

POISONING CONTROL

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BASIC APPROACH TO THE POISONED PATIENT

1. Emergency (ABCD)
2. Clinical evaluation
3. Decontamination
4. Enhancement of poison elimination
5. Antidote therapy

1. INITIAL MANAGEMENT: ABCD

- ✓ Evaluation of (A) Airway
- ✓ Evaluation of (B) Breathing
- ✓ Evaluation of (C) Circulation
- ✓ Evaluation of (D) Depression

EVALUATION OF AIRWAY

Airway obstruction may result from:

- ✓ Vomitus
- ✓ Posterior displacement of the tongue
- ✓ Mucosal swelling
- ✓ Foreign bodies

EVALUATION OF BREATHING

✓ Ventilation failure

✓ Hypoxia

✓ Bronchospasm

EVALUATION OF DEPRESSION (MENTAL STATUS)

✓ Coma scale

Coma Cocktail

Thiamine: 100 mg IV

Dextrose 50%: 0.5-1 g/kg

Naloxone: 2 mg IV

Oxygen

2-CLINICAL EVALUATION

✓ **History**

✓ **Physical examination (Vital signs)**

- Temperature, pupil size, breath odor

✓ **Lab tests**

CLINICAL EVALUATION

Temp

- Hyper → Anticholinergic, Cocaine, MAOI
- Hypo → Ethanol, Opioid, Barbiturates

Pupil size

- Myosis → Opioid, OPs
- Mydriasis → Anticholinergic, Cocaine

CLINICAL EVALUATION

✓ **Breath odor**

- ❑ Cyanide: Bitter almond
- ❑ Arsine gas, Thallium, OPs: Garlic
- ❑ Ethanol, Acetone : Specific odor

CLINICAL EVALUATION

IV line :

CBC, Glucose, Creatinine, Electrolyte, BUN

Arterial blood gas
(ABG)

$$\left\{ \begin{array}{l} \text{pH} = 7.3 \\ \text{HCO}_3 = 24 - 28 \text{ meq/L} \\ \text{P O}_2 = 80 - 100 \text{ mmHg} \\ \text{P CO}_2 = 36 - 44 \text{ mmHg} \end{array} \right.$$

تستهای تشخیصی



- ECG
- آنیون گپ (Anion Gap)
- اسمولار گپ (Osmolar Gap)
- بررسی‌های رادیولوژیک
- گرافی شکم
- CXR
- بررسی‌های آزمایشگاهی

ECG

- مواردیکه باعث ایجاد آریتمی میشود
- مسمومیت با سمپاتومیمتیکها، TCA، دیژیتالها، بتابلوکرها، مهارکنندههای کانال کلسیم، ترکیبات ضد فشار خون

- **Anion gap = $\text{Na}^+ - (\text{Cl}^- + \text{HCO}_3^-) = 12 \pm 2$ meq/L**

↑ Anion gap:

**Alcohol, CN^- , Salicylates, Co,
Hypoxia,**



بررسی‌های رادیولوژیک

- انجام گرافی در تشخیص فلزات یا بسته داروهای مصرف شده،
- موارد زیر در گرافی ساده شکم رویت می‌شوند:
- آهن، سایر فلزات سنگین مثل سرب، آرسنیک، جیوه
- کلرال هیدرات، بسته‌های کوکائین، کلسیم
- بسته‌های مواد مخدر
- عوامل آهسته رهش یا پوشش دار روده‌ای



بررسی‌های آزمایشگاهی

- اندازه‌گیری مواد در مسمومیتها، اغلب به ندرت در تشخیص و درمان استفاده می‌شود .
- بررسی سطح خونی مواد به دو صورت کیفی و کمی انجام می‌گیرد
- در مسمومیت با استامینوفن، به طور روتین سطح خونی آن اندازه‌گیری می‌شود

3-GUT DECONTAMINATION

✓ Emesis (Ipecac)

❖ Disadvantages:

- Time
- Small and variable amount remove
- Aspiration pneumonia
- Gastric rupture
- Stroke
- Bleeding
- Diarrhea
- Drowsiness



EMESIS

✓ **Contraindications:**

- Acid or alkali ingestion
- Hydrocarbon ingestion
- Agent with rapid act (e.g. TCAs)
- Phenothiazine
- Anticoagulant
- Coma
- Seizure

✓ **Dose : 30 mL + 250 mL water** —→ repeat

GUT DECONTAMINATION

✓ Gastric aspiration and lavage

✓ **low clinical effect:**

First hour

Remove from stomach no effect on intestine

✓ Tube: # 36 – 40 (adult), 22-28 (child)

✓ NG tube

✓ Trendelenburg position

✓ 200 mL N/S or water 37°C

GASTRIC LAVAGE

✓ **Complications:**

- Esophageal perforation
- Stimulate cholinergic nerve → arrhythmia

✓ **Contraindications:**

- Acid or alkali
- Coagulating dysfunction

✓ **Precaution:** after intubation : coma , seizure

GUT DECONTAMINATION

✓ Activated Charcoal

Administer as soon as possible

✓ **Contraindication :**

- GI perforation
- Bowel obstruction



ACTIVATED CHARCOAL

- ✓ **No absorption:**

- ✓ Acid

- ✓ Alkali

- ✓ Alcohol

- ✓ Hydrocarbon

- ✓ Heavy metals and Lithium

- Dose: 1 g/kg (50g) , repeat as needed

GUT DECONTAMINATION

✓ Cathartics

sorbitol 70% (1 mg/kg)

Magnesium citrate 10%

Makes charcoal palatable and constipation

- Caution: electrolyte disturbance

GUT DECONTAMINATION

Whole Gut Lavage

- Isotonic electrolyte solution contain PEG (500-1000 mL/h until clean rectal effluent)
- **Indication**
- EC tablet and S.R. tablet
- Body Packers
- Heavy metals
- Chemical low absorb to charcoal (e.g. Li, Fe, Lead)
- Late presentation of patient

4-ENHANCEMENT OF ELIMINATION

- ✓ Diuresis
- ✓ PH alteration
- ✓ Hemodialysis
- ✓ Hemoperfusion

ENHANCEMENT OF ELIMINATION

✓ PH alteration

- Alkaline: phenobarbital, salicylates, methanol, TCAs
- 1 Lit dextrose water: 1-2 meq / kg bicarbonate (pH:7.5-8)
- **Caution:** CHF, Renal failure, Cerebral edema, pH shift, Hypokalemia

HEMODIALYSIS

- ✓ Size < 500 Dalton
- ✓ PB: low
- ✓ $V_d < 1 \text{ L/kg}$
- ✓ Water solubility: high
- ✓ **Indication:**
 - Alcohol
 - Salicylates
 - Phenobarbital
 - Lithium
 - Theophylline
- Caution: hypotension, bleeding

HEMOPERFUSION

- ✓ Size > 500 Dalton
- ✓ PB : high
- ✓ $V_d < 1 \text{ L/kg}$
- **Indication:**
 - Theophylline
 - Phenothiazine

HEMOPERFUSION

■ Caution :

✓ Thrombocytopenia

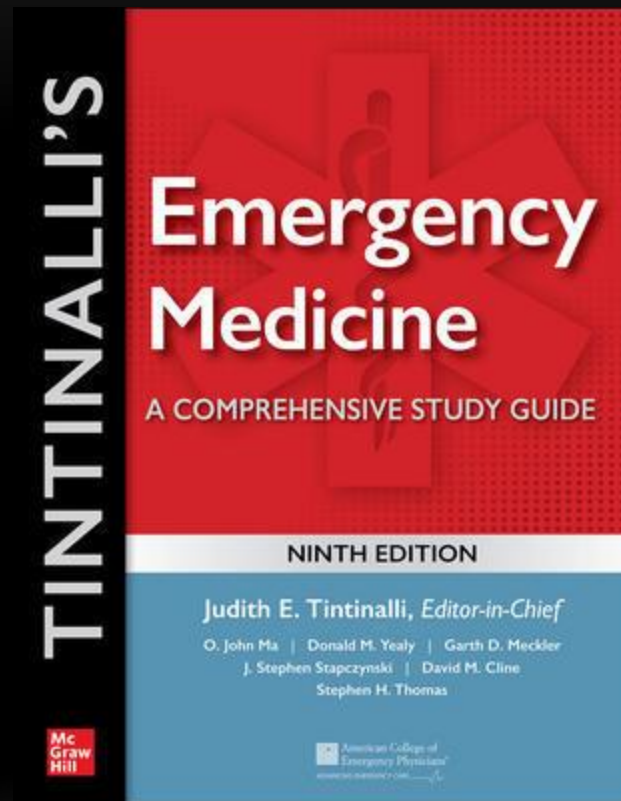
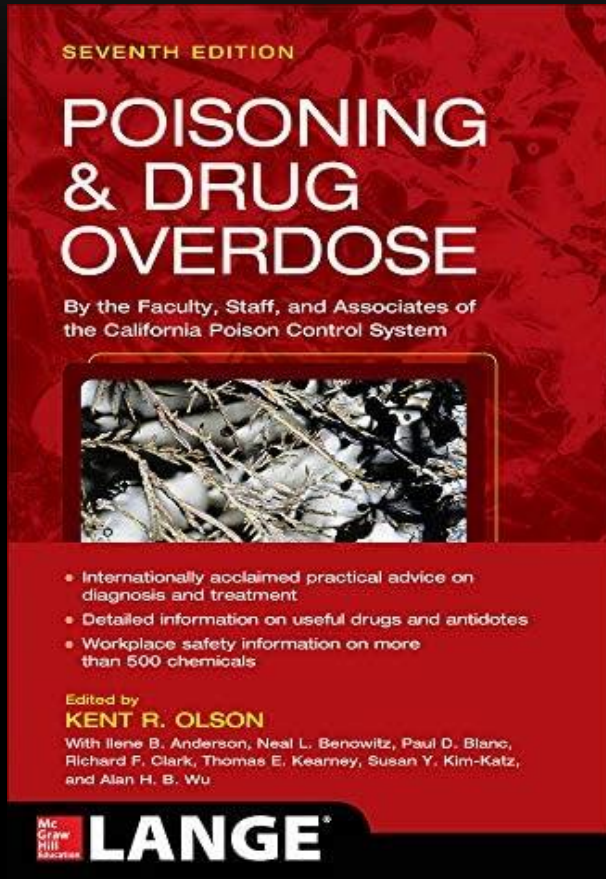


✓ Ca, phosphate, glucose

✓ Leucopenia

✓ Charcoal embolization

REFERENCES:



ALCOHOL OVERDOSE

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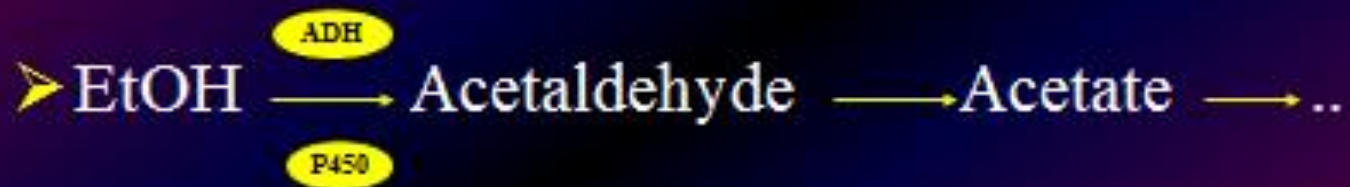
ETHANOL POISONING

- Ethanol (ethyl alcohol, C_2H_5OH) is derived from fermentation of sugars in fruits, cereals, and vegetables.
- Ethanol has had a historical role in mankind's medical, social and religious rituals.
- Commercial beer, wine and liquors contain various amounts of ethanol.
- Ethanol is also found in variety of colognes, perfumes, after-shaves, mouthwashes, some rubbing alcohols, pharmaceutical preparations (elixirs) and many other products.

PHARMACOKINETICS

- Ethanol is readily absorbed(peak 30-120 min.) and distributed into the body water ($V_d=0.5-0.7\text{L/kg}$).
- It is rapidly absorbed by diffusion across the lipid membranes of the stomach and small intestine.
- Co-ingestion of food or decreased GI motility produces a delay in absorption and increases the gastric metabolism of ethanol.

➤ Metabolism:



Acetaldehyde Syndrome

The mediator of liver toxicity

Elimination

- Elimination is mainly by oxidation in the liver and follows zero-order kinetics.
- The average elimination rate in non-drinkers to be 12-24mg/dl/h; in social drinkers 15mg/dl/h and higher, and in alcoholics 15-49mg/dl/h.

FACTORS AFFECTING BLOOD ETHANOL

- Sex
- Age
- Adiposity
- Smoking
- Delayed gastric emptying

Toxic Dose:

Adult : 6-10 ml/kg

Children : 4 ml/kg

INTOXICATION SIGNS

<150 mg%	150-300 mg%	300-500 mg%
Warmth Well-being Talkative Self-confidence Coordination Decrease reflex	Ataxia Diplopia Flushing Sweating Tachycardia	Hypothermia Drowsiness Coma Metabolic acidosis Respiratory depression

BLOOD ETHANOL LEVEL > 500 MG%

Hypotension

Hypothermia

Coma

Convulsion

Respiratory Arrest

MANAGEMENT OF ACUTE INTOXICATION

- Supportive care
 - Dextrose 5%
 - Thiamin
 - Folic acid
 - Multi Vit.
 - Diazepam
 - Hemodialysis
- **NO gastric lavage**
 - **NO Charcoal**

- Treatment is mainly supportive.
- Protect the airway to prevent aspiration.
- Glucose & thiamine administered.
- Glucagon is not effective for alcohol induced hypoglycemia.
- Correct hypothermia with gradual rewarming.

- Do not induced vomiting or activated charcoal and gastric lavage in pure ethanol intoxication. Consider gastric lavage only if the alcohol ingestion was massive and recent (within 30-45 min.).
- Hemodialysis efficiently removes ethanol but enhanced removal is rarely needed because supportive care is usually sufficient.
- Hemoperfusion and forced diuresis are not effective.

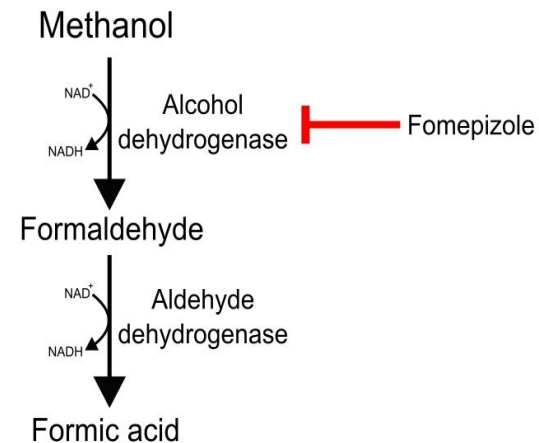
METHANOL Overdose

Methanol (wood alcohol, methyl alcohol, CH_3OH), is a common ingredient in many solvents, washing solutions and paint removers

Toxic dose > 10ml

Fatal dose : 60-240 ml

Methanol Metabolism



CLINICAL FEATURES

- 30` - 2h
resemble mild ethanol intoxication
- 6 – 30h
dizziness, drowsiness, vomiting diarrhea,
abdominal pain

Other Effects

Hyperglycemia

Mydriasis without light reflex

Blurred or snowfield vision-blindness

Delay in Treatment

Convulsion

Metabolic acidosis

Acute renal failure

Coma

TREATMENT

- Supportive care
- Gastric lavage
- Na Bicarbonate
- Folic acid
- Antidotes
- Hemodialysis

ETHANOL THERAPY

- Loading dose

Infusion : 7 ml/kg of ethanol 10% , 30min

Oral : 4ml/kg of ethanol 20% , 30min

ETHANOL THERAPY

- Maintenance dose

ml/kg/h of ethanol 10% (oral , IV)

- Non-drinker/child 0.88
- Average adult 1.4
- Chronic drinker 2

FOMEPIZOLE

L.D. = 15mg/kg (IV)

M.D. = 10mg/kg , q12h , 4 doses
then 15mg/kg , q12h

FOMEPIZOLE

- **Contraindication:**

Hypersensitivity to fomepizole or other pyrazoles.

- **Precautions:**

Do not give undiluted or bolus injection.

In children less than 5 years old

Liver disease

Renal impairment

INDICATIONS FOR HEMODIALYSIS

- Severe Metabolic Acidosis
- Visual Abnormalities
- Osmolar gap >10 mOsm/L
- Methanol Concentration > 25 mg/dl

نحوه برخورد با همه گیری مسمومیت با متانول

براساس تعریف، بروز بیش از سه مورد از مسمومیت با متانول در یک منطقه در فاصله زمانی ۲۴ ساعت مطرح کننده بروز همه گیری است.

- **بیماریابی فعال**
- **از آن جا که داده های کیفی نشان میدهد در اغلب موارد مسمومیت با متانول در بزرگسالان متعاقب مصرف گروهی اتانول آلوده رخ میدهد، برقراری رابطه درمانی مثبت، ایجاد اعتماد، آموزش و بیماریابی فعال از طریق بیمار، خانواده اش و همراهان توصیه میشود. آموزش ارایه شده در این مورد باید بر اهمیت حیاتی مراجعه به موقع و احتمال بدون علامت بودن علیرغم مسمومیت شدید در ۲۴ ساعت اول متمرکز باشد.**

ETHYLENE GLYCOL

Fatal dose in adult : 100ml

CLINICAL FEATURE

- **30'- 1h**

Resemble ethanol intoxication

- **4-12h**

Drowsiness, tachycardia, hypertension, CHF

- **24-72h**

Acute R.F, coma, convulsion, myocard. dep.

OTHER EFFECTS

- Hypocalcemia
 - Arrhythmia
 - Convulsion
- Hypoglycemia
- Hyperkalemia
- Severe metabolic acidosis

سپاس از حسن
توجه شما

Table 170-1 Criteria for Nontoxic Ingestions

Only one substance must be involved in the exposure.

The substance must be absolutely identified.

The substance's product label must not contain any consumer product safety commission signal words indicating a potential hazard of toxicity.

The exposure must have been unintentional.

The route of exposure must be known.

An approximate amount of the substance involved in the exposure must be known.

The exposed individual must be free of symptoms for the extent of the observation period.

Follow-up consultation must be easily available or a responsible parent or guardian must be present.

Note: All of the listed criteria must be fulfilled in order for an ingestion to be classified as nontoxic.



سندرم‌های سم‌شناسی (TOXIDROMES)

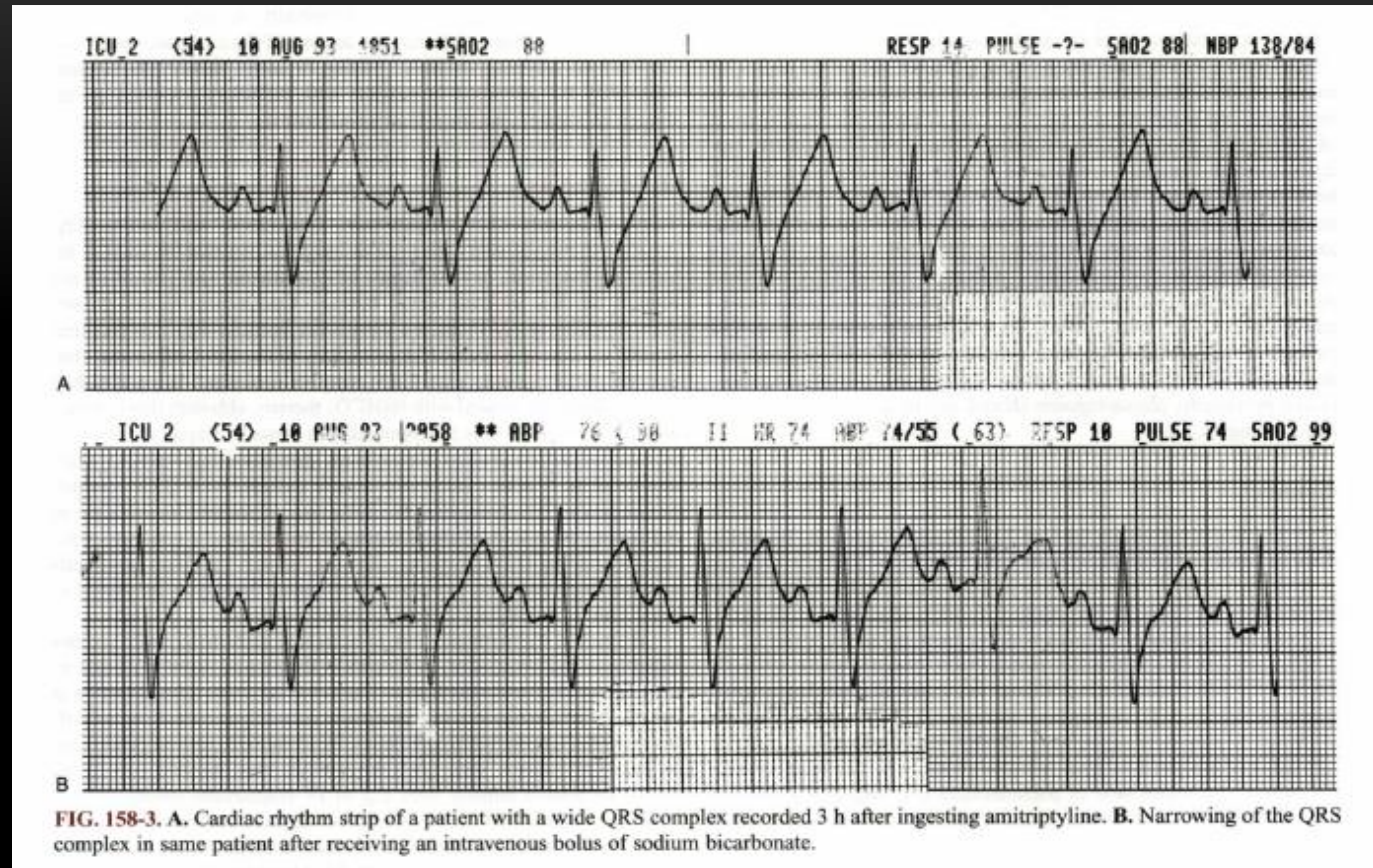
- گروهی از علائم فیزیولوژیکی غیر طبیعی شامل علائم حیاتی، شکل ظاهری بیمار، پوست، چشم، غشاهای مخاطی، ریه، قلب، شکم و علائم نورولوژیک
- مرتبط با گروه خاصی از مواد
- در تشخیص مواردی که، تماس با ماده به نحوی مشخص نباشد کمک کننده است

Table 170-3 Common Toxidromes

Toxidrome	Representative Agent(s)	Most Common Findings	Additional Signs and Symptoms	Potential Interventions
Opioid	Heroin Morphine Oxycodone	Central nervous system depression, miosis, respiratory depression	Hypothermia, bradycardia Death may result from respiratory arrest, acute lung injury	Ventilation or naloxone
Sympathomimetic	Cocaine Amphetamine	Psychomotor agitation, mydriasis, diaphoresis, tachycardia, hypertension, hyperthermia	Seizures, rhabdomyolysis, myocardial infarction Death may result from seizures, cardiac arrest, hyperthermia	Cooling, sedation with benzodiazepines, hydration
Cholinergic	Organophosphate insecticides Carbamate insecticides	Muscarinic effects (salivation, lacrimation, diaphoresis, nausea, vomiting, urination, defecation, bronchorrhea) Nicotinic effects (muscle fasciculations and weakness)	Bradycardia, miosis/mydriasis, seizures, respiratory failure, paralysis Death may result from respiratory arrest from paralysis, bronchorrhea, or seizures	Airway protection and ventilation, atropine, pralidoxime
Anticholinergic	Scopolamine Atropine	Altered mental status, mydriasis, dry flushed skin, urinary retention, decreased bowel sounds, hyperthermia, dry mucous membranes	Seizures, dysrhythmias, rhabdomyolysis Death may result from hyperthermia and dysrhythmias	Physostigmine (if appropriate), sedation with benzodiazepines, cooling, supportive management
Salicylates	Aspirin Oil of wintergreen	Altered mental status, respiratory alkalosis, metabolic acidosis, tinnitus, hyperpnea, tachycardia, diaphoresis, nausea, vomiting	Low-grade fever, ketonuria Death may result from acute lung injury or cerebral edema	Multidose activated charcoal, alkalization of urine with potassium repletion, hemodialysis
Sedative-	Barbiturates	Depressed level of consciousness,	Stupor to coma, depressed	Ventilatory support

Sedative-hypnotic	Barbiturates Benzodiazepines	Depressed level of consciousness, slurred speech, ataxia	Stupor to coma, depressed respirations, apnea, bradycardia	Ventilatory support
Hypoglycemic	Sulfonylureas Insulin	Altered mental status, diaphoresis, tachycardia, hypertension	Paralysis, slurring of speech, bizarre behavior, seizures Death may result from seizures, altered behavior	Glucose-containing solution IV and oral feedings if possible, frequent glucose measurement, octreotide
Hallucinogenic	Phencyclidine Lysergic acid diethylamide Psilocybin Mescaline	Hallucinations, dysphoria, anxiety	Hyperthermia, mydriasis, nausea, sympathomimetic symptoms	Generally supportive
Serotonin	SSRIs Meperidine A variety of drug interactions with dextromethorphan, monoamine oxidase inhibitors, tricyclic antidepressants, other SSRIs, and amphetamines	Altered mental status, increased muscle tone, hyperreflexia, hyperthermia	Intermittent whole-body tremor Death may result from hyperthermia	Cooling, sedation with benzodiazepines, supportive management, theoretical benefit of cyproheptadine
Extrapyramidal	Haloperidol Phenothiazines Risperidone Olanzapine	Dystonia, torticollis, tremor, muscle rigidity	Choreoathetosis, hyperreflexia, seizures	Diphenhydramine Benztropine Benzodiazepines

Abbreviation: SSRI = selective serotonin reuptake inhibitor.



پهن شدن کمپلکس **QRS** در مواردی نظیر مسمومیت با **TCA**، کوکائین، پروپوکسی فن، آنتی آریتمی‌ها، تیوریدازین و کینین مشاهده می‌گردد