Chapter 12 Reading Guide

1. Describe the four components of blood.
2. List each of the nutrients mentioned in this chapter. For each:
    a. Is it a vitamin or a mineral?
    b. Is it water soluble or fat soluble?
    c. When applicable, name the different forms
    d. Their specific function with blood health, and any other functions discussed
    e. Symptoms of deficiency and toxicity, and the names of the def/tox syndromes, when mentioned
    f. How common deficiency is in the USA today, and why deficiencies occur here, when discussed
    g. Why toxicities occur
    h. Good, non-fortified food sources
    i. If, where, and how they are stored
    j. Only address specific storage and transport proteins as asked in the following questions

3. What are hemoglobin and myoglobin? Where is each found (what type of cells)? What is iron's role as part of each of those substance? * A note: the book states that iron picks up "… oxygen from the environment, binding it… then dropping off… at tissues." Just to clarify, "the environment" is the air in our lungs. That's where the O2 comes from ☺
4. Go back to chapter 7: why do we need O2 constantly?
5. What are the other roles of iron, besides O2 transport and storage?
6. Discuss several factors that affect iron bioavailability.
7. Describe absorption and transport of iron including the substances: ferritin, ferroportin and transferring (don't worry about the others).
8. How can iron absorption rate be adjusted by enterocytes? Be sure to use one of the terms from the previous question. This is not about outside factors (V-C, phytates, etc)… it's something enterocytes do.
9. Explain where and how iron is stored, and how that storage changes when iron levels increase.

10. Discuss how iron is lost via feces and blood.
11. Discuss how iron from red blood cells is recycled.
12. Sum up and bring together the absorption, circulation, storage, and recycling of iron. Be sure to incorporate in this explanation when and how absorption efficiency can be adjusted. Also be sure to mention specific proteins (ONLY those I asked you to name in previous questions; that is most, but not all, mentioned by the book). When you get to Zinc, come back to this question and talk about how Zinc interacts with iron absorption and circulation.
13. List the many factors that a)enhance and b)limit iron absorption.
14. What food sources provide heme irons? Non-heme? Which is better absorbed?
15. Why is too much circulating iron dangerous?
16. What is the most common cause of poisoning deaths in kids under 6 in the US?
17. Does cookware play any role in iron status? Explain.
18. What are some symptoms of early-stage iron deficiency? Of full-blown anemia?
19. Why is it potentially dangerous to self-diagnose iron deficiency because of tiredness, and begin a regimen of supplements without having blood tests?
20. In men, is iron-deficiency or iron-overload more common?
21. Why is the RDA for iron higher for females in reproductive years than it is for men?
22. What are some non-animal derived foods that are good sources of iron?
23. Describe several functions of zinc.
24. Compare/contrast metallothionein with mucosal ferritin.
25. Why can a low meat, high grain and legume diet put a vulnerable person at risk for zinc deficiency?
26. Why do vegetables vary in the amount of zinc they contain?
27. There has been some evidence to suggest that high-doses of zinc may help to reduce the length of colds. Is that evidence conclusive?
28. How common are copper deficiencies in the US?
29. What is the role of vitamin-K, related to blood?

30. Is V-K stored in the liver?
31. Why is adequate folate crucial for women of childbearing age?
32. How are folate, B12, B6, methionine and homocysteine related?
33. Is supplemental or food folate more bioavailable?
34. How well is folate stored? *note: some is actually stored in the skin
35. Discuss folate "toxicity."
36. How are folate and B12 deficiencies similar? Why are they similar?
37. Why does B12 deficiency have both anemic and neurologic symptoms?
38. Who makes B12? Why are non-animal foods not sources of it?
39. Describe the role of intrinsic factor. Where is it made?
40. Is B12 stored? Explain.
41. What are the "2 unique features" of B12? *note, B12 is pretty interesting for other reasons, too-
42. Mr. Wood is a vegan. Mr. Plastic is a processed foodie who eats very few whole plant foods. Both have megaloblastic (macrocytic) anemia. What deficiency is each likely to have (they are different)?
43. Discuss neural tube defects, vascular disease and anemias as they relate to the nutrients in this chapter. Be sure to name the anemias caused by the different nutrient deficiencies.
44. Discuss several non-specific immune defenses.
45. Describe inflammation. Mention its function, and recall why excess can be harmful.
46. What role does your immune system have in preventing and fighting cancer?
47. How do immune cells recognize foreign substances?
48. Why is a second exposure to a disease organism fought more effectively than the first exposure? How does this relate to vaccination?
49. Generally, what's the difference between Tcell and Bcell function?
50. Explain the roles of omega-6 and omega-3 fatty acids in inflammation. What effect doe this have on heart disease? Why might the ratio of o-6: o-3 intake be important?
51. Discuss nutritional status and immune function in general.

52. List several nutrients that are especially important to proper immune function.
53. Discuss potential advantages and disadvantages of herbal supplements.
54. What are probiotics? Prebiotics? How might they promote immune health?
55. Revisit phytochemicals. What are they, where do they come from, what's good about them?

-The following questions are summary questions for you to draw chapters 8-12 together, go back through these chapters and review the nutrients covered as you answer these:-
56. Which vitamins and minerals are especially important for vegetarians/vegans to be mindful of?
57. Which vitamins and minerals are likely to be deficient or out of whack in somebody who eats mostly processed, refined foods, meats, and very few fresh, whole plant foods?
58. Which vitamins are fat-soluble? Water-soluble? How does this generally relate to absorption, storage and elimination?
59. Why is variety of diet important?

Supplemental Lectures

I. **A couple extra things about zinc:**
Zinc is one mineral whose availability can vary considerably in soil (selenium and iodine are two other notable minerals like this); this variability is reflected in the plant tissue that grows in the soil. So, plant sources are a little less reliable than animal sources for this reason in addition to those laid out in your book.

Zinc is also important as part of an enzyme system that converts the retinoids. This role can lead a zinc deficiency to cause some symptoms of V-A deficiency, such as night blindness.

II. **Anemia-** Anemia is a set of SYMPTOMS associated with a decreased ability of the blood to carry oxygen, for some

reason. Anemia itself is not a disease. However, there are many types of anemias, based on why the blood is less able to deliver oxygen. Megaloblastic is caused by folate/B12 deficiency. Active folate is required for the proper maturation of red blood cells. Red blood cells are made in bone marrow. Young red blood cells are large, not properly shaped, and not packed with much hemoglobin. They cannot carry much oxygen. Normally, blood cells mature completely within the bone marrow, and will not be released to the blood until they are mature, small, properly shaped, stuffed with hemoglobin and able to carry oxygen. With a lack of folate, many red blood cells never mature, and are released into general circulation in the immature state.

III. **Omega-3 and Omega-6 Fatty Acids**

The text mentions these a little bit in a couple of different chapters, I'd like to expand upon the information.

As stated in the text, the O-6s are used to make pro-inflammatory compounds. The O-3s are used to make anti-inflammatory compounds. Both are vital to health, as you know.

The same enzyme systems are used to convert the O-6s to their compounds, as are used to convert the O-3s to theirs. Evidence suggests that the ratio of these two fatty acid classes is important, because if there are too many of one type, it can "hog" the enzymes and prevent adequate conversion of the other.

The US diet is typically too high in O-6s relative to O-3s. You already know good sources of both.

I will also mention that many researchers suspect that animal sources of O-3s (DHA and EPA) are more effective than plant sources (alpha-linolenic), because they need to undergo fewer conversions to become active. However,

don't skip the walnuts and flax thinking they are ineffective! They are! But eat some low-mercury, sustainably harvested fish sometimes, too ☺ And even splurge on an organic grass-fed steak occasionally (… though, while a better source of O-3s than grain fed, it still doesn't provide nearly as much as salmon).

And while I'm thinking about it, some farmed salmon are fed grain, which they are not designed to eat. They are designed to eat greens. And, like cows, when fed grain they produce much less O-3.

IV. Blood Components: Just a little clarification- the erythrocytes, leukocytes and platelets are considered the cellular portion of blood. Plasma is acellular. It is not just water; it contains all of the non-cellular solutes in the blood. Some examples: hormones, proteins, vitamins and minerals, glucose, LDLs, HDLs, fatty acids, etc!