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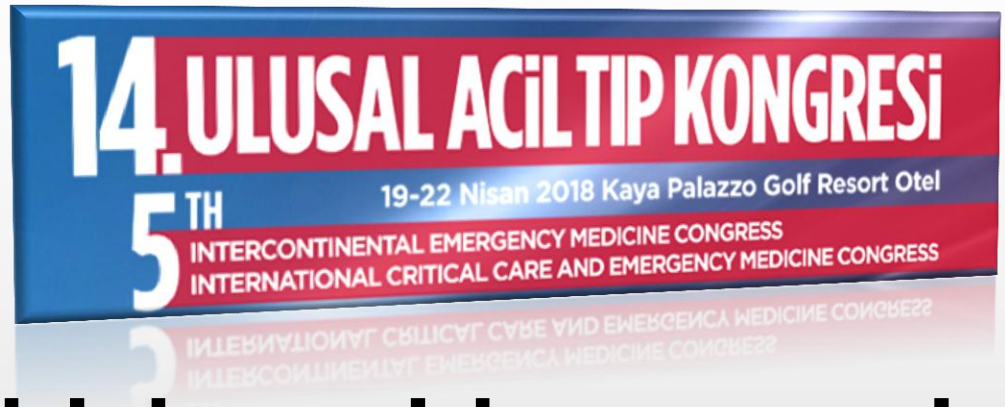

Which antidotes are in our pocket during daily practices?

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Initial stabilization and therapy

- Endotracheal intubation as needed for airway protection, oxygenation, ventilation, and orogastric lavage
- Supplemental oxygen for hypoxia
- Pulse oximetry
- Cardiac monitor
- IV access

- **Hypotension:**
  - Administer 0.9 % normal saline IV fluid bolus
  - Trendelenburg position
  - Vasopressors for persistent hypotension
- **Bradycardia:**
  - Atropine
  - Cardiac pacing
- **If altered mental status:**
  - Thiamine,
  - D50W
  - Naloxone

- **Decontamination:**
  - Gastric Decontamination.
  - Prevents systemic absorption of ingested toxin
- **Orogastric lavage:**
  - Consider in potentially lethal ingestions without known antidote within 1 hour of ingestion
  - Protected airway essential prior to lavage

- **<u>Activated charcoal:</u>**
  - Most effective within a few hours of most toxic ingestions
  - Contraindicated if caustic ingestion, unprotected airway, or bowel obstruction

- Drugs not effectively bound to charcoal:
  - Metals (borates, bromide, iron, lithium),
  - Alcohols,
  - Potassium

- **<u>Activated charcoal:</u>**
  - Multiple-dose activated charcoal:
    - Theophylline
    - Carbamazepine
    - Phenobarbital
- Dosing: 1–2 g/kg PO

- **<u>Whole-bowel irrigation:</u>**
  - Polyethylene glycol evacuates bowel without causing electrolyte disturbances
  - In toxins not well adsorbed by charcoal (e.g., iron and lithium), body packers/stuffers, sustained-release ingestions.
  - Contraindicated if bowel obstruction, perforation, or hypotension

- **Urinary alkalinization:**
  - Salicylates,
  - Phenobarbital
- **Hemodialysis/hemoperfusion:**
  - Salicylates,
  - Lithium
  - Theophylline
  - Toxic alcohols
  - Valproate

Acetaminophen: N-acetylcysteine

- **Oral dosing** is suitable for non-pregnant patients with a functional GI tract (no hepatotoxicity)
- **140 mg/kg** loading dose,
  - **followed by 17 doses of 70 mg/kg every 4 hours**
- If vomiting occurs within 1 hour of NAC dosing, a full dose should be repeated

N-acetylcysteine: IV dosing

- In patients with no biochemical evidence of hepatic failure (ie, INR <2):
- 21 hour IV protocol:
  - **150 mg/kg** loading dose over 60 minutes,
  - followed by **50 mg/kg** infused over 4 hours,
  - with the final **100 mg/kg** infused over the remaining 16 hours

N-acetylcysteine: IV dosing

- In patients with biochemical evidence of hepatic failure (ie, INR >2),
- 21 hour IV protocol:
  - **150 mg/kg** loading dose over 60 minutes,
  - followed by **50 mg/kg** infused over 4 hours,
  - followed by **100 mg/kg** infused over the next 16 hours)
  - followed by a continuous IV NAC **infusion at 6.25 mg/kg** per hour until INR is <2

Anticholinergic: Physostigmine

- Patients who manifest both peripheral & moderate central anticholinergic toxicity should be treated with:
  - **0.5 to 2 mg** (0.02 mg/kg IV, up to a maximum of 0.5 mg per dose in pediatric patients);

(should be given by slow IV push, over five minutes)

Benzodiazepines: Flumazenil

- Nonspecific competitive antagonist of the BZD receptor
- It can be used to reverse BZD-induced sedation following general anesthesia, procedural sedation, or overdose

Benzodiazepines: Flumazenil

- The use of flumazenil in the setting of overdose remains highly controversial
- It can precipitate withdrawal seizures in patients who have developed a tolerance to BZDs through chronic use or abuse

Benzodiazepines: Flumazenil

- It does not consistently reverse respiratory depression caused by BZD overdose
- It appears to be safe and effective when used to reverse the sedating effects of a BZD in patients who do not use BZDs chronically.

Benzodiazepines: Flumazenil

- Initial dose is **0.2 mg** IV over 30 seconds
- Repeated doses of **0.2 mg, to a maximum dose of 1 mg** can be given until the desired effect is achieved (no more than 3 mg within any one hour)

β-blockers: Glucagon et al.

- For severe poisoning (eg, profound hypotension), give following treatments simultaneously:
  - IV glucagon, **5 mg** IV bolus, may be repeated if the initial bolus is ineffective
  - IV calcium salts,
    - Calcium chloride (10% solution) **10 to 20** mL
    - Calcium gluconate (10% solution) **30 to 60** mL
  - Vasopressor (eg, epinefrin),
  - IV high-dose insulin (with glucose),
  - IV lipid emulsion therapy.

- IV high-dose insulin (with glucose): Bolus of **1 U/kg** IV of regular insulin, followed by infusion of **0.5 U**/kg/hour; (titrate infusion upwards until hypotension corrected or dose reaches 2 U/kg/hour)
- Relative hypoglycemia and hypokalemia must be corrected prior to therapy
- IV lipid emulsion therapy: **1.5 mL/kg** over 2 minutes, followed by **1.5 mL/kg** infusion over 60 minutes

Carbon monoxide: Oxygen, hyperbaric oxygen

- Intubate as clinically indicated
- Apply high-flow oxygen to **all** poisoned patients regardless of pulse oximetry or arterial pO2

Carbon monoxide: Oxygen, hyperbaric oxygen

- Hyperbaric oxygen (HBO) for:
  - CO level >25 percent (>20 percent if pregnant)
  - Loss of consciousness
  - Severe metabolic acidosis (pH <7.1)
  - Concern for end-organ ischemia (chest pain, ECG changes, altered mental status)

Vitamin K antagonist (eg, warfarin)

- **If 4-factor prothrombin complex concentrate is available (preferred approach):**
  - 4F PCC **1500 to 2000 units** IV over 10 minutes.
  - Check INR 15 minutes after completion of the infusion
  - If INR is not ≤1.5, give additional 4F PCC
  - Give vitamin K 10 mg IV over 10 to 20 minutes.

Vitamin K antagonist (eg, warfarin)

- **If 3-factor prothrombin complex concentrate is available**
  - 3F PCC **1500 to 2000 units** IV over 10 minutes.
  - Check INR 15 minutes after completion of the infusion
  - If INR is not ≤1.5, give additional 3F PCC
  - Give vitamin K 10 mg IV over 10 to 20 minutes.

Vitamin K antagonist (eg, warfarin)

- **Neither 3F PCC nor 4F PCC is available**
  - FFP 2 units IV by rapid infusion.
  - Check INR 15 minutes after completion of infusion. If INR ≥1.5, administer 2 additional units
  - Repeat process until INR ≤1.5
  - Administer loop diuretic if volume overload occurs
  - Give vitamin K 10 mg IV over 10 to 20 minutes

Vitamin K antagonist (eg, warfarin)

- These products and doses are for use in life-threatening bleeding only
- PCC will reverse anticoagulation within minutes of administration;
- FFP administration can take hours due to the volume required;
- Vitamin K effect takes 12 to 24 hours, but administration of it is needed to counteract the long half-life of warfarin.

Cyanide: Cyanide antidote kit, hydroxocobalamin

- If hydroxocobalamin is available
  - Hydroxocobalamin **70 mg/kg** up to 5 g IV (**5 g** is standard adult dose)
  - Sodium thiosulfate (25%): **1.65 mL/kg** up to 50 mL IV; may repeat once (maximum dose 12.5 g)

Cyanide: Cyanide antidote kit, hydroxocobalamin

- If hydroxocobalamin is not available (no contraindications to nitrites)
  - Sodium nitrite **10 mg/kg - up to 300 mg** - by slow IV infusion; may repeat once
  - Sodium thiosulfate (25%): **1.65 mL/kg** up to 50 mL IV; may repeat once

Cyanide: Cyanide antidote kit, hydroxocobalamin

- If hydroxocobalamin is not available and cyanide toxicity is possible but not certain, or the patient has contraindications to nitrites
  - Sodium thiosulfate (25%): **1.65 mL/kg** up to 50 mL IV; may repeat once

Methanol, Ethylene glycol: 4-methylpyrazole (Fomepizol), Ethanol

- Block alchohol dehydrogenase with **fomepizole**,
  - **15 mg/kg** IV loading dose,
  - followed by **10 mg/kg** q 12 h x 4 doses.
  - If patient requires further treatment after this regimen, increase dose to **15 mg/kg** every 12 hours

Methanol, Ethylene glycol: 4-methylpyrazole (Fomepizol), Ethanol

- If fomepizole is unavailable or patient has a known allergy, block alcohol dehydrogenase with ethanol,
  - **10 mL/kg** of a ethanol solution (10%),
  - followed by **1 mL/kg** of ethanol solution (10%) infused per hour.
  - Titrate to serum ethanol concentration of **100 mg/dL**.

Methanol, Ethylene glycol: 4-methylpyrazole (Fomepizol), Ethanol

- Administer **sodium bicarbonate**,
  - 1 to 2 meq/kg bolus followed by infusion of 132 meq $NaHCO_3$ in 1 L D5W to run at 200 to 250 mL/hour for patients with pH below 7.3
- For patients with known or suspected methanol poisoning, administer **folic acid**, 50 mg IV every six hours

Methanol, Ethylene glycol: 4-methylpyrazole (Fomepizol), Ethanol

- For patients with known or suspected ethylene glycol poisoning, administer
  - **thiamine**, **100 mg IV**, and **pyridoxine**, **50 mg IV**

Methemoglobinemia: Methylene blue

- If the patient is symptomatic and does not have G6PD deficiency, we recommend the immediate use of intravenous MB
- Prefer MB over ascorbic acid because of its more rapid onset of action.
  - The usual dose in this setting is **1 to 2 mg/kg**, given over five minutes.

Opiates: Naloxone

- If the O2 saturation is <90% but the patient is breathing spontaneously, administer supplemental oxygen followed by IV naloxone, **0.05 mg**
- Repeat until ventilation is adequate.
- The goal of treatment is adequate ventilation, **not** normal mental status

Opiates: Naloxone

- If the response is inadequate after 5 to 10 mg, reconsider the diagnosis
- If the patient is apneic, ventilate using a bag-valve mask attached to supplemental oxygen and administer naloxone in doses of **0.2 to 1 mg IV or IM**

Organophosphates: Atropine, pralidoxime

- **Atropine 2 to 5 mg** IV/IM/IO bolus
  - Escalate (double) dose every 3-5 minutes until bronchial secretions and wheezing stop
  - Tachycardia and mydriasis are not contraindications
  - Hundreds of milligrams may be needed over several days in severe poisonings
  - Inhaled ipratropium 0.5 mg with parenteral atropine may be helpful for bronchospasm

Organophosphates: Atropine, pralidoxime

- **Pralidoxime** (2-PAM)
  - **2 g** IV over 30 minutes; may repeat after 30 minutes or give continuous infusion if severe
  - Continuous infusion at 8 mg/kg/hour in adults
  - If no IV access, give pralidoxime 600 mg IM
  - is given with atropine
  - Diazepam **10 mg** IV, repeat as necessary if seizures occur. Do not give phenytoin.

Tricyclic antidepressants: $NaHCO_3$

- for QRS duration >100 msec or any ventricular arrhythmia caused by TCA poisoning
  - The initial dose of sodium bicarbonate is **1 to 2 mEq/kg.**
  - In adults, this may be given as two to three **50 mEq (50 mL)** vials or prefilled syringes of 8.4 percent sodium bicarbonate given as a rapid IV push through a large bore IV

Digoxin: Digibind

- Clinically significant manifestations of digitalis poisoning be treated with digoxin-specific antibody (Fab) fragments
- As temporizing measures or if Fab fragments are not immediately available, bradycardia can be treated with atropin 0.5 mg IV in adults and hypotension with IV boluses of isotonic crystalloid

Iron: Deferoxamine

- The usual dose of deferoxamine is **15 mg/kg** per hour intravenously.
- In cases of severe overdose, higher doses of deferoxamine (up to 35 mg/kg per hour) be administered during the first 24 hours of treatment

Iron: Deferoxamine

- Patients with a significant number of radiopaque pills on abdominal radiograph receive gastric lavage and/or whole bowel irrigation

Isoniazid: Pyridoxine (vitamin B6)

- **1 g** intravenously for every gram of INH ingested.
- When the quantity of INH ingested is unknown, **5 g IV** may be administered to an adult
- The dose can be administered at a rate of **0.5 g/min**, and may be repeated in patients with refractory seizure activity

4-metil pirazol (Fomepizol sulfat)	FOMEPİZOL	5 amp / kutu	100 mg / 20 ml	Etilen glikol ve Methanol zehirlenmeleri
Botulismus Polivalan Antiserum (A-B-E)	BOTULİSMUS ANTİTOKSİN	250 ml şişe	Tip A 750 IU/ml Tip B 500 IU/ml Tip E 50 IU/ml	Botulismus vakaları için Antitoksin
Calcium Ededate sodyum	CALCIUM EDEDATE DE SODIUM % 5	10 amp / kutu	500 mg / 10 ml	Kurşun zehirlenmeleri
Di cobalt EDTA	KELOCYANOR % 1,5	6 amp / kutu	300 mg / 20 ml	Siyanür zehirlenmeleri
Digoksin İmmün Fab	DİGİFAB	1 vial / kutu	40 mg / vial	Digoksin zehirlenmeleri
Dimercaprol	B.A.L.	12 amp / kutu	200 mg / 2 ml	Ağır metal şelatörü
DMPS	DİMAVAL	20 cap / kutu	100 mg kapsül	Ağır metal şelatörü (Hg)
D-penisilamin	METACAPTASE	100 cap / kutu	150 mg kapsül	Ağır metal şelatörü (Pb, Cu)
Etil Alkol	ETİL ALKOL % 10	500 ml şişe	500 ml şişe	Etilen glikol ve Methanol zehirlenmeleri
Hydroxocobalamin	CYANO KİT 2,5 g	2 vial / kutu	2,5 gr vial	Siyanür zehirlenmeleri
Metilen Mavisi	METİLEN MAVİSİ % 1	1 flakon	20 ml / flakon	Methemoglobinemi yapan zehirlenmeler
Physostigmine	ANTİCHOLİUM	5 amp / kutu	2 mg / 5 ml	Antikolinerjik zehirlenmeler
Pralidoksim	CONTRATHİON	10 flakon/ kutu	200 mg / flakon	Organik fosfor zehirlenmeleri
Silibinin	LEGALON-SİL	4 flakon / kutu	350 mg / flakon	Mantar zehirlenmeleri
Succimer (DMSA)	SUCCİCAPTAL	15 cap / kutu	200 mg / kapsül	Ağır metal şelatörü (Hg)

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