# Brewer's Yeast or not?

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Do you ever wonder what all the supplements and little dietary extras actually do for your bird? If you would like to know more about what your feeding regime does for your birds then read on!

Pet birds do not get the opportunity to search for food outside as they would in their native environment. Foraging allows a bird to feed selectively and to supplement its diet in the event of the nutritional balance of the diet being inadequate. The captive bird is therefore dependent on its owner to provide a complete and balanced diet. This places a heavy responsibility on the owner to supply an adequate, balanced diet.

Confusion may occur when nutritional knowledge is transferred between species: what is good for humans is not always good for birds. This article is not intended to be a complete guide to budgie feeding but aims to give budgerigar breeders more background so they are able to make informed decisions about their own aviary nutrition.

It is scientifically accepted that maternal condition is responsible for chick size, vigour, early feeding behaviour and immune response to illness. The nutritional status of the parents is likely to be important over a very long time period, and its influence may extend beyond just the next immediate generation. However, the most dramatic consequences of nutrition appear to occur during the breeding season itself where nutrition can influence sperm quality, nutrient deposition into yolk, egg formation, hatchability, and both short and long term viability of the young.

The 3 major food groups, protein, fat and carbohydrate, are further sub-divided up into classes of nutrients; all of which are essential for health. As well as these nutrients, birds also require energy (fuel). Energy can be gained from any of the nutrient groups but how much energy and how easily it can be used vary greatly. For example, carbohydrates such as starch provide an easily used source of energy and fats provide a more concentrated form of energy that is more difficult to use instantly.

Energy supply in budgerigar diets is plentiful, even to excess, so limiting energy whilst maintaining sufficient levels of key nutrients is often a challenge in budgerigar feeding. The list of nutrients required for maintaining health is extensive so this article will focus on some of the most important and easily improved by breeders.

**Protein**

Protein is made of building blocks called amino acids. Birds absorb these amino acids from the gut in a very particular ratio. The ratio of amino acids in a protein source is called its amino acid profile. If the profile of amino acids is wrong in protein, very little of the protein is absorbed. The closer the amino acid profile in the protein is to the amino acid profile required by the bird, the better its quality. An ‘ideal’ protein is one where the amino acid profile perfectly matches the requirements of the bird. In reality, there is no such thing as an ideal protein but egg is usually regarded as the closest to the ideal that we can get.

Sometimes diet components can be mixed together to produce a diet with a good amino acid profile. If the diet is not balanced for amino acid ratio, no amount of supplementation with vitamins or minerals will help. This is where egg food, sprouted seeds and supplemented seed mixes play an important role in breeding. They all contribute different amino acids to the seed-based diet, ensuring the breeding birds are able to absorb plenty of protein in the correct amino acid ratio. If dietary protein is scarce or not available in the correct amino acid ratio, the breeding female will either produce fewer or no eggs or sacrifice her own stores of amino acids (usually in skeletal muscle) to ensure the amino acid profile of the egg is always perfect.

Protein quality in the pre-laying diet also influences breeding success since birds appear able to store essential amino acids in muscle. A study fed two different diets prior to pairing up, one with a poor amino acid profile and one with a good amino acid profile. After pairing, all birds received the same diet but those which had received the better protein diet leading up to lay produced almost twice the weight of eggs and raised three times as many young as those who were fed the poorer diet. Females were also in better condition after laying, losing less muscle mass than the females fed the lower quality diet. Egg supplemented diets have also been shown to improve immunity in young chicks, leading to improved disease resistance.

Protein is not only required for growth and breeding but also for general maintenance of condition. Feathers comprise a large proportion of the total protein in birds, particularly in the sheath. Dietary deficiencies in the amino acids cysteine and methionine may cause feather deformities and deficiency in the amino acid lysine reduces feather strength. The production of feather sheaths during moult increases the protein requirement from the diet. Once again, it is vital that the extra protein provided has an appropriate amino acid profile or the protein will be wasted. When excessive amounts of protein or a poor amino acid profile are fed in the diet, the bird has to break down and excrete this spare protein. The spare protein is also an energy source, which will make birds fat if they do not need this extra energy.

**Vitamins and antioxidants**

Vitamins are natural components of food found in minute quantities but essential for health. There are six groups of vitamins, which are divided into two basic types. The water-soluble vitamins (B and C) are not stored in the body and so any deficiency in these tends to be quickly apparent, hence daily supplies are essential. The fat-soluble vitamins (A, D, E and K) are well stored in fat and the liver and so daily intake is less critical as long as regular intake occurs.

Each group has its own set of functions and when severely deficient in the diet, display their own set of characteristic deficiency symptoms. The effect on the metabolism is proportional to the level of deficiency so that when deficiency is mild, the symptoms are vague and non-specific. However, breeding is extremely sensitive to vitamin and mineral deficiencies and is often affected long before adult birds show any signs of deficiency. Concentration of vitamins are measured in international units (i.u.) per kg diet or milligrams (mg) per kg diet or mcg (micrograms) per kg) or ppm (parts per million).

Several vitamins are now known to have health benefits beyond alleviating their recognised deficiencies; these are known as antioxidants. The body constantly reacts with oxygen as part of the energy producing processes of cells. As a consequence of this activity, highly reactive molecules are produced known as free radicals. These interact with other molecules within the cell, which can cause oxidative damage to proteins, membranes and genes (oxidative stress). This

damage has been implicated in the cause of certain diseases and speeds up the ageing process within cells. Free radicals can be neutralised by a combination of antioxidants produced by the body and those supplied in the diet neutralise free radicals.

Reproduction causes oxidative stress to the parent birds so diets containing antioxidants are beneficial. Hatching also causes oxidative stress, and it is well accepted that addition of antioxidant sources to maternal diet improves the antioxidant status of chicks.

**Role of Vitamins**

Vitamin A is necessary for healthy skin and mucus membranes, including the lining of the mouth, sinuses and cloaca. The low levels of vitamin A in seed diets have made vitamin A supplementation a standard diet feature. However, a two-year experiment feeding female cockatiels varying levels of vitamin A concluded that they are much more susceptible to vitamin A toxicity than deficiency. This is not to say vitamin A supplementation is unnecessary but serves to highlight the importance of correct dosage. Vitamin A can also be given to birds in a different form as beta-carotene. The bird is able to transform beta-carotene into vitamin A as required but, unlike vitamin A, beta-carotene is not stored in excessive amounts by the bird so there is no risk of toxicity.

The B vitamins are a large group of compounds that work together to promote growth, reproductive health, nervous system function, resistance to disease, feather and skin health, and many other functions. They are among the most important group of vitamins for birds, due to egg production and the rapid growth requirements of chicks.

The B vitamins currently known (there may be more) include B1 (thiamine), B2 (riboflavin), B3 (Niacin), B6 (pyridoxine), B9 (Folic acid), B12 (cyanocobalamin), Biotin, Pantothenic acid, choline, inositol, and PABA (para-amino benzoic acid). The total spectrum of the B vitamins has not yet been completely identified, and all of their functions are not known.

It is known that the B vitamins work together, which is called working synergistically. Like the fat-soluble vitamins, the B vitamins also compete for uptake so too much of one or more B vitamins can bring about a deficiency in other B vitamins. Thus the complete spectrum of B vitamins needs to be consumed. The B Vitamins assist the body in responding to stress, so this vitamin is even more important during breeding, moulting, and quarantine periods. These vitamins also aid in the digestion of carbohydrates and proteins.

Vitamin C is a metabolic regulator. In most species of seed-eating birds vitamin C is synthesised in the liver in sufficient quantities to avoid deficiency symptoms but the antioxidant properties of vitamin C mean it still provides benefits as a supplement in the diet.

Vitamin D is necessary for the absorption of calcium and phosphorus from the gut into the body. Vitamin D comes in many slightly different forms. The formed required by birds is 1,25-dihydroxycholecalciferol: Vitamin D3. Birds can make their own vitamin D3 if they have access to UV light (from a UV lamp or daylight).

It is obligatory for adequate vitamin D3 to be available for the proper absorption of calcium and phosphorus to take place. Inadequate vitamin D3 levels in the body can lead to calcium deficiency symptoms in an otherwise calcium-adequate diet.

Vitamin E is the fertility vitamin. High levels of Vitamin E (a potent anti-oxidant) have been shown to improve chick quality and boost immunity. Vitamin E is one of the least toxic vitamins, however, very high doses decrease absorption of vitamins A, D and K, resulting in reduced liver and egg yolk storage of vitamin A and impaired bone mineralization. Vitamin E also influences male fertility: avian sperm benefit from increased antioxidant levels in the diet.

Vitamin K is necessary for blood coagulation. It is found in green plants and can be produced by the normal bacteria in the birds' bowel. It is in fact quite difficult to produce a vitamin K deficiency unless antibiotics have been overused and have killed all of the bacteria in the bowel or birds are prevented from eating their own droppings or probiotics are not used.

**Table 1: Good sources of each vitamin and 3 key amino acids:**

| | |
|---|---|
| **Vitamin A** | **Yellow squash, sweet potatoes, carrots, egg yolks, kale, cod liver oil, broccoli, chicory, chard, green peppers, dandelion, carrots** |
| **Vitamin B** | Eggs, cheese, nuts, sunflower seeds, millet seeds, green leafy vegetables, broccoli, bananas, wheat germ, brewer's yeast, liver, Marmite, (some sources all contain some but not all of the B vitamins |
| **Vitamin C** | Broccoli, red peppers, green peppers, tomatoes, peas, kiwi fruit, oranges, strawberries, melon |
| **Vitamin D3** | Egg yolk, sunlight, cod liver oil, oily fish, sweet potatoes, dark green leafy vegetables |
| **Vitamin E** | Egg yolk and white, green leafy vegetables, watercress, oats, wheat germ, almonds, cashew, corn, sun flower seeds, liver, pumpkin seeds |
| **Vitamin K** | Kelp, alfalfa, green leafy vegetables, eggs, soya beans, Lysine Legumes (e.g. peas, soya), high lysine corn, poultry, fish, eggs, dairy products, nuts, meat and brewer's yeast. Methionine + Cysteine Spinach, green peas, nuts, meat, sesame seed, egg |

**Keeping vitamins balanced**

It can be seen from the descriptions above that all the vitamins have essential roles in maintaining health. Even in diets carefully supplemented with every vitamin on the list, it is possible for your bird to have vitamin deficiencies: the fat-soluble vitamins often share a special carrier protein that transports them from the gut into the body tissues. They have to compete for these absorption sites in the gut and any of them can be squeezed out through over-supplementation of another vitamin.

Dietary excess of one vitamin can diminish uptake and lead to deficiency of another, despite adequate levels in the diet. Vitamins not only interact with each other but also with other substances such as amino acids and minerals. The most significant relationships between vitamins and minerals are the relationship between calcium, phosphorus and vitamin D3 and the relationship between vitamin E and selenium. Vitamin E and selenium perform the same role: if one is deficient, then the other can

make up the difference. The B vitamin niacin and the amino acid tryptophan are also able to substitute for each other. Current recommendation levels and dietary sources of vitamins are shown in the table below (table 2).

**Table 2: Recommended level of vitamins in budgie diets:**

| | MIN | MAX |
|---|---|---|
| **Vitamin A activity (total) IU/kg** | 2000 | 10000 |
| **Vitamin D3, ICU/kg** | 500 | 2000 |
| **Vitamin E, ppm** | 50 | unknown |
| **Vitamin K, ppm** | 1 | unknown |
| **Biotin, ppm** | 25 | unknown |
| **Choline, ppm** | 1500 | unknown |
| **Folic acid, ppm** | 1.5 | unknown |
| **Niacin, ppm** | 50 | unknown |
| **Pantothenic acid, ppm** | 20 | unknown |
| **Pyridoxine, ppm** | 6 | unknown |
| **Riboflavin, ppm** | 6 | unknown |
| **Thiamine, ppm** | 4 | unknown |
| **Vitamin B12, ppm** | 0.1 | unknown |

**Vitamin toxicity**

The water-soluble vitamins are not stored in the body so a daily supply is required. This also means that overdosing with water-soluble vitamins is less likely although B vitamin overdose is possible and excessive vitamin C may cause irritation to the gut and diarrhoea.

The fat -soluble vitamins are stored in the body and overdose of these vitamins is much more serious. Table 2 shows the current recommended levels of vitamins and maximum recommended levels of vitamins A and D. Excessive supplementation of the other vitamins is also detrimental for the reasons discussed earlier but exact maximum figures have not yet been determined.

## Minerals

The mineral status of the laying female determines the amount of each mineral transferred to the egg and the mineral stores of the hatchling. There is a complex set of interrelationships that exist between the different minerals in the bird. This is largely as a result of the fact that in order for minerals to be absorbed by a bird, they first need to be transported across the gut wall, mostly by what is known as a carrier protein. The different minerals are believed to compete for these proteins, which is why an excessive level of a mineral can and does inhibit the absorption of another. Certain minerals also have key roles in reproduction. This will be covered in more detail in a future article.

In conclusion, this article is an overview to help breeders in deciding whether a new diet ingredient might be of benefit to their aviary or whether they have already accounted for those nutrients in their feeding regime. Remember: more isn’t always better! Unless dietary protein is well balanced, all the vitamin/mineral supplements in the world are not going to help breeding and in excess they may harm your birds. All the nutrition facts stated in this article are taken from scientific reports.

## Nutritional Supplements

Budgerigars may eat corn as a treat now and then, but be sure to include treats that supplement your bird's nutrition. Cod liver oil helps indoor budgies manufacture vitamin D, while a pinch of brewer's yeast every other day will help them get their B vitamins. Add eight drops of cod liver oil to each pound of birdseed. You can also feed budgies a bit of boiled egg yolk combined with cracker crumbs for protein, or a small amount of bread soaked in milk.