anesthetics can exist either as the uncharged base (non-ionized form) or as a cation (ionized form). The ionized form most likely mediated which of the following properties of the drug?

A. Tissue redistribution
B. Liver biotransformation
C. Blood–brain crossing
D. Receptor binding
E. Half-life

Difficulty level: Easy

21. A 56-year-old woman was about to undergo emergency minor skin suturing after an accidental self-injury with a knife. The woman was agitated and firmly refused any injection procedure. Examination of the wound showed a long superficial cut of the skin with extensive bleeding. The anesthesiologist chose to apply a solution of a topical anesthetic that could also cause local vasoconstriction. Which of the following drugs was most likely administered?

A. Cocaine
B. Prilocaine
C. Bupivacaine
D. Tetracaine
E. Lidocaine

Questions: III-5 Skeletal Muscle Relaxants

Directions for questions **1–4**

Match each skeletal muscle relaxant with the appropriate description (each lettered option can be selected once, more than once, or not at all).

A. Tubocurarine
B. Cisatracurium
C. Mivacurium
D. Succinylcholine
E. Dantrolene
F. Gabapentin
G. Diazepam
H. Tizanidine
I. Baclofen

Difficulty level: Easy

1. An antagonist at Nn acetylcholine receptors in autonomic ganglia

Difficulty level: Easy

2. An agonist at Nm acetylcholine receptors

Difficulty level: Easy

3. Primarily an agonist at α_2 receptors located in the spinal cord.

Difficulty level: Easy

4. An anticonvulsant agent that can reduce spasticity in patients with multiple sclerosis

Difficulty level: Easy

5. A 63-year-old man underwent abdominal surgery for prostate cancer. General anesthesia was supplemented with tubocurarine. Which of the following anatomical structures most likely represents the main site of action of the drug for this clinical application?

A. Ganglionic neuron membranes
B. Adrenal medulla
C. Postjunctional folds of motor end plates
D. Autonomic cholinergic nerve terminals
E. Spinal motor neuron membranes
F. Skeletal muscle cell membranes

Difficulty level: Easy

6. A 38-year-old patient was admitted to the emergency department with extensive soft tissue burns. He was semiconscious and was artificially ventilated. His uncoordinated respiratory movements were interfering with the mechanical ventilation. Which of the following drugs would most likely be effective to decrease the patient's spontaneous breathing?

A. Diazepam
B. Vecuronium
C. Botulinum toxin
D. Dantrolene
E. Baclofen
F. Tizanidine

Difficulty level: Easy

7. A 57-year-old woman was admitted semiconscious to the emergency department after an accident at home. Artificial ventilation was needed, and a drug was given to facilitate intubation. This drug has the shortest duration of action among skeletal muscle relaxants. Which of the following drugs was most likely administered?

A. Succinylcholine
B. Cisatracurium
C. Dantrolene
D. Vecuronium
E. Tubocurarine
F. Tizanidine

Difficulty level: Hard

14. A 39-year-old woman complained to her physician of joint pain that had worsened over the past month. The pain was worst in the morning and prevented her from performing her household tasks for at least an hour after waking. She tried ibuprofen three times daily for 2 weeks, but relief was poor, and she stopped the medication because of epigastric pain. The woman was also suffering from chronic active hepatitis B, currently treated with lamivudine. On physical examination, the patient appeared uncomfortable with any movement. Her wrists, metacarpophalangeal joints, and knees showed bilaterally symmetrical swelling, tenderness, and warmth. Further exams confirmed the diagnosis, and a pharmacotherapy was prescribed. Which of the following drugs would be appropriate for the patient at this time?

A. Methotrexate
B. Aspirin
C. Etanercept
D. Piperacillin
E. Ciprofloxacin
F. Erythromycin

Difficulty level: Easy

15. A 32-year-old man diagnosed with rheumatoid arthritis had been taking methotrexate for 4 months. The disease was controlled initially, but the pain returned, and his rheumatologist decided to add a drug to the treatment regimen. The second drug is a recombinant fusion protein consisting of the extracellular portion of two tumor necrosis factor (TNF) receptor moieties. Which of the following drugs was most likely prescribed?

A. Infliximab
B. Etanercept
C. Leflunomide
D. Triamcinolone
E. Cyclosporine
F. Piroxicam

Difficulty level: Medium

16. A 15-year-old girl was admitted to the emergency department because of a sudden attack of severe abdominal pain accompanied by fever (103.5°F, 39.7°C). The patient had had two similar attacks 3 and 2 weeks ago that subsided spontaneously over the course of 48 hours. Multiple other family members had similar complaints. Physical examination showed a patient in moderate distress with evidence of pleural effusion in the right lung. Genetic testing showed a mutation in a gene of chromosome 16. Which of the following drugs would most likely prevent the recurrence of the attacks in this patient?

A. Indomethacin
B. Etanercept
C. Methotrexate
D. Prednisone
E. Colchicine

Difficulty level: Easy

17. A 55-year-old man recently diagnosed with hyperuricemia started a treatment with allopurinol. Plasma levels of which of the following pairs of endogenous compounds most likely increased after a few days of therapy?

A. Guanine and xanthine
B. Xanthine and hypoxanthine
C. Inosine and guanine
D. Adenine and inosine
E. Adenine and hypoxanthine

Difficulty level: Easy

18. A 44-year-old woman at a routine check-up was found to have a serum urate level of 18 mg/dL and a urine urate level of 800 mg/24 h. She started an appropriate treatment, and 3 weeks later her serum urate level was 7.2 mg/dL and urinary urate level was 530 mg/24 h. Which of the following drugs did the patient most likely take?

A. Probenecid
B. Aspirin
C. Furosemide
D. Allopurinol
E. Indomethacin
F. Naproxen

Difficulty level: Easy

19. A 43-year-old man suffering from rheumatoid arthritis complained to his physician that his joint pain had increased recently despite current naproxen and hydroxychloroquine therapy. The patient was otherwise healthy, and his past medical history was unremarkable. Which of the following drugs would be appropriate to add to the patient's therapy at this time?

A. Diclofenac
B. Acetaminophen
C. Methotrexate
D. Fentanyl
E. Amitriptyline
F. Carbamazepine

Difficulty level: Medium

20. A 55-year-old man complained to his physician of blurred vision, night blindness, light flashes, and photophobia. The man was diagnosed with mild rheumatoid arthritis 6 months

ago and was taking a combination therapy that included a disease-modifying antirheumatic drug (DMARD). Ophthalmoscopy disclosed a macular area of hyperpigmentation surrounded by a zone of hypopigmentation on the left retina. Which of the following drugs most likely caused the patient's signs and symptoms?

A. Hydroxychloroquine
B. Etanercept
C. Methotrexate
D. Infliximab
E. Ibuprofen
F. Celecoxib

A

Answers and Explanations: VII-1 Histamine and Serotonin: Agonists and Antagonists

Questions 1–3

1. **E**
2. **A**
3. **B**

Learning objective: Outline the use of antihistamines to treat systemic itching.

4. **D** Itching is sometimes caused by exposure to sunlight, especially in the elderly. Because histamine is most often involved in itching, histamine H_1 antagonists are effective antipruritics. In this case, a second-generation antihistamine is the appropriate choice, as the patient has prostatic hypertrophy, which contraindicates first-generation antihistamines because of their antimuscarinic properties.

   A, B See correct answer explanation.

   C, E, F These drugs lack antipruritic properties.

Learning objective: Explain the mechanism of antimigraine action of ergot alkaloids.

5. **A** The effectiveness of ergot alkaloids in migraine seems to be primarily related to their cerebral vasoconstricting effects, which are apparently due to activation of both α adrenoceptors and serotonin (5-HT) receptors. The pathophysiology of migraine seems to include a vasomotor component, because the onset of headache is sometimes associated with increased amplitude of temporal artery pulsations; ergotamine can diminish these pulsations. Other mechanisms are probably also operative. For example, ergotamine blocks inflammation of the trigeminal neurovascular system. This action, possibly mediated by activation of 5-HT receptors, may be responsible for both the pain-relieving and the vasoconstricting effects of ergot alkaloids.

   B–E Ergotamine does not cause these effects. Moreover, these effects would increase, not decrease, the risk of a migraine attack.

Learning objective: Explain the mechanism of the antimigraine action of $5\text{-HT}_{1B/1D}$ serotonin agonists.

6. **D** Triptans (e.g., sumatriptan and zolmitriptan) are specific $5\text{-HT}_{1B/1D}$ agonists that are equally as or more effective than ergot alkaloids in the acute treatment of migraine attack. There are two major proposed mechanisms for effectiveness of triptans in acute migraine headache:

   - Vasoconstriction of cerebral vessels via the activation of vascular 5-HT_{1B} receptors
   - Inhibition of release of neuropeptides with inflammatory properties via the activation of presynaptic 5-HT_{1D} receptors

   Triptans are not intended for use in the prophylaxis of migraine.

   A Beta-blockers are effective for the prophylaxis of migraine in some patients, but they are of no value in the treatment of an ongoing migraine attack.

   B, C, E, F Drugs acting on these receptors cannot cure a migraine attack.

Learning objective: Outline the clinical uses of antihistamines.

7. **D** Drugs usually given to prevent an acute allergic reaction in patients at risk are glucocorticoids and histamine H_1 antagonists. First-generation H_1 antagonists are generally preferred when drug-induced sedation may be useful to reduce fear related to the procedure, as in this case.

   A–C, E, F These drugs are devoid of antiallergic properties.

Learning objective: Explain the reason for ergonovine use in postpartum bleeding.

8. **E** Uterine atony (absence of uterine contracture following the delivery of the placenta) is the most common cause of postpartum hemorrhage. When the hemorrhage does not respond to oxytocin administration, ergot alkaloids may be used to decrease bleeding. The uterus at term is extremely sensitive to the stimulant action of ergot alkaloids, and even an intermediate dose produces a prolonged and powerful spasm of the muscle that squeezes the uterine vessels, thus controlling bleeding.

   A Ergotamine can constrict uterine arteries, but this is not the main reason why the drug can stop postpartum bleeding.

   B–D Ergotamine does not have these effects.

Difficulty level: Easy

7. A 50-year-old woman with rheumatoid arthritis was recently diagnosed with refractory disease, and infliximab was added to her ongoing treatment. Which of the following endogenous compounds was most likely the molecular target of the drug?

A. Interleukin-1
B. Vascular endothelial growth factor
C. Interleukin-10
D. Epidermal growth factor
E. Tumor necrosis factor-α

Difficulty level: Medium

8. A 48-year-old man was admitted to the emergency department with the chief complaint of an excruciating pain in his left ankle. The pain had started the previous night and increased over several hours. The patient reported that he sprained his ankle 1 week ago. On physical examination, the ankle appeared warm and tender, and the entire area was red and swollen. A synovial fluid analysis showed crystals engulfed by phagocytes. A diagnosis was made, and a pharmacotherapy was prescribed. Which of the following drugs would be most appropriate to treat the patient's pain?

A. Codeine
B. Indomethacin
C. Methotrexate
D. Aspirin
E. Etanercept
F. Allopurinol

Difficulty level: Easy

9. A 57-year-old man recently diagnosed with mild rheumatoid arthritis complained to his physician of joint pain despite ongoing therapy with ibuprofen. The man was a heavy smoker and had a history of chronic bronchitis with frequent acute exacerbations usually treated with antibiotics. The physician decided to add a disease-modifying antirheumatic drug (DMARD) to the treatment. Which of the following drugs would be most appropriate for the patient at this time?

A. Leflunomide
B. Hydroxychloroquine
C. Rituximab
D. Etanercept
E. Azathioprine

Difficulty level: Easy

10. A 44-year-old woman suffering from rheumatoid arthritis recently had leflunomide added to her methotrexate therapy. Inhibition of which of the following enzymes most likely mediated the therapeutic effect of the drug in the patient's disease?

A. Cyclooxygenase-1
B. Type II topoisomerase
C. Dihydrofolate reductase
D. Dihydroorotate dehydrogenase
E. Reverse transcriptase
F. Peptidyl transferase

Difficulty level: Easy

11. A 55-year-old man complained to his physician that a rash had appeared the previous day on his thorax and legs. The patient was recently diagnosed with hyperuricemia and had been receiving allopurinol for 2 weeks. The physician suspected the rash was due to the ongoing pharmacotherapy and decided to discontinue allopurinol and to start a treatment with probenecid. The physician should advise the patient not to concurrently use which of the following drugs?

A. Acetaminophen
B. Ibuprofen
C. Phenylephrine
D. Aspirin
E. Loratadine
F. Diphenhydramine

Difficulty level: Easy

12. A 53-year-old woman recently diagnosed with gouty arthritis started a treatment with a drug that inhibits leukocyte migration and phagocytosis secondary to inhibition of tubulin polymerization. Which of the following drugs did the patient most likely take?

A. Indomethacin
B. Prednisone
C. Colchicine
D. Allopurinol
E. Probenecid
F. Piroxicam

Difficulty level: Medium

13. A 54-year-old Black woman was admitted to the hospital because of joint pain and a rash flare of erythematous maculopapular lesions on her neck, upper chest, and elbows. The patient was diagnosed with systemic lupus erythematosus 5 months earlier and had been receiving piroxicam since then. After further exams, another drug was added to her current pharmacotherapy. Which of the following drugs would be appropriate to administer at this time?

A. Aspirin
B. Indomethacin
C. Ampicillin
D. Hydroxychloroquine
E. Clarithromycin
F. Ciprofloxacin

Difficulty: Medium

29. A 27-year-old primipara woman delivered a baby boy at term. The woman was Rho(D) negative, and her husband was Rho(D) positive. The woman received an intravenous injection of Rho(D) immune globulin just after the delivery. The reason for this treatment was most likely to prevent which of the following events?

A. Placental crossing of fetal erythrocytes in subsequent pregnancies
B. Production of antibodies against fetal Rho(D)-positive erythrocytes
C. The mother's hemolytic disease in subsequent pregnancies
D. Production of fetal Rho(D)-positive erythrocytes in subsequent pregnancies
E. Placental crossing of fetal Rho(D) antibodies in subsequent pregnancies

Difficulty level: Easy

30. A 45-year-old woman received a deceased-donor kidney transplant. Within 12 hours of the transplantation, she started immunosuppressive pharmacotherapy that included cyclosporine. Which of the following actions most likely mediated the therapeutic effect of the drug in the patient's disease?

A. Stimulation of synthesis of tumor necrosis factor
B. Stimulation of B-cell differentiation into memory B cells
C. Inhibition of the apoptosis pathway in target cells
D. Stimulation of gene expression for interleukin-2 production
E. Inhibition of calcineurin enzyme

Questions: VII-5 Drugs for Arthritis and Gout

Directions for questions **1–4**

Match each drug with the appropriate description (each lettered option can be selected once, more than once, or not at all).

A. Allopurinol
B. Azathioprine
C. Colchicine
D. Cyclosporine
E. Etanercept
F. Infliximab
G. Hydroxychloroquine
H. Leflunomide
I. Methotrexate
J. Rituximab

Difficulty level: Easy

1. An antimalarial drug used in rheumatoid arthritis

Difficulty level: Easy

2. A monoclonal antibody that binds to CD20 B lymphocytes

Difficulty level: Easy

3. A monoclonal antibody that binds to tumor necrosis factor-α

Difficulty level: Easy

4. This drug can inhibit the synthesis of inosinic acid.

Difficulty level: Easy

5. A 52-year-old woman recently diagnosed with mild rheumatoid arthritis started a therapy with nonsteroidal antiinflammatory drugs (NSAIDs), but 2 months later, the physician decided to add a disease-modifying antirheumatic drug (DMARD) to the therapeutic regimen. Which of the following is most likely the main advantage of DMARDs over NSAIDs in the treatment of rheumatoid arthritis?

A. To cause fewer adverse effects
B. To slow down the progression of bone and cartilage destruction
C. To improve symptoms after one week of therapy
D. To completely cure the disease, after 2 to 4 months of therapy
E. To completely abolish acute joint pain

Difficulty level: Easy

6. A 33-year-old man complained to his physician of low back pain and stiffness that were greatest on awakening in the morning and gradually improved throughout the day. The intermittent use of ibuprofen had been able to improve the symptoms in the past, but recently he had no relief. Magnetic resonance imaging confirmed the diagnosis of ankylosing spondylitis. Which of the following drugs would be appropriate for the patient at this time?

A. Hydroxychloroquine
B. Trastuzumab
C. Etanercept
D. Naproxen
E. Colchicine
F. Aldesleukin

Difficulty level: Easy

29. A 41-year-old man suffering from amyotrophic lateral sclerosis presented to his physician with muscle fasciculations, limb spasticity, hyperactive deep tendon reflexes, and extensor plantar reflexes. Baclofen was prescribed to reduce spasticity and cramps. Which of the following actions most likely mediated the therapeutic effect of the drug in the patient's disease?

A. Activation of $GABA_B$ receptors in the spinal cord
B. Blockade of Nm receptors of motor end plates
C. Increased substance P release in the spinal cord
D. Blockade of Ca^{2+} channels in skeletal muscle membranes
E. Increased K^+ conductance in skeletal muscle membranes

Difficulty level: Easy

30. A 48-year-old man presented to his physician complaining of intermittent limb muscle spasms. The patient was referred to the neurologic clinic, where the diagnosis of stiff man syndrome was made. A pharmacotherapy was prescribed to improve his muscle spasms. Which of the following drugs would be most appropriate for this patient?

A. Phenobarbital
B. Baclofen
C. Tubocurarine
D. Succinylcholine
E. Chlorpromazine
F. Mivacurium

Difficulty level: Medium

31. A 62-year-old woman underwent surgery to remove an ovarian cancer. General anesthesia was induced by thiopental, maintained by sevoflurane and nitrous oxide, and supplemented by vecuronium, which is currently one of the most commonly used skeletal muscle relaxants during surgery. Which of the following is a primary advantage of vecuronium over tubocurarine?

A. A very short duration of action (less than 5 minutes)
B. Negligible effects on histamine release
C. No fasciculations before paralysis
D. Lack of effects on the central nervous system
E. Induction of complete anterograde amnesia

Difficulty level: Easy

32. A 79-year-old man underwent surgery to remove a stomach cancer. Pertinent laboratory results before surgery were creatinine 3.5 mg/dL (normal 0.6–1.2 mg/dL), alanine aminotransferase 25 U/L (normal 8–20 U/L), urea nitrogen 65 mg/dL (normal 7–18 mg/dL). Diazepam was given the night before surgery. The general anesthesia was induced by propofol, maintained by sevoflurane and nitrous oxide, and supplemented by cisatracurium. Which of the following was most likely the primary reason for the use of cisatracurium instead of tubocurarine in this patient?

A. Liver insufficiency
B. Advanced age
C. Propofol induction
D. Renal insufficiency
E. Diazepam administration

Questions: III-6 Antiseizure Drugs

Directions for questions **1–3**

For each numbered item select the one lettered option that is most closely associated with it (each lettered option can be selected once, more than once, or not at all).

A. Acetazolamide
B. Carbamazepine
C. Ethosuximide
D. Felbamate
E. Gabapentin
F. Lamotrigine
G. Levetiracetam
H. Phenytoin
I. Tiagabine
J. Topiramate
K. Valproic acid
L. Zonisamide

Difficulty level: Easy

1. This drug is effective in all forms of epilepsy in all age groups.

Difficulty level: Easy

2. This drug binds selectively to a synaptic vesicular protein, altering the synaptic release of glutamate and gamma-aminobutyric acid (GABA).

Difficulty level: Easy

3. This drug inhibits gamma-aminobutyric acid (GABA) reuptake in both neurons and glia, enhancing GABAergic transmission.

Difficulty level: Easy

22. A 54-year-old man who had been suffering from amyotrophic lateral sclerosis for 1 year complained of generalized muscle spasms. His physician prescribed diazepam to reduce spasticity. Which of the following statements best explains the mechanism of the spasmolytic effect of diazepam in this patient?

A. Blockade of calcium release from the sarcoplasmic reticulum
B. Blockade of acetylcholine release from motor nerves
C. Depolarization blockade of Nm receptors
D. Facilitation of $GABA_A$ actions in the spinal cord
E. Activation of $GABA_B$ receptors in the spinal cord

Difficulty level: Easy

23. A 67-year-old woman required intubation and mechanical ventilation for management of respiratory failure. Vecuronium was given intravenously to reduce chest wall resistance and ineffective spontaneous ventilation. Which of the following membrane potentials was most likely blocked by vecuronium in this patient?

A. Action potential of motor nerve
B. Miniature end-plate potential
C. Resting potential of smooth muscle
D. Action potential of cardiac muscle
E. Action potential of corticospinal tract

Difficulty level: Hard

24. A 40-year-old woman, admitted to the emergency department after a car collision, had multiple surgeries to repair her injuries and was placed on mechanical ventilation to assist respiration. On day 13 she was scheduled for a transesophageal electrocardiogram (ECG) and was given a muscle relaxant intravenously to facilitate the procedure. Soon afterward, the patient suffered cardiac arrest, and cardiopulmonary resuscitation was performed successfully. The serum potassium levels recorded just before the arrest peaked at 7.3 mEq/L. Which of the following muscle relaxants most likely caused the cardiac arrest?

A. Cisatracurium
B. Vecuronium
C. Tubocurarine
D. Dantrolene
E. Succinylcholine

Difficulty level: Easy

25. A 40-year-old woman underwent surgery for ovarian cancer. She received atropine, loratadine, and morphine as preanesthetic medication. The anesthesia was then performed with thiopental, sevoflurane, nitrous oxide, and succinylcholine. A few minutes later, the patient developed muscle fasciculations, trismus, rigidity, tachycardia, and hypotension, and her body temperature rose to 103.8°F (39.8°C). Which of the following drugs most likely caused the patient's syndrome?

A. Atropine
B. Morphine
C. Loratadine
D. Succinylcholine
E. Thiopental
F. Nitrous oxide

Difficulty level: Easy

26. A 43-year-old man complained of generalized muscle soreness upon recovering from surgery to remove prostate cancer. General anesthesia had been performed with thiopental, halothane, and a skeletal muscle relaxant. Which of the following muscle relaxants most likely caused the patient's complaint?

A. Tubocurarine
B. Cisatracurium
C. Succinylcholine
D. Dantrolene
E. Diazepam

Difficulty level: Easy

27. A 34-year-old woman suffering from hemifacial spasms started treatment with botulinum toxin injected directly into the abnormally contracting muscles. Which of the following molecular actions most likely mediated the therapeutic effect of the drug in the patient's disorder?

A. Long-lasting activation of Nm acetylcholine receptors
B. Inhibition of acetylcholine storage into synaptic vesicles
C. Inhibition of choline acetyltransferase
D. Inhibition of acetylcholine exocytosis from cholinergic terminals
E. Stimulation of acetylcholinesterase
F. Opening of Ca^{2+} channels in cholinergic terminals

Difficulty level: Easy

28. A 64-year-old woman complained to her physician of involuntary blinking and closing of the eyes. She noticed that the eyelid spasm was made worse by fatigue and anxiety. Further exams led to the diagnosis of benign essential blepharospasm, and a treatment with local injections of botulinum toxin was prescribed. Which of the following adverse effects was most likely to occur in this patient?

A. Retinal detachment
B. Visual hallucinations
C. Visual loss
D. Eyelid ptosis
E. Limb muscle paralysis

infection, timolol and latanoprost for glaucoma, and lovastatin for hypercholesterolemia. General anesthesia was induced by thiopental sodium, maintained by isoflurane and nitrous oxide, and supplemented by vecuronium. Which of the following of the patient's medications most likely enhanced the action of vecuronium?

A. Gentamicin
B. Darifenacin
C. Timolol
D. Latanoprost
E. Lovastatin

Difficulty level: Easy

16. A 44-year-old man brought to the emergency department after a car accident required intubation and mechanical ventilation. The patient's history was significant for a genetic deficiency of plasma cholinesterase. A muscle relaxant was administered intravenously. Which of the following muscle relaxants would be contraindicated in this patient?

A. Tubocurarine
B. Cisatracurium
C. Baclofen
D. Mivacurium
E. Vecuronium
F. Tizanidine

Difficulty level: Medium

17. A 56-year-old woman was undergoing major surgery to remove a breast carcinoma. The woman, who was a heavy smoker, had been suffering from chronic obstructive pulmonary disease for 15 years. A drug was administered preoperatively, and the anesthesia was supplemented with a skeletal muscle relaxant. Which of the following drugs would be contraindicated for this patient?

A. Tubocurarine
B. Glycopyrrolate
C. Clonidine
D. Vecuronium
E. Cisatracurium

Difficulty level: Hard

18. A 49-year-old woman required intubation and mechanical ventilation for management of respiratory failure due to severe emphysema. The patient was agitated, attempting to sit up in bed and reach for the endotracheal tube. Lorazepam was given intravenously (IV) for sedation, and the patient got drowsy, but motor restlessness was only marginally improved. An IV muscle relaxant was given. The patient relaxed as paralysis developed, but 5 minutes later her heart rate was 160 bpm. Which of the following drugs most likely caused this adverse effect?

A. Botulinum toxin
B. Dantrolene
C. Succinylcholine
D. Tubocurarine
E. Cisatracurium

Difficulty level: Easy

19. A 57-year-old woman underwent surgery for breast cancer. General anesthesia was induced by thiopental, maintained by sevoflurane and nitrous oxide, and supplemented with a muscle relaxant that causes a long lasting activation of Nm receptors. Which of the following drugs was most likely administered?

A. Succinylcholine
B. Cisatracurium
C. Tubocurarine
D. Mivacurium
E. Vecuronium
F. Baclofen

Difficulty level: Easy

20. A 48-year-old woman underwent heart surgery for placement of an artificial valve. Anesthesia was induced by thiopental, and a muscle relaxant was then given intravenously to facilitate intubation. Soon after the administration of the drug, the patient exhibited transient muscle fasciculations that progressed to generalized paralysis within 1 minute. Which of the following muscle relaxants was most likely given?

A. Cisatracurium
B. Succinylcholine
C. Dantrolene
D. Vecuronium
E. Tubocurarine
F. Tizanidine

Difficulty level: Easy

21. A 10-year-old boy diagnosed with hereditary spastic paraparesis 2 years ago was treated with several spasmolytic drugs with limited success. Recently, the neurologist prescribed another spasmolytic agent that acts as an α_2-receptor agonist in the spinal cord. Which of the following drugs was most likely prescribed?

A. Diazepam
B. Baclofen
C. Dantrolene
D. Mivacurium
E. Tizanidine

Difficulty level: Hard

8. A 49-year-old man diagnosed with inguinal hernia was prepared for surgery. Shortly after the initiation of general anesthesia with halothane and succinylcholine, the patient developed muscle rigidity, tachycardia, labile blood pressure, profuse diaphoresis, and high fever (104.2°F, 40.1°C). The anesthesia was discontinued at once, and a drug was administered by rapid intravenous push. Which of the following was most likely the mechanism of action of the administered drug?

A. Activation of $GABA_B$ receptors in the spinal cord
B. Blockade of excitatory neurotransmitter release in the brain
C. Blockade of Ca^{2+} channels in the skeletal muscle membrane
D. Blockade of Ca^{2+} channels in the sarcoplasmic reticulum
E. Increased K^+ conductance in the skeletal muscle membrane

Difficulty level: Easy

9. A 22-year-old man suffering from strabismus started treatment with local injections of botulinum toxin into the extrinsic ocular muscles. Which of the following structures was most likely the site of the therapeutic action of the drug?

A. Nicotinic muscular receptors
B. Somatic nerve terminals
C. Muscarinic receptors
D. Autonomic nerve terminals
E. Nicotinic neuronal receptors

Difficulty level: Easy

10. A 73-year-old man underwent thoracic surgery to remove a lung cancer. General anesthesia was supplemented with vecuronium. Which of the following molecular actions most likely mediated the muscle relaxant effect of this drug?

A. Stimulation of plasma cholinesterase
B. Long-lasting activation of postsynaptic Nm receptors
C. Competitive blockade of postsynaptic Nm receptors
D. Blockade of action potential of the motor nerves
E. Blockade of Ca^{2+} release from the sarcoplasmic reticulum
F. Competitive blockade of Nn receptors in the brain

Difficulty level: Medium

11. A 61-year-old man underwent surgery for prostate cancer. The anesthesia was induced by thiopental and maintained by halothane and nitrous oxide. Vecuronium was added to ensure adequate muscle relaxation. Which of the following was most likely the sequence of the paralysis of skeletal muscles induced by vecuronium in this patient?

A. Eye extrinsic muscles, limb muscles, diaphragm
B. Limb muscles, diaphragm, eye extrinsic muscles
C. Diaphragm, eye extrinsic muscles, limb muscles
D. Diaphragm, limb muscles, eye extrinsic muscles
E. Limb muscles, eye extrinsic muscles, diaphragm

Difficulty level: Easy

12. A 59-year-old woman was undergoing surgery for breast cancer. General anesthesia was supplemented with a nondepolarizing neuromuscular blocker that has a short duration of action and is metabolized by plasma pseudocholinesterase. Which of the following drugs was most likely administered?

A. Succinylcholine
B. Tubocurarine
C. Vecuronium
D. Mivacurium
E. Cisatracurium

Difficulty level: Easy

13. A 74-year-old man underwent abdominal surgery to remove a colon carcinoma. The patient had severely impaired hepatic and renal function, and the anesthesiologist decided to supplement general anesthesia with a muscle relaxant that is inactivated primarily by a form of spontaneous breakdown (also known as Hoffmann elimination). Which of the following drugs was most likely given?

A. Succinylcholine
B. Dantrolene
C. Tubocurarine
D. Cisatracurium
E. Mivacurium

Difficulty level: Medium

14. A 65-year-old woman underwent hysterectomy for endometrial carcinoma. The general anesthesia protocol included sodium thiopental, isoflurane, nitrous oxide, and tubocurarine. The anesthesiologist also administered another drug to counteract tubocurarine-induced hypotension. To which of the following classes did this drug most likely belong?

A. β_1 agonists
B. D_1 antagonists
C. Muscarinic agonists
D. Cholinesterase inhibitors
E. H_1 antagonists

Difficulty level: Easy

15. A 66-year-old woman was brought to the emergency department following a car accident. Surgery was needed to repair a badly damaged leg. Medications of the patient on admission were gentamicin and darifenacin for urinary tract