CHAPTER 17

# MIDWINTER ANEMIA: A NEW NAME AND A NEW LOOK AT AN OLD PROBLEM

The months of November through March are properly regarded in falconry circles as the "hawking months." Eyases have learned much about flying and catching prey, intermewed birds are back to being well-conditioned and steady on the wing, and falconers and dogs have put the distractions and heat of summer behind them. Game is concentrated, cover is down, and the cold, crisp air acts as a tonic. The scene is set for regular and frequent forays into the field by the falconer and his entourage.

This is all well and good; it is the essence of falconry and the reason for having the birds as hunting companions. It is also a high-energy, demanding situation that must be skillfully managed by the falconer in order to keep his bird in top hunting condition for the duration of the season. All too often, however, the screenplay is interrupted about mid- to late December with a hawk or falcon that starts refusing prey, may appear weak or disinterested, and, in some instances, undergoes severe weight loss and dies. The falconer is astonished, as he is feeding the bird well, the weight has been maintained, and the bird has been flying strong.

To understand what has happened and the rationale for the approach to treatment, a brief explanation of the physiology of energy metabolism in game hawks is required.

Though diets may vary, all living, warm-blooded vertebrates obtain energy from three basic sources: fats, carbohydrates (sugars), and protein. Carbohydrates (sugars, especially glucose) are the most readily utilizable source of energy, whether in the diet or stored in the liver and muscle of the animal as glycogen. Glucose is the substrate used by most tissues of the body as energy and is the only form utilized by the brain and central nervous system. Maintenance of circulating levels of glucose are jealously guarded and protected by the body. When dietary intake of carbohydrate is low and body stores have been depleted, glucose is manufactured by complex biochemical pathways from fat or proteins, either dietary or stored body reserves.

The body's strategy for maintaining glucose levels varies in relation to feeding. Immediately after eating (post-prandial state), the bird's energy needs are met largely by direct absorption of energy substrates from the intestine. Energy in excess of what is needed for maintaining bodily function is stored as glycogen or fat, utilized in replacing proteins such as enzymes, or used to maintain structural and functional proteins such as hemoglobin and collagen. Several hours later, in the post-absorptive state, energy must be extracted from body reserves of carbohydrate (glycogen), fat, and to some extent protein. An animal can store sufficient glycogen in its liver

to supply the body with about two hours of energy before the supply is depleted. After this, metabolism of fat stores, and in some cases, protein, must increase significantly in order to provide energy. Whereas a hawk may require nearly 24 hours to digest a crop full of food when gorged, maintenance crops such as those typically fed on a day-to-day basis will be completely devoid of absorbable nutrients 12 to 14 hours after feeding. Hence, on a daily regimen, the bird must rely on stored energy for 8 to 10 hours each day.

The extent to which a bird depletes its energy stores depends on the amount of food available to it on a daily basis, the demand for energy put upon it by vigorous activity (flying and hunting in our case), and producing heat to stay warm when ambient temperatures go below that which can be managed by the insulation of their feathers alone. The availability of energy reserves in turn depends upon several factors, including species, sex, whether it's an eyas or passage bird, whether it's imprinted or not imprinted, the amount of time in training (i.e., first year of training or later), and the degree of manning and conditioning. All falconers will immediately recognize that these same factors affect the quantity we refer to as "flying weight."

It is useful to examine, however, the physiological state represented by the flying weight of the bird. Basically, fat birds don't fly and lean ones do. However, the body doesn't burn off its energy stores sequentially. That is, it doesn't wait until the fat stores are depleted before labile proteins (e.g. plasma albumin) are utilized for energy in its efforts to provide adequate glucose levels. In fact, some fat stores are held in reserve even in advanced states of starvation, with energy demands being met by metabolism of body proteins. Therefore, as weight is reduced to bring a hawk into flying condition, we are losing more than just body fat.

To a point, this does not impair function of the animal, and for imprinted females of most species flown in falconry, especially beyond their first year, there is no appreciable impact on body proteins as the bird is brought into flying condition. A measure of the amount of protein in plasma can be obtained by measuring "total plasma solids" with a Goldberg refractometer. In wild birds of normal weight, this value ranges between 3.6 and 4.6 grams of protein per 100 ml of blood (gm/dl). An average figure for most falconry trained birds is 3.2 to 3.4 gm/dl, regarded as a low normal value. It is not uncommon, however, in passage and non-imprinted tiercels (long-wing or short-wing) at their flying weight, for this value to be under 3.0 gm/dl, indicating a significant metabolism of labile body proteins for energy under the conditions in which they are being regularly flown. Post-mortems conducted on numerous tiercels, including jerkins, peregrine, prairie, and gos tiercels, have verified the near-total depletion of body fat stores in these so-called conditioned birds at their flying weight. Thus, most tiercels, and some falcons--either because of a recalcitrant disposition or poor management by the falconer--are being taken to the field in a physiological state of insufficient energy to see them through the post-absorptive period before their next feeding without breaking down essential body proteins. Their survival is dependent entirely upon the falconer providing a daily meal of high-quality food, but over time they will slowly lose weight and condition.

It is a surprising and deceptive situation, since these birds can usually fly reasonably well and do maintain their so-called flying weight. But in time, or as a result of a slight miscue in the

quantity or quality of food, telltale signs of deficiency appear. Usually such signs appear as a bird that only dips a wing or puts in a shallow stoop when quarry is flushed, or blasts off the fist and flies to a tree rather than vigorously pursuing quarry. All too often the falconer's response to this circumstance is to assume the bird isn't hungry enough, and therefore proceeds to further deprive it of the vital energy sources of which it is already deficient.

Hunting hawks can operate for extended periods of time on this narrow margin unless one of three events intervenes: 1) a break in the schedule, leading to a missed meal (bird is lost and left outside overnight), 2) a sudden drop in the temperature, or 3) 1 and 2 combined.

Thus, a new and critical variable is introduced--temperature. Below 20 degrees F, most hawks dramatically increase their metabolic rate in order to keep warm. If this increase in energy demand is not adjusted for by increasing their energy reserves (i.e., feeding them more or bringing their weight up 1 to 2 ounces, the standard feeding regimen that has kept them in the field from August through October will be insufficient to keep them from digging deeper into their protein energy stores. If they are close to the margin to begin with, and the temperature drops from the mid-20s to zero or below overnight, a bird that has been flying reasonably well can nearly starve to death overnight. They will undergo a precipitious overnight weight loss, severe dehydration, and metabolism of nearly all available enrgy stores; they appear listless, light weight, "almond-eyed," and often will be sleeping during the day. Many are too weak to stand or will fall over if subjected to the slight exertion of handling. A pronounced keel is the sign most falconers are readily familiar with, although some individual birds can be in an advanced state of energy depletion with only moderate atrophy of the breast musculature.

Past experience has shown the middle of December, with the distractions of the holiday season and the onset of serious winter weather, to be the time of most probable incidence of these problems.

Clinical evaluation of a bird in such a state underscores the severity of this sudden turn of events. Body weight will be 2 to 3 ounces under flying weight, total plasma proteins will be less than 2.0 gm/dl, and they will exhibit an anemia because they no longer have the raw materials for producing red blood cells which can be measured by a "packed cell volume" (PCV) or "hematocrit" determination. While normal raptors have PCVs of 42 to 45 percent (50 percent in large falcons), many game hawks in mid-winter have PCVs of 37 to 40 percent, indicative of a mild anemia (hence, the term "mid-winter anemia"). Clinically ill birds will have PCVs below 30 perecent; their uric acid levels will also be elevated. The latter is a nitrogen-containing product that appears in the blood when large amounts of protein are being broken down for energy. Surprisingly, glucose levels are not appreciably lowered, giving evidence to the fact that the body will literally tear itself down to provide substrate for glucose to keep the central nervous system operating. A hawk in this condition is in critical condition, and emergency care is required.

## Treatment

Although its energy stores are severely depleted, **the most inappropriate thing one can do is feed the bird. DO NOT FEED A HAWK THAT IS IN ADVANCED STAGES OF LOW CONDITION.** "Gorging" or "cropping-up" is invariably done and is encouraged by the fact that in all but the most moribund cases, the hawk will eat, sometimes with great vigor. Lacking the energy to digest food, the bird will fail to turn its crop over and will quickly acquire the condition referred to as "sour crop." Despite the energy-depleted status of the bird, the most significant alteration to its physiological status in the last few hours has been significant dehydration. Hence, the treatment program requires fluid replacement first, along with the provision of energy substrates that are added to the fluids.

To be most effective, these fluids must be given intravenously. Subcutaneous injection is less effective but may be the only choice in some instances. The following is a list of recommendations for treating game hawks suffering from low condition:

1. Provide fluids as follows: Intravenous administration of 15 cc/kg of lactated Ringer's solution diluted 50:50 with 5 percent dextrose. This can be injected as a bolus in the large vein on the underside of the wing and should be repeated at eight-hour intervals for three days. Warm the fluids to about 100 degrees F before administration. If the PCV is less than 20 percent, use a blood transfusion. (See Chapter 3, Management of Medical Emergencies in Raptors.)

2. In milder cases or where intravenous injections are not possible, subcutaneous administration of the same fluid may be utilized. The web of skin between the underside of the thigh and the body wall is a good site for injection. A 25-gauge needle should be used. Again, warm the fluids.

3. Boiled coke and egg and/or warmed electrolyte solutions such as pedialyte may be given orally and will be effective in mild cases. These can also be used as a supplement to the intravenous injections of fluids beginning with the second 8 hour injection. A 10-perecent mixture of Nutrical (Evsco Pharmaceuticals, Immunogenetics, Inc., Buena, NJ 08310) provides a balance of fluids, electrolytes, vitamins, and caloric base that is an ideal adjunct to treatment of this condition.

4. Administer the following drugs by intramuscular injection: dexamethazone (Azium, Dexasone) at the rate of 2 mg/kg, B-complex vitamins equivalent to 10 mg/kg of thiamine (see label for thiamin content), and iron dextran at 10 mg/kg. Iron is given once, B-vitamins daily for one week and the dexamethsone may be repeated at two-day intervals if needed.

5. Keep the bird in a warm, quiet environment (basically indoors).

6. Provide small amounts of "clean meat" (i.e., no bone, no casting material). Liver of chicken

or other avian species is optimal. Give no more than 1 ounce at a time to a 1 kg bird and give it at 6-hour intervals for 4 days. As the bird gains strength and weight, the amount can be increased and frequency decreased. There is a lot of latitude in the amount of food to provide, depending on the response of the bird. No matter how ravenous the bird appears at this stage, however, do not feed it a full crop. Monitor the weight and keep feeding enough so that the weight increases slightly each day.

By the end of one week of treatment, the intravenous and oral fluids as well as the injections of B-vitamins can be stopped. If food is being handled well, three-quarter crops can then be fed. For the duration of recovery, which will take three weeks, feed the bird a high-quality, vitamin-supplemented (Nutrical paste, Vionate or equivalent) diet. Continue to feed up until the weight is several ounces above flying weight and maintain it there for at least a week before returning the bird to the training and flying schedule. A final confirmation of the bird's fitness can be acquired by another set of blood tests, which should yield a PCV of 42 to 45 percent (52 percent for large falcons), total plasma solids of 4.0 gm/dl, and uric acid levels below 5 mg/dl.

## Prevention

Prevention of this condition requires anticipating the increased energy demands of flying hawks in cold weather by increasing both their daily ration and the flying weight, feeding a high-quality diet (stew meat, chicken necks, venison, day-old chicks, etc., as staples of the diet are entirely inadequate), and maintaining a rigid and disciplined schedule of flying and feeding interspersed with periods of time off.

In the cold periods of midwestern winters, when the temperatures are below zero for extended periods of time, I don't believe it is possible to fly tiercels of most species daily and keep them healthy and strong. They should be flown on a weekly schedule that aims to fly them hard for three consecutive days, followed by a good gorge of high-quality food on the last day, a day to turn that over, and three days of an intermediate level of feeding to readjust their flying weight for the following interval of heavy field activity.

## Summary

In summary, low condition has long been recognized among trained raptors. However, the physiological alterations that accompany it in terms of anemia, body-protein breakdown, and the factors that contribute to the precipitous decline in the condition of the bird, often leading to death, have not been previously addressed. Further, the emergency nature of the condition, requiring intravenous fluid administration and refraining from feeding the bird a full crop, have not been emphasized. This discussion has linked these various elements together and provided a recipe for treatment that addresses the major physiological defiencies.