FHS NEWSLETTER

FISH HEALTH SECTION - AMERICAN FISHERIES SOCIETY

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FHS PARTICIPATION IN THE AAVLD / USAHA ANNUAL MEETING

Scott LaPatra, President-Elect

During the Fish Health Section (FHS) annual meeting in Madison a discussion occurred in the EXCOM regarding FHS advocacy. After active debate, the members present at the annual meeting voted unanimously to support an active role for the FHS on issues of importance to the Section. My charge was to attend and participate in the One Hundredth Annual Meeting of the United States Animal Health Association (USAHA) and the Thirty-Ninth Annual Conference of American Association of Veterinary Laboratory Diagnosticians (AAVLD) in Little Rock, Arkansas, October 12-18. The USAHA is the most well established animal health organization that has approximately 1,400 members and works with a variety animal health entities both nationally, including the United States Department of Agriculture Animal Plant Health Inspection Service (USDA APHIS), and internationally. The FHS's objectives, interests and goals regarding animal health are very similar to the USAHA. The FHS has applied for membership in the USAHA as an Allied Organization so that we can provide leadership and expertise in aquatic animal health management and maintain visibility with other groups also concerned with animal health. That was part of my function while attending.

The purpose of the AAVLD, which works closely with the USAHA, is the dissemination of information relating to the diagnosis of animal disease, the coordination of the diagnostic activities of regulatory, research and service laboratories, the establishment of accepted guides for the improvement of diagnostic laboratory organizations relative to facilities, equipment and personal qualifications. Any laboratory worker engaged in the field of disease diagnosis in animals or in allied fields involving teaching, research, commercial or regulatory functions is eligible for membership. I am an individual member of the USAHA and the AAVLD as are other Section members.

Both the AAVLD and the USAHA have Aquaculture Committees chaired by Jerry Heidel (Oregon State University, Corvallis) and Bob Goetz (Keo Fish Farms, Arkansas), respectively. With the help of the committee chairs I was able to get on each committee's agenda and speak about the American Fisheries Society and the Section's mission and objectives. I also spoke about our programs including our annual and regional meetings, the FHS Newsletter and Journal of Aquatic Animal Health, the fourth edition (1994) of the "Bluebook," and our certification and continuing education programs. The message was that we represent the largest group of aquatic animal health professionals within the US and that we are willing to collaborate with other interested organizations. Our message was very well received in both committees. Additionally, I participated on an AAVLD Aquaculture Committee Subcommittee on Aquaculture Laboratory Accreditation chaired by Tom Baldwin (Washington State University, Pullman). The AAVLD has a laboratory accreditation process and, as many of you know, Dr. Baldwin supervises the first USDA-APHIS aquatic animal testing laboratory in the School of Veterinary Medicine at WSU which is accredited by AAVLD. However, Tom's laboratory is essentially

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only provisionally accredited; i.e. the aquatic animal health laboratory is accredited because Washington Animal Disease Diagnostic Laboratory is accredited. Currently AAVLD has no specific accreditation criteria for aquatic animal laboratories and no quality control testing for aquatic pathogens of regulatory concern. Tom's subcommittee has proposed working with the FHS to provide guidance to AAVLD and USDA APHIS on aquatic animal laboratory accreditation. An FHS committee will be formed to pursue this. The EXCOM also drafted a resolution that was presented to the USAHA Aquaculture Committee regarding "Health Inspections for Interstate Movements of Aquatic Animals" that read :

BACKGROUND INFORMATION: The individual states may regulate the movement/transportation of aquatic animals into their state, which creates a need to harmonize recognition of certifying officials for aquatic animal health inspections. Since the United States Fish and Wildlife Service (USFWS) certifies Title 50 Inspectors for salmonid fish and eggs, the American Fisheries Society (AFS) Fish Health Section (FHS) certifies Fish Health Inspectors and Fish Pathologists, and the United States Department of Agriculture Animal Plant Health Inspection Service Veterinary Services (USDA APHIS VS) accredits Veterinarians, there is a need to develop a national aquatic animal health management strategy and program that is consistent and equitable for commercial aquaculture industries and wild stocks of aquatic animals.

RESOLUTION: The USAHA resolves that inspections signed by an Accredited Veterinarian, an AFS FHS certified Fish Health Inspector or Fish Pathologist, or a USFWS certified Title 50 inspector for salmonids, should be equally recognized as having been produced by a competent authority that satisfies health inspection requirements for the interstate movement of aquatic animals. Our goal was to level the playing field for aquatic animal health inspections for interstate movements. The resolution passed the USAHA Aquaculture Committee and was forwarded to the USAHA Executive Committee where it also passed. The resolution has been forwarded by the USAHA Executive Committee to the appropriate agencies for comment. As responses become available they will be published in the newsletter.

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HOFFMAN IS ALIVE -- PARASITES OF NORTH AMERICA FISHES IS ALIVE

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Cornell University Press has officially accepted the completed revision for publication. A spring 1998 publication date is planned. The revised edition contains all that was in the 1967 edition plus covering additional literature through 1992 which was the manuscript cut-off date. There are 483 black and white figures and 32 in color. There has been some delay due to reviewing problems, the death of Glenn's beloved wife Carolyn, and Glenn's health problems.

For further information contact Cornell University Press, 512 East State St., Ithaca, NY, 14850. (607) 277-2338.

Submitted by Glenn L. Hoffman, Rt 3, Box 36, Kearneysville, WV 25430.

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Does Renibacterium salmoninarum Become Attenuated and Lose its Pathogenicity?

Authors:M. Randall White, DVM, PhD Diplomate, ACVP; Ching Ching Wu, DVM, PhD; Sharon R. Albregts, Animal Disease Diagnostic Laboratory, Purdue University, 1175-ADDLWest Lafayette, Indiana, 47907-1175

Much insight has been gained regarding Bacterial Kidney Disease, caused by *Renibacterium salmoninarum,* through the study of fish naturally infected with this bacterial agent. (1-4) Likewise, other studies have also been performed by experimental inoculation of non-infected fish with *Renibacterium salmoninarum.(* 5-8) In this paper, we report on three separate studies, whereby steelhead trout (*Oncorhynchus mykiss*) were exposed experimentally, at a dosage sufficient to cause disease, yet the fish remained clinically normal and minimal evidence of disease was detected.

In experiment 1, 75 fish were given a single intraperitoneal (IP) injection of 0.1 ml of a suspension of 1×10^7 bacteria per ml on day 0. In experiment 2, 75 fish were given a single IP injection of 0.1 ml of a suspension of 0.5×10^8 bacteria per ml on day 0 and in experiment 3, 75 fish were given a single IP injection of 0.1 ml of a suspension of 1.0×10^8 bacteria per ml on day 0. For each experiment, the inoculum was prepared from a subculture of *Renibacterium salmoninarum* which originated from a purchased stock culture (ATCC 33209). In each experiment, 5 fish were randomly captured on days 1, 3, 5, 7, 10, 14, 21, 28, 35, 42, 49, 56, 63, 70, and 77 post-infection, euthanized with an overdose of Finquel, necropsied, and samples collected for histopathology, FA, ELISA (DiagXotics), bacteriologic culture, immunohistochemistry and electron microscopy.

Throughout all of three experiments, fish were maintained in Living Streams (tanks with a water temperature of 12 C). Fish were fed to satiation with a commercial trout fish food and observed for clinical signs of illness twice daily. Water quality was monitored twice weekly throughout all three experiments and was within normal range for dissolved oxygen, pH, nitrate, nitrite and ammonia.

The diagnostic results of this experiment are summarized in Table 1. The majority of the positive data within the shaded region of Table 1 was collected within 10 days PI and 14 days PI for the ELISA and culture results, respectively. Since the FA test is the most subjective of the tests with positive results, the high percentage of positive results reported for this test, in experiment 1, most likely represent false positives, due to over-interpretation of the test.

Clinical evidence of disease never was observed in any of the fish in the three experiments. However, mild and non-specific histologic lesions were present in most fish in all three experiments. These histologic lesions were limited to the kidneys and consisted of renal tubular hyaline droplet degeneration, tubular mineralization and a membranous glomerulopathy which was progressive with the time course of the experiment. These lesions were easily confirmed and further characterized by electron microscopy. However, immunohistochemistry using an indirect procedure was negative and attempts to identify any bacteria within sections of kidney using electron microscopy were negative.

The results suggest that some fish in each experiment were infected with *Renibacterium salmoninarum* and were able to shed the organism but did not develop disease. In a previous experimental study, fish given similar dosages, and using the same injection technique, became clinically ill with BKD and the disease was confirmed by FA, ELISA, bacteriologic culture as well as histopathology. (8) The most likely explanation for the failure to cause disease following experimental infection in each of these three experiments is attenuation of the *Renibacterium salmoninarum in vitro* which led to a decreased pathogenicity *in vivo*. The attenuation may be attributed to loss of the capsule. A capsule of this bacterium has just recently been described,(9) and the property of auto-agglutination and hydrophobicity of this bacterial capsule has been shown to be a virulence factor.(10) Likewise, loss of hydrophobicity and auto-agglutination has been shown to be associated with avirulence of this bacterium, and can occur with subculturing.(10) Loss of plasmids are a common explanation for the alteration of capsular properties in some bacteria. However, plasmids have not been identified in R*enibacterium salmoninarum.* (11) In summary, loss of encapsulation or alteration of the bacterial capsule associated with decreased auto-agglutination and altered hydrophobicity results in decreased virulence of *Renibacterium salmoninarum* which may result in a transient infection in fish without clinical disease. More studies are necessary to determine other possible virulence factors associated with this bacterium in order to better understand the pathogenesis of this disease.

References:

1. Gudmundsdottir, S. et al. 1993. Detection of *Renibacterium salmoninarum* in salmonid kidney samples: a comparison of results using double-sandwich ELISA and isolation on selective medium. J Fish Dis. 16, 185-195.
2. Austin, B. Rayment, J. N. 1985. Epizootiology of *Renibacterium salmoninarum*, the causal agent of bacterial kidney disease in salmonid fish. J Fish Dis. 8, 505-509.
3. Banner, C. R. et al. 1986. Occurrence of salmonid fish infected with *Renibacterium salmoninarum* in the Pacific Ocean. J Fish Dis. 9, 273-275.
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5. Moffitt, C. M. 1992. Survival of juvenile chinook salmon challenged with *Renibacterium salmoninarum* and administered oral doses of erythromycin thiocyanate for different durations. J Aqua Anim Health 4, 119-125.
6. Sami, S. et al. 1992. Immune complex-mediated glomerulonephritis associated with bacterial kidney disease in the rainbow trout *(Oncorhynchus mykiss)*. Vet Path 29, 169-174.
7. McCarthy, D. H. et al. 1984. Immunization of rainbow trout, *Salmo gairdneri* Richardson, against bacterial kidney disease: preliminary efficacy evaluation. J Fish Dis 7, 65-71.
8. White, M. R. et al. 1995. Comparison of diagnostic tests for bacterial kidney disease in juvenile steelhead trout (*Oncorhynchus mykiss*). J Vet Diag Invest 7, 494-499.
9. Dubreuil, D. et al. 1990. Immunoelectron microscopic demonstration that *Renibacterium salmoninarum* is encapsulated. FEMS Micro Let 66, 313-316.
10. Bruno, D. W. 1988. The relationship between auto-agglutination, cell surface hydrophobicity and virulence of the fish pathogen *Renibacterium salmoninarum*. FEMS Micro Let 51, 135-140.
11. Toranzo A. E. 1983. Characterization of plasmids in bacterial fish pathogens. Infect and Immun 184-192.

Table 1. Test results of experiments 1,2 and 3 using experimental infection of steelhead trout with *Renibacterium salmoninarum.* Results are expressed as a percentage of total positive from each experiment. See text for explanation of shaded area.

	Experiment number:		
	1	2	3
Test:			
FA	100	6	0
Culture	5	32	36
ELISA	0	25	18
Immunohistochemistry	0	0	0
ElectronMicroscopy	0	0	0

ANNOUNCEMENTS

AQUACULTURE APPLICATION OF CONTROLLED DRUG AND VACCINE DELIVERY

An International Congress on the improvement of bioavailability and on the administration methods of therapeutic and prophylactic tools including sanitary measures in the fight against infectious diseases of farmed aquatic animals, will be held from **May 21 to 23, 1997,** in Udine, Italy. The theme is of great interest because of the possibility of many applications in the near future. The official language of the Congress, organised with E.E.C. contribution, will be English. There will be an introductive lecture for every theme followed by specific sessions of oral communications of 15 minutes with discussion, and posters. At the end of the Congress, it is scheduled a final Round Table.

For further information, that you will find anyway in the "First Announcement and Call for Papers", near to be published, please contact:

Prof. G. Giorgetti - Dr. A. AmadeiDipartimento di IttiopatologiaIstituto Zooprofilattico delle VenezieVia della Roggia, 94-33030 Basaldella di Campoformido (UD), Italy
Tel. 0039/432/561196-561532; FAX 0039/432/561532

or Dr. I. RoelantsZoological Institute of the University of LeuvenDe Berlotstrasse 32, B - 3000 Leuven, Belgium
Tel 0032/16/323710; FAX 0032/16/394575

MORE ANNOUNCEMENTS

First Call For Papers, Catfish 2000, the First International Ictalurid Symposium

The Program Committee for the First International Ictalurid Symposium invites contributed papers for this conference scheduled for **June 23-28, 1998** in Davenport Iowa (Quad Cities area of Illinois-Iowa). Sessions will cover biology and management of channel, flathead, blue, and white catfish, as well as smaller members of the family. We especially solicit presentations that focus on: population dynamics including age-growth, recruitment, reproduction, and mortality; assessments of stockings of public waters; genetic relationships among catfishes; catfish behavior and sensory capabilities; movement and migration studies; population characteristics in large rivers, streams lakes, and reservoirs; human dimensions including socioeconomic analyses, angler attitudes, competitive fishing, and edibility and consumption advisories; sampling techniques; effects of rod-and-reel angling, non-angling techniques of fishing like "noodling," and non-rod-and-reel methods including limblines, trotlines, and jug fishing; commercial fisheries; habitat requirements; effects of habitat alteration on populations; and harvest management through regulations. The Committee will consider all submissions; however, The Committee recognizes that some studies may not yet be completed but abstracts should be as definitive as possible. Papers may report results of recent investigations or cover topics from a historical perspective, or review a topic (review papers). In all cases, authors should relate their results to the broader literature. Please submit abstracts ranging in length from 150 to 350 words that may be typed or sent electronically via FAX, modem, or email.

Send enquiries and submissions to Steve Eder, Missouri Department of Conservation, by February 1, 1997. Hard Copy: PO Box 180, Jefferson City, MO 65109-0180 E-mail: eders@mail.conservation.state.mo.us FAX: 573/526-4047

Acceptance of abstracts will be based on review by the Program Committee and outside reviewers. Once abstracts are accepted, first-draft manuscripts will be due by January 15, 1998. Manuscripts will be peer reviewed by experts in the field. Papers accepted and presented will be published in a hard-cover proceedings that will serve as a major reference for catfish researchers in the 21st century.

7th Congress of the International Society of Developmental and Comparative Immunology

July 21-25, 1997, Williamsburg, VA hosted by College of William and Mary, School of Marine Science, Virginia Institute of Marine Science .Contact: **Stephen Kaattari,** VIMS, PO Box 1346, Gloucester Point, VA 23062. 806-642-7362, fax 804-642-7186, E-mail Kaattari@vims.edu.

EASTERN FISH HEALTH WORKSHOP

For information concerning the 1997 Eastern Fish Health Workshop, please contact Rocco Cipriano, NFHRL, 1700 LEatown Rd, Kearneysville, WV 25430 , phone 304-725-8462 or E-mail Rocco Cirpiano@nbs.gov

EVEN MORE ANNOUNCMENTS

Third International Symposium on Aquatic Animal Health

August 30 -September 3, 1998 Baltimore, Maryland, USA

The 3rd International Symposium on Aquatic Animal Health will be held in Baltimore on the east coast of the USA from August 30 until September 3, 1998. The symposium will be the first major international meeting to focus comprehensive presentation and discussion on the health of a diversity of aquatic animals including shellfish, fish and marine mammals.

The symposium will be sponsored by the American Fisheries Society -Fish Health Section, Asian Fisheries Society, European Association of Fish Pathologists, International Association for Aquatic Animal Medicine, Japanese Society of Fish Pathology, and the National Shellfisheries Association. The meeting is supported by the John Hopkins University and the University of Maryland at Baltimore.

For further information please contact: Dr. Sarah L. Poynton, Division of Comparative Medicine, John Hopkins University School of Medicine, Ross Research Building 4th Floor, 720 Rutland Avenue, Baltimore, MD 21205 USA, ph: (1) 410-955-3273, Fax: (1) 410-550-5068, E-mail: spoynton@welchlink.welch.jhu.edu.

DIRECTORY UPDATE—EXTENDED DEADLINE

It has been over 5 years since the FHS Directory has been updated. Please type or print the requested information on the form included in this issue of the Newsletter by April 30,1997 and either put a stamp on it, and mail it to Larisa Ford or FAX it to her at 208-885-9080.

Thank you, Jim Winton

POSITIONS AVAILABLE

LOUISIANA STATE UNIVERSITY Post-Doctoral Research Associate

A position is available immediately to compare the immune response of channel catfish to killed and live attenuated bacterial vaccines, and to evaluate the effect of the immune response on bacterial pathogenesis. Studies will emphasize comparative humoral, cell mediated, and mucosal responses to *Edwardsiella ictaluri.* A strong background in cellular/mucosal immunity is desired. Submit a curriculum vitae, statement of research interests, and the names of three references to: Dr. Ronald Thune, Department of Veterinary Science, Louisiana State University Agricultural Center, Baton Rouge, LA 70803. FAX 504-346-3308; E-mail thune@vt8200.vetmed.lsu.edu.

LOUISIANA STATE UNIVERSITY Graduate Research Assistantship

A position is available immediately to support graduate studies (MS or PhD) concerning the immune response of fish to killed and/or live attenuated bacterial vaccines, and to evaluate the effect of the immune response on bacterial pathogenesis. Studies will emphasize comparative humoral, cell mediated, and mucosal responses. Submit a resume, statement of research interests, and transcripts to: Dr. Ronald Thune, Department of Veterinary Science, Louisiana State University Agricultural Center, Baton Rouge, LA 70803. FAX 504-346-3308; E-mail thune@vt8200.vetmed.lsu.edu

Zoosporulation of the Rosette Agent

Kristen Arkush, University of California, Bodega Marine Laboratory,
P.O. Box 247, Bodega Bay, CA 94923

A systemic protist, the rosette agent, was isolated from infected captive broodstock of the Sacramento River winter run chinook salmon in 1993. Infected kidney tissue from an adult salmon was incubated with the chinook salmon embryo cell line (CHSE-214) at 15°C and the rosette agent has been continuously maintained since initial isolation in *in vitro* cultures of CHSE-214 cells. In natural infections, the organism is found systemically, and can replicate in epithelial, mesenchymal, and hematopoietic cells. In both cell culture and natural hosts, two distinct morphological types have been detected, either 2-4 μm (non-dividing) or 4-6 μm (dividing) in diameter. The rosette agent has been detected singly or in aggregates within the cytoplasm of biliary and renal tubular epithelium as well as within the lumina of bile ductules and renal tubules, suggesting that bile and urine are routes of excretion and potential sources of horizontal infection.

Recently, we were able to induce another, previously undescribed form of the rosette agent by incubating *in vitro* cultures of the organism in distilled water. Three 150 cm^2 tissue culture flasks containing 28-day old (28 days since last passage) cultures of infected CHSE-214 cells, in minimal essential media supplemented with 7.5% fetal bovine serum, 5000 IU penicillin, 5000 mg streptomycin, and L-glutamine (MEM-7.5), were used. The supernatant, containing cell-free parasites, and the infected monolayer were separated from each flask. The monolayers were trypsinized, and centrifuged at 1200xg for 2 min. The supernatant was centrifuged at 1200xg for 10 min. Pelleted material from either the infected monolayers or supernatant were combined from the three flasks and then divided equally into four parts. These were centrifuged a final time, and resuspended in either MEM-7.5 (pH 7.5), phosphate buffered saline (PBS; pH 7.4), or distilled water (pH 6.4). Separately, both the cell-free and cell-associated parasites were added to 25 cm^2 flasks containing one of the media types. Samples incubated in MEM-7.5 but in the absence of CHSE-214 cells were sonicated to remove any host cells. As a control, CHSE-214 cells were added to one pair of flasks containing the parasites in MEM-7.5, enabling continued intracellular propagation. All flasks were held at 15°C.

Those CHSE-214 cells present in the cell-associated samples that were transferred to distilled water burst from osmotic stress and those placed in PBS remained rounded and did not divide. By 7 days, both the cell-free and cell-associated rosette agent cultures in distilled water had begun to zoosporulate, producing small, very active zoospores. The body was approximately 1-2 um in diameter, with a flagellum of approximately 10 um. By 20 days, nearly all of the cell-associated organisms had undergone zoosporulation and no more motile zoospores were detected. Zoosporulation continued for up to 23 days in the cell-free cultures in distilled water. Fewer of the parasites underwent zoosporulation in the cell-free cultures, suggesting that perhaps some of the organisms were no longer viable. This explanation seems reasonable, since the culture source was 28 days old at the time the parasites were collected. For 30 days, no zoospores were ever detected from either cell-free or cell-associated preparations in MEM-7.5 alone, MEM-7.5 plus CHSE-214 cells, or PBS. In the flasks containing MEM-7.5 plus CHSE-214 cells, the monolayers were infected with aggregates of both 2-4 um and 4-6 um organisms, seen both

intracytoplasmically and attached to the cell surface.

When *in vitro* cultures of the rosette agent were again placed in distilled water, zoosporulation was detected as early as 3 days post transfer. Interestingly, organisms placed in sterile, artificial sea water have not undergone zoosporulation in 29 days (as of this writing). Zoospores have been prepared for both scanning and transmission electron microscopy, to enable detailed structural analysis.

Uniflagellated zoospores of another fish parasite, *Dermocystidium salmonis*, have been shown to be infectious (Olson et al., 1991). The zoospore stage of the shellfish pathogen *Perkinsus marinus* has also been shown to infect oysters in laboratory experiments (Chu, 1996). To determine if the motile stage of the rosette agent is infectious, we are currently challenging chinook salmon fry with zoospores.

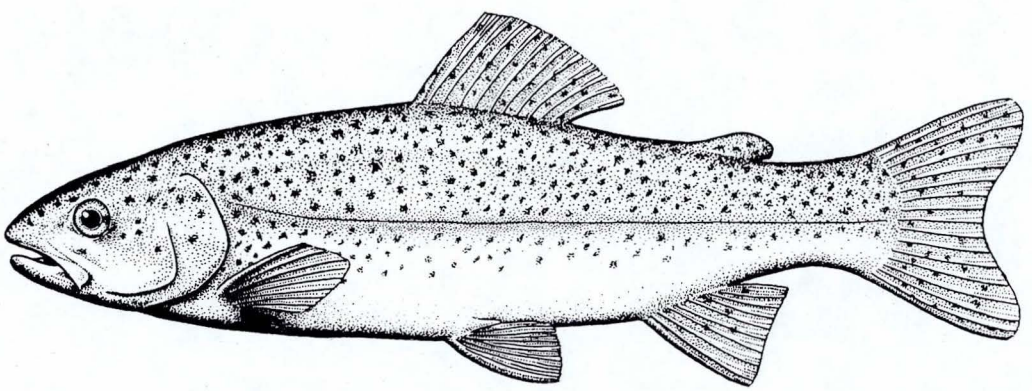
We have developed primers to amplify a 518 bp product from the small subunit ribosomal RNA gene of the rosette agent. When DNA from the oyster pathogen *P. marinus* is used as a template, some amplification occurs (relative to rosette agent DNA), producing a product of approximately 500 bp. Preliminary evaluation of full sequences of the genomic DNA encoding the small subunit ribosomal RNA of the rosette agent (Kerk et al., 1995) and *P. marinus* (Fong et al., 1993), reveal that the organisms share 77.1% homology, when aligned using the Higgins-Sharp algorithm (CLUSTAL4). This molecular evidence, combined with the observation of a flagellated zoospore, suggest that the rosette agent shares an evolutionary history with organisms as diverse as *Dermocystidium* spp. described from fish and *Perkinsus* spp. from oysters.

Chu, F-L.E., 1996. Laboratory investigations of susceptibility, infectivity, and transmission of *Perkinsus marinus* in oysters. Journal of Shellfish Research 15(1):57-66.

Fong, D., Rodriguez, R., Koo, K., Sun, J., Sogin, M.L., Bushek, D., Littlewood, D.T.J., and S.E. Ford. 1993. Small subunit ribosomal RNA gene sequence of the oyster parasite *Perkinsus marinus*. Molecular Marine Biology and Biotechnology 2(6):346-350.

Kerk, D., Gee, A., Standish, M., Wainwright, P.O., Drum, A.S., Elston, R.A., and M.L. Sogin. 1995. The rosette agent of chinook salmon (*Oncorhynchus tshawytscha*) is closely related to choanoflagellates, as determined by the phylogenetic analyses of its small ribosomal subunit RNA. Marine Biology 122:187-192.

Olson, R.E., Dungan, C.F., and R.A. Holt. 1991. Water-borne transmission of *Dermocystidium salmonis* in the laboratory. Diseases of Aquatic Organisms 12:41-48.



WESTERN FISH DISEASE WORKSHOP
June 18-20, 1997
Bodega Bay, CA

HOSTS: University of California, Bodega Marine Laboratory
California Department of Fish and Game

LOCATION:
The workshop will be held at the University of California, Bodega Marine Laboratory, a research facility located on a 362-acre biological reserve in Bodega Bay, approximately 65 miles from the San Francisco International Airport. From the airport, take 101 North, across the Golden Gate Bridge to Petaluma. Take the Washington/Central Petaluma Exit, and continue on Washington Avenue heading West. This road becomes Highway 1 at Valley Ford, and continues to the town of Bodega Bay. In Bodega Bay you will drive past the Tides Restaurant and through a sharp hairpin turn. After the hairpin turn you will come to an intersection with Eastshore Road, you will see a sign for Bodega Head, Marinas, and Westside Park. Turn left onto Eastshore Road, then right at Bay Flat Road, and drive around Bodega Harbor past Spud Point Marina and Westside Park. BML Housing is approximately 1/4 mile beyond Westside Park, on the right. The main gate to the laboratory is about 1/4 mile further along Bay Flat Road.

REGISTRATION:
The Continuing Education Session on DISEASES OF MARINE INVERTEBRATES will be conducted on Wednesday, June 18 by Carolyn Friedman of the California Department of Fish and Game. Registration is $15.00 which includes a half-day laboratory session with microscopes available for examination of slides. Enrollment is limited to 40 participants. The lecture/laboratory session will cover normal marine invertebrate gross anatomy and histology, and selected infectious diseases of aquaculturally important species.

The Western Fish Disease Workshop Technical Session will be conducted Thursday, June 19 and Friday, June 20. Registration is $50.00, which includes two lunches and all coffee breaks during the workshop, as well as a social gathering on Wednesday evening. A separate ticket can be purchased for dinner on Thursday evening at $15.00 per person. You must register in advance by sending a check or money order along with the enclosed registration form **by April 30, 1997** to: Kristen Arkush, UC Bodega Marine Laboratory, P.O. Box 247, Bodega Bay, CA 94923. Please make checks payable to Bodega Marine Laboratory. Receipts will be available at the workshop.

During the workshop, tours of the Bodega Marine Laboratory, including the Winter-Run Chinook Captive Broodstock Project rearing facilities, will be provided by staff members.

LODGING:
Bodega Bay is a popular summer destination, and lodging can be difficult to find, so be sure to make your reservations as early as possible! A block of rooms has been reserved at two hotels. At the Bodega Coast Inn, 35 rooms are available at a rate of $85.00 single or $95.00 double occupancy, but **you must place your reservation by May 1**. Contact the Bodega Coast Inn

directly at (707) 875-2217. At the Inn at the Tides, 35 rooms have been held at a rate of $110 per night. Contact the Inn at the Tides at (707) 875-2751 to **make your reservations by May 17.** To offset costs for student attendees (or anyone with limited travel funds), several dormitory-style rooms will also be provided at BML Housing. Single occupancy rates range from $14.00-$16.00, and double occupancy rates from $16.00-$20.00. Please contact Missy Ragland at BML to confirm at (707) 875-2002.

AIR TRAVEL:
You may fly into the San Francisco International Airport, Oakland Airport, or the Santa Rosa Airport. No public transportation services are available to Bodega Bay, so it is best to rent a car or to car pool.

FOOD:
Lunch and coffee breaks will be provided during the technical session. The cost of registration will include these services plus a social gathering on Wednesday evening. A separate ticket will be offered for the cost of the dinner on Thursday evening, and family members/guests can also attend by purchasing tickets in advance.

OTHER ACTIVITIES:
Bodega Marine Laboratory is located on the northern California coast. Enjoy the wine country in Sonoma or nearby Napa. Beaches, redwood forests, and coastal hiking trails are all within a short driving distance. Enjoy the workshop, then stay a few extra days and treat yourself and your family to a summer getaway!

INFORMATION:
If you need further information, please contact the workshop coordinators, Kristen Arkush at (707) 875-2062, kdarkush@ucdavis.edu, or Bill Cox at (916) 358-2829.

**********NOTICE**********

National Fish Health Reseach Laboratory

Dr. Roger Herman retired on December 28th, 1996 as Director of the National Fish Health Research Laboratory, Leetwon, WV. The position will be filled in the next few months. Anyone interested or with questions, please contact:

Vicki Blazer, phone 304-725-8461 x 350 or E-mail Vicki_Blazer@nbs.gov