

# An Overview of Pet Bird Nutrition

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The clinically ill bird is often presented to the avian veterinarian with a variety of signs that are often vague. They include lethargy, weight loss, poor feathering, and loss of condition. The avian practitioner at this time begins to take a history and do a physical examination. In reaching a good definitive diagnosis, one aspect of avian disease is often overlooked. Improper nutrition is one of the most prevalent problems in avian medicine today. The practitioner must realize that a particular disease may be the result of a nutritional deficiency. Proteins, fats, carbohydrates, vitamins, and minerals are essential elements in the diet of a healthy bird. When a deficiency occurs, the body's ability to resist disease is damaged. Nutritional deficiencies are also a sequelae to systemic diseases. When a bird is ill, its feed intake declines, therefore, its requirement for basic nutrients is not satisfied. Proper nutrition of the ill bird is essential for prompt recovery from other systemic illnesses. Hence, primary systemic disease and nutritional deficiency often occur simultaneously.

Nutritional deficiencies are almost always multiple in origin. Malnutrition can become evident during periods of high demand and stress. Birds are more prone to deficiencies during reproduction, molting, and disease. Therefore, the breeding bird and the young bird are the most common victims of an improperly calculated diet. Stress related conditions such as handling, quarantine, temperature change, and treatments can increase a bird's requirements and interfere with absorption of nutrients. An adequate diet prior to stress becomes a diet that is later deficient.

The practitioner must also evaluate a bird's feed intake. Some birds will eat only a small variety of foods and new foods are often rejected. The seed

eating budgerigar that is not supplemented with various feedstuffs is a good example of a bird whose limited intake of seed predisposes to nutritional imbalances. The aviculturist who houses a considerable number of birds in one cage may not be aware of the ill bird not consuming the proper ingredients for a balanced diet. Each ingredient in the diet must be evaluated for its protein, fat, vitamin, and mineral content. Certain factors and components of the diet may also interact resulting in a nutritional deficiency. For example, avidin contained in raw egg whites binds to dietary biotin yielding the nutrient unavailable to the bird.<sup>1</sup> The majority of nutritional deficiencies are chronic in nature while many other deficiencies show extremely subtle clinical signs. The owner of the bird may not realize a deficiency is present until the bird begins to show clinical signs several months or years later. A quote from the Duke of Bedford many years ago sums up the chronicity of nutritional deficiencies in this manner, "Madam, your parrot has not lived a long time, it's merely taking a long time to die".<sup>1</sup>

A pet bird that is presented to a veterinary hospital for malnutrition will have a variety of clinical signs involving the major organ systems of the body. Multiple nutrient deficiencies will present with a bird that is depressed, unthrifty, and lethargic in addition to clinical signs pertaining to each nutrient deficiency. The following text will outline each organ system and the pertinent clinical signs seen in the more common nutrient deficiencies of pet birds.

## The Integument

Evaluation of the skin and feathering reveals a bird who lacks luster and is ruffled in appearance. The loose appearance of the feathering is due to breakdown of the interlocking barbules that hold the feathers tightly together. A deficiency in pro-

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tein, especially the amino acid, arginine, causes poor feathering in pet birds.<sup>2</sup> The practitioner may also see transverse stress lines along feathers, incomplete molts, chronic heavy pinfeathering, and easily broken wing and tail feathers.<sup>2</sup> A lysine deficiency will present as a change in pigmentation of the normal blue-green feathers to a yellow-black color.<sup>2,3</sup> Lysine, possibly the most important amino acid affecting protein nutrition, appears to be deficient in cereal and all seed diets.<sup>4</sup> Interruption of white in feather coloration indicates a folic acid deficiency. Brittle, easily broken feathers and scaly skin can be a sequelae to calcium, zinc, selenium, manganese, magnesium and biotin deficiencies<sup>2</sup> while niacin and pantothenic acid deficiencies will cause poor development of the feathers in young chicks.<sup>3</sup>

The epithelial surfaces of the skin, beak, legs, and nails often appear dry and flaky due to nutritional deficiencies. The beak and nails of psittacine birds can become extremely long and brittle yielding a misshapen, unhealthy appearance. The beak appears layered because of an inability to slough the keratinized tissue normally. The normal scaly pattern of the legs and feet appears thickened and dull. The plantar surfaces of the feet are smooth and worn due to inactivity of the bird. The above skin lesions can be due to a deficiency in protein, vitamin A, pantothenic acid and biotin<sup>3</sup> but lack of vitamin A and protein are probably the most common encountered in avian medicine.

#### **Mucous Membranes of Oral Cavity and Nares**

A good examination of the mouth and mucous membranes is essential for the diagnosis of vitamin A deficiency. Often the mucous membranes are inflamed, crusty, and present with small raised white plaques. Vitamin A functions in the integrity and maintenance of normal epithelial tissue. The white plaques are sequelae to abnormal keratinization and plugged mucous glands of the pharynx and upper gastrointestinal system.<sup>5</sup> Early signs of vitamin A deficiency appear clinically as an infectious sinusitis. Chronic deficiencies begin to involve the eye. There may be enormous discharge and plaque formation that eventually pastes the eye shut<sup>5</sup> and obstructs the opening to the nares.<sup>5</sup> Differential diagnoses include candidiasis, trichomoniasis<sup>6</sup> and Avian Pox virus.<sup>5</sup>

#### **Growth and Skeletal Abnormalities**

Slow growth and skeletal abnormalities are a common problem in the young psittacine bird.

Usually, a failure to grow is due to a deficiency of several nutrients such as protein, fat, vitamin A, vitamin D, vitamin B<sub>12</sub>, and choline.<sup>3</sup> Proteins are critical for normal growth in young chicks. The young bird especially needs glycine and proline in the diet for optimum growth<sup>5</sup> while adult birds are more likely to be deficient in methionine and lysine.<sup>5</sup> The deficiency of these amino acids in adult birds will result in loss of muscle mass and body weight.<sup>5</sup>

Fats are needed in the diet of pet birds for growth and for a concentrated source of energy. Two unsaturated fatty acids are required, linoleic and arachidonic acids.<sup>5</sup> These fatty acids are needed for cell growth and as precursors of prostaglandins. A minimal amount of fat is also required to promote absorption of the essential fat soluble vitamins. Other sequelae of fat deficiency include fatty liver syndrome, decreased resistance to respiratory infections and loss of skin condition.<sup>6</sup> Unsaturated fatty acids may be destroyed by oxidation to form aldehydes and subsequently react with free amino acid in protein thus decreasing amino acid availability.<sup>5</sup> Hence, both fat and protein metabolism play an important role in the growth of the young bird.

Skeletal abnormalities in the immature bird are usually caused by mineral deficiencies. Rickets can be caused by a deficiency of calcium, phosphorus or vitamin D<sub>3</sub>. Lack of calcium, phosphorus, or vitamin D<sub>3</sub> results in stunting, angular defects of the long bones, pathological fractures and subsequent abnormal healing of fractures.<sup>6</sup> In adult birds, osteomalacia is relatively uncommon but presents with similar clinical signs as rickets.<sup>6</sup> A proper calcium-phosphorus ratio is important. Laying hens require higher levels of calcium. Seed diets are notoriously deficient in calcium.<sup>6</sup>

Vitamin D<sub>3</sub> is required for proper absorption and utilization of calcium and phosphorus. It acts by stimulating absorption of calcium from the gastrointestinal tract. Vitamin D<sub>3</sub> is the form utilized by birds and is produced by the action of ultraviolet light from the sun on the skin.<sup>5</sup> Vitamin D<sub>3</sub> can be deficient in birds reared in confinement and its deficiency in mature birds produces decreased egg production, paralysis, and softening of the bones, beak, and nails.<sup>6</sup> It usually takes two to three months before a deficiency of vitamin D<sub>3</sub> is clinical in the mature bird but young birds show signs in several days.<sup>5</sup>

#### **Reproduction**

Breeding hens have increased requirements for

protein, lipids, vitamin A, vitamin B complex, vitamin D<sub>3</sub> and trace minerals. Early death of hatchlings is not uncommon when hens are malnourished.<sup>6</sup> Subsequent clutches of budgerigars have the tendency to become smaller and weaker if the hen is deficient in nutrients.<sup>6</sup> Unsupplemented budgerigars will ultimately cease to reproduce until the appropriate deficiencies are alleviated.<sup>6</sup> Aviculturists rest pairs of breeding birds after two clutches to insure healthier nestlings. Year-round production is possible if the adult's diet is supplemented with protein, vitamins, and minerals.<sup>6</sup>

Soft-shelled eggs and poor hatchability can be caused by a deficiency in many nutrients such as vitamin E, riboflavin, pantothenic acid, biotin, fat, iodine, and vitamin B<sub>12</sub>.<sup>3</sup> Large psittacine birds such as the macaw need calcium supplementation during laying to prevent this problem.

### Vascular System

A deficiency in vitamin K can cause bleeding disorders due to the decreased production of prothrombin needed for normal clotting. Vitamin K deficiency is seen more commonly in conures than in any other species of psittacines.<sup>5</sup> Because vitamin K is synthesized by bacteria in the intestine, deficiencies can occur if the bird is treated with excessive amounts of antibiotics. An exclusive sunflower seed diet may predispose a bird to vitamin K deficiency.<sup>5</sup> Vitamin K deficiency clinically presents with hemorrhaging in the skin and musculature. Clotting times usually are prolonged with vitamin K deficiency.

### Central and Peripheral Nervous System

Central and peripheral nervous system disorders due to nutritional deficiency are rare in pet birds. Psittacines will present with leg weakness, paralysis, muscle twitching, dizziness, and convulsions usually brought on by a collective deficiency in the water-soluble vitamins.<sup>3</sup> A chronic deficiency in thiamine or vitamin B<sub>1</sub> may produce a bird that "stargazes" due to paralysis of the muscles of the neck.<sup>5</sup> Vitamin E deficiency is rare in the adult bird but the young bird may present with nervous signs due to brain damage and edema.<sup>5</sup> Central nervous system disorders caused by vitamin E deficiency include sudden prostration, incoordination,<sup>3</sup> encephalomalacia, muscular dystrophy and impaired reproduction.<sup>7</sup> Vitamin E deficiency is usually caused by a diet consisting of a high percentage of unsaturated fat or rancidity of the

feed.<sup>7</sup> Riboflavin deficiency produces curled toe paralysis in poultry, but this is seen infrequently in pet birds.<sup>7</sup>

### Diagnosis

Diagnosis of nutritional deficiency is based on history, physical findings, and clinical signs. A good history of the diet, the environment, and the clinical signs are essential to evaluate any nutritional deficiency. Each ingredient in the diet should be evaluated for its protein, vitamin and mineral content. Radiology, gram stains and clinical pathology<sup>6</sup> facilitate diagnosis. Radiographs will reveal changes in bone density and secondary hepatomegaly associated with calcium, vitamin A, phosphorus, vitamin D and other deficiencies.<sup>6</sup> Dropping or choanal swabs are prepared on a microscope slide and stained using a quick, inexpensive stain such as Diff Quick. The stained slides reflect the quantitative and qualitative population of bacteria present in the gastrointestinal tract and pharynx. During incorrect nutrient intake, the normal flora of the intestinal tract is altered resulting in a shift of the bacterial population. A chronically malnourished bird may show low numbers of bacteria with an abnormal increase in gram negative bacteria and yeast. However, a low bacterial count is not pathognomonic for malnutrition because overtreatment with antibiotics and concurrent viral infections will produce similar results.<sup>6</sup> Lack of response to treatment of other diseases may also indicate a problem relating to the bird's diet. Clinical pathology values are nonspecific for the diagnosis of nutritional deficiencies. Elevated liver enzymes such as SGPT and SGOT may indicate a vitamin A deficiency.<sup>6</sup> Increased SAP levels can occur with deficiencies of calcium.<sup>6</sup>

### Treatment

Treatment for all nutritional deficiencies is to create a balanced and palatable diet for the bird. Since there are no requirement standards for the various nutrients for pet birds, most of the information is derived from what we know exists in poultry medicine today. To begin creating a balanced diet for pet birds, the aviculturist must consider the species of bird and the feedstuffs available. There are many different species of parakeets from different parts of the world which feed on entirely different kinds of seed, greens, fruits, and vegetables. A diet which is adequate for the budgerigar is not adequate for an exotic parakeet from South America. Hence, there is considerable

variation of nutrient requirements and suitability of diet within a particular genus and species of birds.

The type of seed varies in its content of protein, fats, carbohydrates and minerals.<sup>1</sup> A diet with only one seed type may not provide the daily nutrient requirements for a healthy bird. A variety of seeds is desirable for both increased palatability and increased nutrient content. The quality of the seeds in the mixture is probably the most important aspect of the avian diet.<sup>1</sup> Cheaper seeds are lacking in the essential nutrients, especially protein. A seed that can no longer germinate is deficient in many nutrients. Sprouted seeds are higher in protein and vitamin content.<sup>8</sup> They are especially valuable in the diet of breeding birds who need an increased intake of protein.

The psittacine diet usually begins with a mixture of millets, canary seed, wheat, and oats. Larger psittacines will be able to consume larger feedstuffs such as whole sunflower seeds, peanuts, milo, and corn. Several well-formulated diets for psittacines are included at the end of this text.<sup>5,14,17</sup>

The fat soluble vitamins can be supplied through a variety of feedstuffs. Vitamin A can be added to the diet by cod liver oil at one teaspoon per pound of feed.<sup>8</sup> Care must be taken to prevent rancidity of the seed mixture if cod liver oil is to be used.<sup>3,16</sup> Green leafy vegetables such as kale, dandelion leaves, parsley, and spinach contain the largest amount of vitamin A. The richest sources of vitamin E are found in the vegetable oils such as corn, cottonseed, soybean, and wheat-germ.<sup>3</sup> Vitamin E is also found in unmilled cereal and eggs. It is not practical to add vitamin E through vegetable oils in the diet because the oil on the feed eventually coats the bird's feathers through preening and impairs flight. Vitamin D<sub>3</sub> needs to be supplemented if birds are raised in confinement. Eggs and milk products contain vitamin D<sub>3</sub>.<sup>3</sup> The major source of vitamin K is phyloquinone found in the green leafy vegetables such as broccoli, lettuce, turnip greens, and spinach.<sup>5</sup>

Vitamin-mineral supplementation is a good practice for both the individual bird and flock. They can be supplemented either by mixing a good product in the feed, or in the bird's water source. Mixing in the feed is less desirable since birds tend to sample their feed and may not receive their entire supplement. Adding vitamins and minerals to the water is by far the best method. The aviculturist, however, must observe the bird's intake of water. Color and taste change will

decrease a bird's intake and predispose to dehydration. Supplemented water must be changed daily. Other good mineral sources include cuttlebone, oyster shells, chicken bones, egg shells, milk, and mineral blocks.<sup>3</sup> Commercial mineral mixes should be used with caution. Most natural foods contain some amount of minerals. Oversupplementation with one particular mineral can be detrimental to the health of the bird. When using mineral supplements, the rate of supplementation should be calculated for each mineral.<sup>9</sup>

The new pelleted feeds for psittacines offer a good alternative to seed containing diets. They contain all the necessary nutrients needed for pet birds. One problem that has plagued the pelleted diet is its acceptability by the bird. Some birds will not change. To wean birds onto a pelleted diet, several methods have been used. A gradual switch is important. For the first week, a combination of four parts seed to one part pellets is advisable. Then slowly decrease the amount of seed while increasing the amount of pellets.<sup>10</sup> The pellets can also be placed in hot water and offered to the bird as a semi-solid mash.<sup>10</sup> Lafeber suggests starting a bird on a 10 percent pelleted diet and increasing the percentage regularly. A bird should gradually accept and begin eating the pellets in 4-12 weeks.<sup>11</sup> Using larger pellets on the larger psittacines like the macaw encourages the parrot to pick up the pellet and begin eating. After the initial change of diet, the pellet can be reduced in size to eliminate waste.<sup>11</sup> Covering the pellets with familiar foods such as peanut butter, corn, or fruit also may entice the finicky bird to eat the new diet.<sup>11</sup> Repeated exposures to the pelleted diet produces birds that eventually convert and begin eating the new diet.<sup>12</sup>

### Conclusion

Nutrition in pet birds is a complex science that offers many difficult problems to aviculturists throughout the world. More research into the area of nutrition for the pet bird is needed. Poultry nutrition is well understood, but we cannot assume the nutrient requirements are identical. Avian veterinarians must be aware of the nutritional diseases that are common to psittacine birds. Poor nutrition of pet birds is a common occurrence and education of the aviculturist is important.

**Essential Amino Acids Required by the Chicken**

Arginine  
Lysine  
Histidine  
Leucine  
Isoleucine  
Valine  
Methionine  
Threonine  
Tryptophan  
Phenylalanine

**Vitamin A Sources**

Corn gluten	50	IU/g*
Yellow corn	81	
Broccoli	25	
Escarole	58	
Spinach	70	
Carrots	120	
Dandelion	140	
Sweet potato	80-200	
Cabbage	31	
Kale	100	
Parsley	85	
Peach	13	
Red Pepper	200	
Cheese	14	
Butter	35	
Eggs	10	
Cantaloupe	41	
Mang	48	

\*International Units per gram

**Anticipated Daily Vitamin Requirements**

	<u>Canary</u>	<u>Parrot</u>
Vitamin A	10-15 IU*	35-52 IU
Vitamin D	1-4 IU	3.5-14 IU
Vitamin E	.05-.20 IU	.17-.71 IU
Vitamin K	.01-.02 mg	.035-.07 mg
Thiamine	.01-.04 mg	.035-.28 mg
Niacin	.15-.25 mg	.53-.88 mg
Pantothenic Acid	.025-.04 mg	.088-.28 mg
Pyridoxine	.01-.03 mg	.035-.1 mg
Folacin	5-10 mg	17.5-35 mg
Choline	2-5 mg	7-17.5 mg
Biotin	.2-.4 mg	.7-1.4 mg
Vitamin B <sub>12</sub>	.05-.10 mg	.18-.35 mg

\*IU - International Units

**Vitamin K Sources**

Cheese	3.5	mg/g
Eggs	.1	
Liver	.9	
Oats	.2	
Green Beans	.14	
Broccoli	2	
Lettuce	1.3	
Turnip Greens	6.5	
Watercress	.57	
Spinach	.89	
Fruit	.01-.08	

**Common Seed Values (%)**

	<u>Protein</u>	<u>CHO</u>	<u>Fat</u>	<u>Minerals</u>
Canary	14-16	52-61	5-6	2-7
White Millet	11-15	60-70	4-5	2-4
Yellow Millet	11	63	4-5	2-3
Hemp	16-19	16-18	32	2-4
Maw	17	12	40	6
Niger	17	15	32-33	7
Rape	19-24	10-12	40-42	4-6
Linseed	21-24	24-30	34-36	3-6
Sunflower	16-24	20-21	22-29	3
Wheat	10-12	70-81	2	2
Maize	10	65	7	2
Oats	11-12	53-56	5	2

**Selected Psittacine Diets**

Macaw

Purina Dog Chow 14g  
Seed: 14g corn, wheat, milo, maize, safflower  
Nuts: 14g almonds, walnuts, hickory nuts, pine nuts, brazil nuts, peanuts (peanuts with 1 drop wheat germ oil placed in opened end, fed during breeding)  
Fruit: 37.5g banana, orange, apple  
Vegetables: 18g corn, carrots, sweet potato  
Greens: 21g Swiss chard, comfrey, spinach or sprouted oats  
Free choice oyster shell or crumbled dried chicken eggs shells

### Cockatoo

Purina Dog Chow 14g  
Seed: 14g sunflower, wheat, milo, oats, eucalyptus seed, melaleuca seed  
Nuts: 14g peanuts, almonds  
Fruit: 37.5g orange, apple  
Vegetables: 18g fresh corn, carrots, sweet potato  
Greens: 21g Swiss chard, spinach, comfrey, sprouted oats  
Free choice oyster shell or cuttle fish bone  
\*11g whole wheat bread

### Amazons

Purina Dog Chow 14g  
Seed: 14g corn, sunflower, safflower, oat groats, milo, maize  
Nuts: 14g peanuts, pine, almonds (1 drop wheatgerm oil on peanut during breeding)  
Fruit: 37.5g apple, orange, banana  
Greens: 21g spinach, dandelion, swiss chard, comfrey, oats or barley  
18g corn on the cob  
Vegetables: 18g sweet potato, carrots  
Cuttle bone free choice

### Budgerigars

Seeds: 5g mixed - 2 parts canary seed, 1 part millet, millet sprays, oat groats  
Greens: 18g chickweed, dandelion, shepherds purse, sweet alyssum, spinach, chicory, sprouted oats  
Bread: 11g whole wheat  
Cuttlefish bone, mineralized grit

### Cockatiel

Seeds: 5g canary, millet, hulled oats, sunflower  
Greens: 18g chickweed, swiss chard, comfrey, dandelion, sweet alyssum, sow thistle, spinach  
Fruit: 1/4 apple  
Bread: 11g whole wheat  
5g cuttle fish bone, mineralized block  
\*5g pound cake during breeding

### Budgerigar to Red Rumped Parrot

2 parts white millet  
2 parts canary seed  
1 part red or yellow millet  
1 part oat groats  
1 part wheat  
mineralized grit and shell grit  
Cuttlebone  
Seeding grasses, wholemeal bread

### Medium Parrots

1 part white millet  
1 part canary seed  
1 part wheat  
1 part oat groats  
1 part sunflower seed  
1 part milo  
Green food, fruit (apple, pear, orange)  
Wholemeal bread  
Mineralized grit and shell grit (essential)  
Cuttlebone

### Large Parrots (Cockatoos, Macaws, African Grey)

1 part sunflower  
2 parts wheat  
1 part milo  
1 part oat groats  
1 part whole/cooked corn  
1 part peanuts  
Mineralized grit and shell grit  
Wide variety of fruits, vegetables, bread

### Amazon, African Grey, Cockatoo, Macaw

Seed mixture: 1/3 large canary seed  
1/3 sunflower/safflower seed  
1/3 cereal seeds/nuts - (1 part each of ground nuts, sweet corn, milo or clari, buckwheat, rolled oats)  
Protein supplement: ground/chopped meat, chicken starter ration, cooked egg, carrot.  
Fruits/Vegetables: Apples, pears, oranges, grapefruit, bananas, figs, plums, dates, grapes, chickweed, plantain, dandelion leaves, spinach, endive, carrots, cabbage, lettuce  
Nuts: variety

### Small Parrots (conures, parakeet)

Seed mixture: 50% large canary seed  
25% safflower/sunflower  
1 part large white millet  
1 part hemp  
25% 1 part dari or milo  
1 part buckwheat  
1 part hulled oats

No protein supplemented

Fruits: apples, plums, figs, cherries, blackberries, oranges, pears, dates, raspberries, green oats, bananas, grapefruit, grapes, logan berries, chickweed  
(dried raisins, currents and nuts can replace fresh fruits)

### Parakeets, Lovebirds, Conules, Dwarf Parrots

Seed mixture: 50% canary seed  
25% mixed millet seed (no red millet)  
25% 1 part sunflower  
1 part safflower  
3 parts hulled oats/rolled oats

\*canary seed increased in juvenile ration

\*white millet increased in adult ration

Protein supplement: hard boiled egg yolk

Greens: chickweed, dandelion, sow thistle, watercress, cabbage leaves, spinach, carrot tops, alfalfa, brussel sprouts, broccoli, cloves, rye grass, beet tops, celery leaves, kale

\*small amount of greens over long periods to prevent diarrhea

Vegetables: carrots, turnips, beets, parsnips

Fruits: Apple, grapefruit, orange, banana, grapes, pineapple, figs, pear

### Baby Cockatoos and Parrots (from San Diego Zoo)

1/2 cup Sperry wheat hearts or Heintz dry baby food cereal  
1/8 teaspoons salt  
1/2 teaspoon fine cuttle fish bone meal  
1 teaspoon corn syrup or honey  
2 egg yolks  
milk or water  
4 drops vitamin supplement

### Supportive Diet for Sick Birds

30% high protein cereal  
25% egg powder  
15% skimmed milk powder  
30% bread crumbs  
Vitamin supplement  
To 5 grams of this mixture add:  
10 ml 25% sugar solution  
1-2 ml vegetable oil

### "Cocktail" for Birds

4 parts pellets  
4 parts grated egg  
1 part shredded wheat  
2 parts water

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