

PTS x MedSoc 2a Questions - Pharmacology

Questions

1. Which of the following diuretics increases sodium and water excretion by competitively binding to aldosterone receptors in the distal tubules of the kidney?

- A. Spironolactone
- B. Furosemide
- C. Bendroflumethiazide
- D. Bumetanide
- E. Chlorthalidone

2. A 75-year-old woman is diagnosed with osteoporosis. You decide to prescribe bisphosphonates to reduce her risk of fractures. What is the mechanism of action of alendronic acid?

- A. Promotes osteoclastic activity to increase bone resorption, which increases bone turnover to improve bone structure and density
- B. Promotes osteoblastic activity to increase bone formation, which improves bone structure and density
- C. Inhibits osteoclastic activity to decrease bone resorption, which reduces bone turnover and improves bone mass
- D. Inhibits osteoblastic activity to decrease bone formation, which reduces bone turnover and improves bone mass
- E. Promotes osteoclastic activity to decrease bone resorption, which reduces bone turnover and improves bone mass

3. A patient with atrial fibrillation needs anticoagulation medication to reduce their risk of stroke.

What is the mechanism of action of rivaroxaban?

- A. Directly inhibits activated clotting factor X to prevent conversion of prothrombin to thrombin
- B. Inhibits production of cholesterol to reduce formation of atherosclerotic plaques
- C. Enhances the anticoagulation effect of antithrombin, which inactivates clotting factors
- D. Irreversibly inhibits COX enzymes to reduce platelet aggregation and lower risk of arterial occlusion
- E. Inhibits production of vitamin-K dependent clotting factors

4. A patient has recently been prescribed a new medication for her long-standing hypertension. She has come back to the GP for a review, however, as she has developed a persistent dry cough.

Which medication is she most likely to have recently been prescribed?

- A. Candesartan
- B. Bisoprolol
- C. Furosemide
- D. Verapamil
- E. Ramipril

5. A patient has recently been started on a medication regimen for tuberculosis. She is concerned as her urine has been bright red in colour since she started taking the new medications.

Which medication is most likely to be responsible for this side effect?

- A. Ethambutol
- B. Rifampicin
- C. Pyrazinamide
- D. Amoxicillin
- E. Isoniazid

6. COX enzymes play a role in the formation of prostanoids and prostaglandins.

Which of the following drugs does not inhibit the action of COX enzymes?

- A. Aspirin
- B. Celecoxib
- C. Paracetamol
- D. Ibuprofen
- E. Clopidogrel

7. A 42 YO woman presents to the GP complaining of heartburn and abdominal discomfort. She has a past medical history of hypertension and gout. She reports taking pain killers for her back pain.

Which of these medications is the most likely cause of her heartburn and abdominal pain?

- A. Ramipril
- B. Simvastatin
- C. Allopurinol
- D. Desogestrel
- E. Diclofenac

8. A 80 YO patient at a care home is suffering with constipation. He has a past medical history of asthma, arthritis, hypertension.

Which of these medications would contribute to his constipation?

- A. Amlodipine
- B. Salbutamol inhaler
- C. Paracetamol
- D. Codeine
- E. Vitamin D

9. A patient takes medication for his hypertension.

Which of these medications inhibits sodium reabsorption at the DCT (distal convoluted tubule) in the kidney by blocking the $\text{Na}^+/\text{-Cl}^-$ symporter?

- A. Spironolactone
- B. Bendroflumethiazide
- C. Furosemide
- D. Ramipril
- E. Amlodipine

10. Patients with BMI of 32 with Type 2 diabetes mellitus needs to be started on medical therapy as dietary and lifestyle interventions have not been enough. He does not want to gain any more weight. He is started already started on metformin

Which of these would be best to add to his metformin treatment?

- A. Insulin
- B. Sitagliptin
- C. Gliclazide
- D. Pioglitazone
- E. Tolbutamide

11. A patient is on warfarin to manage her atrial fibrillation. A nurse is speaking to her about her lifestyle.

Which of the following would reduce the effect of warfarin?

- A. Cranberry juice
- B. Leafy green vegetables
- C. Acute alcohol intake
- D. Vitamin C supplements
- E. Eggs and Dairy

12. A 16 YO patient with mental health issues was admitted to A+E for a paracetamol overdose 5 hours ago.

What is the most appropriate treatment?

- A. Intravenous fluids
- B. Nutritional Support
- C. N-Acetyl Cysteine
- D. Liver transplant
- E. IM adrenaline

13. Which of these anti-emetics is contraindicated in a patient with Parkinson's disease?

- A. Ondansetron
- B. Domperidone
- C. Metoclopramide
- D. Cyclizine
- E. Peppermint

Answers

Answer	Explanations
1. A	<p>Spironolactone (A) is correct - it is an aldosterone antagonist, meaning its mechanism is binding competitively to aldosterone receptors in the distal tubules in the kidney, preventing aldosterone from binding and thus reducing water and sodium reabsorption. Aldosterone antagonists are potassium sparing diuretics. Furosemide (B) and Bumetanide (E) are loop diuretics, meaning they act to inhibit the Na⁺/K⁺/2Cl⁻ co-transporter in the ascending loop of Henle and therefore prevent the movement of ions out of the lumen, which means water stays in the tubular system. Bendroflumethiazide (C) and Chlorthalidone (D) are thiazide diuretics, meaning they act to inhibit the Na⁺/Cl⁻ cotransporter in the distal tubules of the nephron. This has the same effect as loop diuretics, just on a different part of the kidney.</p>
2. C	<p>Osteoporosis is characterised by having low bone mass/density. Osteoclasts increase bone resorption, and osteoblasts increase bone formation (remember osteoblasts build). The answer is C - bisphosphonates inhibit osteoclastic activity, meaning there is decreased bone resorption and therefore reduced bone turnover. This reduces bone loss and therefore improves bone mass to reduce risk of fractures.</p>
3. A	<p>Rivaroxaban is a Direct Oral Anticoagulant (DOAC), meaning it directly inhibits activated clotting factor X (i.e. Xa) to prevent conversion of prothrombin to thrombin. Answer B is the mechanism of statins. Answer C is the mechanism of Heparin. Answer D is the mechanism of aspirin. Answer E is the mechanism of Warfarin.</p>
4. E	<p>A. Candesartan is an Angiotensin Receptor Blocker (ARB). It is often used as an alternative to ACE inhibitors if a patient gets a coughing side effect.</p> <p>B. Bisoprolol is a beta-blocker.</p> <p>C. Furosemide is a loop diuretic.</p> <p>D. Verapamil is a calcium-channel blocker.</p> <p>E. Ramipril is an ACE inhibitor. These are known to have a common side effect of a dry cough as they increase bradykinin levels, which is usually inhibited by the ACE enzyme.</p>
5. B	<p>The medication regimen for tuberculosis is a 6 month course of rifampicin and isoniazid, with pyrazinamide and ethambutol for the first 2 months. Rifampicin (B) is correct, as it can cause dark/red urine. Ethambutol (A) can cause eye problems, like blurred vision. Isoniazid (E) can cause peripheral neuropathy, with numbness and tingling.</p>

6. E	<p>A. Aspirin irreversibly inhibits COX enzymes to reduce production of thromboxane, preventing platelet aggregation.</p> <p>B. Celecoxib is an NSAID. NSAIDs inhibit COX enzymes, which reduces prostaglandin synthesis. Prostaglandins are protective to the gastric mucosa, hence why NSAIDs can cause gastric ulcers.</p> <p>C. Paracetamol is a weak COX-2 inhibitor. COX-2 is involved in inflammation and not protection of the gastric mucosa, hence why paracetamol doesn't cause gastric problems.</p> <p>D. Ibuprofen is an NSAID - mechanism is the same as Celecoxib.</p> <p>E. Clopidogrel is an antiplatelet medication like aspirin, but acts as an ADP-receptor antagonist by binding irreversibly to ADP receptors on the surface of platelets. This pathway is independent of the COX pathway, so the action of clopidogrel is synergistic with that of aspirin.</p>
7. E	<p>A. Ramipril - ACE inhibitor is the first line medication used to treat hypertension. CCB (calcium channel inhibitor) eg amlodipine would be prescribed first line to anyone over 50YO or afro-caribbean. ACE inhibitors are known to cause coughs and should be avoiding in asthmatic and acute renal injury.</p> <p>B. Simvastatin - statins are used to lower blood cholesterol. Used in treatment of angina, heart failure and hypercholesterolaemia. Known to cause muscle aches.</p> <p>C. Allopurinol - used in gout prophylaxis works by inhibiting xanthine oxidase. They can sometimes cause skin reactions</p> <p>D. Desogestrel - progesterone only contraceptive or mini pill.</p> <p>E. Diclofenac - NSAID. Works by inhibiting COX1/2 and reducing prostaglandin E2 production. COMMON side effect is peptic ulceration, can make GORD symptoms like dyspepsia, regurgitation worse</p>
8. D	<p>A. Amlodipine</p> <p>B. Salbutamol inhaler</p> <p>C. Paracetamol</p> <p>D. Codeine - opioids cause constipation</p> <p>E. Vitamin D</p>
9. B	<p>A. Spironolactone - potassium sparing diuretic works as an aldosterone antagonist at the collecting duct. Used in heart failure and fluid overload. Caution use with ramipril.</p> <p>B. Bendroflumethiazide - works on DCT by inhibiting the Na reabsorption. Most commonly used to treat high blood pressure</p> <p>C. Furosemide - loop diuretic. Most commonly used in heart failure.</p>

	<p>D. Ramipril - ACE inhibitor used to treat hypertension. Stop conversion of angiotensin 1 to angiotensin 2. They raise potassium.</p> <p>E. amlodipine - Calcium channel blocker for HTN TX. commonly caused peripheral oedema/ flushing</p>
10. B	<p>A. Insulin - usually a last line treatment in type 2 diabetes. Can also cause weight gain, main side effect is hypoglycaemic episodes</p> <p>B. Sitagliptin - side effect is pancreatitis</p> <p>C. Gliclazide - type of sulfonylurea. Side effects are hypoglycaemia, increased appetite and weight gain, SIADH, cholestatic liver disease,</p> <p>D. Pioglitazone - type of glitazone that also causes weight gain, fluid retention, liver dysfunction and fractures</p> <p>E. Tolbutamide - type of sulfonylurea</p> <p>Beware: diabetics, beta blockers eg bisoprolol can reduce hypoglycaemic awareness</p>
11. B	<p>Warfarin is a vitamin K antagonist. If a patient is bleeding heavily, it means high INR, high warfarin - something is increasing the effects. If a patient has a low INR - something is decreasing the effects of warfarin and they are not sufficiently anticoagulated. Leafy green vegetables contain high amounts of vitamin K and can antagonise the effects of warfarin.</p> <p>A. Cranberry juice</p> <p>B. Leafy green vegetables</p> <p>C. Acute alcohol intake - this can increase the effects of warfarin</p> <p>D. Vitamin C supplements</p> <p>E. Eggs and Dairy</p>
12. C	<p>N-acetylcysteine is the treatment for paracetamol overdose.</p> <p>A. Intravenous fluids - patients would also need this but not specific to paracetamol overdose.</p> <p>B. Nutritional Support - not the priority here</p> <p>C. N-Acetyl Cysteine</p> <p>D. Liver transplant - very late indication</p> <p>E. IM adrenaline - anaphylactic reactions</p>
13. C	<p>A. Ondansetron- 5HT Receptor antagonist. Prolongs the QT interval. Constipation is common</p> <p>B. Domperidone - D2 receptor antagonist but does not cross the blood brain barrier</p>

	<p>C. Metoclopramide - D2 receptor antagonist. crosses the blood brain barrier, can cause extra-pyramidal side effects and parkinsonism</p> <p>D. Cyclizine - usually first line choice</p> <p>E. Peppermint</p>
--	--