

# Pharmacology Cholinergic Agents Practice Test (Sample)

## Study Guide



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**SAMPLE**

## **Questions**

- 1. Which drug is used to reverse the effects of curare in anesthesia?**
  - A. Atropine**
  - B. Neostigmine**
  - C. Succinylcholine**
  - D. Physostigmine**
- 2. What is a primary function of atropine in clinical settings?**
  - A. To treat hyperactivity in children**
  - B. To decrease secretion and heart rate**
  - C. To act as a muscle relaxant**
  - D. To increase cardiac output**
- 3. Which of the following effects is associated with cholinergic agonists in the eyes?**
  - A. Increased intraocular pressure**
  - B. Mydriasis**
  - C. Miosis**
  - D. Blurred vision**
- 4. Cholinergic agents are involved in the treatment of which of the following diseases?**
  - A. Multiple sclerosis**
  - B. Rheumatoid arthritis**
  - C. Asthma**
  - D. Alzheimer's disease**
- 5. What is the usual dosage frequency for Donepezil?**
  - A. Once daily**
  - B. Twice daily**
  - C. Every other day**
  - D. As needed**

- 6. Which of the following is a primary action of Bethanechol on the urinary system?**
- A. Inhibition of detrusor muscle**
  - B. Contraction of the bladder wall**
  - C. Relaxation of the internal sphincter**
  - D. Inhibition of urethral tone**
- 7. Which molecules serve as amplifiers in ACh signal transduction?**
- A. Neurotransmitters**
  - B. Second messengers**
  - C. Cyclic nucleotides**
  - D. Hormones**
- 8. What is a common autoinjector used for nerve agent exposure?**
- A. Epipen**
  - B. Atropine autoinjector**
  - C. Insulin autoinjector**
  - D. Adrenaline autoinjector**
- 9. Which enzyme is crucial for the breakdown of acetylcholine?**
- A. Monoamine oxidase**
  - B. Acetylcholinesterase**
  - C. Cyclooxygenase**
  - D. Histidine decarboxylase**
- 10. Drugs that lack selectivity have limited therapeutic use.**
- A. True**
  - B. False**
  - C. Only in specific patient populations**
  - D. This is not always true**

## **Answers**

SAMPLE

- 1. B**
- 2. B**
- 3. C**
- 4. D**
- 5. A**
- 6. B**
- 7. B**
- 8. B**
- 9. B**
- 10. A**

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## **Explanations**

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**1. Which drug is used to reverse the effects of curare in anesthesia?**

- A. Atropine**
- B. Neostigmine**
- C. Succinylcholine**
- D. Physostigmine**

Neostigmine is the drug used to reverse the effects of curare in anesthesia. Curare is a competitive neuromuscular blocker that prevents acetylcholine from binding to its receptors at the neuromuscular junction, resulting in muscle paralysis. Neostigmine works as an acetylcholinesterase inhibitor, which means it prevents the breakdown of acetylcholine. By inhibiting this enzyme, neostigmine increases the concentration of acetylcholine available to compete with curare at the neuromuscular receptors, effectively counteracting the paralysis caused by curare. The other options have different roles or mechanisms and are not suitable for reversing the effects of curare. Atropine, for instance, is an anticholinergic drug that blocks acetylcholine receptors and would not help in reversing muscle paralysis. Succinylcholine is a depolarizing neuromuscular blocker that works in a manner similar to curare but is not used for reversal; instead, it causes paralysis itself. Physostigmine, while an acetylcholinesterase inhibitor like neostigmine, is primarily used for treating anticholinergic toxicity and is not commonly employed in the context of curare reversal. Thus, neostig

**2. What is a primary function of atropine in clinical settings?**

- A. To treat hyperactivity in children**
- B. To decrease secretion and heart rate**
- C. To act as a muscle relaxant**
- D. To increase cardiac output**

Atropine is primarily acknowledged for its ability to decrease secretion and heart rate, making it an important agent in various clinical scenarios. It is an anticholinergic drug that blocks the action of acetylcholine at muscarinic receptors. This inhibition leads to reduced salivary and bronchial secretions, which is particularly beneficial during surgical procedures when airway management is crucial. Additionally, atropine increases heart rate by preventing vagal effects on the heart, a mechanism that's beneficial in treating bradycardia (slow heart rate). The dual action of decreasing secretions and modulating heart rate underscores its role in preparations for surgery and emergencies where vagal stimulation has led to excessive bradycardia. The other options propose functions that are either not relevant to atropine or are functions associated with different classes of medications. Atropine does not treat hyperactivity in children, it is not a muscle relaxant, nor is its primary function to increase cardiac output directly; rather, it modifies heart rate by acting on the parasympathetic nervous system.

**3. Which of the following effects is associated with cholinergic agonists in the eyes?**

- A. Increased intraocular pressure**
- B. Mydriasis**
- C. Miosis**
- D. Blurred vision**

Cholinergic agonists are medications that stimulate the parasympathetic nervous system by activating acetylcholine receptors. In the context of the eyes, these agents primarily act on the muscarinic receptors located in the iris sphincter muscle, leading to the constriction of the pupil, a phenomenon known as miosis. When cholinergic agonists induce miosis, they contract the circular muscles of the iris, resulting in a smaller pupil size. This effect is beneficial in the treatment of conditions like glaucoma, as it also facilitates the drainage of aqueous humor, thereby reducing intraocular pressure. In contrast, increased intraocular pressure is generally associated with conditions like glaucoma and is not a desired effect of cholinergic agonists. Mydriasis, or pupil dilation, is typically caused by antagonists that block the actions of acetylcholine at the muscarinic receptors. Blurred vision can occur as a result of some ophthalmic agents but is not a direct effect of cholinergic agonists in the context of their action on pupil size. Thus, miosis is recognized as the characteristic effect of cholinergic agonists in the eyes, making it the correct answer in this scenario.

**4. Cholinergic agents are involved in the treatment of which of the following diseases?**

- A. Multiple sclerosis**
- B. Rheumatoid arthritis**
- C. Asthma**
- D. Alzheimer's disease**

Cholinergic agents play a significant role in the treatment of Alzheimer's disease due to their ability to enhance the activity of acetylcholine, a neurotransmitter that is critically involved in memory and learning processes. In Alzheimer's disease, there is a marked deficiency of acetylcholine, which contributes to the cognitive decline observed in patients. Medications such as donepezil, rivastigmine, and galantamine are classified as cholinesterase inhibitors, which work by preventing the breakdown of acetylcholine, thereby increasing its availability in the brain. This helps improve the symptoms related to memory and cognition in individuals with Alzheimer's. The therapeutic approach aims to alleviate some cognitive symptoms of this neurodegenerative condition, improving the quality of life for those affected. In contrast, while multiple sclerosis, rheumatoid arthritis, and asthma are important medical conditions requiring intervention, they do not primarily rely on cholinergic mechanisms in their treatment. Multiple sclerosis is often treated with immunomodulators, rheumatoid arthritis with anti-inflammatory medications, and asthma with bronchodilators and anti-inflammatory drugs, none of which primarily target cholinergic pathways.

**5. What is the usual dosage frequency for Donepezil?**

- A. Once daily**
- B. Twice daily**
- C. Every other day**
- D. As needed**

Donepezil is typically prescribed for the treatment of Alzheimer's disease and related dementias. The standard dosage frequency for Donepezil is once daily, usually taken in the evening. This dosing schedule is designed to provide a consistent level of the medication in the bloodstream over a 24-hour period, which helps manage symptoms effectively. The rationale for once-daily dosing lies in Donepezil's half-life, which allows for sustained action without the need for multiple doses throughout the day. This regimen enhances patient compliance, as it is more convenient for individuals to remember to take a single dose rather than multiple doses. Additionally, taking it in the evening may help to optimize patient tolerance with regards to potential side effects, such as gastrointestinal discomfort or nausea. This dosing frequency is widely supported by clinical guidelines, ensuring that patients receive an effective treatment while minimizing the burden of multiple daily medications.

**6. Which of the following is a primary action of Bethanechol on the urinary system?**

- A. Inhibition of detrusor muscle**
- B. Contraction of the bladder wall**
- C. Relaxation of the internal sphincter**
- D. Inhibition of urethral tone**

Bethanechol primarily acts as a muscarinic agonist, which means it stimulates the muscarinic receptors found in the smooth muscle of the bladder. One of its key actions is stimulating the contraction of the bladder wall, or the detrusor muscle. This contraction is essential for promoting urination, particularly in individuals with urinary retention or atony of the bladder, as it enhances the ability to expel urine from the bladder. The effect on the bladder wall contributes to increased intravesical pressure, thus facilitating the process of micturition. This is particularly useful in clinical settings where patients may have difficulty urinating due to conditions such as postoperative urinary retention or neurogenic bladder disorders. While relaxation of the internal sphincter may assist in the process of urination, Bethanechol's primary and most significant action is in promoting bladder contraction. Therefore, focusing on how Bethanechol augments bladder wall contraction highlights its distinct role as a cholinergic agent in the management of urinary conditions.

**7. Which molecules serve as amplifiers in ACh signal transduction?**

- A. Neurotransmitters**
- B. Second messengers**
- C. Cyclic nucleotides**
- D. Hormones**

In the context of acetylcholine (ACh) signal transduction, second messengers play a crucial role in amplifying the signal received by the cells. When ACh binds to its receptors on the post-synaptic membrane, it can trigger various intracellular pathways that involve second messengers. These second messengers, which include molecules such as cyclic AMP, cyclic GMP, inositol trisphosphate, and calcium ions, help to transmit and amplify the signal initiated by ACh binding. This amplification is essential for ensuring that even a small amount of ACh can lead to significant physiological responses, such as muscle contraction or changes in heart rate. In contrast, neurotransmitters themselves are the primary signaling molecules that initiate the response but do not function as amplifiers in the signal transduction pathway. Similarly, cyclic nucleotides and hormones do not directly act as amplifiers within this specific context, though cyclic nucleotides can be considered a type of second messenger. Thus, the emphasis on second messengers as amplifiers clearly highlights their important role in enhancing and propagating the ACh signal within the cell.

**8. What is a common autoinjector used for nerve agent exposure?**

- A. Epipen**
- B. Atropine autoinjector**
- C. Insulin autoinjector**
- D. Adrenaline autoinjector**

The atropine autoinjector is specifically designed for use in cases of nerve agent exposure, providing a rapid means of counteracting the effects of organophosphate poisoning, which includes many nerve agents. Atropine works by blocking the action of acetylcholine at muscarinic receptors, which is advantageous in situations of nerve agent poisoning where excessive acetylcholine accumulation occurs due to the inhibition of acetylcholinesterase. The atropine autoinjector is commonly carried by military and emergency personnel for immediate administration in the event of a nerve agent exposure. This prompt action can significantly mitigate the life-threatening effects of nerve agents, including respiratory distress and other cholinergic symptoms. In contrast, other options like the epinephrine autoinjector (often marketed as the Epipen) are used primarily for severe allergic reactions, insulin autoinjectors are designated for diabetes management, and adrenaline autoinjectors serve similar purposes as epinephrine. These devices are not designed or indicated for treating the specific and urgent needs posed by nerve agents, which underscores the unique role of the atropine autoinjector in emergency protocols related to chemical warfare or exposure to nerve agents.

**9. Which enzyme is crucial for the breakdown of acetylcholine?**

- A. Monoamine oxidase**
- B. Acetylcholinesterase**
- C. Cyclooxygenase**
- D. Histidine decarboxylase**

The correct choice indicates that acetylcholinesterase is the enzyme crucial for the breakdown of acetylcholine. Acetylcholine is a neurotransmitter that plays a key role in the transmission of signals in the nervous system, particularly at the neuromuscular junction and within the central nervous system. Once acetylcholine is released into the synaptic cleft and binds to its receptors, it must be rapidly inactivated to terminate the signal and prevent continuous stimulation of the postsynaptic cell. Acetylcholinesterase is specifically responsible for hydrolyzing acetylcholine into acetate and choline, effectively halting the neurotransmitter's action. This process is vital for maintaining proper synaptic function and preventing over-excitation of neurons or muscle fibers, which could otherwise lead to adverse effects such as spasms or paralysis. In contrast, the other enzymes listed do not play a role in the breakdown of acetylcholine. Monoamine oxidase is involved in the metabolism of monoamine neurotransmitters, cyclooxygenase is important in the synthesis of prostaglandins, and histidine decarboxylase is responsible for the production of histamine. Therefore, acetylcholinesterase is the specifically targeted enzyme for the degradation

**10. Drugs that lack selectivity have limited therapeutic use.**

- A. True**
- B. False**
- C. Only in specific patient populations**
- D. This is not always true**

Drugs that lack selectivity indeed have limited therapeutic use primarily because they can interact with multiple receptors or systems within the body, leading to a broader range of effects, many of which may be undesirable. This non-selectivity can result in a higher risk of side effects and adverse reactions, making it challenging to achieve the desired therapeutic outcome without causing harm. For example, a non-selective cholinergic agent might stimulate not only the desired muscarinic receptors in the target tissues (e.g., the heart or digestive system) but also nicotinic receptors, which could lead to unwanted stimulation of the neuromuscular junction or other sites. This could result in symptoms such as muscle twitching or cardiovascular complications, which could detract from the medication's efficacy for the intended condition. As a result, while some non-selective drugs can be beneficial in specific situations or for certain conditions, their general applicability in wider therapeutic contexts is often restricted by the potential for these more extensive effects. Thus, this characteristic underscores the importance of selectivity in drug development, aiming to optimize therapeutic benefit while minimizing adverse effects.