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AVS 305
Exam #3
Wednesday, November 18, 1998

1. Draw the structure of urea. 4 pts

\[ \text{NH}_2 - \text{C} - \text{NH}_2 \]

2. The major dietary form of vitamin A available to grazing ruminants is \textit{\underline{Be}} \textit{ta-carotene} (chemical) which is converted to its active form \textit{\underline{r}} \textit{etinol} (chemical) in \textit{intestinal epithelial} (tissue). 6 pts

3. Briefly explain why previously well fed animals may take many months to exhibit deficiency symptoms when fed diets deficient in vitamin A. Name a symptom of vitamin A deficiency. 4 pts

Because vitamin A is a \textit{fat soluble vitamin} that is \textit{stored} either in the \textit{liver} or in \textit{adipose tissue} and they use it as \textit{necessary}, it is only \textit{after all storage is used up} that \textit{they will show a deficiency}.

\textit{Night blindness (xerophthalmia)}

4. (a) Graphically illustrate the general relation between protein intake and tissue protein deposition in growing pigs fed a high quality protein diet. 3 pts

(b) Show how this relation is altered if the diet is deficient in lysine, methionine and threonine. 3 pts

(c) Indicate on the illustration how feeding the 3 amino acid-deficient diet would affect the amount of protein needed to meet total protein requirement. 3 pts

\[ \text{Protein intake} \]

\[ \text{Tissue Protein Deposition} \]

\[ \text{\textit{A}} = \text{High Quality diet} \]

\[ \text{\textit{B}} \text{ deficient in lysine methionine and threonine} \]

\[ \text{\textit{C}} \text{ it would take more dietary protein to actually get to a plateau level} \]

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5. Would you expect the biological value of corn gluten meal to be higher, lower or similar to that of blood meal? Briefly explain your answer. 3 pts

Biological value of corn gluten meal would be lower than blood meal because the blood meal contains all or most essential amino acids (Nitrogen) since it came out of an animal that needed these amino acids to survive.

6. List three trace minerals. 6 pts

- Molybdenum
- Iron
- Selenium

7. Vitamin D plays a significant role in the absorption of calcium. Describe the activation of vitamin D as well as how it acts to improve calcium status. 5 pts

Vitamin D is activated by sunlight. It starts out as 7-dehydrocholesterol. It then (through sunlight) gets turned to provitamin Cholecalciferol then to 25-hydroxycholecalciferol and finally to 1α,25-dihydroxycholecalciferol in the kidney.

It has two main functions:
1. Reduces loss of calcium in the form of urinary excretion
2. Causes a greater production of calcium binding proteins in the intestine to increase absorption of calcium.

8. Why are dairy farmers advised to reduce the calcium content of rations fed to dry cows during the last couple of weeks of pregnancy? 3 pts

To mobilize parathyroid hormone and vitamin D thus reducing possibility of milk fever. It also causes an increase in mobilization of calcium from bone.

9. A sheep farm in a part of California known to have soil rich in the trace element molybdenum, has been heavily fertilized for several years with superphosphate (contains sulfates). The farmer has recently noticed decreased weight gains in his weaned lambs, and a lack of pigmentation in the wool of some black sheep. Also, his veterinarian has diagnosed anemia in some lambs. Give a likely explanation for this problem. 8 pts

A likely explanation is that the molybdenum which is in high amounts along with the sulfates (sulfur) he has been fertilizing with are taking any copper that the animal is absorbing and binding it up as copper thiomolybdates in the rumen thus causing a copper deficiency.
10. What is the average nitrogen content of proteins? 3 pts

10% 

11. Give an example of an amino acid for each of the following. 6 pts
- sulfur-containing: cysteine
- aromatic: phenylalanine
- heterocyclic: histidine

12. Define: essential or indispensable amino acids. 3 pts
They are amino acids that are necessary for life but cannot be made by the animal that needs them.

13. Briefly discuss why plasma urea nitrogen (PUN) concentration is often used as an index of efficiency of protein utilization in growing pigs, referring to nutritional causes of variation and the main tissue site of origin of PUN. 8 pts

The liver is the major tissue site where urea is made after oxidative deamination of the amino acids. It is then put into the blood where it becomes plasma urea nitrogen. PUN is a good measure of protein utilization because it tells whether there might be a deficiency or imbalance or whether too much protein is being fed. It tells whether the animal is using the protein or breaking it down.

14. (a) Graphically illustrate the general relation between protein intake and tissue protein deposition in growing pigs fed two levels of energy. 4 pts

(b) Indicate on the illustration how feeding level of energy would affect the amount of protein needed to meet total protein requirement. 3 pts

\[ E_1 = \text{more energy} \]
\[ E_2 = \text{less energy} \]

\[ \downarrow \text{You would need less protein with less energy because you couldn't make more tissue since you are limited by energy in tissue protein} \]
15. What are provitamins? Give an example. 4 pts
   Compounds that need to be changed chemically to become
   organically active vitamins

16. What tissue is particularly responsive to dietary iodine? 3 pts
   Thyroid tissue

17. What hormone from the thyroid gland increases when blood calcium concentrations are low? 3 pts
   Calcitonin

18. What is the closely interrelated general function of the B vitamins? 3 pts
   Oxidative decarboxylation
   Pyruvate to Acetyl CoA

19. Why can urea be fed to ruminants as a source of nitrogen? 3 pts
   Because microbes can make ureases which break down urea

20. What happens to the carbon skeletons of amino acids after deamination? 3 pts
   It can be used for energy (TCA), turned into ketones or turned into glucose

21. Ruminants do not generally require these kind of vitamins since they are made by rumen bacteria? 3 pts
   B vitamins

22. What is the chemical name for vitamin C? 3 pts
   Ascorbic Acid

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