AAVP Newsletter

American Association of Veterinary Parasitologists

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FROM THE SECRETARY/TREASURER

The 43rd Annual Meeting of the AAVP is fast approaching. Almost 100 people are pre-registered for the conference (as of 15 May), with the pre-registration deadline of 15 June. Most of the AAVP functions, except for Monday evening's social event and the President's AVMA/AAVP joint Symposium, will be held in the Renaissance Harborplace Hotel, 202 East Pratt Street, in Baltimore ((410) 547-1200. This location is a prime spot on the newly renovated Inner Harbor, a few blocks from the Baltimore Aquarium, Maryland Science Center, shopping, B&O Train Museum and other attractions. Rob Rew has assembled a great program, starting with the first session at 3PM Saturday afternoon and ending Tuesday noon with Jimmy Williams's President's Symposium. In between, there are plenary sessions, abstracts, THREE company-sponsored socials plus coffee and rolls every morning. Overviews of the program titles together with the meeting room assignments are listed elsewhere in the Newsletter. In addition, if you asked to be notified about the acceptance of your abstract, you should have received a notice from Dr. Rew by now. If you haven't already done so, make your travel arrangements to not miss a minute. Notice of pre-registration postcards will be sent 17 June 1998. Please bring the card as your evidence of registration. If you need to know whether your registration was received prior to that date, call, fax or e-mail the numbers below. The on-site staff in Baltimore will provide you with badges, Proceedings and other meeting material. If you do not take advantage of pre-registration, you will be able to register starting at 2PM Saturday and all day Sunday on site. There will be a registration area just outside of the AAVP meeting rooms in the

Renaissance Harborplace Hotel. You can also check on the status of your dues and catch up, if necessary, at that time. We will also have a few exhibits in the registration area, so stop by and peruse the literature on display. If you didn't get a hotel reservation in the Renaissance, the AVMA will run a shuttle service among the various hotels and the convention center starting Sunday morning, which we are free to use. For those unable to attend the Baltimore meeting, Proceedings will be mailed to you immediately after the meeting. I look forward to seeing many of you in Baltimore.

This is my last Newsletter as your Secretary/ Treasurer. The AAVP Constitution wisely imposes term limits on the job, so someone new will hound you from these pages in the future. I would like to thank so many of you for the help and advice you have graciously offered over the last six years. The duties of Secretary/Treasurer have been enjoyable and a valuable opportunity to serve the

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~~advancement of parasitology and this organization.~~ *Submitted by Tom Kennedy*. phone (913) 962-2890 fax (913) 268-2541 Email mailto: tom.kennedy.b @bayer.com/. ð

News in Brief

Research Funding Takes Hiatus to Ensure Future Funding Availability

Since 1972, the American Veterinary Medical Foundation (AVMF) has distributed more than $2.58 million dollars in support of 200 projects. These projects have initiated further studies that have generated significant and lasting benefits to veterinary medicine and the animal kingdom. In 1997, the AVMF granted more than $165,000 for projects focussing on auto-immune and infectious diseases, new approaches to oncology therapy and treatment, vaccine development, companion animal nutrition supplementation for diabetes, and food and dairy safety. During 1998, due to changes in major donor funding restrictions, the AVMF is supporting four projects in the area of canine lymphoma diagnosis, the effects of polymyxin B on *ex vivo* endotoxemia in horses, equine infectious anemia virus infected ponies during pregnancy, and DNA-based diagnostic tests to determine the presence of the bacteria *Salmonella enterica*.

To ensure the availability of future funding for the programs of the AVMF, the Foundation's board of directors have approved new guidelines requiring that funds be collected or pledged prior to approving future year's grant expenditures. Due to these recent restrictions, funding will be held for the 1999 funding cycle and <u>they will not be soliciting proposals for 1999 funding.</u> They hope to build these restricted funds over the next 18 months to the level which will sustain continued funding for animal health studies as well as the AVMF's other programs.

This change helps ensure the AVMF's long-term potential for sustained funding while building an endowment capable of supporting its operations and programs, including funding for the following: veterinary-related disaster relief; veterinary medical education via loans, fellowships, and scholarships; animal health studies; congressional science fellowships; and, the promotion and enhancement of public awareness regarding the human-animal bond; animal health; and the value of veterinary medicine. If you have questions about these or other AVMF programs, please feel free to call the AVMF office at 800-248-2862, extension 207 or e-mail at AVMFMail@aol.com. ð

Clinical News

Veterinary Clinical Parasitology—New Edition

After lengthy negotiation with Iowa State University Press, AAVP has finally signed a contract to produce an international color edition of *Veterinary Clinical Parasitology*. I have agreed to edit this edition because ISU Press has now essentially given us the latitude to determine the content of this new version. Having color photographs should enhance the appeal of the book which is still intended principally as a diagnostic manual for practitioners and students. However, to increase the book's market, the publisher has asked that we expand it's scope to include parasites of major importance found in English speaking countries outside of North America and that we "beef-up" the text material to include a few bulleted items for each parasite including major diagnostic features, etc. The expected date for completion of the project is June, 2000. We have been assured that the price of the book will not be increased despite the use of color photographs.

Because this is a publication of AAVP, I would like to invite any comments you may have on this new edition. There are clearly some areas of the current book that need improvement and I hope we can finally make this a comprehensive diagnostic manual. When I took over editing the current edition we had already missed the deadline and the primary concern was just to get it finished. For this edition though, we have some planning time and I hope to draw on the entire membership's expertise. Please let me know how you feel about issues like: How we should handle "internationalizing" the book? What needs to be included? Do we have a separate section

for parasites not found here or do we incorporate them into the North American parasites? How should we establish which foreign parasites need to be included? What information should be included in the bullets for each parasite? What is missing from the current edition? Are there format changes that would make the book more useful?

I welcome your ideas on any aspect of this publication. Feel free to call or email me. I will be attending the annual meeting in Baltimore and will be soliciting opinions there as well. Of course, soon I will be badgering you for photographs again, but since we can use color slides for this edition I am hopeful that collecting the photos will be much easier this time around. Thanks in advance for your help and insight. *Submitted by Anne Zajac*, phone 540-231-7017, e-mail: azajac@vt.edu. ð

Research News

Control of nematode infections by African great apes: A new paradigm for treating parasite infection with natural medicines?

Parasites cause a variety of diseases which can affect the overall behavior and reproductive fitness of the host making the need to counteract such pressure great. The effects of parasitosis on the host and the host's response to infection is thought to be the product of a long evolutionary process. Ecologist, Dan Janzen (1978), first suggested that the incidental ingestion of secondary plant compound rich plants by animals may help to combat parasites. Recent evidence from the African great apes suggest that certain plants are ingested perhaps directly for their antiparasitic properties (cf. Huffman, 1997). Unquestionably, the implications of self-medicative behavior in animals is of extreme interest when considering the evolution of host-parasite relationships. Such studies may also prove to be invaluable when looking for new avenues of treating parasite infections in humans and other animals. The purpose of this brief report is to describe cutting-edge developments in our knowledge of self-medication in the chimpanzee, present a primate based paradigm of parasite control, and to stimulate collaborative research into the practical application of this knowledge in the veterinary sciences.

The hypothesis currently being developed from the author's long-term collaborative investigation of wild chimpanzees is that these behaviors aid in the control of intestinal parasite infection and provide relief from related gastrointestinal upset (cf. Huffman et al., 1996; Huffman et al., 1993; Wrangham, 1995). Two types of self-medicative behavior, bitter pith chewing and leaf swallowing, have been documented in the greatest detail from studies of wild chimpanzees in the Mahale Mountains in western Tanzania. This discussion will focus largely on the work done by the author in Tanzania but the reader is referred to a recent review of the topic for further details (Huffman, 1997).

Bitter pith chewing

The hypothesis that bitter pith chewing has medicinal value for wild chimpanzees was first proposed from detailed behavioral observations of patently ill chimpanzees ingesting Vernonia amygdalina Del. (Compositae) and from follow up parasitological and phytochemical analyses. When ingesting the young shoots of V. amygdalina, chimpanzees meticulously remove the outer bark and leaves to chew on the exposed pith, from which they extract the extremely bitter juice. Despite year round availability of the plant, use by chimpanzees is rare and occurs mainly during the early rainy season. Chewing of the bitter pith of two other Vernonia species by chimpanzees has been observed at Gombe, Tanzania and Kahuzi-Biega, former Zaire. Another two species from two genera are also known to be ingested by chimpanzees in the Tai forest, Ivory Coast.

Leaf swallowing

Leaf swallowing behavior was first reported for chimpanzees in east Africa at Gombe and Mahale (Wrangham & Nishida, 1983). Like bitter pith chewing, despite year round availability of these plants, use by chimpanzees at Mahale and Gombe is rare and occurs mainly during the early to mid-rainy season. Currently, leaf swallowing behavior involving 30 different plant species has been observed in 9 populations of the three chimpanzee sub-species and

in one each of bonobo and the eastern lowland gorilla at 10 sites across Africa. Leaf swallowing is unlikely to provided any nutritional value because the undigested leaves are expelled whole in the dung. The plant species used vary in life form (herb, vine, shrub, tree), but the common property linking all of these plants is their hairy, rough-surfaced leaves. The distal half of each leaf is selected one at a time, folded by tongue and palate as they are slowly pulled into the mouth and then individually swallowed whole. An individual may swallow anywhere from one to 100 leaves in one bout.

Typically, nearby chimpanzees do not join in and chew bitter piths or swallow whole leaves, unlike a group of foraging individuals converging upon a food source. Infants between 1-3 years of age, however, have been observed on occasion to taste a piece of discarded pith or to fold and half-heartedly swallow the same rough leaves used by their ill mothers or other elder individuals. This suggests that aspects of both behaviors must be learned. The relative contributions of instinct and learning in the acquisition of self-medicative behavior is not yet well understood, but both are thought to be involved.

The evidence for ape self-medication and its proposed antiparasitic function

General detailed observations on the state of health at the time bitter pith was chewed or whole leaves were swallowed has verified ill health (diarrhea, constipation, malaise, nematode infection) in most individuals. Detailed observations of two individuals documented recovery within 20-24 hr. from a lack of appetite, malaise, and constipation or diarrhea after chewing V. amygdalina bitter pith (Huffman and Seifu, 1989; Huffman et al., 1993).

A longitudinal investigation of the intestinal parasite fauna of Mahale chimpanzees shows that they are infected by at least three parasite species from three genera of nematodes, *Strongyloides fulleborni*, *Trichuris trichiura*, and *Oesophagostomum stephanostomum*; 1 genus of trematode, *Dicrocelium lanceatum*; and 4 genera of protozoa, *Entamoeba coli*, *Endolimax nana*, *Iodamoeba buetschlii*, and *Giardia lamblia* (Huffman et al., 1997). Among all M group chimpanzees monitored over a four year period, a statistically significant rainy season increase in the incidence of infection was noted only for individuals infected by *O. stephanostomum*. Among all three nematode species detected, infections of *O. stephanostomum* (95% 14/15) were also associated significantly more frequently with bitter pith chewing and leaf swallowing, than either *T. trichiura* or *S. fulleborni*. In one case the EPG level of *O. stephanostomum* was found to have dropped from a count of 130 to 15 within 20 hours. No change occurred in this individual's concurrent infections by *T. trichiura* (Huffman et al., 1993). When compared to seven other individuals with *O. stephanostomum* infections monitored over the same period, this was the only case in which such a dramatic drop in EPG was noted. To the contrary, the overall tendency was for EPG's to rise at this time of the rainy season.

Across Africa, a concoction made from V. amygdalina is a traditionally prescribed treatment for malarial fever, schistosomiasis, amoebic dysentery, several other intestinal parasites and stomach upset (Huffman, Koshimizu, Ohigashi, 1996). Our phytochemical analysis of *V. amygdalina* samples collected from plants used by chimpanzees at Mahale have revealed the presence of two major classes of bioactive compounds, sesquiterpene lactones and the newly discovered stigmastane-type steroid glucosides (Ohigashi et al., 1994). The sesquiterpene lactones present in *V. amygdalina* are well known for their anthelmintic, antiamoebic, antitumor, and antibiotic properties. From both groups of compounds isolated from this species thus far, we have found inhibition of tumor promotion and immunosupressive activities, *in vitro* antischistosomal activity as well as leishmanicidal (*Leishmania infantum*), amebicidal (Entamoeba histolytica), and plasmodicidal (K1 multi-drug resistant *Plasmodium falciparum*) activities (Koshimizu et al., 1993; Ohigashi et al., 1994).

Initially, leaf swallowing was suggested to deliver a potent anthelminthic compound to the site of parasite infection (Rodriguez & Wrangham, 1993). Detailed field observations, the diversity of plant species now known to be used, and phytochemical studies, however, have failed to support this hypothesis (Huffman et al., 1996; Page et al.,

1997). Currently, the major mechanism of leaf swallowing is considered to be the physical expulsion of parasites. A possible phytochemical component, however, has not been totally out ruled (Huffman et al., in press).

The mechanism for *O. stephanostomum* worm expulsion at Mahale has been preliminarily deduced from the examination of chimpanzee dung samples. The occurrence of worms in the dung is extremely rare (3.7% of 245), but when they are found, the probability that whole leaves too are present is significantly high (p= 0.0001). In one instance, two nodular worms were actually found firmly attached by the trichomes to the surface of a leaf as if by Velcro. At the time of expulsion in most cases, adult worms were found trapped within the folded leaves or free floating in loose fecal matter. All worms recovered thus far have been alive and motile up to several days thereafter (Huffman et al., 1996).

Based on micro- and macro-parasitological inspection, leaf swallowing was found to affect only *O. stephanostomum* infections. Furthermore, from the current evidence *O. stephanostomum* is the only parasite stimulus consistently associated with the occurrence of these two self-medicative behaviors at Mahale.

Following accidental ingestion, the infective stage larvae of *O. stephanostomum* penetrate the wall of the gut, develop, and molt twice to become adults. The prepatent period is roughly one month and infections are typically self-limiting. At Mahale, the peak period of elevated reinfection (i.e. peak in individual O.s. EPG counts) is manifested two months after the onset of the rainy season around December and January. This is also the peak time that Mahale chimpanzees swallow leaves, chew bitter pith, and expel worms most frequently. Adult worms leave the mucosa and migrate back to the lumen of the bowel. Adult worms in the lumen rarely cause pathology. However, some of the larvae remain encapsulated, perhaps by pre-munition, causing inflammation that leads to diarrhea and abdominal pain, and in severe cases, simulated appendicitis. This discomfort is hypothesized to be the stimulus for leaf swallowing (and bitter pith chewing) behavior (Huffman et al., 1996). Removal of adult worms from the lumen may thus induce the encapsulated larvae to mature and leave the tissue. By freeing these encapsulated larvae, pain may be lessened or alleviated all together. Prolonged leaf-swallowing and bitter pith chewing around the peak period of re-infection would be expected to suppress the worm burden to tolerable levels during the remaining rainy season peak of re-infection. In the late-rainy and dry season months, re-infection is limited, and incidences of *O. stephanostomum* infection are quite low.

It is of interest to note that in western Uganda at the Kibale and Budongo Forest sites, however, the expulsion of tapeworm (*Bertiella studeri*) proglottids is closely associated with leaf swallowing (Wrangham, 1995; Huffman, unpublished data). It seems that different parasite species induce the same behavioral response by chimpanzees and other apes in different habitats. Leaf swallowing is reminiscent of grass swallowing in domestic cats and dogs and their wild counterparts, a behavior which has surprisingly remained unstudied. Homologous behaviors have recently been described in such diverse species as the brown bear and snow goose. In these two species, grass swallowing has also been associated with the expulsion of tapeworms prior to hibernation and winter migration, respectively (Huffman, 1997). Further details of leaf and grass swallowing in relation to *Bertiella* infections are needed.

A new paradigm for the treatment of parasite infections and anthelminthic resistance?

Anthelminthic resistance is a serious problem for livestock management (Geerts & Dorny, 1995; Jackson, 1993; Roepstorff, Bjoern, Nansen, 1987) and resistance to drugs used in treating life threatening diseases such as schistosomiasis and malaria in humans is a global problem urgently in need of solutions (Brindly, 1994; Geerts et al., 1997; Kremsner et al., 1997). The widespread geographical occurrence and broad taxonomical representation of great ape species exhibiting leaf swallowing and bitter pith chewing behaviors suggests that these self-medicative behaviors represent a stable evolutionary response to parasite infection. Can the study of great

ape self-medication offer new strategies for countering parasite chemoresistance?

According to Geerts et al. (1997) factors selecting for anthelmintic resistance are mass treatment, frequent use of the same class of drugs over long periods of time and under dosing. Theoretically, therefore, the converse approach may help stem anthelminthic resistance. Geerts and others have recommended a three pronged approach to stem or control anthelminthic resistance in livestock and human as follows: I. minimize treatments, II. rotate or combine different chemotherapy's, and III. administer proper dosage.

Some of our findings closely support this approach. Bitter pith chewing and leaf swallowing are sometimes displayed by an individual on the same day and in combination may have a bimodal affect on parasite infections. The occurrence of bitter pith chewing and leaf swallowing during the first few months of the rainy season in effect minimizes treatment to the heaviest periods of infection. Chimpanzees, of course unknowingly, are doing this by responding to the discomfort of higher level infections. Instead of totally eradicating them each season, chimpanzees in affect may be maintaining infections at sub-clinical levels most of the year. The bimodal action of bitter pith chewing and leaf swallowing behavior may act effectively towards the control of *O. stephanostomum* infections by the combination of treatment types used and the complex chemotherapy employed. The pith of *V. amygdalina* alone contains at least 18 different bioactive constituents from two distinct classes of compounds.

Continued muliti-disciplinary studies of self-medicative behavior in great apes and indeed other animal species is necessary. Such research will no doubt provide new insight into systems of parasite control occurring in nature and may help in the development of an evolutionarily based paradigm for countering parasite chemoresistance and approaching parasite related diseases in general (cf. Ewald, 1994).

Future prospects and collaborative research

Three of the greatest constraints on field investigations of self-medicative behavior are; 1) the unpredictability of the behaviors' occurrence, 2) the unreliability of being able to consistently follow and observe sick individuals over the course of their illness, and 3) the constraints on experimental manipulation. To overcome these limitations, increased collaboration between fieldworkers and applied animal scientists is essential in any attempt to fully understand the implications of animal self-medicative behavior.

Recently, great interest has been directed toward ethnoveterinary research. This is a fast growing field looking for alternative ways of treatment using natural plant products derived from ethnomedicines (e.g., McCorkle, 1996; Boegh, Andreassen & Lemmich, 1996). As the forgoing discussion has suggested, the study of great ape self-medication holds the potential to provide novel insights into strategies for suppressing or slowing down the rate of acquisition of chemoresistance by parasites and to provide viable new natural products for the effective treatment of parasitosis.

Through the controlled introduction of medicinal plants to captive primates and other alternative animal models, investigations into the potential for self-medicative behavior in this way can be expected to greatly advance our understanding of host-parasite relationships in the wild and to provide important benefits to captive animals. Based on the results of work in progress at Mahale, a joint effort between The C.H.I.M.P.P. Group*, the Danish Centre for Experimental Parasitology (The Royal and Agriculture University, Denmark) and The University of Dar es Salaam (Tanzania) is underway to determine the *in vitro* efficacy of medicinal plants against *Oesophagostomum* infections in swine and other livestock. * C.H.I.M.P.P. is an acronym for Chemo-ethology of Hominid Interactions with Medicinal Plants and Parasites, and was established in 1989 by the author with co-founders Prof. Koichi Koshimizu and Hajime Ohigashi of Kyoto University. The group currently has on-going collaborations in 10 countries.

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Nominations Committee Report

AAVP Election Results

The results of this year's AAVP election are in. Congratulations to the following individuals who

were elected by the membership of AAVP for the following offices and committee assignments. **Vice President** - Tom Kennedy**; Secretary/ Treasurer** - Dan Snyder; **Nominating Committee** – Linda Mansfield and Al Marchiondo.

I wish to thank all AAVP members who sent in their ballots, and the other members of the Nominating Committee, Drs. Conder, Fayer, Klei, Lindsay, and Stromberg, for their work on this year's election. *Submitted by Kevin Kazacos*. ð

Positions Available

Predoctoral Program in Cellular and Molecular Parasitology, University of Wisconsin-Madison

The Center for Research and Training in Parasitic Diseases announces the availability of pre-doctoral fellowships through an NIH-funded training grant in the area of cellular and molecular parasitology. This program offers a variety of course and seminar offerings in basic and advanced parasitology, and exciting opportunities for research training in immunoparasitology, molecular parasitology, vector biology, and parasite biochemistry, neurobiology and physiology. Additional opportunities also are available for advanced training in medical parasitology through a cooperative agreement with the University of Puerto Rico Medical Sciences Campus. For further information contact: Timothy P. Yoshino, Director, CMP Training Program, Dept. of Pathobiological Sciences, University of Wisconsin, School of Vet. Medicine, 2015 Linden Drive West, Madison, WI 53706. Email: yoshinot@svm.vetmed.wisc.edu.

Applicants must be a US citizen or permanent resident to be considered. Applications from women and other minorities are especially welcome. Join the Fun!! Tim Walker parasite@biology-afs.biology.uiowa.edu. Administrative Assistant to George Cain, Secretary-Treasurer of the American Society of Parasitologists. Snail mail: Tim Walker, Department of Biological Sciences, The University of Iowa, Iowa City, IA 52242. (319) 335-1329 office (319) 335-1069 fax. ð

Immediate Opening, Biology Faculty Position, Peru State College, Peru, NE

Immediate opening available for an interim, academic year, full-time appointment as an Assistant Professor of Biology at Peru State College, Peru, NE. Teaching assignments include courses in human anatomy, freshwater biology, general chemistry, microbiology, and ornithology. Undergraduate research programs are encouraged. A doctorate is preferred, but a master's is required. The position begins August 1998. A tenure track search for the position will begin in the Fall. Submit a letter of application (including teaching experience and statements of teaching and research interest/ philosophy), vita, and a list of three references to: Beverly Ramsey, Personnel Director, Peru State College, P.O. Box 10, Peru, NE 68421. Completed application reviewed upon receipt.

Database Information

Two new websites to check out

The first new website is "getting more from your sequence on the web" by Elizabeth A Greene and Steven Henikoff from Nature genetics at http://genetics. nature.com/gazing/.

The second website is the Ribosomal Database project (RDP) which is now online at Michigan State University. It includes a variety of analysis tools, many of which were developed by Dr. Niels Larson. Check it out at http://www.cme.msu.edu/RDP/. ð

Future Meetings

XIX International Congress of Hydatidology
San Carlos de Bariloche

The XIX International Congress of Hydatidology will be held at Rio Negro, Argentina on September 20-24, 1999. The conference will be held at Hotel Panamericano. Information can be obtained through the Secretariat: Dirrecion de Salud Ambiental, Laprida 240-3 piso, Viedma, Rio Negro, Argentina, Fax –54-920-30007; e-mail: msrione@anmat.gov.ar.

Future Meetings of the AAVP

1998 - July, Baltimore, Maryland
1999 - July, New Orleans
2000 - Salt Lake City, Utah

AMERICAN ASSOCIATION OF VETERINARY PARASITOLOGISTS

1998 MEMBERSHIP RENEWAL

Please consider this letter as notice for the payment of dues to the AAVP for 1998. Please complete the form and return it to me at the address below. Please pay your dues promptly. The success of the AAVP is at least in part dependent on fiscal survival.

PLEASE PRINT

Name_____
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The American Association of Veterinary Parasitologists

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October, 1998	September 20, 1998
February, 1999	January 20, 1999
June, 1999	May 20, 1999

Please contact the editor with questions regarding these dates.