

ATROPINE SUMMARY

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Drug class

Anticholinergic / anti-muscarinic

Atropa belladonna

Atropine is sometimes referred to as a belladonna alkaloid. The *atropa belladonna* plant contains alkaloids such as atropine, hyoscine, and scopolamine. It is mainly found in Mediterranean countries, North America, Western Europe and Himalayas.

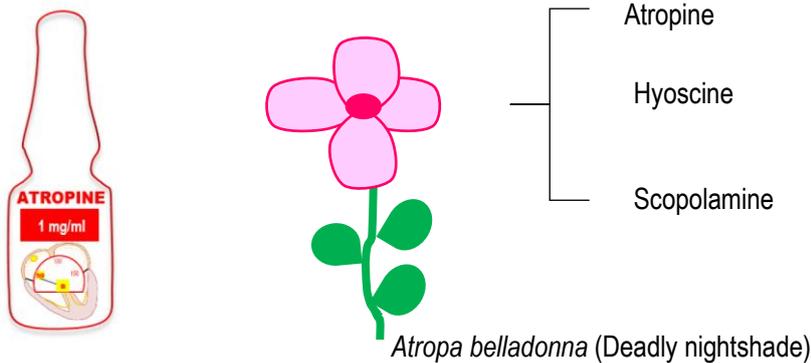
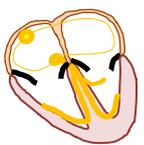


Diagram 1: atropine vial of 1 mg/ml and *Atropa belladonna*.

Mechanism of action

Atropine is a competitive antagonist at the muscarinic receptor which competes with acetylcholine for receptor binding. It blocks parasympathetic effects that would be caused by acetylcholine.

Effects of atropine on different organ systems.

SYSTEM	EFFECTS OF ATROPINE
Eyes 	<ul style="list-style-type: none">Relaxation of the iris sphincter muscle and mydriasis.The lens flattens to focus distant objects and is not able accommodate for near vision resulting in cycloplegia.Dry eyes to inhibition of lacrimal gland secretion.
CVS 	<ul style="list-style-type: none">Initial transient paradoxical bradycardia at lower dosesTachycardia at optimum doses.
Pulmonary 	<ul style="list-style-type: none">Bronchodilation resulting from bronchial smooth muscle relaxation.Inhibit respiratory tract secretions.
CNS 	<ul style="list-style-type: none">Normal doses: initial transient excitation which is followed by sedation.High doses: delirium.Extremely high doses: hallucinations.
GIT 	<ul style="list-style-type: none">Decrease the tone of lower oesophageal muscle tone.Reduced peristalsis.Delayed gastric emptying time.Constipation.
Urinary	<ul style="list-style-type: none">Relaxation of detrusor muscle of bladder and urinary retention.

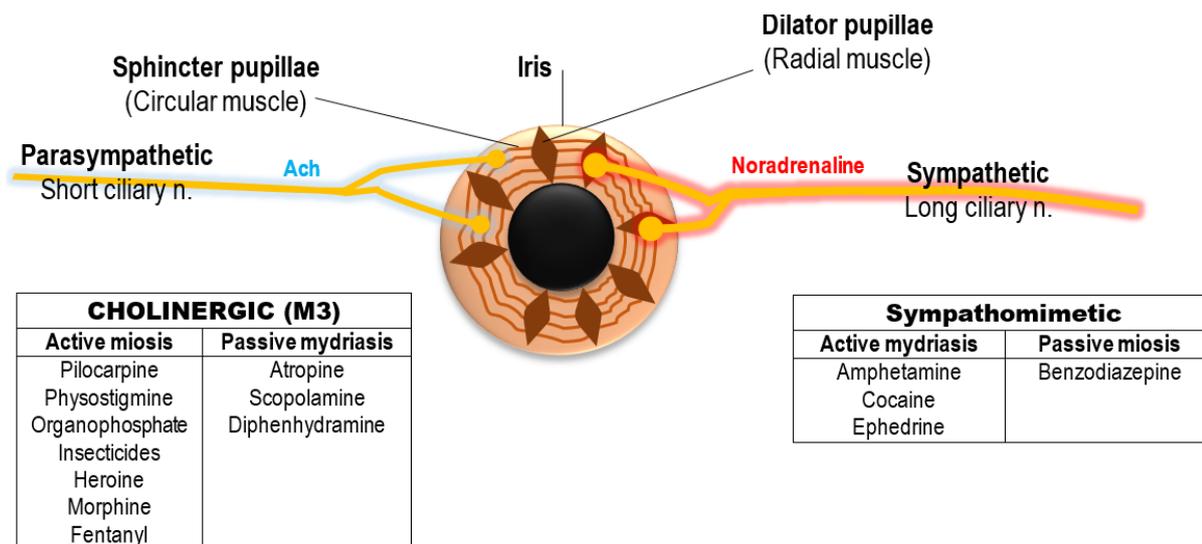


Diagram 2: Different effect on the eye by various drugs.

Indications for atropine

- Unstable bradycardia with a pulse.
- Premedication for drug induced intubation or rapid sequence intubation in order to prevent bradycardia.
- Used as an antisialagogue for anaesthetic procedures.
 - Also read up on **glycopyrrolate**
- Atropinization for organophosphate and carbamate poisoning.
- Iritis and cyclitis
- Mydriasis caused by atropine allows ophthalmoscopic examinations of the retina relive
- Relief of intestinal spasms
- Hyperactive bladder treatment

Atropine side-effects

- Dry mouth
- Blurred vision
- Photophobia
- Raised intraocular pressure
- Anhydrous
- Flushing
- Dysrhythmias
- Urinary retention
- Constipation
- Urticaria
- Skin rashes
- Nervousness
- Dizziness,
- Confusion
- Nausea,
- Loss of balance
- Drowsiness
- Excitement

Contraindications for atropine usage

- Known atropine allergy
- Closed angle glaucoma
- Urinary retention
- Pyrexia

- Thyrotoxicosis
- Conditions with gastrointestinal tract atony
- Myasthenia gravis
- Pyloric stenosis

Dosage (Adults)

- Bradycardia with pulse.
 - 1 mg IV every 3 to 5 minutes to maximum of 3 mg.
- Organophosphate and carbamate poisoning.
 - Atropinization as soon as possible after airway is secured.
 - Atropine 1 – 2 mg initial dose.
 - After every 5 minutes double the previous dose of atropine give. See diagram 3 below.
 - Stop if:
 - Respiratory secretions have dried up and there is absence of bronchoconstriction
 - Begin atropine infusion after respiratory secretions had stopped.
 - 3 mg/hour or 0.02 – 0.08mg/kg/hr
 - Stop atropine infusion if signs of toxicity develop.
- Premedication:
 - 0.2 – 0.5 mg intravenously just before induction.
 - 0.2 – 0.5 mg intramuscularly 45 minutes before induction.
- Postoperatively
 - 0.5 – 1 mg.
 - With neostigmine.

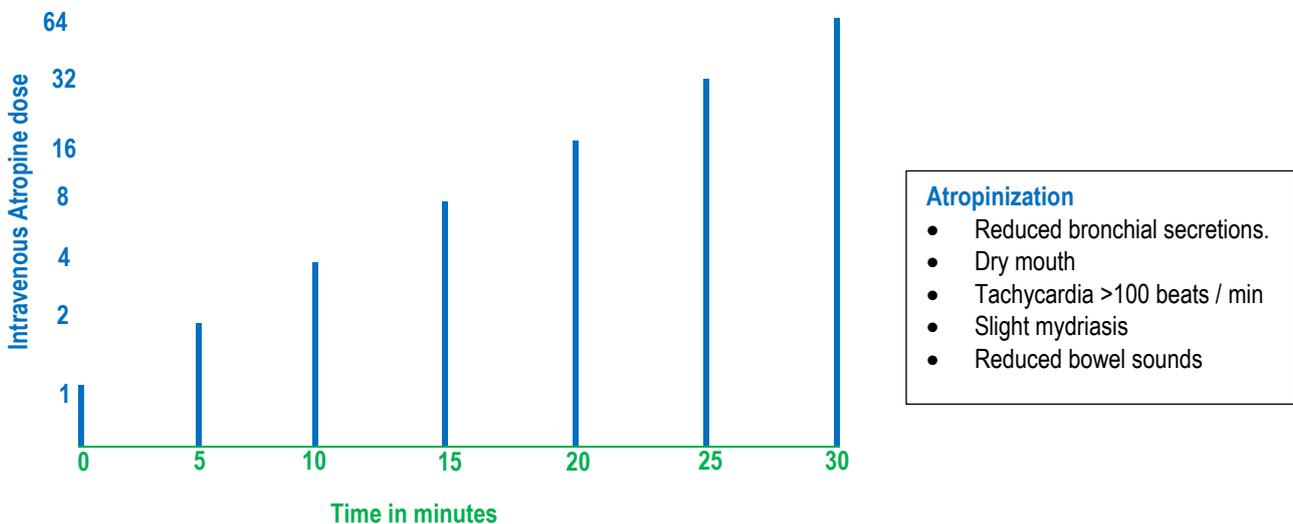


Diagram 3: Atropinization in organophosphate poisoning. The recommended initial dose is 2 mg.

Pharmacokinetics

- There is good absorption of atropine when injected intramuscular.
- Atropine crosses the blood brain barrier and also crosses the placenta.
- The $\frac{1}{2}$ -life of atropine is between 12.5 hours to 38 hours.

Dose-dependent receptor sensitivity

Atropine does not have the same degree of sensitivity on all organs and the sensitivity on peripheral organs is dose-dependent. Receptors that are highly sensitive to atropine are situated in salivary glands, bronchial glands sweat glands and lesser sensitive receptors are located in the eyes, heart and gastrointestinal tract.

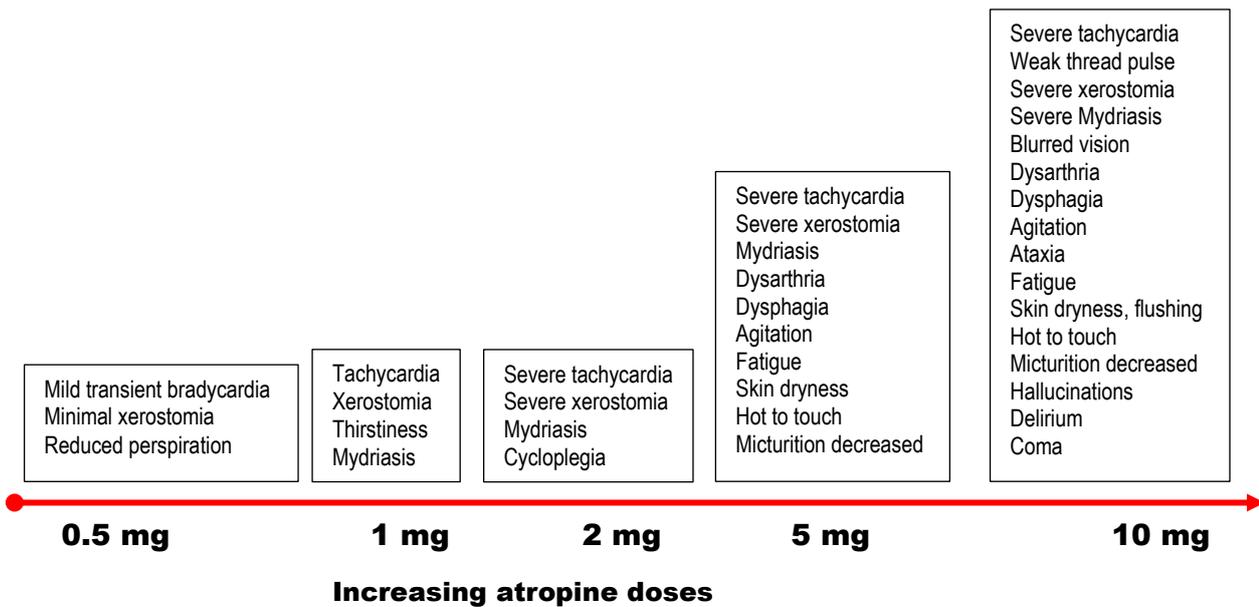


Diagram 4: Shows the dose dependant effects of atropine.

Other anti-muscarinic agents

- Ipratropium
- Scopolamine

Closing remarks

Treating healthcare providers must always remember to use the local guidelines and protocols. Healthcare providers must also remember to consult specialists early as they are continuing with the management of patient. Often, patient management will need to be tailored according to the specific case.

Bibliography

Ainslie G, Ascott-Evans BH, Barnes KI, et al (2010). Cardiovascular system. In South African Medicine Formulary: 136-137. Edited by Rossiter D. Cape Town. FA Print.

Anaesthesia, u. In (no date) management of organophosphorus poisoning, wfsahq.org. Available at: <https://resources.wfsahq.org/wp-content/uploads/uia-19-management-of-organophosphorus-poisoning.pdf> (accessed: July 23, 2023).

Chapter 7 Acetylcholine Receptor Antagonists. In Pharmacology: 63-65. Edited by

Brunton L.L., Parker K.L., Blumenthal D.K. & Buxton I.L.O. (2008). Chapter 7 Muscarinic Receptor Agonists and Antagonists. In Goodman & Gilman's Manual of Pharmacology and Therapeutics. Edited by Brunton L.L., Parker K.L., Blumenthal D.K. & Buxton I.L.O. USA. The McGraw-Hill Companies

McLendon, K. and Preuss, C. V. (2023) Atropine. StatPearls Publishing.

Mycek M.J., Harvey R.A. & Champe P.C. (). Cholinergic Antagonists. In Lippincott's Illustrated Reviews: Pharmacology Edited by Harvey R.A. & Champe P.C. USA. Lippincott Williams and Wilkins.

Organophosphate toxicity medication (2023) Medscape.com. Available at: <https://emedicine.medscape.com/article/167726-medication?form=fpf> (Accessed: July 23, 2023).

Robb, E. L. and Baker, M. B. (2023) Organophosphate Toxicity. StatPearls Publishing.

(No date) Epa.gov. Available at: https://www.epa.gov/sites/default/files/documents/rmpp_6thed_ch5_organophosphates.pdf (Accessed: July 23, 2023).