FHS NEWSLETTER

FISH HEALTH SECTION - AMERICAN FISHERIES SOCIETY

Volume 24, Number 2 Page 1 April, 1996

In Vitro Effects of T-2 Toxin and Ochratoxin A on Pronephric Cells of Carp, *Cyprinus carpio*

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All Russian Research Institute of Pond Fisheries, Moscow Province, Dmitrov Region, Rybnoe, RUSSIA 14182

The important roles of mycotoxins in producing pathology in animals, including fish, have been reported by scientists around the world. Mycotoxins are secondary metabolites of microscopic fungi that affect the ingredients of animal diets. Mycotoxins not only cause toxicosis in humans and animals, but also predispose individuals to agents of infectious disease. Specifically, one of our recent studies showed that T-2 toxin (a metabolite of *Fusarium*) and Ochratoxin A (a metabolite of *Aspergillus*) contamination in carp diets was accompanied by increasing susceptibility of carp to Motile Aeromonad Septicemia. These results served as a pretext for carrying out our study concerning the influence of various concentrations of T-2 toxin and Ochratoxin A on the carp pronephric cells *in vitro*. The results presented here are just a component of a detailed study we are conducting on the effects of natural mycotoxins on the immune status of fish.

Materials and Methods

All experimental procedures were performed using sterile technique and incubations were performed at room temperature (approximately 20° C). Standard concentrations of T-2 toxin (Sigma Chemical Company, St. Louis, MO, USA) were prepared and diluted to give experimental concentrations of 300, 200, 100 and 50 µg/ml. For Ochratoxin A, concentrations used in this study were 500, 400, 300 and 200 µg/ml.

The pronephros of two year old carp were used as the source of cells and carp serum was used as the culture medium. The cells of the pronephros were separated using a discontinuous density gradient described by McDowall et al. (1987). Briefly, a stock solution of 35% bovine serum albumin (BSA) in Leibovitz medium was prepared and sterilized. Using the BSA, the discontinuous density gradients were set up in centrifuge tubes. The pronephros was homogenized and then the cells were suspended in culture medium and carefully layered over the BSA gradient. The gradient was centrifuged at 20,000 *g* for 30 min at 4°C. The distribution of cell types for each resulting fraction is listed in Table 1.

Table 1. Distribution of blood cells (listed as % of total cell counts) of each carp pronepheric cell fraction obtained by density gradient centrifugation.

Fraction	Granulocytes	Lymphocytes	Erythrocytes
1	8	71.38	0
2	46.25	41.58	1
3	59.25	30.25	3.5

Equal volumes of pronephric cells from different fractions were added to glass tubes containing the various concentrations of T-2 toxin or Ochratoxin A. Cell viability of each tube was determined by the 1% trypan blue dye exclusion test after 1, 2.5, 4.5, 6.5 and 22 hours incubation with T-2 toxin and 1, 3.5, 5.5, 7 and 22 hours incubation with Ochratoxin A.

Results

In general, the total number of viable, carp pronephric cells from the first and third fractions of the density

IN THIS ISSUE:

gradient, decreased after a 22 hour incubation with T-2 toxin regardless of mycotoxin concentration (Figure 1a and c). Viability of cells in control tubes (0 µg/ml T-2 toxin), however, also decreased. Viability of cells from fraction 1 that were incubated with 300 µg T-2 toxin/ml was significantly lower than that of cells incubated without T-2 toxin. At 300 µg/ml, the total number of cells decreased from 32 X 10^3 cells/ml after 1 hr to only 18 X 10^3 cells/ml after 22 hrs which means that only 56% of the cells remained viable. At all other T-2 toxin concentrations, survival of cells after 1 hr to 22 hr incubation with toxin was above 75% regardless of which cell fraction was considered. In fact, viability of cells from fraction 2 did not appear to be adversely affected at any of the T-2 toxin concentrations tested (Figure 1b).

For cells from fraction one incubated with Ochratoxin A, the viability of cells was decreased after 1 hr incubation with concentrations of 200, 300 and 400 µg Ochratoxin A/ml (Figure 2a). By 22 hrs, the viability of cells exposed to each concentration including 500 µg/ml was significantly reduced compared to the control cells. Viability of cells from fraction 2 was significantly reduced only at the 500 µg Ochratoxin A/ml concentration at both 1hr and 22 hr incubation samples (Figure 2b). For the third cell fraction, after 1 hr exposure to Ochratoxin A at 200, 300 and 500 µg/ml, significant decreases in viable cell numbers were noted. However, after 22 hr incubation significant differences from the control cell viability were no longer detectable (Figure 2c).

Figure 1. Total number of carp pronephric cells after exposure to T-2 toxin for 1 hr and 22 hr.

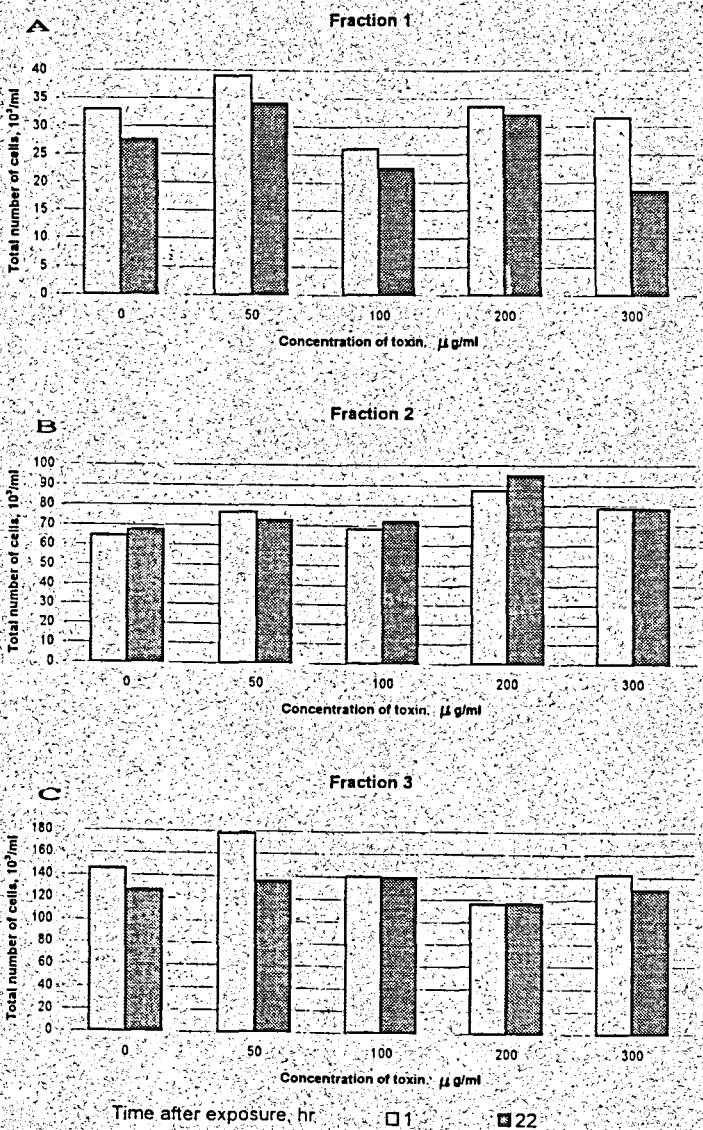
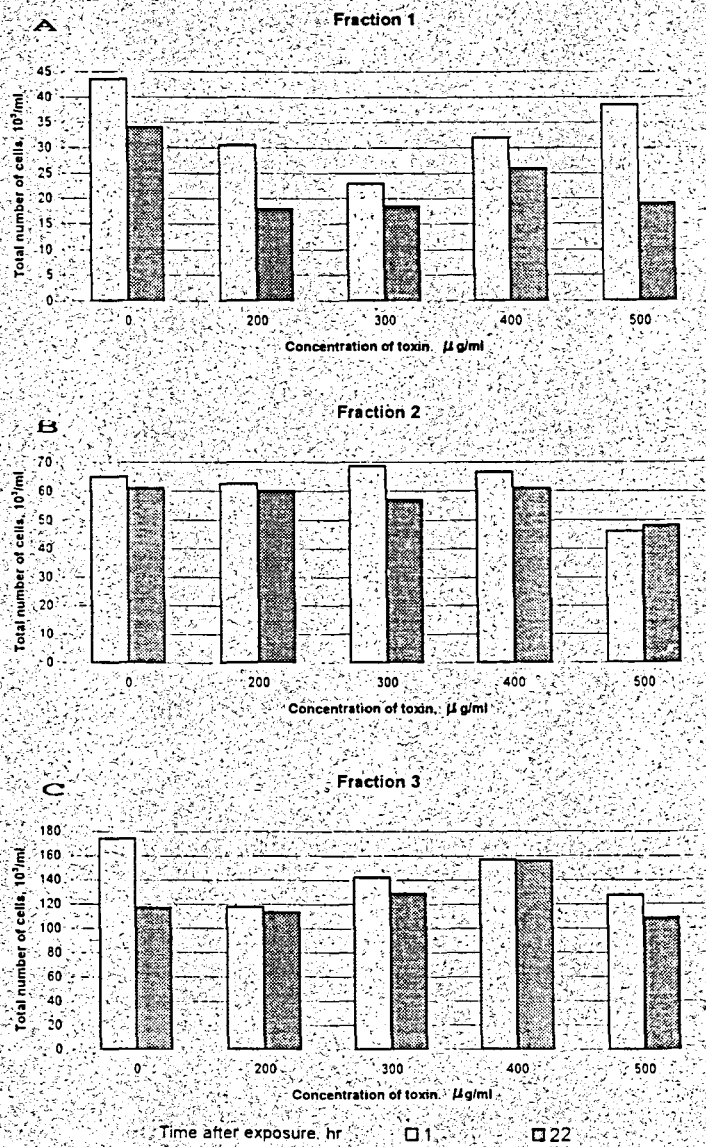
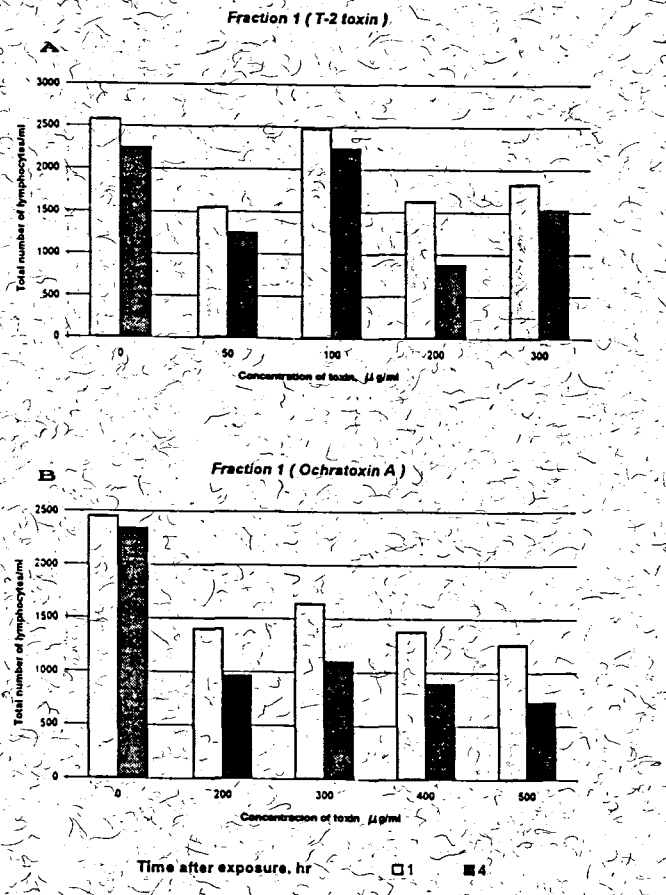


Figure 2. Total number of carp pronephric cells after exposure to Ochratoxin A for 1 and 22 hr.



The influence of T-2 toxin and Ochratoxin A on the viability of lymphocytes (the primary cells of fraction 1 as discussed above) is important to consider when measuring the effects of mycotoxins on immune functions. Therefore, in another experiment, the changes in total number of viable lymphocytes from fraction 1 cells were calculated after 1 and 4 hrs exposure to both toxins using the otherwise same experimental design mentioned previously. Viable lymphocyte numbers decreased sharply after 1 hr exposure to T-2 toxin at 50, 200 and 300 µg/ml and remained significantly lower than the control cell counts after 4 hrs (Figure 3a). After exposure to Ochratoxin A, viable lymphocyte counts at all concentrations tested decreased significantly from the controls at both sampling periods (Figure 3b).

Figure 3. Total number of lymphocytes from the pronephros of carp after exposure to T-2 toxin and Ochratoxin A for 1 and 4 hr.



Discussion

Our study demonstrated that at all concentrations tested, T-2 toxin and Ochratoxin A had a toxic effect on some populations of carp pronephric cells. Both mycotoxins caused a pronounced decrease in the total number of pronephric cells from the first density gradient fraction which was composed mainly of lymphocytes. From cells in fractions 2 and 3 (primarily granulocytes and erythrocytes), dramatic changes in the total number of viable cells were not noted for either mycotoxin. The results from the lymphocyte viability experiment support the results from the first set of experiments, in that the lymphocyte population was damaged by both mycotoxins.

Further investigations on the changes in cell morphology of the pronephric cells exposed to mycotoxins also supported these results. We noted karyorrhexis in juvenile and mature lymphocytes from fraction 1. Also, complete cell lysis was commonly found in cells from fraction 1 after exposure to the toxins. Karyorrhexis, pyknosis and degeneration of cytoplasm were noted in immature neutrophils from fractions 2 and 3 but at a lower frequency.

The cytotoxical influence of mycotoxins appears to be directed at the lymphocyte population of carp pronephric cells. The profound pathological changes in pronephric lymphocytes and to some degree the granulocytes indicates that these cells probably lost their ability to function. The decrease in immune cell numbers and functions would directly relate to the decreased immune status of carp exposed to T-2 toxin and Ochratoxin A; and therefore, put the carp at an increased risk to become infected by opportunistic or secondary microbial agents.

References:

Galash, V.T., Marchenko, A.M. 1987. Trichothecene mycotoxins effect on carp. In: Questions of fish parasitology and pathology. Science Academy of USSR, Leningrad, 171: 135-148.

Galash, V.T., Marchenko, A.M., Victorova, V.F. 1988. Dropsy and gill necrosis signs in carp and their causes under experimental trichothecene mycotoxicosis. In: Fish resources of water bodies in Moldavia and their usage. Kishinev, pp. 104-113.

McDowall, A.A., Healey, L.J., Manning, J. 1987. Separation of carp, *Cyprinuscarpio*L., pronephric cells on discontinuous bovine serum albumin density gradients. Journal of Fish Biology 31: 227-229.

SECOND CALL FOR PAPERS

This is the second call for papers for the American Fisheries Society Fish Health Section meeting to be held at the University of Wisconsin-Madison's Wisconsin Center on August 7-9, 1996. Co-sponsored by the Bureau of Fish Management, Wisconsin Department of Natural Resources and the La Crosse Fish Health Center, U.S. Fish and Wildlife Service.

ABSTRACT SUBMISSION INSTRUCTIONS

Please type the abstract on the attached abstract form, keeping all printed material within the "Box". Please note: (1) the title should be capitalized; (2) use superscript numbers, if necessary, to denote affiliation of authors; (3) place an asterisk (*) following the author who will make the presentation; and (4) please use a high quality printer. You may also submit abstracts in the above format on computer disks utilizing WordPerfect. **Please no faxed abstracts.**

Please complete the following form and submit it with your abstract by June 7, 1996 to:

La Crosse Fish Health Center
U.S. Fish and Wildlife Service
555 Lester Avenue
Onalaska, WI 54650
Attn: Becky Lasee

I am submitting an abstract for the Fish Health Section Annual Meeting.

Name _____

Address _____

_____

Title _____ Telephone _____

I prefer that my presentation be: an oral presentation _____ a poster _____
I will be using: overheads _____ slides _____

Any questions regarding meeting program can be directed to Terry Ott, Becky Lasee or Richard Nelson at the La Crosse Fish Health Center, 608/783-8444 (Fax: 608/783-8450).

ABSTRACT

AMERICAN FISHERIES SOCIETY FISH HEALTH SECTION MEETING

MADISON, WI

AUGUST 7-9, 1996

HOST-PARASITE RELATIONSHIPS BETWEEN BROOK TROUT SALVELINUS FONTINALIS AND SALMINCOLA EDWARDSII (COPEPODA). Becky A. Lasee[1]*, John D. Noble, Jr.[2] and Richard C. Nelson[1], [1]U.S. Fish and Wildlife Service, Fish Disease Control Center, La Crosse, WI 54602-1595 and [2]Department of Army, Natural Resources Management Division, Fort McCoy, Sparta, WI 54656-5000.

Several streams located within the boundaries of the Fort McCoy military installation support healthy feral brook trout populations. Anglers at the fort reported that numerous brook trout were infected with "gill maggots." The purpose of this study was to

The 19th American Fisheries Society Fish Health Section Meeting

The 1996 AFS Fish Health Section Meeting will be held August 6-9 at the Wisconsin Center on the University of Wisconsin campus in Madison, WI. Registration will be the evening of August 6, formal papers will be presented August 7 and 8, and a continuing education workshop on hematology will be held from 8 am to 2 pm on August 9. The meeting is co-sponsored by the Wisconsin Department of Natural Resources and the USFWS LaCrosse Fish Health Center. In these times of reduced budgets and downsizing of state and federal governments, we have tried to keep costs as low as possible, hoping this will encourage attendance and participation. Madison is a great place to spend a few days, especially during the summer. We've also included a small pitch for the Department of Tourism-what a great idea to combine a professional meeting with your family vacation!

The Program

The program (papers, posters, etc.) will be organized by the LaCrosse Fish Health Center; registration and local arrangements will be handled by the Wisconsin DNR. All presentations will be at the Wisconsin Center, 702 Langdon St. (608) 262-0881 (The phone number is only listed as a way for people to contact you at the conference; the Center staff **will not** be handling any part of registration so please do not call them).

Lodging

Hopefully we have something for every budget: Twenty-five rooms have been reserved at the Edgewater Hotel (608) 256-9071 which is two blocks from the Wisconsin Center. Rates at the Edgewater are the same for a single or a double- $85.00 (yes, it is the tourist season). A list of other hotels within walking distance is attached, however a block of rooms could not be reserved (individual rooms may be available).

As is the case on most campuses, staying at a dorm is a less costly lodging alternative. The Elizabeth Waters dorm is available to us from August 6 through August 9. The rooms are air conditioned, linens are furnished, and there is a cafeteria for breakfast. Smoking is not allowed in this dorm. It is about a 15 minute walk from the dorm to the Wisconsin Center. A separate registration form is attached for those who plan to stay at the dorm. When you arrive, rooms may be charged (Mastercard, Visa), paid by check (U.S. currency/U.S. Bank), traveler's checks, or cash. **There is a July 1 deadline for dorm reservations.**

Transportation

Madison has a moderately sized airport for direct flights; it may be less expensive flying into Chicago's O'Hare airport and taking the Van Gelder bus to Madison- the bus stops at the Memorial Union which is just a few blocks from the dorms and the Edgewater Hotel; Madison is located at the confluence of Interstates 94 and 90 for those who plan to drive. If you fly into Madison, the Edgewater has a limo service available from 3 p.m. Sunday to 4 p.m. Friday. Call (1-800-922-5512) to make arrangements; cabs are available for those staying at the dorm.

Registration/Social

Registration will begin on Tuesday night (August 6) from 7 to 9 pm at the Wisconsin Center. During this time, a cash bar will be available as will various hors d'oeuvres. Registration will continue on Wednesday morning (7:30 to 8:30 am) just outside our conference room.

Banquet

The banquet is Wednesday night (August 7). We plan to give you a taste of Wisconsin, outdoor picnic style- brats, grilled chicken/steak sandwiches, all the other "stuff", preceded by a social hour/cash bar. This is the only meal that we will eat together. Lunches and Thursday dinner are on your own. Madison has a wide variety of ethnic restaurants/food carts within walking distance of the Wisconsin Center.

Other Options for Lodging Near the Wiconsin Center

Hotels listed on the map — area code 608

- The Concourse 257-6000
  1 West Dayton St.
- The Edgewater 256-9071
  666 Wisconsin Ave.
- Howard Johnson Plaza Hotel 251-5511
  525 West Johnson St.

Inn on the Park–Best Western 257-8811
22 South Carroll (Capitol Square)

- The Inntowner–Best Western 233-8778
  2424 University Ave.

Madison Inn 257-4391
601 Langdon St.

Memorial Union 262-1583
800 Langdon St. at Park St.

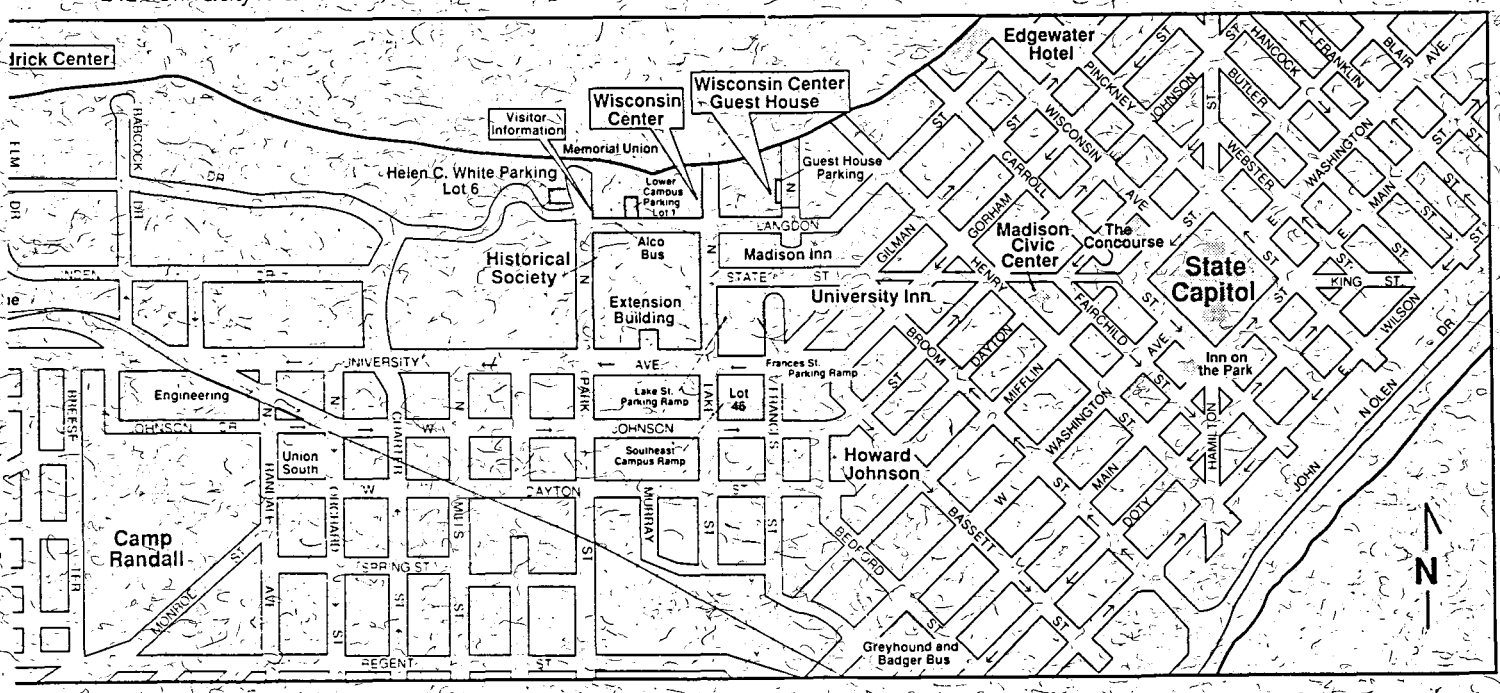
University Inn 257-4881
441 N. Frances St. (at State St.)

Union South 263-2600
227 North Randall

Wisconsin Center Guest House (Lowell Hall) 256-2621
610 Langdon St.

Shuttle service available from these hotels to campus meeting facilities.

University and Downtown Area



CONTINUING EDUCATION

How's Your Hematology? The Continuing Education Committee is sponsoring a class on **HEMATOLOGY** in conjunction with two meetings this summer. The first time will be June 25, the day preceding the Western Fish Disease Workshop in Corvallis, OR. The second will immediately follow the Fish Health Section annual meeting in Madison, WI on August 9. Both times the class will consist of about four morning hours of illustrated lecture followed by an informal afternoon lab session for microscopic examination of slides. The class in Corvallis will be taught by Mike Kent and Charlie Smith; Colleen Caldwell and Mike Kent will be the instructors in Madison. Subjects covered will include fish blood cell types, morphology, function, hematopoiesis, physiological and chemical measurements of blood, sample collection and staining, and changes induced by stress pathogenic diseases and toxins. In addition to the lab materials provided, participants are invited to bring slides of their own to share. Registration for either class is $20.00 and should be submitted along with your meeting registration. Facility space will limit the number of participants that can be accomodated so early registration is encouraged.

As an added bonus to the Corvallis class, Jo Ann Leong and Jim Winton will give us an overview of PCR techniques and their application to fish health testing.

**********MEETINGS**********

May, 1996

Forest-Fish Conference: Land Management Practices Affecting Aquatic Ecosystems. ***May 1-4.*** For more information contact: Kerry Brewin, Conference Steering Committee, c/o Trout Unlimited Canada, Box 6270, Station D, Calgary, AB CANADA, T2P 2C8; Phone: 403-221-8369; Fax: 403-221-8368.

International Association for Aquatic Animal Medicine. ***May 11-15.*** Comfort Hotel River Plaza, 407 Chestnut St., Chattanooga, TN 37402 (615-756-5150). For general questions regarding the meeting contact: Jackson Andrews, Tennessee Aquarium, P.O. Box 11048, Chattanooga TN 37401-2048 USA. Phone: 423-785-4006, Fax: 423-267-3561, Email: JCA@tennis.org.

June, 1996

International Symposium on Fish Vaccinology. ***June 5-7.*** IABS Task Force on Vaccines. Contact: Veso, PO Box 8109, DEP 0032, Oslo, Norway. Fax: 47-2256-6254.

******PLEASE NOTE******

THERE ARE SERVAL INSERTS IN THIS ISSUE OF THE NEWSLETTER

THEY ARE COLOR CODED

PLEASE MAKE SURE YOU HAVE THE CORRECT FORMS AND ARE SENDING THEM TO THE RESPECTIVE ADDRESS

ALSO
PLEASE NOTE
LARISA HAS A NEW ADDRESS

A special thank you from the editors to everyone who submitted materials for this issue, keeping to the deadline really helped getting the newsletter out on time despite Larisa's move. Thank you everyone!

Larisa and Bev

Diseases of Warmwater Fish
Two Week Course

Where: Department of Fisheries and Aquatic Sciences, University of Florida, Gainesville, FL

When: June 3-14, 1996

Sponsors: University of Florida, College of Veterinary Medicine, Department of Fisheries and Aquatic Sciences, and the Whitney Marine Lab

Topics: Water quality and aquaria; fish necropsy procedures; bacterial, viral, fungal, parasitic, nutritional and environmental diseases of fish; treatment

CEU's: Participants may earn up to 20 hours of Continuing Education Units by attending this course.

Contact: Dr. Ruth Francis-Floyd, Department of Fisheries and Aquatic Sciences, University of Florida, 7922 NW 71st St., Gainesville, FL 32653.
Telephone: (904) 392-9617 ext. 229 Fax: (904) 846-1088.

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*****ANNOUNCEMENT*****
Oregon State University Salmonid Disease Workshop
June 12-21, 1996

This workshop is designed for professionals working in the fish health field and will emphasize recent advances and developments in our understanding of salmonid diseases. The workshop will be held at the OSU Hatfield Marine Science Center in Newport, Oregon. The workshop is limited to 20 participants. Cost of the workshop is $625 plus $125 for housing at the HMSC. For further information call or write:

Dr. Robert E. Olson, Associate Director, OSU Hatfield Marine Science Center, Newport, Oregon 97365-5296.
Telephone: 541-867-0251
Email: olsonr@ccmail.orst.edu

Position Available:

Fish Pathologist- Integrated Food Technologies Corporation is a intensive, recirculated system, fish culture facility in Emmaus, PA. The company is seeking a fish pathologist. Interested parties should contact W. Scott Bivans, Integrated Food Technologies Corporation, 840 Broad St., Emmaus, PA 18049. (610)-965-3133.

Infectious Hematopoietic Necrosis Virus (IHNV) neutralizing activity in blood serum from anadromous salmonids

H. Mark Engelking[1] and Scott E. LaPatra[2]

[1]Oregon Department of Fish and Wildlife, Center for Salmon Disease Research, Department of Microbiology, Nash Hall 220, Oregon State University, Corvallis, Oregon 97331-3804.

[2]Clear Springs Foods, Inc., Research Division, P.O. Box 712, Buhl, Idaho 83316.

In 1974 it was first shown that rainbow trout (*Oncorhynchus mykiss*) could mount an immune response to IHNV. That response could neutralize the virus and this activity could be passively transferred by the blood sera from immunized fish to naive fish. Those naive fish were then protected from subsequent infection by IHNV. (Amend and Smith 1974. J. Fisheries Res Bd. Canada 31: 1371-1378) Further studies have shown that a protective immune response arises in rainbow trout during exposure to several fish viruses, including IHNV. In rainbow trout, it has been shown that broodstock that possess neutralizing activity in the blood sera do not carry virus (Hattenberger-Baudouy, et al. 1995. Vet. Res. 26:512-520). This could be an effective management tool to determine which adults are potential virus carriers. Blood sera from anadromous fish has not been examined for similar complement dependent neutralizing activity. From 1993 to 1995 we have tested more than one thousand blood sera samples from spawning adult salmon and steelhead trout at twelve locations. In general, some of the fish that do not carry IHNV, in stocks in which IHNV has been found, have this neutralizing activity. They appear to be protected from infection in some manner. Almost all fish that have IHNV do not possess the neutralizing activity. In stocks that do not have IHNV, neutralizing activity is rarely found, suggesting they have not been exposed to the virus. Interestingly, at some locations, such as Elk River and Salmon River hatcheries, where IHNV has not been found recently, fish appear to have been exposed to the virus and carry serum neutralizing activities. The results for 1993 through early 1994 are described in this report.

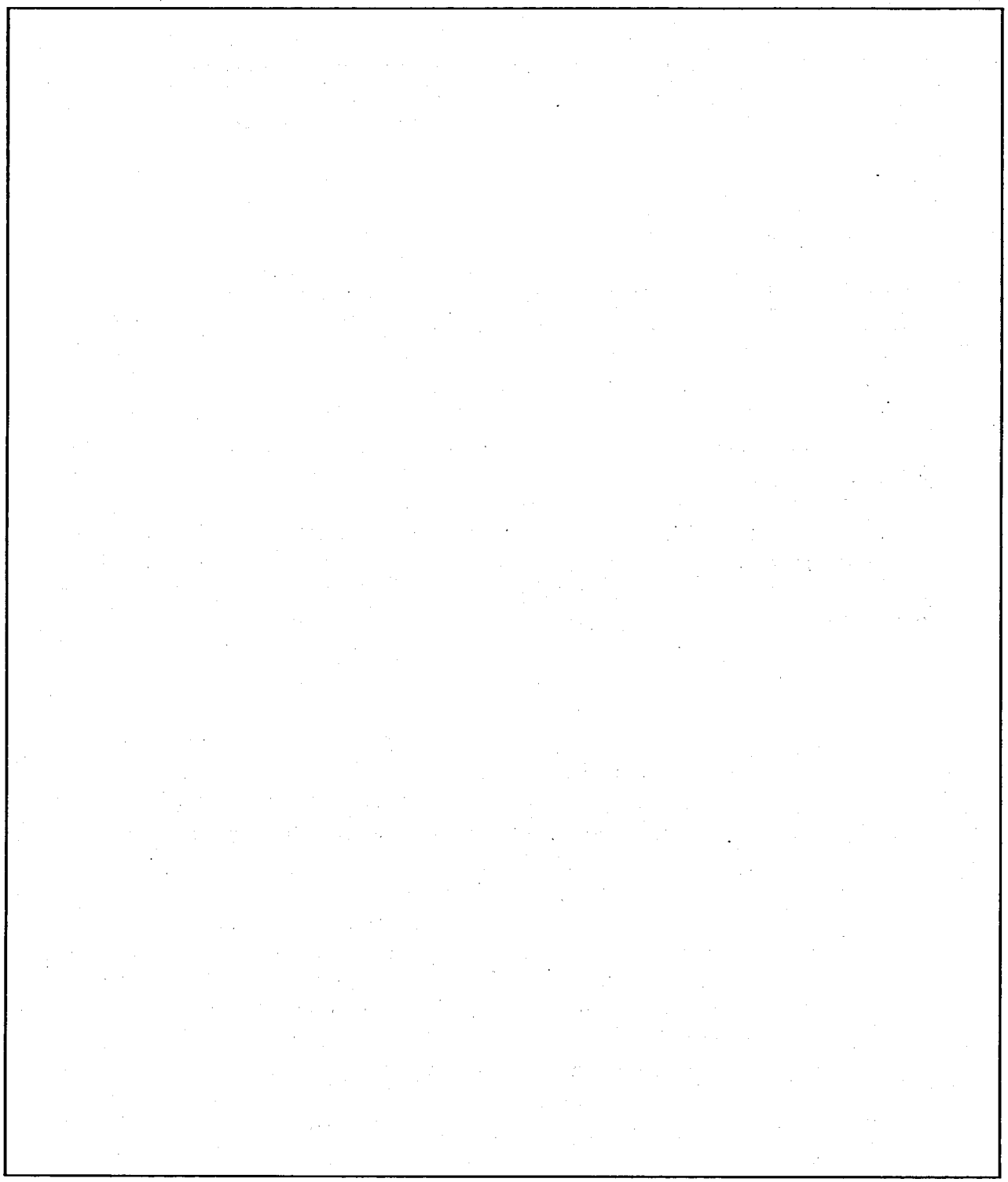
This study attempted to determine the occurrence and distribution of IHNV neutralizing activity in anadromous salmonids in Oregon. Adult fish were studied. This information allowed evaluation of this technique in predicting the risk of IHNV outbreaks and in determining which fish stocks, both wild and hatchery, may have been exposed to virus and could be carriers. By comparing traditional tissue sample results to blood sera data the usefulness of the procedure as a possible non-destructive sampling method was determined.

ABSTRACT

AMERICAN FISHERIES SOCIETY FISH HEALTH SECTION MEETING

MADISON, WI

AUGUST 7-9, 1996



Registration Form for the AFS Fish Health Section Meeting
August 6-9, 1996

Name_____
Address_____
_____
_____
Phone (day)_____

Please check the boxes below and enter fees as appropriate:

	Registration Fee[1]	$20.00
	Banquet # persons X $14.00/person	
	Check here if you prefer a vegetarian meal (same cost)	
	Continuing Education Workshop on Hematology	20.00
	TOTAL ENCLOSED-U.S. funds	

[1] The deadline for registration is July 15. The late registration fee is $30.00

Please make checks out to "AFS Fish Health Section" and send this form with your check to:

Marybeth Loibl
Wisconsin DNR- FM/4
Box 7921
Madison, WI 53707
Phone: (608) 267-7499

Questions? For local arrangements contact:

Susan Marcquenski
Wisconsin DNR- FM/4
Box 7921
Madison, WI 53707
Phone: (608) 266-2871
FAX: (608) 267-7857
e-mail: marcqs@dnr.state.wi.us

For presentations/posters/abstracts/program information contact:

Becky Lasee
LaCrosse Fish Health Center
555 Lester Avenue
Onalaska, WI 54650
Phone: (608) 783-8442
FAX: (608) 783-8450
e-mail: laseeb@mail.fws.gov

For tourism information contact:

Wisconsin Division of Tourism
123 W. Washington St.
Madison, WI 53707
1-800-432-8747

HOUSING REGISTRATION FORM FOR ACCOMMODATIONS IN ELIZABETH WATERS HALL

UNIVERSITY OF WISCONSIN-MADISON

AMERICAN FISHERIES
AUGUST 7-9, 1995

(PLEASE PRINT)

NAME: _____

STREET ADDRESS: _____

CITY, STATE, ZIP CODE: _____

PHONE: ( ) _____ FAX ( ) _____

MALE _____ FEMALE _____

PLEASE CHECK EACH DATE YOU WILL NEED HOUSING ACCOMMODATIONS.

Dates	Single Room	Double Room
TUESDAY, AUGUST 6		
WEDNESDAY, AUGUST 7		
THURSDAY, AUGUST 8		
FRIDAY, AUGUST 9		

_____ I wish to room with another participant the University will assign.

_____ I wish to room with (Please Print) _____.**

**Please check with the named person before sending the reservation.
Each participant should send a reservation form.

SINGLE ROOM RATES (per person/per night)

Rate per night $32.25
X Total nights _____

TOTAL DUE ON ARRIVAL $_____

DOUBLE ROOM RATES (per

Rate per night $20.25
X Total nights _____

TOTAL DUE ON ARRIVAL $_____

Complete and return this form to:

Conference Groups Office
University Housing
625 Babcock Drive
Madison, WI 53706-1213
FAX: (608) 262-4082
email: andrea.romine@mail.admin.wisc.edu

REGISTRATION
WESTERN FISH DISEASE WORKSHOP
JUNE 25-27, 1996
CORVALLIS, OREGON

NAME:_____

ADDRESS:_____

_____

_____

_____

TELEPHONE:_____ FAX:_____

Please indicate your intent in attending/participating in the following:

JUNE 25 Continuing Education Session: PCR AND HEMATOLOGY
($20.00 per person) $_____

JUNE 26-27 Technical Session, coffee breaks, social and dinner
($30.00 per person) $_____

If you intend to bring a guest(s) to the social and dinner who will not be attending the sessions, please indicate number_____ and add $15.00 per guest. $_____

TOTAL $_____

Return by May 10, 1996 to:

Please make checks payable to:
Department of Microbiology, OSU

Rich Holt
Department of Microbiology
Nash Hall 220
Oregon State University
Corvallis, OR 97331-3804

ABSTRACT SUBMISSION INSTRUCTIONS
WESTERN FISH DISEASE WORKSHOP
CORVALLIS, OREGON
JUNE 25-27, 1996

The abstract should not exceed one page with margins at least 1.25 inches. The title should be in all capital letters, use superscript numbers if necessary to denote affiliation of authors and place a superscript asterisk following the author who will make the presentation. Please use a good quality printer because abstracts will be duplicated as they are received.

Please complete the following form and submit it with your abstract by May 10, 1996 to:

Rich Holt
Department of Microbiology
Nash Hall 220
Oregon State University
Corvallis, OR
97331-3804

I am submitting an abstract for the Western Fish Disease Workshop meeting.

Name:_____

Address:_____

_____

_____

Telephone:(___)_____ Fax:(___)_____
Email:_____

I prefer that my presentation be:_____ an oral presentation
_____ a poster presentation

Please select one candidate for each of the following AFS Fish Health Section offices:

President-Elect

___ Scott LaPatra

___ Bruce Nicholson

Secretary-Treasurer

___ Jerri Bartholomew

___ Sandra Ristow

___ Chris Wilson

Nominating Committee

___ Diane Elliot

___ Larisa Ford

___ Roselynn Stevenson

FOLD, STAMP AND MAIL TO THE ADDRESS ON BACK BY
JUNE 1, 1996

TO: Jill Jenkins
Balloting Committee, Chair
FHS/AFS

Southern Science Center-Lafayette
700 Cajun Dome Blvd
Lafayette , LA 70506

Table 2. 1993-1994 survey of anadromous salmonids for the presence of IHNV and IHNV complement dependent neutralizing antibodies.

LOCATION	SPECIES	NUMBER of Blood Serum Samples	NUMBER with IHNV neutralization activity	IHNV Detected	NUMBER with IHNV & neutralization activity
BONNEVILLE HATCHERY	Fall Run Chinook Salmon	18	5	6	N/A [a]
ELK RIVER HATCHERY	Fall Run Chinook Salmon	90	2	0	N/A
		Late spawn	after IHNV	exposure	
	Fall Run Chinook Salmon	26	6	9	2
LEABURG HATCHERY	Summer Run Steelhead Trout	15	12	12	5
SOUTH SANTIAM HATCHERY	Summer Run Steelhead Trout	34	10	10	1
TOTAL		183	35	37	8

a. N/A = Not Applicable

IHNV was detected in seven of the ten stocks tested and at all hatcheries except Round Butte hatchery during these sampling periods. All the virus strains found were type 2 IHNV except for the type 3 strain of IHNV found at Elk River Hatchery. The ovarian fluid samples taken at Leaburg, Elk River, and South Santiam hatcheries were matched to the blood samples for comparison of the antibody levels in IHNV infected fish.

Interestingly, of the 1993 blood samples (Table 1) 13% of the chinook salmon at Round Butte Hatchery had antibodies to IHNV, although the virus was not detected. At Lookingglass Hatchery 17% of the uninfected spring chinook stock (ChS/85) carried antibodies, while in the infected stock (ChS/29) no antibodies were detected. No antibodies were detected in the two spawns of steelhead trout sampled at Wallowa Hatchery, however IHNV was detected in the second spawning. At Carson National Hatchery and South Santiam Hatchery only a single serum sample from each site of the infected fish stocks had IHNV complement dependent neutralizing antibodies.

In late 1993 and early 1994 three additional sites and South Santiam Hatchery again were tested. Matched virus to blood samples were taken at all sites except Bonneville Hatchery where it was not practical to do so. Neutralizing antibodies to IHNV were found in all of these stocks. At

Table 1. 1993 survey of anadromous salmonids for the presence of IHNV and IHNV complement dependent neutralizing antibodies.

LOCATION	SPECIES	NUMBER of BLOOD SERUM SAMPLES	NUMBER with IHNV neutralization activity	IHNV DETECTED
CARSON NATIONAL HATCHERY	Spring run Chinook Salmon	20	1	YES
LOOKINGGLASS HATCHERY	Spring run Chinook Salmon	31	0	YES
	Spring run Chinook Salmon	23	4	YES
ROUND BUTTE HATCHERY	Spring run Chinook Salmon	60	8	NO
SOUTH SANTIAM HATCHERY	Summer run Steelhead Trout	24	1	YES
WALLOWA HATCHERY	Summer run Steelhead Trout	28	0	NO
	Summer run Steelhead Trout	35	0	YES
TOTAL		221	14	

RESULTS

In 1993 to early 1994, the initial survey of the distribution of IHNV complement dependent neutralizing antibodies in adult anadromous salmonids was begun at eight locations in ten distinct fish stocks. IHNV had been detected at all of these locations previously. One location is coastal; Elk River hatchery. Leaburg and South Santiam hatcheries are located on the Willamette watershed in western inland Oregon. Bonneville Hatchery and Carson National Hatchery are located on the middle Columbia River. Round Butte Hatchery is located in central Oregon on the Deschutes River. Lookingglass and Wallowa hatcheries are located on tributaries of the lower Snake River. Summer run and winter run steelhead trout (*Oncorhynchus mykiss*) and fall run and spring run chinook salmon (*O. tshawytscha*) were used in this study. More than four hundred blood serum samples were examined.

Bonneville Hatchery there was a 33% incidence of IHNV in the fish sampled at this spawning. Of these chinook salmon, 28% of those sampled had anti-IHNV antibodies. Two spawnings at Leaburg Hatchery were sampled and 80% of the fish had antibodies to IHNV. Of the IHNV infected fish at Leaburg Hatchery, 42% also had significant titers of antibody to IHNV. In steelhead trout at South Santiam Hatchery, IHNV was detected in 29% of the fish and antibodies to IHNV in another 29%. Only one of the IHNV infected fish at SouthSantiam hatchery also had antibodies to IHNV. The situation at Elk River Hatchery presented an interesting development. Ninety fish were sampled during a single spawning. All samples had no detectable IHNV and two fish had significant IHNV antibody titers. Fish infected with IHNV were unintentionally introduced later to the water supply by being put in a pond which drained into these chinook salmon. In the three later spawnings 35% of the fish were infected with IHNV. Antibodies to IHNV were detected in 23% of the fish. Of the infected chinook salmon 22% had antibodies to IHNV. (Table 2)

DISCUSSION

The results do not lead to straight forward conclusions, but some general trends are observed. First anadromous salmonids mount a similar immune response to IHNV as do rainbow trout. In some cases, it was found that fish bearing antibodies also were infected with virus. Is this antibody unable to prevent virus infection in adult anadromous fish or was the infection recent and elicited antibodies were not able to neutralize all IHNV because of the short period of time post infection? The percentage of fish bearing antibodies ranged from 0 to 80% in this sudy. Some fish carry anti-IHNV antibodies, although the virus was not detected at the time of spawning . This result may preclude the use of antibody assays to detect IHNV infected stocks by this method. Further research is needed. The change from 2% of the early to 23 % of the later chinook salmon at Elk River Hatchery bearing these antibodies suggests that sexually mature fish remain immunocompetent. The results from more than 800 samples taken in late 1994 and 1995 are similar to those presented and will be more fully described later.

ACKNOWLEDGMENTS

We would like to acknowledge the excellent technical assistance of Ken Fliszar, Gary Susac and the former Elk River Hatchery Manager, Jerry Russum and his crew. This group has obtained several hundred individual matched samples for this study. Also at Clear Springs Foods Research Division, Bill Shewmaker and Kathy Lauda provided dedicated assistance in this project. The assistance of the managers, crews and many volunteers at the other hatcheries, who helped obtain other samples is also gratefully acknowledged.

Funding for these studies were provided by USFWS project AFS-78, State of Oregon wildlife and general funds.

1996-1997 Candidate Biographies

AFS-FHS OFFICES

Each candidate for AFS Fish Health Section offices was asked to submit biographical information. The following biographies were received.

Jerri Bartholomew. Jerri is currently an Assistant Professor/ Senoir Research in the Department of Microbiology at Oregon State University, and a member of the Center for Salmon Disease Research. Her research focus is on myxosporean parasites and specifically on examining the life cycle of *Ceratomyxa shasta*. In addition to research responsibilities, she teaches the Immunology laboratory class in the Microbiology Department and portions of the Salmon Disease Workshop taught at the Hatfield Marine Science Center. She received her B.S. in Biology (1980) from Pennsylvania State University and her M.S. in Fisheries (1984) and PHD in Microbiology (1989) from Oregon State University. After graduation she took a postdoctoral position at the USFWS National Fisheries Research Center in Seattle, WA, working on bacterial kidney disease and later on developing genetic probes for detection of *C. shasta*. She has been a member of the AFS Fish Health Section since 1983 and is interested in the development of the section in relation to the parent society.

Diane Elliot. Diane received B.S. (1971), M.S. (1976) and PHD (1985) degrees from the University of Washington School of Fisheries. She was employed as a Fish Pathologist/Title 50 Fish Health Inspector for Biometrics , Inc. in Tacoma, WA in 1974-1976, as a Research Fish Health Biologist for Tavolek Inc in Redmond, WA in 1976-1979, and as a Research Fishery Biologist for the National Marine Fisheries Service in Seattle, WA in 1979-1981. In 1984, she began working as a research scientist for her present employer, the Northwest Biological Science Center of the National Biological Service (formely USFWS). Diane is a principal investigator for the bacteriology and histopathology laboratories within the Center; her current research is focused primarily on bacterial kidney disease of fishes. She also holds a position as an Affiliate Professor in the University of Washington School of Fisheries, and is certified as a Fish Pathologist by the AFS/FHS. In the FHS, Diane has served as chair of the Membership Committee, as a member of the Nominating Committee, and a member of the Blue Book Committee.

Larisa Ford. Larisa received her B.S. in Marine Biolgoy and M.S. in Microbiology at Texas A&M University at Galveston. She continued her graduate studies at Louisiana State University and completed her PHD in 1990. The focus of her dissertation research was the immune response of channel catfish to virulence factors of motile aeromonads. Larisa has recently accepted a position as Assistant Professor in the Department of Fish and Wildlife Resources, University of Idaho. She was employed as a research microbiologist for the past six years at the National Fish Health Research Laboratory in Leetown, WV. Her research focus has been on non-lethal detection of bacterial fish pathogens and the immune responses of salmonids to bacterial pathogens. She also worked closely with federal and state agencies planning health management strategies for the New England Atlantic Salmon Restoration Project. Larisa has been a member of the FHS for 12 years and is currently the co-editor of the section's newsletter. She is also completing a term on the FHS Awards Committee.

Scott LaPatra. Scott is currently a staff research scientist for Clear Springs Foods, Inc., whose work focuses on integrated fish health management. He received a B.S. degree in biology and a PHD in microbiology from Oregon State Univeristy in 1979 and 1989, respectively. Prior to his employment in commercial rainbow trout Scott worked in the commercial fisheries in Alaska, the salmon farming industry, and as a fish virologist and diagnostician for the Oregon Department of Fish and Wildlife. Scott is a member of numerous professional societies but is most active in the FHS/AFS which he joined in 1984. He has served as Secretary-treasurer for the past 6 years, a Disease Network Chairperson, on the Nominating Committee and Blue Book Advisory Committee, and is a Fish Health Editor for the *Transaction*. He is also an AFS certified Fish Pathologist, Fish Health Inspector, and Fisheries Scientist and is recognized as a United States Title 50 Inspector and Canadian Fish Health Official. Scott is knowledgeable of current issues and is committed to the continued growth and development of the Fish Health Section.

Bruce L. Nicholson. Bruce is currently Professor and Chair of the Dept. of Biochemistry, Microbiology and Molecular Biology at the University of Maine. He obtained a B.S. (1965) and a PHD in Microbiology (1969) from the University of Maryland. In 1969, he joined the Dept. of Microbiology in Maine as Assistant Professor and was promoted to Associate Professor in 1974 and to Professor in 1979. In 1984, he was also appointed to the newly created Center for Marine Studies. Bruce served as Chair of the Dept of Microbiology from 1979 to 1990 and, since 1990 in his current position. He has been advisor to 26 graduate students. Bruce played a major role in the initiation and development of the Center for Marine Studies and the Maine/New Hampshire Sea Grant COllege program. In 1982, he was awarded the annual U Maine Presidential Faculty Research and Creative Achievement Award. Bruce has been a FHS member for many years, has served on the International Standards Committee and the Infectious Pancreatic Necrosis (IPN) Procedures Evaluation Committee, and has participated

in most national and eastern regional Section meetings. He has served on the Committee on Nomenclature Standardization of Viruses from Lower Vertebrates of the International Committee on the Taxonomy of Viruses (ICTV). He is also a member of the American Society for Microbiology, American Society for Marine Molecular Biology and Biotechnology (Founding Member), European Association of Fish Pathologists, and Japanese Society of Fish Pathologists. Bruce serves on the editorial board of the journal, Disease of Aquatic Organisms and is an *ad hoc* reviewer for the Journal of Fish Diseases, Journal of Aquatic Animal Health, and Journal of Clinical Microbiology. He has served on numerous international conference boards and advisory committees and organized workshops for a variety of organizations, such as the World Health Organization and International Comparative Virology Organization. Bruce's primary research interest has been fish viruses with emphasis on antigenic structure and relationships, molecular genetics, virus-host interaction, and the development of improved methods of virus detection and identification. He has been principal investigator on 27 competitive external research grants and has published over 50 journal articles on fish viruses and diseases. Bruce has presented over 30 invited presentations at international fish disease meetings including: 3rd International Symposium on Virus of Lower Vertebrates, International Symposium on Applications of Biotechnology in Aquaculture, 3rd Pacific Rim Biotechnology Conference, International Symposium on Infectious Diseases of Salmonid Fish, 6th International Conference on Comparative Virology, US-Ireland Applied Aquaculture Workshop, 7th International Conference on Invertebrates and Fish Tissue Culture, WHO 1st International Conference on Impact of Viral Diseases on Development of Asian Countries, and WHO 4th International Conference on Impact of Viral Disease on Development of African and Middle East Countries.

Sandra Ristow. Sandra is Associate Professor of Animal Science at Washington State University, Pullman, Washington. She received a B.S. degree from Wisconsin State University, Eau Claire, and a PHD in biochemistry from the University of Minnesota. She did postdoctoral research in immunology at the University of Minnesota. She currently teaches aquaculture in the College of Agriculture at WSU. She has been a member of the FHS/AFS since 1988 and has served on the national awards committee for two years. She has been active in the Technical Committee of the Western Regional Aquaculture Consortium and also on the IHNV work group of that consortium. At WSU she has actively promoted an aquaculture seminar series: *Aquaculture: Problems and Perspectives*, which is jointly sponsored by the University of Idaho. Her principal research interests have been in the area of salmonid immune system and the infectious hematopoietic necrosis virus. Her laboratory has published papers on these topics in *Diseases of Aquatic Organisms, Journal of Aquatic Animal Health, Fish and Shellfish Immunology* and *Developmental and Comparative Immunology*. Recently, she and Dr. Gary Thogaard have developed and immunologically characterized androgenetic families of rainbow trout, which may be useful in future vaccine research.

Roselynn M,W. Stevenson. Roselynn received her B.Sc. (Hons.) and PHD (1974) in microbiology at the University of Manitoba. She is faculty member of the Department of Microbiology, University of Guelph since 1977, with teaching responsibilities in systematic bacteriology and general microbiology, and in the M.Sc. Aquaculture program. Her research interests concern the virulence factors of bacterial pathogens of fish, salmonid fish immune responses to microbial pathogens, and detection methods for fish pathogens. Her responsibilities include the operation of the Fish Health Laboratory in the Department of Microbiology, in cooperation with the Fish Culture Section of the Ontario Ministry of Natural Resources. She has been a member of AFS and the FHS for approximately 18 years.

Chris Wilson. Chris is currently employed with the Utah Division of Wildlife Resources as fish health specialist at the Fisheries Experiment Station. He serves as director of the Technical Services program, providing fish disease diagnostic services as well as fish health inspections for state fisheries programs. Chris received his DVM degree from the University of Tennessee, College of Veterinary Medicine in 1979 and a MS degree in fish health from Mississippi State University, College of Veterinary Medicine in 1985. He has been a member of the FHS since 1984, and served as newsletter editor for the FHS Newsletter from 1992-1994. He is certified as a fish pathologist and fish health inspector with the AFS/FHS.

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PLEASE VOTE!!!

A official ballot is including in this newsletter as an insert

Response to Injury and Tumor Biology of Aquatic Invertebrates and Fish, June 3-6, 1996,

Marine Biological Laboratory, Woods Hole, MA.

This 4-day symposium is co-sponsored by the Registry of Comparative Pathology and the Department of Pathobiology, University of Pennsylvania, School of Veterinary Medicine. The purpose of this symposium is to present an overview of important mechanisms involved in the response to injury, and comparative tumor biology in aquatic invertebrates and teleost fish species. Emphasis will be placed on explanation of the mechanisms involved in the pathogenesis of these responses in various organ systems and the subsequent functional effects; tumor development as it relates to potential etiological agents and fish models of carcinogenesis. The course topics will encompass the disciplines of pathlgoy, toxicology, immunology, molecular/ cell biology, and fish biology, and is designed for pathologists, toxicologists, basic researchers, residents, and graduate students who may working with such species or find them useful as models. A registration fee of $600.00 (single occupancy) or $475.00 (double occupancy) covers room and board (June 2-8th), course registration and course material. Participants are encouraged to bring dissection kits. For additional information contact the Registry at 202-782-2440 or fax 202-782-9150/9161.

Short Course

The short course entitled **"Disease Diagnosis and Control in MarineShrimp Culture"** will be offered in Tucson, Arizona, USA from **July 20 through August 9, 1996.** The course is sponsored by The University of Arizona's Department of Veterinary Science in cooperation with the US Department of Agriculture's Marine Shrimp Farming Consortium and Sea Grant (US Department of Commerce). The course is in English and will consist of comprehensive lectures and practical laboratory training on current diagnosis, prevention, and treatment methods for the prinicpal disease of cultured penaid shrimp. Participants should have at least a bachelor's degree in fisheries biology, microbiology, or a related field. Registration is limited to 40 participants, with preference given to those working in shrimp disease diagnostic labs or shrimp culture research programs. Among the faculty will be Donald V. Lightner, PhD,, a University of Arizona specialist in the diseases and pathology of cultured crustacea and finfish and a member of the World Aquaculture Society, Dr. Lightner is an internationally recognized expert on shrimp pathology. The fee is $1200 for the ten day course, including the text, "A Handbook of Normal Penaeid Shrimp Histology." Graduate credit is available for an additional fee ofa pproximately $307. Application deadline is June 1, 1996. For application forms or additional information, contact Imelda Angelo at 520-621-8414, or by FAX at 520-621-4899; or by Email:aquapath@ccit.arizona.edu.

MEETING ANNOUNCEMENT

Successes and Failures in Commercial Recirculating Aquaculture.
July 19-21, 1996.

The Hotel Roanoke & Conference Center,
Roanoke VA

For further information about the program content please contact
Stephen Smith, Assistant Professor,
Dept of Biomedical Sciences and Pathobiology, Virginia Tech, Blacksburg, VA 24061,
phone: (540)-231-5131, Fax: (540)-231-7367.

For more informationabout registration, contact the
Conference Registration Office,
Division of Continuing Education, Virginia Tech,
phone (540)-231-5182, Fax: (540)-231-3306.

First Detection of an Aquareovirus in Alaskan Chinook Salmon, *Oncorhynchus tshawytscha*

Jana L. Geesin, Tamara O. Burton, and Jill E. Follett

Alaska Dept. of Fish and Game
Commercial Fisheries Management and Development Division
333 Raspberry Rd.
Anchorage, AK 99518

The first isolation of an aquareovirus in Alaska was made from a pooled ovarian fluid sample from adult chinook salmon *Oncorhynchus tshawytscha* returning to Ship Creek in Anchorage, Alaska. Samples were collected from 44 ripe chinook salmon and processed in four and five fish pools. The pools were inoculated onto epithelioma papillosum cyprini (EPC) and chinook salmon embryo (CHSE-214) cell lines and incubated at15 C. No cytopathic effect (CPE) was observed after 15 days and inoculated cultures were blind passed. Five days later, CPE was evident in one of the five fish pools on the CHSE-214 cell line. The CPE was characterized by plaques of synctial cells typically caused by aquareoviruses. Electron microscopy performed on negatively stained virions revealed icosahedral particles of approximately 75 nm with a double capsid layer. Further passage of the virus produced replication in both EPC and CHSE-214 cells, although the CHSE-214 cell line was more sensitive based on rapidly developing CPE and a higher virus titer. Genetic analysis using reciprocal RNA-RNA cross hybridization indicated that the Alaskan virus isolate did not react with probes for the 5 genogroups of aquareoviruses (Lupiani et al. 1993) when 35 different aquareoviruses from around the world were tested (Dr. Frank Hetrick, personal communication). The Ship Creek aquareovirus may represent a new genogroup.

Fertilized eggs from the Ship Creek chinook salmon are currently incubated at Elmendorf State Fish Hatchery and the reared fry are released back into Ship Creek at the hatchery site. This current enhancement program will not be affected by the aquareovirus finding because the fish will be restricted to those watersheds historically transplanted with this stock. Although no mortality or disease has been associated with aquareoviruses in the Pacific Northwest, increased surveillance of this chinook stock will be initiated to monitor prevalence of the virus in the future.

References

Lupiani, B., Hetrick, F.M., Samal, S.K. 1993. Genetic analysis of aquareoviruses using RNA-RNA blot hybridization. Virology 197: 475-479

Book Review

An exciting new book will be available in March. **New Directions in Invertebrate Immunology** edited by Kenneth Soderhall, Saddaki Iwanaga, Gerado Vasta. ISBN 0-9625505-9-0. 495 pp. hardcover, $95.00 US.

Invertebrate animals include a vast diversity of different species from unicellular protozoans to the more complex echnioderms and protochordates. The number of species is probably more than 2,000,000 and invertebrates comprise 95% of all animal species. It is therefore not surprising that one can find a considerable variation in how these animals defend themselves against parasites. This does not necessarily mean that each species utilizes different molecules or processes to recognize foreign material, and one can suspect that most immune recognition reactions ought to be carried out by phylogenetically conserved molecules. Such molecules are, for example, alpha-2-macroglobulin, antibacterial peptides, serine proteases and proteinase inhibitors. The contrary also exist where invertebrate immune molecules may be exclusive to these animals as for example glucan binding proteins and clotting proteins. Because there is such considerable variation in the immune responses in invertebrates one can never foresee in which taxonomic group a new, unique molecule or immune process is found and this warrants investigation on invertebrate animals other than *Drosophila*, although it may in a short term view prove scientifically both more profitable and advisable to concentrate on *Drosophila* or *Caenorbites*. It should also be emphasized that several invertebrate animals such as crustaceans and molluscs are of great economic value, and it is expected that several millions of US dollars are lost every day due to diseases of these animals. Thus there is a great demand to understand more about the immune reactions, and to be able to find better ways to avoid the deleterious effects of diseases and parasites on these commercially-important animals. It has to be emphasized that research on *Drosophila* Immunity has made enormous progress during the recent years and the regulation and control of antibacterial peptide expression have been clarified to a large extent. The advancement of this type of research has been greatly influenced by the pioneering studies of Hans G. Boman who laid thefoundation for this type of work through excellent contributions on the antibacterial peptides in the insect *Hyalophora cecropia*. Other important and obvious factors for the advancement of *Drosophila* immunity research are the availablility of isogenic strains, the possibility to make mutant and transgenic strains of this fly and to use cell lines which can express these antibacterial peptides. There is a general concensus that invertebrates do not have an adaptive immune system, but are able to recognize and respond to non-self even more efficiently than vertebrate animals, since they can recognize and respond to very minute concentrations of microbial cell wall components such as (1,3)-beta-D-glucan, lipopolysaccharides and peptidoglycans. These processes and reactions are named innate immune reactions or non-adpative immunity and although some of them, e.g. antibacterial peptides, require induction by a microganism ,or a wound; the response is short-lived and does not discriminate between individual pathogens. Thus invertebrate animals have to rely solely on innate immune reactions it appears, and if one thinks on how some aquatic crustaceans live on the bottom of a lake or sea (often in the vicinity of sewage outlets), then one can imagine how these animals have to depend on very efficient means to seal a wound which is inflicted on their cuticle and to combat microorganisms and other parasites trying to gain entry into their bodies. They are literally living in a microbial soup! One very important -and from scientists, overlooked -defence process in invertebrate animals is the clotting system. The clotting system of the horseshoe carbs which is comprosed of a cascade of serine proteases terminating with conversion of the clotting protein to coagulin is completely different from the clotting system in crustaceans which comprises a clotting protein and a transglutaminase and proteinases do not appear to be involved. This again emphasizes and shows that a vital process in two arthropod species are completely different. The situation in insects is not well established and it therefore remains to be shown if the insect clotting system is different from crustaceans and the chelicerates- or constituttes yet another new process. The intention with this book is to demonstrate that reseatch in the field of invertebrate immunity is going into an exciting future with clear possibilities to study among other things the phylogeny of different immune factors. It is impossible to cover all research areas in invertebrate immunity and thus these chapters have been chosen to show some new and hopefully interesting directions in invertebrate immunity research.

Kenneth Soderhall, Sadaaki Iwanaga, Gerardo Vasta.

This book is available from SOS Publications,
43 DeNormandie Ave., Fair Haven, NJ 07704,
Fax 908-530-5896, Email: SOSJS@AOL.COM

WESTERN FISH DISEASE WORKSHOP
JUNE 25-27, 1996
CORVALLIS, OREGON

HOST:
Oregon Department of Fish and Wildlife, and Oregon State University Center for Salmon Disease Research.

Location and Registration:
The workshop will be held on the Oregon State University campus at Corvallis, Oregon. The Continuing Education Session on PCR and HEMATOLOGY will be conducted on June 25 at Nash Hall. Registration is $20.00 and further information on the session is available from Craig Olson (360-438-1181). The Western Fish Disease Workshop Technical Session will be conducted June 26 and 27. Registration is $30.00 which will include coffee breaks during the workshop and a social gathering and dinner on Wednesday evening. You must register in advance by sending a check or money order and the enclosed registration form to: Rich Holt, Department of Microbiology, Nash Hall 220, Oregon State University, Corvallis, OR 97331-3804. Please make checks payable to the Department of Microbiology, OSU.

Lodging:
Blocks of rooms are being held for Workshop participants for June 24,25 and 26 at:

1) Super 8, 407 NW 2nd, single $44; double $51. Call 541-758-8808 (7AM-3PM) or 1-800-800-8000 by June3

2) Ramada Inn, 1550 NW 9th, single $62; Double $75. Call 541-753-9151 by June 7, group code FISH.

3) Shanico Inn, 1113 NW 9th, single $40; double $47. Call 1-800-432-1233 by May 25.

Other motels available: Best Western Grand Manor, 935 NW Garfield Ave, Single $69; double $75 (OSU rate) 1-800-626-1900. Motel Orleans, 935 NW Garfield Avw, single $40; double $42 (OSU rate), call Jackie at 1-800-626-1900. Summer is a busy time in Corvalllis. We recommend you make your resrvations as soon as possible.

AIR TRAVEL:

You may fly into Portland (2 hr from Corvallis) or Eugene (45 min from Corvallis). Shuttle Service is available for both airports:

1) Anthony's Limousine Airport Shuttle to and From Portland airport. Reservations required. 1-541-753-7831 or 929-2265.

2) Express Shuttle for Eugene/Corvallis: 1-541-751-1478, 4 hr advance notice.

3) Airport Ground Transportation Eugene/Corvallis: 1-541-686-0033, 1 day advance notice.

Food:
Lunches are on your own; there are several restaurants near campus. A social gathering and dinner is planned for Wednesday evening at the Tyee Wine Cellars.

Other Activities:

Before or after the workshop you can visit the Oregon Coast Aquarium in Newport (57 miles from Corvallis) and say hello to Keiko. The Aquarium is open everday, 9am-6pm. Adults $8, age 4-13 $4. Advanced tickets are less expensive. Telephone 541-867-3437.

If you have questions, contact Rich Holt at 541-737-1863, or Tony Amandi at 541-737-1855.

Fish Health Section Newsletter

The editors of the FHS Newsletter thank the members for their support regarding their enthusiam in submitting contributions for publication in the newsletter. The **prohibitive** cost of mailing more than a 20 page newsletter, however, imposes limits for the length of each article so we are implementing **new guidelines** for authors. Articles should not exceed 4 single-spaced typed pages so that the maximum length would not exceed 6 newsletter columns. Also, please note that articles will continue to be accepted with the understanding that the material will be published without peer review. Articles should be submitted on disk in **Word perfect 5.1 or in generic form that can be read on WP5.1 for IBM.** Disks will be returned if a SASE is included with your submitted article. Again, thank you all very much for your continued support, which allows for the publication of a high quality and informative newsletter. The Fish Health Section Newsletter is a quarterly publication of the Fish Health Section of the American Fisheries Society. Submissions should be addressed to the editors listed below:

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