycles found on body (e.g. eggs / maggots) (Insects)
- Different insects found in different geographic areas

## STOMACH CONTENTS

→ **NOT indication to post-mortem interval** - digestive processes end after death

**Stomach contents can reveal following info at post-mortem examination -**

(a) what person ate before death

(b) approx. how long he lived after eating

→ Stomach contents digestion & emptying vary considerably & can be unpredictable

## DECOMPOSITION / PUTREFACTION in SUBMERGED BODY

**Slower in liquid medium than in air**

» **Rate of putrefaction in submerged body determined by -**

1. Temperature of medium

→ Putrefaction more rapidly in warm than cold medium

2. Nature of medium

→ Putrefaction more rapidly in sewage water (warmer) than in fresh water

(colder)

→ Putrefaction more rapidly in fresh water than in seawater.

3. Movement of liquid

→ Putrefaction more rapidly in stagnant water.

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## ASPHYXIA (SU 8)

### ASPHYXIA

» Deaths due to lack of oxygen (Drowning / Carbon-monoxide poisoning)

1. **Suffocation**
2. **Smothering** (External)
3. **Choking** (Internal)
4. **Restriction of respiratory movements (mechanical asphyxia)**
5. **Pressure on neck**
6. **Hanging** → Ligature strangulation with FORCE APPLIED by BODY WEIGHT
7. **Auto-erotic deaths** → Usually occurs in young middle-aged males
8. **Drowning** → Immersion **without** aspiration → Drowning **with** aspiration

### CLASSIFICATION of CAUSES of ASPHYXIC DEATHS

#### 1. Suffocation

- **Decreased atmospheric oxygen pressure**  
(decompression of aircraft cabin at high altitude)
- **Consumption or displacement by inert gasses**  
(nitrogen [N<sub>2</sub>] / carbon dioxide [CO<sub>2</sub>]) (wine tanks / silos)  
(Inert gas asphyxiation)

**During cleaning of wine tank - worker dies while climbing into tank. What is probable cause of death?**

**This is an example of suffocation due to inhalation of fermentation gasses in wine tank**

- Oxygen decreases & carbon-dioxide are produced.
- Fermentation produces carbon dioxide gas – about 40 times the volume of grape juice. Excessive carbon dioxide in the air can cause.

## 2. Smothering (External)

- **Obstruction of external airways** (mouth / nose- Gagging) (accident / suicide / murder)

## 3. Choking (Internal)

- **Obstruction of internal airways**
  - » (throat / windpipe) (severe allergic reactions / regurgitation)
  - » **Risk of vomit** – person with high blood alcohol level with stomach contents in airways at post mortem

## 4. Restriction of respiratory movements (**mechanical asphyxia**)

- **Movement of chest restricted**
  - » compression diaphragm muscles prevented inspiration
- **Upside-down position**
  - » pressure of intestines on diaphragm limits inhalation - **develops asphyxia & dies**

## 5. Pressure on neck

- (5) **List mechanisms which may cause death in case where physical pressure is applied to neck?**

In cases of death due to **violence to neck** → **neck structures must be examined carefully**

### 1) **Airway obstruction**

- » **direct pressure on throat & windpipe** can obstruct airways
- » results in **hypoxic/anoxic anoxia**
- » base of **tongue displayed backwards against throat**

- 2) **Compression of jugular veins in neck (common)**
  - » leads to **stagnation of blood flow to & from brain**
- 3) **Compression of carotid arteries (less common – protected by bone)**
  - » results in **stagnation hypoxia**
- 4) **Neurogenic stimulation (NB\* cause of death)**
  - » Alcohol / hypoxia / drugs cocaine / anxiety & fear can sensitise receptors of carotid arteries in neck & cause exaggerated response
  - » **Neurogenic cardiac arrest - more common in throttling** fingers dig below muscles & **stimulate receptors**) & hanging (cord knot often lies directly over receptors) than in strangulation (ligature usually lower down on neck away from receptors)
  - » **Blows to neck - can also stimulate receptors directly or indirectly** (martial arts)
- 5) **Combination of above mechanisms**
  - **hypoxic anoxia** - brain injury is caused by a reduction in oxygen supply to the brain
  - **anoxic anoxia** - brain injury when there is a complete lack of oxygen to the brain.
  - Both conditions can occur despite sufficient blood supply to the brain.

**Person throttled with hands during assault. What could be causes of death?**

**(a) Throttling** (strangulation with hands)

- » dynamic process - hands tend to change grip continuously & therefore combination of above conditions could play role
- » **Relatively common occurrence** → domestic murders / sex-associated murders / child murders
- » **Physical advantage needed** to overpower & throttle (Females seldom throttle victims – except children) & men don't often succumb to throttling
- » **Post-mortem signs** – local skin wounds / abrasions by fingers & nails (collect material under nails)

- » **Damage to deep-lying structures** - haemorrhage to soft tissue & muscles of neck / damage of vascular structures / fractures of bone & cartilage of neck / haemorrhage into thyroid gland may occur

During application of pressure to neck, death may be caused by following

- |                                   |                             |
|-----------------------------------|-----------------------------|
| (a) airway obstruction            | (b) occlusion of neck veins |
| (c) occlusion of carotid arteries | (d) neurogenic stimulation  |
| (e) combination of above          |                             |

### **b) Strangulation**

**(Force applied to neck with ligature or rope → BODY WEIGHT plays NO role)**

- **Ligature**
  - » wrapped around neck / can be knotted / can cut into skin / can be wound-up
- **Post-mortem findings**
  - » skin lesions & scratches / ligature mark / impression abrasion by ligature / ligature may be imbedded due to swelling or oedema of surrounding soft tissue / mark usually horizontally round neck relatively low down or just above or below Adam's apple
- **LESS DAMAGE to neck structures than in throttling**
- **Asphyxia signs**
  - » petechial haemorrhages & oedema often pronounced above ligature.

### **(c) Neck hold grip**

**(12) Discuss neck grips as a cause of death**

**“carotid sleeper”** - *A chokehold restraint used to subdue overactive, unruly, violent, or inebriated subjects, to prevent them from harming themselves or others. It acts by (1) reducing blood flow to the brain via the carotid arteries and blocking venous return via the*

*jugulars, and (2) bilateral compression of the carotid baroreceptor, causing asystole or marked bradycardia, reduced blood pressure, and syncope; under controlled conditions, non-combative subjects lose consciousness within 6–15 seconds. The sleeper hold is safer than the air choke.*

(c) **Neck holds - NECK HOLD GRIP** = “carotid sleeper” –law enforcement means of incapacitating person

○ **Hold intended**

- » to impede blood flow in **carotid arteries** by **pinching effect of arm & forearm**
- » **Result** in temporary loss of consciousness

○ **If properly applied**

- » airway unaffected while **carotid arteries** are compressed

**ARM BLOCK / BAR ARM CONTROL - could be dangerous / Risk factors**

- Forearm placed over front of neck with **force applied backwards** → causing occlusion of airways
- **Base of tongue** forced back violently & obstructs throat
- **Thyroid cartilage** could be damaged
- During struggle to escape from hold → **carotid sinus** can be stimulated
- **Risk factors** can lead to death during application of neck hold

Which **RISK FACTORS** may increase risk of death during **application of neck grip**?

**Risk of neck grips increased by following factors**

(a) ischaemic heart disease

When arteries are narrowed, less blood and oxygen reaches the **heart** muscle. This is also called **coronary artery disease** and **coronary heart disease**. This can ultimately lead to **heart** attack. Ischemia often causes chest pain or discomfort known as angina pectoris.

- (b) psychiatric illness
- (c) epilepsy
- (d) drugs, alcohol & certain medication
- (c) physical activity preceding application of pressure – increases sensitivity of carotid sinus due to adrenalin sensitisation of sinus.

## 6. Hanging

**Ligature strangulation** with **FORCE APPLIED** by **BODY WEIGHT**

**Not necessary that body hangs free** → part of body could still be in contact with floor.

- **Accident or suicide** → seldom used in murder cases **except** in situations of premeditated execution
- **Post-mortem signs** → localised with ligature mark on neck / friction abrasion similar to mark caused by whip / seldom goes right round neck **except** if knot is sliding knot
- **Neck structures** → less damaged than with throttling
- **Hypostasis** (post-mortem colour changes) can occur in arms & legs if body hanged for some time
- **Usually no signs of asphyxia** → death due to **neurogenic cardiac arrest**
- **Execution by hanging** → body drops farther than in suicide
- **Severe mechanical disruption of neck structures**

**Deaths as a result of hanging are usually caused by neurogenic cardiac arrest** (vasovagal inhibition), and not by the tightening of the noose around the neck with obstruction of the airway

## 7. Auto-erotic deaths

- » Usually occurs in young middle-aged males

Body of young man found in weird circumstances - **rope with sliding knot around neck** - body naked & pornographic material present on scene. **With what phenomenon are we faced here? Example: of auto-erotic death**

- » **Cerebral hypoxia**>(\*hypoxia - deficiency in the amount of oxygen reaching the tissues).
    - causes **erotic hallucinations**
    - hypoxia induced by **pressure to neck or mask over face**
  - » **Usually ligature around neck**
    - placed to loosen as person becomes unconscious
  - » **Important - inspect scene of death** for other sexual practices (bondage / transvestism / fetishism)
  - » Erotic literature often found
    - deaths unplanned/unforeseen – **NO suicide letters**
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## TOXICOLOGY & ALCOHOL / DRY DROWNING (SU 11)

### TOXICOLOGY & ALCOHOL

(30) Write essay on general principles of TOXICOLOGY & POISONING

#### cytotoxic anoxia

**Cytotoxicity** is the quality of being toxic to cells. Examples of toxic agents are an immune cell or some types of venom, e.g. from the puff adder (*Bitis arietans*) or brown recluse spider (*Loxosceles reclusa*). - causing the an absence of oxygen - **anoxia**

### CLASSIFICATION

Toxicological substances (incl. medicines) can be classified according to

<b>Chemical characteristics</b>	→ e.g. organic / inorganic
<b>Mode of action</b>	→ e.g. corrosive / irritant
<b>Target organ</b>	→ e.g. lungs / heart
<b>Intended use</b>	→ e.g. solvent / insecticide
<b>Field of use</b>	→ e.g. agricultural / industrial
<b>Origin</b>	→ e.g. plant / bacterial / fungal

### FACTORS AFFECTING TOXICITY

- 1) **Intensity of reaction** → ranges from most insignificant to death
- 2) **Dose** → amount administered & frequency of administration
- 3) **Rate of absorption** → influenced by route of administration (by mouth / intravenously / inhalation)
- 4) **Rate of elimination** → accelerated by vomiting / diarrhoea / accelerated metabolic pathways



- 5) **Specific properties of subject** → include hypersensitivity / various diseases
- 6) **Physico-chemical nature of poison** → solid / gas / liquid / soluble

### **DIFFERENCE BETWEEN THERAPEUTIC & LETHAL DOSAGE**

There are **interpersonal + intrapersonal differences** in reaction to a given dose.

- EFFECTIVE DOSE** → where 50% of individuals will experience a therapeutic effect of the dose
- LETHAL DOSE** → where 50% of individuals will die
- TOXIC DOSE** → where a specific toxic effect other than death is reached

**\*\*Closer these doses are to 1 another → the higher the risk for toxic reactions**

### **POISONING**

substance resulting in harm or death when absorbed by living organism

### **POISONING CAN BE**

- 1) **acute**                      2) **sub acute** or                      3) **chronic**

### **MANY SUBSTANCES**

- » **occurring naturally or in synthesised** form exhibits a poisonous property

### **MEDICINES & BEVERAGES**

- » can result in poisoning **if used in excess** or inappropriately

### **COMBINATION of INNOCUOUS SUBSTANCES**

- » could also have **harmful effect**

**SIGNS, SYMPTOMS & INTENSITY vary in person** → discomfort over **long time** / appearing **suddenly**

## HOW is POISONING PROVED?

### POISONING proved from

- (1) (i) **symptoms & signs displayed** by victim during lifetime +
  - (ii) **chemical analysis** to test for presence of particular poison
- (2) **Post-mortem examination**

#### Conducted in order to:

- exclude certain diseases
- chemical analysis confirm nature & amount of poison
- indicative of condition of victim & what caused death

**Examination of internal organs & tissues** removed from body for chemical analysis

- **Liver** - can **destroy or modify poison** or **poison can damage liver**
    - can lead to symptoms & signs indicating liver disorder
    - **often no clinical evidence** liver damage due to disease or poisoning
  - **Kidneys** - often sent for analysis in case of deceased
    - **Urine** in case of living person
  - **Stomach + contents** often analysed
    - **Vomit** examined in living patient
- (2) **Poisoning**
    - **Heavy metal poisons** found in tissues
      - evaluated carefully + possibility of environmental contamination
    - **Arsenic**
      - acts on almost every system of body
      - can be mistaken for many diseases
    - Often **virtually negative findings at post-mortem examination** which arouse suspicion about poison as possible explanation of cause of death
    - **Negative post-mortem finding** becomes VERY IMPORTANT FACTOR to investigate case of suspected poisoning

**(3) Evaluation:**

- (i) **Clinical history**
- (ii) **post-mortem findings &**
- (iii) **results of any special investigations** - must be evaluated to arrive at conclusion

**ALCOHOL POISONING - (ETHANOL)**

**ETHANOL** (systematic chemical name for ethyl alcohol) a.k.a **ALCOHOL**

Ethanol, also commonly called ethyl alcohol, drinking alcohol, or simply alcohol is the principal type of alcohol found in alcoholic beverages:

- produced by the fermentation of sugars by yeasts - and -
- distilled to increase alcohol level

**MOST POTENT PSYCHO-ACTIVE ANAESTHETIC DRUG**

**legally available without prescription**

- Colourless / odourless / volatile substance which burns easily
- No taste / completely water soluble
- Often abused - resulting in acute intoxication / chronic alcoholism

**Discuss factors which may influence absorption of alcohol from gastro-intestinal tract?**

**ABSORPTION of ALCOHOL by the BODY**

**INGESTION** (most common) - absorbed into body **directly & unchanged** by process of diffusion

**ABSORPTION** - **proceeds immediately** in stomach & small intestine

**FACTORS INFLUENCING RATE OF ALCOHOL ABSORPTION**

- 1) **Peristaltic movement**
- 2) **Nature / composition / amount & strength of beverage ingested**
  - **Optimal absorption** occurs when beverage has **lower** (between 10 & 20%) alcohol **concentration**
- 3) **Contents of stomach & small intestine**
  - fatty foods / carbohydrates / proteins **prevent absorption**
- 4) **Medicines & other chemical substances** → influence peristalsis & speed of absorption

## METABOLISM & SECRETION of ALCOHOL

### About 85% to 90% alcohol **metabolised by liver**

- Rest **secreted unchanged** via lungs / kidneys & perspiration
- **Alcohol elimination**
  - » STARTS moment alcohol is distributed through body & reaches liver
- Alcohol eliminated at **constant rate**
  - » **average used** = 0,015g% per hour → called the B60 value
  - » **NOT affected** by cold / exercise / sleep or any other factor
- **Concentration** of blood alcohol **does NOT influence elimination rate**
  - » In practice rate will be constant
- Assumed that approximately
  - » 60% of ingested drink will be absorbed after 60 minutes &
  - » 90% after 90 minutes

## ALCOHOL-LEVEL ANALYSIS

- ★ **LIVING PERSON** **How will alcohol level of a living person be determined?**
- Determined by means of **VENOUS** blood sample
  - Any blood specimen can be used

- IMPORTANT to prevent contamination with alcohol-containing solutions during cleaning of skin

➤ Specimen

- to be collected in special test tube containing preservation solution

➤ Modern Breath-alcohol analysis

- used by law-enforcement as screening procedure at roadblocks with level of alcohol intoxication confirmed by blood analysis



**DEAD BODY**

**How will alcohol level of deceased be determined?**

➤ **Eye fluid** or **venous blood** may be used

- **Venous blood** to be obtained as far as possible from **heart / stomach / liver** (preferably from thigh)
- Cardiac blood NOT acceptable

➤ **Alcohol levels**

- routinely measured in ALL individuals older than 16 years who die unnaturally

**80kg female arrested** for alleged **driving under influence** of alcohol - blood-alcohol concentration = 0,14g% - She alleges to have consumed 3 glasses of white wine - last one 2 hours before arrest. **How will you confirm or refute her statement regarding alcohol consumption?**

**Or: (7) Write short notes on Windmark's formula, incl. Windmark's factor**

**WIDMARK FORMULA** can be used to calculate **specific blood-alcohol concentration** at given time

» **Formula is rough indication**

» **Body mass** of person also taken into consideration for calculation of formula

» **2 hours already passed**

➤ **can be accepted that all ingested alcohol had been absorbed**

**Legally acceptable blood-alcohol level = 0,05 g%** - Does any risk of danger & even death exist at blood-alcohol concentration **lower** than this legal limit?

## PHARMACOLOGICAL EFFECT

ALCOHOL = MOST POTENT PSYCHO-ACTIVE ANAESTHETIC DRUG legally available without prescription

## NERVOUS SYSTEM

**Alcohol causes impairment & damage to central- & peripheral nervous systems**

### EARLY STAGES of intoxication

- Loss of inhibitory effect accounts for behavioural changes loss of emotional restraint
- With alcohol levels as low as 0,05 g% - difficult to attend & respond to external stimuli

**Death could follow due to**

- depression of respiratory &
- later circulatory control centres

## MUSCULAR SYSTEM

**Detrimental effect on muscle activity**

- poor control due to central nervous system & decrease in impulse transmission

**False feeling of self-confidence**

- may increase RISK of getting involved in fight that can be fatal

## DEGREES of INTOXICATION - CLINICAL FEATURES

- lightly intoxicated
  - moderately intoxicated
  - heavily intoxicated
  - very heavily intoxicated
  - intoxicated to extent of being stuporous to comatose
-