

Vitamin A Requirements of Adult Cockatiels and Orange-winged Amazon Parrots

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Vitamin A is required in animals for a variety of functions, the best known of which is vision. The area in which vitamin A deficiency is first expressed is a decrease in the ability of an animal to see at night. Vitamin A is, however, required for other purposes as well. It is a fundamental factor in cell differentiation. Epithelial tissue in a variety of areas is affected by vitamin A adequacy or deficiency. Sinusitis in birds is often associated with vitamin A deficiency. Vitamin A deficiency allows the epithelial tissue of the sinus to be degraded because cells differentiate improperly or incompletely. When this occurs, the cells are more likely to be invaded by pathogenic bacteria which will then lead to sinusitis. Treatment of sinusitis in birds without the use of vitamin A frequently results in a recurrence of the disorder, often with different bacteria being present. Vitamin A in birds, therefore, is a fundamental and basic concern in the maintenance of adult health and well being. Nutritional dogma has, for many years, suggested that vitamin A, being a fat soluble vitamin, needs to be given only occasionally in relatively large amounts since it is stored in the liver where it can be easily mobilized into the circulation for peripheral tissues to use as needed.

Our work with cockatiels brings this data into doubt. We fed cockatiels and Orange-winged Amazons diets which were devoid of vitamin A. Over the course of a few weeks, cockatiels began to lose weight and eventually three died. Orange-winged Amazons, on the other hand, continued to thrive and showed no deleterious effects when fed the same diet. Cockatiels which died were examined and several observations noted. The progression of the cockatiels from the time they received the vitamin A deficient diet until the experiment ended was the classic "going light" syndrome. That is, the cockatiels showed no outward signs of deficiency except that they became thin. After the birds had died, liver samples were taken from birds which had been fed adequate levels of vitamin A and birds which had died after receiving diets containing no vitamin A. When the vitamin A in these livers was measured, it was about the same in each of the birds. This leads us to the tentative conclusion that even though adequate amounts of vitamin A were available in livers of these birds, this vitamin A was not leaving the liver and being made available to peripheral tissues. Why this substantial store of vitamin A is not available to the animal to sustain itself is unknown.

Vitamin A in the liver is stored in specific cells which store this material as an ester. The ester can be transferred to a specific protein called retinol binding protein (RBP). This complex can then leave the liver and go to peripheral tissues to allow the vitamin A or retinol to be left in those tissues and used by the cells which receive it. One of the potential problems in the cockatiel is that it may lack adequate amounts of RBP to mobilize the vitamin A which is present in the liver. This would lead to an animal having adequate supplies of vitamin A in the liver but being unable to move it to where it is needed. One of the factors which affects the level of RBP in the circulation is the amount of vitamin A

available. How this vitamin A is recognized is not known. However, if circulating vitamin A levels are low because little vitamin A is coming into the system from the diet, then production of RBP might be reduced to conserve vitamin A stored in the liver. In other words, if little vitamin A is coming into the body via the intestine, then this signals the liver that it does not have a supply to back up what is in storage. This being the case, the liver then produces less RBP and allows less of the retinol or vitamin A which is stored in the liver to be removed. Under normal circumstances where there is an up and down supply of vitamin A in the diet, this would result in the animal being able to conserve its vitamin A to carry it through to a time when more vitamin A would be available. Under conditions in which birds are normally kept in captivity, however, this could result in a bird having a long term shortfall in the availability of vitamin A. This process of conserving vitamin A would then result in the bird maintaining a long term deficiency. What remains to be done in cockatiels and Amazon parrots is to measure the level of RBP in circulation under conditions of adequate dietary vitamin A levels and under conditions of low vitamin A levels. If it proves, as we suspect, that cockatiels substantially reduce their level of RBP when they are under conditions of limited vitamin A intake, but on the other hand Amazons maintain high levels of RBP under conditions of low vitamin A intake, then it may be possible to understand how a cockatiel with large stores of vitamin A would show the signs of deficiency.

One of our original goals when we began this research on vitamin A levels in psittacine birds was to determine whether there was a readily available assay which would tell us when a bird was eating an A deficient diet. We thought the circulating levels of vitamin A or liver levels of vitamin A would tell us whether a bird is in a deficient state. It appears that, in cockatiels, one of the keys to recognizing whether a bird was on a vitamin A deficient diet might be to measure the level of RBP in circulation. With the Amazon parrot, on the other hand, this may not be a useful tool. This finding is not altogether unexpected, because of the now recognized variation among species of birds in their responses to varying nutritional situations. ●



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