

Intoxication

Although the incidence of intoxications is high, their **overall mortality** has been **below 1%** for a long time . The incidence of two categories has increased sharply in the last decade: suicidal (usually demonstrative) trials and drug and alcohol use (gradually shifting to ever younger age groups).

The spectrum of possible toxic substances is extensive, but fortunately in clinical practice we encounter a relatively narrow group of repeating units in most cases. The most common poisons include poisoning with paracetamol , **household cleaners** , and **cough and cold remedies** .

Toxin identification

Accurate identification of the potentially intoxicating agent, time and amount ingested are key initial steps. It is necessary to insist on the **precise identification of the potential intoxicating substance** . Bringing packaging from drugs, chemicals, parts of fungi or plants greatly facilitates the doctor's decision.

The effort to determine the amount of ingested substance is repeatedly proving difficult . In many cases, it never remains an unanswered question, sometimes in terms of whether ingestion has taken place at all. A typical situation in this direction is when a toddler is found with an open box of medicines, or with licked tablets in his mouth or on his hands. If other children were present on site, always keep in mind the risk of ingestion in them as well. Because in most cases we are not able to determine the amount ingested, it is necessary to count on the maximum ingested dose for each individual child.

The possibility of intoxication should also be included in the differential diagnostic balance for some acute conditions such as quantitative or qualitative disorders of consciousness , convulsions , ionic and metabolic imbalances. Keep in mind that substances acting on the autonomic nervous system can cause a picture of intoxication with mixed clinical manifestations. If we believe that it may be an intoxication, and if we are able to identify the substance, the next step is to **quickly obtain basic information** about it. We most often use the Toxicology Center of the Medical Faculty of Charles University with its 24-hour service, which has a wide database of both basic information on substances and accumulated clinical experience with individual types of intoxications. They are also indispensable for the subsequent balance sheet **pharmacokinetic data** . Information on the toxic or lethal dose, rate of resorption from the GIT and from the circulation can be very helpful in creating a plan for the timing and intensity of treatment measures. A database of specific records of past poisons also provides valuable inspiration.

Symptomatology of intoxications

Acute impairment of consciousness, abnormal behavior, convulsions / coma, heart rhythm disorders , shock , respiratory distress , profuse vomiting , diarrhea or metabolic acidosis come to the fore as non-specific symptoms of intoxication .

In some cases, intoxication can mimic typical clinical units:

- non-ketotic hypoglycemia → ethanol, in differential diagnosis we consider disorders of β -oxidation of fatty acids , glycogenosis ;
- acute liver failure → paracetamol, in differential diagnosis we consider other causes of acute liver insufficiency ;
- ketotic hyperglycemia → acetone, theophylline, in differential diagnosis we consider diabetic ketoacidosis ;
- impaired consciousness / convulsions , fever → ecstasy, in differential diagnosis we consider febrile convulsions , neuroinfections ;
- fever, tachypnoea → salicylates, we consider pneumonia in differential diagnosis .

Clinical symptomatology in intoxications

■ Odor:

- bitter almonds → cyanide ,
- acetone odor → acetylsalicylic acid, methanol ,
- garlic odor → organophosphates, arsenic, phosphorus,
- alcoholic odor → ethanol , methanol ,
- Diesel odor → kerosene.

■ Leather:

- cyanosis without response to oxygen therapy → nitrites, nitrates, phenacetin, benzocaine,
- erythema → CO , cyanide, anticholinergics,
- dry skin → anticholinergics,
- sweating → amphetamines, LSD, barbiturates, cocaine, organophosphates,
- jaundice, → paracetamol , fungi , iron, phosphorus.

■ Blood pressure :

- hypertension → sympathomimetics, amphetamine, organophosphates,
- hypotension → narcotics, sedatives, hypnotics, β -blockers, Ca channel blockers, tricyclic antidepressants (TCA).
- **Heart rate:**
 - bradycardia → digitalis, hypnotics, β -blockers, Ca channel blockers,
 - tachycardia → sympathomimetics, amphetamine, TCA, syntophyllin, anticholinergics, cocaine, alcohol.
- **Arrhythmia:**
 - supraventricular tachycardia → TCA, anticholinergics, syntophyllin,
 - ventricular ES / ventricular tachycardia → digitalis, TCA, cocaine,
 - arrhythmias in general → β -blockers, Ca channel blockers, organophosphates.
- **Mucosa :**
 - dry → anticholinergics,
 - hypersalivation → organophosphates, carbamate,
 - lesions → acids, lyes.
- **Respiration :**
 - depression → alcohol, narcotics, barbiturates, sedatives, hypnotics,
 - tachypnoea → salicylany, amphetamine, CO,
 - Kussmaul respiration → salicylanes, methanol, ethylene glycol,
 - wheezing → organophosphates,
 - pneumonia → hydrocarbons, kerosenes,
 - pulmonary edema → organophosphates.
- **CNS:**
 - convulsions → TCA, cocaine, phenothiazines, amphetamines, salicylates, organophosphates,
 - miosis → narcotics, phenothiazines, barbiturates, organophosphates, fungi (muscarinic type),
 - mydriasis → anticholinergics, sympathomimetics, cocaine, TCA, LSD, methanol,
 - fasciculations → organophosphates,
 - nystagmus → diphenylhydantoin, barbiturates, carbamazepine, ethanol,
 - delirium / psychosis → anticholinergics, sympathomimetics, alcohol, phenothiazines, LSD, cocaine, heroin, heavy metals,
 - coma → alcohols, anticholinergics, narcotics, sedatives, hypnotics, CO, salicylates, organophosphates,
 - weakness / paralysis → organophosphates, carbamates, heavy metals.
- **GIT:**
 - vomiting / diarrhea → iron, phosphorus, heavy metals, lithium, fungi, organophosphates.

Toxic syndromes - toxidromas

Anticholinergic syndrome:

- **Parasympatholytic** → atropine, scopolamine, Belladonna alkaloids;
 - dry skin / mucous membranes;
 - thirst, dysphagia;
 - fixed dilated pupils, blurred vision;
 - hypertension;
 - erythema, scarlatiniform rash;
 - urinary retention, polakisuria.
- **Central** → antihistamines, TCA;
 - lethargy, confusion, delirium, hallucinations, ataxia;
 - respiratory failure;
 - cardiovascular collapse;
 - extrapyramidal movements.

Anticholinesterase syndrome:

- **Muscarinic** → organophosphates ;
 - sweating, tearing, salivation;
 - miosis, blurred vision;
 - wheezing;
 - bradycardia, hypotension;
 - vomiting, diarrhea, tenesms;
 - urinary incontinence.

- **Nicotine**

- fasciculations, twitching;
- striated muscle weakness;
- respiratory failure, cyanosis;
- cardiac arrest.

- **Sympathetic ganglia**

- Tachycardia, hypertension

- **Central**

- fear, restlessness;
- convulsions, areflexia, ataxia, insomnia, coma;
- Cheyne - Stokes breathing;
- respiratory / circulatory insufficiency.

Cholinergic syndrome: → acetylcholine, muscarinic, pilocarpine

- the same symptoms as with anticholinesterase muscarinic and nicotine syndrome.

Extrapyramidal syndrome: → chlorpromazine, haloperidol, tioridazine;

- dysphonia, dysphagia, rigidity, tremor;
- torticollis, opisthotonus, trismus;
- ocular crisis.

Narcotic syndrome: → opium and its derivatives, codeine;

- CNS depression, miosis, hyporeflexia;
- hypoventilation, hypotension;
- pulmonary edema;
- weakening of peristalsis.

Symphathomimetic syndrome: → amphetamines, caffeine, cocaine, ephedrine, aminophylline;

- CNS excitation, convulsions;
- psychosis, hallucinations;
- hypertension, tachycardia, arrhythmias;
- mydriasis;
- hyperpyrexia, hyperreflexia.

Withdrawal narcotic syndrome : → omission of narcotics, alcohol, barbiturates, benzodiazepines and opioids;

- diarrhea;
- mydriasis, tachycardia, hypertension;
- insomnia;
- salivation;
- muscle twitching;
- restlessness, hallucinations;
- tearing, "goose" skin.

Laboratory examination

It is always advisable **to provide gastric contents** for eventual identification of the substance (vomiting, gastric lavage), **stool sample in intoxication with fungi** . For a number of drugs, it is then possible to determine plasma levels, and for drugs it is also possible to collect them in the urine. The value of plasma levels and its dynamic development is crucial for some drugs to decide on the method of treatment (paracetamol, salicylates, digoxin, theophylline, lead, barbiturates, carbamazepine, phenytoin).

Biochemistry - blood

When detecting methaemoglobinaemia , we mean nitrite or nitrate poisoning. Demonstration of **anion gap** positive metabolic acidosis is often caused by poisoning with methanol, ethanol, ethylene glycol, salicylates, INH, toluene, iron, isopropyl alcohol, CO, cyanides. Increased osmotic gap is characteristic of methanol, ethanol, ethylene glycol, or isopropyl alcohol poisoning. **Hypoglycemia** is found in overdose with insulin or poisoning with ethanol, salicylates, isopropyl alcohol, INH, paracetamol, post-antidiabetics. **Hyperglycemia** , on the other hand, is characteristic of salicylate, INH, iron or organophosphate poisoning. **Hypocalcaemia** is found in ethylene glycol or methanol poisoning.

Biochemistry - urine

Oxalate crystals in the urinary sediment indicate ethylene glycol poisoning, **ketonuria** is found in isopropyl alcohol, ethanol or salicylate poisoning.

Therapy

Poisoning therapy basically consists of three basic components. All components go "hand in hand" and take place practically simultaneously. It is necessary to **eliminate noxa** (gastric lavage, whole bowel irrigation, administration of activated charcoal), ev. administer **specific antidotes** and ensure the basic **vital functions** of the patient.

In the light of evidence based medicine data, it should be borne in mind that **the effectiveness of gastric lavage decreases significantly 1 hour after ingestion** of the toxic substance, while most patients do not come to hospital care until > 3 hours after ingestion of the toxic substance. **Activation of activated charcoal** comes to the fore as the most effective method of elimination, doses varying from 0.5–2.5 g / kg for dose, which can be repeated indefinitely. Activated charcoal is also very suitable for outpatient use, ie in pre-hospital care.

This brings us to hospital care. High enemas and emetics are considered obsolete and ineffective in eliminating toxic substances. **Whole bowel irrigation** is the method of choice when removing pollutants that cannot be absorbed on activated carbon and depot substances, retarded forms of drugs or the contents of small batteries that the child has swallowed. It is performed in large volumes of 25 ml / kg / hour. solutions that do not resorb do not cause diarrhea and only wash out the gut. They are administered until the tube is inserted into the stomach until a clean solution leaves the intoxicated person. It is a laborious but highly effective method for many substances that do not bind to activated carbon.

Toxicological examinations recede into the background and are important especially where the administration of antidotes is controlled by the level of the toxic substance in the serum (eg application of N-acetylcysteine in paracetamol poisoning). Otherwise, we work with so-called toxic syndromes = toxidromas.

Patients who are deep unconscious (GCS <8 b.) And have vital disorders should be intubated, **UPV** should be initiated, and access to the bloodstream or bone marrow should be initiated. We administer infusions, ev. antidotes, in case of need for circulatory support we administer inotropics (α - mimetics in severe intoxication with barbiturates with arterial hypotension). **Regardless of the current state of vital functions, resuscitation care includes patients who have consumed ethylene glycol, organic solvents (eg trichlorotoluene or tetrachlorotoulene) and tricyclic antidepressants.** ⚠

Stabilization of vital functions

- These include **airway safety** (patency, assisted or controlled ventilation) **and circulation** through well-known cardiopulmonary resuscitation measures.
- It is extremely important to **assess the degree of impaired consciousness**, to monitor it on an ongoing basis and to record it using the Glasgow coma scale. An unconscious or convulsive child deserves increased attention, as impaired consciousness can lead to hypoventilation and respiratory failure. Aspiration with repeated vomiting is also a risk.
- We will **also provide access**, if it is impossible to insert an intravenous catheter, today we prefer access to the bone marrow. We ensure sufficient **oxygenation** by administering oxygen or intubation and UPV.
- A quick capillary blood test will rule out **hypoglycemia** and acid-base imbalances.
- We also treat cramps, hypotension, ionic imbalance, and maintain a stable body temperature.
- Depending on the type of poisoning, the **adjustment of heart rhythm disorders** can be a therapeutically essential - first it is necessary to exclude secondary causes of dysrhythmias (ionic imbalances, circulatory failure, hypoxia, hypercapnia). Most of these dysrhythmias are not serious and are transient in children, so it is necessary to be warned against hasty application of antiarrhythmics. On the other hand, some intoxications are notorious for their **threat of malignant dysrhythmias** (TCA, digoxin, cocaine, antiarrhythmics, antihistamines). Here it is necessary to take into account this risk and respond to it adequately.

Gastric lavage

See Gastric lavage for more information.

We perform rinsing in the patient either in a stabilized position on the side or sitting. We insert a strong catheter into the patient's stomach (the probe should be inserted approximately at the same distance as the distance between the root of the nose and the process xiphoides) and after insertion, the stomach contents usually flow out of the probe. We perform the actual rinsing by applying physiological solution: 200–300 ml in adults and 10 ml / kg in children for those who are warmed up to body temperature (they do not have to be sterile). We then aspirate the contents back (we do not use "clean" water due to the risk of hyponatremia).

Antidote

 *For more information see Antidote.*

Antidotes form a group of substances that bind to nox, inactivate it or cancel its toxic effect. They exist only for some noxa and have a specific effect.

Elimination

Substances absorbable and non-absorbable by activated carbon	
Good absorption	Bad absorption
acetaminophen (paracetamol)	boric acid
amitriptyline	ethyl alcohol
amphetamine	methyl alcohol
acetylsalicylic acid and its salts	ethylene glycol
chlorpromazine	lithium
codeine	iron
diazepam	kerosene
digoxin	strong acids and bases
imipramine	
morphine	
pentobarbital	
strychnine	



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