Mitochondria Mastery Course

Study Guide #3

1. True or False - Magnesium is critical for the cell nucleus with regards to physical stability, repair mechanisms, and proper sequencing of information?

2. All the following are components of cells that make them vulnerable to malfunction, except?

    A. Membranes
    B. Enzymes
    C. Membrane receptors
    D. Transcription factors
    E. All the above can lead to malfunction.

3. All the following are true of epoxides, except?

    A. Most epoxides are toxic because they are highly reactive.
    B. This reactivity in biological systems makes them mutagenic.
    C. Epoxide reactivity with nucleic acids can interfere with G-C pairing.
    D. A & B only.
    E. All the above are true.

4. True or False - Components of the electron transport chain such as CoQ_{10}, Fe-S complexes, etc. do not need to be readily available for optimal mitochondrial function

and can be made quickly by the cell nucleus and then transported to the mitochondrion?

5. All the following are correct with regards to magnesium, except?

    A. At the cellular level Mg^{2+} competes with Ca^{2+}, as well as protons (+) or amines (-NH_2^+), for binding affinity to various anions found in the mitochondria, cytosol, and nucleus.

    B. Mg^{2+} ions activate *adenylyl cyclase* control over cyclic adenosine-monophosphate (cAMP) synthesis. *Adenylyl cyclase* activation is critical for control of anaphylactic reactions.

    C. Deficiency symptoms of magnesium are extensive and include decreased appetite, anxiousness, depression, fatigue, mental confusion, poor stamina, sleep disturbance, muscle twitching, spasms, and cramping…and more.

    D. Mg^{2+} deficits stimulate histamine release from mast cells by inhibition of cAMP production.

    E. All the above are correct.

6. Elevated tiglylglycine is linked to which complex of the electron transport chain?

    A. Complex I

    B. Complex II

    C. Complex III

    D. Complex IV

    E. Complex I and IV

7. True or False - Most epoxides are toxic because they are highly reactive?

8. True or False - Each cell has just one nucleus, but there are 1000's of mitochondria with approximately 10,000-15,000 ETC complexes and multiple copies of DNA?

9. All the following are true of mycotoxins, except?

A. Mycotoxins are chemicals produced by molds that cause toxic results.

B. Mycotoxins disrupt cellular processes such as protein, DNA and RNA synthesis.

C. Cause mitochondrial damage and deplete glutathione.

D. B & C only

E. All the above are true.

10. Arabinose from invasive *candida* interacts with lysine and arginine to form an advanced glycation end-product called pentosidine. Which of the following is incorrect with regards to pentosidine?

A. Decreases enzyme activity.
B. Causes cross-linked proteins to become inflexible.
C. Enhances the function of myelin.
D. Induces autoimmune reactions to dysfunctional proteins.
E. Linked to cardiovascular and kidney problems.

11. True or False - Most proteins necessary for mitochondrial function are encoded by genes in the mitochondria only?

12. True or False – Malonic acid is a competitive enzyme inhibitor of which electron transport chain complex?

A. Complex I

B. Complex II

C. Complex III

D. Complex IV

E. All the above.

13. True or False - The main human toxic metals mentioned in module #7 include aluminum, arsenic, cadmium, lead, mercury, and thallium?

14. All the following are true of mold, except?

    A. Molds spread and reproduce via mold spores.
    B. For some people, exposure to mold can lead to various symptoms such as nasal congestion, cough, wheezing and red and itchy eyes and/or skin.
    C. Severe reactions can occur among workers exposed to large amounts of mold in occupational settings.
    D. Individuals with immune deficiencies are susceptible to mold illness.
    E. All the above are true.

15. True or False – One reason mitochondria have their own DNA is they need to have control over their own fate and respond to challenges quickly, efficiently, and individually?

16. All the following are true of oxidative stress, except?

    A. Oxidative stress is defined as a condition in which the generation of reactive oxygen species (ROS) exceeds our ability to neutralize and protect ourselves against them.
    B. Oxidative stress is a characteristic feature of inflammatory diseases in which cells of the immune system produce ROS in response to a challenge.
    C. Oxidative stress can be localized in the joints in arthritis or in the vascular wall in atherosclerosis, or can be systemic, for example, in systemic lupus erythematosus (SLE) or diabetes.
    D. A & B only
    E. All the above are correct.

17. Strenuous or exhaustive exercise leads to which of the following?

    A. Muscle damage.
    B. Increased pro-inflammatory mediators, e.g., lactic acid.
    C. Leakage of muscle proteins.

D. Leakage of nucleotides, e.g., purines.

E. All are correct.

18. True or False - Molds are fungi that can be found in both indoor and outdoor environments, but they are always located in places of high moisture?

19. True or False - T-2 is cytotoxic to dentritic cells and monocytes during differentiation process into macrophages?

20. True or False - Approximately, 90% of consumed oxygen is linked to oxidative phosphorylation within the mitochondria for adenosine triphosphate (ATP) production?

21. Which component of the electron transport chain is most directly involved in caspase enzyme activation for apoptosis signaling?

A. Complex II

B. CoQ10

C. Cytochrome c

D. Fe-S complex

E. None of the above

22. True or False - One of the main treatment goals for any mycotoxin is to prevent absorption from digestive system?

23. Which form of exercise seems to have the greatest impact on mitochondrial biogenesis?

A. Aerobic exercise.

B. Resistance training.

C. High Intensity Interval Training (HIIT).

D. Aerobic exercise only.

E. None of the above.

24. Hydroxyl radicals are most significantly toxic to which types of fats?

    A. Saturated fats
    B. Monounsaturated fats
    C. Polyunsaturated
    D. Saturated and monosaturated
    E. None of the above.

25. True or False - Nicotinamide riboside (NR), aka nicotinamide ribonucleoside, is a form of Vitamin B3?

26. All the following are true of D-ribose, except?

    A. Five carbon sugar, and important intermediate in the pentose phosphate pathway.
    B. Critical component of DNA and RNA structure.
    C. Important for energy production as a structural component of ATP.
    D. Many studies in cardiology show D-ribose given prior to or immediately after ischemia in the heart can assist cardiomyocytes recover their energy levels more quickly.
    E. All the above are correct.

27. True or False - L-carnitine, like CoQ_{10}, is made in significant amounts by our body, but like CoQ_{10} it likely increases naturally with age, so supplementation is less important?

28. True or False - Regarding L-Carnitine for primary mitochondrial disorders there are no reported safety concerns below 2 grams daily?

29. All the following are functions of CoQ10, except?

    A. Regulates gene expression.

B. Neuroprotective.

C. Regulates redox.

D. Essential for protein uncoupling and membrane permeability pores.

E. All the above are correct.

30. True or False – The positive effects of PQQ supplementation are enhanced when used with CoQ_{10}., particularly with regards to brain and nervous system function?