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Welcome

Harrison's Bird Foods (HBD International Inc.) and Avifood of Germany are proud to sponsor this *Advances in Companion Bird Nutrition Symposium*, and we acknowledge Univ.-Prof. Dr. med. vet. Rüdiger Korbel for making this opportunity possible. We are very proud of the distinguished group of international speakers who represent bird clients from five countries (on three continents). We appreciate their commitment to the cause of better care for companion birds through nutrition. We are also proud of the results people worldwide are sharing from their feeding of organic formulated diets to birds, both from scientific and empirical standpoints. We stand ready to improve these formulations as more data becomes available. We hope you enjoy this symposium. Please let us know how we can be of further service to you.

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Nutritional Status of Wild Psittacines: Optimizing the Balance of Fat-soluble Vitamins

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The fat-soluble vitamins are a group of nutrients that require dietary fat to facilitate uptake and are stored for extended periods of time in the body. Therefore, dietary requirements are influenced by previous dietary concentrations and dependent on body stores. In order to establish dietary requirements for pet and aviary birds, it is necessary to establish baseline data from wild birds that can then be used to evaluate controlled scientific studies of captive birds.

VITAMIN A

Vitamin A is necessary to support growth and basic health of birds. Vitamin A deficiencies are commonly associated with seed-based diets and contribute to at least four distinct problems: a loss of vision, defects in reproduction, defects in growth and defects in the differentiation of epithelial tissues, often resulting in keratinization. However, symptoms of vitamin A deficiency can often resemble those of toxicity, with hyperkeratosis and alterations to vocalisations of birds resulting from both deficiencies and excesses of the vitamin (Koutsos and Klasing, 2002). Vitamin A is essential for maintaining healthy epithelium but excess retinol penetrates the lipid portion of the membrane leading to expansion, while the protein portion of the membrane resists expansion, resulting in a weakened membrane. This increases access to pathogens and development of infection. Excesses of vitamin A have also been associated with pancreatitis in cockatiels (Koutsos and Klasing, 2002).

Although up to 90% of vitamin A is stored in the liver (McDowell, 2000), vitamin A status is regularly evaluated from blood samples alone. However, studies of wild psittacines indicate a poor correlation between hepatic (33-824 mg kg^{-1}) and serum (0.46-1.85 μmol L^{-1}) vitamin A concentrations, with significant taxonomic differences in both values (McDonald, in prep).

Vitamin A Toxicity in Lorikeets

There is no indication that nectarivorous birds have a high dietary requirement for vitamin A, yet nectar products are continuously formulated with high vitamin A concentrations. A study of captive lorikeets maintained on formulated diets containing up to 10,000 mg kg^{-1} vitamin A showed a high percentage of embryonic deaths at 2 weeks of age characterized by small embryos, high hatchling mortality, a decline in egg fertility and thin-shelled eggs common in first season birds (McDonald and Oldfield, 2003). Feather condition was also compromised in 10% of birds, including elongated oval marks in the centre of back feathers, general irregular spotting and loss of pigment on back feathers and underneath the legs, and marked deterioration of the ends of otherwise good feathers with black edges. While hepatic vitamin A concentrations of wild lorikeets range between 29-56 mg kg^{-1}, levels in captive birds were significantly higher (97-4093 mg kg^{-1}), with rapid increases when wild birds were transferred to formulated diets (90 mg kg^{-1} after 1 month, 588 mg kg^{-1} after 6 months). Hepatic vitamin A concentrations of day old chicks (46.1-61.6 mg kg^{-1}) were higher than 6-month-old wild birds (19-38 mg kg^{-1}), with rapid depletion up to 4 weeks of age (3-7 mg kg^{-1}), possibly contributing to poor hatchling survivorship.

Excess dietary vitamin A can interfere with uptake of other fat-soluble vitamins, with deficiencies of vitamin D implicated in abnormal feather condition and aberrant pigmentation as well as poor hatchability and embryonic death (McDowell, 2000). While hepatic vitamin E concentrations appeared to be adequate, interference by vitamin A in micelle formation may have prevented sufficient uptake and contributed to infertility, embryonic degeneration and immunodeficiency. Encephalomalacia generally affects chicks deficient in vitamin E from 2-6 weeks of age, with symptoms evident in one chick that appeared healthy but died stretched out with clenched feet and erratic head movements. Improvements in fertility, hatchability and feather condition were evident when birds were transferred to a diet supplemented with

carotenoids (spirulina) and vitamin E (wheat germ oil) and devoid of vitamin A. While vitamin A concentrations of birds in this collection are declining, hepatic vitamin A remains high in some birds and it is possible that overall improvements in health will not be evident for some time (studies of cockatiels indicate a period of up to 18 months is required on a diet devoid of vitamin A before symptoms of deficiency occur; Koutsos and Klasing, 2002)

Vitamin A and Iron Storage Disease

Iron storage disease (ISD) is problematic for a variety of frugivorous and insectivorous species as well as a number of psittacines (Rosskopf et al, 1992; Rupiper and Read, 1996; Gerlach et al, 1998). While genetic predisposition and immunological stress have been implicated in the aetiology of ISD, nutritional inadequacy appears to be of primary importance. Dietary iron concentrations less than 80-100 mg kg^{-1} are recommended, yet psittacines have been maintained on organic formulated products relatively high in iron (approximately 150 mg kg^{-1}), with no evidence of disease development.

Dietary iron intake may be less important than concentrations of nutrients that influence iron uptake. Vitamin C (ascorbic acid) increases absorption by facilitating the conversion of the ferric form of iron to the more absorbable ferrous state, with vitamin C content of commonly available fruits generally higher than many wild fruits. Fruits high in vitamin C such as strawberries, cantaloupe, orange and papaya should be restricted in the diets of birds susceptible to ISD. Diets high in saturated fats may alter the fatty acid composition of the intestinal mucosa and increase the absorption of iron. While some insects contain large concentrations of fat, those from colder climates contain high proportions of unsaturated fatty acids. Thus, replacing these diets with commercial canine and feline foods that are high in saturated fats may promote development of the disease in some insectivorous species. Vitamin A enhances the uptake of iron, with the conversion of vitamin A from selected carotenoids controlled by a negative feedback mechanism, thus preventing vitamin A toxicity in wild birds. While vitamin A levels are low in insects (Barker et al, 1998) and absent in plants (plants provide carotenoids and contain no preformed vitamin A), commercial diets generally exceed requirements established for either poultry (1,500 mg kg^{-1}; NRC, 1994) or cockatiels (4-6,000 mg kg^{-1}: Koutsos and Klasing, 2002), and may promote the uptake of iron.

In evaluating iron status of birds, blood concentrations do not reflect hepatic concentrations in wild Australian psittacines (McDonald et al, subm) plasma iron concentrations (36-484 μmol L^{-1}) generally exceed those deemed maximal for birds susceptible to ISD (27 μmol L^{-1}; Worell, 1993), while hepatic iron concentrations (110-1030 mg kg^{-1}) are generally higher than values reported for other birds in captivity (60-300 mg kg^{-1}; Worell, 1993; Rupiper and Read, 1996) and do not support findings by Dierenfeld and Shepherd (1989) that hepatic iron concentrations of granivorous birds are below 50 mg kg^{-1}.

Vitamin A Toxicity and Pigmentation Loss in Passerines

Carotenoids are responsible for many of the bright feather colours in passerines. However, the uptake of carotenoids follows a similar pathway to fat-soluble vitamins and an excess of vitamin A can impact on the expression of feather colour in passerines. When the helmeted honeyeater (*Lichenostomus melanops cassidix*) was maintained on a variety of commercial nectars high in vitamin A, the bright yellow feather color was replaced with near-white feathers until presented with a home made diet including egg yolks. Analysis of the feathers indicated that the predominant carotenoids were lutein and zeaxanthin, chemicals that are commonly found in the eggs of hens fed maize. Despite being provided with mixed carotenoids in the formulated products, it is likely that the excessively high vitamin A concentrations prevented the uptake of lutein and zeaxanthin from the diet.

VITAMIN D

Imbalances in dietary calcium, phosphorous and vitamin D are problematic for a number of pet and aviary birds, with hypocalcaemia prevalent in birds maintained on seed-based diets or kept indoors under inappropriate lighting conditions. In contrast, hypercalcemia is common in birds such as budgerigars (*Melopsittacus erithacus*: Roset et al, 2000) and blue and gold macaws (*Ara ararauna*: Phalen, pers comm) when maintained on diets exceeding 0.7% calcium, with many formulated products exceeding 0.9% calcium, exacerbated by calcium supplementation.

An evaluation of calcium status should include an assessment of the biologically active ionic portion and not be confined to studies of total calcium. While studies of wild Australian psittacines indicate little taxonomic variation in serum ionised calcium (0.92-1.14 mmol L^{-1}), significantly greater taxonomic variation in phosphorous concentrations (0.79 mmol L^{-1} *Cacatua galerita*; 2.41 mmol L^{-1} *Cacatua tenuirostris*), influences Ca:P ratios (McDonald, subm). Taxonomic variation is also evident in vitamin D concentrations (14.17 μmol L^{-1} *C. tenuirostris*; 23.33 μmol L^{-1} *C. galerita*) but it is not clear whether temporal variation influenced these results (McDonald and Stanford, 2003). Despite the greater susceptibility of African grey parrots (*Psittacus erithacus*) to calcium

deficiency, both serum vitamin D and ionic calcium concentrations are similar to those of wild sulphur crested cockatoos. It is possible that UV-B radiation or activity of the parathyroid gland is of greater importance in maintaining adequate calcium status in psittacines.

VITAMIN E

Vitamin E is an important nutrient that is often overlooked in the diet of pet birds. A membrane stabilizer and extremely potent antioxidant, vitamin E maintains the phospholipid structure of cellular membranes, with disruption of this membrane impairing biochemical reactions and increasing access to pathogens. Symptoms of vitamin E deficiency are varied and include neuromuscular, vascular and reproductive aspects such as decreased hatchability, slowed embryonic growth and differentiation, reduced viability of newly hatched chicks (Hvidsten and Herstad, 1973) and male infertility (Surai, 2002). They are mainly attributed to membrane dysfunction, due to the high polyunsaturated fatty acid content of the membranes, which increases susceptibility to lipid peroxidation and cellular breakdown.

Micelles formed from dietary lipids serve as the delivery system for vitamin E to reach the absorptive surface of the gut. There are a number of processes involved in vitamin E absorption, with impairment of any of these stages decreasing assimilation from the diet. In order for vitamin E to be absorbed there must be appropriate dietary lipids, pancreatic activity and production of lipases, and production of bile salts that form structural components of micelles. Exposure to toxins/pesticides may interfere with the formation of micelles and thus decrease vitamin E assimilation despite adequate dietary intake. Excesses of other nutrients that also interfere with vitamin E assimilation include: vitamin A, minerals (copper, iron and zinc) and carotenoids (excess canthaxanthin; Blakely et al, 1991 and excess ß-carotene; Woodall et al, 1996).

Stress Conditions

Being maintained in stressful situations can increase dietary requirements for vitamin E as stress can lead to an overproduction of free radicals, which in turn lead to oxidative stress. It is not always possible to detect if birds are exposed to stressful conditions as these are varied and include:

- ***Nutritional stress:*** Nutritional stress can result from an excess of vitamin A, which leads to oxidative stress, and decreases vitamin E and carotenoid tissue concentrations, increasing tissue susceptibility to lipid peroxidation (Surai et al, 1998). Decrease in vitamin E assimilation may be a result of retinyl ester effect on micellar solubilization of tocopherol (Combs et al, 1996). Polyunsaturated fatty acids (either in the diet or as part of a cellular membrane) increase the possibility of lipid peroxidation. Toxic products of lipid peroxidation may damage the brush border membrane of the intestine (Kimura et al, 1984), decreasing the absorption of antioxidants. The passage of lipids (and thus vitamin E absorption) through the brush border membrane is passive and absorption rates depend on chain length and degree of unsaturation of fatty acids (Krogdahl, 1985). Excesses of minerals such as copper, iron and zinc can decrease concentrations of plasma tocopherol.
- ***Environmental:*** Environmental stresses include extremes of temperature, humidity, insufficient oxygen or extremes of radiation,
- ***Internal:*** Internal stresses include infections from bacteria and viruses as well as allergic reactions to foods or environmental parameters.
- ***Medication:*** Preventive medication such as coccidiostats or other veterinary drugs in the diet can decrease antioxidant assimilation or increase the requirement to combat stress (Surai, 2002).
- ***Toxins:*** Oxidative stress from exposure to toxins/pesticides can decrease immunocompetence, decrease reproductive performance and increase the requirement for antioxidants.
- ***Others:*** Stress can also arise from overcrowded situations, interactions with other birds, noise, pollutants, breeding, etc.

Therefore, just because a bird looks healthy and happy does not mean it is not subject to stress of some nature and values recorded for wild Australian psittacines (serum, 3.6-23.3 μmol L^{-1}; liver, 1.9-7.0 mg kg^{-1}: McDonald, in prep) may not be indicative of vitamin E status required for captive birds.

Dietary and Cellular Fatty Acid Composition and Susceptibility to Lipid Peroxidation

Dietary fatty acids as well as fatty acid composition of cellular membranes can influence lipid peroxidation. Essential fatty acids of the *n-3* family are more susceptible to lipid peroxidation than those of the *n-6* family. The enzymatic systems that perform chain elongation and desaturation handle all groups of fatty acids with the *n-3* family more effective at suppressing metabolism of the *n-6* family than vice versa. Therefore, despite the anti-inflammatory benefits of *n-3* fatty acids, increasing fats of this nature will significantly out compete *n-6* fatty acids for uptake and increase susceptibility to lipid peroxidation.

Polyunsaturated fatty acids have a structural function as an integral part of the phospholipid membrane. In essential fatty acid deficiency, *n-3* and *n-6* membrane lipids are replaced

with *n-9* fatty acids with a deleterious effect on biomembrane function and integrity. The higher proportions of PUFA in lipid fractions of spermatozoa reflect the need to maintain high membrane fluidity and flexibility for sperm motility and fusion with the egg (Surai, 2002). Since sperm cannot undertake extensive repair of damaged membranes (Hammerstedt, 1993), their function (especially motility) can be irreversibly altered in the absence of adequate antioxidants (such as vitamin E), leading to infertility or even permanent sterility. As little as 40 mg/kg vitamin E increases susceptibility of sperm to lipid peroxidation, while supplementation of vitamin E at 200 mg kg^{-1} can minimise peroxidation and combat age-related declines in sperm productivity (Surai, 2002).

In contrast to mammalian spermatozoa (predominantly *n-3* fatty acids), the *n-6* fatty acids characteristic of avian spermatozoa, are resistant to dietary manipulation. However, an increase in dietary *n-3* fatty acids could influence susceptibility of dietary lipids and other cellular membranes to lipid peroxidation, thus increasing dietary antioxidant requirement. Studies of the wild diet of the endangered Orange-bellied Parrot (*Neophema chrysogaster*) show that *n-3* fatty acids are lowest in winter indigenous species, higher in summer indigenous species and significantly higher in introduced species. While there is a distinct lack of *n-6* fatty acids in most native species, concentrations are highest in one of the favoured winter species. Given the exposure to toxins at a water treatment complex at their main winter site, a change in the fatty acid profile of the wild diet may influence detoxification processes and is implicated in the failure of the wild population to expand (McDonald and Burgman, 2003).

Requirement for Adequate Maternal Dietary Vitamin E

Since a certain amount of vitamin E is recycled (oxidised form is converted back to the active reduced form by reacting with other antioxidants), it is difficult to induce a deficiency in adult animals. However, inadequate maternal transfer can compromise health of developing embryos and hatchlings. At day 19 of embryonic development, tissues are high in PUFA (Speake et al, 1998) but levels of vitamin E have not yet reached their peak (Surai, 1999).

An inadequate antioxidant system can compromise development of the immune system and increase chick mortality during the first weeks of postnatal development (Surai, 2002). As pipping occurs, there is an increase in oxygen for tissues (Surai, 2002), which in combination with low levels of antioxidants (vitamin E), higher temperatures and humidity can increase susceptibility of tissues to lipid peroxidation. Chicks don't all hatch at the same time, with eggs from older breeders and chicks from smaller eggs hatching earlier (Vieira and Maran, 1999). A longer time in the incubator can increase the stress placed on the antioxidant system of the newly hatched chick and a delay in food and water intake can affect some performance parameters such as delayed maturation of enzymatic systems that control metabolism (Decuypere et al, 2001). When chicks hatch, their immune, digestive, endocrine and nervous systems are still not mature and are actively developing during at least the first week post-hatch. Lipid metabolism is active and proper antioxidant protection of the newly hatched chick is crucial for future success. At the time of hatching, natural antioxidants such as vitamin E are at a maximum (Surai, 1999) but there is also an increase in the level of unsaturated fats in tissues. By day 9, stores of vitamin E in the liver have rapidly declined and the decreased concentrations of vitamin C limit vitamin E recycling. Chicks have a low efficiency of vitamin E assimilation during the first week post hatch (Paenok et al, 1985) so dietary supplementation may not be adequate, emphasising the crucial role that the maternal diet plays in maintaining physiological levels of vitamin E in chicken tissues during this time.

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Calcium Metabolism in Psittacine Birds: The Effects of Husbandry

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Calcium is the major mineral in the bird responsible for skeletal development, nerve function, muscle contraction, hormone secretion and eggshell production. Calcium metabolism is tightly regulated in birds as in mammals predominately by the hormones vitamin D_3 and parathyroid hormone (PTH) but the system is far more responsive. Birds can respond to low blood calcium levels in minutes compared with the mammalian response, which may take up to 24 hours. In the laying hen the bird is able to use up to 10% of the total body calcium content in 24 hours to produce hard-shelled eggs.

Calcium is found in three forms in the bird reported by most pathology laboratories as total calcium. This consists of free ionized calcium, protein bound calcium (mainly to albumin) and complexed calcium (bound to anions). Ionized calcium is the bio available form of the mineral and it is important to assay ionized calcium rather than total calcium wherever possible to more accurately investigate disorders of calcium metabolism. The author's laboratory recorded that 13.7% of grey parrot blood samples submitted had low ionized calcium concentrations despite normal total calcium levels.

Variations in protein levels have a profound effect on total calcium levels potentially leading to misinterpretation of results. Both vitamin D and parathyroid hormone are considered hypercalcaemic in action responding to low blood ionized calcium levels. Parathyroid hormone is produced in small amounts from the parathyroid glands and acts mainly on the skeleton to increase bone resorption. The structure of parathyroid hormone in birds differs dramatically from mammals so traditional laboratory assays are unreliable. The use of a PTH 1-34 assay appears to give the most reliable results although sample handling is still a problem as the hormone is very labile.

Vitamin D is obtained from a combination of dietary supply and endogenous synthesis. Natural synthesis occurs on the featherless areas of the skin and involves an ultraviolet light (285-315 nm) dependent reaction to form cholecalciferol. Poultry do not have a requirement for vitamin D in their diet if they receive adequate ultraviolet light. Following absorption cholecalciferol is converted to the active metabolite 1, 25 dihydroxycholecalciferol via a 2-stage hydroxylation process in the liver and kidney. Vitamin D acts mainly by increasing the intestinal absorption and decreasing the renal excretion of calcium to increase blood ionized calcium concentrations. The measurement of 25 hydroxycholecalciferol is considered the most accurate assessment of the vitamin D status of an individual as other metabolites have a very short half-life.

Disorders of calcium metabolism are common in caged psittacine birds fed seed based diets low in both calcium and vitamin D_3. They are usually kept inside so would be expected to have an ultraviolet light deficiency too. The clinical signs include hypocalcaemic seizures in adults and osteodystrophy in juvenile birds. Grey parrots are known to suffer from clinical hypocalcaemia more frequently than other psittacine species. Calcium metabolism has been extensively researched in the poultry industry revealing the complex relationship between dietary vitamin D_3, dietary calcium and ultraviolet light in the 285-315 nm spectrum. Calcium and vitamin D_3 metabolism is poorly researched in psittacine birds despite evidence that clinical signs of hypocalcaemia are common. In one study 34% of juvenile grey parrots had radiographic evidence of osteodystrophy. This study looks at the effects of diet and ultraviolet light on calcium metabolism in a group of healthy grey parrots.

METHOD

Twenty pairs of grey parrots were kept in a single span building. All the birds had been examined endoscopically to confirm both sex and maturity. The health of group was confirmed by blood and faecal analysis including PCR tests for circovirus, chlamydophila and polyoma virus. Additional blood was analysed for ionized calcium and 25 hydroxycholecalciferol concentrations. The birds were allotted to two feed groups randomly One group was fed a seed based diet (Tidymix®) without further supplementation. The other group was fed Harrison's High Potency® formulated diet without further supplementation. After 12 months further blood samples were taken for 25 hydroxycholecalciferol and

ionized calcium to investigate the effect of change of diet on these parameters. Both dietary groups were then exposed to artificial ultraviolet light in the 285-315 nm spectrum (Phillips TLD/96s tubes) for 12 hours daily. After a further 12 months blood samples were taken for ionized calcium and 25 hydroxycholecalciferol to investigate the effects of artificial ultraviolet light on calcium metabolism in grey parrots. Throughout the study the ultraviolet light was monitored in the 285-315 nm spectrum range using an Elsec UVb meter.

RESULTS

The results are shown in Figures 1-4. One female bird died in the seed-fed group over the 2-year project and has been left out of the results. Statistical comparisons between diet groups over time were made using ANOVA.

Figure 1. Effect of Diet on Vitamin D_3 Blood Concentrations (nmol/l)

	Mean	Standard Deviation
Vitamin D_3 Year 1 (All Seed fed) n=39	53.29	86.85
Vitamin D_3 Year 2 (Seed Group) n=19	102.32	127.54
Vitamin D_3 Year 2 (HBD group) n=20	130.78	127.52

Figure 2. Effect of Diet on Ionized Calcium Blood Concentrations (mmol/l)

	Mean	Standard Deviation
Ionized Calcium Year 1 (All seed fed) n=39	1.082	0.05
Ionized Calcium Year 2 (Seed group) n=19	1.14	0.06
Ionized Calcium Year 2 (HBD group) n=20	1.19	0.06

Figure 3. Effect of Ultraviolet Light on Calcium Parameters in Seed Fed Group

Seed Fed Group	Mean	Standard Deviation
Vitamin D_3 Year 2 (No UV) n=19	106.38	129.70
Vitamin D_3 Year 3 (Artificial UV) n=19	177.61	110.00
Ionized Calcium Year 2 (No UV) n=19	1.14	0.06
Ionized Calcium Year 3 (Artificial UV) n=19	1.24	0.06

Figure 4. Effect of Ultraviolet Light on Calcium Parameters in HBD Fed Group

HBD Fed Group	Mean	Standard Deviation
Vitamin D_3 Year 2 (No UV) n=20	130.74	127.50
Vitamin D_3 Year 3 (Artificial UV) n=20	168.44	109.52
Ionized Calcium Year 2 (No UV) n=20	1.19	0.07
Ionized Calcium Year 3 (Artificial UV) n=20	1.24	0.01

DISCUSSION

The study indicates that providing a diet with an increased calcium and vitamin D_3 content will significantly increase ionized calcium and vitamin D_3 concentrations in the blood despite being kept in low UV conditions ($P<0.05$). An improved diet would therefore be expected to prevent the many expressions of calcium deficiency seen in the grey parrot when kept indoors. The provision of artificial ultraviolet light also had a statistically significant effect on the ionized calcium and vitamin D_3 concentration in the blood in both dietary groups ($P<0.05$). There was no statistically significant difference between the dietary groups for either the ionized calcium or vitamin D_3 concentrations under artificial ultraviolet light. This would suggest that clinical signs of calcium deficiency could be avoided in birds fed a diet with poor calcium and vitamin D content by providing sufficient ultraviolet light in the 285-315 nm spectrum. The results of the study suggest that captive psittacine birds are best provided with both adequate ultraviolet light and a diet containing sufficient vitamin D_3 to prevent the clinical signs of hypocalcaemia. This is equivalent to findings in poultry. The owners of the birds saw a general improvement in breeding results in the Harrison's-fed group. The birds had significantly better breeding results than the seed fed group including heavier egg weights and stronger progeny. All progeny from the study group were parent reared. The progeny from seed fed birds were more likely to have radiographic evidence of osteodystrophy at 8 weeks old than the Harrison's-fed group. The progeny from the Harrison's-fed group had faster growth rates. .

Poicephalus Studbook Data Compared to a 12-year Feeding Trial Using an Organic Formulated Diet

ERIC A.W. VAN KOOTEN, BSc

Since 1985, parakeets and parrots have been successfully bred at our breeding facility. Although various kinds have been bred, the first breeding of *Poicephalus rueppellii* can be indicated as a highlight. This success has been realized by a dramatic change in the management of the nursery during the early 90s.

The basis of this change was the improvement of the well being of the parrots. Major changes were realized as far as accommodations, feed and purchase and sales policies. In addition to the changes in management, it was decided to use an avian veterinarian specializing in birds as a consultant for our breeding station. The results of these changes, of which the use of a specific feed is the main factor, will be described in this paper in comparison to the results realized by the members of the *Poicephalus* Studbook of The Netherlands.

The *Poicephalus* Studbook of The Netherlands has been founded by the author of this paper together with some other enthusiastic breeders of the *Poicephalus*. With 125 participants and more than 1150 registered birds, it is one of the largest parrot studbooks in the world. The complete list of birds and its administration were registered in a special administrative program called Zooeasy. Next to the standard control of individual bird data, the breeding administration is kept in here as well. By the University of Wageningen, a specific calculation concerning inbreeding has been developed that has been integrated in the software program applied by the studbook organization. To be able to execute additional statistical analyses, the PSN organization has developed its own software program (Studbook Management Information System - SMIS), which generates, for example, the data for the yearly-published Master Studbook. The specific software mentioned above enables the comparison of data gathered by the author and those of the PSN.

GENERAL CONSIDERATIONS

Unfortunately, my experiences are not performed by a professional research institute and therefore lack a scientific basis. An experimental and scientific model to investigate the results of using pellet-feed was difficult to realize as well.

To investigate possible breeding differences as a result of a breeding station having twelve years of experience in using HBF and a group of *Poicephalus* parrots represented by the database of the PSN, breeding data of 9 years of PSN and a total of 12 years' experience using HBF was compared. Here a remark has to be made as we only can speak of real consistent data since 1999. This particularly applies to the data of the PSN.

Various Comparisons

In the statistical study, comparisons have been made between the outcome of our private breeding station and the PSN. The comparisons included the number of:

- eggs produced
- eggs fertilized
- eggs per breeding cycle
- hatchlings from these eggs
- birds that have "flown out"

From all comparisons it can be concluded that in all cases the results of the private breeding station are dramatically better than those of the PSN.

Comparison of Price /Investments Needed in Feed

It is obvious that the main objective of the breeder definitely will be the number of birds that will fly out, can be sold or used for internal breeding programs. Before being able to make a price comparison, the number of birds that have flown out has been considered. The graph presented shows the number of young birds per pair over a period of years.

From the graph can be learned that the number of youngsters per year as a result of the private breeding station shows to be considerably larger than the result of an average

pair presented by the PSN.

The pairs in the private breeding station show 3,37 (SD 0,61) birds as an average over a period of 9 years against 0,91 young birds (SD 0,56) for the PSN. In case we correct the figures for the consistency of the data produced during the early days of the database, the following information can be given:

- For the Private breeding station 3.17 young bird (SD 0.61) per pair
- For the PSN 1.45 young birds (SD 0.16) per pair.

The main objective of the above mentioned information is to come to a well-founded financial basis for the use of HBF. The starting point is a pair of *Poicephalus rueppellii* for which the feeding data are known. The comparison is made on the basis of the daily feed allowance whereby all feed-supplements, as available in both databases, have been ignored. In this comparison only the prices for the HBF feed including additional supplements as Power Treat and Juvenile powder, are considered next to the High Potency pellets.

To come to a calculation of the conventional way of feeding the daily quantities of seed, egg concentrate, extra vitamins and minerals, specimen are taken into consideration. As a quantity of feed, approximately 80 g of seed per day per year and approximately 24 g High Potency Coarse pellets per day per year are used.

Pair of ruppells per day		
	Conventional	**Pellet (HBF)**
Price per day	€ 0,10	€ 0,32
Supplements per day	€ 0,06	€ 0,04
Total per day	€ 0,16	€ 0,36
Total per year	€ 58,40	€ 131,40
Difference	€ 73,00	
Mean youngsters	1,45	3,17
Price per young	€ 400,00	€ 400,00
Total per year	€ 580,00	€ 1.268,00
Profit per year	€ 521,60	€ 1.136,60
Difference	€ 615,00	

In addition to this simple calculation other elements can be taken into account which all are extra features once HBF is used:

- The birds will need fewer veterinary check-ups
- Young birds become independent faster
- Fewer dead parent birds due to breeding problems
- As a result a smaller need for new birds and therefore a smaller chance to introduce infectious diseases into the existing population.

CONCLUSION

To check whether the use of the HBF methodology against the conventional feeding method of mixture of seed completed with various supplements proves to be beneficial, a comparison is made between the data of the author's breeding station and the data of the *Poicephalus* Studbook of the Netherlands. Given the fact that the consistency of the historical data (early 1990s) can be questioned, the data available from 1999 definitely can be used as a basis for conclusions on HBF-usage in comparison to conventional feeding methods.

The data of the PSN might be influenced by the fact that some members of the studbook organisation in the meantime switched to pellets as main or supplementary feeding method for their birds. The results presented in this paper have not been corrected for this.

The conclusion is justified that the use of HBF is definitely worth the extra costs when compared to the use of traditional feed. Next to the benefits mentioned previously, such as a larger number of young birds, fewer dead birds, healthier birds, faster independence of young birds and fewer ill birds, other aspects have not been mentioned. Among others, the most important are that we experienced a major improvement in behavior since the introduction of HBF as well as a remarkable change in color of the feathers.

No doubt, the introduction of HBF is one of the elements that has improved the well-being of our parrots in addition to the other actions we initiated in the early 1990s to realize a more sensible captivity of these beautiful animals.

Effects of Dietary Change on Fecal Gram's Stains in the Grey Parrot

MICHAEL STANFORD, BVSc, MRCVS

It is recognized that assessment of a Gram's-stained fecal smear, while not definitive in making a diagnosis, can be a useful tool in assessing the patient's general health. The normal intestinal bacteria in psittacines are gram-positive (staining blue). These represent both anaerobes and aerobic organisms commonly *Bacillus, Enterococcus* and *Lactobacillus* species. The presence of gram-negative bacteria (red) in a healthy psittacine fecal Gram's stain would not be expected. Gram-negative bacteria can include both pathogenic (such as *Salmonella*) and non-pathogenic strains, but they should not be present in a healthy parrot's fecal Gram's stain. During the government cockatoo cull in Australia 2002, fecal Gram's stains were performed on birds found healthy on clinical examination, and no gram-negative bacterial were found.

The normal microflora of the intestine prevent the overgrowth of pathogenic bacteria by competition for nutrients and sites for adhesion.[1] The most significant factor controlling the normal microflora found in the intestinal tract is believed to be the by-products of the diet. The digestion of the psittacine diet by various microflora produces more bacteria. This proliferation of bacteria and subsequent fermentation produces acids and intestinal secretions. The acidic nature of the gut then inhibits the viability of gram-negative bacteria and yeasts.

The presence of numerous gram-negative bacteria, yeasts or an excessive number of bacteria would indicate potential problems in a psittacine fecal smear.

METHOD

Thirty pairs of healthy grey parrots were used in the trial. They had been fed a cereal based diet (Tidymix®) for the previous 12 months. Twenty pairs were randomly selected and placed on a formulated diet Harrison's High Potency Coarse (HBD®) with the remaining 10 pairs staying on the seed diet as a control group. fecal samples were taken from the birds on a monthly basis. A small portion of fecal material was smeared onto a slide and gram stained in the usual way. The same microbiologist prepared and assessed the gram stains to try and avoid bias between samples. The slides were assessed for 3 simple parameters:

1) Relative % of gram-positive bacteria to gram-negative bacteria
2) Overall number of bacteria (to assess for bacterial overgrowth)
3) Presence of yeasts (and indication of budding)

RESULTS

The results of the study are shown in Figures 1 and 2 (see page 21).

DISCUSSION

The initial Gram's stains indicated extensive deviation from the desired 100% gram-positive fecal sample. The majority of the samples had an excess number of gram-negative bacteria, and yeasts were common. Over the next 3 months, the Gram's stains gradually converted into 100% gram-positive results in 39/40 birds.

In the follow-up samples in September 2002, the pellet-fed greys still had significantly better Gram's stains than the seed-fed greys. During this time period, other improvements were seen in the pellet-fed birds including a dramatic improvement in fertility.

This simple study indicated that the conversion of apparently health birds from a cereal-based diet to a pellet food would have dramatic effects on the fecal Gram's stain characteristics. A healthy psittacine fed a well-balanced pellet food would be expected to provide consistently normal fecal Gram's stains. An imbalanced seed diet would be expected to produce consistently abnormal fecal Gram's stains. Using this information, fecal Gram's stains can serve as a useful tool in avian practice to assess the general health of a bird. It is also useful when converting a bird to an improved diet by taking monthly fecal samples to indicate a steady improvement in the Gram's-staining characteristics, thereby encouraging the owner.

Reference

1. Cheville NF: Introduction to Veterinary Pathology 2nd ed. Iowa State University Press, p 155.

Figure 1. Change in Gram's Stain Characteristics After Dietary Change

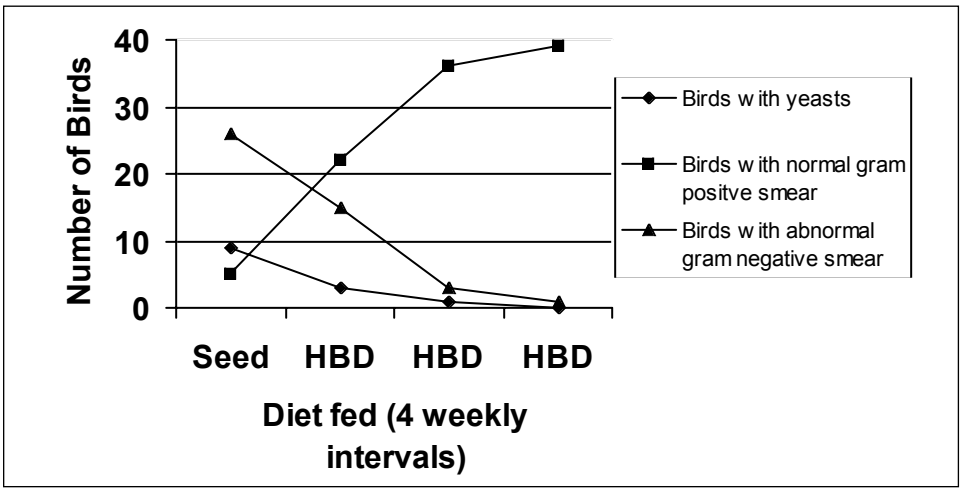
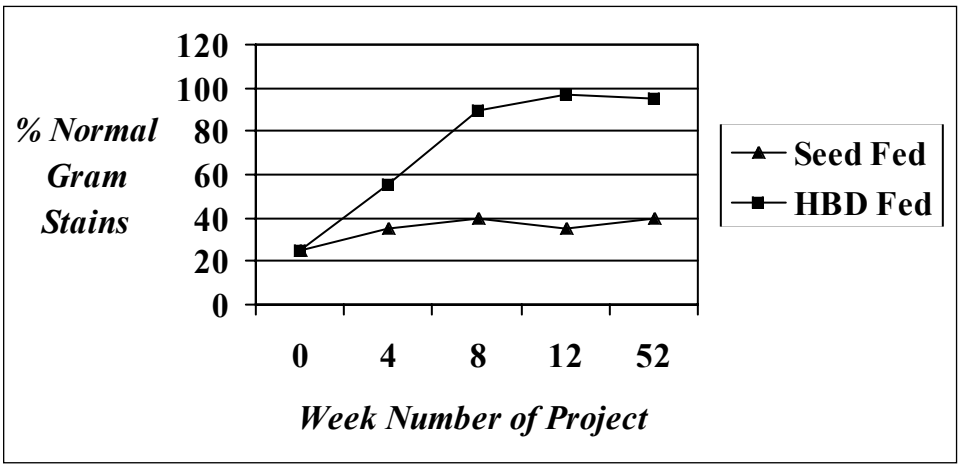


Figure 2. Comparison Between Seed Control Group and HBD-Fed Group



The Physical Examination and Nutrition

GREG J. HARRISON, DVM, Dipl ABVP-Avian, Dipl ECAMS

When one examines a large number of pet and wild birds, a distinction between the two often becomes obvious. Often in clinical practice, one sees so many abnormal birds that this distinction is missing. In fact, often NO normal pet birds are ever seen. Since not all these birds are being presented as sick, the veterinarian assumes some of the birds are normal. Most wild birds are normal. Certainly there are those that are not. But seldom is that abnormality seen in wild birds due to poor diets. The clinician needs to see some wild birds and perfect the art of observation.

Since there are more and more birds being raised on formulated diets, one might be fortunate enough to see a normal captive bird. If so, one should examine every minute facet of such a normal bird and hold that standard in one's mind when every bird presented for veterinary care is observed.

Use that same keen observation one has developed by seeing hundreds of normal cats and dogs. That power allows one to spot a thin dog with hookworm anemia without so much as touching the dog. A heartworm dog in the later stages of their disease is seldom a preliminary diagnostic challenge. Such dogs as these two described would never be anesthetized or have a hysterectomy preformed as if they were normal. Yet often such powers of observation are not used on pet birds. I feel part of this is a mindset. Well, we say to ourselves, it's a bird and birds hide symptoms and die when we touch them, so a through examination is not performed.

Even more commonly the veterinarian has attended a few seminars and read some journals and feels if he could just do a CBC, chemistry panel, culture, psittacosis test and a few PCR tests he can comfortably make a decision. Well the problem is most of those tests are preformed in an unscientific manner. In fact, scientific standards for bird testing are nonexistent in most laboratories. Just one example is the common practice for a laboratory to use an estimated WBC as if it were a fact that this is useful. It has been shown beyond a doubt to be worthless. Additionally laboratory tests often have standards established for normal performed on sick birds that have been randomly sent in for evaluation and maybe the veterinarian said the bird was normal.

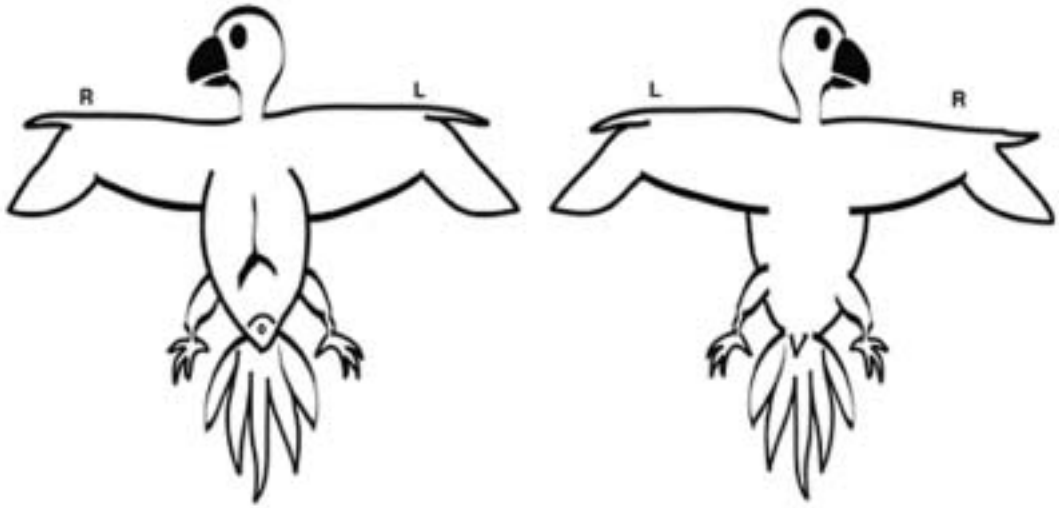
There are no laboratory tests that are going to show if a bird is normal. Often they cannot even show if they are sick. So one must perfect the art of the physical examination and using a few simple tests to make that determination. I use the physical examination with the bird's weight in grams and a fecal Gram's stain as my barometers for making the decision — is the bird normal or does it need fine tuning — or does it need extensive diagnostics?

The following form is a rather long version of one that can be used once the powers of observation have been developed for pet birds. The total process will necessarily be lengthy initially. But as one sees the distinctions, you can make a shorter version and accomplish the exam in 10 minutes.

Physical Examination Form

MAP OF FINDINGS

[Harcourt Brown]



BODY CONDITION

Body weight _____ g

Hydration: ☐ Normal
Dehydration: ☐ <5% ☐ <6-10% ☐ <10%

Emaciation . . . . . ☐ yes ☐ no

Underweight. . . . . ☐ yes ☐ no
(percent or by how many grams? _____% _____ g

Amount of body fat: ☐ None ☐ Trace ☐ Light ☐ Obese

Lipoma(s). . . . . ☐ yes ☐ no
Where located? _____ (see diagram)

BLEEDING

IF BLEEDING IS OR HAS BEEN PRESENT

Bleeding/bruising of

Sternum. . . . . ☐ yes ☐ no

Distal wing . . . . . ☐ yes ☐ no
(note: bleeding from wing tips may be from skin tears, bruising or damaged blood feathers and these must be differentiated)

Skin . . . . . ☐ yes ☐ no
Location: _____

Beak . . . . . ☐ yes ☐ no
If yes from beak tip, trauma? . . . . . ☐ yes ☐ no
Bite wound . . . . . ☐ yes ☐ no

Skin at commissure. . . . . ☐ yes ☐ no

Blood feathers . . . . . ☐ yes ☐ no

Cloacal blood

Frank red blood in feces . . . . . ☐ yes ☐ no

Occult blood in feces. . . . . ☐ yes ☐ no

Black feces . . . . . ☐ yes ☐ no

Frank blood from cloaca independent of droppings . . . . . ☐ yes ☐ no

Hemolyzed blood in urine . . . . . ☐ yes ☐ no

Occult blood in urine . . . . . ☐ yes ☐ no

"Chocolate milk" methemoglobin in urine . . . . . ☐ yes ☐ no

FEATHERS

Clipping of Wings

IS BIRD CURRENTLY FULL-FLIGHTED? . . . . . ☐ yes ☐ no

Owner declines clipping . . . . . ☐ yes ☐ no

Wing clipped: Now. . . . . ☐ yes ☐ no
Previously . . . . . ☐ yes ☐ no

Wing clipped: Right . . . . . ☐ yes ☐ no
Left . . . . . ☐ yes ☐ no
Both. . . . . ☐ yes ☐ no

Feather Structure/Color

Abnormal molt. . . . . ☐ yes ☐ no
Describe _____

Chronic pinfeathers that fail to open . . . . . ☐ yes ☐ no

Is there retained keratin in the feathers of head . . . . . ☐ yes ☐ no
Feathers of head body. . . . . ☐ yes ☐ no

Saw-toothed edges to feathers (failure to zip) . . . . . ☐ yes ☐ no

Broken, malformed or bent feathers . . . . . ☐ yes ☐ no

Lack of powder down when applicable . . . . . ☐ yes ☐ no

Dull appearance to feathers . . . . . ☐ yes ☐ no

Stained or dirty . . . . . ☐ yes ☐ no
☐ Generalized ☐ Localized

Stress lines/bars . . . . . ☐ yes ☐ no

Flexibility of feather at 180° tip to base: (test of feather integrity)

- Breaks when bent . . . . . ☐ yes ☐ no
- Bends and remains bent . . . . . ☐ yes ☐ no
- Indents when flexed . . . . . ☐ yes ☐ no
- Straightens back to normal when released . . . . . ☐ yes ☐ no

Are there malcolored feathers (abnormal for species, i.e., black on normally green or blue feathers, pink or red feathers; yellow coloration to normally blue, green or white feathers; white discoloration of hyacinth feathers; red pigment in grey feathers) . . . . . ☐ yes ☐ no
If yes, describe (color, location, onset): _____

Over-preening, picking, or other feather destructive behavior . . . . . ☐ yes ☐ no

Feather dystrophy . . . . . ☐ yes ☐ no

Multiple feathers in follicles . . . . . ☐ yes ☐ no

BEAK

Is beak symmetrical . . . . . ☐ yes ☐ no

If no, describe abnormality (scissors beak, prognathism, beak trauma, groove in beak from nare (previous rhinitis, other) _____
_____

Overgrown . . . . . ☐ yes ☐ no

Friable . . . . . ☐ yes ☐ no

Hyperkeratinization . . . . . ☐ yes ☐ no

Small scratch abrasions from concrete perch evident on beak . . . . . ☐ yes ☐ no

NAILS

Missing nails . . . . . ☐ yes ☐ no
List: _____

Abnormally curled . . . . . ☐ yes ☐ no

Otherwise deformed . . . . . ☐ yes ☐ no
If so, describe: _____

SKIN

Flaking . . . . . ☐ yes ☐ no

Pruritic . . . . . ☐ yes ☐ no

Other lesions (erythema, excoriations, scabs, lacerations, necrotic areas, etc.)
List and see diagram: _____
_____

Cutaneous or subcutaneous masses . . . . . ☐ yes ☐ no
Describe: _____

Loss of normal grooves - (thin shiny skin) . . . . . ☐ yes ☐ no
Where located: _____

Pododermatitis . . . . . ☐ yes ☐ no
Where located and degree _____

Self-cannibalized (mutilation) . . . . . ☐ yes ☐ no
Where located: _____

Burn . . . . . ☐ yes ☐ no
Where located: _____

Bite wounds . . . . . ☐ yes ☐ no
Where located: _____
(Note: with a history of an encounter with a dog or cat, one should assume that a bite wound has occurred whether or not a wound is detected)

UROPYGIAL GLAND

Is a uropygial gland normally present or absent in this species? . . . ☐ yes ☐ no
If present, is the uropygial gland normal in size and symmetry . . . . . ☐ yes ☐ no

Able to express small amount of sebum from papilla . . . . . ☐ yes ☐ no

ABAXIAL SKELETON

Wings

Symmetrical at rest (i.e., no wing droop) . . . . . ☐ yes ☐ no

Bilaterally symmetrical on extension . . . . . ☐ yes ☐ no

Symmetrical range of motion . . . . . ☐ yes ☐ no

Pain on palpation, extension or flexion . . . . . ☐ yes ☐ no

Swelling or thickening of any joints . . . . . ☐ yes ☐ no

Skin of patagium healthy and elastic . . . . . ☐ yes ☐ no

Legs

Tibiotarsal length _____

Chordal length _____

Symmetry of legs when extended . . . . . ☐ yes ☐ no

Range of motion of leg joints - bilaterally symmetrical . . . . . ☐ yes ☐ no

Pain on extension or flexion . . . . . ☐ yes ☐ no

Weakness of grip when perched . . . . . ☐ yes ☐ no

Favoring one leg when perched or ambulating . . . . . ☐ yes ☐ no

Feet abnormally warm . . . . . ☐ yes ☐ no

Posture (erect, drooped, unstable) . . . . . ☐ yes ☐ no
If yes, describe: _____

Toes

Toes missing . . . . . ☐ yes ☐ no
Which one(s): _____

Toes deformed/luxated . . . . . ☐ yes ☐ no
Which one(s): _____

Sternum

Carina of keel - smooth, straight . . . . . ☐ yes ☐ no

Breast muscle bilaterally symmetrical . . . . . ☐ yes ☐ no

ABDOMINAL PALPATION

Normal or increased sterno-pubic distance . . . . . ☐ yes ☐ no

Palpable fluid in sterno-pubic area . . . . . ☐ yes ☐ no
Severity/extent of fluid? _____

Masses palpable in sterno-pubic area . . . . . ☐ yes ☐ no

RESPIRATORY/CARDIOVASCULAR

Nares

Dirty feathers over nares . . . . . ☐ yes ☐ no

Nasal discharge . . . . . ☐ yes ☐ no
Character: _____

Nares enlarged or distorted . . . . . ☐ yes ☐ no

Dry (lith), hard mass in nares . . . . . ☐ yes ☐ no

Infraorbital sinus swollen . . . . . ☐ yes ☐ no
Describe: _____

Excessive sneezing . . . . . ☐ yes ☐ no

Dyspnea . . . . . ☐ yes ☐ no
If yes, characterize the dyspnea: _____
_____

Is neck extended and does the bird vocalize with inspiratory dyspnea . . . . . ☐ yes ☐ no

Is there increased abdominal movement . . . . . ☐ yes ☐ no

Open mouth breathing . . . . . ☐ yes ☐ no

Tail-bobbing . . . . . ☐ yes ☐ no

Panting with exercise . . . . . ☐ yes ☐ no

Cessation of panting within 2-3 minutes . . . . . ☐ yes ☐ no

Auscultation

Respiratory Rate _____ Heart Rate _____

Cardiac murmur . . . . . ☐ yes ☐ no

Arrhythmia . . . . . ☐ yes ☐ no
Describe: _____

Air sacs audible . . . . . ☐ yes ☐ no
Describe: _____

Lung sounds audible . . . . . ☐ yes ☐ no
Describe: _____

NEUROLOGIC - SENSORY

Ears

Presence of symmetrical openings . . . . . ☐ yes ☐ no

Discharge or matting of feathers . . . . . ☐ yes ☐ no

Pruritus, excessive scratching at ears . . . . . ☐ yes ☐ no

Fluid or material visible beneath tympanic membrane . . . . . ☐ yes ☐ no

Head tilt . . . . . ☐ yes ☐ no

Eyes

Symmetrical size when viewed head-on . . . . . ☐ yes ☐ no
(If not, R/O glaucoma, exophthalmos, sinusitis, microphthalmia, retrobulbar mass)

Redness or hyperplasia of conjunctiva . . . . . ☐ yes ☐ no

Blepharospasm . . . . . ☐ yes ☐ no

Corneal opacity . . . . . ☐ yes ☐ no

Clarity of lens . . . . . ☐ yes ☐ no

Eye color consistent with age and species . . . . . ☐ yes ☐ no

Pupillary light response . . . . . ☐ yes ☐ no
(Note consensual response is not present in birds, and voluntary constriction can occur, so interpret carefully)

Eyelid margins normal . . . . . ☐ yes ☐ no

Does the bird appear visual . . . . . ☐ yes ☐ no

Neurologic exam - use special form

REPRODUCTIVE SYSTEM

Female

Abdominal palpation suggestive of egg retention . . . . . ☐ yes ☐ no

Evidence of cystic ovarian disease

Egg-yolk peritonitis . . . . . ☐ yes ☐ no

Egg-yolk stroke . . . . . ☐ yes ☐ no

Hyperostosis on radiographs . . . . . ☐ yes ☐ no

Increased serum calcium . . . . . ☐ yes ☐ no

Male

Is the vent irritated . . . . . ☐ yes ☐ no

Change in cere color (budgerigars) . . . . . ☐ yes ☐ no

DIGESTIVE SYSTEM

ORAL EXAMINATION

Choana

Choanal papilla normal . . . . . ☐ yes ☐ no

Papillomas in oral cavity . . . . . ☐ yes ☐ no

Presence of plaques . . . . . ☐ yes ☐ no

Abscesses near glottis at base of tongue . . . . . ☐ yes ☐ no

Infundibular cleft visible . . . . . ☐ yes ☐ no

Infundibular cleft swollen or discharge present . . . . . ☐ yes ☐ no

Submandibular space abscess . . . . . ☐ yes ☐ no

Wounds . . . . . ☐ yes ☐ no

Regurgitation

Passive or active regurgitation noted . . . . . ☐ yes ☐ no

Passively regurgitates water when handled . . . . . ☐ yes ☐ no

Delayed crop emptying . . . . . ☐ yes ☐ no

Food retained in crop/crop distention . . . . . ☐ yes ☐ no

Odor to crop contents . . . . . ☐ yes ☐ no

Droppings

Odor to feces . . . . . ☐ yes ☐ no

Decreased/increased amount . . . . . ☐ yes ☐ no

Yellow or green in urine . . . . . ☐ yes ☐ no

Yellow or green in urates . . . . . ☐ yes ☐ no

Change in feces color . . . . . ☐ yes ☐ no

Increased liquid in urine . . . . . ☐ yes ☐ no

Increased powdered urates . . . . . ☐ yes ☐ no

White, fluffy droppings . . . . . ☐ yes ☐ no

Undigested food in feces . . . . . ☐ yes ☐ no

Dark brown, black tarry or coffee ground feces . . . . . ☐ yes ☐ no

Parasites or eggs in feces . . . . . ☐ yes ☐ no

Bubbly, gaseous droppings . . . . . ☐ yes ☐ no

Scant feces . . . . . ☐ yes ☐ no

Diarrhea . . . . . ☐ yes ☐ no

Pasting of vent . . . . . ☐ yes ☐ no

Gram's Stain of Droppings

Normal numbers of digestive bacteria (100-150/high power field) . . . . . ☐ yes ☐ no

Decreased number of bacteria . . . . . ☐ yes ☐ no
(_____/field)

High % of gram-positive rods (>90%) . . . . . ☐ yes ☐ no

Low % of gram-positive cocci (<10%) . . . . . ☐ yes ☐ no

Gram-negative rods . . . . . ☐ yes ☐ no
☐ >1% ☐ >10% ☐ >30% ☐ >90%

More than 5-10 yeast per field . . . . . ☐ yes ☐ no

More than 10% budding yeast . . . . . ☐ yes ☐ no

Clostridial sp. present . . . . . ☐ yes ☐ no

Undigested fiber . . . . . ☐ yes ☐ no

RBCs in Gram's stain . . . . . ☐ yes ☐ no

WBCs in Gram's stain . . . . . ☐ yes ☐ no

Megabacteria (Macrorhabdosis) in Gram's stain . . . . . ☐ yes ☐ no

Fungal or yeast hyphae in Gram's stain . . . . . ☐ yes ☐ no

Cloaca

Vent lips normal . . . . . ☐ yes ☐ no

Diameter of vent and tone normal . . . . . ☐ yes ☐ no

Mucosa of cloaca normal thin, clear tissue . . . . . ☐ yes ☐ no

Irritation, ulceration, cobblestone appearance or papillomas noted . . . . . ☐ yes ☐ no
(If yes, further diagnostics are indicated).

Acknowledgements

The Bird Hosptial PA acknowledges the following veterinarians for their input into the physical examination form: Drs. Greg J. Harrison, Teresa Lightfoot, Bob Doneley, Nigel Harcourt-Brown, Jan Hooimeijer and Thomas Tully.

Organic Nutrition For Racing Pigeons

JAN HOOIMEIJER, DVM

Complete diets are still not commonly used for racing pigeons, despite the many advances in the aviculture of racing pigeons. Pelleted diets are available for poultry, waterfowl, pheasants, ostriches, parrots and other bird species, however, the demand for a complete balanced diet for racing pigeons has yet to emerge.

Champions within the aviculture of racing pigeons are still becoming champions using grains and seeds as their "traditional" nutrition in combination with all kind of products containing vitamins, spore-elements and minerals for nutritional improvement. Fanciers use a variety of different foods according to their personal experiences. The hereditary quality of the pigeons to perform during the races dominates the sport. Fanciers have yet to recognize that nutrition may be equally important. Over the years we see that fanciers are racing more and more with younger pigeons. It is rare that pigeons older then 5-6 years of age are used.

Malnutrition within the aviculture of racing pigeons is underestimated. According to a survey executed by the author, it is common that only 10 percent of the racing pigeons born in a certain year will survive more then three years. The majority of the young birds are culled within the first year. It is the author's experience that most serious signs of malnutrition in birds are only manifested after some years of chronicity. In older breeding pigeons we see the results of long-term malnutrition: moulting disorders, diminished feather quality, egg quality problems and diminished development of their young. The life expectancy of even the best racing pigeons is less then 10 years of age. The life expectancy of racing pigeons on a complete balanced diet would be closer to 20-25 years.

Fanciers are starting to realize that proper and safe nutrition is the key for the future of their racing pigeons. A growing number of fanciers, clients of the Clinic for Birds, are finding that proper organic nutrition can make a difference during the breeding season, the racing season and the moulting period. Within the Clinic for Birds we are using different foods from Harrison's Bird Foods (HBF) for racing pigeons. The advantage of HBF is the guarantee that we are dealing with Certified Organic Foods without agricultural pesticides, herbicides or anti fungal products. The advice is to invest in the best and most valuable racing pigeons to prevent problems and to get the best results. We recommend HBF during the time of breeding when the female is developing the eggs. During the period the youngsters are fed with crop milk we advise the use of HBF Juvenile formula and HBF High Potency Fine. We advise feeding HBF High Potency Fine or HBF Power Treats 3-4 days before racing and 1-2 days after returning home. We advise feeding HBF High Potency Fine during the moult. The most valuable racing pigeons are the older breeding pairs. We recommend supplying those pigeons with HBF High Potency Fine all year. The health and performance improvements will be greatest with a complete diet change; however, we see results with as little as 10 g Juvenile per 10 pigeons, 10 g High Potency Fine per 10 pigeons, and 4 pellets Power Treats per pigeon. Fanciers do see the difference and are amazed that the general condition of the pigeons can improve within a few days.

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Indications and Use of Harrison's Organic Formulated Food in a Veterinary Practice: How to Convert Birds and Clients

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INDICATIONS AND USE OF HARRISON'S BIRD FOOD IN A VETERINARY PRACTICE

The use of the Harrison's premium, certified organic, formulated bird food can help to maintain the bird health and lead to better therapy results in bird diseases. Here a few examples of already clinically tested applications:

Lipomas in Budgerigars, Amazons, Galahs and Blue and Gold Macaws

Within the first 8 weeks, the birds should receive limited quantities of High Potency Coarse or fine or super fine (15% resp. 12% fat), fruits and vegetables. Already during this diet change from seed mixtures or table food a slight body weight reduction can mostly be experienced. After these 8 weeks the birds will get the following limited daily rations of Adult Lifetime Coarse or fine or super fine (5% resp. 6% fat) until they reach their ideal body weight:

- approximately 4 g per budgerigar
- approximately 15-20 g per Amazon or galah
- approximately 20-25 g per blue and gold macaw.

To satisfy eventual urge of hunger, fresh vegetables or fruits should be offered, e.g., 2 g per budgerigar, 5 g per Amazon or galah and maximum of 15 g per blue and gold macaw. After arriving at the desired weight, the food amount will be increased so far as to maintain the reached body weight. At this stage, the lipomas have generally completely disappeared. The surgical removal of the rest is not necessary!

Chronic Disturbances of the Normal Bacterial Intestinal Microflora, Occurrence of Potentially Pathogenic Bacteria in the Gut

Experience has shown that the use of antibiotics rarely has a long-term success in cases of infection with potential pathogenic bacteria in the gut. The diet change of your patients from the conventional seed mixtures to the Harrison's premium, certified organic, formulated bird food and a higher hygienic level during keeping results very often in a lasting establishment of a normal intestinal microflora as well as a distinct reduction, even a complete disappearance, of the potentially pathogenic bacteria in
the gut.

Recommendations are:

- Adult Lifetime Coarse or Fine or Super Fine on birds not older then 6 months, not breeding or molting, or
- High Potency Coarse or Fine or Super Fine on birds younger then 6 months or in breeding or molting birds resp. on species who need a higher level of protein, fat, vitamins and minerals, e.g., African grey parrots, hyacinth macaws, palm cockatoos
- In conjunction with a reduction of fruit and vegetables (recommended amounts see paragraph 1.)

Elevated Liver Parameters, Triglycerides and Cholesterol

The results of necropsies or clinical examinations point to chronic liver diseases in the majority of the parrots and parakeets. A diet change from the conventional seed mixtures to the Harrison's premium, certified organic, formulated bird foods leads regularly to a an improvement of the hepatopathies and a reduction of the increased levels of triglycerides and cholesterol. The therapeutic success can be perfectly documented through regular biochemical serum profiles.

Tube Feeding Sick Birds or Patients with Body Weight Loss

During acute illness, the intensive metabolism of your bird patients, due to reduced food intake, leads very quickly to a life-threatening loss of body weight. The administration of the easily digestible handfeeding formula Recovery Formula (Passerine Formula 1, 35% crude protein, 19% crude fat) with a silicon crop tube, the bird will receive regularly a sufficient amount of liquid, nutrients, vitamins, minerals and trace minerals. Necessary medicine can easily be mixed under the

food-mash. After a distinct improvement of the patient a slow changeover to the handfeeding formula Juvenile Handfeeding Formula (18 % crude protein, 11% crude fat) is recommended. After that, preferably High Potency Coarse or Fine should be given, which has almost the same ingredients as the Juvenile Hand-feeding Formula. This food is a perfect basis for the convalescence of your patient. Addition of the digestive aid, HBD's Avian Enzyme, to the hand-feeding formulas is helpful at any patients with body weight loss.

Hand-raising Parrot and Parakeet Chicks

The hand raising food, Neonate formula (Passerine formula 2), is very easily digestible and through its balanced composition, based on its premium quality, certified organic raw materials, ideally suitable for the hand raising of parrot and parakeet chicks from their 1st day to the 21st day of life. The 26% crude protein and 12% crude fat levels, together with its easy digestibility and balanced composition, lead to gains of weight similar to parent raised chicks. After the 22nd day, one recommends a slow change to the Juvenile Hand-feeding Formula. High Potency Coarse or Fine or Super Fine should preferably be used for the weaning of the chicks. The digestive aid, HBD's Avian Enzyme, can be added to the hand-raising formulas if any signs of slow growing or slow food passage occur.

Passing of Undigested Seeds

A few diseases of the digestive tract (e.g., proventricular dilatation disease - PDD, chronic infections with bacteria and fungi) can lead to the excretion of undigested seeds in the feces as well as to emaciation of the birds even after good food intake. In such cases, the feeding of High Potency Fine or Super Fine is highly recommended as reinforcement of the medication therapy. The extruded food particles (approx. 3 mm in size) consist of finely ground components. They dissolve within the crop and proventriculus into an easy digestible mush. Additional offerings of digestive enzymes can support the absorption of the nutrients. High Potency Fine or Super Fine is also suitable for the prophylactic feeding of clinical inconspicuous birds in flocks with proventricular dilatation disease and can prevent the deadly dilatation with undigested seeds in the proventriculus. Addition of the digestive aid, HBD's Avian Enzyme, is highly recommended to help the food passage in the proventriculus, ventriculus and the intestines and the digestion.

Unbalanced Nutrition of Parrots and Parakeets

Many birds select a maximum of only 2-3 different grains out of the offered seed mixture and therefore feed themselves unbalanced. Many times the favorite grains or nuts have a very high fat content. Organic disturbances and an elevated susceptibility for infectious diseases could shorten the life expectancy drastically. Harrison's premium certified organic formulated bird food consists of up to 15 different types of grain, peas, beans, seeds and nuts. It contains no artificial colors, sweeteners or flavors, no preservatives or antioxidants. The food is enriched with spirulina algae, vitamins, minerals and trace elements. With every piece of the Harrison food, the bird receives a well balanced diet. A selective feeding behavior is impossible.

Mycotic Diseases in Parrots and Parakeets

Chronic infections with fungi and yeasts as well as mycotoxicosis are frequent reasons for the death of parrots. Regular intake of seed mixtures and nuts contaminated with fungi, their spores and mycotoxins and permanent stored in inadequately ventilated rooms without direct sunshine are the principal causes for the development of a mycotic disease. With exclusive antimycotic treatment a lasting therapy success is rather unlikely. The complete change from the previous, mostly unbalanced and qualitatively inferior diet to the High Potency Coarse or Fine with a higher content of vitamin A is an essential therapeutic and prophylactic measure, since Harrison's Bird foods is certified free of fungi or mycotoxins.

HOW TO CONVERT BIRDS AND CLIENTS TO HARRISON'S BIRD FOOD

Food Conversion for Companion Pet Birds and Breeder Aviary Birds

Tame birds like to eat what the owners eat. Harrison's food is human grade food, and in the beginning of the conversion, it should be eaten by the clients in front of the birds to show it to them. This proved to be the fastest way of switching the birds to Harrison's food. After the birds started to eat the new food, the old food should be completely removed and not offered anymore. In pet birds that do not eat any table food or in breeder's aviary birds, the actual food must be reduced to 1 Tbs/bird in medium and large and 1 tsp/bird in small birds. It should be mixed with the new food in a 1:1 ratio in the feeding cups. Additionally to it the new food should be crushed or powdered and mixed with chopped fruits and vegetables the bird knows and likes to eat. The new food can be also soaked with fruit juices or mixed with yogurt if the bird likes these. After the bird starts to eat the new food or latest after 7 days, the amount of the previous food should be reduced to zero. More detailed information how to switch birds to this food are indicated in the brochure "The Organic Difference," which is available from Avifood for free in

English or German language.

Not all owners have the discipline to change the food for their birds even after it was explained to them. They are often not able to change their own eating habits to a better and healthier food! The veterinary practices or clinics should offer food conversion service by boarding the birds for 10-20 days and switch their food during this period from fatty low-quality seed mixtures to the Harrison premium organic balanced bird food. This service will increase the success rate in the nutritional conversion of the patients, increase the number of the birds consuming this organic balanced food significantly and is also an additional income source for the veterinarian.

Practical Recommendations for a Nutritional Consultation with Clients

The clients should bring a sample of the food or food supplements they feed to their birds (e.g., seed mixtures, pellets, vitamin and mineral powders, etc.) to the nutritional consultation to allow the veterinarian to analyze it. To explain the basic of the balanced nutrition and the dietary needs of pet birds in captivity, a minimum of 15 minutes consultation should be planned. The client should be informed about the disadvantages of the food he feeds to his birds and the influence of this food on the bird's health. This should be proved by the following results of the clinical evaluation, the biochemical serum analysis or other suitable tests. After the nutritional consultation, the client should know if he done any nutritional errors in the past and how it can be improved by using Harrison's premium organic balanced bird food with the goal of the maintenance of the bird's health on a high level for the whole bird life.

Starting with Use and Distribution of Harrison's Organic Formulated Food in Veterinary Clinics or Practices

Harrison's organic formulated food works in more than a thousand veterinary clinics and practices around the world.

In the midsize and large pet birds, the clients should get two bags of food (each 450 g) - HPC (High Potency Coarse) and PT (Power Treats) after the initial nutritional veterinary consultation. The clients switch the bird to PT first and after acceptance of PT to HPC. When the birds eat HPC they continue buying the 450 g bags or switch to the cheaper 2,27 kg or 11,34 kg or 22,27 kg bags. In the small parrots and parakeets, finches, canaries and mynahs, the clients should get one 450 g bag of HPF (High Potency Fine) or HPSF (High Potency Super Fine) after the nutritional consultation. The food change in these birds is more difficult (they are mostly seed imprinted), and it takes a longer time than in the large parrots. When the birds eat HPF or HPSF or later Adult Lifetime Fine or Super Fine (ALF or ALSF), the clients continue mostly purchasing the 450 g or 2,27 kg bags due to the small size of the birds.

The author's experience since 1990 shows about 50% of the clients who receive the initial nutritional consultation will continue using the HBD in their birds. So the numbers of clients purchasing Harrison's organic formulated food will slowly and continuously grow in each veterinary practice or clinic. Without a proper balanced nutrition of each patient there is no base and sense for any further veterinary work. So it is important that every parrot, parakeet, etc. that previously consumed seed mixtures or table food must leave the veterinary practice or clinic with one or two bags of food after their first visit there.

More information including the addresses of veterinarians using and distributing the Harrison's organic formulated food in Europe is indicated under www.avifood.com — in English and German languages. Avifood invites all veterinarians to join its distribution network for Harrison's organic formulated food. Professional consultation service and fast delivery are guaranteed. Veterinarians can order the wholesale pricelist for the Harrison's organic formulated food by fax ++49-89-854 814-50 or by email info@avifood.com.

The Potential Nutritional Benefits of Feeding an Organic Pelleted Diet to Seed-Eating Passerines

B.C. STOCKDALE, BVM&S, MRCVS

Compared with other classes of birds, little work has been done towards establishing specific nutritional requirements for health, reproduction and optimal nestling growth in small seed-eating passerines.

Given that seeds, the basic components of captive passerine nutrition, are deficient in as many as 32 essential nutrients, then when nutritional needs exceed the available nutrient supply, the result is a metabolic and physiological compromise and the birds under-perform.

There would seem to be many potential benefits to the general health and productivity of captive seed-eating birds of feeding a nutrient complete organic pelleted diet, but as yet these remain unexplored both in aviculture and research.

INVESTING IN FUTURE GENERATIONS
Providing a Nest Egg

The effects of maternal nutrition on all the parameters of the avian reproductive cycle begin not with the pre-ovulatory period, but with the nutrition received as a nestling a generation earlier. Parental investment in their offspring is also an investment in the next generation.

Growth rate as nestlings and fledgling weight are strongly related to adult weight. As females typically plunder their body reserves of protein and lipid to manufacture eggs, their fecundity is strongly related to their weight at fledging. Nest nutrition is paramount.

THE MATERNAL COST OF PRODUCING EGGS
Don't Count Your Chickens Before They Hatch

The nutritional worth of an egg depends on which nutrients and at what level the mother is able to invest in the production of that egg. The energy cost of egg production in passerine birds has typically been estimated to be from 34-60% of basic metabolic rate and 165% increase in metabolic protein requirements. It has been well documented that it is the nutritional status of the mother bird and her capacity to supply these nutrients that is the major determining factor in the viability, health and immune status of the chick. As all the essential nutrients required to sustain optimal chick embryo development are contained within the egg at the point of lay, it is incumbent on the female bird to provide the egg with this source of nutrients. Good nutritional status of the mother bird is therefore crucial to the transfer to the egg of an adequate, balanced supply of these nutrients. The quality of both pre-ovulatory and ovulatory nutrition affects this status

The level of nutritionally induced dead-in-shell, reduced hatchability and poor post-hatch viability in pet birds has not been investigated. What levels of early embryonic loss and dead-in-shell can be directly attributed to malnutrition is a question as not yet been addressed.

Effects of Maternal Nutrition on Clutch Size and Egg Size

In birds, food availability during the pre-laying period can have a marked direct influence on egg production. Egg mass has been shown to be correlated with hatch weight, and tends to decline with subsequent eggs in a clutch. Bigger eggs produce larger nestlings that have a better chance of survival and better long-term breeding prospects. Improved nutrition in the form of increased dietary proteins allows maintenance of egg size throughout the clutch and also in subsequent clutches that season.

GROWTH AND VIABILITY IN NESTLINGS
Where size does matter

Early post-hatch nutrition in birds has been shown to have pervasive, downstream effects on life-history parameters including life span and breeding capacity. It has been shown that independent of subsequent nutrition, individuals experiencing a short period of low-quality nutrition during the nesting period show long-term impairment. In canaries, daily mass gain is highly correlated with mass (i.e., the heavier the chick the more daily weight it gains). The greater the chick's daily mass gain the more likely it is to survive to independence.

HBD's Avian Examiner is brought to you as a service of HBD International, Inc., manufacturer and distributor of Harrison's Bird Foods. This publication is part of HBD's commitment to building avian practice through education and nutritionally sound diets. Although every effort has been made to ensure the accuracy of the information presented herein (particularly drug doses), it is the responsibility of the clinician to critically evaluate the contents, to stay informed of pharmacokinetic information and to observe recommendations provided in the manufacturers' inserts. Reader responses, comments and suggestions are encouraged. Please mail to Avian Examiner, 7108 Crossroads Blvd., Suite 325, Brentwood, TN 37027 or fax to 800-279-5984.

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