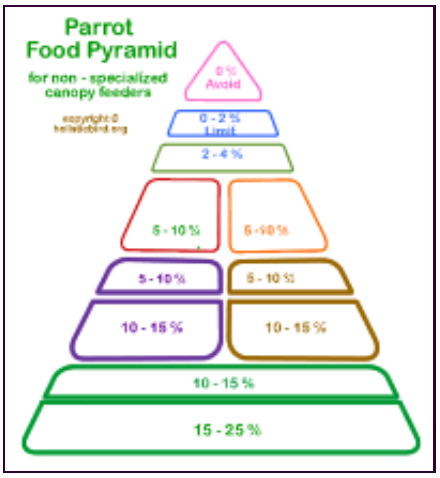
Food Pyramid for Parrots



The lay person's guide to a healthy and natural diet for avian companions.

by gloria scholbe
Autumn 2002

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The Myths

1. "Avian nutrition is similar to rocket science. It is so complex, that it takes a college degree to understand it.

2. "Pet owners can't feed their birds a healthy diet without using pellets ."

3. "Pet owners who don't feed their birds pellets are condemning them to die of diseases caused by malnutrition."

4. "Pet owners are too uneducated to design a healthy diet for birds."

5. "Pet owners are too lazy and undisciplined to feed their birds a good diet."

6."Birds in the wild die from malnutrition."

7. "Pellets are formulated by science; therefore they are superior to naturally foraged diets."

8. "Pellets are good, seeds are bad."

If you haven't heard one of the above statements, you haven't been in contact with the bird community. What those statements imply is sufficient to totally invalidate the intelligence, competence, devotion, and sometimes heroic efforts of bird owners whom I have come to respect over the years.

Although each statement has an element of truth in it, none of the statements is entirely true. They are myths. Let's debunk them.

Debunking the Myths

1. **Nutrition is too complex for ordinary people to understand.**

True, the science of nutrition is complex. Understanding the interaction of nutrients, their chemistry, and how they function does require advanced studies.

However, advanced knowledge is not required to to feed birds any more than it is required to feed oneself and ones family. Until recently, as long as food has been available, people have, for thousands of years, managed to feed their families a healthy diet with little or no understanding of nutrition beyond the common sense basics.

2. **Pet owners can't feed their birds a healthy diet without using pellets**

This is not true, but feeding a healthy diet does take a little thought and effort. If a pet owner isn't willing to rise to the challenge, then feeding the bird either all seeds or all pellets will be the result. Neither option can be considered a healthy diet for all parrots.

Non-breeding cockatiels and budgies do fairly well on an all seed diet and senegals do fairly well on an all pellet diet. These are the only two species, in my experience, that manage to maintain long-term health on an exclusive diet of either pellets or seeds.

Pet owners who are able to follow a few simple common sense guidelines can indeed feed their birds a far healthier diet than either all seeds or all pellets.

3. **Pet owners who don't feed their birds pellets are condemning them to die of diseases caused by malnutrition.**

This is true only if pet owners feed an all seed diet or a diet of human junk food or a diet limited to a bird's favorite few foods. I once visited a macaw who would only eat mashed potatoes and gravy. This bird's feathers were patterned with black bars, a sign of malnutrition.

Birds on a manufactured diet can also suffer and die from malnutrition. Malnutrition means bad nutrition. Some formulated diets are too high in some nutrients and too low in other nutrients for certain species and individuals. Either extreme, if fed on a daily basis, is poor nutrition.

4. **Pet owners are too uneducated to design a balanced diet for birds**

This is not true. Designing a balanced diet for a bird requires two things:

1. Having a general idea of what their species thrives on in nature
2. Possessing enough common sense to follow food pyramid guidelines

If the bird has a health problem that requires a specialized diet, then the pet owner might need to consult with an avian nutrition professional for help developing an appropriate diet.

5. **Pet owners are too lazy and undisciplined to feed their birds a good diet.**

This might be true for some but not all pet owners. It can be overcome with strategy and a little willingness to make the effort required for keeping a companion animal. The food pyramid we are about to design can help.

6. **Birds in the wild die from malnutrition**

Yes, some birds do, but not under normal circumstances. Here are some of the reasons birds die from malnutrition in the wild:

- They have come to depend on raiding domestic crops because their natural foraging areas have been destroyed. Subsisting on one kind of food will typically cause malnutrition...unless their diet is specialized to that one food.
- Disease or injury makes them unable to forage.
- A bad growing season, drought, fire, or pests have decimated their naturally foraged food.
- Heavy competition for food in one area.

7. **Manufactured diets are superior to diets based on nature..**

This simply is not true. Manufactured diets have several problems including:

- Narrow focus - only take macro and micro nutrients into account.
- Use grain, which is not a natural food for most parrots, as the base.
- Exclude fruits, nuts, and green vegetation, which is the major natural food source of most parrots.
- Ignore the importance of diet variation and rotation.
- Do not accommodate species or individual needs.
- Many more issues that have been covered in previous articles. (See back issues)

8. **Pellets are good, Seeds are bad.**

Neither seeds nor pellets are a perfect and complete diet by themselves. Neither seeds nor pellets are completely bad.

Seeds are good food, contain many nutrients, and can be a part of a healthy diet. Single types of foods in nature are seldom a complete diet for any animal.

Pellets contain a balance of macro and micro nutrients that livestock nutritionists have decided will fill all the nutritional needs of captive parrots. These formulations are based on studies of chickens conducted over 20 years ago and are limited to what was known about nutrition at that time.

Since then, there have been many advances in the field of nutrition, but none of that huge body of knowledge seems to be reflected in today's livestock or pet bird formulations. The major change we see in companion bird formulas involve the introduction of shapes, dyes, textures, perfumes, and sugar. None of these changes involve nutrition. Also, pellets do not accommodate the needs of all species or individuals.

One major problem with formulated foods for livestock and companion animals is they are based on the wrong kinds of foods.

To give them credit, some manufacturers varied certain components of their formula to compensate for the more documented problems caused by pellets. They began to: decrease calcium / D3 for cockatiels; increase calcium / D3 for African greys; increase vitamin A for eclectus; increase fat for macaws; and decrease iron for softbills.

Still, they have not addressed major problems with formulated foods for companion parrots, one of which is that manufactured formulas are based on the wrong kinds of foods. Most companion bird species did not evolve on a diet of grains and soy. For them, these are alien food sources and likely are part of the cause of so many health problems seen in companion parrots. More about this later.

What a shame if endangered species in captive breeding programs die because their owners require that they consume a formulated diet in the mistaken belief that it is better for them than a natural diet is.

A better alternative to manufacturing pellets would be to manufacture prepackaged frozen diets for birds based on the kinds of foods they consume in their natural environment. This is a yet untapped marketing niche with great potential. It would benefit the birds, the bird owner, and the pet product industry.

Natural Foraging

Except for specialized feeders, birds in nature consume a wide variety of foods as they become available. Availability is determined by the seasonal growth of plants and the life cycle of insects and other animals. Even in the tropics, flowers, fruits, and seeds are available in cycles.

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Not all birds live in tropical rainforests, however. Birds come from a multitude of terrains and climates that vary from desert, to savannah, to mountains, to wetlands, and to forest. The terrain they inhabit offers a hint to the kinds of foods they forage upon.

Birds that are dependent on one type of food often travel long distances each day to find their particular food source when it has been depleted from an area. Even so, these specialized feeders sometimes consume small amounts of food other than their main food. African greys, for example, who subsist almost solely on the fruits of the African Oil Palm (Elaeis guinensis) have been seen foraging on the ground.

Omnivorous feeders are not required to fly long distances to find food. If one type of food isn't available, they will eat something else.

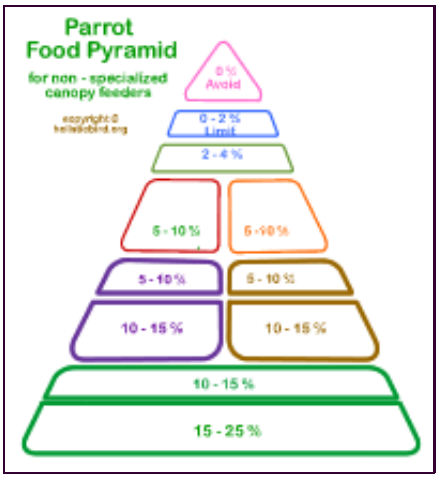
Example of Omnivorous Foraging through the Seasons

Zoologists studying wild turkeys found that: In late spring and through the summer, newly hatched grouse and turkeys eat large numbers of protein-rich insects and larvae. Observing my own free-range turkeys, peacocks, and chickens while foraging, I have found this to be true. Although they have a higher need for protein while they are growing, the chicks, along with the adults, also enjoy grass, clover and other plant leaves.

In the fall, grouse feed on aspens, acorns and berries; turkeys prefer seeds from grass and other plant plus acorns, hazel nuts, walnuts and hickory nuts. Both turkeys and peacocks like apples, berries, broken pumpkin, squash, and they scratch under fallen leaves for insects and fallen seeds.

During the winter, food is less bountiful and insects are dormant. Grouse generally feed on buds and catkins from bushes and trees; turkeys scratch on the ground for acorns and other seeds and nuts. This time of the year I feed my own birds some grains, commercial mash, wild bird seeds, alfalfa pellets and added protein in the form of hard boiled eggs and cooked ground beef.

In spring, turkeys, grouse, peacocks, and chickens feed on leaves and shoots of new plant growth plus insects and bugs awakening from dormancy. Ducks and geese spend much time digging into freshly thawed mud for roots, shoots, amphibians and bugs.



The food pyramid we are building is a general guide for non-specialized canopy feeders. At the end of this article are sample pyramids that accommodate some other foraging habits. As we discuss the nature of the canopy feeder's pyramid you will gain an understanding of how to construct a food pyramid for your own bird's special needs.

For our purposes, vegetables are divided into two categories: those that grow above ground and those that grow below ground.

Above ground vegetables consist of leafy greens, stems, flowers, flower vegetables, and fruits of flowering vegetables. This type of vegetation can make up 25 - 40% of canopy feeders' diets. The wide range in percentages is designed to accommodate the needs of species and individual differences, which must be determined by the pet owner or nutritional consultant.

Root and tuber vegetables in general contain less water than flower, fruit, leaf or stem, thus providing more nutrient density. They can be good sources of carotenoids and vitamin C, have moderate to high protein and fiber content, but are still poor sources of many minerals (often with an inverse Ca:P ratio). They also contain high levels of starch. They would not normally be part of canopy feeders' diets since they need to be dug from the ground. Because of this, they are not a part of the base diet. We will discuss these later.

Green vegetables are relatively higher in protein, minerals and fiber than stem or root vegetables and are often excellent sources of vitamins C, E, and carotenoids. Levels of Ca and P are good and meet a minimal 1:1 Ca:P ratio in most leafy green parts.

Greens are the Base

Why should greens be the basis of our parrots' diets instead of grains, which are the basis of formulated diets? There are many reasons.

The diet of birds who forage in tree canopies consists mainly of leaves, leaf buds, flowers, flower buds, pollen, fruit, nuts, seeds, and insects. None of these foods are similar to grain/grass seeds. Although we cannot exactly replicate our birds' natural diets, we can approximate it by providing similar foods available to us. Greens, which contain chlorophyll, are more similar to the green food they consume in their natural environment than non-chlorophyll containing grains are.

The pyramid we are working with is a general guide for canopy feeders.

Since canopy feeding parrot species do most of their foraging in the trees where grains and other grasses do not grow, grains are an unnatural dietary component.

This matters because it is not only the macro-nutrients (protein, carbohydrates, and fat) that should concern us when composing a diet for our birds. Other factors present or missing from the foods we feed our birds should also be of concern.

For example, certain plant factors in grains are not commonly present in other kinds of vegetation (e.g.. phytate, gluten.) Since birds may not have adapted to these factors as part of their evolution, these grain factors could act as allergens, inflammatories, toxins, or stimulate other degenerative responses.

The opposite is also true. Some plant factors in birds' naturally foraged vegetation may promote their long-term health. Udo Erasmus reports: "about half of all edible green plants contain anticancer, cardio-protective, anti-diabetic, anti-inflammatory ingredients —hundreds of different ones— and they confer their protection in many different ways." Many of these factors are not present in grains.

Chemical constituents of native forages once felt to decrease diet quality are increasingly found to have beneficial components, and warrant much further investigation in relation to animal nutrition. Information on the nutrient composition of foods consumed by birds in their native habitats would add immensely to our limited knowledge of dietary requirements for these species.

Nutrient composition of greens vs grains

Overall, green vegetation contains a better mix of nutrients than grains do. In a study comparing the nutrient composition of a number of food sources, Dr. William Harris found that 96 readily available vegetables are deficient only in vitamin B12. By contrast, 18 readily available grains are deficient in vitamin C, vitamin B12, vitamin A, alpha-tocopherol (vitamin E), and calcium.

The leafy greens are one of the richest sources of nutrients in the vegetable kingdom. The greener they are, the more nutritious they are. Chlorophyll, which is the basic component of plants' blood, uses magnesium as the center of the chlorophyll molecule much as our blood uses iron as the center of the hemoglobin molecule of our red blood cells. Thus, green plants contain goodly amounts of heart-healthy magnesium which is also necessary for proper calcium metabolism.

Chlorophyll has a nourishing and soothing effect on the mucus lining of the intestinal tract. It helps to purify and detoxify the body and is especially important in detoxifying the liver.

Omega 3 and Omega 6 fatty acids

In the mid 1980s dietitians and scientists discovered that certain fatty acids are essential for health. Some important fatty acids are located at the nerve synapses in the brain. All animals require an appropriate balance of fatty acids in their diet for proper body function. Two essential fatty acids are Omega 3 and Omega 6.

Nutritional scientists report that many leading health problems are caused by diets with an improper omega 6 to omega 3 ratio. The ideal ratio is 2 parts Omega 3 to: 1 part Omega 6. In captive diets, however, Omega 6 is far more abundant than Omega 3. This is because Omega 6 fatty acids come mainly from grain, whereas Omega 3 fatty acids come mainly from green leafy plants (on land and in the sea) and certain nuts and seeds such as walnuts and flaxseeds.

Omega 6 fatty acids come mainly from grains, whereas Omega 3 fatty acids come mainly from green leafy plants

The health problems associated with diets high in Omega 6 and low in Omega 3 are cancer, heart disease, arthritis, depression, obesity, insulin resistance, allergies, autoimmune diseases, diabetes, behavior problems, and more.

We Are What We Eat and What They Eat

As we all know, we are what we eat. We also are what the animals we eat have been fed. We are not going to eat our parrots, but there is direct correlation between the Omega fatty acid level in the bodies of different livestock animals with the kinds of food they consume. Since this has been established for humans, cattle, chickens, and fish, it also holds true for parrots.

When beef cattle have been fed grains instead of grass, their meat is high in Omega 6. If they have been raised on pasture, their meat is high in Omega 3. Cattle finished on grain in the feedlot gradually lose their store of Omega 3 as it is replaced with Omega 6 from grains.

The meat of chickens, if fed their natural diet of grass, insects, vegetables, foraged greens supplemented with some fruit and a modest amount of added corn or barley, will contain more Omega 3s; whereas commercially grown chickens, primarily raised on grain, can have up to 20 times more Omega 6 fatty acids.

Free range chicken eggs also reflect this Omega fatty acid difference. Eggs from free range hens are lower in cholesterol and have an Omega 6:Omega 3 ratio of 1.3:1 versus supermarket eggs, from grain fed chickens, which have an Omega 6:Omega 3 ratio of 20:1.

Humans have been encouraged to substitute fish for red meat because fish typically has a high Omega 3 content as compared to red meat.

The relatively high Omega 3 content of fish results from larger fish eating smaller fish which have been feeding on algae and plankton (plant life of the sea). Since the small fish are loaded with Omega 3 from the plants they have been consuming, the larger fish that eat them (which we eat in turn) are also high in Omega 3. However, when fish are farmed commercially, they are raised on formulated feeds that contain grains instead of green plants. Thus, the benefit of consuming fish is lost because these fish are high in Omega 6 instead of Omega 3.

Health Problems from Unbalanced Omega 6 : Omega3

Humans are not the only species with health problems related to diets high in Omega 6 versus Omega 3 fatty acids.

All livestock, cattle included, evolved on a diet of green leafy plants along with relatively small amounts of grain, when grass matures and goes to seed. Dairy cows that graze on good pasture consume ample amounts of vitamin A. When they are switched to a grain diet, vitamin A deficiency is common. Cows on grain also absorb lower amounts of fat-soluble vitamins A, D and E, even when these vitamins are added to feed. As a result, milk contains little of these vitamins which must be added after the cow is milked.

Livers were examined from 5,647 grainfed and 621 grass-fed cattle of similar breed, age and weight, killed at a Queensland slaughter house. Eleven percent of the grainfed animals had liver lesions compared with only 0.2 percent of the grassfed animals.

The purpose of feeding grain instead of grass to cattle in feedlots is to 'fatten' them up before slaughter. Feeding large amounts of grain lowers the stomach pH, throwing cattle into a condition of acidosis.

Forcing meat chickens to grow quickly by providing them high energy grain-based feeds can result in heart failure or 'ascites.' The chickens develop so rapidly that their heart muscles cannot keep pace.

Geese and ducks are force-fed large amounts of a grain mash to cause their livers to enlarge and infiltrate with fatty deposits. Pate' de foie gras, considered a delicacy, is made from this diseased liver. Necropsies have shown that these birds also suffer from cardiac and renal failure.

Alternative to Grains

Today's enlightened agriculturists and consumers have been turning their eyes once again toward pasturing as a healthier method of

feeding livestock over feeding grains.

Suze Fisher explained pasture fed this way: "Grass fed/pastured animals are raised on pasture, as opposed to being kept in confinement and fed primarily grains. Depending on the region, some are on pasture 100% of their lives, while others are on pasture seasonally (spring - fall). Some animals are also supplemented with grains or hay while on pasture.

Pasturing livestock and poultry is the traditional method of raising farm animals, is ecologically sustainable, humane, and produces the most nutritious meat, dairy and eggs.

In recent years research on pastured meat has shown it to be significantly higher than conventional meat in vit. E, Essential Fatty Acids (EFAs), Conjugated Linoleic Acid (CLA) which has anti-cancer properties, beta-carotene and various other important nutrients. Pastured dairy and eggs are similarly higher in a number of nutrients (including vitamin B12, folic acid, vitamin E, EFAs, vitamin A, and carotenes), than are conventional eggs and dairy.

Eating grass and other plants typically found on pastureland is the key to the healthy nutrient profile of these foods. Cattle, lamb and bison may be raised on 100% grass, as it's their natural diet, however commercial poultry is typically fed grains while on pasture. But they do have access to grass and bugs making their meat and eggs healthier than non-pastured. Commercially raised goat and pork are also typically fed grains, root vegetables and/or hay while on pasture. The general rule of thumb is that more grass/pastureland and fewer grains produce healthier meat and fat. Some cattle are finished on grain, and this reduces the healthful properties of the meat. So be sure to ask farmers what percent of their animals' diet is pasture.

(Note that 'free range' does not necessarily mean the animal has access to grass.)"

If agri-culture can feed a healthier and more natural diet to livestock, then avi-culture should be able to do the same for companion birds. Thus, greens should be the basis of the diet for birds who originally fed in the canopy.

Which Kind, How Much?

The best greens to feed are dark leafy greens such as endive, kale, spinach, arugula, radicchio, mustard, beet, dandelion, Swiss chard, water cress, turnip, collard and romaine.

Purslane, if you can find it, is incredibly rich in Omega 3 fatty acids. In some states, it grows as a pesky weed in gardens. Clip it and feed it to your birds as long as it is free from pesticides, herbicides and fertilizers.

The greens from Chia pets, if chia seed is used, are also high in Omega 3 fatty acids.

Greens can comprise 15% - 30% of the diet, depending on your bird's species, condition, and general health. Obese birds benefit when greens and vegetables replace some higher calorie foods.

The following table will give you a general idea of the food value of greens. They tend to be very high in vitamin A, C, folate and electrolyte minerals.

Greens	protein %	carbs %	phyto and micro-nutrients
endive	1.2	3.3	

bibb, boston, leaf	1.2	2.3	C, A, folate, calcium, potassium, magnesium, phosphorous
bok choy	1.5	2.1	
cabbage	1.4	5.4	same as kale, C, folate, calcium, potassium, magnesium, glutamic acid
chickweed			inositol, rutin, PABA, C, rutin, biotin, choline, insoitol, B6, B12, D, beta carotene, magnesium, iron, calcium, potassium, zinc, phosphorus, manganese, sodium, copper and silicon.
chicory	1.7	4.7	C, A, folate, calcium, potassium, magnesium, phosphorous,
collard	2.4	5.6	same as kale: A,E,C,folate, calcium, potassium, sodium, niacin
dandelion	2.7	9.2	bioflavanoids, inositol, inulin,A B, C and G (B2). lecithin and potassium
kale	3.3	10	sulphoraphane, lutein, indoles, quercetinA,B,C,calcium
mustard	2.7	4.9	myrosin, sinalbin, sinapine, A, C, B1, and B2 calcium, potassium and magnesium beta carotene
nettle	10% highest protein of listed greens		tannin, formic acid, A, C, beta carotene, and B, calcium, magnesium, iron, potassium, phosphorus, manganese, silica, iodine, silicon, sodium, chlorophyll vitamins.
parsley	2.9	6.3	coumarin, carveol, limonene, quercetin, apiol, pinene, C, E, A, carotenes
purslane	1.3	3.4	high land source of Omega 3 fatty acids A, C and E, essential amino acids, glutathion, calcium, magnesium, phenylalanine, potassium and tryptophan

romaine	1.6	2.3	lutein, zeaxanthin, varying but goodly amounts of A, C, folate, calcium, magnesium, sodium, potassium,
spinach	2.8	3.5	
swiss chard	1.8	3.7	
turnip greens	1.5	5.7	same as kale, C,A,E, folate, calcium, potassium
watercress	2.3	1.2	A, C iron, calcium, thiamine, riboflavin and niacin.

Do not limit feeding to one type of green or any other food. Rotate many foods to provide a variety of nutrients and to reduce the development of food sensitivities.

Oxalic Acid

Several foods, though excellent sources of nutrition, are also high in oxalic acid. If fed frequently, oxalic acid can cause health problems.

When you feed a food high in oxalic acid and balance it with foods low in oxalic acid, it becomes less of a concern. Regardless, foods high in oxalic acid should not be fed on a daily basis.

Although oxalic acid binds to calcium (producing calcium oxalate crystals), and making calcium unavailable for absorption, many vegetables that contain oxalic acid also contain calcium. The amount of oxalic acid is what determines how much calcium is bound. So if there is more calcium than oxalic acid present, the calcium that has not been bound will be available for use by the body.

To the right is a table with the oxalic acid content of some vegetables.

	Oxalic acid (g/100 g)
asparagus	.13
beans, green	.36
beet leaves	.61
broccoli	.19
brussels sprouts	.36
cabbage	.10
cauliflower	.15
celery	.19
chicory	.21
chives	1.48
collards	.45
corn, sweet	.01
cucumbers	.02
eggplant	.19
endive	.11
kale	.02
lettuce	.33
okra	.05
onion	.05
parsley	1.70
peas	.05
peppers	.04
purslane	1.31

Above Ground Vegetables

In addition to green leafy vegetables, other vegetables are a part of the pyramid base and can provide 10 - 15% of the diet.

Stem vegetables include asparagus, celery, and fern head. In this category we also list the buds and branches of edible trees and bushes such as apple, willow, poplar, aspen, and American lilac. Birds relish these particularly in spring when the sap begins to flow and the leaf buds fill.

Flower Vegetables are vegetable flower heads that are consumed before they open into their flower form. Among these are broccoli, artichoke, cauliflower, and Brussels sprouts.

Edible Flower Blossoms include squash, pumpkin, nasturtium, chamomile, dandelion, hibiscus, lilac, thistle, apple, and many more. For more information regarding edible flower

spinach	.97
squash	.02
tomato	.05
turnip greens	.05
watercress	.31

blossoms, you are invited to read Carolyn Swicegood's article about Edible Flowers from our first issue.

Do not limit the diet to one type of food. Rotate many foods to provide a variety of nutrients and to avoid food sensitivities.

Vegetable Fruits form after a plant's flowers have fallen. They contain seeds within the pulp much as typical fruit does. These vegetables come in all colors and varieties along with a wide array of nutrients. Among them are pumpkin, squash, peppers, tomatoes, and okra. Birds often enjoy eating the seeds as well as the pulp of these vegetables.

In general, vegetables with the most color contain more nutrients. Different colors indicate different plant chemicals, so it is helpful to strive for a mixture of colors in the diet.

The nutrient value of foods (except for the phyto-nutrients) can be obtained from the United States Department of Agriculture Food Composition Database. http://www.nal.usda.gov/fnic/foodcomp/

In general, vegetables have fair amounts of potassium, magnesium, phosphorus, calcium, folic acid, and vitamins C and A. They also have smaller amounts of other vitamins and minerals not listed in the table.

Veggies	protein %	carbs %	phyto and micro-nutrients
asparagus	2	4.5	saponins, C, A, folate, potassium, magnesium, calcium,
celery	0.7	3.6	pthalide, sedanolide, sodium, potassium
edible fern head	4.5	5.5	C, A, niacin, calcium, magnesium, potassium,
artichoke	3.2	10.5	silymarin, polyphenols, A, Calcium, potassium, phosphorous, folate
broccoli	2.9	5.2	sulforaphane, indole-3, quercetin, lutein, C, A, Calcium, potassium, folate,
brussel sprouts	3.3	8.9	protease inhibitors, sulforaphane, indole-3C, A, Potassium, folate
cauliflower	1.9	5.2	indoles, isothyocynates, C, potassium
cucumbers	0.5	2.5	potassium
pepper, hot	2	9.4	capsaicin, lutein, C, A, sodium

pepper, sweet	9	6.4	C, A, potassium
pumpkin	1	6.5	A, potassium
squash, winter	1.4	8.8	C, A, calcium, potassium
squash, summer	1.1	4.3	potassium
tomato	0.8	4.6	lycopene, quercetin, kaempferol, C, A, potassium, folate

It really is not necessary to know the exact nutrient content of different foods unless we feed the same food every day. Feeding a limited diet of the same food can lead to diseases of malnutrition.

When we feed a diet of variety and moderation, much as we feed ourselves, then we only need to know, in a general way, that certain foods are high in certain nutrients or low in other nutrients in order to balance out the diet. For example, if we are feeding spinach and we know that spinach is high in oxalates, then other foods we select for that day should be low in oxalates. Or, if a food we feed is high in fat, then we would balance it against a food that is lower in fat in order to avoid feeding too many calories.

Fruit

Fruits provide good sources of carbohydrates, vitamin C, potassium, folic acid and carotenoids. Many are high in fiber, but most are poor sources of minerals and are low in protein and fat. Wild fruits may be nutritionally superior to domestic fruit crops, but direct comparisons are few. One fruit we can compare is the wild fig, which has up to 9 times the calcium content of domestic figs.

Most fruits that birds consume in nature are quite different in flavor and succulence from those we cultivate for human consumption. We humans prefer fruit that is juicy and sweet. Many species of wild fruit are not considered edible by human standards because their flavors are often too sour or acid for human taste.

Birds possess fewer taste buds than humans do, so they are equipped to enjoy strong flavors that seem unpleasant to us. Thus, contrary to popular belief, a flavorless diet of pellets is not an ideal one for birds whose taste buds appreciate penetrating flavors rather than subtle ones. Anyone who has seen parrots devouring raw peppers or unsweetened fresh cranberries can attest to this fact.

Although fruit is relatively unimpressive in its content of macro and micronutrients, its true value lies in other plant chemicals. Cutting-edge university courses in the field of phytonutrition (phyto=plant) are currently underway. Because of findings in this field, fruits are no longer regarded as little more than sugar and water.

Phytonutrients are plant substances that confer health benefits to those who consume them. These substances include over 2000 known plant pigments; 1500 flavonoids; 600 carotenoids and 200 anthocyanins. Here is a list of some of them. Many more have yet to be discovered.

- Anthocyanins - water soluble, reddish pigments found in many fruits. They inhibit cholesterol synthesis
- Flavonoids - were once known as vitamin P. They number over 1,500 and they work with vitamin C to build and strengthen cell walls.
- Limonoids - subclass of terpenes found in citrus. Dissolves gallstones and prevents tumor development
- Lycopene - powerful antioxidant against prostate cancer
- Lutein - for eye health
- Phenols / Polyphenols are a large class that include flavonoids, catechins, quercetin, caffeic acid, ellagic acid, ferulic acid, and gallotannic acid . They are characterized by blue, blue-red and violet colorations seen in berries, grapes and purple eggplant.. They perform a variety of antioxidant actions.

You are invited to read the article about **Phytonutrition** in our Feb/Mar issue of this newsletter for a more thorough discussion.

This table lists some fruits with a few of their known macro, micro, and phyto nutrient values.

Fruit	protein %	carbs %	phyto and micro-nutrients
apple	0.1	14.8	pectin, quercetin, C, A, calcium,
banana	1.0	23.3	fructooligosaccharide, C, A, folate, potassium
blackberries	0.7	12.7	lutein, C, A, calcium, folate, potassium
blueberries	0.7	14.1	anthocyanins, ellagic acid, quercetin, lutein, C, A, folate
cantaloupe	0.8	8.3	C, A, folate, calcium, potassium
cherries, sour	1	12	perillyl, anthocyanins, quercetin, A, calcium, potassium
cranberries	0.4	12.6	anthocyanins, ellagic acid, quercetin, lutein,C, A, potassium
kiwi	1	14.8	C, A, calcium, folate, potassium
mango	0.5	17	A, C, potassium
olives, ripe, *canned in brine	0.8	6.2	A, E, flavonoids, anthocyanins, sterols, phenols, 10% fat, *sodium
orange	0.9	1.7	monoterpene, limonene, pectin, coumaric acid, phenols, C, A, calcium,

			folate, potassium
papaya	0.6	9.8	papain, C, A, folate, potassium,
pineapple	0.4	12.4	bromelain, A, C, potassium, magnesium
pomegranate	0.9	17.1	estrone, C, potassium
raspberries	0.9	11.5	anthocyanins, ellagic acid, quercetin, lutein, C, A, calcium, folate potassium
strawberry	0.6	7	anthocyanins, ellagic acid, quercetin, luteinC, A, folate, calcium, magnesium, potassium
watermelon	0.6	7	lycopene, C, A, potassium

The best fruits to feed are those with deep color that extends throughout the fruit. Berries should make up the majority of fruit offered because they contain the most nutritional benefit.

Grapes should be extremely limited because they contain the least nutritional beneft. (Most of grape's nutrition is in the skin, which birds do not eat and in the seeds, which people seldom purchase.)

Nuts, seeds and sprouts

Nuts are good sources of protein, minerals, and healthy fats plus vitamins unless they are roasted first. Once roasted, the fat begins to deteriorate and vitamins and minerals are lost. Nuts have a better amino acid profile than some seeds, like sunflower or safflower do, but they are a tad low in the amino acids tryptophan and methionine.

Each type of nut varies somewhat in its known nutrient and plant chemical profile. Phytochemicals contained in nuts include several phytosterols: beta-sistosterol, campesterol, and stigmasterol. Phytosterols are major components of cell membranes in both plants and animals.

Flower seeds have a nutrient profile similar to nuts. This varies, depending on its type and where it they are grown. Overall, their fats are healthy but high in calories, so amounts fed need to be regulated according the needs of the individual birds. Flower seeds found in seed mixes are Sunflower, safflower, thistle, and and hemp. Buckwheat is included with these because it is a thistle seed, not a grain.

Other seeds we feed our birds are grass head seeds that are closely related to cereal grains but do not contain gluten as most cereal grains do. These non-glutinous grains include various millets, corn, canary grass and rice.

Most cereal grains contain a protein/carbohydrate molecule called gluten, which can cause digestive malabsorption in sensitive individuals. Glutinous grains include wheat, rye, and oats.

Grains have an incomplete protein profile, being low in the amino acids lysine and methionine. Quinoa is said to be an exception to this.

Sprouts

When grains, legumes, and seeds are sprouted, the carbohydrate content becomes converted into protein and vitamin levels such as C, E and K increase. Protein increases anywhere between 15% - 30%. B-

vitamins increase tenfold. Most sprouts are served shortly after the seed has germinated and a 'tail' begins to emerge. Legumes are generally served at this stage.

If sprouts are allowed to develop to the leaf stage, then chlorophyll begins to form and beta carotene increases. Wheat grass and barley grass are sometimes grown to this stage.

Sprouts are living foods that contain enzymes which aid in digestion and the assimilation of nutrients. Good seeds to sprout are adzuki, buckwheat, clover, fenugreek, lentil, mung, quinoa and sunflower.

Nuts, grains, seeds, sprouts	protein %	fat %	carbs %	phyto and micro-nutrients
almonds	21	50	20	phytosterols, fiber, poly and mono unsaturated fats, E, folate, calcium, magnesium, phosphorus
brazil	14	66	12	phytosterols, fiber, poly and mono unsaturated fats, folate, magnesium, potassium, phosphorus, selenium
coconut	3	33	15	phytosterols, fiber, poly and mono unsaturated fats, saturated fats, calcium, magnesium, potassium, phosphorus
filbert / hazelnut	14	60	16	phytosterols, fiber, poly and mono unsaturated fats, folate, magnesium, potassium, phosphorus
macadamia	8	75	13	phytosterols, fiber, poly and mono unsaturated fats, folate, calcium, potassium,
pecan	9	71	13	phytosterols, fiber, poly and mono unsaturated fats, A, magnesium, phosphorus, potassium
pine nuts	11	60	19	phytosterols, fiber, poly and mono unsaturated fats,

				folate, magnesium, potassium
walnut	15	65	13	phytosterols, fiber, poly and mono unsaturated fats, magnesium, phosphorus, potassium
watermelon seeds	28	47	15	folate, magnesium, phosphorus, potassium
millet	11	4	72	non-glutinous grain, magnesium, potassium, niacin, riboflavin, iron
oats	16	6	66	contains gluten, Ca, B , folic acid, iron, magnesium. The bran contains soluble fiber.
sunflower	22	49	18	phytosterols, fiber, poly and mono unsaturated fats, calcium, phosphorous, magnesium, potassium
lentil sprouts	8.9	0.5	22	C, calcium, phosphorous, magnesium, potassium, folate
mung bean sprouts	3	0.1	5.9	C, calcium, phosphorous, magnesium, potassium, folate
quinoa	13	5	68	B, calcium, insoluble fiber, coumarins, flavonoids, protease inhibitors, phytates, phenols, gluconates. minerals.

Animal Protein

Insects and their larvae are the natural source of fats and complete protein for birds in nature. Bugs are an especially sought after food during breeding season and when parents are feeding their young.

Mealworms are the larvae of a beetle, Tenebrio molitor. Mealworms are a common insect food but they are high in fat and low in protein, this may lead to an obesity problem if fed in excess.

Wax moth larvae, Galleria mellonella, and the lesser bee moth larvae, Achroia grisella, are each a good source of vital nutrients and are comparable, or in some cases superior, to other insects. Larvae have very low chitin levels and therefore are easier to digest than other insects such as mealworms and crickets.

Mulberry silk worms, Bombyx mori, are highly nutritious and very digestible. They, like the wax moth larvae, do not have a thick exoskeleton which increases their digestibility. Their calcium to phosphorous ratio is almost 1:1. To provide additional calcium, the larvae can be dusted with calcium.

Earthworms, Lumbricus vulgaris, and nightcrawlers, Lumbricus terrestris, require little care and their soft bodies are easily digested. Earthworms are very high in protein, low in fat, and high in carbohydrates.

Any of these foods can be readily obtained from online sources. I do not recommend feeding any insects or worms from your own yard because these may harbor bacteria that can make your bird sick. They may also have been exposed to fertilizers and pesticides.

Larvae and insects raised specifically for pet food are fed a clean diet and are raise in a hygienic manner that will not risk your bird's health.

Some of these are easy to raise in your own home. If you choose to do this, you will also control the kinds of food they eat, which could potentially improve their nutrient profile for your bird.

If dealing with insects and larvae are a problem for you, then offering cooked ground beef, well cooked chicken, and hard boiled egg can substitute for live insect food. However, your bird will miss the benefit of the enzymes obtained from live food.

Animal Protein	protein %	fat %	micro-nutrients
mealworm	35%	50%	Ca .26% P .23% varies
cricket	50%	40%	Ca .23% P .74% varies

silkworm	55%	45%	Ca .21% P .54% varies
waxworm	25%	75%	Ca & P varies
earthworm	73	13	Ca & P varies
chicken breast roasted	31	4	phosphorus, potassium
chicken dark meat roasted	27	10	potassium, phosphorus
ground beef 85% lean cooked	28	15	phosphorus, potassium
whole egg, cooked	12	10	A, D,folate, Ca, P, K, Na
egg yolk, cooked	16	30	A, D, folate, calcium, phosphorus, potassium

Cooked Tubers, Legumes and Grains

Tubers, legumes, and grains contain healthy fiber and complex but starchy carbohydrates. The problem with starchy carbohydrates is that they contribute to obesity in some sedentary birds like amazons, cockatoos, and eclectus.

There really is no such thing as an essential carbohydrate. Carbohydrates are not used to build body tissue or strengthen the immune system as proteins are. They are not used to lubricate skin and joints or protect the nervous system as fats are. Carbohydrates have one function only. That function is to provide immediate energy for flight and other activities. Any carbohydrates not used shortly after being digested are stored as fat. For this reason, we need to limit the feeding of starches to our cage bound and relatively inactive birds.

Another reason to limit feeding tubers to birds is they are not a natural food for many species. Very few species of birds in nature will actually forage for and dig tubers out of the ground. However, some birds living on the edges of civilization will raid harvests of sweet potatoes. As we have discussed earlier, we do not consider crop raiding as being either natural or healthy for birds unless it is only a part of their diet.

Exceptions, in the tuber department, are sweet potatoes and carrots. These orange tubers are so loaded with good nutrition that their starch content can be overlooked as long as portions are moderate. Sweet potatoes should be cooked but carrots can be served raw or steamed.

Legumes

Birds do forage legumes in nature. Some of these are from vines that climb trees and some are from leguminous trees and shrubs. Red fronted Macaws, for example forage mesquite beans in their natural savannah habitat. The rainforest also grows varieties of legumes. However, birds in nature would consume these while they are fresh and green or ripe rather than dried and cooked.

Legumes tend to be high in protein and carbohydrates and low in fats but different varieties contain different levels of nutrients and Antinutrients. The legumes we feed them are unlikely to be similar to those they consume in their countries of origin and certainly not in the form we feed them except as sprouts or fresh.

One legume about which there is much controversy is soy. Soy Online Services, an organization of private citizens with a mission to inform the public of the truth about soy, became concerned about the toxicity of soy because of its effects on animals. They report: "The harm that soy causes animals has been known for decades, but this fact currently appears to be ignored by manufacturers of animal feeds. The use of formulated bird feeds that contained soy coincided with thousands of bird deaths and disorders. These effects were widespread and were reported by many of New Zealand's leading parrot breeders.

Among the effects seen by these bird breeders were:

- beak and bone deformities
- goiter
- immune system disorders
- infertility

- premature maturation (bird breeders were finding that their birds 'colored-up' after just a few months, a fact that wasn't missed by one bird food manufacturer who actually used this fact in promotional material)"

Soybeans contain several phytochemicals in relatively high concentrations, including lectins, phytosterols, phytic acid, saponins, protease inhibitors, a variety of phenolic acids and isoflavones. Some of these phytochemicals in soy play dual roles of being beneficial and also as Antinutrients.

Antinutrients

Antinutrients are compounds with negative nutritional effects. For example, phytic acid in soybeans inhibits the absorption of iron, zinc and calcium. One of the phytochemicals in soybeans, isoflavones, are being studied for their favorable effects on cancer, heart disease, osteoporosis and menopause; they may be a possible alternative to hormone replacement therapy. It is the isoflavone factor in soy that may be responsible for infertility and premature maturation in birds.

Another area of concern with soy is the fact that it is virtually impossible to find soy beans that have not been genetically engineered. For reasons that include both the health of our birds and environmental ethics, soy is a food to avoid.

The safest domestic beans to feed birds are are mung, adzuki, and lentils. These beans can be served either sprouted or cooked. Other beans considered fairly safe are pinto beans, great northern beans, and navy beans. These should **not** be served sprouted, but should instead be thoroughly cooked before serving.

Soy is a legume that birds do not eat in nature. Another food not included in the natural diet of canopy feeding parrots is grain.

Grains

The bran and germ of whole grains contain phytochemicals that are said to help to prevent cancer. Refined and processed grains do not possess these benefits. Vegetable oils, such as corn oil, have been shown in laboratory studies to lower immune function and to cause cancer in lab animals.

Grains such as wheat, rye, barley, tritical, spelt, and kamut contain proteins (gluten, gliadin and glutinin) that can cause diseases of the digestive tract and other diseases throughout the body of sensitive individuals. Humans have been consuming grains for the last ten to fifteen thousand years and some races have still not adapted to the proteins in grains. Researchers have recorded over 150 diseases in humans related to grain consumption. Those most sensitive to grains have ancestor originating furthest from the original source of gluten grains (the Mediterranean area), which indicates they have had less time to adapt to them.

Compare this with birds, most species of which have been exposed to grains for only one or two generations in captivity.

Some symptoms of sensitivity to grains includes: itchy skin, easy bruising and bleeding, mineral deficiencies from poor absorption, respiratory conditions not related to bacterial or viral infections, digestive problems, mental disorders, reproductive disorders, susceptibility to fungal infections, thyroid problems and auto-immune disease.

The safest grains to feed would be quinoa, millet, buckwheat, brown rice, corn as a vegetable, and the bran or germ of wheat and oats. However, keep in mind that any phytic acid they contain will bind with

minerals in the diet so they cannot be assimilated by the body. Consequently, vitamins and minerals should be supplemented to compensate.

Tubers Legumes Grains	protein %	fat %	carbs %	phyto and micro-nutrients
carrots	1.0	0.2	10.1	carotenoids, A, C, folates, potassium, calcium, iron, magnesium
sweet potato	1.6	0.3	24	carotenoids, A, C, B, potassium, iron
turnip	0.9	0.1	6.2	indoles, isothiocynates, C, A.
pinto beans cooked	8.2	0.5	25.6	calcium, magnesium, phosphorous, potassium, folate
navy beans cooked	8.7	0.5	26.3	calcium, magnesium, phosphorous, potassium, folate
lentil cooked	9	0.3	20	thiamin, niacin, pantothenic acid, iron, potassium, calcium, phosphorous.
peas raw	5	0.4	14.4	C, A, B, folate, potassium, magnesium, iron, calcium
peas, dry cooked	8	0.3	21	calcium, phosphorous, magnesium, folate

brown rice cooked	2.3	0.83	23.5	Calcium, magnesium, phosphorus, potassium, folate
quinoa cooked	13	5.8	68.9	insoluble fiber, coumarins, flavonoids, protease inhibitors, phytates, phenols, gluconates. Contains a saponin coating that must be rinsed before using.
whole oats, cooked	16.8	6.9	66.2	soluble and insoluble fiber, coumarins, flavonoids, protease inhibitors, phytates, phenols, gluconates.
corn, sweet raw	3.2	1.1	19	coumarins, flavonoids, protease inhibitors, phytates, phenols, gluconates.
whole corn, dry	9.4	4.7	74	coumarins, flavonoids, protease inhibitors, phytates, phenols, gluconates.

Supplements

The best way to obtain vitamin and minerals is directly from food. There are three major reasons for this.

First, synthetic vitamins are not absorbed as well as vitamins found in real food.

Second, synthetic vitamins are not accompanied by companion nutrients found in real food. This fact alone means that many nutrients are being excluded from manufactured supplements.

Third, there have been studies showing that the synthetic form of some vitamins does not perform as effectively as the real thing. One example is the beta carotene/smokers/lung cancer study where smokers given beta carotene supplements had an increased risk for lung cancer, but those given actual foods high in beta carotene had a decreased risk for lung cancer.

However, food grown on soils depleted of mineral content and food sitting on produce shelves gradually losing their nutrients cannot provide all the vitamins and minerals that the body needs. Thus, supplementation is necessary. The best way to supplement these needed vitamins and minerals is from mineral-rich plants.

Plants rich in vitamins and minerals have one of these characteristics:

- grow in the oceans and lakes.
- have deep roots, bypassing depleted top soils.
- are the first leaf that develops from the nutrient rich seed before the root begins to draw nutrients from the soil.

Sea and Fresh Water Vegetation

Oceans and some freshwater lakes are a stew of vitamins and minerals. Plants that grow here partake of this richness and themselves become powerhouses of nutrition. On average, dry powdered sea vegetables contain 50% protein; 7% fat; 20% carbohydrates and a vast array of vitamins and minerals. Sea vegetables include algae, dulse, kelp, wakame, nori, and kombu. Edible fresh water algae include spirulina, chlorella, and blue-green algae.

Although most birds do not consume ocean plants as part of their natural diet, they probably do eat algae that grows in ponds and hollows in trees and rocks that act as natural catch-basins and water reservoirs.

Supplements	Chlorella contains all of the B vitamins, C, E, 58% protein, , amino acids, carbohydrates and rare trace minerals. It contains more B12 than liver does and large amounts of carotenes. It contains not only chlorophyll but probiotic compounds that support good health.
alfalfa	
barley grass	
sea vegetables	Spirulina is also ideal as a supplement because it contains concentrations of nutrients higher than any other single grain, herb, or plant. The same amount of land used for spiriulina ponds can produce 20 times more protein than soy beans. Spirulina contains 70% protein, essential amino acids,

wheat grass	essential fatty acids, B12, and anti-oxidant blue pigments.
Nutritional Aids	Molecules in spirulina, when added to animal feed helps farm animals to naturally resist infections.
digestive enzymes	Several pet bird owners have reported problems of toe-tapping and wing flipping with birds, particularly eclectus, that have been fed spirulina. This is a problem I have personally not experienced in connection with spirulina and my own eclectus even though I used spirulina liberally in soft food and in handfeeding formula when I was raising them. I would speculate that some spirulina is obtained from sources where the water is contaminated with chemicals or pesticides and it is this contamination rather than spirulina itself that is responsible for the neurological pathologies seen.
HSO's and probiotics	

Deep Rooted Plants

Alfalfa has roots that grow up to 130 feet into the earth. Because its roots go so deep, the plant can absorb minerals well below depleted topsoil. Alfalfa is an extremely nutritious plant loaded with vitamins A, B1, B6, B12, C, D, E, K, P, niacin, pantothenic acid, biotin, folic acid, saponins, calcium, phosphorous, potassium, magnesium, zinc, copper, iron, and digestive enzymes.

Dehydrated alfalfa contains additional reproductive factors that scientists have not yet been able to isolate and synthesize. Experimental studies show these reproductive factors improve poultry egg production and hatchability of eggs.

Other mineral-rich plants, though not quite so deep rooted, are nettle, dandelion, and kudzu.

Grasses

Cereal grasses are the immature shoots of plants that will eventually become grain. However, they do not contain gluten, which is the protein in grain that causes sensitivites. Instead, they are the richest source of vegetable nutrients, chlorophyll, and enzymes.

There are thousands of unidentified and non isolated molecules in green foods which benefit the health of those who consume them. One phytochemical is called the 'grass juice factor'. It is a water soluble growth molecule that is markedly different from all other vitamins. It is a powerful anti-inflammatory, slows cellular ageing, stimulates the body's repair system. Its availability is limited to whole grasses like wheat grass and barley grass.

Grasses can be purchased as powdered supplements or you can sprout them yourself and clip the young growing grasses for juicing.

Nutrients in green food supplements are not synthetic, are better absorbed by the body, are accompanied by companion nutrients, and they function the exact way they are supposed to function. This is the form of nutrition that life on this earth evolved to assimilate.

Nutritional Aids

Enzymes are catalysts that work in the body to speed up metabolic processes and to digest foods. There are two main type of enzymes: those that are contained in raw foods and those that are produced by the body.

Raw foods contain a percentage of the enzymes required to digest them, but those enzymes are prevented from digesting the living plant by its own enzyme inhibitors until the food is consumed.

Birds suffering from digestive disorders, and other symptoms of chronic disease, would benefit from a regimen that includes Probiotics, HSOs, and Prebiotics.

The body has organs that produce enzymes to digest food. However, when raw food is consumed, then the body does not need to work so hard to produce its own enzymes. Cooked and processed food requires the body to work harder, thus wearing down its resources and vital forces.

The suffix *ase* in a word is an indication that it refers to an enzyme responsible for breaking down the food molecule into a form usable by the body.

Protease breaks down protein
Lipase breaks down fat
Amylase breaks down starch (into simple sugars)
Lactase breaks down lactose (milk sugar)
Cellulase breaks down cellulose (the cell walls of plants)

It is the function of the body's pancreas to produce enzymes that the body uses (protease, lipase, amylase). However, if the pancreas malfunctions or has been overworked for a long time, it does not produce the enzymes necessary for metabolism or to fight disease.

When the pancreas does not produce sufficient enzymes then supplemental enzymes from plant sources can be administered. Bromelain from pineapple and papain from papaya are both proteases. They break down protein molecules into amino acids. Bromelain has additional use as an anti-inflammatory, and helps to reduce clot formation in the arteries.

Probiotics

Probiotics are "A live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance", (Fuller; 1989.) Various studies have revealed that probiotics stimulate the immune function and have anti-tumor effects. They are also effective in correcting diarrhea and fighting bad bacteria and fungal infections.

Probiotics affect the immune system, break down food ingredients for ease of absorption and play an important role in general health.

There are two major kinds of beneficial bacteria in the intestinal tract: resident and transient.

Resident bacteria are those that live and grow in the intestines. Transient bacteria temporarily colonize the gut and perform normalizing functions before being digested or eliminated after a short period of time.

Homeostatic Soil Organisms (HSOs)

HSOs are transient bacteria. These bacteria must be ingested from outside sources such as food that has been grown in soil. They are available in supplements that also include a variety of green foods such as plankton, wheat grass, and barley grass.

They aid in the absorption of nutrients, displace pathogenic bacteria, adjust the pH of the intestinal tract, making it a more hospital environment for friendly bacteria, and can function in any environment.

HSOs are extremely hardy and survive with or without oxygen, in acid or alkaline conditions.

Prebiotics

Prebiotics are non-digestible carbohydrates such as oligosaccharides that nourish and aid friendly bacterial flora (e.g., lactobacillus and bifidobacteria.) Some of the same benefits as ingesting probiotics can be achieved by taking prebiotics.

Foods high in fructooligosaccharides are: apples, artichokes (globe but especially Jerusalem), bananas, blackberries, carrots, garlic, and peas.

Birds suffering from serious problems like digestive disorders, malabsorption of nutrients, sluggish immune system, and other symptoms of chronic disease would benefit from a regimen that includes supplementing with therapeutic levels of Probiotics, HSOs, and Prebiotics combined.

Carotenes and Essential Fatty Acids

Some species of birds, like African Greys and Red-bellied Macaws subsist mainly on palm fruits with a high carotene content. These types of birds would benefit from the addition of unrefined Red Palm oil to their diet. Be sure the red palm oil you purchase is unrefined or it will have no carotenes present.

Most seeds, nuts, and grains are higher in Omega 6 than in Omega 3 fatty acids. (There are exceptions.) The proper ratio should be 2 parts Omega 3 to one part Omega 6.

One way to get more Omega 3 fatty acids in the diet is to supplement with Flax seed oil or to grind flax seeds just before serving then sprinkle the powder over your bird's soft food.

Another option is to add a blended oil, such as Udo's Choice, to your bird's food. Make sure these fragile oils are from the refrigerated section of the health food store and keep them refrigerated. Taste the oil to make sure it is not rancid. Rancid oils should never be fed to your birds. Never cook with flax, evening primrose, borage, or any other oil that will become damaged by heat. These oils can be served as a salad dressing or food topping.

Foods to Limit

In general, foods that are processed, cooked, and alien to the natural diet of a species should be limited. Other foods that a bird shouldn't see very often are those that offer little in the way of nutrition.

Since companion birds are sedentary compared to their wild counterparts, they cannot afford many calories that do not carry beneficial nutrients. Grapes were mentioned earlier. Birds love grapes, but all the nutrition of grapes is contained in the skin and in the seeds. The rest is water and sugar. Birds do not eat the skin and many owner prefer seedless grapes. My own birds see grapes about once a year. There are far better fruits to feed.

What can I say about pasta, bread, and cereal? They are all highly processed grains stripped of enzymes and natural nutrition and 'enriched' with artificial supplements plus: trans-fats in the case of bread; and sugar in the case of breakfast cereal.

True, many birds enjoy these foods but only because their human owners perverted their preferences by offering them in the first place. Now it is time to undo the harm. Limit these and substitute them with real food that will truly benefit your bird's health.

Avoid These Speaking of perversions, among them I would have to include teaching birds to crave candy, ice-cream, cake, cookies, french fries, chips, and the like.

We love our birds, our dogs, our kids, and one of the ways we show love is to feed them. It is especially pleasurable to feed them things that fill them with enthusiasm. It certainly is no pleasure to have them ignore what we offer. However, with very little effort, we can teach them to be enthused about fruits and vegetables.

It is hard not to personalize the way they respond to what we feed them. If they reject their food, aren't they rejecting us? If they love their treats, don't they love us too? Not so. If parrots enjoy a food, it is the food they like, not us. If parrots demonstrate a dislike for a food, it is not a reflection of how they feel about us. Please be assured that they will still love us if we feed them a healthy diet that does not include cookies.

Set yourself a goal of Zero Percent junk food. Make every calorie count toward good nutrition for your bird.

Putting the Pyramid to Work

There you have it, a completed food pyramid for parrots who live and feed in the canopy!

Now that you have read a bit about constructing a food pyramid for parrots, you will be relieved to know that you do not have to remember all the technical jargon. Just as you do not require a degree in nutrition in order to feed your children a healthy diet, you do not need such knowledge to feed your birds a healthy diet. All you need is a little self-discipline and a food pyramid.

Let's feed Harry as an example of how it works.

Everything balances out over a few days time just as it does for you as long as you consume food from each food group every day.

Harry is a 6 year-old Solomon Island Eclectus. His first meal of the day is a mixture of frozen/thawed vegetables and fruit mixture. Yesterday it was a portion from a prepackaged mix of corn, peas, carrots, green beans, and lima beans plus strawberries. The total amount was about 3/4 of a cup.

Harry doesn't like strawberries (he loves cherries, blueberries, and cranberries) so he will remove them from his food cup and throw them on the cage floor unless I chop them up and mix them in with the vegetables.

On top of this mixture is added half a capsule of probiotics, half a capsule of kyolic garlic, two drops of Udo's oil blend, and half a capsule of Kyo-green. Then it is mixed together and served.

For supper, I had chili with beans and tomatoes, so I gave a portion of this to Harry, making sure that he had some pinto beans, a little shredded beef and some tomato.

Later that night I gave Harry a couple of almonds.

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Today I gave Harry a 3/4 cup portion of a prepackaged mix that includes Broccoli, cauliflower, carrots and zucchini plus chopped spinach and two or three of his beloved cherries. Again I added the supplements he had yesterday. (Next week I will not use garlic and I will offer alfalfa instead of Kyo-green to vary the supplements.)

Mid-afternoon I will give him 1/5 stalk of fresh celery, 8-10 cranberries, and 1/4 hard-boiled egg with shell.

Since I'm feeding all of the birds sunflower seeds tonight, he will get about ten of those.

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Every day when I take him out of the cage, I check his breastbone to ensure he is not too thin nor too fat. If he is carrying too much fat, I will reduce but not necessarily eliminate the seeds or nuts I feed. If he starts lose weight, I can offer him more seeds or nuts or if he is being energetic, I can increase his carbohydrate load with sweet potato or some other nutrient dense starch food.

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So to review the last two days of Harry's diet:

- about 60 - 70%% of his diet came from fruits and vegetables because I was out of greens. Otherwise, I would have reduced the fruit and vegetables a bit and substituted greens.
- about 20% of his diet was seeds and nuts
- another 15% was animal protein and cooked legumes
- about 1% was supplements.

It was easy to figure out by portion size and I had the pyramid to guide me. I touched all the bases. On this diet Harry is maintining is weight well and there is no room for crackers, cake, or any other unnatural junk food.

There are only three things to remember using this system:

1. Fat has about twice the calories of protein or carbohydrates. Never eliminate healthy fats, but do portion them accordingly.
2. You do not need to worry about feeding the exact correct ratio of protein to fat to carbohydrates every day. Everything balances out over a few days time just as it does for you as long as you consume food from each food group every day.
3. It is only when you feed the same food day after day, as in pellets, that you must insure exact correct proportions of nutrients are fed at each meal.

Now lets look at a couple of other pyramids.

Research the Natural Diet of your Species

Unfortunately, detailed and reliable fields studies for particular species of parrot are not always available. Further, reading about the crop contents of a 'sacrificed specimen' only tells us what the bird was eating when it was killed. It doesn't reveal what the bird consumes throughout the year or what it favors while breeding or feeding young. However, such reports are all the information we have for some species. It is a start.

Information about some species consists of scattered bits and pieces that can be pulled together from different sources. Some of these

sources are ornithologists, bird watchers, vacationers on field trips, and naturalists from many countries. Many of these people have websites and use them to share their adventures, observations, and photos. Other sources include University student field trips in areas of zoology and botany.

Surprisingly, botanical studies can provide important clues about edible fruit, seeds, and nuts in a particular area. Joseph Forshaw's Parrots of the World and Thomas Arndt's Lexicon of Parrots often list the botanical names of trees and bushes from which birds forage. Typing those names into internet search engines can tell you about the plant, where it grows, what kind of fruit it bears, what kinds of birds feed from it, and other kinds of flora that also grow in the same area. Some of these plants could be exotic ornamentals growing in your own backyard.

Then there are the bird trappers and importers from the '70's, '80's, and early 90's. They 'know stuff' but most of them aren't sharing, at least not publicly. Hidden in their memories are important clues to parrots' foraging and social habits.

Pyramid for Large Macaws

The smaller macaws, such as Noble, Hahn's, Severa and Military, forage on many of the same foods as other canopy feeders do. As always, there are exceptions to this. For example, the Red-bellied macaw feeds almost exclusively on the fruit of the Buriti palm, which provides high levels of carotenes and very low fat. However, insects and other bugs most likely are also included as a portion of the diet, which would increase the protein and fat levels. Red-fronted macaws forage on cactus fruit (nopal) and leguminous trees and shrubs plus availble seeds and berries.

Larger macaws are equipped by their strong, large beaks to partake of foods not accessable to less powerful birds. Each favors certain foods in its ecological niche, but in general, the large macaws include more of the high fat seeds and nuts in their diets.

According to Thomas Arndt's Lexicon of Parrots: Blue and gold macaws forage on a "variety of ripe and unripe fruits (e.g Mauritia vinifera, Astrocaryum sp., Bactris sp., Maximilianea), mango, nuts (brazils, various palm nuts), seeds (e.g Hura crepitans), berries, flowers and vegetable matter foraged in trees; probably also insects and their larvae; almost daily flights in morning and evening to ccollpas (clay banks) to feed on mineral-rich soil; this believed to neutralize toxic content of unripe fruits."

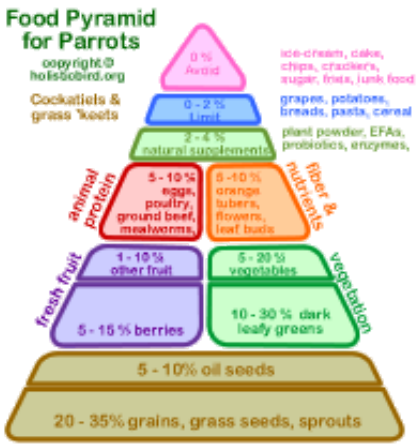
Green Wing Macaws forage on foods similar to those sought by Blue and Gold Macaws.

Hyacinthine Macaws require an even higher fat content than the Ara species. Although they consume a variety of palm fruits including Acrocomia lasiopatha, Astryocaryum tucuma, Attalea phalerata, Acrocomia aculeata, Syagrus commosa, Attalea funifera; plus other ripe and unripe fruits, figs and berries, they also feed on any available nuts and vegetable matter. Thomas Arndt reports one observer seeing them feed on water snails and one can surmise from this that they would not miss an opportunity for partaking of other animal protein.

The pyramid for large macaws reflects the increased fat requirement of

larger macaws but does not ignore their need for other nutrients.

Pyramid for Cockatiels and Grass 'Keets



Cockatiels, budgies, rosellas, and other grass parakeets forage mainly on the ground among grasses, hence the nick name. The major portion of their diets consist of seeding heads of grasses but other foods of which they take advantage are seasonal berries, bugs, and no doubt the occasional snatched beakful of leaf, grass, and ripe flower seeds when available.

This pyramid needs to be adjusted by the owner for each special bird.
Domestic budgies, for example, are quite a bit different from their wild counterparts. They are nowhere near as active and they are prone to fatty lipomas, cancerous tumors, and thyroid problems. Budgies prone to fat would benefit from more greens and sprouts than oil seeds in their diet.

More active birds, such as rosellas, if they live in an aviary instead of being confined to small cages, can have increased levels of oil seeds and carbohydrates, especially in cold weather.

Overall, this pyramid emphasizes the grass 'keets' natural diet of grass seeds as the base while recognizing that other foods are required to provide nutrients absent from or low in seeds.

Other pyramids for other species of birds can be designed by doing a little research on their natural diet, taking your own bird's special needs into consideration, and adjusting the components accordingly.

Strategy for Feeding

Many birds prefer to eat seeds over any other foods. So, if they are offered vegetables and seeds at the same time, they will eat eat the seeds and leave the rest. Therefore, birds should be fed at least twice a day.

A bird's first feeding of the day, while it is hungry, should be greens, fruits and vegetables. If the bird likes to pick out and discard less favored foods, you may find it necessary to lightly chop/shred the foods together in a blender before serving. One of the healthiest birds I saw back in the '80's was an Amazon who was fed this way.

Foods that have been cooked, frozen/thawed, or chopped/shredded, must be removed from the food dish within a couple of hours after serving because of bacterial growth. For folks who leave for work or school in the morning and will not return until evening then, this is not an option.

An alternative for these folks is to feed sprouted beans and seeds as the first meal. Since sprouts are living food, they will not spoil if left in the cup for 8 hours. Vegetables and fruit can be fed when the owner returns home from work or class.

The last feeding of the day would be seeds and/or nuts. Remove anything the bird has not consumed before going to bed. This will insure hunger for other food in the morning.

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