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Based on decades of clinical experience and reports from avian pathologists and nutritionists, as well as consultations with companies that produce commercially formulated diets, I have postulated the following cascade of clinical signs and diseases resulting from improper nutrition (Table 1). Although there are individual expressions of this cascade, the most common thread is the bird's history of a basic seed and table food diet. Generally, at presentation of a "sick" bird, the patient exhibits pansystemic clinical signs that often include various behavioral problems. Typically though, the earliest clinical signs are reflected in the integument, followed closely by the digestive system. But birds are often not presented for veterinary evaluation until the reproductive or respiratory system is affected.

The Disease Cascade can be initiated from several factors:

- a true nutrient-deficient or -imbalanced diet

As I See It

Improper Nutrition Disease Cascade

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Adapted from Harrison GJ, Lightfoot T (eds):
Clinical Avian Medicine. Palm Beach, Spix Publishing, 2006.



An Amazon parrot exhibits typical external clinical signs of malnutrition, specifically relating to the integument. In addition to the scruffy feathers, it is obvious that the beak has been trimmed due to overgrowth.

- improper husbandry (especially lack of exercise and sunlight).
- improper handling and storage of foodstuffs
- over-supplementation of formulated diets.

Therefore, when evaluating nutritional disorders, one must consider the stability or availability of nutrients as well as composition of foods eaten. Pathologic influences, such as parasite infestation, metal toxicoses, malabsorption syndromes, pancreatitis and gastroenteritis, result in similar clinical signs and need to be ruled out.

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Improper Nutrition Disease Cascade

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Improper nutrient utilization results in malnutrition that weakens the body immunologically and struc-

turally. This can allow invasion of low level pathogens or commensals of viral, bacterial or fungal origin.

Research by Dr. M. Beck of the University of North Carolina¹ showed that when the host is affected by a

nutritional deficiency, the invading pathogen is affected as well. By sequencing the viral isolates recovered from selenium-deficient mice, she demonstrated mutations in the viral genome associated with increased pathogenesis

of the virus affected by nutrient deficiency.

1. Beck MA: Antioxidants and viral infections: Host immune response and viral pathogenicity. *J Am Med Coll Nutr* 20 (5 suppl):384s-388s; discussion 396s-397s, 2001.

Table 1. Improper Nutrition Disease Cascade

NUTRITIONAL IMBALANCES						
MULTISYSTEMIC ABNORMALITIES						
CELLULAR	STRUCTURAL	FUNCTIONAL		IMMUNOLOGIC		
<ul style="list-style-type: none"> • Impaired metabolism • Altered cell wall permeability • Cellular auto intoxication • Change in GI pH (alkaline) • Increased WBC counts <p>Chronic Effects</p> <ul style="list-style-type: none"> • Hepatic lipidosis, fibrosis, cirrhosis • Iron storage disease • Irreversible degradation of retinal cones leading to blindness 	<ul style="list-style-type: none"> • Metaplasia of columnar epithelium • Increased mucus viscosity • Loss of normal collagen elasticity <p>Chronic Effects</p> <ul style="list-style-type: none"> • Abnormal cilia • Renal tubular nephrosis • Follicular atresia • Cataract formation • Bone/muscle abnormalities 	<ul style="list-style-type: none"> • Impaired mucin production of goblet cells • Loss of cleansing ability of mucus • Normal glandular production of various systems suppressed • Changes in biochemical values <p>Chronic Effects</p> <ul style="list-style-type: none"> • Hyperglycemia (diabetes mellitus?) • Deposits of high density lipids in vasculature • Exocrine pancreatic insufficiency • Infertility, decreased hatchability of chicks • Secondary hyperparathyroidism 		<ul style="list-style-type: none"> • Commensal organisms normally bound to mucus are not excreted • Relationship with commensal organisms disrupted • Bone marrow suppression • Decreased IgA, decreased lymphocytes <p>Chronic Effects</p> <ul style="list-style-type: none"> • Secondary microbial infections • Increased susceptibility to neoplasia 		
ABERRANT BEHAVIORS						
INTEGUMENT	GASTROINTESTINAL	RESPIRATORY	RENAL	ENDOCRINE	REPRODUCTIVE	CARDIOVASCULAR
<ul style="list-style-type: none"> • Skin • Feathers • Beak • Nails • Fat deposits 	<ul style="list-style-type: none"> • Oropharyngeal • Pancreatic • Hepatic • Intestinal 	<ul style="list-style-type: none"> • Nares • Infraorbital sinus • Syrinx • Air sacs 	<ul style="list-style-type: none"> • Glomeruli • Renal tubules • Ureters • Urodeum 	<ul style="list-style-type: none"> • Pancreatic • Thyroid • Parathyroids • Intestinal • Renal • Gonadal 	<ul style="list-style-type: none"> • Ovarian • Uterovaginal • Testicular • Cloacal • Egg abnormalities 	<ul style="list-style-type: none"> • Vasculature • Myocardium • Air capillaries • Pericardium



Clinical NOTES

Avian Critical Care and Fluid Therapy

Marla Lichtenberger, DVM, Dipl ACVECC
Animal Emergency Clinic, Milwaukee, Wisconsin

(Adapted from presentation at 2005 International Conference on Exotics, www.exoticdvm.com)

- Arterial blood pressure measurement is an important tool in the management of the critically ill bird.
- Although there are several indirect or noninvasive methods (e.g., oscillometric and Doppler) available to measure blood pressure (BP), it is sometimes impossible to obtain a reading on the avian patient. The Doppler method is more versatile than the oscillometric method and is the method used by the author for all exotic patients (Fig 1). The Doppler cuff can be placed on the distal humerus or femur of a bird and the Doppler probe on the medial surface of the proximal ulna or tibiotarsus, respectively (Fig 2).
- The normal systolic BP for psittacines under isoflurane/sevoflurane anesthesia at the author's clinic is 90-150 mmHg, and the same measurement for awake psittacines is 90-180 mmHg.
- Acute blood loss of 30-40% of blood volume has been shown to result in 50% mortality (LD_{50}) in mammals. Blood loss is better tolerated in birds than in mammals.
- Crystalloids (saline, lactated Ringer's solution and Normosol-R or Plasmalyte-A) will expand the intravascular space, but this effect will be short-lived. Because approximately 80% of extracellular fluid is in the interstitial space, crystalloids will

rapidly redistribute. After approximately 1 hour, only 20% of the administered volume will remain in the circulation. Thus, crystalloids should be thought of as interstitial rehydrators, not intravascular volume expanders.

- Colloids (hetastarch and biologic colloids such as whole blood, plasma and albumin) are fluids containing large molecular weight substances that are generally not able to pass through capillary membranes. They can be considered intravascular volume expanders.
- Hydroxyethyl starch (HES or Heta-starch) is a synthetic colloid fluid that effectively increases the colloid oncotic pressure beyond that which can be obtained with infusion of blood products alone. Hetastarch expands the intravascular volume by about 1.4 times the volume infused and has a half-life of 25 hours.
- Most birds benefit from initial administration of warmed crystalloids at 3 ml/100 g BW IV, IO or SC.
- Synthetic colloids are administered with isotonic crystalloids to reduce interstitial volume depletion. In this case, the dose of crystalloid administered is only 40-60% of what it would be if crystalloids were used alone during resuscitation.
- Hemoglobin-based oxygen carriers (HBOC) are indicated during resuscitation when increased oxygen delivery to tissues is required. In addition, HBOC are effective colloids. The most commonly available HBOC has been Oxyglobin.



Fig 1. Indirect Doppler pressure apparatus: Doppler blood pressure monitor with the attached probe and the Doppler blood pressure cuff with attached sphygmomanometer are shown. The Doppler blood pressure gel is used to enhance contact of the probe to the skin.



Fig 2. The sphygmomanometer is attached to the cuff. The cuff is inflated to suprasystolic Doppler blood pressure sounds and released slowly. The first sound heard is the systolic blood pressure.

- Oxyglobin should be administered to patients that have become hemodiluted from crystalloids (PCV < 15-18%). Oxyglobin can also be administered to patients suffering from chronic anemia with PCV values less than 10%.

Table 1. Fluid Requirements in Birds

	Crystalloids	COLLOIDS (HES or Oxyglobin)
Hypovolemic shock (systolic BP < 90 mmHg)	Give 1-3 bolus infusions at 10 ml/kg mixed with colloids until systolic BP is > 90 mmHg	Give 1-3 bolus infusions at 5 ml/kg mixed with crystalloids until systolic BP is > 90 mmHg
Rehydration replacement	% dehydration x body wt. (kg) x 1000 is added to maintenance requirements and administered over the first 24 hours	
Maintenance requirements until eating	48 ml/kg/day divided into 3 bolus infusions over 24 hours until eating	

A Closer Look

Red Palm Oil

Thomas Bankstahl, DVM

(Adapted from transcription of comments presented at HBD and AVIx Chat held during the AAV Annual Conference, Monterey, California, August, 2005)

Red palm oil is the flesh of the fruit of the palm tree, *Elaeis guineensis*. It is considered one of the richest natural sources of carotenoids, containing 700-1000 parts per million (30 times that found in carrots). In addition to the beta-carotenes found in traditional foods, red palm oil also contains alpha-carotene, which is considered to have anti-cancer properties in human medicine.

Red palm oil has several characteristics that make it appealing for use in humans:

- It is more stable at room temperature than most other natural oils.
- It tends not to oxidize and turn rancid (because of its levels of vitamin E, other antioxidants and linoleic acids).
- It can be used for cooking.
- It is not hydrogenated or processed and there are no trans-fatty acids.
- It actually inhibits the enzyme for cholesterol synthesis.

Red Palm Oil in Human Medicine

- The vitamin A and E components of red palm oil are excellent scavengers for free radicals, which are part of the degenerative processes of heart disease, cellular aging, cancer, arthritis and Alzheimer's disease.
- In addition to the four tocopherols (alpha, beta, gamma and delta), the vitamin E in red palm oil contains an abundance of the four tocotrienols, which seem to have more anti-cancer specific properties in human studies.
- Women taking red palm oil with tamoxifen had a 45% reduction of breast cancer recurrence and improved immune function.
- Because red palm oil decreases LDLs and triglycerides as well as increases HDLs, physicians are seeing a decrease in heart attacks and strokes in patients who take it. They are also seeing an increase in immune function.
- University studies have shown definite examples of decreasing the incidence of atherosclerosis, lowering blood cholesterol and decreasing blood clots with increased vasodilatation.
- Red palm oil is being used to lower the risk of cataract formation.
- The vitamin E content of red palm oil inhibits the arachidonic acid cycle, thereby decreasing the production of prostaglandins and stopping some of the inflammatory cascade.
- Palmitic acid is a 16-carbon chain saturated fat that makes up half of the fatty acids in red palm oil and is touted to be a good source of energy that is easy to digest and does not cause elevations in blood sugar.

Red Palm Oil in Veterinary Medicine

- In conjunction with full diagnostic workups, we use red palm oil as adjunct therapy for cases involving the skin, heart, eyes, conjunctiva, bladder, inadequate nutritional situations, immune system weakness and prevention of neoplasia.
- We also found that it decreases the need for nonsteriodals, such as in birds that may be on meloxicam for chronic arthritic changes in the feet or other dermatologic conditions.
- When red palm oil is used with antihistamines, we seem to get an improved antipruritic effect over other oils used in combination with antihistamines.
- We actually saw return of vision in two 35-year-old Amazons with very mature cataracts.
- I am applying it in small mammals preventively for the inhibition of the growth of breast cancer cells, because of the use in humans as a cancer preventive drug. It also helps with improved immune function for the prevention of respiratory diseases.

(Ed note: Jan Hooimeijer, an avian veterinarian from The Netherlands, uses red palm oil along with Harrison's foods on almost every new bird that comes into his practice, because they all have nutritional problems. He says, "When Amazons are put on red palm oil, you can see changes in a couple of weeks in their feet, scales and nails, and the beaks become shinier. After a longer term, you can see skin changes on the planter surface of the feet. We see Amazons with flat-surfaced sore feet back to normal structure within a year.")



Harrison's Power Treats now contain organic red palm fruit oil.

Power Treats can be offered up to 30% of a bird's diet if fed along with other Harrison's foods. The organic red palm oil is available separately to veterinarians as AVIx Sunshine Factor™ from Zoological Education Network, www.exoticdvm.com.

HBD NEWS



Tanya Harrison Coffinberry

Avian Nutrition Research Grant



Michael Stanford, BVSc, MRCVS, of Birch Heath Veterinary Clinic in Tarporley, Cheshire, United Kingdom, has been awarded a \$28,000 research grant to continue his nutritional research with African grey parrots. Two reports of his latest work, Update on Clinical Pathology of Hypocalcemia in Grey Parrots and Significance of Cholesterol Assays in the Investigation of Hepatic Lipidosis and Atherosclerosis in Psittacine Birds, were presented at the 2005 International Conference on Exotics.

Results of avian nutritional research projects are available at www.avianmedicine.net. If you need to obtain login and password information, contact: <jean@harrisonsbirdfoods.com>.

From the International Front

Recycling Wooden Pallets

There are special requirements for shipping Harrison's Bird Foods into Europe. Among these is the necessity to use brand new, sturdy wooden pallets for each shipment. European distributors have come up with some creative ways to recycle these:

- AviFoods of Germany delivers them to the garage of an elderly neighbor, who breaks them down and uses them to heat his house in the winter.
- HBF-UK (United Kingdom) donates the pallets to community gardens, where they are put up as fencing to help keep rabbits out and chickens in. During cold weather the pallets have been broken down and used to fuel stoves.

These recycling ideas are possible (and healthy) because the wooden pallets are pretreated with heat to rid them of insects rather than with the more commonly used chemical treatments.

Just a Reminder...

• Neonate Formula -

The precursor of this product has been around for 10 years as Passerine I diet. Passerine I preceded all of the formulated diets

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and was developed by Drs. C. R. Grau and Ann Brice at the University of California in the early 1980s for a wildlife rehabilitator. More recently, the formula has been field tested in a large avian collection in the Philippines, where it was found superior to other formulas for incubated chicks from day 1 to day 10. Juvenile Formula, which has a higher fiber content, can be used for the developing chick after day 10.

• Recovery Formula -

A second diet, originally known as Passerine II and also developed for passerine rehabilitation by Drs. Grau and Brice, has been used as a hospital diet in the Philippines for sick birds needing a formula that digests very quickly. Renamed Recovery Formula, it is very low in fiber; thus it passes quickly through the digestive system. The clinical recommendation for very sick, dehydrated birds is to start with oral fluids, then add a product with malt dextran and fructose, then start using Recovery Formula. If the bird can handle some extra fiber, the Juvenile Formula works better as a hospital care diet because the number of feedings can be reduced. The birds are released on a High Potency formula.

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• Don't forget to offer **Wild Wings Organic Wild Bird Seed** to backyard birds this winter, www.wildwingsorganic.com



Clinical Avian Medicine Book

The exciting, new, full-color, two-volume avian medicine text, edited by Drs. Greg Harrison and Teresa Lightfoot, is scheduled to be shipped to customers shortly after the first of the year. For details on topics and contributing authors, go to www.clinicalavianmedicine.com. The book will be available from the following distributors:

- Harrison's Bird Foods, 800-346-0269, www.harrisonsbirdfoods.com
- Teton New Media, www.tetonnm.com
- Meadows Animal Health Care in the United Kingdom, www.meadowsanimalhealthcare.co.uk
- AviFoods in Germany, www.avifood.com.

New Test Diet for Eclectus

In response to requests from bird owners for a special eclectus diet, Harrison's Bird Foods has developed a test formulation. High Potency Eclectus™ (HPE) has been prepared with the same high quality, organic ingredients Harrison's is known for — the difference is the overall nugget size, which is half the size of High Potency Coarse, and the omission of spirulina.



Harrison's High Potency Coarse (HPC) has been fed to eclectus parrots for two decades with excellent results, with the exception of the occasional concern of some veterinarians and eclectus owners who have suggested the "toe-tapping" and "wing-flapping" exhibited by some individuals of this species are related to ingestion of spirulina. Although there has been no proof of a causal relationship between these behaviors and ingredients in HPC, (and Dr. Greg Harrison has not seen these conditions in over 36 years of avian practice no matter what brand of food is fed), Harrison's wanted to test this theory. Please contact the Harrison's Bird Foods office at 800-346-0269 or customerservice@harrisonsbirdfoods.com if you are interested in a contract to field test this new product.

News Bytes

Check out the new look to www.harrisonsbirdfoods.com. Good stuff can be seen and downloaded from there:

- HBD Learning Center is a new, changing and expanding information department featuring articles of interest, past issues of the Avian Examiner, Avian Caregivers, HBD video and lots more.
- Debra McDonald's white papers on vitamin A. This information has also been published: McDonald DL: Feeding ecology and nutrition of Australia lorikeets. *Sem Avian & Exotic Pet Med* 12(4):195-204; 2003. (*Ed note: It is really amazing how high the vitamin A content is in many of the commercial diets; many diets have as much as 125,000 IU vitamin A, which is believed to be 10 times the amount needed.*)
- Advances in Companion Bird Nutrition, the proceedings of the 2004 European Nutritional Seminar held in Munich, Germany
- An online version of the Handbook for a Healthier Bird booklet can be accessed at www.harrisonsbirdfoods.com/learningcenter/handbook.html.
- An interesting resource for keeping up with what's happening in the organic field is the Organic Consumers Association (campaigning for food safety, organic agriculture, fair trade and sustainability): www.organicconsumers.com.

NUTRITION IN THE SCIENTIFIC LITERATURE

Wang Y, Chang CF, Chou J, et al: *Dietary supplementation with blueberries, spinach or spirulina reduces ischemic brain damage. Experimental Neurology* 193(1):75-84, 2005.

Free radicals are involved in neurodegenerative disorders, such as ischemia and aging. We have previously demonstrated that treatment with diets enriched with blueberry, spinach or spirulina have been shown to reduce neurodegenerative changes in aged animals. The purpose of this study was to determine if these diets have neuroprotective effects in focal ischemic brain. We found that animals that received blueberry-, spinach- or spirulina-enriched diets

had a significant reduction in the volume of infarction in the cerebral cortex and an increase in post-stroke locomotor activity. Animals treated with blueberry, spinach or spirulina had significant lower caspase-3 activity in the ischemic hemisphere. In conclusion, our data suggest that chronic treatment with blueberry, spinach or spirulina reduces ischemia/reperfusion-induced apoptosis and cerebral infarction.

(*Ed note: Spirulina is an important ingredient in all standard Harrison's Bird Foods formulations.*)



Using Harrisons

Clinic Sentinel Program

Vanessa Rolfe, DVM
Bird and Exotic Hospital
Lake Worth, Florida

When a patient that has been eating Harrison's comes in and doesn't look "picture perfect," I want to know why. Part of their history would include how long a bag of the food lasts. A time period beyond six weeks may be a significant clue as to why there is flaky skin or imperfect feathering. (Unfortunately, not everyone reads the information on the back of the bag.) Linking the purchase of food to the patient on the computer makes it easy to track the history.

Our front office staff is also part of our sentinel program. Our receptionists are trained to occasionally inquire as to why a household with a single cockatiel would purchase a 5-pound bag, and to be alert to when someone who historically buys 1-pound bags suddenly gets a 5-pound bag. Typically, the reasons are to save trips or money, but our staff members know how to explain why this will not work for their birds' optimum health. For convenience, the owners are encouraged to just get an extra small bag to keep from traveling in sooner.

Harrison's Bird Foods and UVB Light

Studies by Michael Stanford of the United Kingdom with African grey parrots have shown that the Harrison's formulas provide ample calcium and enough vitamin D₃ for calcium uptake. But the vitamin D₃ levels did not approach what is considered ideal. Adding more D₃ to the diet was not the solution. With additional UVB exposure, the levels optimized, and vitamin D₃ was available to the bird to perform functions other than calcium metabolism.

According to Dr. Rüdiger Korbel of University of Munich in Germany (personal communication), Philips lamps with UV light in the 285-315 nm spectrum range are fine for pet bird UVB requirements. Phillips TL950 5000K and Color Tone 50 are examples. They are good for 9000 hours (2 years at 10-14 hours per day). A timer can be set up to turn them on 30 minutes after sunrise and off 30 minutes prior to sunset. Two lights should be installed 1½-2 feet over the bird's cage.

This subject has not been completely investigated and these are the best supplementary lighting recommendations we can find at the current time.



TIP: Roll up pieces of HBD in layers of paper to give to a cockatoo as environmental enrichment.

WE GET MAIL

No More Foot Infections

Charlene Fertig
charlene@amnet.co.cr



My yellow-naped Amazon had chronic foot infections that numerous vets could not cure. It seems that the skin on her feet would start to soften and cause her to endlessly bite at them. She then would open wounds, which would become infected. Nothing seemed to help. I switched her to Harrison's food when an avian vet in the States recommended a diet change. Since then, not only has her foot problem cleared up but her feathers are just gorgeous, and her overall health and energy are great.

Recovery from Vitamin Deficiency

Rhonda Lopez
South Haven, Michigan
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My African grey was diagnosed with a vitamin deficiency, but soon after starting to eat Harrison's, there has been a great change in his appearance and attitude. He seems to be a much healthier and happier bird.



Q: What measures can/should we take to protect our parrots from the avian flu spreading around the globe? I trust your opinion. Thanks for the wonderful product line.

Elizabeth Lyons, drlizlyonsphd@excite.com

A: Dear Elizabeth, Some collections in Asia are using an unproven poultry vaccine. The susceptibility of parrots is not known. The best advice is to keep you and your parrots healthy. Wash your hands frequently. Make sure your parrots are fed Harrison's Bird Food (HBF) and get 15 minutes of sun several days a week. HBF has many ingredients that maximize the immune system, such as spirulina. Several fruits and vegetables are also immune boosters, for example, blueberries, strawberries, spinach and broccoli. If an outbreak starts, put your bird on AVIx Booster, which you can obtain from your veterinarian or www.avi-x.com. Then relax, as stress is the best friend of disease.

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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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Photographs courtesy of Rhonda Lopez



The first 10 people to spot the "Bird Doc" inside this Avian Examiner receive a free bag of the NEW Harrison's Power Treats.
E-mail Tanya@harrisonsbirdfoods.com or call 800-346-0269.