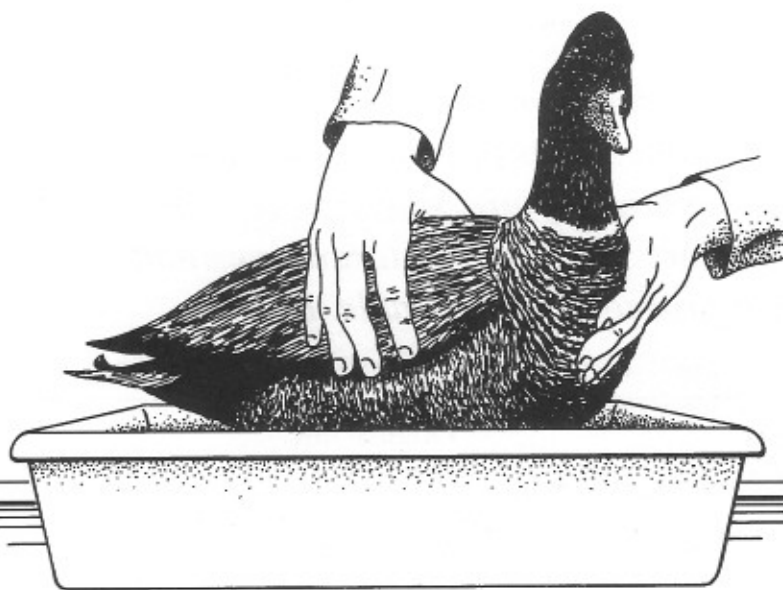
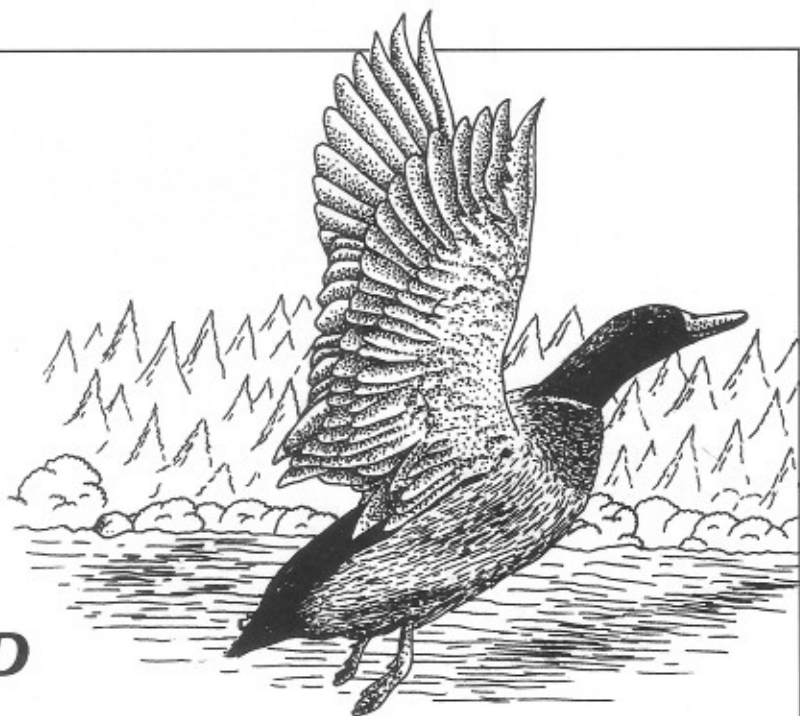
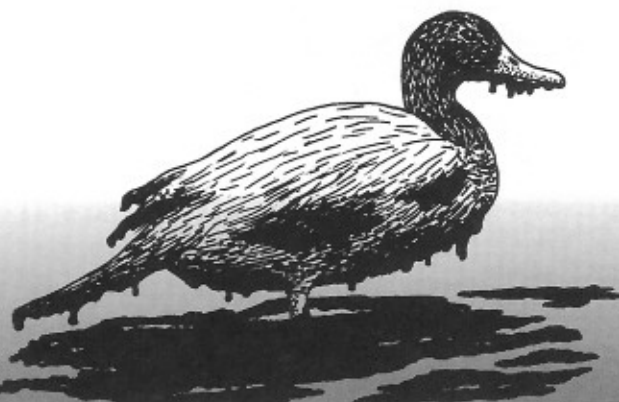


Emergency  
action guide  
for oil spills

**REHABILITATION  
OF CONTAMINATED  
BIRDS**



Danielle Beaulieu  
Guy Fitzgerald



UNION QUÉBÉCOISE DE RÉHABILITATION  
DES OISEAUX DE PROIE

## INTRODUCTION

*When oil spills occur in areas where large numbers of birds may be contaminated, people concerned about protecting wildlife and anxious to help often volunteer their services. These people must be allowed the opportunity to assist animals in distress, but such action must be very well organized to be effective and rewarding.*

*Planning plays a major role in rescue operations and must be done well in advance of any emergency that might occur. When such events do happen, speedy response is crucial, since much of the damage is done immediately. Training of volunteers is part of such preparation and is a key factor in the success of operations.*

*This guide is intended as a training and reference tool, designed to be much more practical than theoretical, for anyone wanting to participate in the rescue of oiled birds. A review of the main effects of oil contamination on birds will be followed by detailed discussion of bird capture, stabilization, cleaning and reconditioning. There will also be a short section for veterinarians outlining the principal diagnostic and treatment procedures applicable to birds.*

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## EFFECTS OF OIL CONTAMINATION

Oil contamination have many deleterious effects on birds. Some of these are very easy to identify, but others, those affecting the reproductive system for example, emerge only over the longer term.

Certain bird species, such as the alcids (murre, puffin, guillemot, razorbill), diving ducks (eider, scoter, scaup, merganser, goldeneye, oldsquaw, harlequin duck, ruddy duck, etc), as well as grebes and loons, are more vulnerable than others to oil spills because of their habits and behaviour. These are the species that spend much of their lives at sea or along coasts, often socially, and forage by diving and swimming submerged. These birds do not seem to be afraid of oil, often diving and resurfacing within slicks. When spills reach the flats or the shore, however, a wider range of creatures is affected, depending on the location and season.

### 1- WEIGHT OF OIL

One of the most obvious effects of hydrocarbons on birds is the weight of the oil on the plumage. Badly oiled birds often cannot fly or even remain afloat because of this added weight. They are then in danger of drowning or of further contamination since they can no longer flee the slick. Some, however, may manage to struggle ashore, where they can then be easily captured.

### 2- LOSS OF WATER RESISTANCE

Oil also affects birds' plumage by destroying its resistance to water. Water cannot penetrate the plumage to reach the skin of a bird in good condition because of the structure of the feathers. Each feather filament (barb) is connected to the next by a fine system of

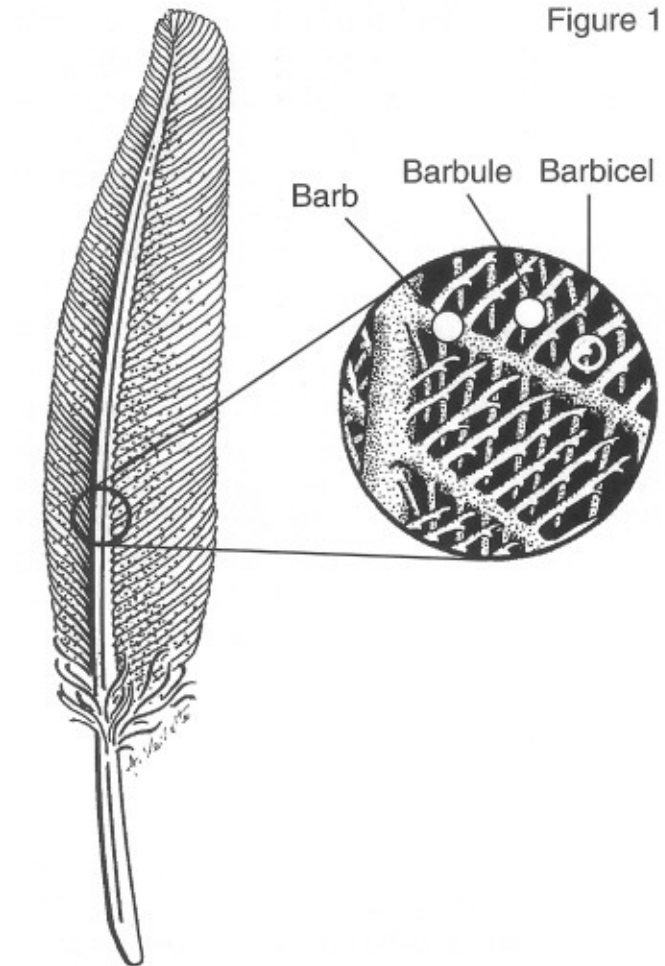


Figure 1

barbules, each of which interlocks with the next by means of barbicels. This tight weave of filaments is impervious to water, which is prevented from penetrating such fine spaces by its own surface tension. When feathers are contaminated with hydrocarbons, their structure breaks down, as the surface tension of the oil is weak enough to allow it to penetrate and undermine water resistance. Water then invades the plumage, which becomes waterlogged, and the bird has trouble flying and staying afloat.

### 3- LOSS OF INSULATION

The structure and arrangement of feathers also play a major role in keeping birds insulated. Birds have a high metabolic rate and at low temperatures must be able to conserve heat. The outer plumage acts as a windbreak, and

the dense weave of barbules and barbicels traps small pockets of air warmed by body heat. The plumage, together with a layer of subcutaneous fat, shivering, enhanced muscle tone and increased motor activity, helps normal birds to maintain a steady body temperature in cold weather. Contaminated plumage loses its insulating properties, and the bird has to expend more energy to keep its body temperature stable and thus needs to eat more. However, oiled birds tend to spend most of their time on preening and neglect feeding. Their body then starts using up subcutaneous fat reserves, further diminishing insulation; the birds then lose weight and dehydrate. When heat loss outweighs the body's heat production, hypothermia and enfeeblement set in, sometimes with fatal results.

#### **4- INGESTION OR INHALATION**

Hydrocarbons also have harmful effects when ingested, inhaled or absorbed through the skin; in general, toxicity increases with volatility and fluidity. They are also easily absorbed through the skin. Ingestion is the most common channel of contamination, whether as a result of preening or from consumption of contaminated food or water.

The toxic effects of oil depend on its composition and the quantity absorbed. Stress and malnutrition can further complicate matters and cause death even in cases where minimal amounts of oil are involved. The most common consequences of oil ingestion are haemolytic or Heinz body anemias (conditions in which the organism destroys those red blood cells made abnormal by the poison), behavioural changes in such areas as breeding, nesting and reaction to scaring, and damage to liver, stomach, intestines, kidneys and pancreas. Disruption of electrolytic equilibrium resulting in dehydration also occurs, especially among seabirds, whose intestines are modified to enable them to drink salt water. Even very small quantities of certain oils may block this mechanism, so that

rapid dehydration ensues. Other possible consequences are gout, inhibited circulation and ultimately hypovolemic shock (shock due to sudden or drastic changes in blood volume). Hydrocarbon poisoning can also provoke hypertrophy of the adrenal glands, shrinkage of the lymphoid tissue and possibly impairment of intestinal absorption of certain nutrients.

Toxic hydrocarbon vapours may be inhaled. Pneumonia due to oil vapours carried into the respiratory tract can prove fatal, especially for weakened birds.

#### **5- IMPACT ON BREEDING**

Hydrocarbons also affect birds in less obvious ways, with particular impact on their reproductive systems. Delayed laying, fewer eggs, lower hatching rates and thinner eggshells are among the effects of oil on bird breeding. Eggs contaminated by oil from soiled adult birds may not hatch or may produce deformed chicks, and nestlings fed contaminated food may be impaired in their growth.

When a bird is brought to a rehabilitation centre, it must be given prompt and adequate treatment for the immediate effects of hydrocarbons. Yet it must not be forgotten that captured birds are often seriously debilitated. An effective and safe capture system is therefore crucial.

## **HANDLING OF BIRDS**

### **1- CAPTURE**

Catching a healthy bird is usually very hard, if not impossible. In most cases, capture is only possible once a bird is severely weakened and unable to flee. Though it is important to cap-

ture birds as promptly as possible to administer the required treatment, certain safety rules need to be observed for the good of both birds and handlers.

The people assigned to catch birds are divided into two two-man teams, one patrolling on land, where possible in a four-wheel drive, and the other on the water in a Zodiac with a shallow-draft propeller, a flat-bottomed boat or, better yet, a hydroglider or air-cushion vehicle. Without boats, capture may be much riskier and harder, especially where the shore is rocky, shallow or overgrown with seaweed.

Birds can be taken using fishing nets fitted with telescopic handles three to four metres long, lasso nets or any other techniques which extend the reach sufficiently. As a last resort, sheets can be used. These are thrown over a bird, aiming particularly at its head, so that it can be approached and taken without undue risk. Some birds have a very strong, sometimes sharp beak, and protective goggles are strongly recommended. Rubber gauntlets likewise protect the hands from beaks and claws, as well as from contact with the oil. Good boots or hip waders with non-slip soles will make progress through the water easier without slipping on oil-slick rocks and protect the legs against claws. The talons of certain birds can inflict quite painful gashes.

Birds should be stalked carefully, cautiously and methodically. Those that are weak enough can be taken quite easily if approached calmly. However, some birds, though clearly in trouble, will still have enough strength to try to evade capture at all costs. Such birds are not yet weak enough to take, and to persist in chasing them may endanger not only the capture team but also the bird itself. In fact, a sufficiently arduous chase may be enough of a stress factor to seriously worsen the bird's condition. It is better to concentrate on those birds that are easy to catch, leaving the others until they weaken, which they inevitably will.



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## 2- RESTRAINT

Once a bird has been captured, proper handling is very important. Using the right hold reduces the risks of injury to both handler and bird. Various holds can be applied, depending on the type of bird. Larger birds with potentially dangerous beaks, such as most duck species, can be held under one arm with the other hand on the base of the cranium or back of the neck, though without gripping too tightly. Another way is to carry the bird under the arm but with its head to the handler's rear; while effective for mere transportation, this method does not allow another person to examine the bird without risk of jabs and bites from the beak.

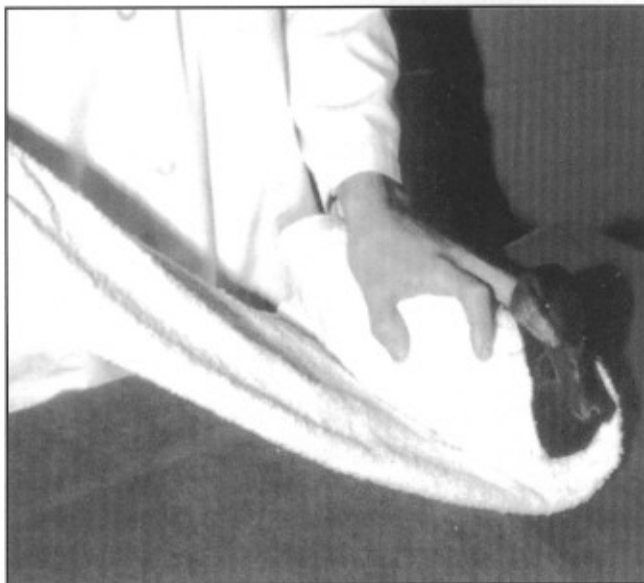
For birds with a less menacing beak, the head need not be restrained. They can be held by simply placing the hands on either side of the body, thus immobilizing the wings. To avoid blows from the beak, which can still be quite painful, the bird should be held away from the body.

Small birds can usually be held in the palm of the hand. They are best kept in an upright position to enable them to breathe and should not be gripped too tightly. Birds have no diaphragm and breathe solely by expanding



Guy Fitzgerald

and contracting the rib cage; if held too firmly, they cannot do this and risk suffocation. Small birds with dangerous beaks can be held the same way, restraining the head, very loosely, between thumb and index finger.



Guy Fitzgerald

A very useful technique for handling oiled birds is to wrap them in a towel. This immobilizes the wings and also prevents preening, thus diminishing the risk of more serious poisoning. This method can also be applied when transporting the birds to a cleaning centre. Birds wrapped in a towel with only the head protruding can be carried by hand or transported in perforated boxes. An alternative to the towel is to place the bird in a box too small for it to turn round, thus preventing preening. Of course, no bird can tolerate this position for very long, and it is important to get them to a rehabilitation centre as quickly as possible.

### 3- PRECAUTIONS

When handling birds with threatening beaks, it is sometimes tempting to keep the beak shut with an elastic band or sticking plaster. This can be dangerous for birds; when stressed, as in the case of unaccustomed handling, their body temperature rises appreciably, and they have few mechanisms for dissipating this heat other than panting. The linings of their mouths are rich in capillaries that cool the blood, thus minimizing the risk of a potentially fatal heat stroke. It is therefore very important to allow them to breathe through the mouth, which also makes suffocation less of a threat. It is better to use a safe and effective hold than to keep the beak shut.

A widely used hold, especially for ducks and larger waders, is to grasp them by both humeri and lift them with one hand. Though common, this is not good for the birds; in some species, the shoulder socket into which the humerus fits is quite shallow, and the joint easily dislocates. This hold puts a lot of tension on the humerus and shoulder, with concomitant risk of luxation or even of a fractured humerus, reducing the bird's chances of recovery and release. Not all species have the same shoulder anatomy, but in case of doubt it is better to use other, safer and equally effective holds.

The various holds described in this section are also used in rehabilitation centres, as they facilitate prompt and safe treatment. When handled properly, birds suffer less stress, and their chances of survival are thus greater.

#### **4- TRANSPORTATION**

Captured birds must be moved to the nearest cleaning centre at the earliest opportunity. Perforated cardboard or plastic boxes are the ideal container, but wire cages are not suitable. Nor should containers be kept in a room or vehicle with inadequate ventilation or temperature control. Since the body temperature of contaminated birds is influenced by that of their surroundings, hypothermia is common. On hot summer days, on the other hand, crowding birds into a vehicle parked in the sun may induce heat stroke.

Where the spill site is a long way from the cleaning centre, some treatment may have to be given locally. As outlined in the next section, the inside of the beak and nostrils can be cleaned, the eyes can be irrigated with artificial tears, and fluids can be given by force-feeding.

#### **5- IDENTIFICATION**

When a bird arrives at a cleaning centre, there must be an organized system in place for recording as much information as possible. Before any action is taken, the species must be identified. The treatment indicated may vary from one species to another; for example, loons are much more vulnerable to stress than other species and should be treated more promptly. Diet will also vary by species. Knowledge of certain biological characteristics is a significant asset in bird rehabilitation, and the new Atlas of the Breeding Birds of Southern Québec (Gauthier and Aubry, 1995) is an invaluable tool.

Lastly, when a major spill threatens large numbers of birds, priority must be given to

either rare species or those individuals with the best chances of recovery. A bird identification guide and a priority species list are then useful (Daigle and Darveau, 1995). The list is based on detailed criteria for each species: worldwide population, productivity, vulnerability, local population, commercial value and cleaning survival rate.

#### **6- FILES**

A file should be opened on each bird as soon as it arrives. All relevant information should be gathered, not just for effectively monitoring the individual's progress, but for statistical compilation. Pages 25-26 provide a sample record.

#### **7- OVERALL ASSESSMENT**

Often when a bird covered with oil arrives at a cleaning centre, the staff's first impulse is to clean it immediately. It must be kept in mind, however, that such birds have probably already been contaminated for hours, if not days. They are starving, dehydrated, suffering from the toxic effects of the oil and terrified of this first encounter with humans. They do not have the energy reserves needed to undergo a thorough cleaning. The key to success in rehabilitating oiled birds is to give them restorative treatment before cleaning them. On average, 12–24 hours may elapse between arrival and cleaning, even longer if necessary.

#### **8- PHYSICAL EXAMINATION**

To assess the overall condition of a bird, a full and careful examination should be conducted. This should always be done consistently so that no item is overlooked. If starting with the head, check the eyes, especially for ulceration, the nostrils and the ears and remove any excess oil from these areas. If ulceration of the cornea is suspected, the diagnosis can be confirmed

by means of a fluorescein test. The beak, nostrils and inside of the mouth can also be cleaned with cotton swabs, preventing further ingestion of oil or obstruction of the respiratory passages. The feathers on the head should be gently wiped with a towel.

Good indicators of a bird's general condition and of how long it has been contaminated are the body condition, weight and degree of dehydration. A very thin bird would clearly have been suffering from the effects of hydrocarbon contamination for several days, having not eaten for some time. The body condition can be assessed from the muscle mass on either side of the keel of the breastbone. In a bird in good condition, the keel is hard to feel, whereas in a thin bird it is quite prominent. Weight is also an excellent indicator, especially if normal weights for the species are known (see list following).

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**LIST OF AVERAGE WEIGHTS (in grams)  
FOR VARIOUS WATERBIRD SPECIES**

(Taken from Gauthier and Aubry, 1995;  
Lehoux and Cossette, 1993)

	MALE	FEMALE
Red-breasted Merganser	1,133	907
<b>Hooded Merganser</b>	<b>679</b>	<b>543</b>
Brant	1,500	1,270
<b>Canada Goose*</b>	<b>3,800</b>	<b>3,300</b>
Harlequin Duck**	653	553
<b>Gadwall</b>	<b>989</b>	<b>848</b>
Mallard	1,261	1,048
<b>Oldsquaw</b>	<b>815</b>	<b>634</b>
Black Duck	1,224	1,088
<b>Pintail</b>	<b>997</b>	<b>815</b>
American Wigeon	700	680
<b>Shoveler</b>	<b>634</b>	<b>589</b>
Common Eider	1,995	1,542
<b>Peregrine Falcon**</b>	<b>611</b>	<b>952</b>
Common Goldeneye	997	815
<b>Barrow's Goldeneye</b>	<b>1,087</b>	<b>725</b>

	MALE	FEMALE
Ring-billed Gull	566	471
<b>Great Black-backed Gull</b>	<b>1,829</b>	<b>1,488</b>
Herring Gull	1,226	1,044
<b>Common Merganser</b>	<b>1,588</b>	<b>1,133</b>
Great Blue Heron	2,576	2,204
<b>Greater Scaup</b>	<b>997</b>	<b>907</b>
Horned Grebe**	453	453
<b>Red-necked Grebe**</b>	<b>1,023</b>	<b>1,023</b>
Black Guillemot*	431	434
<b>Common Loon</b>	<b>4,134</b>	<b>4,134</b>
Puffin	431	434
<b>White-winged Scoter</b>	<b>1,542</b>	<b>1,223</b>
Common Scoter	1,087	815
<b>Surf Scoter</b>	<b>997</b>	<b>907</b>
Thick-billed Murre	957	882
<b>Common Murre</b>	<b>1,007</b>	<b>994</b>
Ring-necked Duck	725	679
<b>Redhead</b>	<b>1,133</b>	<b>997</b>
Black-legged Kittiwake	421	393
<b>Snow Goose*</b>	<b>3,310</b>	<b>2,812</b>
Least Bittern**	78	78
<b>Bufflehead</b>	<b>453</b>	<b>317</b>
Lesser Scaup	861	770
<b>Razorbill</b>	<b>727</b>	<b>717</b>
Piping Plover**	55	55
<b>Bald Eagle**</b>	<b>4,300</b>	<b>4,300</b>
Yellow Rail**	60	60
<b>Blue-winged Teal</b>	<b>408</b>	<b>362</b>
Green-winged Teal	362	317
<b>Arctic Tern</b>	<b>112</b>	<b>107</b>
Caspian Tern**	661	661
<b>Roseate Tern**</b>	<b>108</b>	<b>108</b>
Common Tern	124	126

NB: Priority species \* and very high priority species \*\*  
(Daigle and Darveau, 1995)

A bird's state of hydration can be assessed by moving the skin over the breast. In healthy birds, the skin slides very easily, while in dehydrated ones it is harder to move because it has lost its elasticity. Pinching the skin on the feet is another good indicator; if the wrinkle disappears quickly after pinching, then the bird is well hydrated. If the wrinkle remains



for several seconds, the bird is suffering from dehydration.

Dehydration in animals can be expressed as a percentage. A bird rated 7% dehydrated has lost 7% of its weight in water. The following table outlines the signs of various degrees of dehydration.

% of dehydration	Clinical signs
6–7%	moderate water deficit: oral mucous membranes dry, with saliva forming filaments when beak is opened; pinched skin persists for about 2 sec; little urine produced; bird remains alert.
8–10%	severe water loss: oral mucous membranes dry with thick mucous filaments on opening beak; pinched skin persists for 2–5 sec; skin resists sliding over breastbone; very little urine production; bird is apathetic, with sunken eyes and shrunken veins (little filling when pressure is applied).
10–12%	extreme dehydration: oral mucous membranes very dry with thick mucus; pinched skin persists more than 5 sec; skin practically adhering to breast muscle tissue; no urine production; bird in shock (prostrate, eyes closed, often unable to stand, extremities cold, heart rate high); eyes dry and sunken; only a thin flow of blood detectable in veins.



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After the breastbone test, the limbs should be checked for any wounds, fractures or luxations, which should be treated immediately. This is also the time to wipe off excess oil to limit further ingestion.

Lastly, cloacal temperature should be taken. A bird's normal temperature should be about 39–41°C, or 102–106°F. The birds brought in will often be in a state of hypothermia because their plumage has lost its water resistance and insulating properties.

## 9- LABORATORY TESTS

Some laboratory tests are easy to perform, quick to complete and provide useful information on the bird's general state of health. With a simple blood test, we can determine haematocrit (percentage of red cells in the blood), total solids by means of refractometry, and glucose level. Haematocrit, which should be around 40–50% in a normal bird, and total solids are indicative of the creature's state of hydration and whether it is anaemic, a possible result of hydrocarbon poisoning. The total solids test gives an idea of how long the problem has existed. The norm for total solids is around 4.0–5.0 g/dL; anything lower may indicate that the bird has not eaten for a long time. Blood sugar level, normally 200–500 mg/dL, or 11–28 mmol/L, may show whether the

bird is suffering from hypoglycaemia as a result of prolonged food deprivation. If so, the bird will need more intensive care to recover.

## 10- TRIAGE

Sometimes when a major spill affects large numbers of birds, staff and facilities are soon overloaded, and triage has to be resorted to. The principle of triage by species has already been mentioned, but further screening is needed according to the condition of the incoming birds, their chances of survival and the projected time needed to save them. The main indicators for a bird's chances of survival to recovery and release are state of hydration, body temperature, haematocrit, total solids, blood glucose, signs of poisoning and, of course, any other problems, such as diseases, fractures or sores.

A bird dehydrated by more than 10–12% has little chance of survival without treatment requiring a heavy investment of time and effort. The same applies to those with a body temperature below 38°C, or 100°F, a haematocrit of less than 15% or total solids count of less than 2.0 g/dL. Signs of severe hydrocarbon poisoning make prospects yet worse. With respect to fractures and sores, the outlook obviously depends on their severity. Deep or very extensive wounds will demand much more time and care, while superficial damage will heal quite quickly. Some fractures can be mended by applying an external splint such as a figure-eight bandage, whereas others would require expensive surgery that the bird would find hard to bear, followed by intensive post-operative care.

In short, in cases of minor spills where there are enough people available, all birds arriving at the cleaning centre can be treated. If time, staff or space are short, however, it is important to be able to apply triage. It is better to save as many viable birds as possible rather

than strive to save birds that are too far gone. Euthanasia of birds that are too debilitated then becomes a humanitarian issue, and the best person to make such decisions remains the veterinarian.

## 11- RESTORATIVE TREATMENT

After triage, restorative treatment should be started immediately in accordance with the results of the general examination. Here again, prompt and effective action is the key to success. During the first 12–24 hours, treatment should aim to stabilize the bird's general condition. Cleaning should be delayed until the bird is healthy enough to bear the stress of being washed.

### 11.1- Artificial tears

During the examination, the eyes should be washed and artificial tears applied immediately.



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This is useful when the bird is dehydrated or its eyes are dry or have been irritated by hydrocarbons. This treatment can be repeated and is particularly useful when soap gets in the eyes during cleaning.

### 11.2- Fluid therapy

One restorative treatment that is extremely important for stabilizing birds is the administration of fluids. The birds brought to rehabilitation

Figure 2

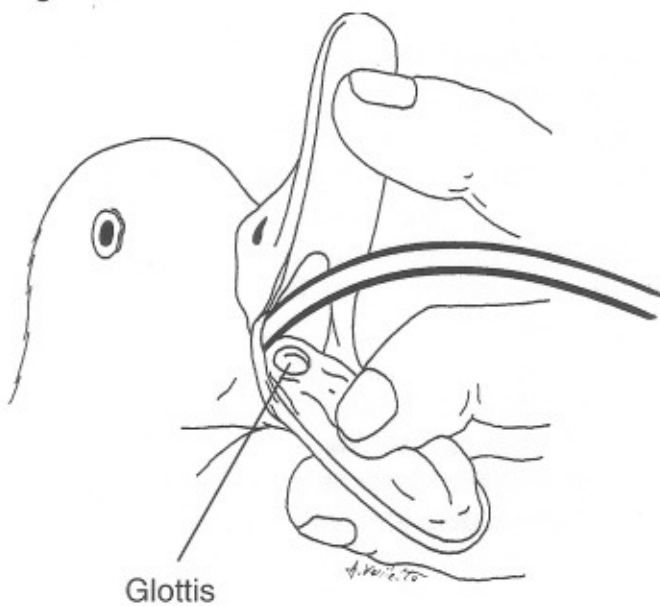
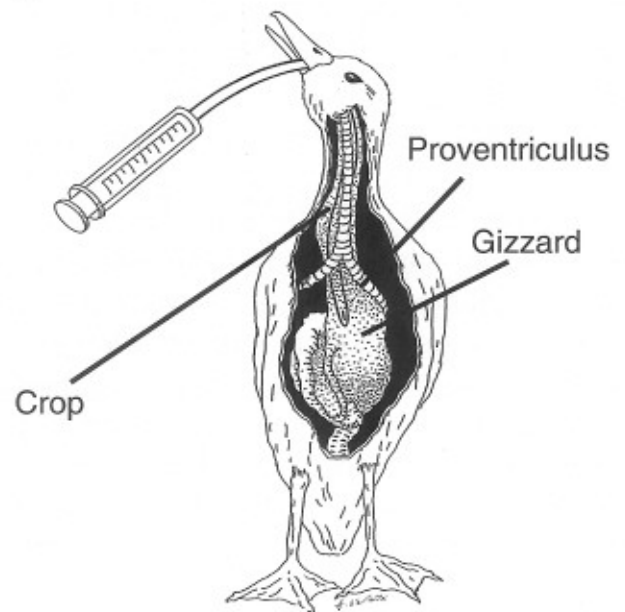


Figure 3



centres are very weak and dehydrated, having often lost 7–10% of their body weight in water, if not more. This deficit is evaluated on the basis of the normal weight for the species. For example, if a 9% dehydrated male Black Duck is admitted with a weight of 900 g, it will have

tion has the same concentration of electrolytes as the blood; it is thus perfectly balanced and can be fortified by adding Nutrical™, a high energy paste which will help restore the bird's strength. An alternative to the LRS/Nutrical mixture is Emeraid™, a nutritional supplement

**Sample fluid therapy plan for a 9% dehydrated male Black Duck**

Day 1	50% of deficit + 100% of daily needs (50 ml/kg)	55 + 61 ml (29 ml morning, noon, afternoon and evening)
Day 2	25% of deficit + 100% of daily needs	28 + 61 ml ( 30 ml morning, noon and evening)
Day 3	25% of deficit + 100% of daily needs	28 + 61 ml ( 30 ml morning, noon and evening)
Day 4	100% of daily needs	61 ml (30 ml morning and evening)

lost 110 ml of water (1,224 g X 0.09) and not 81 ml (900 X 0.09). It is crucial to rehydrate as soon as possible, certainly within the first 48–72 hours, by administering a lukewarm Lactated Ringer's solution (LRS). This solu-

available over the counter.

Fluids are customarily administered orally, using a stomach tube. In place of a tube, a urinary catheter for dogs, 12–16 French, is perfectly adequate. In this operation, the bird's

head must held still. The beak is opened, and the end of the tube, lubricated with K-Y™, is gently inserted into the oesophagus, taking care to avoid the glottis (the opening from the larynx into the trachea); in birds, this opening is relatively easy to see if the tongue is pulled. This orifice leads directly to the lungs and air sacs, and introducing fluids into the glottis may cause pneumonia, or even asphyxiation and death. It is therefore important to identify the organ correctly before administering fluids, making sure that the tube is indeed in the oesophagus, behind the trachea. Once the tube is inserted, it can be checked by feeling the neck for both trachea and stomach tube; if only one tube can be felt, it is safe to assume that the tube has entered the trachea, and it is best to withdraw it and start over. If both structures can be felt, the tube should be pushed down into the proventriculus and the fluid injected. If the tube is not far enough down, the fluid may well back up into the mouth.

The quantity of fluid to be given depends on the bird's state of hydration on arrival. Calculations should take into account not only the fluid deficit, but also daily maintenance needs. Maintenance fluids amount to 50 ml per kg of body weight per day, the typical water intake of an animal that is not dehydrated. This must be added to the deficit, which should be made up quickly, ideally by 50% in the first 24 hours and 25% in each of the next two such periods. In general, birds can take roughly 20–30 ml/kg of fluids three or four times a day, gradually reducing the amount.

Sometimes, a bird will be too weak to keep its head up, in which case oral administration of fluids is not advisable, as it may regurgitate the liquid and choke on it. It is then preferable to administer fluids by subcutaneous, intravenous or intraosseous injection, for which the assistance of a veterinarian is recommended.

### 11.3- Treatment for poisoning

After artificial tears have been applied and fluids administered, special attention must be given to safeguarding the bird from hydrocarbon poisoning. It is impossible to extract from the alimentary canal any oil already ingested, but administration of a mucous membrane protector such as Peptobismol™ may limit absorption and thus mitigate the severity of the poisoning. A 10% activated charcoal solution may also be useful in neutralizing the toxic effects of petroleum. Preventing the bird from preening by wrapping it in a towel also lowers the risk of poisoning.

### 11.4- Warmth

For birds suffering from hypothermia due to loss of plumage insulation, a warm environment is crucial. Their temperature should be taken regularly, and if necessary they should be given warm fluids to try to restore their proper body temperature. Care must be taken, however, not to overheat them, as they also have trouble eliminating excess heat.

### 11.5- Rest

After examination and treatment, what birds need most is quiet. It must be kept in mind that these are wild creatures, probably experiencing their first contact with humans. They are frightened, and this added stress further weakens them. A quiet place away from people where they can rest is essential. Between treatments, the birds should be kept in a safe, quiet, warm place away from noise and bustle. People working in these areas must be reminded of this requirement so that they keep as quiet as possible and avoid needless handling of the birds.

## 12- HOSPITALIZATION

There are many problems associated with keeping wild birds in captivity, and stress is

certainly a major factor in the development of these conditions. It has often been reported that stress diminishes the effectiveness of animals' immune systems, making them less resistant to disease. Calm is therefore an extremely important consideration in keeping birds that are victims of oil spills.

### **12.1- Bumblefoot**

A common problem encountered in birds is bumblefoot. This condition starts with a lesion or small cut on the sole of the foot through which bacteria can enter and create an infection and swelling. Without timely treatment, the infection may reach the tendons, at which point damage is virtually irreversible. Stress, floors such as concrete that are too hard for birds used to swimming, and inadequate hygiene are all contributing factors. As bumblefoot is very hard to treat, the emphasis should be on prevention.

### **12.2- Breast sores**

Breast sores have substantially the same causes as bumblefoot. Diving birds, greatly weakened birds and those suffering from foot problems tend to spend a lot of time resting on their breast, making them susceptible to sores. As with bumblefoot, this problem is more easily treated if detected early.

### **12.3- Aspergillosis**

Aspergillosis is a disease of the respiratory system caused by a microscopic fungus. It is caught when birds breathe in the spores, which are pervasive in the air. The fungus may then develop into nodules in the trachea, air sacs and lungs, making breathing laboured and noisy. The fungus can obviously develop more readily if the immune system is depressed, for example by periods of intense stress. Moreover, some birds may be carriers of aspergillosis long before they arrive at the centre without suffering any consequences, but the

stress of captivity may be enough to bring out clinical signs. Aspergillosis is usually fatal. It can be prevented by keeping stress to a minimum, strict hygiene and adequate floor coverings.

### **12.4- Conditions of captivity**

Birds can be kept in various kinds of cage, but certain criteria have to be observed; in particular, materials must be suitable for birds and easy to clean. Wild birds are inherently dirty in captivity, and cleaning may occupy centre staff for hours on end. It should be remembered, too, that droppings can pollute plumage as seriously as hydrocarbons. Materials that are easy to clean, such as Coroplast™ (a plastic that looks like corrugated cardboard), save a great deal of time and also cut down the risks of transmitting diseases and parasites.

Birds may be caged individually, but often lack of space means that small groups have to be housed together. In such circumstances, it is important not to mix badly oiled birds with less serious cases, as the latter may become more heavily contaminated through close contact with the former. Similarly, birds that have been cleaned should never be kept with those awaiting cleaning.

The floor of the cages should also be easy to clean. A padded flooring is ideal (for example rubber mats, solar blanket, tarpaulin) and reduces the risks of foot and breast sores. Hygiene should be very stringent, for the sake of both birds and staff. These birds are wild animals and may carry diseases and parasites. The walls and floors of pens should be cleaned with strict regularity, ideally once a day, and food and water dishes should be washed with the same frequency. There are many suitable disinfectants available, such as chlorhexidine, Clinicide™, Virkon™ and Savlon™.

## 12.5- Water and food

At first, it is preferable to give birds water only in small containers in which they will not be tempted to bathe. Since an oiled bird's plumage loses its water resistance, bathing would cause waterlogging, making it harder to maintain body temperature. As water resistance is not restored right away, birds should be allowed access to bathing only gradually, even after they have been cleaned.

Some species such as ducks, geese and swans readily take to a diet of commercial duck feed. Others, however, including loons, herons, cormorants and the alcids, will eat only live prey (fish and small vertebrates and invertebrates). Still others, plovers and phalaropes for example, prefer worms. Before feeding a bird, it is important to find out what its normal diet is. A bird biology reference book is likely to be very useful in these circumstances.

Some birds will refuse to eat in captivity. These will need special attention and will have to be force-fed two or three times daily, with fluids administered orally. Force-feeding follows the same procedure as fluid therapy, the beak being opened and the food inserted into the oesophagus. The bird should be given time to swallow between mouthfuls, or it may choke. It is advisable to give the fluids before the food, as food in the crop will impede passage of the stomach tube.

When a bird's strength, body condition and hydration level have recovered, its temperature has stabilized and it looks capable of withstanding additional stress, cleaning can commence. Some restorative treatment may need to continue during this stage, however, to help the bird through it.

## CLEANING

The cleaning of oiled birds demands large quantities of hot water, delivered at the rate of about 1,600 L per hour. Adequate tank capacity is therefore necessary. In general, the most effective temperature is around 40–41°C, or 104–106°F. Cooler water makes cleaning harder and longer and is less comfortable for the bird; hotter water may damage the plumage or scald the bird.

Similarly, water that is too hard, ie too rich in calcium, magnesium and other mineral salts, may leave salt deposits in the plumage, hindering restoration of water resistance. It is therefore recommended that the water used be no harder than 2.5–3.5 grains, or about 30–50 mg of salts per litre. If necessary, water softeners should be used.

### 1- DETERGENT

A number of criteria must be considered in choosing a detergent. First, it must remove



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hydrocarbons from feathers easily. It must be safe for both staff and birds, which means that it should not irritate the skin or damage feathers. It should rinse off easily so that plumage is not prevented from regaining its water resistance, and it should be as environmentally friendly as possible, ie containing no phosphates. One product widely used is Dawn™. For this detergent, a concentration of about 1–2% is usually effective.

Water temperature and detergent concentration may vary depending on the type of detergent, the hardness of the water, the type of hydrocarbon involved and how long the bird has been oiled. A good way to determine the most effective water temperature and detergent concentration is to experiment on oiled feathers or dead oiled birds. Once the ideal criteria have been established, they should be kept constant for all victims of the same spill.

## 2- MINERAL OIL

Most hydrocarbons can be fully eliminated from plumage with a detergent solution alone. However, some petroleum products are very viscous and may, in time, form a very hard coating on the plumage that is practically impossible to remove with detergent because it cannot penetrate. In such cases, light mineral oil can be used to dissolve the hydrocarbon so that cleaning with detergent can proceed successfully. The mineral oil should be applied to the plumage and the bird wrapped in a towel or placed a box where it cannot preen for about half an hour. The bird's body heat will warm the oil, facilitating penetration. The bird can then be washed in the usual way. Light vegetable oil or baby oil can be used instead.

## 3- PREPARING EQUIPMENT

Several bowls of warm soapy water will be needed for each bird. These should ideally be of transparent material or light color and should be prepared just in time so that the water has

no time to cool off before the bird arrives. The size of the bowls should be matched to that of the bird, thus economizing on water and detergent. The water temperature should be checked several times during the washing, and artificial tears should be administered regularly. To minimize stress, which could be fatal, all equipment should be ready when the bird arrives.

## 4- WASHING

When everything is ready, the bird can be immersed in the first bowl of soapy water. Usually, at least two people, and ideally four, should work together, one person holding the bird and keeping its head above water while another cleans, bathing and wiping the feathers to release the oil. It is very important to avoid rubbing, since this further damages the plumage, whose water resistant properties are due to the arrangement of the barbs, barbules and barbicels; rubbing against the grain of the plumage disrupts this arrangement and delays restoration of normal functioning. Care must therefore always be taken to wipe the plumage in the direction of the feathers.

When the first bowlful of water is too dirty to be of further use, the bird should be lifted out, have excess water wiped off its plumage, and taken to the next bowl, where the procedure is repeated. The cleaning team should be particularly attentive to places that are hard to reach, such as the underside of the wings and the area where the bird is being held. As many bowls should be used as are needed to get the bird clean and until the water no longer takes on the colour of the oil. Clear containers make it much easier to check the colour of the water.

When the body is clean, the head should be washed by wiping it with towels soaked in the soapy water. An oral hygiene device such as a Water-Pik can also be used. A complete cleaning may be expected to take 10–20 minutes. The bird is then ready for rinsing.

## 5- RINSING

The bird is bathed in a series of bowls of clean, soap-free water until no more foam appears. Rinsing is completed by spraying with a hose fitted with a shower head. One handler holds the bird in an empty bowl or sink while another dowses it with warm water (39–43°C, or 102–110°F). First, the head is sprayed gently; then the water pressure is raised to rinse the body, always following the lie of the feathers. Once the plumage is free of all oil residue and detergent, it will regain its water resistance, and the water will start to pearl on the feathers. When rinsing is finished, after 15–20 minutes, the bird should look dry. It can then be given a last wipe with a towel to smooth the feathers. This concludes the cleaning, and the bird can be moved to a drying area.

Should the bird's condition show signs of worsening during cleaning (shivering or lethargy), the procedure should be varied. If in doubt, cloacal temperature remains a good indicator. Birds in difficulty should be rinsed off and dried quickly, and full cleaning deferred until their condition has stabilized.

## 6- DRYING

In theory, a wet bird should be able to dry out on its own at room temperature. However, the evaporation of water will have a significant cooling effect lasting several hours, which will induce serious stress. On warm, still days, birds can be placed in an outdoor enclosure, taking care to provide shade in case they get too hot. Otherwise, it is advisable to keep them indoors and find a way of drying them quickly.

### 6.1- Drying pens

Indoor drying can be done in a variety of ways. One of the most widespread methods is the use of drying pens. The birds must first be force-fed fluids to enable them to withstand heat; when it gets too hot, birds breathe through

the mouth, and this entails substantial loss of water through evaporation. Several are then placed together in a pen where they have access to food and water. These should be roofed with several layers of covering to retain heat, and commercial dryers for domestic animals should be installed. The ideal drying temperature is roughly 35–40°C, or 95–104°F. This should be monitored carefully, with thermometers hung in each pen. Likewise, the birds in each enclosure should be regularly checked for signs of cold (shivering) or overheating (breathing through the mouth, wings held away from the body). If such signs are detected, the pen temperature should be adjusted by either adding more dryers or pulling back the covers. Once the birds are dry, they should be moved to another enclosure, or the dryers should be turned off.

### 6.2- Drying cages

When a small number of birds are being treated, they can be dried in individual cages, with commercial dryers each supplying warm air to three cages. Each bird is placed in a cage with food and water, and a warm air inlet is cut in the side of the cage. Once again, temperature and behaviour should be monitored attentively. Drying should take between one and two hours using either of these techniques.

### 6.3- Heat lamps

Birds can also be kept, with food and water, in pens or cages fitted with heat lamps, provided that they are force-fed fluids beforehand. Infrared lamps suspended in the cage or pen supply enough heat, but this method takes longer than the other two.

### 6.4- Things to avoid

Though there are a variety of drying methods, hand drying is not recommended. Holding a bird in front of a dryer for domestic animals or





using a hair dryer on it means restraining it for an extended period, and this it will find highly stressful. Moreover, bringing the dryer too close risks scalding the skin. It is therefore preferable to leave the birds in a quiet place to dry without handling, applying one or other of the first two methods.

### 6.5- Rest

After drying, birds should be force-fed fluids and placed in a holding pen. At this stage in the rehabilitation process, it is important to avoid crowding too many birds together, as their faeces may contaminate each other's plumage, calling for a further clean-up. After a night of rest, and if their condition is stable, the birds should be ready to start the reconditioning process. The purpose of this period is to prepare them for release and give them the best possible chances or survival.

## RECONDITIONING AND RELEASE CRITERIA

When conducting a rehabilitation operation, it is not enough to clean birds; they will have to be capable of looking after themselves, and they should not be released only to starve within a few days.

To be able to survive in the wild, a seabird first needs to be able to swim without difficulty. However, as we have seen, the plumage of oiled birds usually loses its water resistance, and unfortunately cleaning alone is rarely enough to restore it and may even cause further damage. A bird released immediately after cleaning would have a lot of trouble swimming, since its feathers would soon waterlog, making it hard to stay afloat. The bird would also find it hard to maintain a steady body temperature.

For all these reasons, it is important to allow birds to take to the water again gradually. Slowly, by dint of regular contact with water, they will resume their normal activities. Indeed, swimming will not only stimulate appetite and motor activity, but will also encourage preening.

### 1- REINTRODUCTION TO WATER

Since the number of birds being rehabilitated is usually quite large, they should be placed in groups in pools or ponds large enough to allow them to swim. Pools of different sizes can be made using watertight canvas over wooden frames. A plank covered with astroturf can be used as a ramp to make it easier for them to get in and out of the water. Not too many birds should be placed together in one pool, as some of them may prevent others from using it freely. Hardness of the water is also a major factor; as with washing and rinsing, hardness should be 2.5–3.5 grains, or 30–50 mg/l.

On their first swim, birds will probably not stay in the water very long. Quite soon, their plumage will become waterlogged, they will slowly start to sink, perhaps shiver, and will try to leave the water. Each bird should be carefully watched for these signs, and as soon as they appear, the bird should be taken out of the water and put in a warm, sheltered place until its plumage has dried out. Long-handled fish nets are very practical for hoisting the birds out of the pool. The most important consideration is to minimize the stress inflicted. Handling

should be quick, efficient and involve as few people as possible. Birds should be allowed to swim as often as possible each day, provided that they have time for their plumage to dry between sessions. Birds should be constantly supervised while swimming. As time goes by, their plumage will regain its condition and alignment, and they will be able to stay in the water longer without waterlogging. A few sessions may suffice for some birds, while others may take nearly three weeks.

## 2- HYGIENE

In the pools as in the pens, hygiene is of prime importance. The water is rapidly contaminated by droppings, feather detritus, oil residue and food. All of this debris is naturally conducive to the proliferation of bacteria, but it also lowers the surface tension of the water. Such particles floating on the surface may eventually constitute a layer capable of penetrating the weave of feather barbs, barbules and barbicels, even in normal birds; the effects will be all the more serious when the plumage is already damaged, and recovery of water resistance will be delayed. Poor pool hygiene may also lead to proliferation of algae. Small pools can be cleaned several times daily by emptying them with a submersible pump and scrubbing down the sides before refilling. Larger pools can be fitted with a filtration system, which can be used in combination with a pool vacuum cleaner.

Once water resistance of the plumage has been restored, birds of freshwater habitats can be considered for release. However, species of saltwater environments will have to undergo a further stage before returning to the wild. Birds that customarily imbibe salt water and feed on marine organisms need to be reacclimatized to salt water.

## 3- REINTRODUCTION TO SALT WATER

Birds have a supraorbital gland located above the eyes and connected to the nostrils by a canal. This organ is not functional in all species,

but in pelagic birds it is used to excrete the body's excess salt when the bird drinks seawater. Stress may boost this secretion, leaving the bird with a salt deficit (hyponatremia). Conversely, dehydration and certain toxins may inhibit the operation of the gland, exposing the bird to the risk of salt poisoning.

Seabirds should therefore be treated initially the same as all others and given fluids. This will rehydrate them and obviate the danger of salt poisoning. However, doing this involves certain risks that must be taken into account. If the bird is stressed, the supraorbital gland will continue to excrete salt, leading to hyponatremia. This will manifest itself in episodes of lethargy and loss of appetite, associated with the presence of nasal secretions. The birds' diet can then be supplemented by adding salt tablets to their food at the rate of 100 mg/kg per day.

Atrophy of the supraorbital gland is another possibility to be kept in mind when a seabird is given isotonic fluids; if the gland has no excess salt to eliminate, it rapidly ceases to function, and if such a bird is abruptly released into a saltwater environment, the supraorbital gland will lack the capacity to excrete the sudden salt overload. For this reason, seabirds require one more stage of rehabilitation before release. This may start after the first week of captivity and should continue for at least seven days prior to release. Though symptoms of salt poisoning usually appear within 24 hours of ingestion, some may take several days.

There are two ways to reacclimatize birds to salt. The first involves force-feeding a solution of 2–3% salt (2–3 g salt to 97–98 ml water; 1/2 tsp salt weighs 2.5 g) at the rate of 20 ml per kg of the bird's body weight. The birds are then placed in individual pens without access to water and monitored carefully for several hours for any signs of poisoning, such as bouts of lethargy, respiratory difficulties, loss of appetite or convulsions. Any bird exhibiting

such symptoms should immediately be forced fresh water and left to rest for 24 hours with access to water, and the reintroduction procedure should be tried again the next day.

Birds that seem to cope well with the first dose of salt solution should receive the same treatment every three hours throughout the day. If the supraorbital gland is functioning normally, the bird should show no signs of distress, and salt secretions should start running from the nostrils, indicating that the excess salt is being excreted. These birds should be exposed to salt water only in their pens, whether for drinking or swimming, until they are released.

The second technique consists in placing the bird in a bowl of 2% salt water (20 g salt to 980 ml water) once its plumage has recovered its water resistance. The same precautions with respect to salt poisoning should be taken. This method has the advantage of allowing the bird to keep on preening while the functioning of its supraorbital gland is being checked.

The various steps in the reintroduction process help prepare the bird for release. However, there are certain considerations to be looked at before letting it go free.

#### **4- ENVIRONMENTAL CONDITIONS**

To maximize their chances of survival, birds should not be released in bad weather or in places still contaminated with hydrocarbons.

#### **5- STATE OF PLUMAGE**

The state of its plumage is one of the chief criteria for deciding whether a bird is ready for release. In general, birds should be able to stay in the water for 20–90 minutes without waterlogging, though this varies with species. Those that are almost always in the water, such as loons, should be able to go for 24 hours, whereas others, like geese and gulls, which spend a good part of the day on dry land, may have less water resistance, and some species, cormorants for example, become waterlogged

even under normal conditions and habitually spend a lot of time out of the water drying off.

The down around the legs is the last part of the plumage to regain its water resistance, and this is the part that should be checked to assess readiness.

Another aspect of plumage condition is insulation. Before being released, a bird should be able to maintain a steady normal body temperature of 39°C, or 102°F, even in the water.

#### **6- GENERAL CONDITION**

Birds due for release should, of course, have gained weight while in captivity, putting them in the normal range for their species. Their pectoral muscles should be sufficiently developed to enable them to fly with ease, and they should be able to swim without difficulty.

#### **7- BEHAVIOUR**

The bird's behaviour is also a factor in arriving at a decision. It should struggle when handled and should interact with other birds, eat, drink and preen normally, and should look lively and alert.

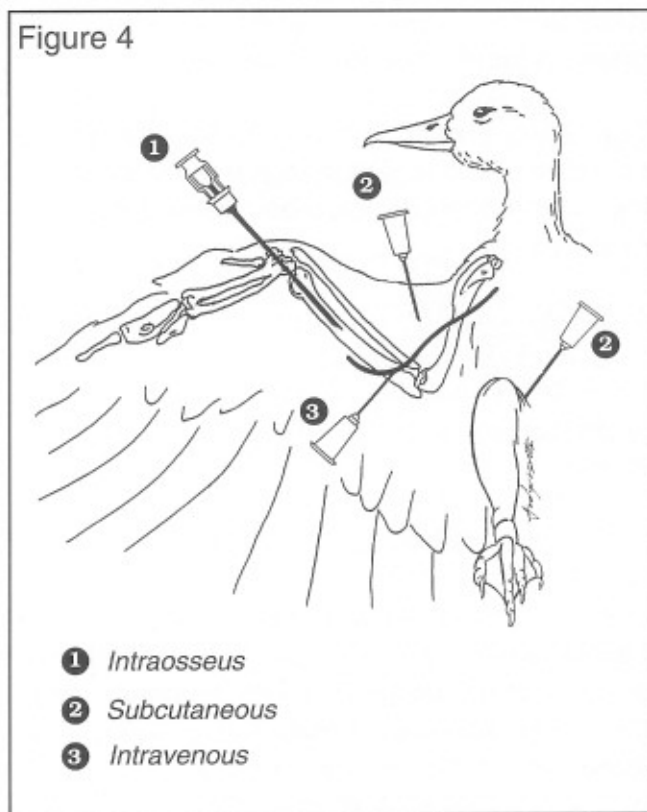
#### **8- CLINICAL EVALUATION**

Clinically, birds selected for release should ideally have a haematocrit of about 40% and should show no signs of disease or handicap. Sick or blind birds and those with a limb amputated should not be released.

#### **9- TRANSPORTATION**

When a bird is deemed ready for release, it should be placed in a carrier that is big enough and is carpeted with absorbent material so that it does not soil its plumage. The best time for releasing birds is early in the day, so that they can get used to their new surroundings before nightfall. They should be set free in calm, quiet places far from contaminated areas.

Figure 4



## VETERINARY CARE

Some of the birds brought to a rehabilitation centre will need veterinary care going beyond routine treatment. Such cases may range from severe dehydration to fractures, wounds and contagious diseases. The purpose of this section is to provide veterinarians with information on the various diagnostic procedures and treatments applicable to avian species.

### 1- DEHYDRATION

It can be dangerous to administer a fluid orally to birds that cannot stand up, as they may regurgitate and choke on it. Fluids administered this way also take longer to absorb than those given by other means.

Lactated Ringer's solution can be given by subcutaneous, intravenous or intraosseous

injection (Figure 4). If subcutaneous administration is chosen, the best injection site is the groin, where the leg joins the abdomen. Here, the skin is very soft and forms a fold that can hold a fair quantity of liquid. The fold of the wing is also a good site.

Fluids can be administered intravenously via the ulnar vein on the ventral side of the elbow or the brachial vein on the ventral side of the humerus. Both these veins are very near the surface and readily visible through the skin. The fluid should be injected slowly so as to avoid rupturing the vein. After injection, light pressure should be applied for about 30 seconds to preclude formation of a haematoma, but if the pressure is too heavy, haemostasis will be delayed. In cases of extreme dehydration, subcutaneous fluids may not be absorbed quickly enough, and the veins may be too small for intravenous administration. The only option then is intraosseous injection.

This can be done with either an intravenous catheter or a spinal needle. The needle is slowly inserted into the ulna at the wrist; in birds, this is larger than the radius. The needle must first penetrate the joint cartilage to reach the bone marrow.

If the catheter cannot be felt through the skin and there is no build-up of fluid under the skin, it can be assumed that the needle is properly inserted, and administration can continue. There will, however, be quite strong resistance to the injection, especially once the marrow cavity is full. Time should be allowed for absorption, which will be very fast, before giving more fluid. To keep the catheter open between administrations, heparin water may be used.

The catheter can be left in place for about two days as long as there is no sign of obstruction or infection. The site must, of course, be disinfected and prepared in the customary way prior to catheterization, and the catheter must be kept clean at all times to minimize the risk of complications.

## 2- HAEMATOLOGY

A quick way to assess the general condition of a bird is through blood samples. A number of sites can be used, including the ulnar and brachial veins already mentioned; these are probably the most accessible. The jugular (more developed on the right in birds) or the medial metatarsal vein can also be used, the latter being on the medial side of the tarsometatarsus and rather hard to see.

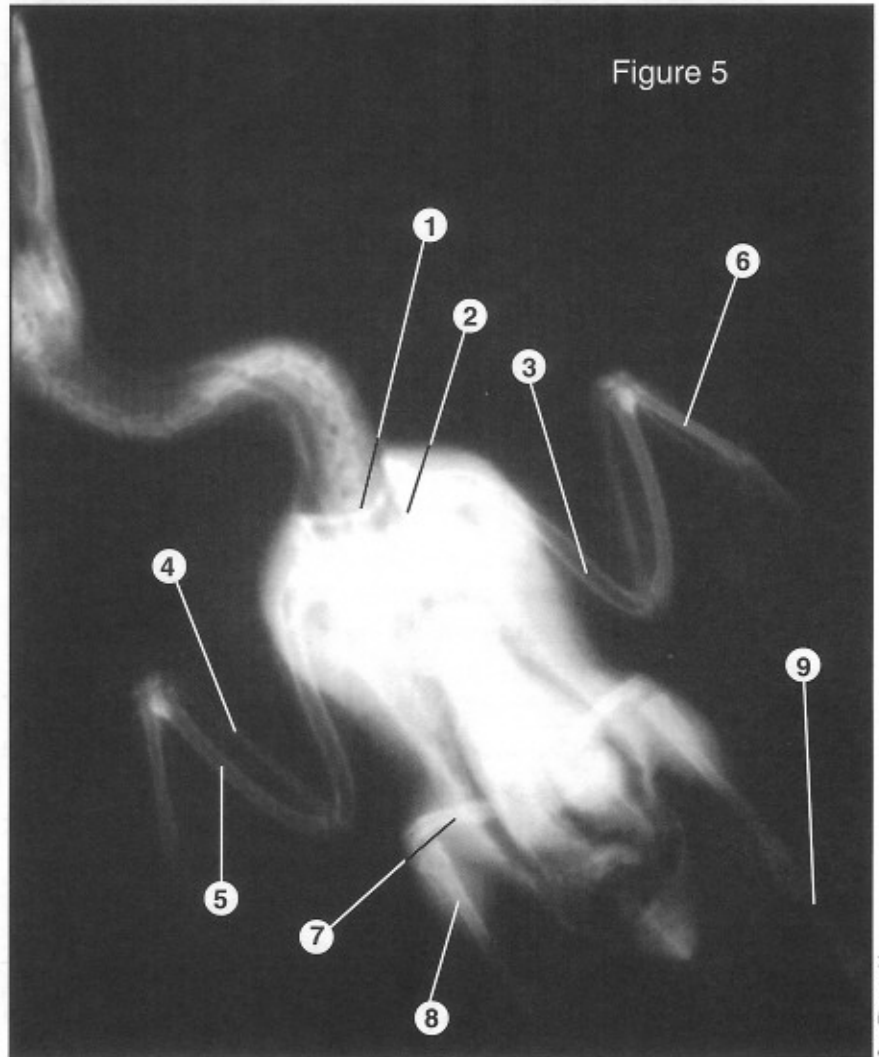
Haematocrit and total solids can be determined from blood samples using the same techniques as apply to mammals, and the same biochemical tests can be used. A white blood cell count can be done manually by means of an Eosinophil Unopette. This technique has been well described by Campbell (1988).

White blood cell counts for birds can also be estimated on the basis of the number of leucocytes in ten 400X microscope viewing frames. By averaging the count for the ten frames and multiplying by 2 000, one can obtain an estimate that is useful for monitoring the bird's condition. Normal white blood cell counts vary by species from 6 000 to 14 000 per  $\text{mm}^3$ . Smears may also reveal blood parasites such as *Haemoproteus*, *Leucocytozoon* and *Plasmodium*.

## 3- PARASITOLOGY

A parasitological examination of the faeces is another useful diagnostic procedure applicable to wild birds in captivity. Such birds are often carriers of parasites that

can be transmitted to others, especially in less than satisfactory hygienic conditions. Simple smear or flotation tests on the droppings are enough to pick out such parasites as coccidia, *Giardia*, *Capillaria*, *Ascaris* and *Syngamus*. These tests should be performed in the pools at regular intervals. Antiparasite treatments for birds, with dosages, are included in the list of medications at the end of the guide.



- |   |          |   |                 |
|---|----------|---|-----------------|
| ① | Clavicle | ⑥ | Metacarpus      |
| ② | Coracoid | ⑦ | Femur           |
| ③ | Humerus  | ⑧ | Tibiotarsus     |
| ④ | Radius   | ⑨ | Tarsometatarsus |
| ⑤ | Ulna     |   |                 |

Figure 6

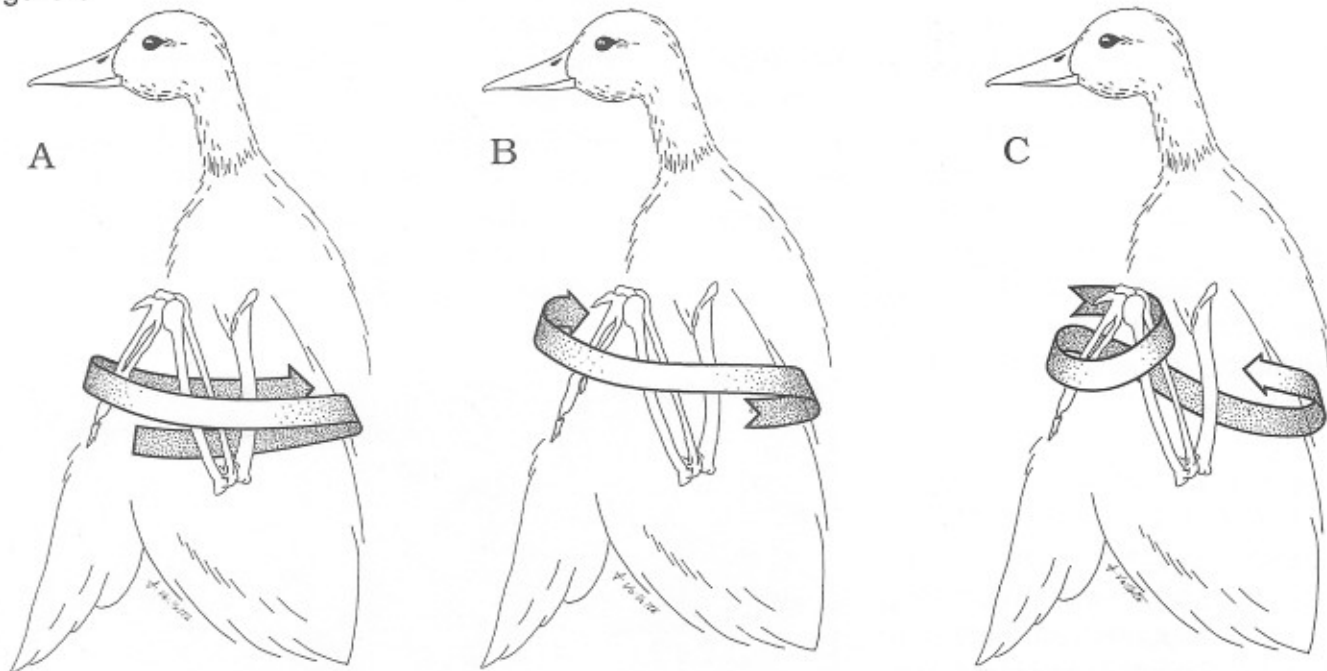
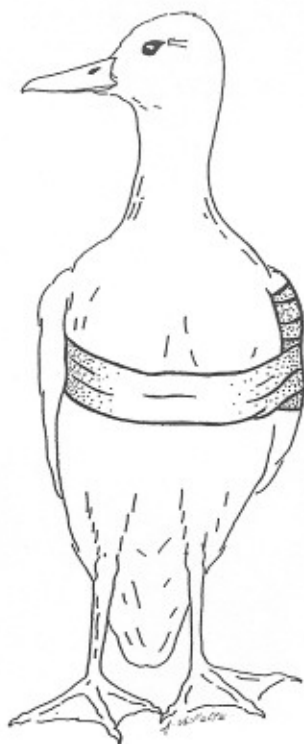


Figure 7



#### 4- FRACTURES

Ideally, fractures should be X-rayed. Figure 5 shows the X-ray anatomy of a duck.

Fractures where there is little displacement can be bandaged. In such cases, the same general

principles apply as for mammals. The bandage should immobilize the joints adjacent to the fracture without being too tight or too heavy. For wing fractures in the radius/ulna or metacarpus, a figure-eight bandage is usually sufficient (Figure 6). For fractures of the humerus, however, where the shoulder joint has to be immobilized, a body bandage must be used in addition to the figure-eight (Figure 7). The figure-eight bandage can be made from such materials as Vetrap™, and the body bandage from two strips of porous tape back to back so as not to stick to the feathers.

For leg fractures below the femur, Robert-Jones bandages or Thomas crutches can be used, or else splints (Sam Splint™) made from malleable material that can be formed to the bird's leg. Fractures of the femur require the pelvic joint to be immobilized, and this makes bandaging much more difficult. Often, the leg has to be folded up and bound to the body, making it hard for the bird to keep its balance.

Fractures with serious displacement or in places difficult to bandage (eg the femur) can be treated surgically. If this option is chosen, a preoperative X-ray is essential. This is much

more easily done and generates much less stress on an anaesthetized bird. Such fractures can be mended using intramedullary pins, full or half wiring, Kirschner wires, etc. For surgical approaches, see Orosz (1992).

## 5- WOUNDS

Wounds in birds must be treated quite differently from those of mammals, since the structure and integrity of the plumage must be maintained. For this reason, ointment should never be applied to feathered parts of the body, where it would gum up the feathers in the same way as hydrocarbons do, making it harder to clean the wound subsequently.

When a wound is found on a bird, the feathers around it should be gently plucked out. Feathers in contact with a lesion actually increase contamination and are conducive to complications. The feathers should be plucked rather than cut, as they then grow back more quickly. However, it is better not to pluck large feathers such as the primaries and secondaries of the wings, as this would inhibit the bird's ability to fly. The lesion should then be cleaned of any debris and dried blood and disinfected with a product such as chlorhexidine (Baxedin™). Finally, if there is enough skin available to do so, it should be sutured, but in most cases this is not possible, and it should be left to heal by second intention.

There are several treatments that can speed up healing. Tegaderm™ is a microporous transparent adhesive bandage that protects wounds against contamination and promotes healing. It should be changed every two days. Another product used to treat wounds is Biodres™, another transparent dressing, but in the form of a colloidal gel. This facilitates healing in certain cases. Yet another treatment that achieves good results is hydrotherapy. This is usually given, with or without anaesthesia, once a day. The wound is simply held under a jet of tepid or warm water from a faucet or shower head for about five minutes. At first, progress will seem very slow, but after

a while it will quicken. In birds, healing by second intention may take several weeks, depending on the extent and depth of the wound.

When treating serious lesions or resorting to surgery, it is always wise to administer antibiotics. A list of antibiotics and other medications used on birds, with dosages, can be found in the references.

## 6- BUMBLEFOOT

Wild birds kept captive sometimes develop bumblefoot. Soft floor coverings are the most effective preventive measure. If a bird is afflicted, its feet should be regularly disinfected and bandaged if necessary, and antibiotics should be administered. In severe cases, surgical excision may be called for.

## 7- ASPERGILLOSIS

Another common problem in captive birds is aspergillosis, a fungal infection of the trachea, lungs and air sacs. Though the prognosis is generally bleak, treatment can be attempted with amphotericin B (Fungizone™) in combination with 5-fluorocytosine (Ancotil™). Itraconazole (Sporanox™) looks like a promising treatment for this condition, provided that it is diagnosed early. 5-fluorocytosine and itraconazole may be used preventively on species, such as loons, known to be vulnerable to *Aspergillus*.

## 8- HYDROCARBON POISONING

Often, oiled birds will have ingested significant amounts of hydrocarbons in the course of preening. Hydrocarbon poisoning shows up in many ways; birds will be severely dehydrated, weak and anaemic, and there will be signs of gastro-intestinal, kidney, pancreatic and liver disorders. A diagnosis of hydrocarbon poisoning is often problematic without laboratory tests. Diminished haematocrit, with Heinz bodies appearing on the red blood cells,

and abnormal biochemical readings such as AST enzyme and uric acid levels will confirm the diagnosis. The symptoms need to be treated, using fluid therapy, mucous membrane protectors (eg Peptobismol™), activated charcoal, iron injections, warmth and rest.

### 9- LEAD POISONING

Other birds may show different poisoning symptoms, especially neurological and gastro-intestinal. Lead poisoning is quite common in ducks, since they are susceptible to swallowing waste shot scattered over the bottom of bodies of water. The diagnosis can be confirmed by particles in the gizzard that show up brightly on X-rays. However, absence of such particles is not counterindicative of lead poisoning, since they may be simply too small to show up or have been completely absorbed. The level of delta-aminolevulinic acid dehydratase (ALAD) in the blood is a good diagnostic tool; lead inhibits this enzyme, and values well below normal (<50 as opposed to a normal range of 3 000–6 000 U) will confirm a diagnosis of lead poisoning. Treatment involves removing the lead from the gastro-intestinal tract, either surgically or by administering oil or peanut butter, chelating the lead already absorbed by means of calcium EDTA, and providing the patient with fluids, warmth and quiet.

### 10- FOREIGN BODIES

Birds may also have swallowed foreign bodies such as fish hooks. These show up readily on X-rays and can be removed by surgery. When performing a gastrotomy, it is important to check whether hooks have any line attached; pulling on the line could result in damage to the oesophagus, which will be very slow and difficult to heal.

### 11- CONTAGIOUS DISEASES

It must be remembered that wild birds may be carriers of diseases which may endanger humans or other rescued birds, but without themselves showing symptoms. Conversely, a healthy bird may be released carrying a potential contagion into a wild population. For this reason, a thorough knowledge of avian diseases and their symptoms and post-mortem examination of all birds that die inexplicably are essential in dealing with oil spill emergencies.

### 12- EUTHANASIA

Euthanasia must be considered as a humane solution in cases of prolonged suffering or poor prognosis. One must avoid the temptation to strive to save every bird at all costs. Intravenous or intrapulmonary injection with T-61™, Euthansol™ or Euthanyl™ is an effective method of euthanasia.

## CONCLUSION

*Rescuing birds from oil spills demands careful organization and great reserves of good will. It involves the safe capture, stabilization, cleaning and rehabilitation of the victims, and this requires the services of competent, well trained and vigilant personnel. Involvement of veterinarians is obviously crucial. The workload is heavy and requires great dedication on the part of all participants, but there are few things more gratifying than to be able to give back a healthy bird its freedom.*



# INDIVIDUAL FILE

## IDENTIFICATION

case#: \_\_\_\_\_

Species: \_\_\_\_\_

Weight: \_\_\_\_\_ g  
Wing cord: \_\_\_\_\_ mm

Age: imm. / ad.  
Sex: m / f / unknown

Band# & color: \_\_\_\_\_ (leg: left / right)

## HISTORY

Date / capture time: \_\_\_\_\_






Date / admission time: \_\_\_\_\_

Area: \_\_\_\_\_

Treatments provided: \_\_\_\_\_

Comments: \_\_\_\_\_

## PHYSICAL EXAMINATION

	Excellent	Good	Fair	Thin	Emaciated
Body condition:					
Dehydration:	0-5%	6-7%	8-10%	10-12%	12%+
Behaviour:	Aggressive	Nervous	Alert	Apathetic	Shock

Body temperature: \_\_\_\_\_

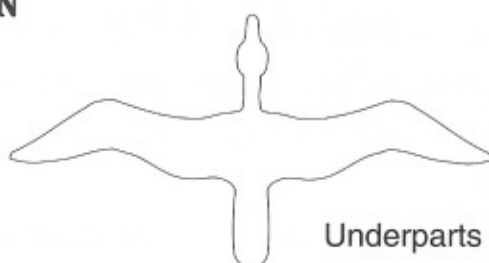
Head: \_\_\_\_\_

Wings: \_\_\_\_\_

Legs: \_\_\_\_\_

Plumage: \_\_\_\_\_

## CONTAMINATION



**PROGNOSIS**

Excellent      Good      Fair      Guarded      Poor      Very poor

**TREATMENTS**

Drug	Dose	Route							

**CLEANING**

Date	Time	Duration

**EVOLUTION**

Outside pen:      date \_\_\_\_\_      Pen # \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**RESULT**

Date \_\_\_\_\_      Location \_\_\_\_\_

Euthanasia      Release      Captivity

**LABORATORY**

Haematology

Date	Ht	Pt	BG	WBC	Comments

Parasitology

Date	External	Internal

## PRODUCTS REFERRED TO

Baxedim™, dilute chlorhexidine, bactericide, Luvabec Inc  
 Biodres™, colloidal dressing, DVM Pharmaceuticals Inc  
 Clinicide™, quaternary ammonium, virucide, bactericide and fungicide, MTC Pharmaceuticals Ltd  
 Coroplast™, plastic panels, FM Industries Inc, Granby  
 Dawn™, dish detergent, Procter & Gamble Inc  
 Emerald™, food supplement, Lafaber  
 Euthansol™, euthanasia solution, Schering-Plough Animal Care  
 Euthanyl™, euthanasia solution, MTC Pharmaceuticals Ltd  
 Eye Stream™, extraocular irrigation, Alcon Canada Inc  
 Hypotears™, artificial tears, Johnson & Johnson Inc  
 K-Y™, sterile lubricant, Johnson & Johnson Inc  
 Nutrical™, food supplement, Evsco Pharmaceuticals  
 Sam Splint™, aluminum and foam splint, Jorgensen Laboratories  
 Savlon™, chlorhexidine gluconate, bactericide, Ayerst Laboratories  
 Sporanox™, itraconazole, Janssen Pharmaceutica  
 T-61™, euthanasia solution, Hoechst Canada Inc  
 Tegaderm™, transparent bandage, 3M Animal Care Products Inc  
 Eosinophilic Unopette™, Test 5877, Becton-Dickinson  
 Vetrap™, bandage, 3M Animal Care Products Inc  
 Virkon™, triple salts, malic acid, sulfamic acid, virucide, bactericide and fungicide, Vétoquinol Canada Inc  
 Water-Pik™, oral hygiene device, Teledyne

## MEDICATIONS AND DOSAGES

Aerrane™, Ohmeda Pharmaceutical Products  
 isoflurane, anaesthetic of choice for birds  
 Amoxil™, Ayerst Laboratories  
 amoxicillin  
 50 mg/kg PO BID  
 Ancotil™, Roche  
 5-fluorocytisine  
 40–50 mg/kg PO TID or BID if used preventively  
 Antirobe™, Upjohn Animal Care  
 clindamycin chlorhydrate  
 10–20 mg/kg PO BID  
 Baytril™, Bayvet, Haver  
 enrofloxacin, injectable at 50 mg/ml  
 10 mg/kg IM SID, BID  
 or as egg dip solution at 32.3 mg/ml  
 10 mg/kg PO SID, BID  
 Aqueous Charcodote, Pharmascience Inc  
 activated charcoal 200 mg/ml  
 6–12 ml/kg PO  
 Clavamox™, Ayerst Laboratories  
 amoxicillin clavulanate  
 50 mg/kg PO BID  
 Dexamethazone 5™, Vétoquinol Canada Inc  
 anti-inflammatory steroid, injectable at 5 mg/ml  
 2–4 mg/kg, IM or IV; TID, BID, SID (with decreasing frequency)  
 Euthansol™, Schering-Plough Animal Care  
 euthanasia solution  
 0.3 ml/kg IV  
 Euthanyl™, MTC Pharmaceuticals Ltd  
 euthanasia solution  
 0.4 ml/kg (regular); 0.2 ml/kg (strong) IV  
 Flagyl™, Rhône-Poulenc Canada Inc  
 metronidazole, anti-protozoan, effective against  
 Trichomonas and Giardia  
 30–65 mg/kg PO SID for 5–7 days  
 Fungizone™, Squibb  
 amphotericin B, 1.5 mg/kg IV TID for 7 days  
 Ironol 100™, Sanofi Animal Care Canada Inc  
 iron supplement, injectable at 100 mg/ml  
 10 mg/kg IM once  
 Ivomec™, Merck Agvet  
 ivermectin, antiparasite 10 mg/ml  
 0.2 mg/kg IM once, repeat in 10 days  
 may be diluted in propylene glycol  
 Lactated Ringer's Solution,  
 Vétoquinol Canada Inc, Sanofi Animal Care Canada Inc, etc  
 isotonic fluid therapy solution  
 10 ml/kg IV in bolus, SC  
 20 ml/kg PO

Leaditate™, MTC Pharmaceuticals Ltd  
 CaEDTA treatment for lead poisoning 200 mg/ml  
 50–70 mg/kg IV, IM, BID or TID  
 Mycostatin™, Pharmaceutical Group  
 nystatin antifungus treatment of candida infections  
 100,000 U/kg PO SID, BID or TID for 7–14 days  
 Nizoral™, Janssen Pharmaceutica Inc  
 antifungal ketoconazole, 20 mg/ml  
 15 mg/kg PO BID  
 Panacur™, Hoechst Canada Inc  
 antiparasite fenbendazole 100 mg/ml  
 30–50 mg/kg PO SID for 3–5 days  
 Peptobismol™, Richardson-Vicks Division, Procter & Gamble Inc  
 mucous membrane protector 17.6 mg/ml  
 2–5 mg/kg or 0.1–0.3 ml/kg  
 Poten AD™, Rogar/STB Inc  
 injectable vitamin A and D supplement  
 0.4 ml/kg IM once  
 Sporanox™, Itraconazole, Janssen Pharmaceutica Inc  
 antifungus  
 5 mg/kg SID or BID  
 T-61™, Hoechst Canada Inc  
 euthanasia solution  
 0.4 ml/kg IV  
 Tribissen™, Janssen Pharmaceutica Inc  
 trimetoprim-sulfa, injectable at 24%  
 30 mg/kg or 0.15 m/kg IM SID, BID  
 Vitamin B Complex, Sanofi Animal Care Inc  
 injectable vitamin B supplement  
 0.25 m/kg IM once

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