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JOURNAL of Wildlife Rehabilitation

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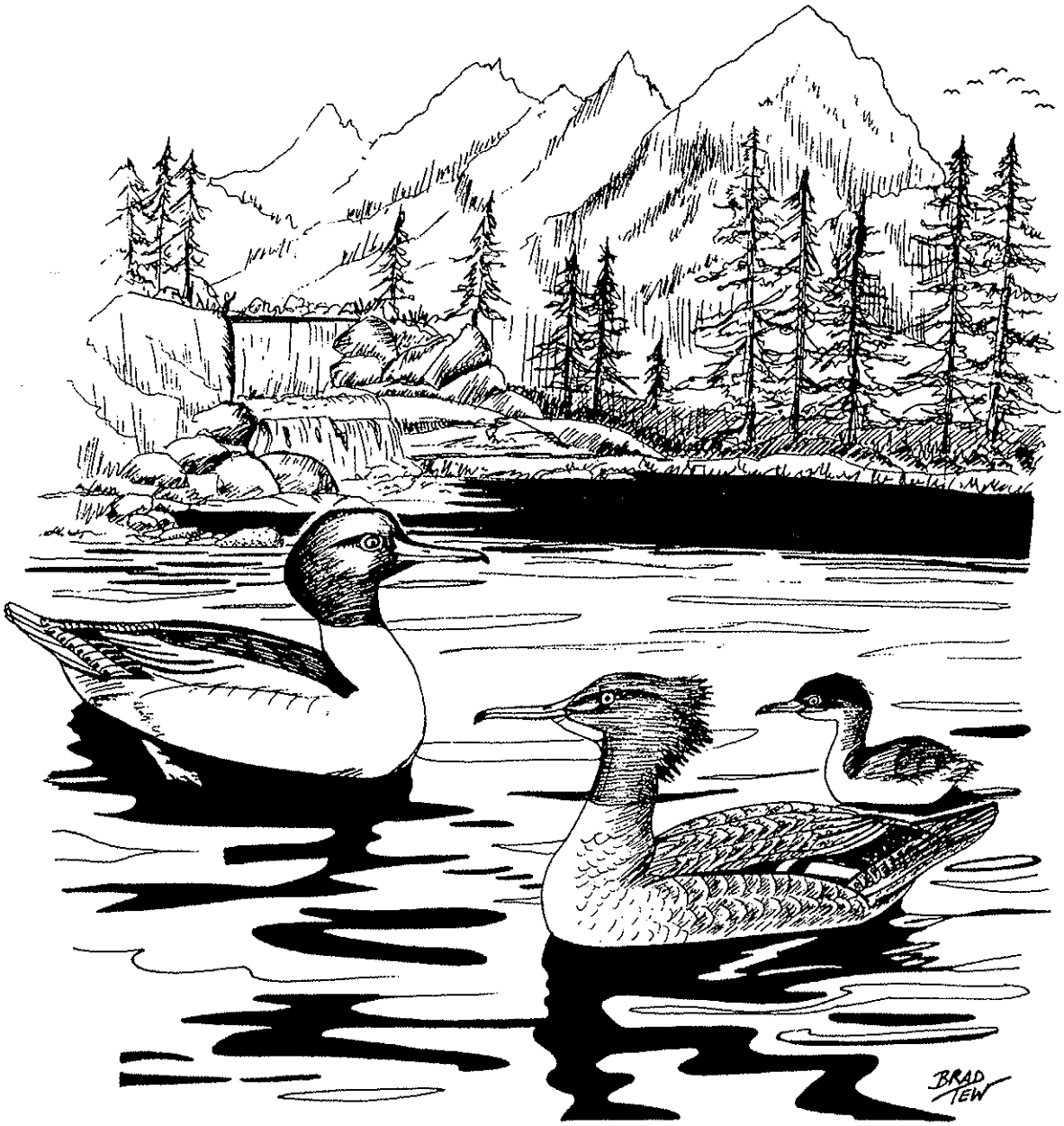

JOURNAL of Wildlife Rehabilitation

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Features

Departments

Cover Photo: Bradley Tew, Lake Tahoe Wildlife Care

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Editorial . . .

Research in Wildlife Rehabilitation

Over the last decade the word research has become "tainted" to the point that various wildlife organizations have deleted it from their names. The animal rights movement called attention to many aspects of animal research. They called into question the "use" of animals for any reason, repetition of experiments, the "publish or perish syndrome", and many aspects of captive animal care. There is no doubt that they have forever impacted the way animals are used and cared for in this country.

Because wildlife rehabilitation is so oriented towards helping individual animals overcome the impact of growing human population, animal rights activists have not targeted our industry. However, we do get comments regarding the "use" of live animals in training sessions. For the animal rights activist, the "use" of animals is wrong and this point is not negotiable. Given that point of view, it is with great trepidation that professional wildlife rehabilitators and collaborating scientists pursue the advancement of wildlife care through research.

What kind of research? Well, for the last several years, I have been doing physical examinations and taking "normal" hematology and serum chemistry samples from birds both in captive care and in the wild. Am I "using" an animal? Yes, but I feel that the risk of injury to the birds is minimal (but can in rare occasions cause injury or even death) and the benefits to the many future patients is greater than the risk.

Another area of particular importance to wildlife rehabilitation is reviewing the efficacy of our rehabilitation efforts. Are we returning animals to the wild that can and do succeed in both survival and reproduction? What methods work the best? What methods do not work? I am sad to say that after some 30 years, our field knows little about how efficient or successful we are at returning *viable* animals back to the wild. Only one national organization, the National Wildlife Rehabilitator's Association, has regularly distributed funds for research. The need has been recognized for years, and with the exception of this one beacon of light—goes unanswered into the 1990's.

My friends, no matter how you feel about the "use" of animals, we need to find the answer to this question. Common animals we care for today become uncommon tomorrow. We can't afford to waste even today's common species on methods that don't work—nor can we afford to waste our limited resources on lost or misguided efforts. Since the beginning of the 1960's biologists and game managers have questioned both the wisdom of rehabilitation efforts and the efficacy of the methods used. We have pointed out that we serve educational purposes and have just as much right to save wildlife as consumptive users do to kill and eat them. As the numbers of animals coming in grew to all time high levels, most state game regulatory agencies realized they needed us to keep their staff from being overrun with injured or orphaned wildlife.

However, times are a changing again. Here in California the laws have been changed to allow the state

Continued on page 22

Building Baby Bird Incubators

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Introduction

The Lindsay Museum cares for thousands of songbirds each summer, so housing for baby birds is very important. This housing must provide proper heat, humidity and protection from stress, easy access for frequent feedings, must keep the birds safe and enclosed, and be easily cleaned and sanitized. The price of the housing needs to be reasonable because funds are always limited. Most of the housing we have used in the previous 25 years had been inadequate in at least one of the categories, and many commercially-available incubators are very expensive.

These baby bird incubators (BBIs) were designed both to be easily constructed and to answer our nestling songbird housing needs. They have proven to withstand the rigors of a busy rehabilitation center over three seasons, and look like they will survive many more years.

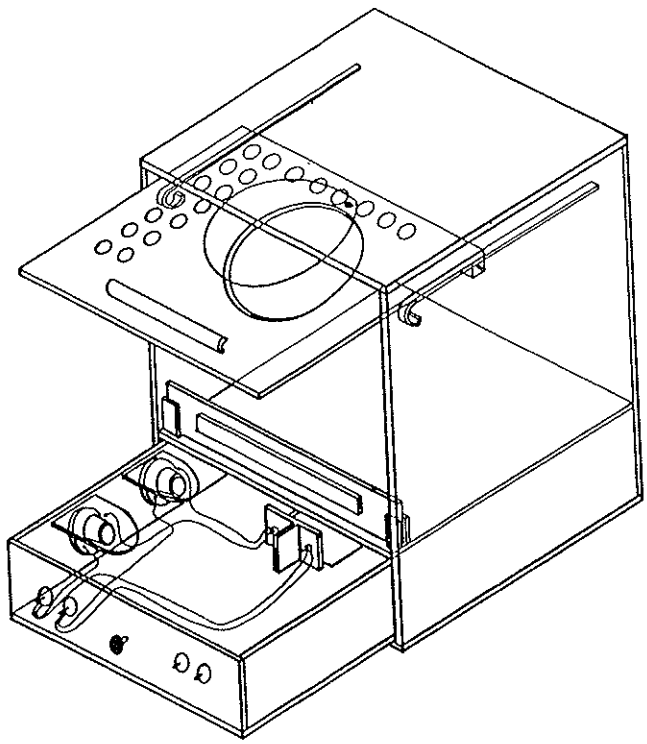
The BBI is a lucite (acrylic) box with Christmas tree lights for the heat source. It is loaded with refinements and although they are not absolutely necessary, they are designed to make it easier to use, to clean, and to squeeze the most out of very low technology. None of the dimensions is critical. Components were chosen for their availability, as well as functionality and cost.

Using the Baby Bird Incubator

An artificial nest made from a margarine tub lined with a generous quantity of toilet paper is put into the incubator for nestlings. As soon as the birds are standing and moving around, the nest is removed.

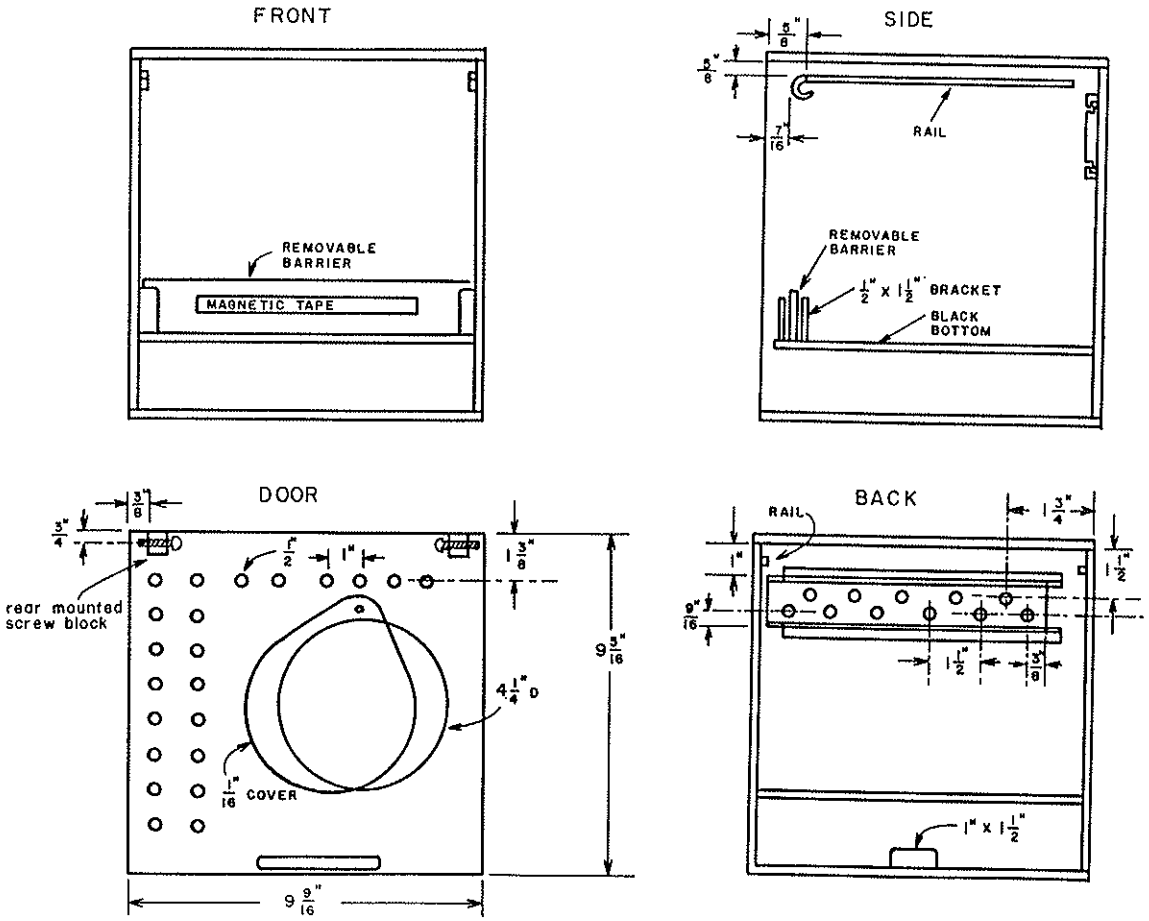
The baby bird incubator has four 4-watt Christmas tree lights in a drawer under the chamber bottom, but we rarely use more than two, except for pre-warming the incubator. The incubator bottom is lined with 10 to 15 sheets of paper towels to prevent hot spots over the lights and to make it easier to keep clean (the top towel is removed at each feeding). Humidity can be provided for naked and downy nestlings with the addition of a small jar of water, and adjustment of the back ventilation holes. The front holes can also be covered with tape when humidity need is especially high.

Access to the birds is through the round door; it is easy to feed the birds while they remain in the incubator. The margarine tub nests containing naked or downy birds can be removed to facilitate feeding of the tiny birds, but care must be taken to avoid chilling the birds. Older birds that are gaping for food should be left inside during the feeding process to reduce human contact (making sure, though, that all birds in the incubator are fed).



Complete Baby Bird Incubator

Incubator Door and Sides



Cleaning the Baby Bird Incubator

The baby bird incubator is designed to make cleaning and sanitizing easy. The heater drawer is removeable, allowing the rest of the incubator to be immersed for cleaning.

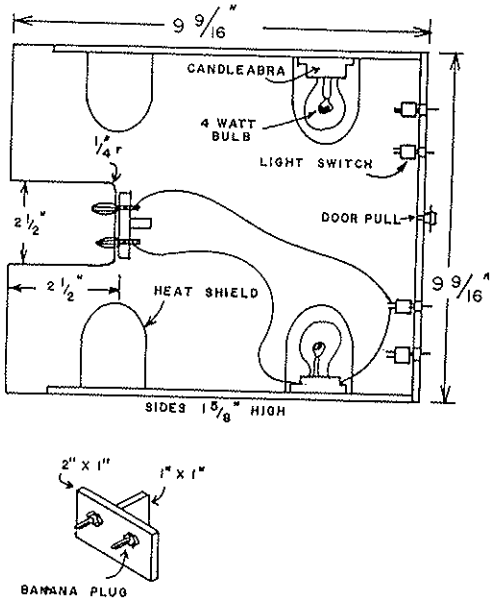
Construction of the Baby Bird Incubator

The basic box is made of 3/16" white opaque lucite; 3/16" gives enough structural strength to make it sturdy, while 1/4" make the BBI a bit heavy. We chose white opaque to give the babies both light and minimal visual stimulus. For fabrication ease, use cast lucite (type GP) wherever possible. It cuts with less shard production and less meltdown than extruded lucite (type FF). Type M lucite is a better substitute for GP than type FF. If cost is a factor, however, type FF is 10% to 15% cheaper than type GP. The per-unit cost is cut almost in half if you make them in lots of four or five.

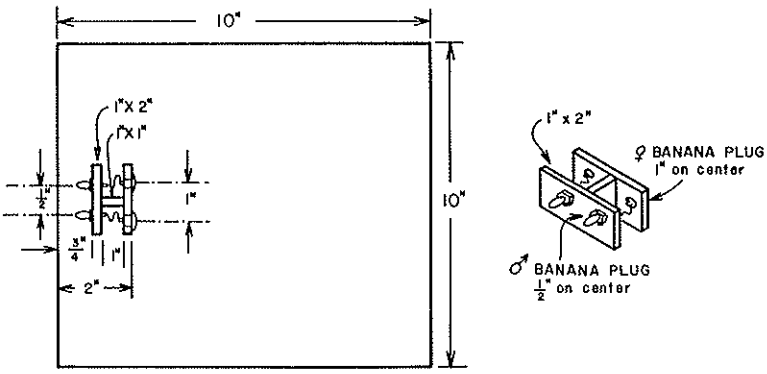
The floor of the BBI chamber is made of black opaque lucite. This maximizes heat convection-dissipation and minimizes light exposure to the babies. Other light-impervious materials will do.

When cutting lucite, use a carbide blade and wear safety goggles because a lot of very sharp chips are ejected. A small-toothed plywood blade produces excessive meltdown and this is not recommended. Use a de-raked bit for drilling, otherwise the plastic shatters at the end of the hole.

We used ethylene dichloride (dichloroethane) as a solvent for bonding pieces together. This chemical is toxic, so you might want



Baby bird incubator heater drawer.



Bottom Piece

to use a solvent sold by the plastic company where you obtain your lucite. We used masking tape to hold pieces together while they bonded (about 4 hours). We used an eyedropper or a camel's hair brush for applying the solvent. Keep in mind that there is no "safe" solvent, so use good ventilation.

The back of the chamber is drilled with about a dozen 1/2" holes for moisture ventilation. Originally we made a sliding panel so the holes could be closed, but found we always left them open. In fact, we added fifteen more holes in the front door for ventilation. For naked and downy birds, the front holes are taped over to maintain higher humidity inside.

There are two 1/4" rails bonded to the sides near the top of the chamber for the door. The door can be slid into the BBI at the top and be out of the way.

The door has a 4" hand hole covered with a moveable transparent 1/16" thick lucite circle. If you are making a lot of these BBIs, purchase a 4" hole saw. Otherwise, cut this hole with a reciprocating saw using a medium-toothed blade. Make the 4" hole off center so the hole cover can be pivoted out of the way during use. We attached the clear hole cover with an aluminum "pop rivet." A small bolt and nut will also work. Whatever you choose, make sure to use washers outside of both pieces (the door and the cover) for stress protection. For a door handle, we used a plastic tube that had been cut in half length-wise. This handle also functions as a holder for the 1 cc syringe we used for feeding.

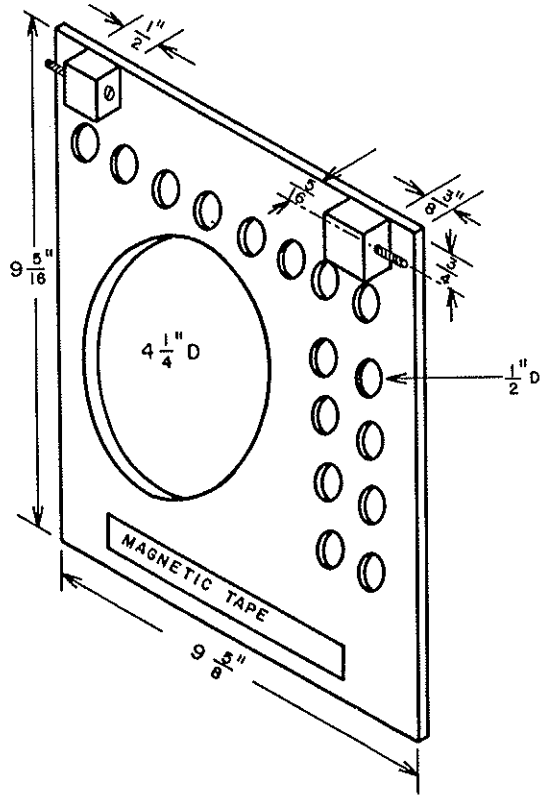
The door hinge was made from two 1/2" x 1/2" x 1/2" lucite blocks. These blocks were drilled and tapped for a 6-32 screw. The screw was put in while holding the door in place between the rails and the top. The hook at the front end of the rail is made from a short (1/4") piece of the same tubing we used for the door handle. You could accomplish the same thing in a square configuration with small 1/4" pieces of lucite. The hook needs only to hold the 6-32 screw and thus keep the door from dropping when in the closed position. The black bottom of the chamber acts as a door stop.

Instead of a door latch we use magnetic tape to keep the door closed. We use epoxy to attach the magnetic tape.

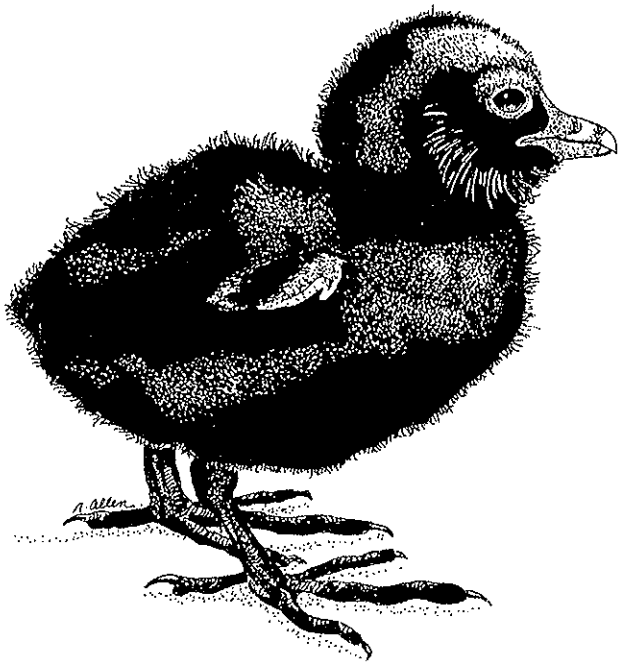
The bottom of the chamber has a removable 1 1/2" x 9 1/2" barrier to keep the babies from rolling out when you open the door. The barrier fits into four 1/2" x 1 1/2" brackets (lucite) bonded to the front corners of the chamber.

The heater is essentially a drawer without a back. It slides into the space under the chamber bottom. The switches for the lights are mounted on the front of the drawer. Candelabra for the Christmas tree lights are screwed to the sides. A small piece of lucite is bonded to the side, just over the lamp to help even out the heat radiation. Banana plugs are used to transfer electricity from the mini appliance plug. The appliance plug attaches to the banana plugs in the heater bottom. These banana plugs are the only things that hold the heater bottom in place. These plugs are really tight, so they hold well. With this arrangement, you can access the lamps in the heater bottom without fumbling around the back of the BBI.

TO "DERAKE" A DRILL BIT, GRIND AWAY THE SHADED PORTION SO THAT THE CUTTING EDGE IS PARALLEL TO THE SHAFT INSTEAD OF SLIGHTLY OBLIQUE



Baby Bird Incubator Door, Rear View



Author Profile

Joe Watson has been a wildlife volunteer for The Lindsay Museum since 1979. Being a caregiver, he has had insight into the technical needs of rehabilitation. Joe earns a living as a Research Associate for the University of California at Berkeley where he designs and builds specialized scientific equipment for the Department of Nutritional Sciences.

Susan Heckly has been a wildlife rehabilitator since 1982. She is the manager of The Lindsay Museum's Wildlife Department which cares for 8,000 animals each year. She is serving on the IWRC Board of Directors and is on the founding board of the California Council for Wildlife Rehabilitators.

Cutting Notes for the Baby Bird Incubator

Sides (2)	11.5" x 10"
Back	11.5" x 9 5/8" 1/2" holes
Top	10" x 10"
Bottom	10" x 10"
Door hole	9 5/8" x 9 5/8" high with 4 1/4"
False Bottom	9 5/8" x 9 5/8" (black opaque lucite)
Barrier	9 1/2" x 1 1/2"
Barrier brackets(4)	1 1/2" x 1/2"
Rails for Door	9" x 1/4"
Handle for Door	2 3/4"
Heat drawer:	
Bottom	9 9/16" x 9 9/16" maximum
Sides(2)	9" x 1 5/8"
Front	9 9/16" x 1 5/8"
Heat shields	1 1/2" x 2 1/2"

Announcements

Esbilac Alert!!

Pet-Ag, Inc. has replaced the "tried and true" Esbilac powder that has been on the market since 1938 with a new "Easy Mixing Formula" which includes butterfat. When all of the original powder has been sold, only the new product will be available.

Reports from rehabilitators indicate that the product causes numerous problems. They are: 1) overmixing occurs when a blender is used, making the formula unusable with standard feeding implements; 2) separation and clumping are common; 3) nipple holes have to be enlarged to accommodate the formula; 4) when whipping cream or Multi-Milk™ is added, the feeding problem is compounded; 5) it is difficult to impossible to feed through a feeding tube; 6) it leaves a greasy film in feeding implements which is difficult to impossible to remove; 7) it can destroy the rubber in syringes within 48 hours *(Editors note: if it does this to rubber, what does it do to the animal?)* and 8) it is very time-consuming to use because it can be easily overmixed.

Although the mixing instructions on the can suggest using "warm" water, try 180° F to facilitate mixing. This was found to be effective at Pet-Ag, but is not noted on the label.

This product appears to be akin to Coca-Cola's "New Coke." As Ann Landers has repeatedly said, "If it ain't broke, don't fix it."

Perhaps Pet-Ag, like Coca-Cola, will listen to its consumers. Comments/complaints should be addressed to: Dr. Jean Heidker, Vice President, Research and Development, Pet-Ag, Inc., 30W432 Route 20, Elgin, Illinois 60120-9527 or call Dr. Heidker at Pet-Ag's toll-free number (800) 323-0877.

-Debbie Marcum-

Keepers of the Kingdom: The Sanctuary Book

The Animals' Voice, a non-profit animal protection organization and publisher of *The Animals' Voice Magazine*, is accepting editorial and photographic submissions for its upcoming coffee-table full-color book, *Keepers of the Kingdom: The Sanctuary Book*. This handsome volume will feature privately owned wildlife sanctuaries, profile rehabilitators, and highlight the very animals whose lives have been saved and/or rehabilitated. We are interested in short editorial profiles (about 800 words each) on a given sanctuary, its rehabilitators, and one or two of its animals. We are also interested in receiving all photos that would interest the book's readers, including any animal rescue operations, building construction, human activity (mending fences, cleaning cages, etc.), photos of the rehabilitators themselves (preferably at work o in the company of rescued animals), and of the animals themselves (particularly any photos that show the before and after conditions of rescued animals). Include an address and phone number to be published in the book, as well as a sentence or two about your sanctuary's (or animal rescue work) needs so our readers may help your operations in the future. Please send all your submissions to: The Animals' Voice, 6433 Topanga Cyn, Blvd., #405, Canoga Park, CA 91303; or call (800) 82-VOICE for answers to your questions and more details. All proceeds from the sale of this book will be used to continue the publishing of the award-winning, international flagship publication of the animal defense movement, *The Animals' Voice Magazine.*

A Word from Dr. John Cooper

Dr. Cooper has been hired as the veterinarinan for the Mountain Gorilla Program in Rwanda. He also noted that the Volcano Veterinary Center would being joining IWRC as an organization soon. We will be glad to welcome another African member!

He also wanted to let our members know that his book, ***Veterinary Aspects of Captive Birds of Prey*** is still in print and limited numbers of copies are available from the following address: J.E. Cooper, 8 Scotchel Green, Pewsey, Wilts SN9 5AU, United Kingdom. The cost is $40 US (surface) or $55 US (airmail). This is the 1985 edition (reprinted in 1991). If you don't have one, you should get one for your library!

Rehabilitation Notes: Common Merganser *(Mergus merganser)*

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Introduction

The Common Merganser is a member of the duck family (Anatidae) but anyone who has been faced with raising one can tell you that you cannot raise them like other ducks! Their genus name, *mergus* is Latin for "a diver" or "to plunge" (Terres, 1980). These are the largest inland ducks in North America and while they are usually seen on fresh water, they may occasionally be spotted in brackish water bays and inlets. They are fish-eating birds and routinely dive in pursuit of prey. One will notice that when they take flight, they must run along the surface beating their wings on the water as they strive to get into the air.

Common Mergansers are generally found in the northern hemisphere. They range from Alaska south through Canada into the central California, Arizona , New Mexico and eastward to New England.

They nest in forested river or areas with lakes beginning in March or April. They move southward in the fall to inland water areas but will go to brackish or coastal marine waters if the fresh water areas are frozen.

Adult Description

- These are large birds with a 21-27" long body with a wingspread of 34-39". The male has a serrated red bill, long white body with a hint of pink on the breast, black back, green-back head with a non-descript crest and red feet. The female has a brownish red head and neck which contrasts markedly where it meets with the white of the throat. Her crest is noticeable. Her body is grey with red feet. (Terres, 1980).
- The males are heavier with average weights of 3.64 lbs (1652 g.) (n=19) versus 2.73 lbs (1239 g.) for the females (n=30) (Bellrose, 1976). Dunning reported weight ranges for males of 1528 to 2054 g (n=13) and females of 1050 to 1362 g (n=11) (Dunning, 1984).

Juvenile Description

- Juvenile birds look like females.

Natural Diet

- While they eat a variety of fish, amphibians, and invertebrates, they love live minnows! Other fish in the diet include killifish, stickleback, suckers, trout and carp. They will eat eels, salamanders, crayfish, shrimp (and other small crustaceans), snails, worms, leeches, aquatic insects and their larva. Interestingly, they are also known to eat roots and stems of aquatic plants (Terres, 1980).

Nesting, Egg laying and Incubation

- Common Mergansers nest in a variety of settings. Often found in cavities of trees along the water, they will also nest on the ground under a low bush, on the floors of old buildings, in old hawk nests or in crevices of loose boulders found along the shore. The nest is lined with the feathers of the male and grasses or other weeds.
- Eggs are laid in May and June. They can number from 6-17 but usually 9-12 make up a clutch. The eggs are buff white to ivory yellow. They are incubated by the female for 28-34 days. Hatch weights are around 28-34 g. (Millham). The brood will leave the nest within one day after hatching. When the nest is in a tree, the young jump out of the tree and walk to water (Bent, 1923). The young first attain flight when 60-70 days old.

Nestling Housing and Care

- Mergansers are jumpers. Consequently, babies are housed in large aquariums (20 to 35 gallons). A towel is placed across the entire bottom and a heating pad is placed at one end, set on low, with four folds of a towel on top. In the other end of the enclosure, 2 shallow dishes are placed. The aquarium is covered with 1/2 inch hardware cloth molded to fit, and on the top of the hardware cloth, on the same end as the heating pad, set a "brooder heater." A can or metal bowl is placed over the heating element.
- The ambient temperature should be 85° F to 90° F at all times. Cover the whole tank with a light sheet to keep it light so the babies can see to eat but cannot see you or anything else. Once the tank has warmed to 85° F, add water to the dishes and then add the babies. After they are settled, drop the mealworms into the water where they will wiggle. This will key the mergangers to feed on the live food. *(Note: if using bran-raised worms, calcium should be supplemented.)* These act as the initial starter food. Always keep water and mealworms available. The worms are discontinued when the birds are moved outside into a habitat with a swimming area.
- To initiate live fish feeding, provide a *shallow swimming* area (about 4" deep) and add the fish by dropping them from the air (so they splash). Always add more fish than the birds will eat to ensure they are being adequately fed. Mergansers are offered live fish three times per day, beginning from day one. Although a variety of swimming tubs can be used, the birds must be supervised to prevent any problems, especially if there is not an *easy exit* for the birds out of the water.
- When the birds are 10-14 days old, they can be moved outside into a cage that provides shelter, a swimming pool, and exercise area. At Lake Tahoe Wildlife Care, a special portable cage was designed that has worked very well. The cage is 10 feet long by two feet wide and two feet tall. It has two bicycle wheels and two long handles to manuever the cage. At one end is a brooder box (two feet by two feet) with a sliding wood sheet to "block" birds into the box while cleaning. The cage is framed with Douglas Fir and entirely lined with hardware cloth. At Lake Tahoe Wildlife Care a laundry sink was installed at one end of the cage (2' x 2' x 16" deep) (see photo). The tub has a small board fastened at the water level to assist young birds getting out of the water. The cage also opens at this end to facilitate cleaning and the addition of live fish. Because mergansers, like other waterfowl, have feet sensitive to surfaces such as wire, a flannel sheet is folded four times and placed on the entire walking surface of the cage. Depending on the number of mergansers in the cage, the toweling needs to be cleaned a minimum of once daily. Net-bottom caging could also be used without the additional requirement of toweling. Care should be taken to use a small mesh netting so that their feet do not get caught or injured. A heating pad is placed in the brooder box, set on low and left on 24 hours a day.
- As the birds get larger and begin to grow in their flight feathers, they are moved into adult housing where they have access to a larger and deeper pool.

Adult Housing

- These large birds should be housed in the same manner as other waterbirds. The key elements are a substantial pool (i.e., at least 3' deep and 4 feet long) that allows diving behavior and suspended netting or daisy mats in the haul out areas. The water depth is important to check waterproofing for diving birds because the deeper they dive, the more pressure is exerted by the

water surrounding the feathers. Additionally, these birds literally chase fish in the pool and they need ample room to practice this behavior. Cattle drinking troughs have been used as pools. To maintain waterproofing, the surface water must be kept clean via a continual overflow or an excellent filtration system.

Juvenile Feeding

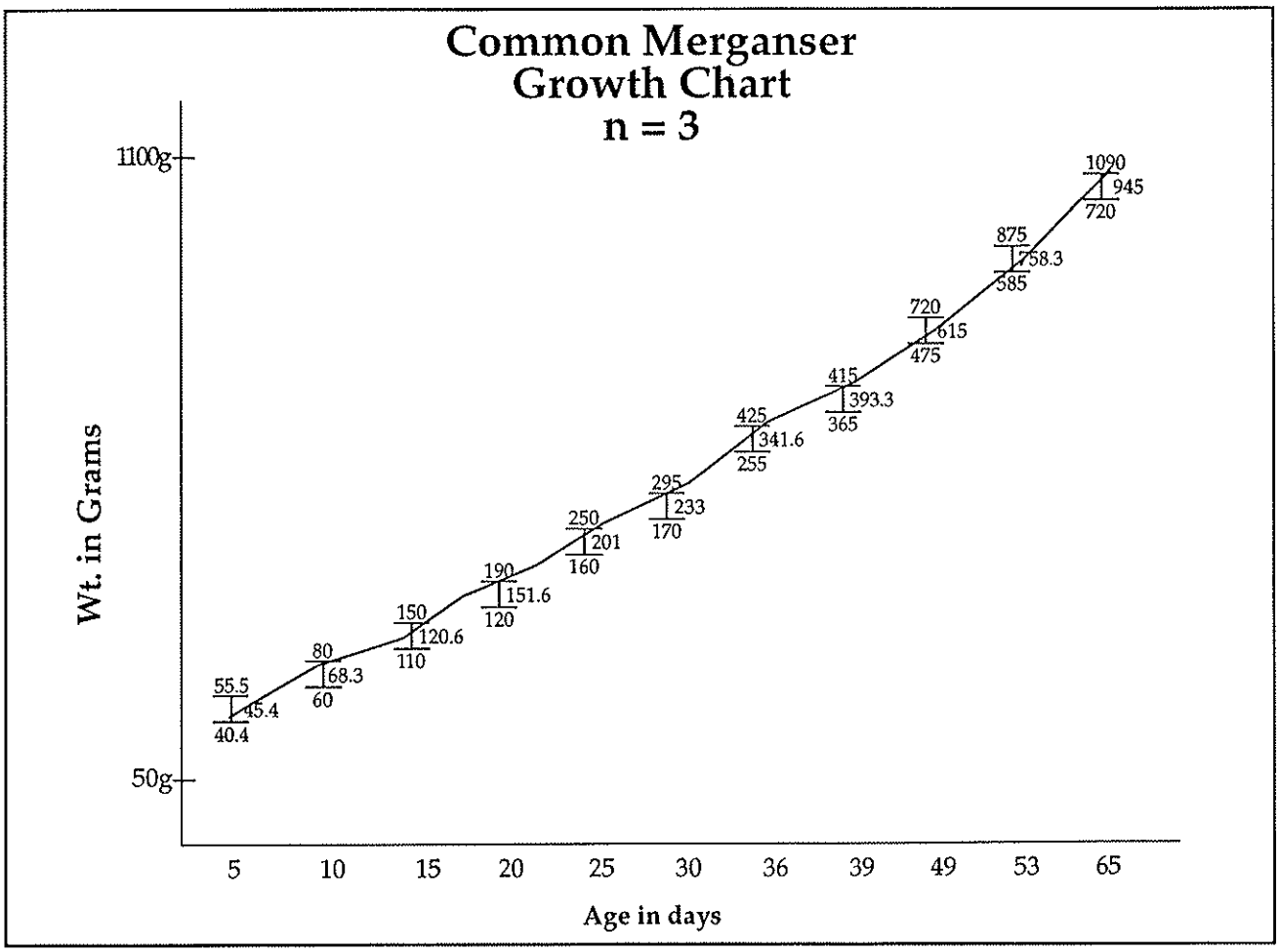
- Feeder goldfish may be ordered in bulk to supply a steady source of food for this species. The smallest size, called "comets," are consumed at the rate of about 100 per day per bird given in three feedings of 35 fish. Their appetite increases with age and the cost just for the live fish can range from $30-50 per week for each bird. As the birds grow, use larger goldfish in about the same numbers.
- As soon as the mergansers are big enough to eat minnows the purchase of a minnow trap(s) is in order. Catching them from the wild will help defray rehabilitation costs. They will eat 30-60 minnows per bird per day. Be sure to check local fishing regulations before trapping native fish.
- Salt water fish are not recommended. In the only case known, mergansers force fed smelt developed CNS signs and died. Upon necropsy, the attending veterinarian felt the cause of death was likely to have been salt poisoning.

Adult Feeding

- Offer a variety of live food items (see natural diet) in quantities in excess of what they will eat.

Maintaining Feeder Fish

Minnows and feeder goldfish thrive in cold (40-50° F) water. A refrigerator minnow housing environment was described by Torsey (1989). At Lake Tahoe Wildlife Care center a 5' long by 2' wide and 18" deep fiberglass aquatic tank with a recycling water pump is utilized. The feeder goldfish are delivered in "iced" water, sealed in plastic bags from the supplier. The plastic bags of fish are floated in the tank prior to release to allow the water to equalize. This process may take 25 to 30 minutes for the water to equalize depending on where you live. Should you not employ this process, the fish may be "shocked" by their new environment and losses may occur.



Juvenile Common Merganser Clinical Chemistries
N=6

Test	*Glucose*	*UAcid*	*Cholesterol*	*Triglycerides*	*Alk. Phos.*
Units	mg/dl	g/dl	mg/dl	mg/dl	IU/L
Average	259.0	12.6	132.0	97.1	729.0
Minimum	221.6	4.4	95.2	46.8	750.9
Maximum	288.0	25.2	158.4	223.2	968.9

Test	*SGOT (ALT)*	*SGPT (ALP)*	*LDH*	*CPK*	*Ca+*	*TP*
Units	U/L	IU/L	IU/L	IU/L	mg/dl	g/dl
Average	74.6	45.7	423	477.8	9.6	3.0
Minimum	31.6	28.4	265.2	597.6	8.8	2.8
Maximum	223.6	91.6	671.6	1966.4	10.8	3.2

Serum Chemistries were performed twice on 3 birds at age 53 and 65 days. Birds were not fasted prior to their blood tests. Tests were run in-house on an Abbott Visions™ Blood Analyzer. LDH samples from the first test averaged one-half (average of 269 vs. 577) of the second and may reflect rapid growth in these birds at this time.

Release Criteria

- Diurnal; release during the day.
- They must be fully waterproof and capable of staying in the water up to 24 hours a day. Should remain waterproof when diving down 3' to catch fish.
- If you raise the birds in captivity, they are releasable when they are capable of flight at between two and three months of age (about 625-950g). This will enable them to flee predators.
- PCV should be about 40%; total proteins about 3 g/dl.
- Release should be in an appropriate lake or stream where fish are present.

Fostering Common Mergansers

Before entering into the long and expensive rehabilitation process, consider fostering them to another female Common Merganser with babies of her own. While not always possible, it does provide the young a better chance of learning survival skills and being integrated into the environment than captive rearing.

Prerequisites:

•The baby has to be in excellent condition (no wounds).

•It must be rehydrated and fed.

•It must not be handled by humans excessively. In general, it should have been handled only to be removed from the cage for cleaning. This will help them keep their "wildness" so they will go to a wild mother.

•It must have been in captivity for a short time (e.g., less than 10 days).

•The merganser family under consideration for fostering must contain young that are the same size or smaller than the proposed "adoptee." If your baby is younger than hers, she will in all probability reject it.

Procedure:

•After a merganser with chicks is located and their size checked, take the proposed "adoptees" out of your container and let them peep loudly. This is important to attract the attention of the mother bird. Maneuver as close as you can to her and gently underhand toss the chick towards her. Make sure she can see the chick. Move away from them and observe their behavior. The mother will start calling, come for the chick(s) and bring them back to her brood.

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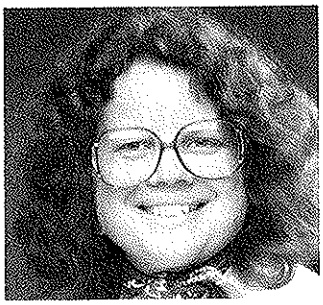
IWRC 1993 Annual Report



Chris Mihulka

President's Message

It is with pleasure that I take this opportunity to introduce to you IWRC's new Board President, Marnie Allbritten, who takes office at the beginning of 1994. Marnie is a wildlife rehabilitator from Roseburg, Oregon, with many years of experience in this field; she was co-founder of Umpqua Wildlife Rescue, a network of home-care rehabilitators, and has served both as president and secretary of Oregon Wildlife Rehabilitation Association. She works for the Oregon Department of Fish & Wildlife and, for a brief, halycon period before funding cuts eliminated the position, served as the department's rehabilitation and oil spill coordinator, during which time the state's rehabilitation regulations took some major steps forward. Her dedication to wildlife rehabilitation, both its practice and its advancement, is total. She has a background in counseling, a delightful sense of humor (both of which should be requirements for the position), and I know that she will serve this organization well.

Stepping down from the President's chair is probably always accompanied by mixed feelings: for me, these are pride in what I have contributed in these two years; satisfaction that membership, financial stability, and a strong working board have grown; disappointment that the organization, despite all its growth, and 'wildlife rehabilitation', are still not quite household words; and relief that Jan White won't be calling me at 10:00 pm quite so often with so many perplexing questions. I will be delighted to be able to focus more on the *Journal of Wildlife Rehabilitation*, knowing that the IWRC board is made up of responsible responsive, committed people who work well together and, almost as important, know how to have fun.

I encourage each of you to consider what this organization can give to you, currently and in the future, and to examine how you might contribute to bringing those services to our many members. The *Journal* can always use articles, the board can always use new members, the conference can always use speakers; and the entire organization can always use your thoughtful comments and constructive criticism.

My personal commitments have grown enormously with the realization of a long-term dream, the purchase by my organization of property on which to expand our raptor rehabilitation facilities and build a nature center dedicated to raptors and their habitats. I foresee going grey very rapidly, grinding my teeth into oblivion in my sleep, developing a premature dowager's hump from the tension in my shoulders, and having the time of my life. As John Muir put it so well, "I care to live only to entice people to look at nature's loveliness." Thank you for the opportunity to serve you as president of IWRC. I look forward to serving for at least one more year on the board, and hope that any of you visiting Eugene, Oregon, will stop by to say hello.

1993 IWRC Membership Report

Mary Reynolds, Office Manager

Total membership increased from 1469 members in 1992 to 1581 members in 1993. This is an increase of 9%! Renewals accounted for 55%, with skills seminars and literature purchases bringing in 14% each. Our organizational members also increased by 9%. We did several outreach mailings this year and received a 4% return from this effort. A 1% return is considered a successful mailing! We also had some exciting new international memberships from places like Taiwan, Africa, Australia, Spain, Mexico, Iceland, and Guatemala! Our goal for 1994 is 2000 members, and it looks like we are well on our way!

Geographic Breakdown:

Total membership = 1581

US members = 1437

International members = 144

Membership Types:

Individual = 1299

Organizational = 187

Family = 91

Life = 3

Affiliate = 1

IWRC continues to offer excellent benefits to our membership. This year we were able to add a copy of the *conference proceedings* to that list by increasing our rates by only $8.00 per membership! (Look for your copy of the 1993 Proceedings around June). We are able to do this by increasing the number of books ordered, thereby decreasing the cost per book. As usual members also receive a membership directory (by the way we are putting our 1994 directory together right now, so if you have any changes or additions that you would like to make please let us know as soon as possible), four issues of our quarterly publication, the *Journal of Wildlife Rehabilitation*, discounts to *IWRC conferences* and *Skills Seminars℠*, as well as discounts on *literature* purchases, and access to our *IWRC Wildlife Hotline.*

We would like to welcome and thank all of our new members and give special thanks to our renewing and longtime members for their continued support! We are all looking forward to a great year in 1994!

1993 IWRC Conference Hits the Jackpot!

Mary Reynolds, Conference Coordinator

Our 16th annual Conference was held in beautiful Lake Tahoe, Nevada, in October 1993, and was hosted by Lake Tahoe Wildlife Care, Inc., with Tom and Cheryl Millham serving as hosts. The conference was held in the *Lake Tahoe Horizon Casino & Resort*, located right on Lake Tahoe. We had a gorgeous view of the lake and the mountains surrounding it. The weather gave us a taste of everything from sunshine to snow! Those of us who felt lucky tried our hands at the slots, roulette and craps. There was a large assortment of restaurants available and shows for anyone who could find the time!

Attendance exceeded 300 this year, with 18 exhibitors and over 40 speakers! This year we also had 19 program sponsors, solicited by the 'ever-energetic' Tom Millham. We would like to extend our special thanks to these sponsors and of course to Tom for all of his hard work in obtaining them.

The field trips were great fun and enjoyed by a large percentage of our attendees. Our thanks to Bob & Sue Rutherdale, Joan Humphrey, and of course (once again) to Cheryl and Tom Millham for their willingness to be our guides on these trips. Thanks also go out to Sheryl Lanier for acting as guide for the early morning bird walks.

The workshops were a great success! They covered topics like feather repair, handling & care of reptiles, raptor-hood making, diagnostic techniques for parasites, hematology, wing-wrap and fracture immobilization, rehabilitation of rabbits, flying squirrels, and raccoons, and procedures for non-releasable educational animals.

We had a special treat prior to the wine & cheese tasting "Ice Breaker" on Thursday evening, when Katherine McKeever of the OWL Foundation of Vineland, Ontario, gave a talk on the "Sex Life of Owls"! Katherine also opened the talks on Friday morning with her presentation of "Stress: the Biggest Killer". Other topics covered in the talks were coping with burnout, the making of an internship program, volunteer management, com-

INTERNATIONAL WILDLIFE REHABILITATION COUNCIL

Wildlife Care Catalog
Spring / Summer 1994

IWRC
Literature Order Form

IWRC Skills Seminars[SM]	Qty.	Total
Session I - Basic Wildlife Rehabilitation 1AB[SM] by Jan White, DVM **Revised 1992** **ISBN 1-884196-02-0** ***Reinforced covers and wire binding for longer wear!*** With the purpose of standardizing rehabilitation skills through a professional packet, the author covers rehabilitation methods and techniques from capture to release. Basic animal physiology, treatments and medications, nutrition, and husbandry are covered for mammals, birds, and reptiles. Also included are nutrition and housing charts which can aid the rehabilitator in determining how to care for and raise wildlife. This 150 page manual also includes individual rehab notes on common species. **Price $25.00**		
Session II - Wildlife Restraint Handbook by the Wildlife Investigations Staff, California Department of Fish and Game **Revised 1992** This 172 page book is designed for the wildlife rehabilitator and field biologist. It has sections on mechanical capture of animals, transportation of captured animals, restraint equipment (ropes, gloves, hobbles, Ketch-All Pole™, pole syringes, dart guns, etc.), pharmacology of restraint drugs, legal information on scheduled drugs, medical concerns in restraint, safety, and specific information on various species (including drug dosages) such as Black Bear, Mountain Lion, Bobcat, Coyote, Fox, Skunks, Badgers, Fishers, River Otters, Beavers, Raccoons, and Sea Otters. **Price $20.00**		
Session III - Laboratory Procedures & Diagnostics in Wildlife Care[SM] by Tami Anderson, AHT **Revised 1987.** Procedures covered include the various aspects of hematology, laboratory tests, urology, parasitology, testing done for heartworm, and basic information on bacteriology and culture sensitivity testing. **Price $7.50**		
Session IV - Physical Examination & Initial Care[SM] by Jan White, DVM, Sandra Emanuuelson, DVM, and Louise Shimmel **Revised 1994.** Topics covered include intake procedures, initial exam, treatment for basic shock and for selected poisons. **Price $7.50**		
Session V - Feeding and Nutrition of Animals in Rehabilitation Centers[SM] by Murray Fowler, DVM Various aspects of feeding and nutrition in wildlife care are addressed including requirements for energy, protein, minerals, vitamins and hydration. In addition, sections are included on thermoregulation, zoonosis, and metabolic bone disease. **Price $7.50**		
Session VI - Physical Therapy in Raptors[SM] by Nancy Horowitz, RPT A registered physical therapist, the author brings to our field her knowledge of the principles, application and cautions in the use of physical therapy on wild raptors. This packet also includes a "New Method for Exercising and Rehabilitating Raptors" by Terry Schultz, Julie Klingman and Russell Tucker, DVM; and "The Goniometer: Its Indications and Use" by Kathie Giblett, RPT. **Price $6.00**		
Session VII - Basic Necropsy Procedures[SM] by Pat Gullett, DVM This packet provides rehabilitators with procedures for both avian and mammal necropsy, complete with diagrams. Reptile illustrations are included for reference along with a necropsy form for the rehabilitator. **Price $6.00**		
Session VIII - Fluid Therapy in Wildlife Care[SM] by Michael Murray, DVM Dr. Murray explains the different types of fluids available, when to use them, criteria for their use and routes of administration. Basic and acid-base balance is also covered in this packet. **Price $ 7.50**		

	Qty.	Total
Session IX - Basic Wound Management for Wildlife Species[SM] **1994.** by Scott Newman, DVM This packet offers step-by-step instructions on how to deal with wounds. The information includes sections on wound debridement, lavage antibiotics, wound closure and open-wound management. **Price $6.00**		
Session X - How to Develop and Organize a Wildlife Rehabilitation Program[SM] by Sally Lewis This packet is designed to accompany the actual seminar. The information is for everyone who wants to start a wildlife rehabilitation program as well as for those who want to see their existing wildlife group get better organized. Topics include; starting up, finding an effective board of directors, managing a volunteer program, qualities in a good leader and in a good worker, fund-raising, public relations, working with difficult people, conflict resolution, preventing burnout, and more. **Price $7.50**		
IWRC PROCEEDINGS **"Handle With Care"© 1991** From the 1991 conference in Vancouver, BC, Canada. Papers include: How to Make Your Wildlife Education Programs More Effective by Marge Gibson; Home Care and Wildlife Rehabilitation by Marnie Allbritten; Squirrel Rehabilitation Project by Carol McIntyre; Handling and Restraint of Wildlife Species by Florina Tseng, DVM; Seal Pup Rehabilitation Program by Laurence Braun, DVM; Rehabilitation of Orphaned Sea Otter Pups by Julie Hymer; Rehabilitation of the Beaver and Muskrat by Cheryl Millham; Rehabilitation of the Coyote (*Canis latrans*) by Jeanne Wasserman; Study of 129 Coracoidal Traumas, Successes Without Intervention by Kit Chubb; Radial and/or Ulnar Fractures: In Support of No Support by Kit Chubb; Current Protocol for the Rehabilitation of Oil Affected Waterbirds by Jan White, DVM; Care of Coots, Rails, Plovers, and Sandpipers by Meryl Faulkner; Aspergillosis in a Rufous Hummingbird Colony by Chris Harvey-Clark, DVM; Avian Hematology: An Overview of Specimen Processing, Sample Evaluation, and Interpretation by Victoria Joseph, DVM; Basic Public Speaking for the Rehabber by Alyssa A. Ottomeier; Raising More Money in Hard Times by Bill Marshall; Hand-Rearing Techniques for Raptors by Claire H. Hager and Walter C. Crawford, Jr.; Rehabilitation of Orphaned Raptors: The Fostering Alternative by Brian Woodbridge; An Investigation Into the Health Status of Bald Eagles of British Columbia by Ken Langelier, DVM. **Limited copies left in stock!! (Price reduction!!) Price $15.00**		
"Under Our Wing"© 1992 From the 1992 conference in Naples, Florida. Papers include: The Ecological Significance of Wildlife Rehabilitation by Dr. John H. Fitch; The Value of Medical Management of the Florida Panther in Assessing a Population Decline by Deborah K. Jansen and Dr. Melody Roelke; Environmental Education-A Back to the Future Approach for Protecting WL and Their Ecosystems in the Next Decade by Walter C. Crawford, Jr.; WL Rehabilitators and State WL Agencies-Uneasy Allies or Fast Friends by Marnie Allbritten; Video: An Effective Tool for Fund-raising by Hope Douglas; Public Speaking by Cheryl Millham; Fund-raising in the 90's by Dale Carlson and Hope Douglas; Fund-raising Made Easy and Other Fantasies by Douglas Dunn; Computers for WL Rehabilitation by Tom Millham; Computer Networks (BBSs) & Databases for Rehabbers by Bill Marshall; Rehabilitation, Computers, and Communication by R. G. Hanes; Emaciation: Unraveling the Mysteries of Recovery by Louise Shimmel and Jan White, DVM; Treatment of Pododermatitis in Cormorants by Chris Harvey-Clark, DVM; Rescue & Rehabilitation of Burrowing Owls in Silicon Valley by Joan Priest; The Slit-Wrap Wing Wrap by Joan Priest; The Reintroduction of Endangered Species-Combining Rehabilitation & Species Preservation in the 90s by Walter C. Crawford, Jr.; Raising Hell, Raising Bobcats by PC Hanes; Treatment of Burned Raccoons: A Case History by Susan Heckly; Initial Care of Northern Elephant Seal Pups by Dawn M. Smith, AHT & Michael Stone, MS; Isoflurane: A Safe & Effective Anesthetic for Marine & Freshwater Turtles by Sarah L. Shaw, Sandra Leone-Kabler, Dr. Peter Lutz, & Dr. Alexis Schulman; Euthanasia by Joanne Richards, DVM; and Intraosseous Fluid Administration in Birds by Janna Wynne, DVM. **ISBN 1-884196-00-4 Price $20.00**		

"The Effects of Oil on Wildlife"© 1990	Qty	Total
Taken from a two day symposium held in Washington DC in October 1990. Topics include: Oil Spills and the Environment: A Review of Chemical and Biological Effects of Petroleum by Dr. Peter Albers; An Assessment of the Capability of the Legal System to Assess Damages and Recover Cost for Damages to Natural Resources From a Large Oil Spill: The Case of the Exxon Valdez by Hope Babcock; Consideration in Planning Wildlife Protection Strategies in Response to Oil Spills: Alaska Experience by Pamela Bergmann; Surfactant Efficacy in Removal of Petrochemicals From Feathers by Henry E. Bryndza; The Natural History of Oil Spills by Richard Brown, D. Phil.; Newfoundland: Crossroads for Seabirds and Shipping in the Northwest Atlantic by John W. Chardine, Ph. D.; Recommendations in the Rescue, Wash, and Care Techniques and Rehabilitation of Oiled Pinnipeds in California by Patty Chen-Valet, BS, Laurie Gage, DVM, and Dawn Smith, AHT; Water Hardness and Waterproofing of Oiled Birds: Lessons from the Nestucca, Exxon Valdez, and the American Trader Spills by Curt Clumpner; Advances in Rehabilitating Oiled Sea Otters: The Valdez Experience by Randall W. Davis, Ph. D.; Nutrition Support of Oil Contaminated Wildlife: Clinical Applications and Research Potentials by Susan Donoghue, VMD, MS, DipACVN; A Perspective on the Effects of Oil on Birds by Lynne Frink; Results of the Eagle Capture, Health Assessment, and Short-term Rehabilitation Program Following the Valdez Oil Spill by Marjorie Gibson and Jan White, DVM; The Toxicity of Petroleum Oils to Birds: An Overview by Dr. Frederick A. Leighton; Status and Summer Distribution of Alaskan Yellow-billed Loons Following the Valdez Oil Spill by Judith McIntyre, Ph. D.; The Question of Avian Water-repellency: Why Are Some Birds More Difficult to Rehabilitate? by Lynn A. Mahaffy; Potential Effects of Oil on Manatees by Dan O'Dell, Ph. D.; Effects of Oil Pollution on Marine Bird Populations by John Piatt, Harry R. Carter, and David N. Nettleship; Pathology of Wildlife Following a #2 Fuel Oil Spill by Virginia Pierce, VMD; Medical Treatments and Husbandry of Wild Sea Otters During Oil Spill Rehabilitation by Pam Tuomi, DVM; Notes on Health and Safety Concerns When Handling Oil Contaminated Wildlife by Sallie C. Welte, Henry E. Bryndza, and John R. Embick; Current Treatments for Hemolytic Anemias in Oil Contaminated Birds by Jan White, DVM; Evaluating the Long Term Effects of Crude Oil Exposure in Sea Otters: Laboratory and Field Observations by Terrie M. Williams, Ph. D. **ISBN 1-884196-01-2 (Price Reduction!!) Price $20.00**		
INDIVIDUAL IWRC PAPERS **Practical Avian Triage© by Gail Hedberg, AHT 1990** This booklet covers the basics of avian stabilization, including assessment of stability, housing and transport, stress management, physical examination, support feeding and therapy, and care for common injuries/fractures. Also included are case examples with model plans of action as well as an appendix for supplies mentioned in the paper. **Price $5.00**		
Immobilization of Simple and Compound Fractures in Songbirds and Raptors© by Victoria Welsh 1981 This booklet covers many aspects of dealing with fractures in birds. Areas covered in this paper include cleaning and disinfecting wounds, fractures of long bones, their treatment and post-treatment rehabilitation. **Price $5.00**		
Immobilization of Simple and Compound Fractures in Mammals© by Victoria Welsh 1981 This booklet covers many areas of dealing with fractures in mammals. Rescue, transport, initial care, treatments for specific breaks, proper confinement, healing time, and rehabilitation. This information is complemented by illustrations for splinting and wrapping methods for fractures. **Price $5.00**		
Current Protocol for Treatment of Oil-Contaminated Birds© by Jan White, DVM 1992 This booklet contains current information regarding the medical care of oil affected birds. Common medical problems encountered include: diarrhea, dehydration, hypothermia, hypoglycemia, hemolytic anemias, pneumonia, fungal disease, hypo- and hyperproteinemia, pododermatitis, and keel lesions. Current treatments and management techniques are covered, as well as criteria for washing and release. Includes a glossary for medical terms used in the text. **Price $7.00**		

	QTY.	TOTAL
Hand-Rearing of Non-Domestic Mammals© by Debbie Marcum Revised 1993 An informative paper in six parts covering such subjects such as initial care, medical problems and their treatment, feeding and nutrition, housing, behavior, and release. This paper includes a medical and dietary products list and biological data sheet. Also added in the updated version are two papers on oral tube-feeding and weaning the Virginia Opossum as well as formula feeding charts for the opossum, beaver, cottontails, raccoon, tree squirrels, marmots, river otters, and porcupines. This 66 page book includes an extensive listing of substitute milk formulas for numerous mammals, and post-weaning diets! **Price $10.00**		
Raccoon Rehabilitation© by Jan White, DVM and Debbie Marcum 1979 This 20 page booklet covers the care, handling and release of raccoons. It includes details on infant and adult diet, medical problems, vaccinations, caging, growth charts, and much more. **Price $5.00**		
A New Method For Exercising & Rehabilitating Raptors© by Terry Schulz, Russell Tucker, and Judy Klingman 1984 This paper introduces a new method of exercising raptors on a shoulder flight harness with a minimum amount of human contact. This method is ideal for the rehabilitation program that does not have room for a large aviary. Complete instructions to build a fixed flight line and harness are included. **Price $3.00**		
Hand-Rearing Orphaned Eastern Cottontails (*Sylvilagus floridanis*)© by Anne M. Hiss 1990 This paper covers natural history, behavior, captive care, feeding and diet, housing, injuries and disease, and release of the Eastern Cottontail. Includes charts on housing, diet and treatment based on age; suppliers of materials; Bactrim™ dosages; as well as a sample health chart. **Price $6.50**		
Rehabilitation of Tree Squirrels© by P. C. Hanes & Jennifer Simmons 1990 Topics covered in this booklet are: natural history; diet & feeding techniques; caging requirements; treatment of injuries and diseases; and release criteria. Also includes charts on comparison of electrolyte fluids and dosages by weight for diarrhea corrective medication. **Price $7.50**		
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IWRC / NWRA Minimum Standards® & Accreditation℠ Revised 1993 This 48 page booklet details the approved standards for temporary care of wild animals undergoing rehabilitation. It also includes information on disinfectants, cleaning, records, medical standards, facilities requirements, minimum caging standards for birds and mammals, and euthanasia standards. IWRC's accreditation section includes an accreditation facilities review and a self-help checklist. This is ***essential*** reading for anyone, individual or organized group, who is developing a program for wildlife care. **Price $6.50**		
NEW! Raptor Biomedicine© by Patrick T. Redig, John E. Cooper, J. David Remple, and D. Bruce Hunter, Editors. Trudi Hahn, Technical Editor. Published by Univ. of MN Press An essential resource tool to anyone involved in the care or conservation of raptors. Covers pathology & microbiolgy; surgery & anesthesia; medicine & therapeutics; and environmental toxicity. If you are concerned with the welfare of raptors, whether in the wild or in captivity, you will benefit from this publication. **ISBN 0 8188 2219 1** **Price $40.00**		

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Zoonoses and Communicable Diseases Common to Man and Animals by Pedro N. Acha, DVM, MPH, Dr. HC and Boris Szyfres, DVM 2nd. Edition 1987 This reference book of over 900 pages is a "must have" for anyone who works closely with animals. The book deals with two groups of communicable diseases: those transmitted from vertebrate animals to man and those common to man and animals. Covers diseases on an International level as well as U. S. **ISBN 92 75 31503 5** **Price $25.00**		
Medical Management of Birds of Prey© by Patrick T. Redig, DVM, Ph. D. 2nd. Edition, 1993 Published by The Raptor Center at the University of Minnesota, St. Paul, MN. A collection of notes on selected topics. Includes: Ethics, Medical Emergencies, Anesthesia, Lab Diagnostics, Fluid Therapy, Nutrition and Feeding, Orthopedic Techniques, Bandaging and Splinting, Soft Tissue Surgery, Treatment Protocols, Parasitic Diseases, Anemia, Lead Poisoning, Release Criteria, and Health Management. Also includes a Formulary of Pharmacological Agents for Emergency Care of Raptors, an Annotated Summary of Medications for use in raptors, and Guidelines for Perch Design. This 176 page manual covers every aspect of raptor care! **Price $20.00**		
American Wildlife & Plants A Guide to Wildlife Food Habits© by Alexander Martin, Herbert S. Zim, and Arnold L. Nelson. Published by Dover Publications, Inc., NY, NY. Ever wonder what is considered natural feed for the animals that you work with? This book is a great reference book for rehabilitators! Covers waterbirds, shorebirds, gamebirds, songbirds, birds of prey, fur and game mammals, small mammals, ungulates, fish, amphibians, and reptiles. Lists plant and animal foods that these animals eat in the wild. Also illustrates normal ranges for the various species. **ISBN 486 20793 5** **Price $9.95**		
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NOW AVAILABLE!! Body Weights of 686 Species of North American Birds by John B. Dunning, Jr., Ph. D., of the University of Georgia, Athens, GA. This monograph, originally published by the Western Bird Banding Assoc. in 1984, is now available to our members through IWRC! Dr. Dunning has kindly allowed us to reprint this booklet in order to make this information available to the rehabilitator. This table of weights offers the standard and normal ranges of weights by species. A invaluable resource tool for anyone who works with birds! **Price $7.00**		
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Handy Drug Dosage Tables for Birds. Compiled by Susan Patton Set of three 5" x 7" reference cards, laminated for extra durability! These will fit in your pocket or handbag, so they will be available to you when you need them, in the field or anywhere! **Price $6.00/set**		
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Avian Haematoza Survey in Fairfield, Ca.
Stress Management for WL Staff & Volunteers
Imprinting and Wildlife Rehabilitation

Volume 7, No. 2 _____

Rehabilitation Notes: Woodpeckers
Fluid Therapy in Birds (Part 2)
Physical Examination of Songbirds

Vol. 7, No. 4 _____

Rehabilitation Notes: Barn Owl
IWRC Skills Certification Class Begins
Raising White-tailed Deer "Wild"
Avian Trichomoniasis
Netting Wild Mammals

Volume 7 Set _____

Volume 8, No. 1 _____

Rehabilitation Notes: Anna's Hummingbird
Inner Ear Infection in a Badger
Wildlife Rehabilitation Today

Volume 8, No. 2 _____

Rehabilitation Notes: Fox Squirrel
Mourning Dove: Natural History and Captive Care
Veterinary Corner: Cryptosporidiosis

Volume 8, No. 3 _____

Rehabilitation Notes: American Goldfinches
How to Read & Use a Syringe
Natural History Notebook: Turkey Vulture

Volume 8, No. 4 _____

Rehabilitation Notes: Turkey Vulture
Tubing Mixtures
Natural History Notebook: White-throated Swift
Philosophy of Wildlife Rehabilitation

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Volume 9, No. 1 _____

Rehabilitation Notes: Black-necked Stilt
Pre-anesthetic, Anesthetic, and Post-Anesthetic Care for Raptors
Mealworms: Their Care & Feeding

Volume 9, No. 2 Out of Print

Volume 9, No. 3 _____

Rehabilitation Notes: American Robin
The Split-Wrap Wing Wrap
Baylisascaris procyonis & the Wildlife Rehabilitator

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Natural History Notebook: The Western Gull
For the New Rehabber: Feather Imping: History and Technique
WL Statistics & Their Importance
1986 Pacific States Fall Graduates

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Let Me Tell You a Story
Sea Lion's Share of A Whale of a Job
How to Get Media Coverage
Internship Programs: An Overview
For the New Rehabber: Newsletters

Volume 11, No. 4 _____

Rehab. Notes: Green-backed Heron
A Review of Avian Hematozoa Parasites
Euthanasia
1988 IWRC Annual Report

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Rehab. Notes: Kingfishers
Physiological Assessment of Rehabilitated Raptors Prior to Release
Alaska Oil Spill Bird Rescue Efforts

Volume 12, No. 2 _____

Rehab. Notes: House Finches
San Miguel Sea Lion Virus
Simple Things: Y - Perch Holders
Guidelines for Exercising in Rehabilitated Raptors

Volume 12, No. 3 _____

CMMC Gift Shop
Using Booths for Outreach & Fundraising
Fundraising for Wildlife Rehabilitation Organizations
Donor Segmentation for Effective Results
Newspaper Advertising for Members Support
Building Memberships Through an Adopt-an-Animal Program

Volume 12, No. 4 _____

Rehab. Notes: The Raccoon
Fluid Therapy: The Science Behind the Miracle
Avian Haematozoa
FNR: Nipple Size

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Volume 13, No. 1 _____

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The Goniometer: Its Indication & Use
Case Report: Hemaproteus in a Red-tailed Hawk
Weaning the Virginia Opossum
Is the Time Ripe to Stop Comparing Apples to Oranges?
Simple things: Raptor Perches

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Volume 13, No. 3 _____

Special Topics Issue: **"Lessons From Rehabilitating Oiled Wildlife" 64 pages Price $7.50**

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Rehab. Notes: Sea Otter Pups *(Enhydra lutria)*
New Advances in Captive Housing for Common Murres
Nutrition Support of Oil Contaminated Wildlife: Clinical Applications and Research Potentials
Rehabilitating Oiled Seabirds During the Exxon Valdez Oil Spill
Advances in Rehabilitating Oiled Sea Otters: The Valdez Experience
Evaluating the Long-term Effects of Crude Oil Exposure in Sea Otters
Results of the Eagle Capture and Short-term Rehabilitation Program

Volume 13, No. 4 _____

Applied Ethics, Decision Making and the Not-For-Profit Organization
Antibiotic Use in the Raptor Patient: Selecting an Appropriate Antibacterial
Rehabilitation Notes: Gadwalls
Clinician's Corner: Squirrel Fibromatosis - A Review
How Emaciated is that Pelican?

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Rehab. Notes: The Common Moorhen
Make Your Own (Catch Pole)
A Quick & Easy Display Booth
Wildlife Rehabilitation: The Ultimate Escape for the Co-Dependent

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CK Elevation in Greater and Lesser Scaups During a Marine Fuel Spill

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Designing a Veterinary Program for the Wildlife Rehabilitation Center
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Emergency Road Kits for Wildlife Rehabilitators
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Cottontail Feeding Problems or "How to Bribe a Bunny, Part I
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Avian Hematology: An Overview of Specimen Processing, Sample Evaluation and Interpretation
A Literature Review of Selected Hematologic Parameters of Raptors

Volume 15, No. 4 _____

"What Do You Mean, Look It Up", Research Resources for Wildlife Rehabilitators
Cottontail Feeding Problems: Part II, The Big "D": Diarrhea in Rabbits
A Warming Shelf for Nestling Song Birds
Simple Things: Feeding Chutes for Raptors

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Constructing Perches for Healthier Feet in Captive Birds of Prey
IWRC Newsletter, Vol. 1, No. 1

Volume 16, No. 2 _____

Feeding Fawns: A Strategy for Wild Returns
Rehabilitation Notes: Tree Squirrels
Intraosseous Fluid Administration Utilizing the Avian Femur
Book Review: "Health & Management of Free-Ranging Mammals"

Volume 16, No. 3 _____

Euthanasia in Wildlife Rehabilitation
Current Guidelines for Euthanasia in Wildlife Rehabilitation
How to Make a CO_2 Chamber
IWRC Newsletter, Vol. 1, No. 2
Book Review: "Environmental Grantmaking Foundations"

Volume 16, No. 4 _____

Baby Bird Incubators
Rehabilitation Notes: The Common Merganser
Immunoglobulins and Their Function in Colostrom
1993 Annual Report

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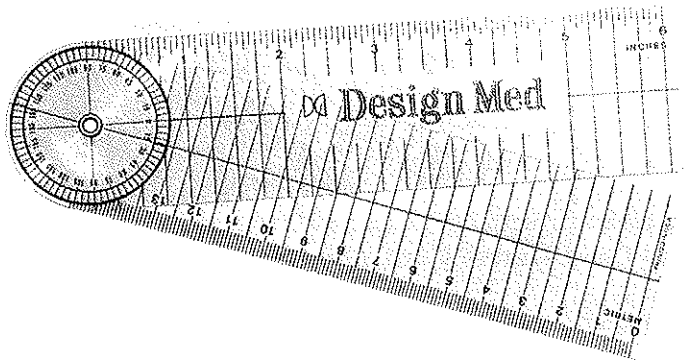
IWRC Products for Sale

Goniometer: Finally, an inexpensive way to measure wing extension! This instrument is used in the assessment of normal range of motion in animals that have recovered from injuries.

Price $5.00

Qty. _____ **Total** _____



IWRC Logo T-shirts!

Made of 100% Cotton (pre-shrunk) these are sturdy and wearable for working with the animals! They can be ordered in two colors (white with a black logo or black with a reversed logo).

Circle Color: Black White
Circle size: **S M L XL**

Price $12.00

Qty. _____ **Total** _____

IWRC Logo Tote Bag:

Heavy canvas, roomy, black with bright IWRC logo!

Price $ 15.00

Qty. _____ **Total** _____

Wildlife Cards!!

Developed at Cascades Raptor Care Center, these beautiful cards by Nancy Allen and Karen Pidgeon, will make your thank you's and note writing easy! Four wildlife design notecards, two of each for a set of eight cards, or eight "Thank You" cards in a set. Printed on recycled paper with envelopes.

Circle one: **Thank Yous** **Raptor Card Set** **Price $5.00/set**

Qty. _____ **Total** _____

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You will be invoiced for additional postage costs as necessary. ***Please allow 6 to 8 weeks for delivery!***

JOIN NOW! Become an Active Member of the IWRC

Individual Membership	**$38.00**	☐
Family (Two designees)	**$48.00**	☐
Organizational (Two designees)	**$48.00**	☐

Amount enclosed or to be charged to your credit card
$ _____

Membership benefits: Four issues of the *Journal of Wildlife Rehabilitation*, a membership directory, an annual conference proceedings, and discounts on conference registrations, skills seminar registrations plus a 10% discount on literature purchases!

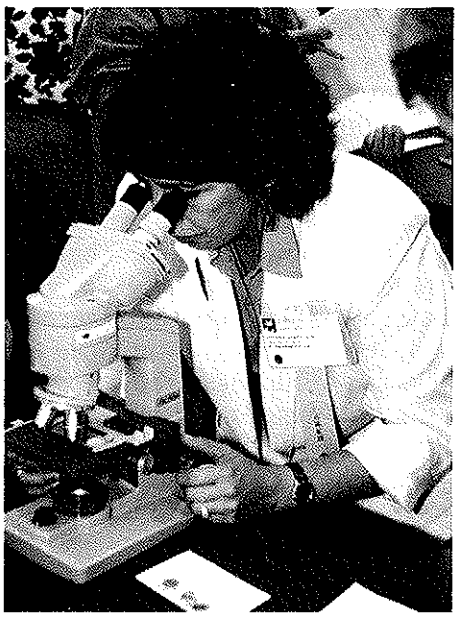
Memberships outside the US, add $4.00 per year for Canada and Mexico and $6.00 per year for all other countries. Please submit payment in US funds.

puters in rehab, dove rehabilitation, raptor care, exotic bird rehab, Gambel's quail, imprinting, rehabilitation of deer, skunks, reptiles, woodchucks, ground squirrels, and harbor seals. Our attendees also participated in a series of roundtable discussions covering topics like federal permitting processes, ethics, avian blood transfusions, creating state organizations, and a director's roundtable.

The *Silent Auction* and *Raffle* were great successes! We had some wonderful photographic prints and artistic works up for bid, as well as many other great items. The raffle grand prize was a fax machine, so ticket sales were booming!

We want to thank Tom and Cheryl for one of our best conferences ever! They, their board of director's, and their volunteers put forth a tremendous effort and the results reflected that! We would also like to extend our thanks to all of our exhibitors for their participation, and once again, thanks go out to our 'special' volunteer, *Judy Shaffer*, who has been so generous with her time and effort!

Plans are underway for the 1994 conference in San Diego, California. The dates will be November 3-6, 1994, with skills seminars presented on the 2nd and 3rd. Some of the planned topics are: raising mallard ducklings, lead poisoning in wildlife, reversing of imprinting in raptors, bat rehabilitation, techniques of policy writing, and effective educational programs. Workshops will be presented on fabricating your own equipment from plexiglass, and initial exam procedures. These are only a few of the things in the works for our next conference! Make plans now to attend! See you there!!



Dr. Vickie Joseph adjusting a microscopic view of a blood smear at our conference hematology workshop.

Elizabeth Komen shared slides on rehabilitation in Namibia, Africa at our banquet.

State/Provincial Representatives Project

Marnie Allbritten, Board Member

A small but dedicated group of state reps met at the IWRC conference in Lake Tahoe this year. They were pleased to hear that IWRC will be asking them to take a larger role in promoting IWRC in the future.

The reps have been asked to attend yearly conferences and to organize at least one IWRC workshop in their state per year and/or promote memberships at state and local conferences. There is some discussion among the representatives about the requirement to attend the conference and this matter will be discussed further at the June IWRC board meeting.

It was also decided, during the conference meeting, to conduct a US & Canada survey to find out if states and provinces require licenses for rehabilitators, have exams to obtain licenses, and what the state and provincial laws are concerning wildlife rehabilitation. That survey is ongoing, 40 states, 2 provinces, and the Virgin Islands reporting back so far. We hope to have more on the survey by the 1994 conference.

We welcomed two new reps to our ranks this year. Trish O'Connell will be representing Pennsylvania, and Becky Picton will be representing Oregon. We are looking forward to working with them.

We now have 17 state and provincial representatives with many states not yet represented. Anyone who is interested in serving with the group is welcome to write me for an application. Write to: Marnie Allbritten, 292 Cleveland Hill Rd., Roseburg, OR 97470.

IWRC Revenue & Expense Statement - 1/1/93 to 6/30/93

Beginning Balance 1/1/93		$1,940.70
REVENUES		
Conference	486.00	
Literature	9,751.51	
Membership	19,161.00	
Skills Seminars	24,645.62	
Other Income	4,834.20	
Interest Income	41.71	
	$60,643.34	
EXPENSES		
Conferences	45.00	
Administration	17,774.85	
Skills Seminars	10,926.91	
Postage & Shipping	7,087.52	
Journal	13,434.29	
Board of Directors	859.36	
Wages - Employees	16,855.59	
	$66,983.52	
Ending Balance 6/30/93		($4399.48)

***Income 7/1/93 to 12/31/93**

Membership	25,780.00
Skills Seminars	33,090.00
Literature	11,604.91
Conference	36,121.26
Standards	8,001.99
Other Income	315.04
	$114,913.32

*Expenses are not yet available for the second half of the year. We are attempting to computerize the accounts, and are still in the process of inputting the remainder of the year. We hope to have this completed for the next issue of the journal.

1993 Skills Seminar Summary

Christina Casey, Skills Seminar Coordinator

This year there were sixteen Basic 1 AB Skills Seminars and four advanced classes. We served 534 students with the basic classes and 91 people with the advanced seminars for a grand total of 625 participants! In 1983 IWRC developed the Skills Seminar program and we now serve 500-700 wildlife rehabilatators annually. Our program is the only one of its kind, nationwide, that offers "hands-on" supervised basic and advanced skills training sessions for the rehabilitators of sick and injured wildlife.

The basic skills classes were held in eight states, California, Ohio, Nebraska, New Jersey, Virginia, Connecticut, Oregon, and Nevada. We also provided Basic classes to three Canadian Provinces, British Columbia, Alberta, and Edmonton. The advanced seminars were held in Nevada and California.

In 1993 we had participants from twenty-five U.S. states from Alaska to Maine, three Canadian provinces and also an attendee from Nambia, Africa.

Each year our program grows, reaching more and more rehabilitators around the world. We look forward to the continued growth of the program and the benefits it brings to the wildlife rehabilitators as well as the animals with which they work so hard to return to the wild.

Treasury Notes

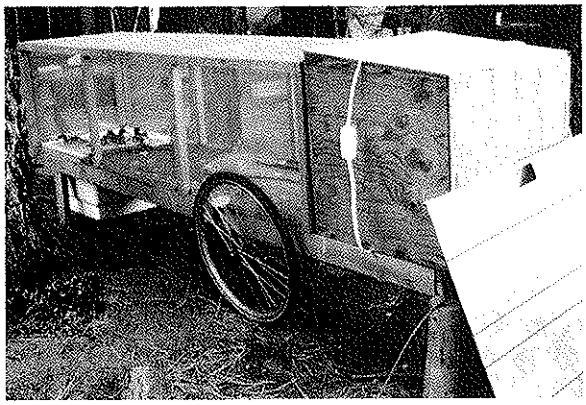
Jan White, Executive Director

Last year was a year of many changes for IWRC. No longer small enough to do things by hand, we continued to computerize our programs and for the first time, our accounting books. We had no idea what we were getting into! We bought a program that would allow us to switch from cash accounting to accrual (which is more accurate). This program will eventually let us computerize all sales and inventory, that is, if we can ever get to where we understand and master the program.

We have a tutor who has been making office calls and assisting us in our modernizing efforts--but we are still posting the last half of 1993. Hence, in this annual report the balance sheet shown is for the first half of 1993 (cash basis). We plan to get the members a balance sheet for the entire year by the next printing of the journal/newsletter in April. Meanwhile, we have been posting the 1994 deposits/expenses so once we have caught up, we will stay that way.

In 1993 we increased our income while holding the line on expenses and consequently met our goal of developing a solid savings program. By the end of the year we were investigating getting a T-bill--a first for IWRC! We think 1994 will be a good year as our membership and programs continue to grow.

American Birds. New York: Alfred A. Knopf, Inc. p. 195.
TORSEY, L. "Rehabilitation Notes: Handrearing the Orphan Kingfisher." *Wildlife Journal* 12 (1): 9-12.
WHITE, J. 1989. Unpublished data from case files of the International Bird Rescue Research Center (Berkeley, California).



Movable Juvenile Merganser Caging

IWRC Jobline

Senior Wildlife Keeper
Willowbrook Wildlife Haven

Responsibilities include: overseeing the daily care and maintenance of the permanent animal collection and wildlife undergoing rehabilitation at the center; position supervises staff and volunteers; performs other miscellaneous duties.

Requires: Associates level major in Wildlife Science, Animal Science, Biology, Zoology, or related field and two (2) years experience in captive animal management, wildlife rehabilitation or related experience; including one (1) year supervisory experience; or an equivalent combination of training and experience.

Hours: Tuesday—Saturday, 8:00 am - 4:30 pm

Starting Salary: $24,642-$36,962/yr.

Application Period Closes: March 10, 1994 (Call for closing date--it may be extended)

Contact: Carol Addante (708) 790-4900 Fax (708) 790-1071
The Forest Preserve District of Dupage County
P.O. Box 2339
Glen Ellyn, Illinois 60138

A Late Jobline Offer is listed on page 22

Veterinarian
Clinical Instructor Position: Wildlife and Exotic Animal Medicine
Dept. of Clinical Sciences, College of Veterinary Medicine
Cornell University
Ithaca, NY 14853-6401

The Department of Clinical Sciences is offering a non-tenure track clinical position in Wildlife and Exotic Animal Medicine. This is a two-year position, with reappointment in the second year contingent upon performance. The successful candidate will be responsible for instructing first through fourth-year veterinary students, overseeing the native wildlife clinic in the veterinary teaching hospital and participating in the Cornell Raptor Teaching and Research Program. Additionally, some time will be spent assisting staff medicine clinicians with exotic animal cases presented to the hospital. The successful candidate will have the opportunity to participate in ongoing research in wildlife and zoological medicine.

Requires: DVM or equivalent degree and experience in wildlife/exotic animal practice. Preference will be given to candidates with residency training in wildlife and exotic animal medicine.

Application Period Closes: May 31, 1994 or until filled with an anticipated starting date of 8/1/94. Applications should be sent to Dr. Brian Farrow, Chairman at the address listed above.

Additional information can be obtained by calling Dr. George Kollias at (607) 253-3049.

Immunoglobulins and Their Function in Colostrum

Kerrin Grant
Oregon State University, Dept. of Fish & Wildlife
Nash Hall, Room 104
Corvallis, Oregon 97331

ABSTRACT

Colostrum is the first milk produced by a lactating animal. The main function of colostrum is to give the neonate a megadose of immunoglobulins (proteins with antibody activity) which gives the young animal passive immunity against many infections.

Generally, the absorption of antibodies occurs only within the first 48 hours after birth. However, there is some indication that ruminants can continue to absorb antibodies if the colostrum is mixed with the milk.

Colostrum also contains some anti-diarrheal effects if given before the onset of diarrhea. Indirect methods for determining serum immunoglobulin levels in neonates include using of refractometer, or conducting one of the following tests, using a serum sample from the animal: zinc sulfate turbidity, sodium sulfite precipitation or 1-0% gluteraldehyde coagulation test. A device called, a "colostrometer" can be used to determine the amount of immunoglobulins present in a colostrum sample.

INTRODUCTION

Many wildlife rehabilitators find themselves with newborn mammals to care for. If colostrum is available, it may be given to the animal, sometimes indiscriminately.

What is colostrum, what is in it, and why do we use it? This article will hopefully clear up some of those questions and provide information that will help the rehabber make informed decisions as to when and why to use it.

Presence and Function of Immunoglobulins in Colostrum

Colostrum, the first milk produced by the lactating female mammal, is secreted upon delivery of the newborn. Colostrum contains an increased amount of milk proteins, especially albumin and globulins (whey proteins), milk fat and high levels of vitamins A, E, carotene and riboflavin. The level of lactose (milk sugar), vitamin D and iron are lower than that found in the natural milk (Ruckebusch et al. 1991).

Figure 1: Composition of Colostrum in Domestic Mammals (g/L)

Constituent	Cow[1]	Ewe[1]	Goat[1]	Mare[1]	Sow[1]	WT Deer[3]	Rabbit[2]
Ash	10	10	9	6	6	15	15
Lactose	22	22	34	47	24	38	15
Lipids	51	177	82	24	72	80	150
Protein	176	201	57	72	188	88	140
Water	733	588	812	851	698	779	680

Colostrum contains lymphocytes and monocytes and has a high titer of gammaglobulins. This gives the newborn passive immunity to a variety of bacterial, viral, fungal and protozoan infections until the young animal's own active immunity is in place. Most mammals, including ruminants, monogastric herbivores and carnivores are dependent on colostrum for receiving antibodies from the mother (Allen, 1989).[4]

While some animals such as dogs, cats and primates deliver antibodies to the fetus transplacentally in addition to transmammarily, most species do not. Most herbivores and some omnivores, such as pigs, have very little transference of antibodies across the placenta. For this reason, the ingestion of colostrum shortly after birth is of paramount importance for protection against microorganisms the neonate will soon face. In these animals, the level of IgG in the colostrum is particularly high. Substantial amounts of IgA and IgM are also present (Blackburn, 1989).[5]

Antibodies to specific pathogens are also present in the colostrum, giving passive immunity to the newborn. However, these antibodies are only those for which that the mother has active immunity. In rehabilitation centers, it is common to give colostrum from a domestic species to the wild species, for example, cow or sheep colostrum to newborn fawns. It is important for the rehabber to give colostrum from a species that has the appropriate antibodies. Sheep colostrum given to a newborn raccoon will not offer the raccoon the proper antibodies.

Since dogs are vaccinated and have immunity to diseases such as distemper and leptospirosis (which the raccoon is also susceptible to) colostrum from a dog would be more appropriate to give.

During the first 24-48 hours of life, there is little proteolytic activity in the gut. Protease suppression causes a delay in the production of stomach acid and enzyme inhibitors such as trypsin. Trypsin inhibitors prevent immunoglobulin proteins from being digested. This delay allows the immunoglobulins in the colostrum to pass intact to the ileum where they can be absorbed by pinocytosis (Ruckebusch, et al., 1991).

Colostrum and Passive Immunity

Absorption of immunoglobulins in the intestine is at its peak shortly after birth and decreases until there is little or no absorption by 48 hours of age. By that time, prenatal epithelial cells that allow absorption are replaced by cells with limited absorption capacity (gut closure). However, after immunoglobulins are absorbed by the newborn through colostrum, the antibodies will enter the bloodstream. Plasma IgG levels in the newborn will persist for several weeks, giving

Figure 2: Immunoglobulin Concentration in Colostrum and Plasma

COLOSTRUM	IgA (mg/dL)	IgE (mg/dL)	IgG (mg/dL)	IgM (mg/dL)
Dog	5-22	———	1-3	0.1-0.6
Cow	1-7	———	34-39	3-13
Sheep	1-7	———	8-13	7-12
Horse	5-15	———	15-50	1-3.5
Pig	9-11	———	30-70	3-32
PLASMA				
Dog	0.2-1.2	0.2-0.4	5-17	0.7-2.7
Cow	0.1-0.5	———	17-27	2.5-4.0
Sheep	0.1-0.5	———	17-20	1.5-2.5
Horse	0.6-3.5	———	5-20	0.8-2.0
Pig	0.5-5.0	———	17-29	1-5

From: Physiology of Small and Large Animals, Ruckebusch,et al.

the animal passive immunity to many infections. Some IgA, absorbed through the colostrum, will also give protection from infections, especially pathogenic bacteria and viruses of the mucosa. The IgA is protected from digestion by the secretory component which aids in passing the IgA dimer across membranes. Lymphocytes absorbed from colostrum give cell mediated immunity to the animal.

IgA, along with IgG, also gives some protection against the onset of severe diarrhea in newborn animals, commonly called "scours." Circulating immunoglobulins don't prevent diarrhea because they don't reach the lumen of the intestine. However, high levels of serum IgA coats the intestine of the neonate which protects the mucosal surfaces of the gut from pathogenic microbial invasion. This protection may reduce the severity of diarrhea and accompanying fluid/electrolyte loss(Frobisher et al, 1974).

Immunoglobulins in colostrum are important in preventing bacterial septicemia and diarrhea, but have little effect once an infection has become established. This protection against diarrhea is one reason why rehabbers traditionally give wild ungulates and lagomorphs colostrum, even after it is unlikely the animal will be able to absorb the antibodies.

Ruckebusch reported that drugs that are not normally absorbed from the gut would also be absorbed more readily during the first 48 hours of life. The ability of immunoglobulins to pass intact through the digestive system also allows the artificial antibodies found in drugs to pass through intact. Thus, drugs have the ability to cause systemic damage because of increased absorption during this time (Ruckebusch, 1991). Drugs that would fall into this category include: sulfonamides, neomycin, streptomycin, carbenicillin and nitrofurans. Antimicrobial drugs will also perturb the intestinal microflora significantly. Many rehabbers have been able to successfully counteract this problem by giving additional amounts of *Lactobacillus* spp. in the milk formula. If possible, synthetic antibiotics should not be given during the first 48 hours of the animal's life, until gut closure occurs.

Normally, if oral antibiotics are given to a ruminant, they will enter the rumen, which prevents full absorption. Injected antibiotics are not affected by this. Allen, however, reported that antibiotics mixed with milk will be fully absorbed because the milk bypasses the rumen and goes directly to the abomasum (Allen, 1989).When milk is suckled, either from the teat or by bottle nipple, a reflex is stimulated which closes the esophageal groove. Like closing off a set of train tracks at a terminal to direct a train in a certain direction, the esophageal groove closes off the path to the rumen. The milk goes directly to the abomasum and then to the small intestine for absorption. According to Allen, if antibodies (either natural or synthetic) are mixed with the milk, they will also go to the abomasum and to the small intestine for absorption. Although there have been no studies to date to prove this, a hypothesis could be proposed that antibodies from colostrum could also be absorbed if the colostrum is mixed with the milk, and the milk is suckled by the animal, rather than bucket-fed.

Brambell, however, indicated that colostral immunoglobulins are absorbed entirely in the small intestine, and not from the abomasum or large intestine. Absorption is the most efficient in the jejunum and ileum (Brambell,1970). If this theory is correct, immunoglobulins would not be absorbed if mixed with milk after gut closure.

Gut closure, the time when prenatal epithelial cells have been replaced by non-absorptive adult cells, occurs at different times, depending on the immunoglobulin class. IgG, the main class of antibodies responsible for secondary immune responses, can be absorbed for the longest period of time. Reports have indicated 27 hours as the outside limit for absorption in calves (Morrow, 1986]. IgA can be absorbed during only the first 22 hours and IgM only within 16 hours of birth. In consequence, if a newborn doesn't nurse until 12 hours of age, it will receive adequate levels of IgG and IgA but only minimal amounts of IgM. IgM is part of the primary immune response against infection.

Colostrum Foal Study

A study using newborn foals was conducted to determine any added benefits to giving additional amounts of immunoglobulin-packed colostrum showed some interesting results (Ruckebusch et al. 1991).

Group #1 consisted of several foals that had been deprived of colostrum since birth. These animals ultimately lacked immunoglobulins (from passive immunity) until day 14. At that time, they were able to produce their own antibodies through active immunity. From ages 14-56 days, their immunoglobulin titer was low compared to the other groups, but eventually reached the normal level for that species. (See Figure 3). Group #2 was a control group. The foals received colostrum soon after birth. From birth to 12 hours of age, the immunoglobulin titer rose until it peaked at 12 hours. The titer then dropped slightly and leveled off through the study period of 112 days (16 weeks).

Group #3 was given additional amounts of colostrum within a few hours of birth. The reason for this was to determine if the amount of colostrum determined the antibody titer, and if so, how long the benefits would last. Within the first 24 hours, the titer increased and hit a higher peak than the control group. As expected, there was a slight drop in the level of plasma gamma--globulins, but the level was significantly higher than the control group during the first four days. It then leveled off and remained only slightly higher than the control group during the remaining study period (Ruckebusch, 1991).

The results of this study indicate that additional colostrum does allow for more immunoglobulin absorption. The level was significantly higher during the first four days, which gives additional protection against infections. The amount of time the additional immunoglobulins were beneficial indicated the effects were not long lasting. Though the titer was higher than the control group it was only slightly higher after the first four days. The added benefits of a slightly higher titer are unknown. However, even a small amount of added protection from infection may make a difference in wild species that are stressed from abruptly being taken from the natural mother, put into captivity and given artificial formulas. In addition, it is this author's opinion that giving additional colostrum, either within the first few days, or mixed in the milk for the first few days of captivity (irrespective of age) will have some beneficial protection from infection since some antibodies are naturally transferred from mother to young in the milk as well as the colostrum (Lascelles, 1977).

Since this foal study did not include animals that had received multiple doses of colostrum, nor colostrum after the first 24 hours, information on extended benefits after gut closure is unknown.

Colostrum and Passive Immunity

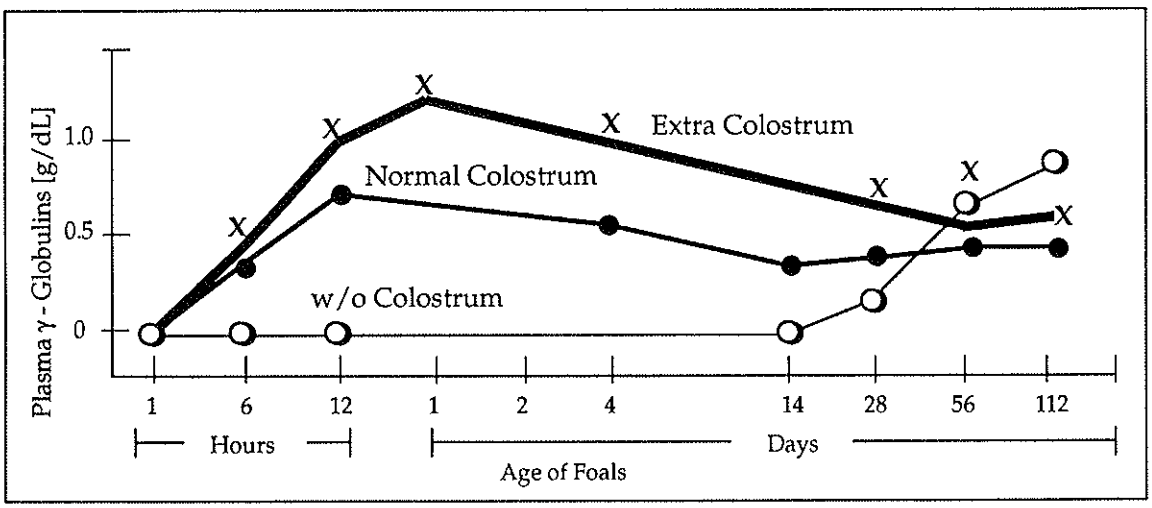
The composition of colostrum has been reported as the source of passive immunity in the neonate. The protein concentration of colostrum shortly after birth is generally two to three times higher than that found in the plasma concentration. Immunoglobulins constitute 50-60% of the total protein in colostrum (Robbins, et al 1987). The concentration of gamma-globulins is highest in colostrum, second highest in serum and lowest in milk (Ruckebusch, 1991).

Blackburn and Hayssen noted structural and functional links between the components of milk and the antimicrobial secretions of other integument-derived glands, especially between alphalactalbumin and the enzyme lysozyme (Blackburn and Hayssen, 1989).

Lysozyme is a bactericidal enzyme that destroys Gram negative bacteria by lysing the mucopolysaccharide cell walls, especially in the small intestine. Lysozyme may also help protect the mammary gland from bacterial infections, since milk bas bactericidal properties as well.

Milk production doesn't occur until synthesis of alpha-lactalbumin is triggered, near the end of pregnancy. Alpha-lactalbumin in the mammary gland allows lactose synthesis to occur as well (Blackburn and Hayssen, 1989).

Figure 3: Comparison of Gamma-globulin Titers Based on the Amount of Colostrum Fed to Newborn Foals.



Lysozyme is only one of the inhibitors in milk. Others include:

1. lactoferrin - iron binding protein
2. immunoglobulins
3. peroxidase generates inhibitory metabolites
4. transferrin present in rabbits instead of lactoferrin)
5. fatty acids increases acidity

Milk plays a central role in protecting the mucosal surfaces and establishes the gastrointestinal flora of the offspring, partly because of the bactericidal and microbicidal properties.

"Lactogenesis" refers to the onset of milk secretions, including colostrum. Lactogenesis has two stages. Stage I initiates "precolostrum" during pregnancy. Stage II occurs shortly before parturition, when copious amounts of colostrum are produced. Hormones (estrogen and progesterone) inhibit stage II lactogenesis until birth of the young (Brambell, 1970).

During pregnancy, the epithelial alveolar cells start to secrete large amounts of milk products which accumulate in the mammary glands as pre-colostrum. This substance contains large molecules such as immunoglobulins. It also contains fluctuating levels of chloride, sodium, potassium and lactose. Fat globules, protein, epithelial cells and leukocytes accumulate in the lumen of the alveoli at this time. In ruminants, stage I and pre-colostrum occurs at midgestation (as reported in goats) and during the last third of pregnancy in monogastric herbivores (rabbits) (Ruckebusch et al. 1991).

The milk proteins synthesized and secreted during lactogenesis by alveolar cells of the mammary glands are:

1. casein - main milk protein
2. serum albumin
3. alpha-lactalbumin
4. beta-lactoglobulin
5. immunoglobulins
6. glycoproteins

(2–6: whey proteins)

Proteins in the milk serve as the source of amino acids for the neonate, and provide 15-30% of the milk energy, depending on the species. Most milk proteins are synthesized from amino acid precursors, but some of the whey proteins are derived from proteins of the blood. Immunoglobulins constitute 85-90% of the total colostral whey protein (Brambell, 1970).

The major rabbit whey proteins consist of secretory IgA (sIgA), alpha-lactalbumin and transferrin, an iron-binding protein. All of these proteins are synthesized by the mammary epithelial cells. IgG and serum albumin are also produced and are derived from the bloodstream. The IgA dimer is produced by local plasma cells in the mammary gland (Dayal, et al. 1982).

Transferrin, the iron-binding protein of rabbit milk is structurally and antigenically identical to serum transferrin, a gene product of the liver (Dayal et al. 1982). In the rabbit, both the liver and the mammary gland secretes transferrin. The iron-binding milk protein in most other mammals is called "lactoferrin" which is structurally and antigenically different from serum transferrin. Lactoferrin is not present in rabbit milk. Transferrin does not assist the transfer of iron from maternal serum to the milk, nor does it affect iron absorption in the nursing kits. Transferrin does, however, have bacteriostatic properties against intestinal microorganisms. Lactoferrin also has these bacteriostatic properties (Jordan, Morgan 1970).

Rabbit milk transferrin also provides protection against bacterial infections of the mammary glands. This function may be especially important in the rabbit because of the infrequent feedings. Rabbits generally only feed their young once every 24 hours. This can cause an increased susceptibility for bacterial infections in the mammary gland because large amounts of milk accumulate in the nipples between feedings (Jordan, Morgan, 1970).

During stage II lactogenesis, large amounts of colostrum are produced and secreted through the mammary glands of all mammals. After three days at this stage, the composition of the colostrum changes as it gradually becomes milk.

Composition Changes in Milk Over Time

The composition of milk varies greatly between species. In general, the milk of carnivores is high in protein and low in carbohydrates. The milk of herbivores is comparatively low in protein and high in carbohydrates. When milk production declines (moves towards weaning) the concentration of proteins, fats and sodium steadily increases. Lactose and potassium decrease during lactogenesis. Milk is iso-osmotic to plasma with a pH of 6.8 (Ruckebusch, et al.1991).

The feeding of colostrum causes a condition in the newborn called "proteinuria", which refers to an excess of protein excreted in the urine. This condition occurs after the first ingestion of

colostrum and subsides by three days of age. The time of appearance and the quantity of protein directly relates to the time and amount of colostrum fed (Brambell, 1970). According to Brambell, alpha-lactoglobulin is the principle protein in the urine. Proteinuria subsides in the normal animal as colostral proteins of small molecular weight no longer enter the circulation from the gut (from gut closure).

"Lipogenesis" refers to the anabolic cellular process that synthesizes milk fats. When energy stores are needed by the animal, the fats are broken down by hydrolysis to fatty acids and glycerol. The regulation of fat anabolism and catabolism depends on the animal's needs. It is accomplished through hormonal activity related to the state of carbohydrate metabolism in the animal.

In the non-ruminant animal, insulin (protein hormone) indirectly promotes the formation of milk fat from carbohydrates. It speeds the entry of carbohydrates into cells where lipogenesis takes place. Insulin also stimulates proliferation of epithelial cells in the mammary glands. Cortisone, corticosterone and deoxycorticosterone can inhibit lipogenesis (Frandson, 1981). The action of insulin is related to the cellular uptake and breakdown of glucose rather than the synthesis of fat. Non-ruminants utilize glucose by glycolysis in lipogenesis, whereas ruminants do not. Because of that, insulin, as well as cortisone have little effect on lipogenesis in the ruminant mammary gland (Frandson, 1981).

Carbohydrates make up between 1-18% of milk energy in most mammal milks. Milk carbohydrates also play a role in drawing water into milk by osmosis. If lactose secretion is inhibited, water secretion is also inhibited (Blackburn, Hayssen, 1989). Lactose also promotes calcium absorption from the gut of the suckling mammal. These carbohydrates may have the capacity to determine the flora of the digestive tract in the young animal (Blackburn and Hayssen, 1989).

Fat content of the milk varies from trace amounts (in carnivores) to 500g/L in which furnishes over 75% of the total milk calories. Milk lipids contain mainly triglycerides, synthesized from fatty acids in the mammary gland (Frandson, 1981).

Methods for Determining Serum Immunoglobulin Levels

1. Direct measurement
   a. Paper electrophoresis
2. Indirect Measurement
   a. refractometer
   b. zinc sulfate turbidity test
   c. sodium sulfite precipitation test
   d. gluteraldehyde coagulation test

The refractometer gives a direct linear correlation between the serum's refractive index and the immunoglobulin concentration. Hemoconcentration (increased concentration of formed elements) of the sample will give artificially high values. In a good sample, values of 6.0g/dL or higher indicate adequate absorption of immunoglobulins (in properly hydrated animals) (Morrow, 1986).

The zinc sulfate turbidity test estimates immunoglobulin concentration by precipitation levels. Units of 0-20 are used for the values, which are somewhat subjective. The degree of turbidity of the sample is proportional to the immunoglobulin concentration. Hemolyzed samples, hemoconcentration and plasma samples give artificially high readings (Morrow, 1986).

The sodium sulfite precipitation test is similar to the zinc sulfate test in procedure. However, the use of sodium instead of zinc allows hemolyzed serum to be used with accurate results.

The 10% gluteraldehyde coagulation test is one that can be used in the field to diagnose colostrum-deprived neonates. A small amount of serum is mixed into the 10% gluteraldehyde. The presence of a coagulation reaction and the degree of coagulation determines the level of immunoglobulin concentration (O'Rourke and Satterfield, 1981). Values of 600mg/dL or higher indicate adequate immunoglobulin concentrations. Values of 400 mg/dl or lower indicate colostrum-deprived animals. Values in between 400-600mg/dL are inconclusive, which is a drawback to the 10% gluteraldehyde test, especially with wild species (O'Rourke and Satterfield, 1981).

Immunoglobulin content of colostrum samples can be measured with a device called a "colostrometer." This device is a hydrometer that measures the specific gravity of colostrum. The specific gravity of the colostrum correlates to the amount of immunoglobulins in the sample. Values of 1.046 indicate an adequate level of immunoglobulins in the sample (Morrow, 1986). A study by Parkinson et al. (1982) on Mule Deer fawns indicatethat all fawns with serum protein concentrations of less than or equal to 5.0 g/dl died. Fawns with concentrations of over 5.2 g/dl survived (except one), so values of 5.2 g/dl should be used as the minimum acceptable Ig value in deer.

Use of Colostrum in Wildlife Rehabilitation

For the wildlife rehabilitator, colostrum can be a useful tool with some species. Colostrum

has been traditionally given to newborn fawns. Colostrum from cows, sheep or goats vaccinated against *E. Coli* and/or *Costridium perfringens* Type D will provide essential antibody immunity to fawns, rabbits, squirrels and other rodents. Colostrum can be given not only to the neonate, but also to infantsduring the first few days after intake at the rehabilitation center. It is unlikely the animal will benefit specifically from the antibodies, but rather, will benefit from the "coating" properties of the colostrum on the intestinal lining. This coating may reduce the onset of diarrhea associated with changes in diet and stress-related bacterial infections.

Colostrum can be obtained from livestock owners. It must be taken from the mother within a few hours post partum to prevent chemical breakdown and loss of antibody properties. The colostrum should then be frozen immediately thereafter to prevent chemical breakdown and loss of antibody properties. Ice cube trays are a handy way to package and freeze the colostrum. One cube (1"x2"x1 1/2") is equivalent to ~25 ml. It can be thawed and added to the milk formula each day and given for two to three days. Fawns at three days old at intake can be given 25-50 mo per feeding for 2-3 days then reduce the dosage in half for 1-2 days. Rabbits and squirrels can be given 1-2 ml per feeding to prevent diarrhea.

Colostrum cubes should be used within one year. Discard any unused portions to prevent unwanted bacterial growth or significant loss of antibodies.

Conclusion

Immunoglobulins present in colostrum provide essential passive immunity against disease for mammals. It is essential that newborn ruminants, such as fawns, receive colostrum within the first 12-24 hours after bird if they are to have a decent chance for survival. May wildlife care organizations receive fawns that are 3-5 days old. Because of the increased stress of captivity and change in diet, the addition of colostrum to the mail may reduce the onset of diarrhea and associated bacterial infections. Mixed with milk and fed by bottle may allow for some antibody absorption. However, the animal must suckle from a bottle for the antibodies to reach the abomasum.

In addition to its use in ruminants, colostrum may have some anti-diarrheal benefits in rabbits and squirrels. Cow colostrum has *E. coli* antibodies in it (if the cow was vaccinated while pregnant). *E. coli* is one of the major pathogens in enteritis-related deaths in rabbits. While no definitive studies have examined colostral benefits to rabbits, anecdotal evidence suggests colostrum added to the recommended milk formula may reduce the onset of some forms of diarrhea in this species. It should be noted, however, that adding colostrum to the diet *after* the onset of diarrhea will have little, or no beneficial effect. Colostrum may act as a preventative measure, but does ***not*** act as a cure.

GLOSSARY

DIMER-a compound formed by a combination of two identical molecules.

IMMUNITY - non-susceptibility to pathogenic effects of foreign microorganisms.

a. cell-mediated - localized reactions to intracellular pathogensmediated by T-lymphocytes and phagocytes rather than antibodies.

b. active immunity- occurs as a result of an animal's ability to develop antibodies to pathogens after exposure.

c. passive - temporary protection against pathogens. Mediated through passive transfer from mother to young either through placenta or mammary gland (milk/colostrum).

IMMUNOGLOBULINS glycoproteins with antibody activity. Synthesized by lymphocytes and plasma cells.
Immunoglobulin + antigen → antibody
Five distinct classes of immunoglobulins in mammals distinguished by size, charge, amino acid composition and carbohydrate content.

1. IgM -confined to intravascular pool. Major antibody in primary immune response to antigenically complex pathogens.
2. IgG -found in intravascular and extravascular pools. Major antibody in secondary immune response and exclusive antitoxin class.
3. IgA - predominant antibody in seromucous secretions such as saliva, colostrum, milk, tracheobronchial/genitourinary secretions.
4. IgE - found on surface membranes of basophils and mast cells. Plays a role in active immunity against helminth parasite infections and hypersensitivity diseases (asthma, allergies).
5. IgD -found on membrane of circulating B lymphocytes and plays a role in antigen-triggered lymphocyte differentiation.

LYMPHOCYTES - mononuclear leukocytes (white blood cells). Product of lymphoid tissue

which participates in immunity.

MONOCYTES - mononuclear phagocytic leukocytes that develop into macrophages (phagocytic cells activated by inflammation).

ABOMASUM - true stomach of the ruminant.

ESOPHAGEAL GROOVE - extends from cardia to the omasum in ruminants. Formed by two heavy muscular folds which can close to direct material from the esophagus to the abomasum or open to allow material to enter rumen.

PROTEOLYIC - splitting peptide bonds of proteins into smaller polypeptides by hydrolysis.

PROTEASE - any proteolytic enzyme

PINOCYTOSIS - mechanism where cells ingest extracellular fluid.

MUCOPOLYSACCHARIDE - group of polysaccharides which, when dispersed in water, form constituents of mucus.

HEMOLYZE - process where hemoglobin is separated from red blood cells.

HYDROMETER - instrument for measuring specific gravity of a fluid.

Footnotes:

1. *From Ruckebush et al., 1991.*
2. *From Cheeke, 1987.*
3. *From Silver, M., 1977.*
4. *Study conducted on cattle, sheep, goats, pigs, horses and dogs.*
5. *For more information on general immunological concepts, consult Lascelles, 1977.*

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Book Review

Raptor Biomedicine

Patrick T. Redig, John E. Cooper, J. David Remple, and D. Bruce Hunter, Editors,
University of Minnesota Press,
Minneapolis, Minnesota 55455-3092
1993 265 pages
(ISBN 0-8166-2219-1) Price—$39.95

With a list of authors, editors and reviewers that reads like a Who's Who list of Eastern U.S. and European raptor biologists, raptor rehabilitators and avian veterinarians, one would expect this book to be extraordinary. We are not disappointed. The use of the word BIOMEDICINE in the title announces the intent of the authors to embrace the multidisciplinary concept throughout the book as it applies to raptors and raptor medicine. The result is a book that is not purely a medical text, not purely a biographic sketch but instead a welcome combination that strives to combine all aspects. It succeeds in giving us a well rounded representation of raptors.

Dr.Cooper dedicates an entire chapter to *...The Need For Closer Collaboration between Biologists and Veterinarians in Research on Raptors.* A concept frequently thought in the raptor world but rarely or so aptly stated. It is a chapter not to be missed by anyone. Read and believe! Dr. Cooper discusses the need for each field and gives examples of how each complements the other. Dr. Cooper writes, "The veterinarian and the biologist (or rehabilitator) have much to offer each other, and through their cooperation, synergism may result." Simply put, we all have something valuable to contribute. We can all learn from each other! By cooperating and collaborating we enhance our efforts and our success. AMEN!

Dr. Redig includes a chapter following the history of raptor biomedicine. This chapter provides an excellent thumbnail sketch of raptors taking us on a journey beginning over a thousand years ago in Persia. We are introduced to the first references for medical treatments as well as the reasons avian and especially raptor medicine developed. The decline of several raptor species and the change in human attitude towards the winged predators is discussed as is the legislation enacted to protect them. We are given an up close and personal view of research begun to better understand raptors, and the success of that research as it is applied to managing both captive and wild free-living raptors. Clear and concise, the rehabilitator will find this chapter helpful in gathering information for educational programs as well as to broaden your own understanding of raptors and their history.

The book itself is a refereed collection of papers presented in 1988 at the Second International Symposium on Biomedical Research in Raptors. During the review process the papers were updated to include the most recent information available. Therefore the book reflects information current to 1992 not the 1988 date of the symposium. The forty-one chapters include papers reflecting areas of concern when dealing with raptors. Sections covered are pathology and microbiology, surgery and anesthesia, medicine and therapeutics, and environmental toxicity. While most subjects are advanced concepts meant for the veterinarian such as surgical procedures and anesthesia, others are valuable to the biologist or rehabilitator. Chapters on flight conditioning, soft wound management, physical therapy and appetite stimulation are but of a few of the topics pertinent to the rehabilitator. The chapters are well written and clear in description. Diagrams, tables and descriptive photos are included where helpful to strengthen understanding.

One important element of *Raptor Biomedicine* is the excellent indexing and cross-indexing. So often this part of the editing job is overlooked. It is however especially Important when the book will be used by people with different backgrounds. Try as I might, I couldn't "wander aimlessly", each index search rewarded me with a reference. It is my experience that a book, no

matter how good the information must also be well edited to be of maximum value to the reader particularly when it will serve as a reference book. Another thoughtful addition is a list of abbreviations used in the papers. Once again the approach being that of being clear to all readers no matter what raptor discipline they hail from.

Who would benefit from reading this book? Dr. Redig senior editor, says it best himself.

> "Anyone involved in the study or maintenance of raptors, whether in the wild or in captivity, requires the information compiled here. Veterinarians will benefit because of the information that is directly applicable to health care delivery. Similarly, falconers and managers of captive birds will gain useful information that will promote their understanding and practice of preventive medicine, as well as an appreciation of the knowledge base from which veterinarians operate when presented with medical problems. Field biologists and rehabilitators will acquire useful perspectives not only on clinical materials, but also on disease and environmental factors that determine survival of casualty birds and determine survival of casualty birds and influence population dynamics of wild raptors."

I agree wholeheartedly! This book was a while in coming, but has proven itself worth the wait.

—Marge Gibson—

Editor's Note: IWRC has made arrangements with the publisher to make this book available to our members. See our literature for ordering information.

Editorial Continued from page 2

Research in Wildlife Rehabilitation

to begin at their leisure, picking and choosing which species they will allow to be rehabilitated and returned to the wild. The emphasis is going in the direction of making wildlife organizations carry out the prejudices of many "old timers" with or without the benefit of science to defend or destroy the myths. In California, we will be required very soon to band or tag all raptors and mammals with state-provided markers. When some of them get into trouble, and we know that some of them will, the battle will reach new heights. We have a problem. We do not know which methods work the best and therefore have little to recommend to our peers. However, we will ***all get blamed*** and the animals will pay the ultimate price for any mistakes that are made.

Now is the time for all of us to get together and support both intellectually and financially appropriately planned unbiased post-release studies to learn the results of our efforts. By the way, what happens in California, usually is used by other state regulatory agencies as a model. I will be sharing with our Board of Directors my concerns for an increased emphasis on research at our budget hearings in June. This is an issue that you will hear more about soon.

-Jan White, DVM-

Late Jobline Entry

Wildlife Clinic Supervisor Position Volunteers for Wildlife

Responsibilities: to manage the operation of the wildlife clinic. Responsible for overseeing a group of trained wildlife care volunteers involved in the treatment and rehabilitation of injured wildlife. Responsible for coordination of release of recovered wildlife.

Requires: A minimum of a BS degree in animal sciences, natural resources or wildlife management. Strong academic credentials in one or more of the following: Ornithology, Biology, Zoology, Nursing, Veterinary or Natural Sciences. At least two years prior work experience at a licensed wildlife rehabilitation facility necessary. Excellent communication, teaching and interpersonal skills required. Candidate must be well organized and able to manage numbers of people.

Salary: Based on experience and benefits.

Application Period Closes: June 1, 1994.

Contact: Executive Director
Volunteers for Wildlife
27 Lloyd Harbor Rd.
Huntington, NY 11743

International Wildlife Rehabilitation Council
4437 Central Place, Suite B-4
Suisun, CA 94585

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Wildlife rehabilitation can be challenging or frustrating depending upon how quickly you find answers to those first-time problems. When you are faced with a new situation or looking for a new solution to a recurring problem, avoid that feeling of hopelessness or isolation and give us a call. The Wildlife Hotline is designed to help *wildlife rehabilitators* by connecting you to an expert who can give you the answers you need. IWRC office personnel staff the hotline and make referrals to any number of specialists in our diverse field. So if you are stumped or just want a second opinion from someone who's been there—give us a call and we will try to help. Calls should be placed during business hours (PST) for the fastest response, however, the answering machine will take messages at any hour of the day.

To use the hotline: call (707) 864-1762; leave a message detailing your question, problem or what specific information you need. The Wildlife Hotline will return your call COLLECT with the help you need.

Photo by Jan White, DVM