**Nutritional and Metabolic Diseases of Cage Birds**

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Though there is yet much to be learned about proper feeding of the hundreds of species of birds maintained and bred by the aviculturist, application of current knowledge could enhance the success of breeding programs. I believe that inadequate nutrition is one of the major factors inhibiting avian reproduction. Aviculturists can learn to recognize developing problems, and more importantly, act to prevent nutritional diseases. I shall describe a few nutritional and metabolic diseases that can be avoided.

**METABOLIC BONE DISEASE**

The metabolic bone disease complex is the winner in any contest of nutritional diseases most likely to interfere with avian propagation. "Metabolic bone disease" (MBD) is a term denoting a group of diseases, usually caused by inadequate dietary and husbandry management, and characterized by metabolic defects affecting the structure and function of bones. MBD develops as a result of prolonged ingestion of a diet deficient in calcium and/or vitamin D; or a diet with an improper ratio of calcium to phosphorus. Many names have been given to the syndrome, including osteomalacia, osteoporosis, rickets, nutritional secondary hyperparathyroidism, cage layer paralysis, and fibrous osteodystrophy.

**Clinical Signs of MBD**

All birds are potentially susceptible to MBD, but certain groups are more likely to be fed inadequate diets. These groups include the carnivores, fruit eaters, and seed eaters, especially those consuming seeds with high oil content. Orphan birds are frequently affected.

In juvenile, growing birds, MBD is manifested as rickets, and characterized by stunted growth, bowing of the legs, swollen joints, spontaneous fractures, inability to perch and poor plumage development. Raptors fed an all meat diet may develop rickets in as short a period of time as 10-14 days.

Mature birds develop osteomalacia, or demineralization of bone. The clinical signs are usually more subtle and develop at a slower rate in adults as compared with immature birds. Nonetheless, the effects are severe.

Spontaneous fractures occur as a result of usually inconsequential trauma. Abnormal molts are common as molting imposes a drain on calcium resources. Egg production may fail or soft shelled eggs are laid.

Other clinical signs include drowsiness, feather picking, regurgitation, excessive drinking, and loose stool. The loose stool may be caused by excess water intake, stimulated by a need for increased urine flow to remove excess phosphate.

Birds are also prone to hypocalcemic tetany. Affected birds appear to be weak and drowsy. They may sway back and forth slightly on a perch until suddenly they fall either forward or backward. In some birds, the premonitory sign is wing fluttering. Starling the bird by opening a cage, or other activity, may precipitate a seizure. Usually in less than a minute the bird recovers from the seizure, but lies exhausted on the cage floor. Intervals between seizures may be minutes, hours, or days. A prolonged seizure may lead to death by preventing breathing.

**Metabolic processes**

All animals require both calcium and phosphorus. Meeting the requirements of birds is especially critical because of the horrendous drain on calcium resources to form the egg shell. Failure to produce a normal egg obviously leads to reproductive failure.

The bird draws upon dietary calcium and calcium in a special type of bone called medullary bone to provide the calcium to form the shell. If dietary calcium is lacking, more will be drawn from the bone until the bone becomes soft and nonfunctional. Ultimately, egg laying ceases. In the immature bird, a similar deficiency of calcium prevents proper mineralization of growing bones (riquets).

The amount of calcium that can be absorbed is dependent upon the absolute amount of calcium in the diet, the presence of vitamin D and the ratio of calcium and phosphorus in the diet. Birds acquire vitamin D3 from the action of ultraviolet light on the skin of the feet, shanks and bare face. Ultraviolet rays can not pass through window glass, so glassed skylights or windows prevent the production of skin.
vitamin D. Certain types of plexiglas do allow passage of U.V. light.

Too much phosphorus in the diet, common in both seed eaters and carnivores, fed nothing but meat, tends to tie up the available calcium. A normal calcium-phosphorus ratio, (Ca/P), is 2:1. A ratio of 1:10 is commonly seen in seed-eater diets such as those to many of the parrots and 1:20 in all-meat diets frequently fed to raptors.

For example, a 360-gm parrot could consume approximately 10% of its body weight or 36 gm of sunflower seeds daily. The sunflower seeds contain 0.17% calcium, which supplies 0.06 gm of calcium to the bird. If the bird is maintained on this unsupplemented diet, no medullary bone will be formed, it is highly likely that overt MBD will ensue. It is highly unlikely that ovulation can occur, but if ovulation does take place, 0.75 gm of calcium will be expended to supply the shell for one egg. The 0.06 gm supplied in the diet falls far short of the requirement. Furthermore, the high oil content of sunflower seeds could further diminish the amount of absorbable calcium because of the formation of insoluble calcium soaps in the intestine. The results of a total diet of sunflower seeds may be no eggs, or soft shelled eggs, and MBD.

It is not difficult to diagnose overt metabolic disease using a combination of diet evaluation, clinical signs and x-rays. Subclinical effects are hard to detect, but can be devastating to propagation attempts. It behooves the aviculturist to make certain the diet is balanced for calcium and that vitamin D, is supplied.

A most important suggestion is to start chicks eating a wide variety of foods. Birds that become habituated to single food items are generally doomed to malnutrition, as was a hyacinthine macaw that ate only coconut meat.

Look for a moment at the composition of a standard parakeet mix, Table 1. The calcium content and the Ca/P ratio are poor. Unless a calcium supplement is added, a bird fed this diet is liable to develop metabolic bone disease. Some calcium sources are listed in Table 2. Notice that some forms of calcium phosphate contain more phosphorus than calcium. Feeding such a supplement would be detrimental.

A common misconception is that a bird will balance its own diet if offered a variety of food items. NOT NECESSARILY SO! A wild population selects a variety of food items and balances the diet, but in captivity, a bird may lack the benefit of parents of the social structure of the flock to teach it how to make the proper selections. The individual may thus become habituated to inadequate food items. A
Hypovitaminosis A

Hypovitaminosis A is also known as vitamin A deficiency and nutritional roup. Nyctalopia (night blindness) and xerophthalmia (dry cornea) are frequently associated with vitamin A deficiency.

Vitamin A is necessary for the proper formation and continued function of, epithelial surfaces, particularly in the respiratory tract, mouth, upper gastrointestinal tract, eyes, sinuses, and feet. In a bird suffering from vitamin A deficiency, the epithelial linings of the various organs lose their integrity, and the epithelial surfaces serve as a barrier against the invasion of the body by numerous bacteria and microorganisms. The bird is continually in danger of contacting infectious diseases.

A bird is capable of storing vitamin A in the liver. A deficiency usually means a long term food depletion. Raptors and large psittacines are most likely to be affected, but many other species may be affected when gross errors are made in the diet.

Vitamin A deficiency may appear in the respiratory tract of one species of bird, and as a digestive tract disorder in another species. The most difficult systems to evaluate are reproductive and urinary tracts.

**Signs**

In parrots and other large psittacine birds, the disease is characterized by an increased incidence of upper respiratory infections and sinusitis. Also seen are lesions appearing to be abscesses in the roof of the mouth, along the tongue or in the opening to the trachea. These have heretofore been thought to all be infectious, but recent findings indicate that they are part of the vitamin A deficiency picture.

In raptors an affected bird will begin to
refuse food. Weight loss follows, and the bird becomes sluggish and weak. Depending on the exact location of the lesion, the bird may exhibit swollen sinuses, conjunctivitis, changes in vocalization, or corns on the feet. Secondary respiratory infections may occur. Small to large, white to pinkish plaques may appear in the mouth, but they are most often located in the esophagus and proventriculus, where they are not seen without the use of special instruments.

Of even greater importance to the serious aviculturist is the fact that epithelial changes as a result of vitamin A deficiency may also affect the reproductive tract. A deficiency so mild that the general signs described are absent may produce subtle changes in the shell-forming gland of the female reproductive tract. Decreased egg production, poor hatchability and increased chick mortality are signs of Hypovitaminosis A in chickens, and it is likely that cage birds are equally affected.

A basic treatment for vitamin A deficiency is supplementation of the diet with vitamin A or carotenes. Excellent sources of vitamin A for raptors include commercial raptor diets, fresh liver, and halibut liver oil. Green and yellow vegetables contain carotenes that are readily converted to vitamin A by birds. Other sources include alfalfa meal, red beets and liver meal.

It is possible to feed too much vitamin A, but only if concentrated sources are indiscriminately used. Budgerigar breeders may be aware of the possible implication of too much vitamin A in the increased incidence of French moul.

STARVATION

Starvation can be caused by a total lack of food or by a deficiency of energy or protein in the diet. Most people are calorie-conscious these days and can relate to the idea that a bird consumes either too many or too few calories.

Experienced aviculturists know approximately how much food a given species should eat, and usually provide a little extra for good measure. There are certain situations that preclude sufficient ingestion of food. An overview of the problems of starvation might help prevent problems. A bird suffering from either a protein or energy deficiency loses weight as evidence by decreased breast muscle. Weakness is apparent if the bird attempts to fly. Ultimately, the bird is unable to perch. The bird will be unable to keep warm if in a cool environment, so shivering and feather fluffing are common. In extreme cases the bird may experience a seizure caused by insufficient glucose in the blood. These are apparent signs easily recognized by anyone. It is much more difficult to recognize the subclinical effects on birds consuming a marginal to deficient diet over a long period of time.

Protein deficiency causes retarded growth; healing of wounds is inhibited, bone development is delayed, basic enzymatic pathways are disrupted, and reproduction is impaired.

Fruit and nectar-eaters are most subject to protein depletion, as fruit is notoriously low in protein. In the wild, these birds must also consume insects or fruit and leaf buds which are good sources of protein. The aviculturist must likewise supply protein.

A diagnosis of either protein or energy deficiency can be made on the basis of signs, but it is of prime importance to assess the actual consumption of food. To assess a diet, the questions listed in Table 3 should be answered.

Good sources of protein include meat and meat by-products, cheese, eggs, soybean meal, alfalfa meal, insects, meal worms and oil seeds such as sunflower, safflower, and rape. The protein content of some bird feeds is listed in Table 4.

Energy is another prime requirement. The smaller the bird, the greater the amount of food consumed in proportion to the body weight. Table 5. The hummingbird is in a class by itself, requiring the daily consumption of 150% of its body weight in the form of syrup. A 50 gm budgerigar requires 16 calories/day. A 1 kg macaw is 20 times the size of a 50 gm budgerigar, yet the macaw requires only 9 times the number of calories needed by the budgie. Other comparisons are illustrated in Table 6.

Some health related conditions other than inadequate food intake may cause the bird to be emaciated. It is not simple to arrive at a definitive diagnosis, but it is essential to assure provision of necessary food items in adequate quantities.

HYPOTHIAMINOIS

Hypothiaminosis is also called thiamine deficiency and Beriberi. Mammals and birds require a dietary source of thiamine or vitamin B1. This vitamin is essential for normal functioning of the brain, nerves and other vital metabolic processes.

The two groups of captive birds that are usually affected by thiamine deficiency are raptors and fish eating birds. This results from one of two ways. (1) An absolute deficiency of the vitamin may occur when a total diet of straight muscle meat or eviscerated whole animals are fed (wild raptos get thiamine from grains in the intestines of prey). Day-old chicks lack grain in the intestine and are also deficient.
(2) Dietary thiamine may be destroyed by thiamine destroying enzymes in foods such as fish that have been improperly stored. Most fresh natural bird foods contain adequate thiamine. Seeds, in particular, are excellent sources for birds.

**Signs:**

Appetite diminishes early in the course of the disease. There may be some muscle quivering. The wings may flap in an uncoordinated manner and the bird may be unable to perch.

The most characteristic sign of thiamine deficiency is the pulling of the head back over the body or to one side. This is called opisthotonos. This is not the only disease in which opisthotonos occurs, but the dietary history of a bird exhibiting opisthotonos should be carefully examined. Thiamine should automatically be given to the bird as therapy. The condition should be corrected in less than 2 weeks if thiamine deficiency is the cause, although a few birds will not recover completely.

Thiamine deficiency in raptors can be prevented by feeding a commercial diet or intact whole animals. Quick freeze and store at 20-40 degrees F. rodents and fish that are to be fed.

**THYROID DISORDERS**

Budgerigars are uniquely susceptible to thyroid enlargement. Names for the disease include thyroid dysplasia, hypothyroidism, goiter and thyroid hyperplasia. A deficiency of iodine in the diet is the prime cause of the disorder in the budgie. Theoretically the ingestion of chemical goitrogens could be involved, but this is questionable in birds.

**Signs:**

An enlarged thyroid exerts pressure on vital structures. in the budgerigar, the thyroid is located within the chest wall, where swelling puts pressure on the trachea, esophagus, and major blood vessels. Clinical signs indicate abnormal function of those organs and include difficulty in breathing, or a click or squeak when breathing, difficulty in swallowing, a dilated crop, spitting up seeds and weight loss.

These are the overt manifestations of the syndrome. The thyroid gland produces hormones that have profound effects on growth, feathering and general metabolic rate. The effects of thyroid hormone deficiency are not always recognized clinically. Some clinicians, myself included, feel that thyroid deficiency may well be partially responsible for feathering problems of birds. Hormonal changes in metabolism may affect a bird’s reproductive capacity as well. Birds raised in an iodine deficient area, or more importantly, fed seeds from an iodine deficient area, should be given iodine periodically, which can be added to water or to vitamin supplements.

**Summary:**

1. Nutritional disease can kill or devitalize birds making them susceptible to infectious and parasitic diseases. Subclinical effects may cause reproductive failure.

2. Nutritional diseases can be prevented by providing a balanced diet and ensuring that the bird eats it.

**A Selected Bibliography for Nutritional Diseases of Birds**


### Table 1
**COMPOSITION OF PARAKEET FEED**

<table>
<thead>
<tr>
<th>Protein</th>
<th>Calcium</th>
<th>Phosphorus</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Oat groats</td>
<td>16.7</td>
<td>.07</td>
</tr>
<tr>
<td>Canary grass seed</td>
<td>13.7</td>
<td>.06</td>
</tr>
<tr>
<td>Millet seed</td>
<td>12.2</td>
<td>.05</td>
</tr>
<tr>
<td>Fruit (banana)</td>
<td>1.2</td>
<td>.008</td>
</tr>
<tr>
<td>Greens (spinach)</td>
<td>3.2</td>
<td>.093</td>
</tr>
<tr>
<td>Commercial diet</td>
<td>20.0</td>
<td>2.30</td>
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</table>

### Table 2
**CALCIUM SUPPLEMENTS**

<table>
<thead>
<tr>
<th></th>
<th>%Ca</th>
<th>%P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium carbonate</td>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>Calcium gluconate</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Calcium lactate</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>Monocalcium phosphate</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>Dicalcium phosphate</td>
<td>29</td>
<td>23</td>
</tr>
<tr>
<td>Bone meal</td>
<td>32</td>
<td>15</td>
</tr>
<tr>
<td>Neo-Cal glucon</td>
<td>23 mg/ml</td>
<td>0</td>
</tr>
</tbody>
</table>

### Table 3
**DIET ASSESSMENT**

1. What is being fed?
2. What is being eaten?
3. How much is being eaten?
4. Are there unique nutrient requirements?
5. Is there a special physiological state?

### Table 4
**COMPARISON OF PROTEIN CONTENTS OF AVIAN FEEDS**

<table>
<thead>
<tr>
<th>Food Item</th>
<th>% Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millet seed</td>
<td>20.0</td>
</tr>
<tr>
<td>Sunflower seeds (without hulls)</td>
<td>26.0</td>
</tr>
<tr>
<td>Lettuce</td>
<td>1.2</td>
</tr>
<tr>
<td>Alfalfa hay</td>
<td>15.0</td>
</tr>
<tr>
<td>Apple</td>
<td>0.3</td>
</tr>
<tr>
<td>Banana</td>
<td>1.2</td>
</tr>
<tr>
<td>Orange</td>
<td>0.9</td>
</tr>
<tr>
<td>Cheese</td>
<td>25.0</td>
</tr>
<tr>
<td>Egg</td>
<td>12.8</td>
</tr>
<tr>
<td>Lean beef</td>
<td>22.0</td>
</tr>
<tr>
<td>Meal worms</td>
<td>20.0</td>
</tr>
</tbody>
</table>

### Table 5
**BIRDS—FOOD CONSUMPTION**

<table>
<thead>
<tr>
<th>Weight</th>
<th>% body weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hummingbird</td>
<td>2.5-10 gm</td>
</tr>
<tr>
<td>Canary</td>
<td>12-29 gm</td>
</tr>
<tr>
<td>Budgerigar</td>
<td>30-60 gm</td>
</tr>
<tr>
<td>Pigeon</td>
<td>260-350 gm</td>
</tr>
<tr>
<td>Mynah</td>
<td>180-240 gm</td>
</tr>
<tr>
<td>African grey parrot</td>
<td>300-380 gm</td>
</tr>
<tr>
<td>Ostrich</td>
<td>120 kg</td>
</tr>
</tbody>
</table>

### Table 6
**CALORIES REQUIRED**

<table>
<thead>
<tr>
<th>Weight grams</th>
<th>Calories Required/day</th>
<th>Calories required if needs based on weight only</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 1.6 oz.</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>100 3 oz.</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>500 1 lb.</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>1000 2 lb.</td>
<td>140</td>
<td></td>
</tr>
</tbody>
</table>

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