

### Test control. "Pain".

1. All of following substances which are known as algogenic, activate the nociceptors, except one:
  1. K-ions;
  2. Na-ions;
  3. H-ions;
  4. Histamine;
  5. Bradikinin;
  6. Serotonin
2. To the secondary nociceptive neurons which begin the spinal thalamic tract, belong followings:
  1. Neurons of substantia gelatinosum;
  2. Neurons of base of dorsal horn (lamina V);
  3. Neurons of central horn of spinal cord;
  4. Neurons of thalamic ventral posterolateral nucleus
3. Two distinct populations of peripheral afferent fibres are responsible for transmission of nociceptive stimuli: A). Afferent fibres of group A-delta, B). Afferent fibres of group C. Choose the right characteristics for each group from listed below:
  1. Are myelinated;
  2. Are unmyelinated;
  3. Conduct at 0.5 - 2 m/sec;
  4. Conduct at 5 - 30 m/sec;
  5. Terminate primarily in the outermost lamina of the dorsal horn;
  6. Terminate primarily in the deep lamina of the dorsal horn;
  7. Can be activated most efficiently by strong pressure and by extreme heat;
  8. Can be activated by chemical stimuli,
4. Please, list the families of endogenous opioids:
  - 1.....
  - 2.....
  - 3.....
5. Analgesic stimulation of periaqueductal grey regions of brain is characterized by all of following features, except one:
  1. Decreased excitability of nociceptors;
  2. Weak answer of secondary nociceptive neurons to nociceptive stimuli;
  3. Activation of endogenous opioid system;
  4. Modulation of pain sensation
6. Which of following pathways can transmit the pain information to the brain?
  1. Paleospinothalamic tract;
  2. Neospinothalamic tract;
  3. Dorsal spinocerebellar tract;
  4. Ventral spinocerebellar tract;
7. For elimination of posttraumatic pain syndrome use all of the following methods of treatment, except one:
  1. Lesion of dorsolateral tract;
  2. Lesion of ventrolateral tract;
  3. Injection of morphine;
  4. Electrical stimulation of periaqueductal grey region

8. Which of the substances listed below are algogenic?
  1. Histamine;
  2. Bradykinin;
  3. Serotonin;
  4. Substance P;
  5. Prostaglandins;
  6. Norepinephrine
9. Which of the statements mentioned below characterize the primary afferent nociceptive neurons?
  1. Neurons locate in spinal dorsal root ganglia;
  2. Neurons locate in spinal dorsal horn;
  3. Terminals of peripheral branch of primary afferent axone (nociceptors) respond to strong mechanical stimuli;
  4. Nociceptors are activated by chemical algogenic substances, which appears in inflammatory sites;
  5. Central branches of primary nociceptive neurons terminate on dorsal horn neurons;
  6. Substance P releases from the peripheral and central terminates of the primary afferents.
10. Spinothalamic tract is characterized by all of following features:
  1. Formed by axons of neurons located in spinal dorsal horn;
  2. Transmits the "sharp" and "long lasting" pain;
  3. Decussates through the medulla;
  4. Fibers of the tract terminate on neurons of reticular formation;
  5. Part of the fibers terminates on ventro-basal nuclei of thalamus;
11. Which of the following substances are mediators of antinociceptive system?
  1. Met-enkephalin;
  2. Leu-enkephalin;
  3. Endorphin;
  4. Morphine;
  5. Serotonin
12. Which of the following substances are metabolites of proopiomelanocortin?
  1. ACTH;
  2. Cortisol;
  3. Enkephalin;
  4. Dinorphin;
  5.  $\beta$ -endorphin;
  6. Norepinephrine
13. Why does the pain and temperature perception damage selectively during syringomyelia?

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14. Electrical stimulation of which region of brain can induce an analgesia?
  1. spinal dorsal horn;
  2. periaqueductal grey;
  3. nucleus raphe magnus;
  3. sensory cortex areas
15. Which spinal cord lesions, listed below, would lead to loss of pain and temperature sensation?
  1. lesion of the dorsal columns;
  2. lesion of the dorsal lateral quadrant;
  3. lesion of the ventral columns;
  4. lesion of the ventral quadrant

16. Please list down the physical methods of pain therapy:

1..... 2..... 3.....

17. Point the substances that are algogenic:

1. bradykinin;
2. prostoglandins;
3. leukotrienes;
4. histamine;
5. Na-ions;
6. endorphins

18. Point the afferent fibers that convey sensory information:

1. myelinated A $\alpha$  fibers;
2. myelinated A $\beta$  fibers;
3. myelinated A $\gamma$  fibers;
4. myelinated A $\delta$  fibers;
5. unmyelinated C fibers

19. Point the stimuli that are algogenic:

1. thermal stimuli ( temperature is above 45<sup>0</sup> C);
2. thermal stimuli ( temperature is above 10<sup>0</sup> C);
3. thermal stimuli ( temperature is lower -10<sup>0</sup> C);
4. mechanical stimuli;
5. chemical stimuli

20. Point the location of a) primary nociceptive neuron and b) secondary nociceptive neuron:

1. ventral horn;
2. dorsal horn;
3. sensory ganglia

21. Point the pathway that convey pain information:

1. anterior spinothalamic tract;
2. lateral spinothalamic tract;
3. ventrolateral spinothalamic tract substances;
4. posterior spinothalamic tract;
5. neospinothalamic tract;
6. paleospinothalamic tract

22. Do the pain pathway decussate together with the temperature pathway in the anterior commissure?

1. Yes;
2. No

23. Write the 3 main group of endogenic opioids:

1..... 2..... 3.....

24. Write the 4 main region in central nervous system that belong to the pain inhibitory system:

1..... 2..... 3..... 4.....

25. Point the substances that are mediators a) in the primary afferent fibers and b) in the pain inhibitory pathway:

1. serotonin;
2. substance P;
3. glutamic acid;
4. GABA;
5. dopamine;
6. acetylcholin

26. Point out the pain-producing substances:

1. histamine;
2. prostaglandin E<sub>2</sub>;
3. potassium ions;
4. serotonin;
5. endorphines;
6. bradykinin

27. Which of the following features are characteristic of the afferent A- $\delta$  fibers?

1. are myelinated fibers;
2. are unmyelinated fibers;
3. get excited under the influence of chemical stimuli;
4. get excited under the influence of mechanical and thermal stimuli;
5. are peripheral fibers dorsal root ganglion neuron;
6. wide-spread slow pain takes place in this case;
7. local prompt pain takes place in this case

28. Which of these features are characteristic of spinothalamic tract?

1. is conductor of antinociceptive information;
2. locates in lateral spinal columns;
3. connects to thalamic neurons;
4. primary neurons are in the dorsal horn of the spinal cord

29. Which of the followings can lead to analgesia?

1. stimulation of somatosensory cortex;
2. stimulation of locus ceruleus;
3. stimulation of dorsal raphe nucleus;
4. stimulation of nucleus reticularis gigantocellularis;
5. stimulation of periaqueductal gray matter of the midbrain;

30. Which substances do sensitize of the nociceptors?

1. leukotrienes;
2. bradykinin;
3. serotonin;
4. potassium ions;
5. histamine;
6. prostaglandin E<sub>2</sub>

31. Point out the mediators of antinociceptive system:

1. serotonin;
2. endorphines;
3. norepinephrine;
4. morphine;
5. dinorphine;
4. sodium ions

32. Point out the pain-producing substances:

1. sodium ions;
2. calcium ions;
3. potassium ions;
4. hydrogen ions;
5. GABA;
6. serotonin

33. Which stimuli can excite nociceptors?

1. thermal stimuli (temperature is lower -10<sup>0</sup> C);
2. thermal stimuli (temperature is about 20<sup>0</sup> C);
3. thermal stimuli (temperature is more 45<sup>0</sup> C);
4. excessive mechanical stimuli;
5. electrical stimuli;
6. chemical stimuli

34. Point the major pathways for pain transmission:
1. dorsal spinocerebellar tract;
  2. dorsal spinal columns;
  3. neospinothalamic tract
  4. paleospinothalamic tract;
  5. anterior spinothalamic tract;
35. Which of the following features are characteristic of the afferent C fibers?
1. are myelinated fibers;
  2. are unmyelinated fibers;
  3. get excited under the influence of chemical stimuli;
  4. get excited under the influence of mechanical and thermal stimuli;
  5. are peripheral fibers of dorsal root ganglion neuron;
  6. wide-spread slow pain takes place in this case;
  7. local prompt pain takes place in this case
36. The activation of pain receptors can be inhibited by:
1. Na<sup>+</sup> channel blockers (local anesthetic);
  2. central anesthesia;
  3. alcohol;
  4. prostaglandin synthesis inhibitors
  5. cooling of the damaged area;
  6. means of surgical nerve transection;
37. Which afferent fibers do relay algetic sensibility?
1. A- $\alpha$  fibers;
  2. A- $\beta$  fibers;
  3. A- $\delta$  fibers;
  4. A- $\gamma$  fibers
38. Please, list down the pharmacological methods of pain therapy:
- .....
1. What substances and stimuli can evoke pain?
  2. Point the kinds of afferent fibers that convey pain information.
  3. Point the location of neurons that belong to the pain pathway.
  4. Give the location of pain spinothalamic tract in the spinal cord.
  5. Write the 3 main group of endogenous opioids.
  6. Write the 4 main regions in central nervous system that belong to the pain inhibitory system.
  7. Point the substances that are mediators in the primary afferent fibers, in the pain inhibitory pathway.
  8. Point the methods of pain therapy.