Environmental Emergencies: Review Questions

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QUESTIONS

Choose the single best answer for each question.

1. **Which of the following is the most efficient mechanism by which the human body dissipates heat when air temperature exceeds body temperature?**
   (A) Convection
   (B) Conduction
   (C) Respiration
   (D) Radiation
   (E) Evaporation

2. **Which of the features listed below best distinguishes heat stroke from heat exhaustion?**
   (A) Heat exhaustion patients can sweat, whereas heat stroke patients stop sweating
   (B) Heat exhaustion patients have higher hepatic transaminase levels than heat stroke patients
   (C) Heat stroke patients always demonstrate a core temperature greater than 40°C (105°F)
   (D) Heat stroke patients always present with altered mental status
   (E) Heat exhaustion patients usually do not exhibit volume depletion, whereas heat stroke patients typically are volume depleted

3. **Which of the following statements about near-drowning victims is CORRECT?**
   (A) A normal chest radiograph virtually excludes significant lung damage
   (B) An injury to the cervical spine is extremely unlikely
   (C) All near-drowning victims require admission
   (D) Up to 20% of patients who arrive in the emergency department (ED) comatose and flaccid with dilated pupils can be expected to fully recover
   (E) Aspirated water drastically interferes with successful ventilation by mechanical obstruction of the airways

4. **Which of the following marine envenomations is correctly paired to its treatment?**
   (A) Jellyfish—immersion in 5% acetic acid and shaving the affected area to remove nematocysts
   (B) Portuguese man-of-war tentacles—removal of tentacles using surgical gloves and irrigation with fresh water
   (C) Puncture wounds from sea urchins—removal of foreign bodies and application of ice packs
   (D) Stonefish stings—immersion in diluted baking soda solution, local wound care, and tetanus-diphtheria toxoid booster if needed
   (E) Sea sponge—application of a dilute baking soda solution 3 times a day

5. **A 35-year-old male scuba diver returns from a diving trip complaining of joint pain, rash, and vertigo. Which of the following best describes this diving-related condition?**
   (A) Type I decompression sickness (DCS I)
   (B) Type II decompression sickness (DCS II)
   (C) Nitrogen narcosis
   (D) Inner ear barotrauma
   (E) Arterial gas embolism

(turn page for answers)

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EXPLANATION OF ANSWERS

1. **(E) Evaporation.** Humans primarily disperse heat by evaporation through the means of sweating.[1] In the ED, evaporation can be maximized by undressing the patient, spraying or pouring warm water on the patient's exposed skin, and propelling air over the skin with a fan. Cold water can induce vasoconstriction and therefore reduce potential heat loss.
2. **(D) Heat stroke patients always present with altered mental status.** Heat stroke, a true medical emergency, is defined classically as the triad of altered mental status, elevated core temperature (> 40°C), and anhydrosis.[1] The patient may be partially cooled in transport, however, and anhydrosis may not be a finding for a variety of reasons. Heat exhaustion is a vague syndrome, characterized by dizziness, weakness, fatigue, nausea, headache, myalgias, and variable core temperatures (from normal to 40°C), but the mental status of the patient is normal. Both heat exhaustion and heat stroke cause an elevation of hepatic transaminase enzymes, but the rise seen in heat stroke tends to be more extreme.
3. **(D) Up to 20% of patients who arrive in the ED comatose and flaccid with dilated pupils can be expected to fully recover.** The appearance of a patient after a near-drowning accident cannot reliably predict the outcome.[2] Patients who are hypothermic must be warmed to at least 32°C (90°F) before they can be declared dead. Not all patients require admission, but patients must be observed. Patients with a history of apnea, unconsciousness, hypoxia, or dysrhythmias; those with an abnormal electrocardiogram or chest radiograph; and those who remain symptomatic in the ED require admission. Cervical spine injuries should be suspected in all near-drowning patients with altered mental status because a diving injury may have precipitated the near-drowning episode. Most near-drowning victims do not aspirate enough fluid to cause mechanical difficulties in ventilation. However, aspiration of both water and waterborne contaminants can cause damage to pulmonary surfactant.
4. **(A) Jellyfish—immersion in 5% acetic acid and shaving the affected area to remove nematocysts.** Although reactions to marine envenomations may be life threatening, often the venom from marine bites and stings can be neutralized early in the treatment.[3] For jellyfish stings, removal of loose nematocysts should be attempted. Fresh water irrigation should be avoided because this can cause nematocysts to discharge. Irrigation with acetic acid or isopropyl alcohol is followed by gentle shaving to remove any remaining nematocysts. The stings of Portuguese man-of-war tentacles can cause severe systemic symptoms, and the tentacles should be removed with forceps and not a gloved hand. A weak vinegar solution may be used to inactivate the nematocysts. When treating wounds from sea urchins, try to remove the barbed fragments and then immerse the affected extremity in hot water (> 45°C) because these toxins tend to be heat labile. Stonefish produce extremely toxic venom and antivenom may be necessary. Like many marine envenomations, applications of basic solutions or fresh water can provoke sea sponge nematocysts to discharge. The best treatment for sea sponge exposures is to remove spicules with adhesive tape, apply isopropyl alcohol, update tetanus status, and prescribe an antihistamine for itching and topical steroids for dermatitis.
5. **(B) Type II decompression sickness (DCS II).** DCS results from the accumulation of nitrogen bubbles in tissue and blood. Symptoms usually occur within 12 hours of diving. DCS is divided into 2 groups: type I ("pain only"), in which DCS causes limb or joint pain with skin or lymphatic involvement; and type II, which also includes neurologic symptoms ranging from weakness to vertigo to altered mental status. DCS II also can manifest as pulmonary symptoms, referred to as "the chokes." Nitrogen narcosis describes the intoxicating effect that nitrogen has on divers. Inner ear barotrauma results from a pressure differential between the inner ear and middle ear causing a rupture of the vestibular or cochlear window. Inner ear barotrauma usually occurs close to the surface during a difficult descent. Symptoms include a sudden onset of severe vertigo not relieved by ascent, tinnitus, nystagmus, a feeling of fullness in the affected ear, and hearing loss. Arterial gas embolism is the most serious and fatal of all diving accidents. Symptoms occur on ascent, usually within 10 minutes of surfacing, and include visual disturbances, muscular or sensory disturbances, loss of consciousness, cardiac dysrhythmia, and cardiac arrest. Sudden loss of consciousness in a diver is assumed to be arterial gas embolism until proven otherwise.

REFERENCES

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