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# Understanding Nutrition -

## Proteins

by Richard D. Tkachuck, Ph.D.

Recently while visiting a new friend's aviaries, I commented on the fine condition of his birds and asked what was fed as a diet. As he listed the various seed types, he added after several that this particular seed was high in protein. This appeared to be a significant consideration in the choice of food for his birds. These comments brought to mind that one has only to listen a short time to hear in the advertising that daily surrounds us that protein has "magical" properties and should be in high concentrations in everything from cereal to shampoo. Perhaps the greatest nutritional fear of most people is that the dietary intake of protein will be inadequate. The following material will attempt to create a better understanding of these remarkable compounds — the proteins. The information below will be in two parts. The first will concern itself with what proteins are and the second will discuss their function.

The first consideration that should be made is that proteins are not primary nutrients in the sense that they are used in an unaltered form taken directly from the diet. Proteins are the primary source of amino acids that an organism uses. In order to understand this better, let us study proteins at a more fundamental level.

The structure of a protein depends on how its basic units, the amino acids, are arranged. Imagine if you will a set of children's beads containing 20 different colors and shapes. Now thread these beads on a string and you will begin to get a picture of how a protein is arranged. The structure of a protein is more complicated than the picture of beads on a string in that for a particular protein there is a unique and precise sequence of amino acids. That is, for a particular protein, the number of amino acids is constant as well as the sequence. If even one amino acid is out of sequence, the chances are very very good that the protein will not be able to function for the organism. This tragically is exemplified in the case of sickle-cell anemia in humans. Here, because of a mutation in

the genetic material, an amino acid substitution is made in only one position of a protein of over a hundred amino acids in length. This substitution causes a change in the shape of the protein so that it cannot function normally.

The last sentence implies another particular feature of proteins. As we examine proteins in their natural state, we see that although the amino acids form a long string, the string is itself a very intricately folded and coiled structure so that a protein also has a unique 3-dimensional shape. In this 3-D shape, the protein is in its active state and performs the various functions mentioned later in this article.

If we were able to look at a protein in its 3-D shape we would see that the protein would seem to be pulsating. We would see in the various portions of the molecule segments moving back and forth within narrow limits. These vibrations are due to temperature. As the temperature is lowered, the rate of vibration slows. As the temperature increases, the rate increases. If the temperature increases over a certain limit specific for each protein, the protein molecule will come out of its folded state and become random in its arrangement. This process is called denaturation. The reader can best visualize this process by remembering the last fried egg eaten. The clear non-yolk part of the egg turned to white as a result of heating, or being denatured.

These observations on the effect of temperature have direct application to the health of a bird as we shall see below.

Another characteristic of proteins is that they can function in different ways. Several of these are now listed.

1. Structure. A large portion of the structural features of a bird are protein. Feathers, bones, ligaments are largely protein in composition. Beak and toe nails are almost pure protein. The skin, lense of the eye and a portion of every cell wall in the body of the bird is composed of protein.

2. Immunity. When the body of a bird is invaded by a bacterial or viral agent, special cells in the body synthesize a

specific protein called an antibody. These antibodies combine with the invading agent and inactivate it.

3. Enzymes. In the recent popular literature, much is attributed to enzymes. In reality, an enzyme functions as a compound (called a catalyst) which speeds up the chemical reactions in the body by a tremendous factor. Some enzymes increase the rate of chemical reactions by a factor of a million or more. One should be able to see that if the body temperature of a bird drops just a bit as is the case in many bird ailments, the rate of the metabolic reactions taking place in the bird slow down drastically. It is hoped that this will give some understanding as to the importance of keeping a sick bird warm.

Finally, several comments on proteins as a food source will now be taken up. From the previous article in this series, we found that amino acids of sufficient quantity and type must be available. Without this availability, the bird cannot synthesize enough of its own proteins. The bird obtains its own amino acids by breaking down the proteins found in its food. This is done in several steps. First the acid conditions in the stomach cause the food proteins to change shape or denature. In this denatured state, an enzyme in the stomach

called pepsin begins to snip the long chains of amino acids into small segments. When the food leaves the stomach it enters the small intestine where a new set of enzymes breaks down these shorter segments into individual amino acids. These amino acids are now absorbed by the intestine and enter the blood stream. Some proteins cannot be digested, but most found in foods can be.

A bird in a healthy state never absorbs a foreign protein into its body, only the amino acids from that protein. There is a belief which holds that an organism must absorb enzymes from its foods and incorporate these into its own body tissues or use them in its own digestion process. The best evidence we have available is that this is totally false. If a foreign protein is detected in the body of a bird, then the immune response is started and antibodies are made to counteract that protein. Continued absorption of these foreign proteins would result in a death-causing allergic response.

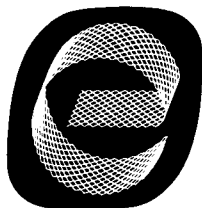
To some, this excursion into proteins, their physiology and chemistry may seem peripheral to bird nutrition. However in the next installment of this series we shall see how important they are as we discuss the vitamins.

## AFA Develops Bird Insurance Program for Members

For the past several months A.F.A., through its Insurance Committee, has been working on a program that will provide bird insurance for its members. This insurance will cover such risks as theft, catastrophic disease loss, fire, storm, etc.

Such insurance is generally unavailable to the bird owner/breeder, but will now be available to A.F.A. members at a group rate unobtainable anywhere else.

Final details of the program will be mailed to each A.F.A. member and will include such information as rates, coverages available, application procedures, and other pertinent data. Deadline for the finalization of the program is expected to be early January. A.F.A. hopes to have policies in effect by the first of April.



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