MUSHROOM POISONING

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- Kind of food poisoning
- Toxin content depends on many factors (clima, part of mushroom ,…)
- Effect on the body depends on many factors and body condition
- How to make diagnose – case history, clinical symptoms, laboratory results, autopsy finding (pieces of the mushroom in the stomach or digestive tract)
- Importance of cooperation with mycologist

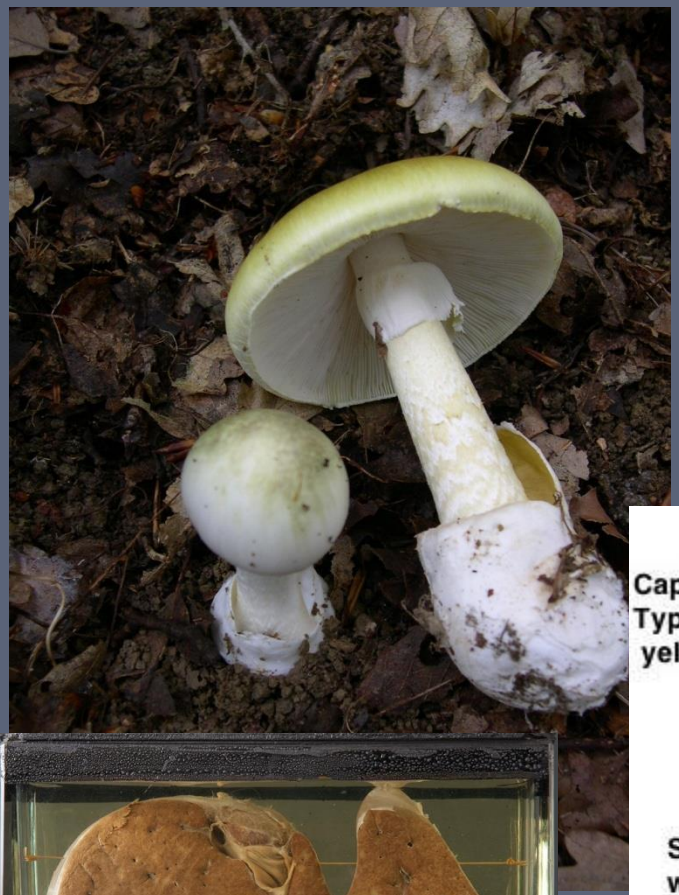
Amanita phalloides (death cap)

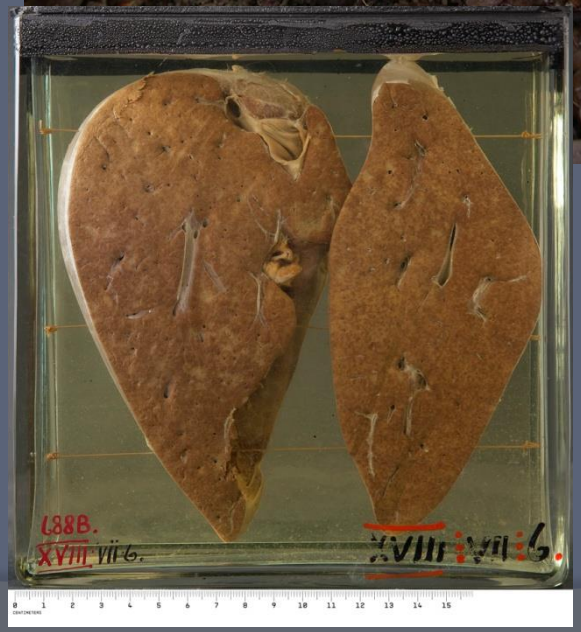
- one of the most poisonous mushrooms – confusion with another mushroom
- contains three main groups of toxins: amatoxins, phallotoxins and falolyzins
- **amatoxins**, especially α-amanitin, are mainly responsible for the toxic effects in humans, 10x more toxic than phallotoxins, thermostable
- inhibitors of syntesis of proteins in the cell, mainly RNA polymerase II, causing protein deficit and ultimately cell death, although other mechanisms are thought to be involved
- letal dose 1/3 or half of mushroom (50 g), 7-35 mg of toxin
- the liver is the main target organ of toxicity, but other organs are also affected, especially the kidneys
- **Three phases of poisoning:**

  Gastrointestinal (1-2 days), begin in 6-8-12 h, cruel pain of stomach, diarrhea with blood, nausea, vomiting, lead to dehydratation or dead at vulnerable individual

  Remision : 24 h, individual feel better but the liver demage begins

  Liver: after 3-4 days, symptoms of demage od liver and kidneys – renal failure, sepsis, metabilic acidosis, bleeding, blood clotting disorders
- therapy consists of supportive measures, gastric decontamination, drug therapy and, ultimately, liver transplantation if clinical condition worsens.
- autopsy finding: depends on period, inflamation of gastrointestinal system, congestion in parenchymatous organs, liver steatosis or necrosis, jaundice, bleeding on serosis



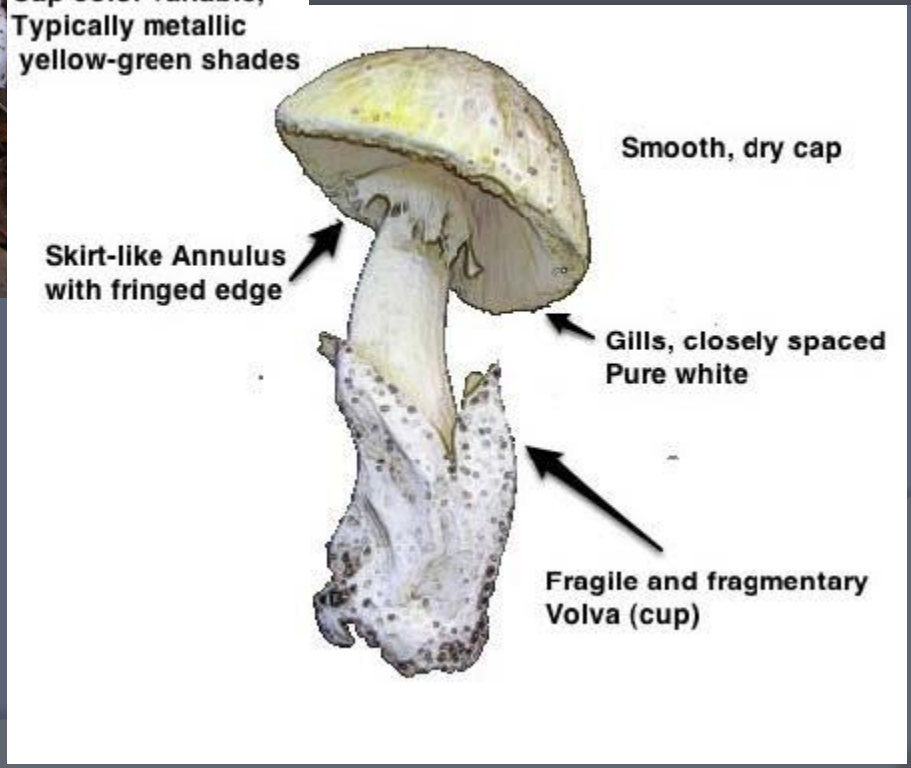


***Amanita phalloides*, commonly known as the death cap mushroom, is responsible for 90% of the world's mushroom-related fatalities.**

CLINICAL PRESENTATION IS TRIPHASIC:

6–24 HOURS	24–72 HOURS	4–9 DAYS
Dysentery phase	**False recovery phase**	**Hepatorenal phase**

Management of symptomatic patients includes supportive measures, promoting renal elimination of amatoxins, and early consultation with a liver transplant centre.

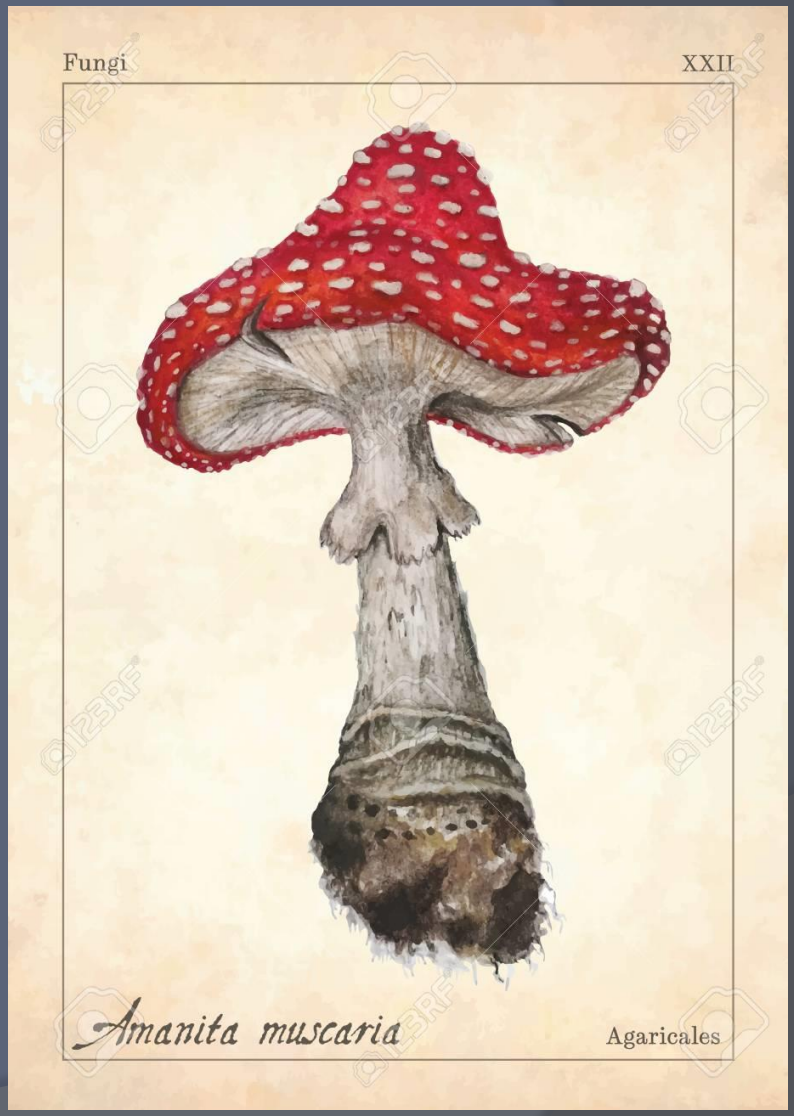


Amanita pantherina (panther cap)

- small amount of toxin **muscarin** (less than 5g/kg dry weight), ibotenic acid and muscimol, which are rapidly absorbed from the gastrointestinal tract
- Ibotebnic acid is metabolized to the toxin muscimol, which bind to receptors in the brain, causing disordered neurotransmission
- involving the central nervous system and presenting with hallucinations, confusion, agitation, seizures and coma (ibotenic or pantherina-muscaria syndrome)

Amanita muscaria (fly agaric)

- Toxin **muscarin**
- Milder course than in Amanita pantherina
- Letal dose approx. 15 caps
- fatal poisoning from ingesting this mushroom is extremely rare


Fungi
XXII
Amanita muscaria
Agaricales

Coprinopsis atramentaria (common ink cap)

- it is a widespread and common fungus found throughout the northern hemisphere.
- Consuming Coprinopsis atramentaria within a few hours of alcohol results in a **"disulfiram syndrome„** - facial reddening, nausea, vomiting, malaise, agitation, palpitations and tingling in limbs, and arise five to ten minutes after consumption of alcohol
- If no more alcohol is consumed, they will generally subside over two or three hours. Symptom severity is proportional to the amount of alcohol consumed, becoming evident when blood alcohol concentration reaches 5 mg/dl, and prominent at concentrations of 50–100 mg/dl. Disulfiram has, however, been known to cause myocardial infarction (heart attack).The symptoms can occur if even a small amount of alcohol is consumed up to three days after eating the mushrooms, although they are milder as more time passes. Rarely, a cardiac arrhythmia, such as atrial fibrillation on top of supraventricular tachycardia, may develop. Because of these effects, in some cases, the mushroom has been used to cure alcoholism.
- The fungus contains a cyclopropylglutamine compound called coprine.Its active metabolite, 1-aminocyclopropanol, blocks the action of an enzyme, acetaldehyde dehydrogenase, which breaks down acetaldehyde in the body. Acetaldehyde is an intermediate metabolite of ethanol and is responsible for most symptoms of a hangover; its effect on autonomic β receptors is responsible for the vasomotor symptoms.
- Treatment involves rehydration (fluid replacement) for fluid loss from vomiting, and monitoring for cardiac arrhythmias

Cortinarius orellanus (fools webcap)

- high toxicity - eating results in kidney fauilure, often irreversible
- common in Poland
- contains toxins, **orellanines,** resistant to boiling and drying
- after a long period without any symptoms (3-14 days), the patient presents with polyuria and severe renal failure
- headache, weakness, thirst, polyuria, anuria, may be bleeding to the stomach, intestine or brain
- treatment: hemodialysis

Psilocybe semilanceata (liberty cap)

- hallucinogenic mushroom
- produces the psychoactive compounds **psilocybin** and baeocystin
- the possession or sale of psilocybin mushrooms is **illegal** in many countries
- typical symptoms (30-60 minutes after use, 1 g) include visual distortions of colour, depth and form, progressing to visual hallucinations. The effects are similar to the experience following consumption of LSD, although milder. Common side effects of mushroom ingestion include pupil dilation, increased heart rate, unpleasant mood, and overresponsive reflexes.
- the effect on mood in particular is dependent on the subject's pre-exposure personality traits
- identical doses of psilocybin may have widely differing effects in different individuals
- somatic symptoms before psychotic, it lasts 4-6 h


HALLUCINOGENIC MUSHROOMS
Psilocybe semperviva
Psilocybe coerulescens var. mazatecorum
Psilocybe aztecorum
Psilocybe yungensis
Psilocybe mexicana
Psilocybe coerulescens var. nigripes
Psilocybe zapotecorum

FOOD POISONING

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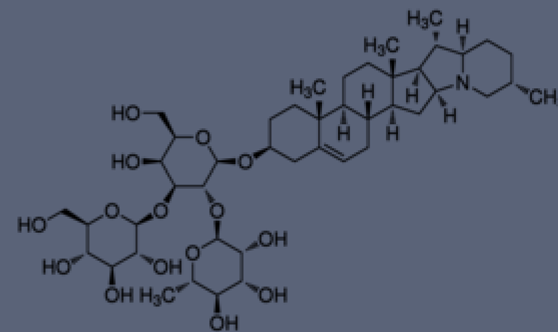
Solanine

- glycoalkaloid poison found in **the potato**, the tomato and the eggplant
- it can occur naturally in any part of the plant, including the leaves, fruit, and tubers
- solanine has pesticidal properties and it is one of the plant's natural defenses
- solanine poisoning is primarily displayed by gastrointestinal and neurological disorders. Symptoms include nausea, diarrhea, vomiting, stomach cramps, burning of the throat, cardiac dysrhythmia, nightmares, headache, dizziness, itching, eczema, thyroid problems, and inflammation and pain in the joints. In more severe cases, hallucinations, loss of sensation, paralysis, fever, jaundice, dilated pupils, hypothermia, and death have been reported
- ingestion of solanine in moderate amounts can cause death. One study suggests that doses of 2 to 5 mg/kg of body weight can cause toxic symptoms, and doses of 3 to 6 mg/kg of body weight can be fatal
- the average potato has 0.075 mg solanine/g potato
- symptoms usually occur 8 to 12 hours after ingestion, but may occur as rapidly as 10 minutes after eating high-solanine foods
- mechanism of action is not well understood. Solanum glycoalkaloids have been shown to inhibit cholinesterase, disrupt cell membranes and cause birth defects. One study suggests that the toxic mechanism of solanine is caused by the chemical's interaction with mitochondrial membranes
- various **storage conditions** can have an impact on the level of solanine in potatoes (light leads to green colour, mechanical injury, extended period of storage)



CYANIDE POISONING

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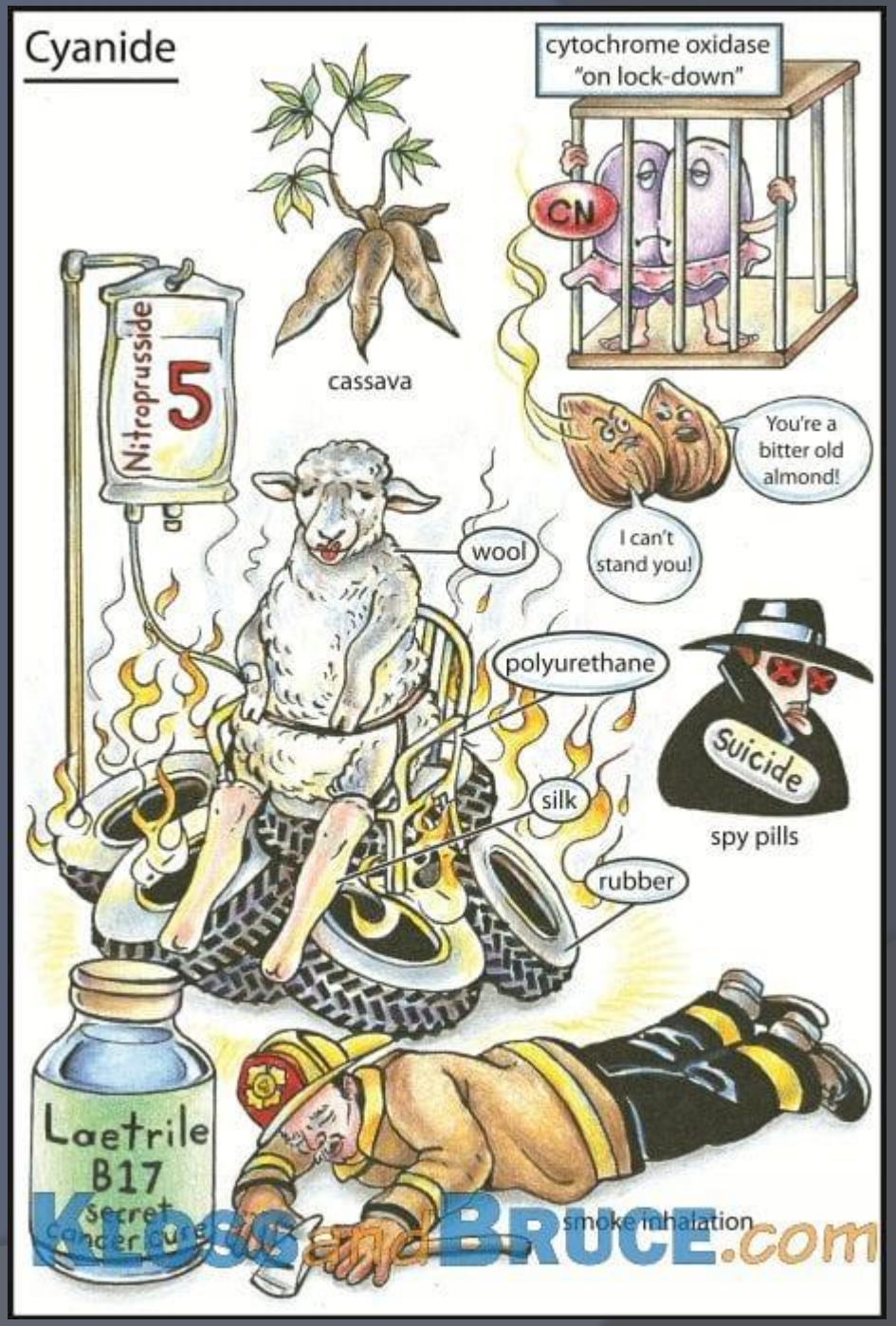
Cyanide, Hydrogen cyanide

- white crystalic substance, colourless liquide
- relatively common poison(suicide, accident, homicide)
- sources: HCN origins during reaction of cyanide with gastric acid, seeds of fruits (apricots, peaches, plums), bitter almond, burning of plastic materials and burning in general, workplaces involved in metal polishing, certain insecticides
- **inhibition of the respiratory enzyme cytochrome oxidase**, resulting the body's tissues being unable to use oxygen, blood can not give off the O2 to the tisues
- lethal dose 0,05 g HCN, 25 bitter almonds
- levels of 0.5–1 mg/L are mild, 1–2 mg/L are moderate, 2–3 mg/L are severe, and greater than 3 mg/L generally result in death
- symptoms: cynosis, headache, bitter taste in mouth, salivation, vomitting, dizziness, astmatic problems, convulsions, paralysis, low pulse, cold skin, death at seconds/minutes
- treatment: supportive care and giving the person 100% oxygen.Hydroxocobalamin (vitamin B12a) appears to be useful as an antidote and is generally first-line.Sodium thiosulphate may also be given. Historically cyanide has been used for mass suicide and by Nazi Germany for genocide
- Autopsy finding: brick red hypostasis (excess of oxyhaemoglobine, it can not be utilized by the tissues), almond-like smell, light red blood,congestion of organs with bright red colour, erosion of stomach and oesophagus mucous membrane, demage or haemorrhages of stomach lining due to cyanide salt


Cyanide
cytochrome oxidase "on lock-down"
CN
cassava
Nitroprusside 5
You're a bitter old almond!
I can't stand you!
wool
polyurethane
Suicide
spy pills
silk
rubber
Laetrile B17
smoke inhalation
KlossandBRUCE.com

CARBON MONOXIDE

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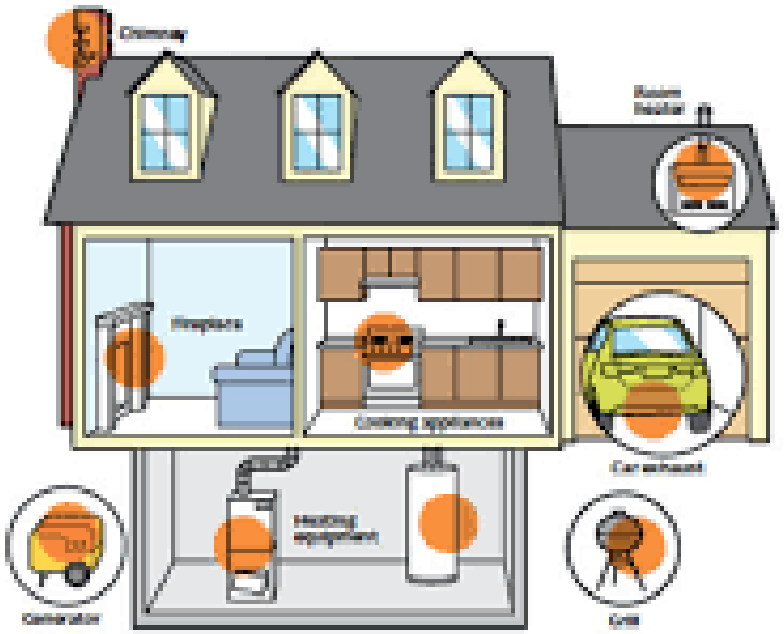
Carbon monoxide CO

- colourless and odourless gas
- lighter than the air
- incomplet combustion of organic materials
- toxicity is caused by its **massive affinity to haemoglobin** and than increase of concentration of carboxy haemoglobin (COHb)
- affinity is 200-300x higher than to oxygen, CO can displace oxygen from the red blood cells and progressively reduce the ability of the blood to transport oxygen to the tissues and leads to inner hypoxia

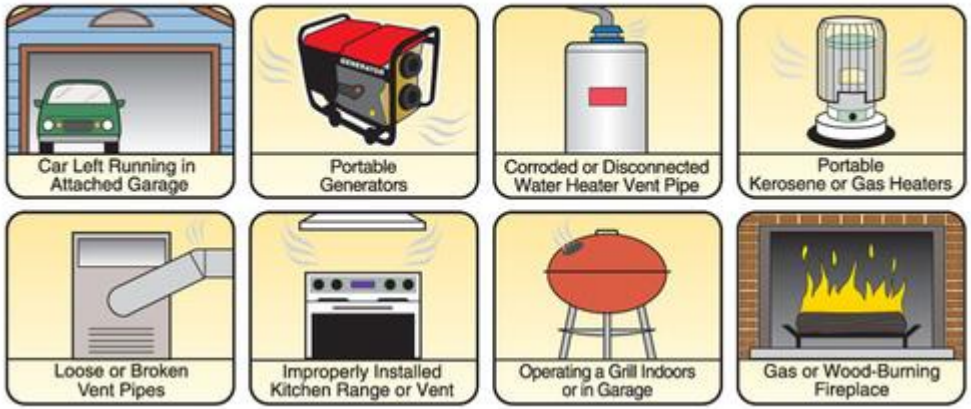
Sources of CO

- incomplete combustion with inadequate oxygen supply
- structural fire
- industrial process
- domestic gas and heating appliance (heaters, boilers, cookers, blocked chimneys)
- motor vehicle exhaust gases (often suicide)

POTENTIAL DANGER ZONES

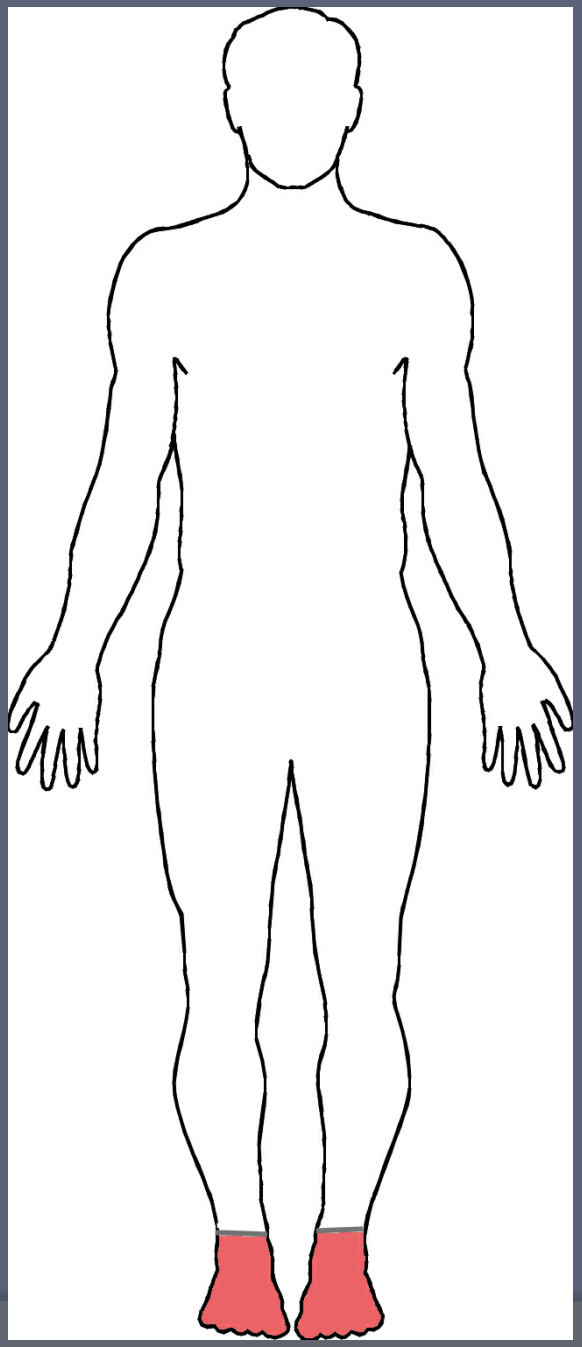


SOURCES OF CARBON MONOXIDE IN A HOME



CO poisoning

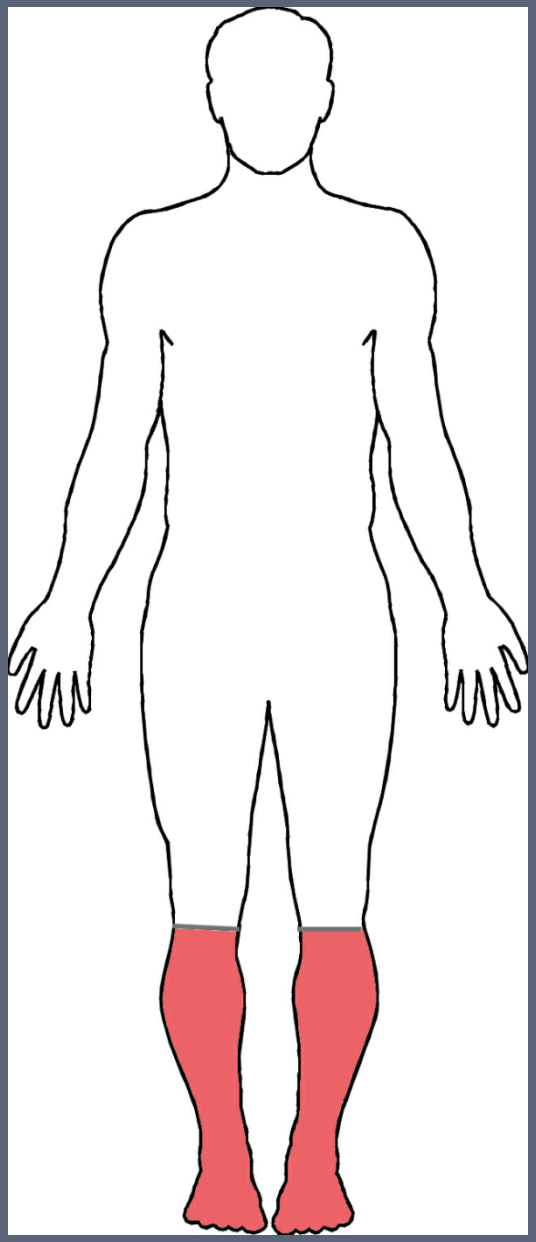
- short exposition of a high concentration x long exposition of a low concentration
- cigarette smokers could have in blood concentration of 6 –10% COHb
- half life of CO is 2-4 h when you breath clear air
- individual sensitivity – polymorbid people (pulmonary or cardiac diseas) die due to lower concentration of CO



Concentration of CO till 10 %

no symptoms

cigarette smokers



Concentration of CO 15 - 30 %

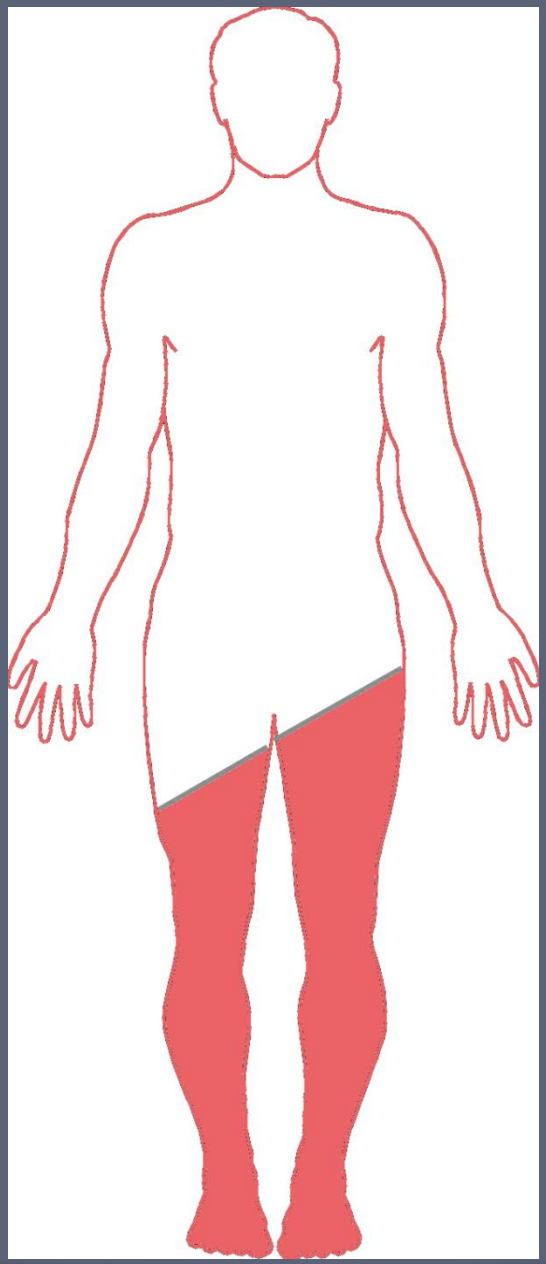
headache

little disorders of vision

dizziness

nausea

sleepiness

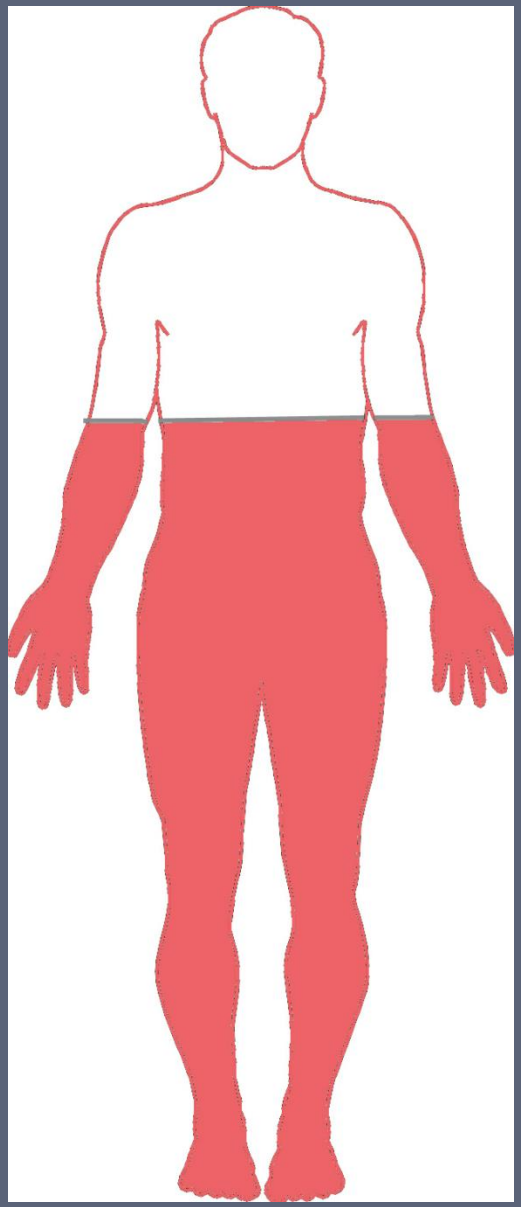


Concentration of CO 30 – 40 %

pink coloured skin

loss of resoluteness and consciousness

coordination and breath disorders



Concentration of CO 50 – 60 %

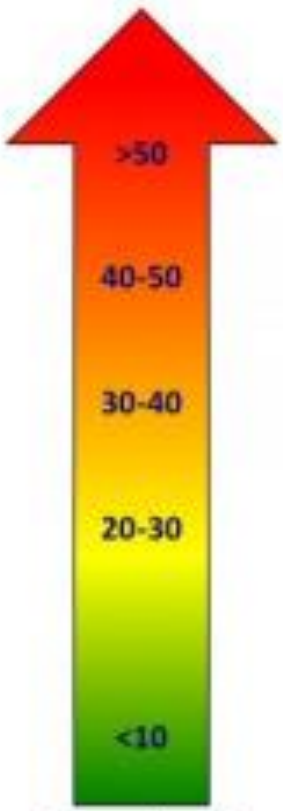
unconsciousness

convulsions

breathing depressed

hearth failure

brain edema



Increasing % of Carbon Monoxide in the Blood

Death (especially if not removed from exposure)

Seizure, Unconsciousness, Heart Attack

Confusion, Blurred Vision, Shortness of Breath, Pounding Headache, Uncontrolled "Sleep", Vertigo, Loss of Coordination, Chest Pain, Memory Loss

Impaired Judgment, Difficulty Breathing, Blurring of Vision, Bad Headache, Increasing Drowsiness, Stomach Pain

Drowsiness, Headache, slight increase in Respiratory Rate, Dizziness

Slight Headache, Nausea

None

Typical Symptoms of Carbon Monoxide Poisoning.

Note: Headache is the most common symptom.

Caution: People experience different symptoms of different intensities and in different orders. This is only a guide.

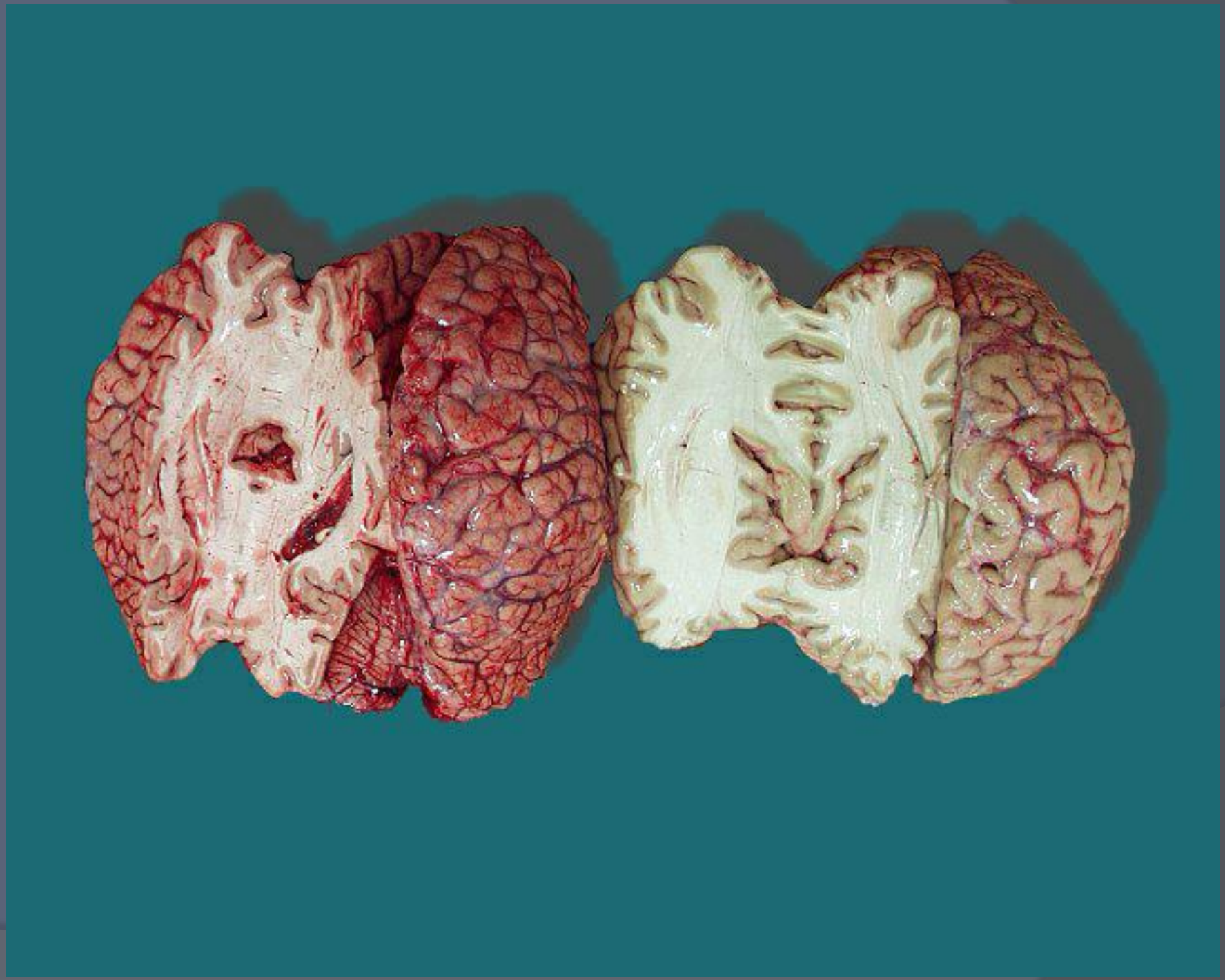
Autopsy finding

- cherry -pink colour of the hypostasis and skin („healthy colour“)
- pink coloration of the brain or fatty tissue, pulmonary liquid edema
- cherry pink coloration of the skeletal muscles
- cherry pink coloration of blood
- ekchymosis(petechiae) in the serous membranes, in conjunctiva

Chemical investigation (spectroscope, chromatography): blood

Results of poisoning

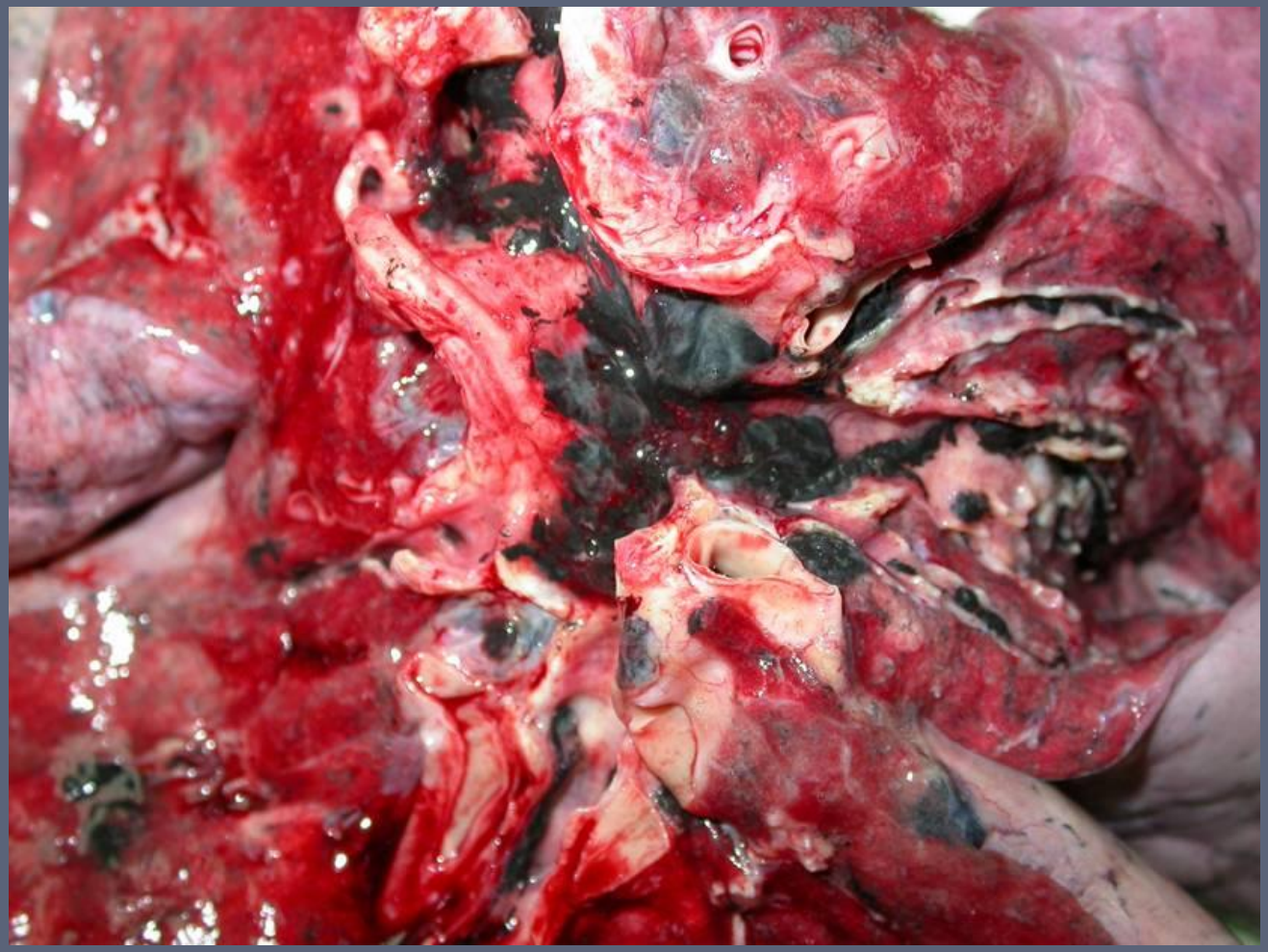
- Necrosis or cavitation of the pallidum or putamen
- Necrosis and hemorrhages in the cortex and white matter
- Treatment by pure oxygen



Case report

Woman in the place, where was a lot of smoke from heater, obturate chimney, carbon black (smut) on the face and part of the body, which was not covered.

Cherry pink hypostasis, smut on the tongue, oesophagus, larynx and in the trachea.



Cherry pink lung and smut in the bronchial tree, congestion.

COHb 54%

ACID POISONING

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- pH<3
- acid substances make **coagulation necrosis** - precipitate and dissolve proteins, dehydratation of tissues, termic changes after the reaction with water
- parenchymatic organs rich of proteins
- after consumation of acid collaps can come immediately, quick death
- tissue liquid comes into the demage place and makes edema, hemoragic lining around, ulcers, crusts

Autopsy finding in general

- constricted stomach
- stomach wall is edematous and thick up to 1cm
- vessels are filled by black altered blood, up to tarry clots (acid hematin)

Sulphuric acid - H_2SO_4

- car batteries
- lethal dose dependents on concentration, 5 ml per os, burns on skin 70% concentration
- symptoms immediately after swallow

  burning pain in the mouth, neck, oesophagus, stomach and in the abdomen, faint

  vomiting of acid

  obstipation, small amout of urine

  intensive thirst with swallowing disorders, attempt to drink lead to new vomiting

  dehydratation

  heavy and noisy breathing, hoarse voice, speaking impossible

  after absorbtion – nervous symptoms

Hydrochloric acid - HCl

- bleach, use in textile and alimentary industry, balance the pH of the garden´s pools
- lethal dose of concentrate acid is 10 – 15 g, at children approximately 2 g
- symptoms are similar as at sulphuric acid

Nitric acid - HNO_3

- use in production of explosives, nitrogen fertilizers, dyes and varnishes, medicines and various organic compounds
- lethal dose is approximately 8 g, death approximately 12 hours after consumation
- vomit liquid has lemon up to orange coloration
- autopsy finding: yellow foam around nose, finding is similar as at another acids, but epithelium is yellow.

Acetic acid CH_3COOH

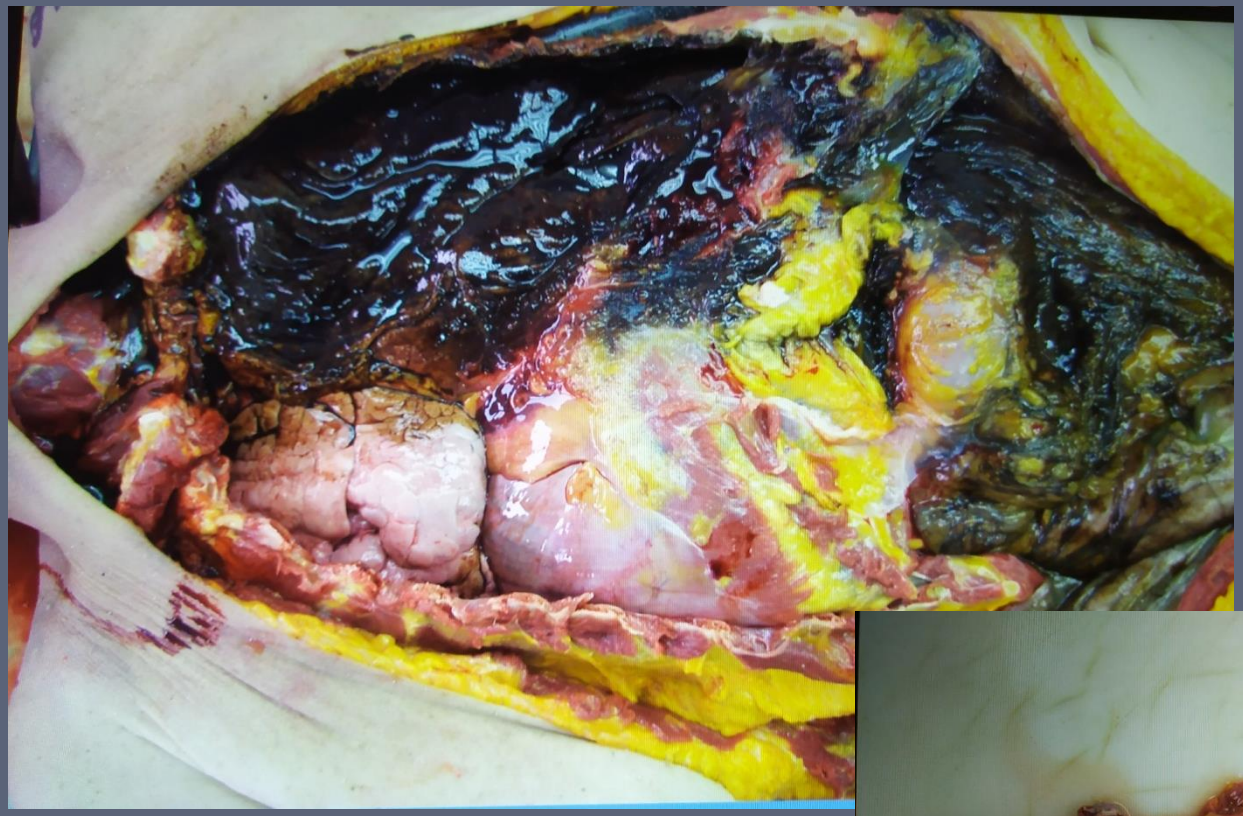
- the aqueous solution (concentration 6-8 %) is used as a vinegar
- lethal dose is approximately 12 g, death after 1,5 hours up to 2 days after consume
- symptoms can be delayed by several hours
- **symptoms**: burning pain in the mouth and pharynx, pain in the stomach and abdomen, thirst, vomiting, noisy breathing, irritable cough, temperature grow up
- nervous signs – tremors, paralysis of the extremites

Oxalic acid - $(COOH)_2$

- lethal dose is 15- 20 g, death after 10 minutes up to 30 hours
- after consume begin burning in the mouth and in the oesophagus, vomiting, pains in the abdomen, hoarse voice. Vomit liquid is greenbrown up to black. consciousness disorders, tremor, spasms, paleness, skin is cold, temperature go down
- the main toxic effect is the formation of **insoluble calcium oxalate crystals in the kidneys**, which leads to their failure. Crystals can be find under epithelium of stomach and intestine
- neurotoxic effects and / or cardiac arrest may occur, oxalic acid is an irritant to the skin, eyes and respiratory tract
- loss of calcium leads to muscle malfunction

Formic acid - HCOOH

- lethal dose 2g
- strong irritable effect on the skin
- in the bloodstream it plays a key role in methanol poisoning, which is first metabolized to formaldehyde and then to formic acid. Its higher concentration then leads to the development of metabolic acidosis, which can end in death
- formic acid **inhibits cytochrome oxidase** and thus mitochondrial respiration, as do cyanides and carbon monoxide. The development of acidosis is accompanied by the formation of formates and lactates. Acidosis also facilitates the penetration of acid into cells. It accumulates mainly in the retina, optic nerve and basal ganglia



poleptání jazyka a jícnu
bez jejich perforace


poleptání okolí úst


ény žaludku s perforací do břišní dutiny,
nožství tekutiny, sliznice otekla, měkká,
cca 1 cm, ve stěně sražená krev v podobě

ALKALI POISONING

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- ph>11
- alkaline substances make **colliquative necrosis** – react with fatty cells in the cell´s membrane which leads to destructions of the cells and penetration into the tissue
- complete enzymatic dissolve of the tissue
- tissue poor of proteins with lots of water (brain)

Potassium and sodium hydroxide

KOH & NaOH

- white crystalic substance
- use for cleaning of the drains at home
- lethal dose 80 – 100 g
- symptoms: burn on the skin or necrosis, healing by scars
- per os: promptly burning pain in the mouth, oesophagus, stomach and in the abdomen, vomit liquid have strong alkalic reaction and there are parts of epithelium and blood, cold feelings, salivation and tremor
- splashes in the eye can lead to blindness

Autopsy finding

- burn around mouth
- epithelium in the stomach is thicker and sticky
- toxic damage of myocardium
- liver necrosis.

NARCOTICS

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WHO definition of drug

Drug

- natural or synthetic substance, which can change one or more function of organism after use
- interaction with CNS
- should be use as a medicine

WHO definition of habituation

Habituation

- condition, when exists thirst for the drug, but his necessity isn’t urgent
- dependence on drug is only mental
- generally lost tendency to increase dose

WHO definition of drug dependence

Drug dependence

- mental and sometimes somatic condition, (reciprocal interaction between organism and drug)
- characteristic changes in the behavior, or another reactions, which always include compulsion to take drug all time or at least regulary, and do this for its mental affect or only for stop difficulties which lead from its absence

WHO definition of mental dependence

Mental dependence

- strange tuning of mental function, which get to do person to next apply of substance for create agreeable mental affection or stop a bad mood

WHO definition of somatic dependence

Somatic dependence

- adaptation of the organism to enjoyed substance, which is a part of metabolism, and its absence lead to rising of abstinence signs

WHO definition of toxomania

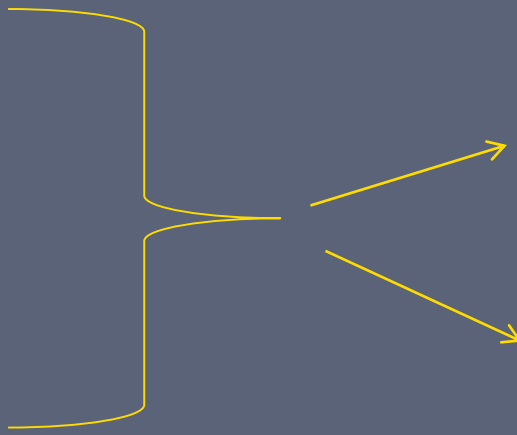
Toximania

- periodical and recurrent or chronic situation of intoxication developed by repeated application of drugs

Medicine or drug?

Crucial is purpose of aplication

indication
dose
frequency



medicine

drug

Medicine or drug?

- opium
- morphine
- heroin
- codeine
- ethylmorphine
- hydrocodone
- phentanyle
- tilidine
- buprenorphine
- methadone
- pentazocine

- cocaine
- THC
- LSD-25
- atrophine
- pethidine
- ketamine

- AM
- MA
- MDMA

Types of drugs dependence

stimulative effect
amphetamines
alcohol
hallucinogenic
solvent
canabis
cocaine
cofeine
tobacco

inhibition effect
barbiturates (anxiolytic, sedative)
opiates

- MDMA
- Benzodiazepines
- Canabinoids
- Cocain
- Opiates
- Heart medication – beta blocker

MDMA

- stimulant
- feelings of empathy (ability to feel feelings of others), freedom, equanimity, interest about others
- communications barriers fall down
- abusers are well-rested, happy, relaxed and friendly to other one
- depression of erection, women are sexual more excitable than men, but haven’t full orgasm

Symptoms

- increase blood pressure and pulse
- dryness in mouth, teeth creak, closing jaws, discomfort, sweat, lose of apetite, muscle fibrilation, nystagmus, spasms
- body termoregulation is unfunction
- lost connection with feelings of warm and cold
- risk of overheating
- after lose of effect often depression, paranoia
- MDMA is neurotoxic (change the brain tissue), can break ability of coordination

Halucinogenic type of dependence

effective substance	mescaline, psilocybin, atropine; MDA, MDMA (ecstasy); LSD
aplication	per os
effects	transient mental changes which lead to affecting sensation, myšlení a nálady bez výraznějšího tlumivého nebo stimulačního efektu na CNS
symptoms	changing between anxiety and depresion with euphoría; ecstasy: loose of barriers, tendence to get-togetherness, sexual stimulation; disturbance in time perception, space perception, perception of own body, "crossed" sense perception, pseudoillusions (acustic and visuál) up to halucination, disorientation, paranoid status up to psychosis - personal changing - higher selfdestructive, suicidal and agresive tendence against surround; - mydriasis, sweating, tremor; - extremly high blood pressure, palpitation, higher body temperature but you feel it as cold – „creepiness“, shakes, muscles fibrilation; rapid – breathing have character of hyperpnoe - „flash-back“ fenoménon - suddenly spontaneous status. comeback intoxication with few days or month latency, when the drug was use (LSD)
abstinence symptoms	unpredictable statuses
death	failure of breathing - malfunction of breathing centre in the CNS; at ecstasy dehydratacion, exhaustion, circulatory failure

Barbiturates type of dependence

effective substance	barbiturates, benzodiazepines
aplication	per os
Effect	anxiolytic, amnestický (sedace při vědomí), central myorelaxans, anticonvulsie, sedative, hypnotic
symptoms	sleepiness, fuzziness, dyplopia, disorientation in time and space, concentration disorder, ataxy, coordination disorder, low blood pressure, inadequate behaviour, sometimes hostility, at women amorosis notions; rise of habit
therapy	symptomatic, flumazenile
abstinence symptoms	anxiety, sleepessness, tremor, convulsions, epileptic fit
death	complications by reason of side effects

Cannabis type of dependence

effective substance	Δ^9-THC delta-9-tetrahydrokanabinol (marihuana, hashish)
aplication	smoking, per os
effects	better temper , feelings of pleasant dreams, lethargy; sometimes feelings as gloominess, anxiety
express	euphory or depression, inner disquiet, verbosity; disorders of time and space perception, short memmory and reminisce, criticism, thinking (not coherent), concentration and attention; intensive perception of sound and colours, low interest about surroundings - sometimes on the contrary aggression against surroundings, disorientation, fuzziness; - lost of stimuli and motivation, paranoid statuses, depersonalization, halucination; dementia - mydriasis, red conjunctiva, photodysphoria, sometimes double vision; loss of appetite or contra higher appetite; worse coordination; - fall of blood pressure, slower pulse, decrease of body temperature; dry and irritable cough
abstinence symptoms	nervousness, hyperactivity, insomnia
death	deathly overdosing wasn't describe

Cocaine type of dependence

effective substance	cocaine, crack (cocaine with alcali substance)
aplication	sniffing, i.v., smoking (crack), chewing leaf of coca
effects	better temper, become feel of freshness, powers and spiritual abilities; quickly start; biological halftime is dependent on dose - ½ up to 1½ hod. tolerance is increasing – time of effect is shorter
express	hyperactivity, irritation, euphory, verbosity, paranoid statuses, tremor, agresivity; personal changing; mydriasis, sweat, loss of apetite, vasoconstriction, higher blood pressure, quicklier pulse damage of nose epithelium and nasal septum, puncture; paralysis of CNS, damage of brain;
abstinence symptoms	irritation, apathy, dejectedness
death	hearth arythmia which is induced by toxic effect on to nervous system of hearth, so called cocaine shock; bleeding into brain at hypertenzion, depress of breathing centre
demonstration	in urine can demonstrate few hours, metabolites few days, hair

Opiate type of dependence

effective substance	opiates: opium, morphine, ethylmorphine (Diolan), diacetylmorphine (heroin), codeine, dihydrocodeine opioids: buprenorphine (Subutex), methadone, pethidine (Dolsin)
aplication	Intra venous, per os (methadone), sniffing, inhalation
effects	changing of affection - euphory; inhibition of affective part of pain; quckly start; perzistence, dependent on degree of tolerance, few hours (biological halftime dependent on kind of the substance: heroin 5 to 20 min.; morphine 2 up to 3 hours, at depot forms longer; methadone 10 up to 18 hours,, pethidine 2,5 up to 4 hours);
symptoms	Inhibition of CNS – slowly reactions, reflexes, slowly speaking, sleepiness, concentration disorders, apathy, rigidity; - extreme miosis, sometimes nettle rash, constipation; punctures; bloody spume in the mouth and in the nostrils; - low blood pressure, slowly pulse, breathing disorders, immune-suppression; - cachexy, total personality marasmus ;
therapy	Naloxone, Intrenone – shorter biological halftime (1 up to 2 hours) – repeat doses
abstinence symptomsy	persists - 5 up to 7 days - disquiet, nervousness, irritation up to aggression, sleeping disorders, depression; thirsty for opiates - mydriasis, disorders of vision; tremor, attacks of spasms, pains of muscles, joints; cold sweat, vomiting, diarrhoea; - ascendent breathing and hearth frequency, arythmia
death	stop of breathing, circulatory failure; „opiates“ brain oedema

Beta-blockers overdose

- beta-blockers are a type of drug used to treat high blood pressure and heart rhythm disturbances
- they are one of several classes of medicines used to treat the heart and related conditions, and are also used in the treatment of thyroid disease, migraine, and glaucoma
- these drugs are a common cause of poisoning

Symptoms

- AIRWAYS AND LUNGS – breathing trouble (shortness of breath, gasping)
  - wheezing (in people who have asthma)
- EYES, EARS, NOSE, AND THROAT – blurred vision
  - double vision
- HEART AND BLOOD – irregular heartbeat
  - lightheadedness
  - low blood pressure
  - rapid or slow heart beat
  - heart failure (shortness of breath and swelling of the legs)
  - shock (extremely low blood pressure)
- NERVOUS SYSTEM – weakness
  - nervousness
  - excessive sweating
  - drowsiness
  - confusion
  - convulsions (seizures)
  - fever
  – coma (decreased level of consciousness or unresponsiveness)

Treatment

- intravenous fluids (given through a vein)
- medicine to treat symptoms and reverse the effect of the drug
- activated charcoal
- laxatives
- pacemaker to the heart for serious heart rhythm disturbances
- breathing support, including a tube through the mouth into the lungs and connected to a breathing machine

Thank you for your attention