REHABILITATION WILDLIFE COUNCIL

WILDLIFE JOURNAL

Journal of the Wildlife Rehabilitation Council Winter 1983



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The following is a guideline for articles to be submitted to the WRC Journal. All manuscripts submitted to the Journal are subject to review and revision by our editors.

1. Submissions should be typed and double-spaced, with 1 inch margins.
2. Full length articles run between 1500 and 2500 words.
3. Fillers and short articles run between 500 and 1500 words.
4. The writer's name and address and organization should be typed on the first page, and name and page number should appear on all consecutive pages.
5. It is the writer's obligation to obtain permission or reprint rights if submitted copy has been published elsewhere.
6. Provide a stamped, self-addressed envelope if you wish manuscript and/or photos returned.
7. We accept black and white glossy photos only, preferably 8 × 10.
8. We pay $25 for any feature article accepted; $5 for any fillers and "Handy Hints" under 500 words.

Articles should be mailed to: Editor, WRC Journal, P.O. Box 3007, Walnut Creek, California 94598.

REHABILITATION WILDLIFE COUNCIL

WILDLIFE JOURNAL

Vol. 6, No. 4 Winter 1983

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* This article is available as a reprint.

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EDITORIAL. . .

New Directions

At the close of the year my mind begins the tedious process of reviewing the year's accomplishments and failures in an attempt to organize a plan of action for the coming year. We at WRC feel there has not been enough time to do all of the things we wanted for our members, yet in retrospect, much has been done.

We have continued our efforts to make the *Wildlife Journal* professional with accurate and helpful information on wildlife rehabilitation. To our amazement, we have had space problems (i.e., too much material submitted) for the first time in our history. That is not to say we don't need more articles submitted and we do encourage all experienced rehabers to share their knowledge. We feel that it is a duty to share information. Additionally, it is nice to see your name in print and know that others and their creatures will benefit from your experience and efforts to share it.

We sent a contingent of Board Members to the newly formed National Wildlife Rehabilitators Association (NWRA) symposium in March of 1983, knowing we would be received with some apprehension by those who believed we were either a competing organization or represented California only. WRC is an international organization which concentrates its efforts on publications regarding wildlife care and helping new and experienced rehabilitators find whatever they need to do their work. The NWRA is a national association of rehabilitators who focus on lobbying for improvements in the field (legislatively, through accreditation, etc.) and inspire individuals to maximal achievements through their achievement awards program. They also gather yearly to share current rehabilitation information at their symposium.

We shared ideas with the NWRA Board and encouraged them in their efforts. We were heard, became better understood, and made many new friends. Each of the two organizations has representatives on the others Board of Directors and have reaped benefits from it. Now we spend our time together looking for ways to help each others efforts without duplication.

We are both working jointly on an accreditation method and hope to have a plan available to centers and organizations recognized by both groups. Work on this project will continue in 1984 and bear fruit soon thereafter.

Several NWRA Board Members have contributed time to write for the *Wildlife Journal* further widening the current body of knowledge. We, in turn, have shared our *Journal* space with them to publicize their programs and events.

Both organizations have annual conferences (see announcements in this issue). Those of us fortunate enough to attend both reap double the benefits of those who manage only to get to one. There is some talk of doing a joint conference together sometime in the future. Onward, the relationship grows, benefiting both memberships.

For sometime, WRC has been working for the upgrading of the permit system in California. This new approach would eliminate the need for a dual state and federal permit system. We understand that the first of these will be issued in December, 1983. WRC, the California Department of Fish and Game, and the U.S. Fish and Wildlife Service all gave input to create a better permit with less red tape, good controls, and reasonable freedom to do our work properly. If it

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Letters To The Editor . . .

Dear WRC:

I respectfully submit a concern I have over the certificate policy voted on at the quarterly WRC Board meeting in October 1983. I was unsure whether a non-board member could speak, so I kept silent.

The Board agreed that individuals must attend all advanced seminar classes to be eligible for a completion certificate. This was not a policy during the last year's offerings. I would like to recommend a separate certificate for each class attended, such as those I received for attending the AALAS rodent, rabbit, and primate workshops. The Board might also consider a small card, similar to those received after successful completion of first aid or CPR, for completion of the oiled bird workshop. This seems to me to be a simple way for an individual to prove he/she is competent to assist during a crisis.

I recently applied for a job at the San Diego Wild Animal Park Veterinary Hospital. The WRC seminars were as professionally taught as those I have attended through AALAS and other professional organizations. Those WRC classes I attended, which were pertinent to this job classification, were listed along with my other continuing education endeavors. Though I have a cancelled check for $50.00, which proves I sent WRC money for something, it does not prove what continuing education that I received. This is my example and I am sure a few other seminar participants would appreciate some form of certification for the same reason.

Sincerely,
Shirley Hayes, AHT
Sacramento Science Center
Sacramento, California

Dear Shirley:

We are glad that you are utilizing our training classes to augment the two-year AHT curriculum you have already completed. The reason the Board voted as it did was to encourage wildlife care personnel to complete the whole series of classes. We are trying to provide a broad range of skills training and are providing incentive for people to take the whole series in our effort to upgrade the training given to supervisors and other key staff in wildlife centers and organizations. We do not wish to penalize anyone who only wishes to complete the seminars they feel they need. Therefore, if you or any other participant need verification, simply let me know and I will write up a statement of verification.

Jan White
Skills Seminar Coordinator

Dear WRC:

Congratulations on your new format and recent articles. They have become very professional and I have recommended that our library at the school of veterinary medicine subscribe to it.

At Purdue University, I am president of an organization for veterinary students who are interested in Exotic Animal Medicine. Once a month I try to have a speaker on wildlife rehabilitation. In addition to our regular meetings, I invite local (actually statewide) rehabers to participate and listen to these. We have had or will have lectures on: Avian Hematology, Avian Orthopedics, Care of the Wild, Emergency Care and Fluid Therapy, Restraint, Diseases, Raptor Handling, and Federal Regulations. If you get rehabers writing to you who are interested in this type of meeting and they are in my area, you are welcome to refer them to me.

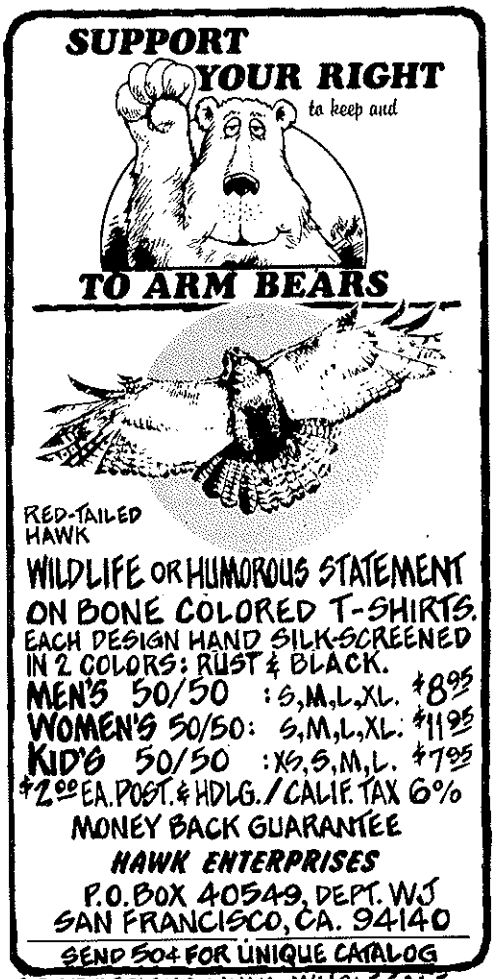
At Purdue, I am presently trying to establish a rehabilitation center at Purdue Veterinary School. Although the clinicians are interested, I am having difficulty convincing the administration to do it. Currently, I am doing all of the rehab work here (excepting orphans which the zoo handles) but lately I have been getting more birds than I can handle.

Our club at Purdue also maintains an extensive reference collection on Exotic and Wildlife Medicine. This is available for use by other interested individuals.

Personally, my main interest is Avian Hematology. I am interested in any blood smears I can get a hold of (unstained) and I will read them and send the results back. I have been doing hematology for 5 years now and I will be speaking at the upcoming Raptor Research Foundation meeting in St. Louis on the use of the complete blood count (CBC) in pre-release evaluation.

Well, that is all for now. Just wanted to let you know what is going on in this area of the country.

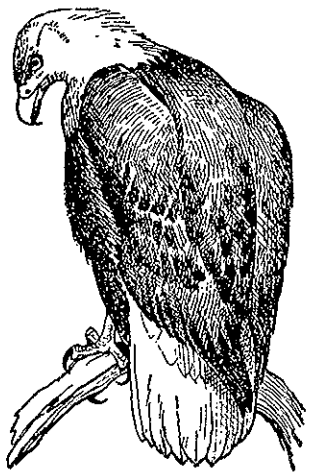
Sincerely,
Nicole Van Der Hayden
1223 N. 28th
Purdue Veterinary School
Lafayette, Indiana 47904



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INFORMATION WANTED ON CALIFORNIA EAGLES—



The California Bald Eagle Working Team, an interagency group that coordinates research and management of eagles, is seeking information from California rehabilitators, rehabilitation centers, and veterinarians to aid a study on mortality factors. The following questions pertain to all Bald and Golden Eagles handled since 1970: 1. Was the bird an adult or immature? 2. Date and location of capture. 3. Name of the person/agency who delivered the bird. 4. Nature of injury. 5. If released, date and location of release. 6. If released, was the bird banded? 7. If dead, name of the person/agency that received the carcass. Send data to: Mr. Phil Detrich, Chairman, California Bald Eagle Working Team, c/o U.S. Forest Service, 2400 Washington Avenue, Redding, California 96001.

WRC Spring Quarterly Meeting

The Spring quarterly meeting will be held on April 14, 1984, at the San Francisco S.P.C.A., 2500 16th Street, San Francisco. From Marin take Hwy 101. Stay on South Van Ness (Hwy 101) to 16th Street and turn left. From Hwy 80 west take the 9th Street exit. Take Harrison to 16th Street and turn left. From the Peninsula take Hwy 101 north exiting at Vermont. Go two blocks and turn left at 16th Street.

The business meeting will begin at 10:00 a.m. followed by the general meeting at noon. The topic of discussion will be announced at the meeting.

(continued from page 1)

works, other states may be interested. Think about it—one permit for both the state and federal governments. We hope that it will move rehabilitation one more small step down the road of a fledgling profession.

A program offered this past year was the Wildlife Hotline. Giving immediate help and referals to rehabilitators from across the country was a dream that was made possible by the dedication of one of our "founding fathers", Gary Bogue. He can be seen here in California carrying around the beeper wherever he goes. People from all over the nation call and the reception from our membership has been very positive. The phone is infinitely faster than the mail and when an animal needs help, you don't always have time to wait for an answer through the mail. We still get loads of letters to respond to and manage to do that with the help of the Corresponding Secretary, Susan Kelly.

Training has been a major goal for WRC. We just completed our first set of Skills Seminars this past year. They are six hour lecture/laboratory training sessions with some of the best instructors in the field. It was a new vision. This year (1983–1984) we are providing certificates of completion for those who complete the series. The offerings will change from year to year, based on the needs in the field. This concept has been well received and workshops of shorter duration providing hands-on supervision are being incorporated into both WRC and NWRA conferences.

Upgrading and standardizing the training available is another important concern for the Council. These seminars are a good first attempt at spreading around "state of the art" information. Further, the hands-on training provides a safety net for people to learn with.

What is up for 1984? More papers as always. We hope to have new ones on hummingbirds of the continental United States, pigeons and doves, and deer. We will have revised versions available on raccoons and opossums. We will be working on our first conference held at a hotel for 1985 which will include workshops, papers, exhibits, and the like. Our latest guidelines for caging, this time on mammals, will be available by early 1984. They will be helpful in the accreditation program.

On a more local level, we are putting together an oil spill contingency plan using the Hotline to mobilize California coastal centers in times of need. Our trained volunteers will assist where needed. Wouldn't it be nice if we weren't!

We are always open and sensitive to the needs of our members when those needs are conveyed to us. Feel free to communicate with the Board. We need your input in order to best serve your needs.

There is something else we need. You and your fellow rehabilitators. All this work is not done by a 15 member board. It is done by people who care and want to get it done. That's you too. Pick something that you have a special interest in and help on the project. We know rehabilitators are very, very busy people. Still it is our duty to share what we have learned so that new people don't have to "reinvent the wheel". Make some time to help with the conference, a wildlife care paper, a Journal article, skills seminar, a quarterly meeting, or some troubling aspect of work that needs to be resolved. WRC is as good as we all make it. It can always increase its potential to serve dependent on the energy put in by the people who care—that's us—all of us.

—Jan White, President

Guidelines of Fundraising for the Wildlife Rehabilitator

Jeffery Lant, Ph.D. and Paul Beaver, Ph.D.

Few rehabilitators like fund raising. It is easy to see why most of us feel distasteful about it. Fund raising, after all, can be intrusive, embarrassing, awkward. But it need not be. Moreover, it is a necessary part of the work of most wildlife rehabilitation organizations.

The first and perhaps greatest problem about fund raising is attitudinal. We don't like it. We'd rather we didn't have to ask. We hope, somehow, the money will simply appear, that a benevolent figure will leave it on the doorstep, along with the disabled wildlife.

Properly understood, however, fund raising is a privilege. It is an act of humanity on the part of good people towards animals which look to us for support.

Fund raising is an activity organized in support of what we consider a high and valuable purpose. If an organization has planned properly, has fully involved its Board of Directors in all aspects of the fund raising process, and has good, solid reasons for raising the funds, no one soliciting on its behalf need at all feel chagrined, ashamed, or anxious about raising money. These feelings are both misplaced and a luxury no wildlife rehabilitation program can afford.

The following eleven points are designed to assist wildlife rehabilitation organizations so that they can feel good about the necessary solicitations they must organize and can approach funders in the independent sector, be they corporate, foundation, or individual, with both enthusiasm and a sense of engaging commitment in their work.

This enthusiasm and commitment are both essential constituents of successful fund raising. You should feel them. First, you are a public servant, contributing to your community as well as your wildlife. Second, you have adopted your fund raising objectives after thoughtful consideration and reviewing the following points. These points are technical. They presuppose, however, that you are appealing to funders in the independent sector honestly and forthrightly, that you are not misrepresenting your organization or project in any way; are not breaking local, state, or federal wildlife laws; are not infringing the rights of any other wildlife rehabilitation organization; are not working against the veterinary and behavioral needs of the animals themselves; and that the final result will not in any way endanger the public.

If this is the case, it is your proud responsibility to raise the money you need. All of us will be better for it, not least the animals themselves to whose welfare we have dedicated ourselves.

Fund raising is properly understood not as a tiresome task we must somehow get through whether we like it or not, but as an essential act of humanity towards both the public and the animals we wish to help. At such times as you despair or lose heart, come back to this statement and read it again. Then carry on with this essential task which must be successfully completed so that the good work of your organization can continue.

ETHICAL AND UTILITARIAN FUND RAISING: ELEVEN CRITICAL POINTS

The following points have been adopted both for their ethical content and utility. Adhered to, they will insure the successful realization of both organizational and fund raising objectives.

I. Obtain Appropriate Tax Exempt Status

To qualify for foundation and corporate donations, all organizations must obtain tax exempt status from the Internal Revenue Service. In most cases this will be category 501(c)(3). Organizations without such status are not eligible for corporate and foundation donations, and individuals who make donations will not be eligible to deduct their contributions. This status must be obtained before any appeal is made to the independent sector.

II. Develop a Broad-Based Board of Directors

All organizations need a diverse and responsible Board of Directors. This Board oversees the development and management of the organization and has specific responsibilities for planning and fund raising. It is recommended that this Board be of at least 15 active members and that it include a lawyer, accountant, local banker, small business representative, a representative of the largest area corporate employer, a foundation representative, and representative from the civic community.

III. Develop a Cogent Mission Statement

It is the responsibility of every organization to set down its goals and purposes for being in a "Mission" Statement". This statement should, in relatively few words, clearly set forth the reasons why the organization should exist and what objectives it exists to accomplish. This statement constitutes the heart of the organization. It needs to be periodically reviewed and updated so as to be current and persuasive and to adequately represent the purposes of the organization. The Board of Directors should oversee the drafting of this statement and should formally approve it. It is therefore the Board's task to insure the realization of the objectives set forth in the Mission Statement.

IV. Institute An Annual Planning Process

An organization's Mission Statement is necessarily broad and general. Each year each organization must implement a Board planning process designed to produce specific objectives to be realized during the course of the next fiscal year. It is the responsibility

of the Board of Directors both to oversee this planning process and to organize it in such a way that the objectives are both specific and can be realized by the organization. They must be challenging, but they must not be either overly ambitious or unrealistic.

For some of these planning objectives, the organization will have regular, secure sources of income. For some, it will have to raise the necessary funds from corporations, foundations, and private individuals. It is the responsibility of the Board to insure that the sums to be raised from the independent sector are realistic, that is to say that consideration has been given to just where these funds will come from and how realistic it is to expect that they will be forthcoming from designated sources. It is the task of the Board's planning process to insure this kind of realistic assessment.

V. Obtain the Financial Support of the Board

Each Board member should make a financial contribution to the organization every year. An extraordinary contribution should be made at such time as the organization embarks on a Capital Fund Raising Campaign. This is one of the responsibilities of Board membership.

Once the Board has completed the planning process and set a fund raising goal, it is the responsibility of the Chairman of the Board or his designee to gather the explicit financial support of each member. Each member of the Board should contribute or pledge a contribution before any approach is made to any possible funders beyond the organization. No organization should contemplate requesting these external funding sources to contribute to its support without a financial commitment from the full Board.

VI. Begin to Accummulate an Endowment

No matter how small an organization, it is the responsibility of the Board of Directors to begin to accummulate endowment funds for long-term stability and prosperity. Endowment will allow for the organization's and animals' security from financial setbacks, illness or the untimely death of the rehabilitator. Each year an organization should raise funds equal in value to no less than 3% of its operating budget and set them aside in a capital account. The amount designated to be so set aside should be added to any annual fund raising objective.

VII. Develop Meaningful Fund Raising Documents

It is the responsibility of the Board of Directors to approve of any documents representing the organization to be set before funding sources. These documents should focus clearly on the services to be provided to wildlife, the community, and the general public and on the success with which the organization has in the past used money so raised as to provide services which fall within the purview of its Mission Statement.

It is not necessary for these documents to be expensively and elaborately designed. Substance is more meaningful than the superficial veneer. The point of fund raising documents is to present, as lucidly and honestly as possible, information to potential funding sources within the independent sector on the projects which need money, their importance, and the ability of the organization to bring about a realistic solution to the perceived problem.

VIII. Use Public Relations and Publicity Techniques

All organizations providing a public service must become aware of at least basic public relations and publicity techniques. Such techniques are especially necessary during any fund raising effort when it is the organization's responsibility to acquaint potential givers with the need for funds and how the funds will help wildlife.

IX. Disseminate Periodic Reports to the Independent Sector

It is the responsibility of the Board of Directors to insure that the public served by the organization is kept current on its work and how funds raised by the organization from the independent sector have been utilized to realize its mission.

Each year the Board of Directors must oversee the drafting and dissemination of an annual report. This report should be made generally available and should be sent to all donors. It is also a wise idea, from time to time, to have the Chairman of the Board address a letter to the donor population on specific organizational projects and how funds raised have helped to achieve desired objectives.

X. Preparation of an Annual Audit

Each year each organization needs to have an audited financial statement prepared by external counsel. It is the responsibililty of the Board of Directors each year to retain such counsel and to insure that recommendations made by such counsel are implemented by the organization. Many organizational funding sources will not consider a donation without the availability of such a document.

XI. Working with External Fund Raising Consultants

It is entirely appropriate and ethical for any organization to retain external fund raising counsel to assist in raising money. It must be understood however, that the task of raising funds is primarily the responsibility of the Board of Directors. Technical assistance can be provided by the Executive Director and both strategic and technical assistance by external development counsel. In no case can the full responsibility for raising funds be delegated either to the Executive Director or to such external counsel. Fund raising is an integral and essential part of the duties of every member of the Board of Directors and as such cannot be delegated or declined.

CONCLUSION

Fund raising is a much misunderstood subject. The preceeding eleven points, however, once grasped and implemented will enable a wildlife rehabilitation organization to approach this task with efficiency, economy, and clarity—and with every expectation of raising the money it needs. Fund raising needs the full support and active participation of the Board of Directors and Executive Director of an organization. External development counsel may be retained, but its advice and technical assistance will not be entirely useful without the same degree of commitment and support from the organization's governing body.

To be successful fund raising must involve a complete planning process and a considered, coordinated effort of engaging support from funders within the independent sector. It must not be handled sporadically or casually. Its objectives must be clearly

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Rehabilitation Notes: Opossum *(Didelphis marsupialis)*

Pam Nave and Joni Lacy

Alexander Lindsay Jr. Museum, Walnut Creek, California

NATURAL HISTORY

The North American opossum is the only marsupial (pouched mammal) on this continent. The genus name is taken from the Greek word *di-delphis* which means double uterus or womb, an anatomical feature of these creatures. The species name is derived from the latin word marsupium, meaning a purse or pouch.

While the opossum has many attributes, high intelligence is not one of them. In fact, it has one of the smallest brain to body ratios among mammals. It does however, have an acute sense of hearing and smell.

Opossums are found throughout most of the U.S. and prefer open woods, brushy wastelands, and farm areas. They are nocturnal and solitary. When threatened, the opossum may "play dead" or try to bluff its attacker by hissing and showing its teeth. Other sounds they emit include growling, sneezing when young, and purring.

This species dates back approximately 65 million years and is considered one of the longest surviving mammals.

DESCRIPTION

- *Adult:* Total length 20"–40"; weighing 4–14 lbs. (1.8–6.4 Kg.). Coat consists of long white hairs covered by black tipped fur. They have large naked black ears with pinkish tips.
- The tail is prehensile and is used when necessary although due to their ultimate size, the adult opossum doesn't use his tail to hang by.
- They possess 50 teeth, more than any other North American mammal.
- *Normal Temperature:* 94°–97° F.
- Solitary except during mating.
- Lifespan ranges 2–7 years.

BIRTH AND YOUNG

- *Gestation:* 12–13 days.
- *Litter Size:* Up to 22; but only a maximum of 13 live. Those that do not locate a nipple perish.
- *Birth Weight:* .13 g
- *Age Weaned in the Wild:* 60 days.

DIET

- *Infant* (up to 75 days): To rehydrate and facilitate a switch to commercial formula, incoming infant opossums should be fed a rehydrating solution for the first three feedings. Given orally by tube, the solution can be either commercially prepared (i.e., Lactated or Acetated Ringers with 5% Dextrose) or homemade (1 quart warm water, one tablespoon refined sugar, and one teaspoon table salt). Solutions should be kept refrigerated and warmed when needed. They will grow mold and should be replaced frequently.
- Infants should be fed at a rate of 50 cc/Kg. Initially, this will often work out to ¼-½ cc and can be repeated every hour to two hours for the first three feedings. Following that they are generally fed Esbilac every 1–2 hours with at least three feedings during the night. Gradually increase the amount as the infant's tolerance increases and lengthen time between feedings as they stabilize.
- At this age, tube feeding is necessary because they do not nurse like other mammals.
- *Adolescent* (75 to 150 days): At approximately 75 to 80 days, the adolescent will no longer tolerate tube feeding. To begin the weaning process, place a small shallow container (i.e., jar lid) of Esbilac in the cage. Tip the front part of the mouth into the dish. Monitor consumption to ensure proper growth and nutrition. Tube feeding may be required during the feeding pro-



cess. Change Esbilac every three to four hours except during the night hours. Offer water in a shallow dish.

- When drinking from a dish, usually in approximately one week, begin adding soaked Purina High-Pro dog kibble or equivalent. Make gruel by blending 1 cup soaked kibble (using 1½ cups boiling water) with one 14 ounce can of Esbilac for two minutes. Continue to feed every three to four hours in the small container.
- After one week, just soak the kibble and pour the Esbilac on top. Feed three times daily. Shelled, hard boiled eggs can be added along with occasional fruits. Dog food is a complete diet. Other items are treats and provide variety. Opossums are prone to calcium deficiencies and fruit is generally high in phosphorous and low in calcium.
- *Pre-Adult* (150 days): To prepare for release offer a wide variety of natural foods including insects, dead mice or chicks, vegetables, raw eggs, crayfish, and fruit. After a few days of providing dead food, release into the wild.
- *Injured Adolescent or Adult:* Tempt them initially with baby meat foods if they will not readily accept dog food. While not eating, they may require fluid therapy to insure they remain properly hydrated.

FEEDING METHODS AND TECHNIQUES

- Tube feeding is used on infants and adolescents unwilling or unable to eat.
- For infants 14–60 days use a Tuberculin 1cc syringe with a French size 3½ feeding tube and urethral catheter. The necessary length of tube is measured from the mouth to the bottom of the left rib cage. Mark this length with a piece of tape on the tube. Before inserting, the tube, fill with formula, eliminate all air bubbles, and lubricate.
- The animal is held immobile by cradling it in the palm of the hand. The head is held still by putting the thumb and middle finger firmly on each cheek, with the index finger on top of the head. Insert tube gently, over the tongue until the premeasured length is reached. If the tube stops before the length is reached, it may be in the lungs, retract and begin again. Insertion should be done quickly and safely and the Esbilac should be propelled slowly into the stomach. Pinch the tube off near the mouth prior to withdrawing.
- If aspiration occurs, remove the tube slowly, clear nasal passages of excess Esbilac with tissue or bulb ear syringe.
- For infants older than 60 days, a French size 5 feeding and urethral catheter can be used.
- Stimulate the infant gently with a tissue or soft cloth for bowel and urinary elimination after each meal. Stools will vary from white to bright yellow depending on the formula.
- Chilling will occur rapidly and therefore, feeding should be done as quickly and carefully as possible. Two pouches are advisable; one for fed opossums and one for those yet to be tubed.
- Force feeding of adolescents or adults can be done with a 6 cc or larger syringe. Wrap the opossum in a large towel leaving head exposed, then place syringe in mouth and feed. While the animal may drool, it generally will swallow. A tongue depressor may also be used instead of a syringe.

HOUSING

- *Infant* (up to 75 days): Use cardboard pet carrier with all bottom side holes covered with masking tape, sticky side out. Place heating pad inside and seal holes that are adjacent to cord at the top of the box. Provide non-stringy terrycloth towel folded two layers over the heating pad. Temperature should be about 85° F. A wash cloth, paper towel, or sponge should be placed on the pad and moistened at each feeding. This will provide the proper humidity to prevent the animal's tail from drying and sloughing off. Normal moisture in the mother's pouch provides this in nature. Lanolin or baby oil placed on the tail will aid in preventing any dryness. Prepare an artificial pouch from soft cloth, preferably flannel, with one end sewn shut. It should measure 12″–15″L by 6″–8″W. Sweat pant legs, receiving blankets, and heating pad covers work well. Toenails may be ripped off upon removal if loosely woven material is used.
- At 60 days, modify environment as follows: Move the heating pad outside under the box. Cover the bottom with newspaper. Place non-stringy towel in box and make into a hammock by pulling the four corners through the holes at the top of the pet carrier and tying them. A small towel can be placed on the hammock for them to crawl under. As the infants grow, raise the hammock until it is completely off the box floor. The hammock provides exercise opportunities and allows for easy cleaning without disturbing the occupants. Additionally, they do not like to defecate or urinate in the hammock.
- *Adolescent* (75 to 150 days): When the animals are eating on their own and are completely furred, they should be transferred to a cage. Recommended wire size is ½″ by 1″ and welded. The cage should measure 3′ × 3′ × 3′. A door large enough to insert both hands is advisable to cope with adolescents. The tray below the cage should have a double layer of newspaper and be filled with a litter (i.e., corn cob litter). The hammock can be tied into the corner of the cage and depending on the temperature, a heating pad can be positioned over the cage and covered. Nest boxes can be used in lieu of the hammock.
- At approximately three months, adolescents should be separated as they may quarrel and injure, kill, or eat each other.
- Exercise is essential at this age. The cage should be placed outside each day to provide sunlight and encourage movement.
- *Pre-Adult & Adult* (150 days +): The pre-adult and recovered adult should be acclimated to outside temperatures prior to release. In periods of intense heat or cold, the cage must be protected from the elements. Temperatures may be mediated by using a garage, or household room with open windows. When ready for continual exposure to the outside, they should be moved to an outside cage 4′ × 6′ × 8′ made of 1″ × 1′ welded wire. This cage can be decorated with native plants, and tree limbs. A nesting box should be provided. After at least two weeks in this cage the pre-adult opossums are ready for release.

(continued on page 10)

Below are two substitute formulas that have been used successfully with the Virginia Opossum. Published data from the natural milk composition is currently being correlated in order to create substitute formulas that more closely resemble the natural milk, but they are not available at this time.

DAILY FEEDING CHART FOR INFANT OPOSSUMS

(Esbilac, whipping cream, water)

BODY WEIGHT			Daily caloric intake reqmt.		Max amt. per feeding	AMOUNT TO FEED PER FEEDING AT VARIOUS FEEDING INTERVALS IN CC's				
ounces	kilo-grams	grams	basal	2X	50 cc/kg	4X day	5X day	6X day	7X day	8X day
0.35	0.01	10.00	2.21	4.43	0.50	***	***	0.52	0.45	0.39
0.53	0.02	15.00	3.00	6.00	0.75	***	***	0.70	0.60	0.53
0.71	0.02	20.00	3.72	7.45	1.00	***	1.05	0.87	0.75	0.66
0.88	0.03	25.00	4.40	8.80	1.25	***	1.24	1.03	0.89	0.77
1.06	0.03	30.00	5.05	10.09	1.50	***	1.42	1.18	1.02	0.89
1.23	0.04	35.00	5.66	11.33	1.75	***	1.60	1.33	1.14	1.00
1.41	0.04	40.00	6.26	12.52	2.00	***	1.76	1.47	1.26	1.10
1.59	0.05	45.00	6.84	13.68	2.25	***	1.93	1.61	1.38	1.20
1.76	0.05	50.00	7.40	14.80	2.50	***	2.08	1.74	1.49	1.30
1.94	0.06	55.00	7.95	15.90	2.75	***	2.24	1.87	1.60	1.40
2.12	0.06	60.00	8.49	16.97	3.00	2.99	2.39	1.99	1.71	1.49
2.29	0.07	65.00	9.01	18.02	3.25	3.17	2.54	2.12	1.81	1.59
2.47	0.07	70.00	9.53	19.05	3.50	3.35	2.68	2.24	1.92	1.68
2.65	0.08	75.00	10.03	20.06	3.75	3.53	2.83	2.35	2.02	1.77
3.53	0.10	100.00	12.45	24.90	5.00	4.38	3.51	2.92	2.50	2.19

* How to use this chart: weigh the animal periodically. Refer to the table on the right, and, based on the feeding intervals used, feed the corresponding amount shown.

* Formula: mixture of 1 part powdered Esbilac, 1 part whipping cream, 3 parts water. Yields 3.59% protein, 21.71% fat, 2.6% cho. Formula has 2.19 Kcal/cc.

* Amount to feed: at least 2 times the basal energy requirement daily. This is approximated by the formula Kcal required = $2 \times (7 \times \text{Body Wt. in Kg}^{.75})$.

* *** Indicates that minimum caloric requirements cannot be met with this feeding frequency.

* Maximum cc's per feeding is based on the fact that the stomach will hold a comfortable maximum of 50 cc/Kg. The stomach may hold more, but distension problems are likely if this range is exceeded. In fact, some animals may not be able to hold this much. This figure is a maximum guideline, not an absolute rule.

* Generally, infant opossums are able to lap on their own by 45 to 50 gms. The rehabilitator should remember that this species is used to nursing in the natural pouch of the mother, and in captivity the animal should be taken from the nest area and placed in front of a shallow container of warm formula every 3 to 4 hours during the day until it is eating well on its own. Formula can also be left out during this time, but it should be replaced frequently.

DAILY FEEDING CHART FOR INFANT OPOSSUMS

(Esbilac, water)

BODY WEIGHT			Daily caloric intake reqmt.		Max amt. per feeding	AMOUNT TO FEED PER FEEDING AT VARIOUS FEEDING INTERVALS IN CC's				
ounces	kilo-grams	grams	basal	2X	50 cc/kg	4X day	5X day	6X day	7X day	8X day
0.35	0.01	10.00	2.21	4.43	0.50	***	***	***	***	0.62
0.53	0.02	15.00	3.00	6.00	0.75	***	***	***	***	0.84
0.71	0.02	20.00	3.72	7.45	1.00	***	***	***	***	1.05
0.88	0.03	25.00	4.40	8.80	1.25	***	***	***	***	1.24
1.06	0.03	30.00	5.05	10.09	1.50	***	***	***	***	1.42
1.23	0.04	35.00	5.66	11.33	1.75	***	***	***	***	1.59
1.41	0.04	40.00	6.26	12.52	2.00	***	***	***	2.01	1.76
1.59	0.05	45.00	6.84	13.68	2.25	***	***	***	2.20	1.92
1.76	0.05	50.00	7.40	14.80	2.50	***	***	***	2.38	2.08
1.94	0.06	55.00	7.95	15.90	2.75	***	***	***	2.55	2.23
2.12	0.06	60.00	8.49	16.97	3.00	***	***	***	2.72	2.38
2.29	0.07	65.00	9.01	18.02	3.25	***	***	***	2.89	2.53
2.47	0.07	70.00	9.53	19.05	3.50	***	***	3.57	3.06	2.68
2.65	0.08	75.00	10.03	20.06	3.75	***	***	3.76	3.22	2.82
3.53	0.10	100.00	12.45	24.90	5.00	***	***	4.66	4.00	3.50

* Formula: mixture of 1 part powdered Esbilac, 3 parts water. Yields 5.10% protein, 6.70% fat, 2.40% cho. Formula has 0.89 Kcal/cc.

* Other notes listed above apply.

Prepared by Debbie and Roger W. Marcum 3/83.

SPECIALIZED CARE

- Infants may bloat if fed to frequently or to much. In this event, switch to a rehydrating solution for 12 hours or until the bloating has receded. After 12 hours, switch to ½ Esbilac and ½ rehydrating solution. Gradually move back to regular strength formula as improvement continues. In the event of no improvement, seek veterinary advise.
- Dehydrated adults can be given Lactated or Acetated Ringers subcutaneously at a rate of 10cc per pound of body weight. Dose and route of administration will vary depending on degree of dehydration. The fluids are usually given two times daily until the condition is reversed.
- Endoparasites include flatworms, roundworms, tapeworms, hookworms, pinworms, and flukes. Opossums should be regulary screened for parasites.
- Ectoparasites, usually fleas, can be managed by using *Sevin Garden Dust* with Carbaryl or a flea powder safe for puppies at least four weeks old.
- Metabolic Bone Disease is a common problem when improper diets are fed.
- Taming can be a problem. Handle only when necessary (i.e., when feeding and cleaning). Do not talk around the animals. Cover the cage for privacy. Do not allow any contact with domestic pets, especially dogs. Many injuries sustained by opossums are caused by dogs attacks.

RELEASE

- Opossums are ready for release at approximately five months, or 7 to 10 inches, excluding tail. Behaviorally, it should bare its teeth and try to escape from humans when ready for release. If to friendly, it should be negatively reinforced with loud noises and unpleasant proddings when it acts inappropriately.
- Release sites should be isolated areas with year round running water, ponds, or lakes. Food should be available in the release habitat.
- They are nocturnal, release at dusk.

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(continued from page 6)

defined and set forward. Those who have previously raised funds from the independent sector must base future appeals on their success in realizing objectives of past efforts and providing evidence that they have thoughtfully spent the funds they have previously raised.

Our American society is rich and diverse because of the continuing efforts of public-minded citizens to raise necessary funds for civic purposes. So it must be with us.

We have a very vital service to provide, a very important public need to fulfill. To do so demands both a profound commitment to our mission and technical mastery of all that is necessary to insure the realization of our goal, including the prerequisites of successful fund raising. Let it be said of us not only that we have both the commitment and the mastery but also that we continually used them to bring about the health and welfare of the wildlife who need us and so provide a necessary element of humanity and compasion to our world.

Dr. Jeffrey Lant is President of Jeffrey Lant Associates, Inc., a Cambridge, Massachusetts consulting firm for nonprofit organizations. He is the author of several books including: DEVELOPMENT TODAY: A GUIDE FOR NONPROFIT ORGANIZATIONS and THE UNABASHED SELF-PROMOTER'S GUIDE: WHAT EVERY MAN, WOMAN, CHILD AND ORGANIZATION IN AMERICA NEEDS TO KNOW ABOUT GETTING AHEAD BY EXPLOITING THE MEDIA.

Dr. Paul Beaver is Chairman of the National Wildlife Rehabilitators Association and Executive Director of Quabaug Bird Sanctuary in Ware, Massachusetts. Author and editor of several books and articles on wildlife, he also works as consultant to several wildlife rehabilitation organizations.

Use of the Gluteraldehyde Method for Detection of Gamma Globulin In Young Ungulates

Judith Duffelmeyer, A.A.S.

Judy Duffelmeyer entered the animal health field in 1971 from State University of New York at Delhi Agricultural and Technology. Currently Judy is an AHT with the Bronx Zoo Hospital, New York, and previously worked as an AHT with the Animal Medical Center in New York.

This article was previously submitted to the Association of Zoo Veterinary Technicians.

As you are all aware, there is a continuing effort to protect, preserve and propagate the wildlife of the planet in zoos. In order to accomplish this goal we are all faced with the dilemma of infant mortality in our zoological breeding programs.

The gluteraldehyde method for detection of gamma globulin in young ungulates was adopted for use in exotic species because it is a simple, effective, financially undemanding program, and now is a time tested method as well.

This study was conducted over a three year period encompassing 150 individual animals covering 22 speices. This wide range of testing was made possible by the unique breeding success at the New York Zoological Park.

A brief synopsis of this procedure is indicated.

Materials Required:
10% Gluteraldehyde
20 µl pipet
test tube
.2 ml. serum

Method:
1. Add 20 µl of 10% Gluteraldehyde to .2ml serum.
2. Watch for coagulation checking every minute up to ten minutes; then every 5 minutes up to 1 hour.

A. Positive reaction—Complete coagulation
B. Incomplete reaction—Jelly-like consistency
C. Negative reaction—No change

Using the gluteraldehyde test the chances of survival are significantly increased for those young who are diagnosed as immunoinsufficient. For example, with early detection, the young may be pulled from the herd and hand reared. If not discovered at such an early stage, the animal would be subjected to further environmental and social pressures.

The success of the gluteraldehyde project has enabled the New York Zoological Society to begin research to discover a method of stimulating the immune response of immunoinsufficient young ungulates. Under the direction of Dr. Emil Dolensek, and in conjunction with his assistant, Dr. Janet Stover, I began a program of feeding cow colostrum to immune

deficient ungulates.

Cow colostrum was shown to transfer IGA using zone electrophoresis. Consequently, since we have kept a stock of frozen cow colostrum, it is immediately available for an animal being hand reared. The animal is given cow colostrum for the first three or four feedings. I would like to present two examples to illustrate this transference using pre and post colostrum serum samples on an Elds deer and a White-tailed Gnu which were hand reared at the Bronx Zoo Hospital.

EXAMPLE #1

A newborn Elds deer, female, was pulled from the herd because there was no interest shown for the young by its mother.[A] The gluteraldehyde test was Negative. The fawn was given two-3 oz. feedings of cow colostrum and a serum sample was taken twelve hours after the first feeding. The gluteraldehyde test was positive and IGA was shown to have been transferred using zone electrophoresis. This animal survived and was successfully returned to the herd at juvenile age.

EXAMPLE #2

A White-tailed Gnu newborn was pulled from the herd to be hand reared as it was found to be wandering aimlessly with no apparent mother.[B] The gluteraldehyde test was negative and a physical examination revealed an empty stomach. It was fed one 4 oz. feeding of cow colostrum and then was switched to whole cow's milk. It was hand reared at the hospital with no further health problems. It was returned to the Yak House to be raised by the Keepers at about three weeks of age. At this time the gluteraldehyde test was incomplete. Twelve days later the test was positive, but only after one full hour. Three days following, the test was positive within five minutes.

Further studies are in progress to determine natural immunity development times of hand raised young.

There have been several instances where blood was taken before the young was observed nursing. In these cases the gluteraldehyde test was either incomplete or negative. Usually a repeated blood sample was not practical if the young seemed healthy and a follow-up was not done.

A Formosan Sika deer born on July 22, 1981 had a negative gluteraldehyde test.[C] It had not been observed nursing that day. The next morning the test was repeated and the keeper noted that it was nursing that morning. The gluteraldehyde test was positive immediately.

Over the three year period this procedure has proved to be highly effective in determining immunoinsufficiency in the 22 species tested. It is not an accurate method for obtaining gradient results. However, it seems to detect immunoinsufficient animals immediately. Further, I would like to point out that this study was not time-allowed project but fit into the working schedule of the daily routine in the New York Zoological Park. Additional information on blood values, body temperatures and physical examinations were all achieved at this time, as well as ear tagging and tattooing to identify the individual animal.

In conclusion, this test has proved itself an invaluable tool in reducing our infant mortality rate by detecting immunoinsufficient animals. This, in turn, aided us to evaluate the effect of cow colostrum as a stimulant for IGA production. We are extremely encouraged by the results to date.

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THE WHITNEY TONG

Management of Diarrhea Related Problems in Cottontails

Dick Evans, D.V.M.

Tree House Wildlife Center, Brighton, Illinois

This article has been compiled in response to Debbie Gregory's inquiry regarding diarrhea and sudden death in cottontails in the Wildlife Journal (Vol.6, No. 1), as well as the protocol suggested by John Lenz, M.A., D.V.M., in his letter to the editor (Vol.6, No. 3).

Working with wildlife can be frustrating since so many variables can effect the successful outcome of the endeavor. In order for the problem which Ms. Gregory and many other rehabilitators have encountered through the years to be properly treated, each case must be evaluated and diagnosed separately. To assume that all, or even the majority of diarrhea problems in suckling or weaning domestic or wild rabbits are of one cause is erroneous. Further, it is not true that the clinical and pathological signs of mucoid enteritis in the domestic rabbit are "nearly identical to the problems we see in cottontails," nor is this condition widely accepted to be caused by coccidia as was stated by Dr. Lenz.

The intent of the following discussion is to dispel such misconceptions, elucidate the varied causes of diarrhea in rabbits, and instill an appreciation of the extensive diagnostic tests and medical sleuthing necessary to unravel the cause of such problems. An analysis of work on rabbit diarrhea problems in the past five years has greatly altered our knowledge of the causes and appropriate classification of these problems.[2,3,6,9,11,15,21,22]

Historically, we have divided rabbit digestive diseases into two categories, e.g., specific and non-specific diarrheas. Category I represents those diseases with a known cause and documented clinical-pathological syndrome, frequently exhibiting many or all of the signs ascribed to mucoid enteritis.

SPECIFIC DIGESTIVE DISEASES

Tyzzer's Disease—*Clostridium piliformes*
*SMD(Spiroforme Mediated Diarrhea)—*Clostridium spiroforme*
Enterotoxogenic colibacillosis—*E. coli*
Pseudotuberculosis—*Mycobacterium pseudotuberculosi*
Salmonellosis—*Salmonella spp.*
*DMD (Difficile Mediated Diarrhea)—*Clostridium difficile*
*Lapine Adenoviral diarrhea—Adenovirus
*Lapine Rotaviral Diarrhea—Rotavirus
*Lapine Coronaviral Diarrhea—Coronavirus
Coliform enteritis—Many species of coliform bacteria
Vibriosis—*Vibrio spp.*
Coccidiosis—*Emerian coccidia*
Cryptosporidiosis—*Cryptosporidia spp.*
*Antibiotic induced diarrhea—Actually the same as SMD or DMD
*Nutritionally induced diarrhea—Osmotic diarrhea, weaning, change diarrhea, etc.
*Specific causes of rabbit digestive diseases found in the last 5–7 years.[9,10,15,19–27]

NON-SPECIFIC DIGESTIVE DISEASES

Mucoid enteritis, mucoid enteropathy, or enteritis complex.

In this category are listed those diseases or syndromes for which there was reported to be no known cause but a well characterized diarrhea usually but not always exhibiting large amounts of loose, mucoid or mucoid stools. The name mucoid enteritis or mucoid enteropathy were given to this group.[6] Within the last few years, a thorough re-evaluation of the literature on this group and the results of more sophisticated diagnostic inquiries in rabbit diarrhea cases have led us to the conclusion that mucoid enteritis is not a separate disease entity, but rather a group of clinicopathological features which appear in a good majority of the above listed specific digestive diseases.[1–15]

In support of this statement, I will very briefly review some pertinent findings. The earliest work on mucoid enteritis [6,8,12] implicated coccidia to be the causative agent alone or in combination with other agents in only 10–22% of the cases, while the bacteria *E.coli* was implicated as the causative agent in 20–75% of those cases. Additionally, most of these works called for "a need to differentiate between coccidiosis and enteritis complex (mucoid enteritis)". While they recognized that coccidial infections could be seen accompanying the classical lesions of mucoid enteritis in many cases, they

felt that such infections were secondary or opportunistic. Alternately, coccidia infections were thought to be primary, causing damage, and thus setting up the bowel for secondary invasion by bacteria, which were actually responsible for the lesions of mucoid enteritis. One must also bear in mind that coccidial infections are widespread in rabbits. Since coccidial infections result in cyclic shedding of eggs during the day, one may find little to large numbers of eggs in the feces of healthy or even clinically ill rabbits depending on when your sample is collected. There is quite a bit of variability in the number of eggs shed in the feces when compared to the extent of intestional infection. Not always are mild to even moderate intestional coccidia infections accompanied by diarrhea, despite the shedding of large numbers of eggs in the feces. Conversely, diarrhea from a coccidial infection may be accompanied by few eggs in the feces and may be mucoid, bloody, and/or very watery in nature. Further, one may see cases of diarrhea with large numbers of eggs in the feces, yet the overall extent of intestional infection determined by microscopic examination in the intestines is mild. One can readily appreciate the complexity of coccidia infections and the caution that must be used in diagnosing coccidiosis as the primary cause of the diarrhea by simply examining feces for eggs or considering stool morphology as completely characteristic.

Getting back to the early works on mucoid enteritis, several authors were unable to identify the causative agent, but their clinicopathological findings led them and others to later conclude that a bacterial toxin mediated diarrhea was occuring.

Recently, research by myself and several others[9,10,19,27] have firmly established the potent toxins of *Clostridium spiroforme* and *Clostridium difficile* to be the agents responsible for many cases of diarrhea exhibiting the classical lesions of mucoid enteritis.

The most exciting new research has come from studies in Ohio[2,1,13] which have experimentally produced, repeatedly, mucoid enteritis in the rabbit by simply obstructing the colon or large bowel by tying it closed (ligation). The researchers have also presented evidence that the disease produced is mediated by a bacterial toxin. No evidence of coccidial involvement was found.

Lastly, as an exotic animal pathologist for an internationally prominent animal food manufacturer, I have been heavily involved with diagnostic medicine and research pertaining to the rabbit diarrhea problems in both the U.S. and European countries. Diarrhea around weaning is the most common cause around delayed growth and mortality in commercial rabbitries in the U.S. and Europe, second only to bacterial respiratory problems. In Spain, the mucoid enteritis complex is common, yet seldom are coccidia implicated. We have set up a diagnostic laboratory especially for the investigation of rabbit digestive problems and have performed over 1,000 necropsies on diarrhea cases in the past four years. Table I lists the results of these necropsies. It should be noted that 52% of the cases showed varying degrees of the signs and pathology classically applied to mucoid enteritis, however, only 9% of them had evidence of coccidiosis. Further, 26% of these animals exhibited one or more current infections (coccidia and rotavirus, colibacillosis and SMD, etc.). The unknown category includes some animals that were too deteriorated to allow diagnostic testing and those who were thought to have been the result of weaning.

Table I

Summary of results of 1,028 postmortems on domestic rabbits with diarrhea.

Disease	Number of Animals	%
Tyzzer's Disease	83	8.0
SMD, DMD	351	34.0
Colibacillosis	203	20.0
Salmonellosis	2	.2
Rotavirus	198	19.0
Coronavirus	5	.5
Coccidiosis	91	9.0
Cryptosporidiosis	8	.8
Antibiotic induced	32	3.1
Unknown	55	5.4

Considering the above, we may reasonably say that the disease recognized as mucoid enteritis is most probably the result of many pathogenic organisms. We now know that any stressful situation (i.e., photoperiod, low feed intake, many antibiotics, unbalanced diets, including low fiber diets, feed changes, inclement weather, high humidity, poor ventilation, seasonal weather changes, "cold turkey weaning", etc.), or even weaning itself can result in an altered gut physiology which can promote one of the specific diarrheas.

Even considering all of this recent information, texts on rabbit management and veterinary medicine as well as many pathologists continue to use the term mucoid enteritis rather commonly. As these new advances become known, veterinarians will find the answer to many more cases of rabbit diarrhea that would otherwise be incorrectly or not diagnosed.

Concerning Ms. Gregory's problem with diarrhea in weanling cottontails, first the diet must be reviewed. Undiluted Esbilac is not adequate in terms of solids, fat, protein, or energy when compared to cottontail's milk (Table II), hence a diluted version is much less suitable.[20]

Table II

Diet	Solid	H_2O	Fat	Protein	Carbo	Kcal
Esbilac	15.3	84.7	6.74	5.08	2.4	.93/cc
Cottontail Milk	33.4	66.6	17.90	12.49	1.0	2.15/cc

To compensate for the lack of energy (fat) and protein in the Esbilac, much larger daily amounts of milk must be given. This is evident by most reports that recommend

feeding every 2–3 hours. This excessive daily milk intake very commonly results in chronic overfilling of the stomach and excessive nutrients (carbohydrates) being delivered to the small intestine which produces osmotic diarrhea and subsequently malnutrition.

REVIEW ON COTTONTAIL LITERATURE

A review of the literature on cottontail rabbit digestive diseases[4,5,9,22] reveal that they also contact diarrhea in captivity. In 1969, Richter[5] described a 50% mortality rate in cottontails within 20 days of being captured in the wild and brought to a local laboratory. The pathological lesions were similar to those described for mucoid enteritis in domestic rabbits. Coccidia were not found in their animals nor was any definitive cause established despite extensive studies. The authors indicated that the clinical picture was that of severe watery diarrhea, similar to bacterial toxin mediated diarrhea in man and domestic rabbits. Yuill and Hanson[4] in 1965 reported high mortality in juvenile wild caught cottontails and in bunnies from captive mothers when attempts to hand-raise them were made. The authors presented evidence although not conclusive, that the bacterial *E. coli* and its toxin were responsible for the hemorrhagic diarrhea observed. However, they did not examine their animals for anerobic bacteria such as *Clostridium spiroforme,* which is now known to result in hemmorhagic enteritis in domestic and cottontail rabbits.[33]

As the medical director and pathologist at Tree House Wildlife Center, I have in the last 5 years, had occasion to perform detailed postmortem examinations and other laboratory tests on a very large number of suckling or just weaned cottontail rabbits which have died of diarrhea at our center and eight other centers in the U.S.[30]. I have found that while some (15%) had evidence of classical mucoid enteritis, most exhibited only marked watery diarrhea without mucus resulting in acute death. Detailed studies with electron microscopy and bacterial toxin testing revealed that Rotavirus, *E. colli* and its toxin, *Clostridium spiroforme* and its toxin, as well as Tyzzer's Disease were the most common agents implicated regardless of whether lesions of mucoid enteritis were present.[30] In almost every case, excessive stress such as young exposed to loud noises, the constant sight of humans and/or overfeeding of inbalanced diets, etc., could be documented. Coccidia were found in 3.5% of these animals.

Further studies at our center has led to the conclusion that overfeeding of nutritionally inadequate diets are probably the most common cause of diarrhea in cottontail rabbits at rehabilitation centers. At our own facility we now raise bunnies in stable humidity and temperature in a quiet area far removed from human sight, noise, or odor. They are fed a diet much closer to that of cottontail milk than Esbilac. The milk formula, consisting of 1 part liquid Esbilac, 3 parts water, and 1 part whipping cream, yields 3.59% protein, 21.71% fat, 2.6% carbohydrates and 2.19 Kcal/cc. The daily amount fed is determined by dividing the total number of calories needed ($140 \times BW$ in $Kg.^{.75}$), by the number of Kcal/cc of formula. This amount is then fed in a sufficient number of feedings to consume that total daily amount, but not to exceed 50 cc/Kg BW per feeding.

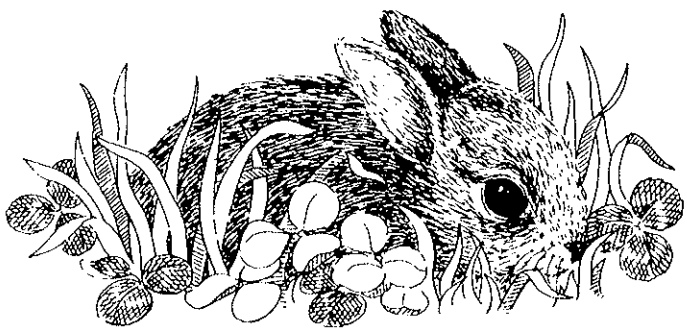
Although this diet appears in testing to supply the caloric requirements of suckling rabbits, we are still working in correcting the protein deficiency (as compared to rabbit milk[28]) with commercial protein supplements. Since the initiation of these changes, we seldom recognize diarrhea problems and when we do they are invariably traced to "lapses" in these procedures.

Lastly, Dr. Levy's protocol calling for blanket treatment of all cottontails with antibiotics in my opinion is unwarranted, excessive, and indiscriminate as well as potentially dangerous. Additionally, according to present FDA policy, it is illegal since this drug is not approved for use in cottontail rabbits. Sulfa drugs, while being antibacterial, are usually not effective against Clostridium organisms and infact may cause such infections to become worse. It must be remembered that the rabbit is one of the human models for diarrahea induced following the use of antibiotics.[19,20] The rabbit is extremely susceptible to such diarrhea resulting from even a few days of treatment with such drugs as Penicillin, Ampicillin, Lincomycin, Amoxicillin, Erythromycin, Clindamycin, the Cephalorposius, and several others (including sulfa drugs).[15–21,26,27] Further continual use of antibiotics sterilizes the gut and promotes the emergence of bacteria resistant to the drug, as other bacteria which are susceptible are killed off. Thus the animal may not have the proper proportion of bacteria in its large bowel and eventually suffer digestive disturbances and malnutrition. Another problem with sulfa drugs is that they are concentrated and excreted in the kidney and thus long term administration frequently leads to kidney failure. Lastly, we must remember that recent FDA policy has restricted the use of those drugs to licenses indicated on the label. Even a veterinarian can not legally use any drug he wants as has been done in the past. At present, only Sulfaquinoxaline and Penicillin-Streptomycin are approved for use in the domestic rabbit and none is approved in wild rabbits.

SUMMARY

In summary, it appears that we are now able to say that both domestic and wild rabbits are susceptible to diarrhea following a stressful situation, such as captivity, inclement weather, weaning, excess noise, etc., as well as dietary mismanagement. Such diarrheas are the result of a wide variety of bacterial infections as well as a few parasites (Coccidia and Cryptosporida) and viruses. The lesions and pathology of these syndromes are very similar usually resulting in a watery diarrhea with (called mucoid enteritis in the past) or without excessive mucus secretion.

To properly treat such conditions, all causative agents must be looked for which requires rather sophisticated



laboratory testing.[10] A thorough clinical history is necessary to document stressful conditions and dietary mismanagement. The days are gone when we can simply diagnose the cause based on outward appearances.

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