Climate Change and Human Physiology

Climate Change · Answer Key · 15 Questions

1. Which specific physiological mechanism is most directly impaired during prolonged exposure to extreme heat, leading to heatstroke?

A) The down-regulation of pulmonary surfactant production
B) The failure of the hypothalamus to regulate thermoregulation
C) The inhibition of renal erythropoietin secretion
D) The hyper-secretion of insulin by beta cells

2. Climate change is expanding the range of vectors for which viral disease, specifically due to the increased metabolic rate and biting frequency of Aedes aegypti mosquitoes in warmer temperatures?

A) Japanese Encephalitis
B) Dengue Fever
C) Lyme Disease
D) Babesiosis

3. What is the primary mechanism by which increased concentrations of atmospheric CO2 reduce the nutritional quality of C3 crops like wheat and rice, impacting human dietary zinc and iron intake?

A) Increased photorespiration rates
B) Dilution of mineral concentrations due to carbohydrate accumulation
C) Increased soil leaching of trace elements
D) Interference with root-mycorrhizal symbiosis

4. Increased ground-level ozone, exacerbated by rising temperatures, is clinically associated with the exacerbation of which respiratory condition due to the induction of oxidative stress in the epithelial lining of the lungs?

A) Idiopathic Pulmonary Fibrosis
B) Chronic Obstructive Pulmonary Disease
C) Cystic Fibrosis
D) Pulmonary Hypertension

5. How does the increase in global pollen concentrations, driven by extended growing seasons due to climate change, impact the human immune system?

A) By inducing long-term T-cell exhaustion
B) By upregulating IgE-mediated hypersensitivity responses
C) By suppressing the production of histamines
D) By permanently altering the blood-brain barrier

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6. Which waterborne pathogen has shown increased proliferation in coastal waters due to rising sea surface temperatures, leading to higher rates of human gastrointestinal infection upon ingestion or wound exposure?

A) Vibrio vulnificus
B) Giardia lamblia
C) Cryptosporidium parvum
D) Salmonella typhi

7. What is the biological impact of heat stress on the human cardiovascular system?

A) Reduction in heart rate variability
B) Increased cardiac output and peripheral vasodilation to facilitate cooling
C) Decreased activation of the renin-angiotensin system
D) Systemic vasoconstriction to protect core organs

8. Which dermatological condition is increasingly linked to the expansion of range for toxic plants like poison ivy, which exhibit accelerated growth and higher potency under elevated CO2 levels?

A) Urticaria pigmentosa
B) Allergic contact dermatitis
C) Psoriasis vulgaris
D) Erythema multiforme

9. The increase in wildfires due to climate change releases PM2.5 particles that are particularly dangerous to human health because they are small enough to reach which part of the body?

A) The upper pharyngeal tract
B) The deep alveolar spaces and subsequently the systemic circulation
C) The esophageal lining only
D) The primary bronchial bifurcations only

10. How does climate-induced drought affect human susceptibility to Valley Fever (Coccidioidomycosis)?

A) By promoting the dormant state of the fungus
B) By facilitating the aerosolization of fungal spores from dry soil
C) By increasing the UV-induced mutation rate of the fungus
D) By suppressing the human cutaneous immune response

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11. Elevated temperatures have been linked to an increased incidence of kidney stones (nephrolithiasis); what is the primary physiological driver of this phenomenon?

A) Decreased urine volume and higher solute concentration due to chronic dehydration

B) Increased dietary intake of calcium

C) Higher rates of vitamin D synthesis

D) Enhanced metabolic clearance of uric acid

12. In the context of climate change, what is the 'urban heat island' effect's primary impact on human sleep physiology?

A) Increased REM latency

B) Reduced core body temperature cooling, which is necessary for the onset of deep sleep

C) Increased melatonin suppression by ambient infrared radiation

D) Higher circulating levels of thyroxine

13. Which essential human nutrient shows a decrease in the gut microbiome diversity of human hosts when the host consumes crops grown under elevated atmospheric CO2?

A) Short-chain fatty acids

B) Vitamin B12

C) Magnesium

D) Selenium

14. Rising temperatures are associated with a decrease in the latency period of Plasmodium falciparum in mosquitoes, which directly leads to what health consequence?

A) Increased mortality of the vector

B) Higher transmission intensity of malaria in endemic regions

C) Development of innate immunity in human hosts

D) Rapid evolution of the mosquito's chitinous exoskeleton

15. What is the effect of severe heat waves on the pharmacological efficacy of medications like beta-blockers?

A) Increased absorption rate in the small intestine

B) Reduced efficacy due to changes in drug-protein binding

C) Altered autonomic response to physiological stress, potentially worsening heat-related strain

D) Increased renal excretion leading to rapid clearance

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