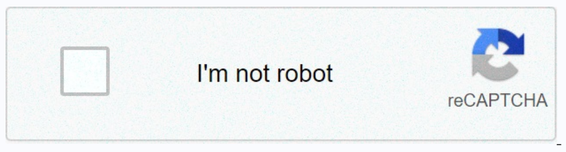

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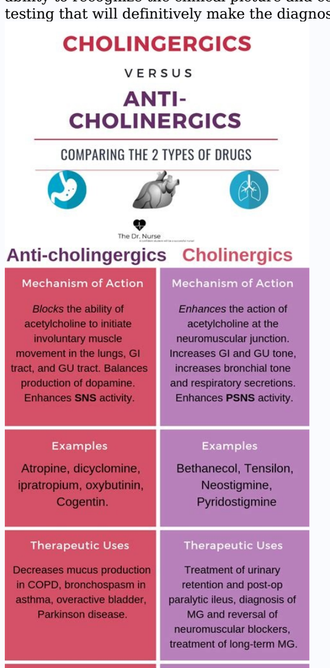
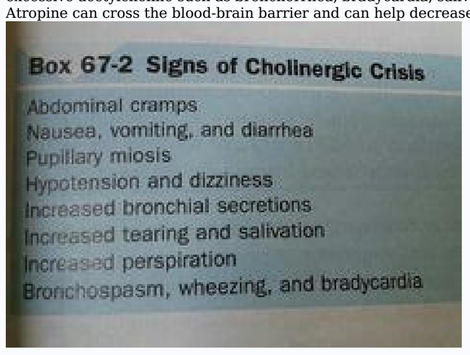
Cholinergic crisis pdf

Cholinergic crisis pathophysiology.
Cholinergic.crisis. Cholinergic crisis diagnosis. Cholinergic crisis management.

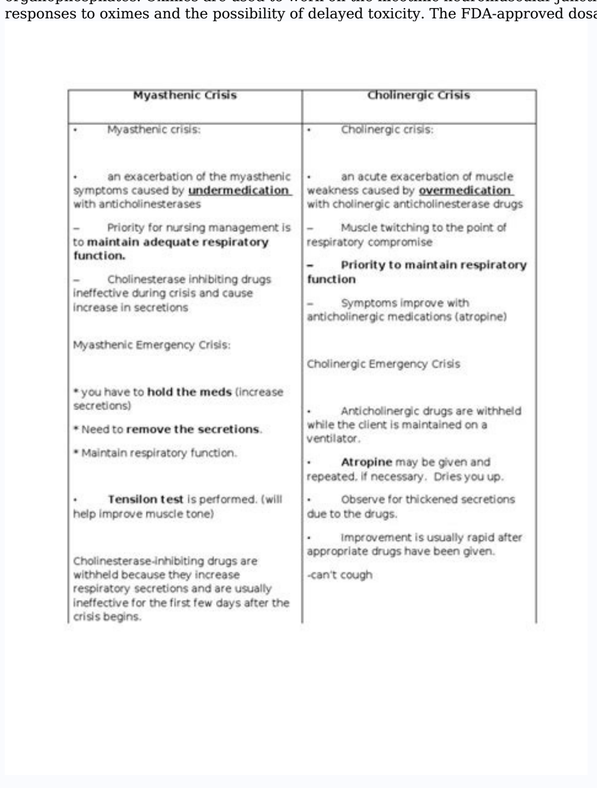
Cholinergic toxicity is caused by substances that stimulate, enhance or mimic the neurotransmitter acetylcholine, the primary neurotransmitter of the parasympathetic nervous systems. Acetylcholine stimulates muscarinic and nicotinic receptors to cause muscle contraction and glandular secretions. Cholinergic toxicity occurs when too much acetylcholine is present in the receptor synapse leading to excessive parasympathetic effects. This activity reviews the presentation, evaluation, and management of cholinergic toxicity and stresses the role of an interprofessional team approach to the care of affected patients. Objectives: Describe the history and physical exam findings typically seen in patients with cholinergic toxicity.Summarize the appropriate treatment for cholinergic toxicity.Review the pathophysiology of cholinergic toxicity.Explain the modalities to improve care coordination among interprofessional team members in order to improve outcomes for patients affected by cholinergic toxicity. Access free multiple choice questions on this topic. Cholinergic toxicity is caused by medications, drugs, and substances that stimulate, enhance or mimic the neurotransmitter acetylcholine. Acetylcholine is the primary neurotransmitter of the parasympathetic nervous system. Acetylcholine stimulates muscarinic and nicotinic receptors to cause muscle contraction and glandular secretions. Cholinergic toxicity occurs when too much acetylcholine is present in the receptor synapse leading to excessive parasympathetic effects.Cholinergic toxicity may result from insecticides, nerve agents, medications, and mushrooms. The most common cause of cholinergic toxicity worldwide is exposure to organophosphate and carbamate insecticides. Exposure to these insecticides may be through inhalation of vapors, ingestion, or direct contact of the chemical with the skin or mucous membrane.Sarin gas is a nerve gas typically seen in chemical warfare. Sarin gas was made originally in Germany in 1938 as a pesticide. It is well known for being involved in terrorist attacks in Japan in 1994 and 1995. Cholinergic drugs may cause a cholinergic crisis during clinical use or after an overdose. These drugs include drugs used to treat myasthenia gravis such as edrophonium and neostigmine, pilocarpine used for glaucoma, and Alzheimer drugs such as rivastigmine and donepezil. Essentially, any agent that creates an abundance of acetylcholine at the synapse may cause cholinergic toxicity. These drugs may cause weakness, but a cholinergic crisis is very rare with drugs taken at therapeutic doses.Organophosphates have been used worldwide for over 50 years as insecticides, though usage has decreased in the past 10 to 20 years. There are about 3000000 exposures to organophosphates or carbamates worldwide each year with approximately 200000 fatalities as a result of exposure.[1] One million of these exposures were found to be unintentional, while the other 2 million exposures were secondary to suicidal attempts.[2] The American Association of Poison Control Centers reported 86914 human exposures to pesticides in the United States in 1996 alone.[3] Poisoning due to occupational exposure only accounted for one-fifth of the incidental contact, with a fatality rate of less than 1%. More than 90% of the non-occupational incidents were intentional with a fatality rate exceeding 10%. Accidental exposure accounted for the other 10% with homicidal use less than 1%.Sarin is a well-known chemical warfare agent that continues to be a threat worldwide. Nerve agents have been used in subways by terrorist groups and by dictators to suppress communities within countries as well.The underlying mechanism for cholinergic toxicity is excessive cholinergic receptor stimulation which can be caused by substances that mimic, stimulate, or enhance acetylcholine. The symptom complex produced by the agent depends on what type of receptor or combination of receptors is activated. There are three types of cholinergic receptors: central, muscarinic, and nicotinic. Excess acetylcholine at muscarinic receptors will result in symptoms of increased secretions, bronchoconstriction, bradycardia, vomiting, and abdominal cramping. Excess acetylcholine at nicotinic receptors causes muscle fasciculations or paralysis due to activation of the neuromuscular junction. Acetylcholine excess in the central nervous system can cause confusion, headache, or drowsiness.[1]Physical exam findings depend on which receptors experience accumulation of acetylcholine. Acetylcholine accumulation at muscarinic receptors produces an increase in secretions which can manifest as bronchorrhea, salivation, tearing and sweating, bronchoconstriction, tightness in the chest, wheezing, bradycardia, vomiting, increased gastrointestinal motility, abdominal tightness, diarrhea, and cramps. Activation of muscarinic receptors in the eye by excess acetylcholine will produce miosis and blurry vision. Increased acetylcholine at nicotinic sites at the neuromuscular junction causes muscle fasciculations and flaccid paralysis due to excess acetylcholine at the neuromuscular junction. Excess acetylcholine in the brain patients may cause headache, insomnia, giddiness, confusion, and drowsiness. More severe exposures may cause central depression resulting in slurred speech, convulsions, coma, and respiratory depression. Death can occur due to effects on the heart, respiration, and brain.Two helpful mnemonics to remember the muscarinic effects of excess acetylcholine are SLUDGE or DUMBELSS - SalivationL - LacrimationU - Urinary frequency D - Diaphoresis/diarrheaG - Gastrointestinal cramping and painE - EmesisD - Diarrhea/diaphoresisU - Urinary frequencyM -Miosis B - Bronchospasm/bronchorrheaE - Emesis L - LacrimationS- SalivationThe correct diagnosis for cholinergic toxicity hinges on the ability to recognize the clinical picture and connect it with the history that would make this toxidrome possible. A thorough history and physical is critical in making this diagnosis. If the toxidrome is present, it is essential to try to identify the agent as the effects and length of toxicity vary by agent.There is no specific laboratory or radiographic testing that will definitively make the diagnosis. RBC acetylcholinesterase levels can be measured, but most hospital laboratories do not offer this test.Evaluation and management of every patient should begin with ABCs (airway, breathing, circulation, disability, and exposure). Usual airway and circulatory support are necessary with two exceptions.



During intubation, succinylcholine should not be used because the lack of acetylcholinesterase caused by the poisoning will cause prolonged paralysis. Aggressive decontamination is necessary. All clothing should be removed and discarded. The skin and eyes should be washed to avoid continued absorption of the agent. Healthcare workers should wear protective gear to prevent dermal and inhalation exposure to the agent.Once suspected, treatment should consist of IV administration of atropine and pralidoxime. Atropine is given first, as pralidoxime may transiently worsen symptoms. Atropine acts as a direct antidote physiologically by antagonizing the muscarinic receptor's actions of excessive acetylcholine such as bronchorrhea, bradycardia, salivation, and bronchoconstriction.
Atropine can cross the blood-brain barrier and can help decrease the activity of centrally acting excess acetylcholine.

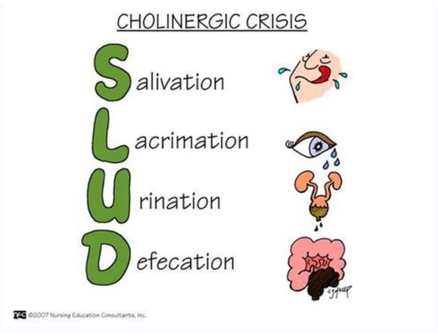


The initial dose of IV atropine is 2 to 5 mg in adults and 0.05mk/kg in children every 5 minutes until pulmonary symptoms improve. Atropine must be titrated to alleviate bronchorrhea and bronchospasm; this may require large doses of atropine and treatment may continue for several days. The hospital pharmacy should receive advance notice that an extra atropine supply may be necessary.Because atropine does not bind to nicotinic receptors, it does not treat neuromuscular dysfunction. Oximes such as pralidoxime have three actions that show benefit in acute cholinergic toxicity. Pralidoxime reactivates acetylcholinesterase, provides endogenous anticholinergic effects, and detoxifies unbound organophosphates. Oximes are used to work on the nicotinic neuromuscular junction and therefore should be given when there are signs of muscle weakness, especially if the weakness is occurring within the respiratory system.[4] Most patients with organophosphate poisoning require treatment with an oxime; this is due to the variability of responses to oximes and the possibility of delayed toxicity. The FDA-approved dosage of pralidoxime for organophosphate toxicity is 1 to 2 g infusion over 30 minutes which may be repeated in one hour if muscle weakness persists. A continuous infusion may also be necessary after the bolus dose.



Myasthenic Crisis	Cholinergic Crisis
• Myasthenic crisis: • an exacerbation of the myasthenic symptoms caused by **undermedication** with anticholinesterases – Priority for nursing management is to **maintain adequate respiratory function.** – Cholinesterase inhibiting drugs ineffective during crisis and cause increase in secretions Myasthenic Emergency Crisis: * you have to **hold the meds** (increase secretions) * Need to **remove the secretions**. * Maintain respiratory function. • **Tensilon test** is performed. (will help improve muscle tone) Cholinesterase-inhibiting drugs are withheld because they increase respiratory secretions and are usually ineffective for the first few days after the crisis begins.	• Cholinergic crisis: • an acute exacerbation of muscle weakness caused by **overmedication** with cholinergic anticholinesterase drugs – Muscle twitching to the point of respiratory compromise **– Priority to maintain respiratory function** – Symptoms improve with anticholinergic medications (atropine) Cholinergic Emergency Crisis • Anticholinergic drugs are withheld while the client is maintained on a ventilator. • **Atropine** may be given and repeated, if necessary. Dries you up. • Observe for thickened secretions due to the drugs. • Improvement is usually rapid after appropriate drugs have been given. -can't cough

If available, obtain a toxicology or poison center consultation.Seizures should receive therapy with benzodiazepines, not anti-epileptics. Prophylactic diazepam decreases neuropathological damage after organophosphate poisoning.[5]Many diseases and toxicities can mimic cholinergic toxicity. These include carbamate toxicity, nicotinic toxicity, carbachol methacholine bethanechol or pilocarpine overdose, pyridostigmine toxicity, neostigmine toxicity, mushroom poisoning, myasthenia gravis, Eaton-lambert syndrome, Guillain-Barre syndrome, botulism, opioid overdose, sepsis, toxic alcohol ingestions, severe asthma exacerbation, and severe gastroenteritis.Medical management may be difficult in cholinergic toxicity, and thus the fatality rate is generally more than 15%.[6]Because cholinergic toxicity involves the parasympathetic nervous system, many severe complications can occur. Due to the severe bronchospasm and bronchorrhea, the respiratory system may fail and require assisted ventilation. Respiratory failure may also occur from profound muscle weakness that can affect the muscles of the diaphragm.
The cardiovascular system may collapse due to profound bradycardia, hypotension, hypertension, or arrhythmias, which can accelerate in a patient with known coronary artery disease, known chronic heart failure, or other cardiovascular diseases. These effects on the cardiovascular and respiratory systems may result in cardiopulmonary arrest and death. Electrolyte abnormalities may also result from excessive vomiting and diarrhea associated with cholinergic toxicity, putting the patient at risk of arrhythmias and death. Consultation with the local poison control center or a toxicologist is appropriate in confirmed or suspected cholinergic toxicity. Patients who may come into contact with insecticides or pesticides require education in the proper handling and care of such substances. Correct handling procedures may decrease the occupational exposure of this chemical and therefore reduce the number of incidents worldwide.[7]Cholinergic toxicity may occur with pesticides or medications, but most serious exposures are due to organophosphate or carbamate pesticide exposure.This poisoning kills about 200000 people worldwide, especially in the Asia-Pacific region.Diagnosis is made by recognition of the cholinergic toxidrome when suspected by the history of illness.Toxicity may be immediate or delayed.Treatment is aggressive supportive care, plus targeted therapy for cholinergic toxicity: atropine followed by an available oxime such as pralidoxime.Decontamination and personal protective equipment must be used to prevent further absorption of the agent by the patient and harm to caregivers.Toxicology or poison center consultation is recommended.The most challenging aspect in treating cholinergic toxicity is the initial recognition of the disease process which would allow for prompt treatment and therefore better outcomes. Nurses and physicians should educate patients about pesticide exposures and how to recognize the symptoms. Strict decontamination policies can help decrease inadvertent exposure to nurses and health care workers in the emergency department. Reducing the use of pesticides worldwide might help reduce the cases of accidental toxicity due to occupational exposure. Pharmacists should review the patient's medication record to verify that there are no medications that could result in cholinergic toxicity or exacerbate existing toxicity. Treatment of cholinergic toxicity requires an interprofessional team approach that includes physicians, nursing, pharmacy, and poison control experts and toxicologists to ensure optimal patient care and outcomes.Review Questions1.Organophosphorus Insecticide Poisoning. EJIFCC. 1999 Jul;11(2):30-35. [PMC free article: PMC6357250] [PubMed: 30720257]2.Jeyaratnam J. Acute pesticide poisoning: a major global health problem. World Health Stat Q.



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1997 Sep;15(5):447-500. [PubMed: 9270389]4.Eyer P. The role of oximes in the management of organophosphorus pesticide poisoning.
Toxicol Rev. 2003;22(3):165-90. [PubMed: 15181665]5.Tuovinen K. Organophosphate-induced convulsions and prevention of neuropathological damages. Toxicology. 2004 Mar 01;196(1-2):31-9. [PubMed: 15036754]6.Eddleston M, Buckley NA, Eyer P, Dawson AH. Management of acute organophosphorus pesticide poisoning. Lancet. 2008 Feb 16;371(9612):597-607. [PMC free article: PMC2493390] [PubMed: 17706760]7.Lutovac M, Popova OV, Jovanovic Z, Berisa H, Kristina R, Ketin S, Bojic M. Management, Diagnostic and Prognostic Significance of Acetylcholinesterase as a Biomarker of the Toxic Effects of Pesticides in People Occupationally Exposed. Open Access Maced J Med Sci. 2017 Dec 15;5(7):1021-1027. [PMC free article: PMC5771273] [PubMed: 29362639]Disclosure: Erica Lott declares no relevant financial relationships with ineligible companies.Disclosure: Elizabeth Jones declares no relevant financial relationships with ineligible companies. Cholinergic crisis is a clinical condition that develops as a result of overstimulation of nicotinic and muscarinic receptors at the neuromuscular junctions and synapses. This is usually secondary to the inactivation or inhibition of acetylcholinesterase (AChE), the enzyme responsible for the degradation of acetylcholine (ACh). Excessive accumulation of acetylcholine (ACh) at the neuromuscular junctions and synapses causes symptoms of both muscarinic and nicotinic toxicity. These include cramps, increased salivation, lacrimation, muscular weakness, paralysis, muscular fasciculation, diarrhea, and blurry vision. In clinical practice, this condition is most commonly seen in: Patients with myasthenia gravis on treatment with high dose acetylcholinesterase inhibitors.Patients after general anesthesia who received high doses acetylcholinesterase inhibitors to reverse the effects of neuromuscular blocking agents, for example, neostigmine.Exposure to a chemical substance that causes inactivation of acetylcholinesterase. Examples of such substances are nerve gas like sarin, tabun, soman and other organophosphates like pesticides and insecticides.