Fish Health Section Conference

From the Pillars to the Next

6-8 September 2023
Swissotel Ratchada, Bangkok, Thailand

Aquatic Animal Health: Learning from the past to inform the future.

Program and Abstract Book

Organized by:
Fish Health Section, Asian Fisheries Society
Department of Fisheries Thailand

Co-organized by:
Network of Aquaculture Centres in Asia-Pacific

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Provisional Agenda

Day/Time	Activity/Presentation	Speaker(s)
Day 1 (6 September; Wednesday)		
08:00-09:30	Registration	Secretariat
09:30-10:30	Opening Ceremony	Master of Ceremony: DOF staff
	• Introduction to the Conference	**Dr. Melba Reantaso**
	• Welcome Remarks (FHS)	**Dr. Kua Beng Chu** (Chairperson)
	• Welcome Message (NACA)	**Dr. Jie Huang** (Director General)
	• Welcome Message (AFS)	**Dr. Murni Marlina Binti Abd Karim** (Secretary)
	• Opening Remarks (DOF-Thailand)	**Mr. Chalermchai Suwannarak** (Director General)
	• Group photo	All participants
10:30-10:45	**Coffee/Tea**	
10:45-11:00	Introduction of Pillars	**Dr. Eduardo Leaño**
11:00-12:30	• Meet and greet; informal interaction/discussion (Pillars and experts are encouraged to engage in a more personal chat/discussion with the younger generation of fish health enthusiasts, students, researchers, etc. and vice versa) • Poster Session (poster presenters are advised to stand beside their posters)	All participants Poster presenters
12:30-13:30	**Lunch**	
(13:30-17:30)	Fish Health Section Showcase	
13:30-14:45	History and journey of FHS	**Drs. Rohana Subasinghe, Melba Reantaso, Celia Lavilla-Pitogo, Richard Arthur**
14:45-15:00	In Memoriam (honoring late FHS pillars)	**Dr. Eduardo Leaño**
15:00-15:15	Coffee/Tea	
15:15-15:45	Messages from other Pillars (including video messages)	**FHS pillars**
15:45-16:15	Messages from younger generation of fish health enthusiasts	TBC
16:15-16:35	Updates on recent activities of FHS	**Dr. Agus Sunarto** Past-Chairperson
16:35-16:45	Video presentation (DAA11 and DAA12)	**Dr. Kua Beng Chu** and Malaysia team; Indian Team

Day/Time	Activity/Presentation	Speaker(s)
16:45-17:15	AFS Publication	**Prof. Mohamed Shariff** (Editor, Asian Fisheries Science)
17:15-17:30	Words from sponsors	Sponsors
18:30~	Welcome dinner	Hosted by DOF-Thailand
Day 2 (7 September; Thursday)		
08:30-09:00	Registration	Secretariat
09:00-12:30	Finfish Health (Moderator: **Dr. Eduardo Leaño**)	
09:00-09:30	Fish Immunology Research for Fish Vaccine Development	**Prof. Ikuo Hirono**
09:30-10:00	Translocation of tilapia's tiny terrors: Nile tilapia and its parasites	**Dr. Andy Shinn**
10:30-10:15	Coffee/Tea	
10:15-10:45	New Challenges, New Solutions: Mitigating Emerging Diseases in Aquatic Animal Health	**Assoc. Prof. Win Surachetpong**
10:45-11:15	Practical Biosecurity Measures in Tilapia Hatchery	**Mr. Amorn Luengnaruemitchai**
11:15-12:30	Panel discussion	Moderator and speakers
12:30-13:30	Lunch	
13:30-17:30	Shrimp Health (Moderator: Dr. Stephen Pyecroft)	
13:30-14:00	Challenges and Diseases Management in Shrimp Aquaculture	**Prof. Chalor Limsuwan**
14:00-14:30	Passing on the Torch of Wisdom in Shrimp Aquaculture Research	**Prof. Grace Chu-Fang Lo**
14:30-15:00	Taking up the Torch of Wisdom: An Interdisciplinary Cooperation of Science, Implementation and Vision for Shrimp Aquaculture	**Prof. Han-Ching Wang**
15:00-15:15	Coffee/Tea	
15:15:15:45	Scientific, Technological and Social Solutions for Sustainable Aquaculture	**Dr. Kallaya Sritunyalucksana**
15:45-17:30	Panel discussion	Moderator and speakers
Day 3 (8 September; Friday)		
	Moderator: Dr. Agus Sunarto	
09:00-09:15	Basic to Modern Diagnostic Technologies: A Key to Risks Assessment of Shrimp Diseases along the Value Chain	**Joseph Carlo V. Vergel**, E.M. Leaño, V. Alday-Sanz, and M.G. Bondad-Reantaso
09:15-09:30	Use of the Viral Accommodation Mechanisms to Control Viral Diseases in Shrimp	**Suparat Taengchaiyaphum**, K. Sritunyalucksana and T. W. Flegel
09:30-09:45	White Spot Syndrome Virus Facilitates and Relies on host de novo Nucleotide Synthesis to Support Viral Pathogenesis	**Cong-Yan Chen**, D.-Y. Lee, S.-S. Lin, C.-H. Liu, and H.-C. Wang
09:45-10:00	Shrimp pva-miR-166 and PvProsaposain Participate in Hemocyte Homeostasis in White-spot Syndrome Virus Induction by Modulating Apoptosis	**Chantaka Wongdontri**, W. Luengtrakool, P. Boonchuen, P. Sarnow, and K. Somboonwiwat
10:00-10:15	**Coffee/Tea**	

Day/Time	Activity/Presentation	Speaker(s)
10:15-10:30	A glance into the Evolution of the White spot Syndrome Virus Isolated from Farmed Penaeus japonicus (Kuruma Shrimp) in Japan	**Pattama Puttirungroj**, S. Kawato, M. Samuel, M. Furukawa, R. Oomine, K. Koiwai, H. Kondo, and I. Hirono
10:30-10:45	Novel Multiplex PCR Assay for the Detection of Three Major Viruses Affecting Global Tilapia Aquaculture	Suwimon Paimeeka, T. Prasartset, M. Khemthong, T. Lertwanakarn, and W. Surachetpong
10:45-11:00	Highly Sensitive and Specific Detection of Tilapia lake virus in Fish Tissues and Environmental Samples using Droplet Digital Polymerase Chain Reaction	**Tharinthon Prasartset**, S. Paimeeka, M. Khemthong, T. Lertwanakarn and W. Surachetpong
11:00-11:15	Fish Vaccination: Benefits and Impact in the Tilapia Industry	Roberto Cascione
11:15-11:30	Cell-mediated and Humoral Immune Responses of Goldfish after Live-attenuated virus Vaccination and High-Water Temperature Treatment against Herpesviral Hematopoietic Necrosis (HVHN)	**Hiroaki Saito**, L.-M. Lau, S. Minami, M. Yuguchi, A. Shitara, H. Kondo, G. Kato, and M. Sano
11:30-11:45	Dynamics of Infectious Hematopoietic Necrosis Virus (IHNV) in Rainbow Trout *Oncorhynchus mykiss* during Maturation	**Ryota Shimizu**, A. Nonaka, G. Tuboi, S. Hirabe, F. Shirotori, T. Takeuchi, K. Takehana, M. Shigekura, M. Kawanobe, S. Ogawa, E. Nakamura, T. Takikawa, H. Matsuyama, G. Kato, and M. Sano
11:45-12:00	Cracking the Code of Tilapia Lake Virus Replication: Unleashing the Way to Inhibit the Virus	**Tuchakorn Lertwanakarn** and W. Surachetpong
12:00-13:30	**Lunch**	
	Moderator: Dr. Erlinda Lacierda	
13:30-13:45	Molecular Epidemiology of Megalocytivirus in Freshwater Angelfish (*Pterophyllum scalare*) from Malaysia	C.A.C. Johan, M.D.D. Abdullah, S.N.E.S.J. Fadaak and **Sandra Catherine Zainathan**
13:45-14:00	Effect of Water Temperature Fluctuation on the Occurrence of Betanodavirus Infection in Asian Seabass (*Lates calcarifer*)	A. Azila, M.K.A. Safwan, M.I. Shaharah and **M. Firdaus-Nawi**
14:00-14:15	An Experimental Animal Model of Yellowfin Seabream (Acanthopagrus latus) for *Amyloodinium ocellatum* Infection	Zhicheng Li and **Anxing Li**
14:15-14:30	Morphological Identification of Parasites in Spotfin Bigeye, Priacanthus tayenus from the East Coast of Peninsular Malaysia	S. Mazelan, F. Shaharom, W. Wahab, M.H. Borkhanuddin, N.A.H.M. Yusoff, S.R. Manaf, N.F.A. Mohamad, R.H. Hamdan, M.B. Martin, M.A. Ghaffar, A.S. Draman and **Mohd Ihwan Zakariah**
14:30-14:45	Characterization of thioredoxin glutathione reductase in *Cryptocaryon irritans* as a target for medicine discovery	Zhihong Zhong, **T. Zilong Tan** and Anxing Li

Day/Time	Activity/Presentation	Speaker(s)
14:45-15:00	Ammonia-Nitrogen Removal and Microbial Community Dynamics in an Outdoor HDPE-lined Shrimp Pond with no Water Discharge	P. Satanwat, P. Tapaneeyaworawong, P. Wechprasit , T. Boonprasertsakul, W. Pungrasmi, K. Sritunyalucksana, S. Powtongsook, and **Anuphap Prachumwat**
15:00-15:15	**Coffee/Tea**	
15:15-15:30	The Effect of Oral Immunization Using Palm Oil Adjuvanted Vaccine Against Streptococcosis in Cage-Cultured Red Hybrid Tilapia	M.S.M. Ridzuan, A. Abdullah, N. Ramli, and **Mohd Firdaus-Nawi**
15:30-15:45	Enhance Resistance to Acute Hepatopancreatic Necrosis Disease in Heat Stressed Shrimp by Peroxiredoxin4	**Supitcha Wanvimonsuk**, P. Jaree, T. Kawai, and K. Somboonwiwat
15:45-16:00	Effects of Probiotic and Nutrient Supplementations on Growth Performance and Gut Microbiota of Stinging Catfish, *Heteropneustes fossilis*	M. Akther, H. S. Mumu, T. Rahman and **Md. Ali Reza Faruk**
16:00-17:00	Closing ceremony and awarding	
18:30~	**Farewell dinner**	Hosted by FHS
Overall Master of Ceremony:		**Dr. Jiraporn Jarungsriapisit**

Message from

Department of Fisheries, Thailand

It is with great pleasure and excitement that I extend a warm welcome to all of you to the upcoming Asian Fisheries Society - Fish Health Section Conference, themed "From the Pillars to the Next: Aquatic Animal Health - Learning from the Past to Inform the Future." The conference is scheduled to take place from September 6th to 8th, 2023, in the vibrant City of Bangkok, Thailand. This event marks a significant moment in the realm of aquatic animal health, as we gather to share insights, experiences, and knowledge that spans generations. Our objective is to foster a platform where expertise from our esteemed senior experts, our pillars, can seamlessly flow to the enthusiastic minds of the next generation of fish health enthusiasts, our future pillars.

The "From the Pillars to the Next" conference brings together a diverse community of researchers, scientists, practitioners, policymakers, and industry experts who are passionate about fostering the health and sustainability of aquatic ecosystems. Through engaging discussions, presentations, workshops, and networking opportunities, we aspire to collectively shape the future of fish health strategies, technologies, and innovations.

As the Director General of the Department of Fisheries of Thailand, I am confident that this conference will not only enrich our collective knowledge but also forge new bonds and collaborations that will shape the future of aquatic animal health. Bangkok, with its rich cultural heritage and dynamic atmosphere, serves as an ideal backdrop for this intellectually stimulating gathering.

I eagerly anticipate your active participation and contributions to this conference. Let us come together to make this event a resounding success, inspiring innovation and excellence in the field of aquatic animal health.

See you in Bangkok!

Mr. Chalermchai Suwannarak
Director General
Department of Fisheries, Thailand

Message from
Fish Health Section, Asian Fisheries Society

Welcome to the Fish Health Conference 2023 with the theme “From the Pillars to the Next”. The tagline for this conference is “Aquatic Animal Health: Learning from the past to inform the future”.

The Fish Health Section of Asian Fisheries Society (FHS-AFS) was initiated in 1987 and formally established in 1989. The FHS-AFS has provided a unique, consistent and dedicated platform for both senior specialists and young career entrants for the last 30 years. Since 1989, FHS organizes events that allow members to meet and engage, to share knowledge, to keep abreast of new developments, expand networks, establish new partnerships, to keep the burning passion of finding solutions to aquatic disease challenges, and even for catching up with talks as part of being a colleague, mentor and mentee. These three decades marked several milestones in the field of fish health in the Asian region. Among them were series of books on Diseases in Asian Aquaculture published after every Diseases in Asian Aquaculture (DAA) Symposium. However, for DAA11, there was a special issue of Malaysian Fisheries Journal which became available during the symposium. Both the books and special issue publication are now recognized as fundamental contributions and references to fish health literature in the region.

In more recent years, our focus has been firmly on the development of the database of researchers involved in aquatic animal health. All these databases were obtained from our series of webinars on the path to DAA11 (December 2020 to June 2022) and during hybrid DAA11 in August 2022. We are delighted to see the combination of new faces and a consistent participation of researchers from DAA1 until DAA11.

It is timely that FHS-AFS hosts this event to strengthen its commitment by providing a platform for delegates to jointly explore progress development in aquatic animal health and to share the recent research findings, as well as to establish new research relations. We are thankful to have the privilege of holding this event here in this amazing city of Thailand and the first conference that the FHS-AFS hold together with Department of Fisheries Thailand and Network of Aquaculture Centres in Asia-Pacific (NACA) which combines both junior and senior researchers gathered from our first DAA series until the coming DAA12 in 2025.

Message from

Fish Health Section, Asian Fisheries Society

My heartfelt congratulations to the organizing committee for working tirelessly towards making this event a reality. I also like to thank all our conference partners, sponsors, plenary speakers, pillars, oral presenters, poster presenters, judges and participants for making FHS Conference a great success.

I express my deepest gratitude for this support and I earnestly hope such support and collaboration will continue.

Lastly, I wish everyone a fruitful meeting and thank you.

Dr. Kua Beng Chu
Chairperson
Fish Health Section
Asian Fisheries Society

Message from

Network of Aquaculture Centres in Asia-Pacific

On behalf of the Network of Aquaculture Centres in Asia-Pacific (NACA), I am grateful for FHS-AFS appointing NACA as a co-organizer of the Fish Health Section's Handover Conference on Aquatic Animal Health in 2023: From the Pillars to the Next, hosted by the Fish Health Section of the Asian Fisheries Society and the Thailand Department of Fisheries, and also warmly welcome all of you to the conference.

NACA is an intergovernmental international organization for aquaculture in the Asia-Pacific region, with its secretariat based in Bangkok, Thailand. Since 1990, 19 governments in East Asia, Southeast Asia, South Asia, West Asia, and the Pacific have joined NACA. I'm glad to inform you that the NACA Governing Council approved the 20th Member, the Kingdom of Saudi Arabia, joining NACA last month. With 20 member countries, NACA has been instrumental in fostering communication, collaboration, and technical training, serving as a vital bridge for sustainable aquaculture development in the region since 1990.

In collaboration with FAO, our Member governments, and international experts, NACA has recently established the Regional Aquatic Organism Health Strategy (RAOHS), adopted last month by our Governing Council and launched this month. This would provide our Member governments guidance to develop the National Aquatic Organism Health Strategy (NAOHS), which is an essential approach to implement the Progressive Management Pathway for Aquaculture Biosecurity (PMP/AB), subsequently upgrade the national aquaculture biosecurity stages, and finally benefit the healthy and sustainable development of aquaculture in the Asia-Pacific region. Moreover, in partnership with the Regional Office in Asia and the Pacific of FAO, NACA has actively spearheaded aquaculture transformation in the region. In November 2022, we organized a High-level Meeting on aquaculture transformation, advocating for innovation, attracting new investments, upgrading technologies, expanding production capacity, and fulfilling the growing global demand for food security, aligning with the United Nations' Sustainable Development Goals by 2030.

Through the collective efforts of NACA members, the Asia-Pacific aquaculture sector has witnessed tremendous growth over the past 33 years, contributing to 88% of global aquaculture production. Aquatic animal health is a major concern for

Message from

Network of Aquaculture Centres in Asia-Pacific

the rapid development of aquaculture in our region and has emerged as a significant area of focus for NACA. NACA has been working with FHS and the network of our Members' scientists on aquatic animal health for decades. We appreciate FHS's efforts in facilitating communication and cooperation to promote the progress of scientific and technological advancement for our region. NACA has also initiated a new subject-oriented network called sNACA for laboratories, agencies, enterprises, and expert teams to build regional or international networks on a specific subject to promote regional cooperation among academies, research, associations, and the private sector. NACA welcomes interested experts to apply as the Regional Lead Centres or Regional Participating Centres on your competency and organize the relevant sNACA. We believe this Handover Conference of the FHS will provide an excellent chance for all participants to find interesting topics and partners in building subject-oriented networks on aquatic animal health.

Together, let us strive to make aquatic animal health a shared responsibility and a symbol of pride. I wish this conference resounding success. Thank you, everyone!

Dr. Jie Huang
Director General
Network of Aquaculture Centres
in Asia-Pacific

Message from
Asian Fisheries Society

Welcome to the Fish Health Section of the Asian Fisheries Society Conference: From the Pillars to the Next: Aquatic Animal Health: Learning from the past to inform the future. This conference, jointly convened by the FHS-AFS, Department of Fisheries Thailand (DOF-Thailand), and the Network of Aquaculture Centres in the Asia-Pacific (NACA), provides an important forum for researchers, managers, and industry to evaluate the current status and directions of fish health research and development in the Asia-Pacific region, the global powerhouse of fisheries and aquaculture production.

The Fish Health Section has been and continues as a very active Section of the AFS since its inception in 1987 and formal establishment in 1989, only five years after the formation of AFS. The FHS is responsible for the organization of the Diseases in Asian Aquaculture (DAA), which has now completed 11 conferences with the last conference, DAA11, held in Kuching, Sarawak Malaysia in 2022. The FHS-AFS provides an invaluable platform for senior specialists, young researchers, and all with an interest in fish health to discuss advances and challenges in the field. It has been very innovative in its activities, with the organization of well-attended webinars during the COVID years providing a continued focus for the discipline when other mechanisms for fostering exchange and discussion were very limited.

The topics of this conference and goals of the FHS are central to the vision and objectives of the AFS, a non-profit scientific society founded in 1984 by fishery and aquaculture professionals in Asia. The Society aims to promote networking and cooperation between scientists, technicians, and all stakeholders involved in fisheries and aquaculture production, research and development in the Asia-Pacific region. Its ultimate objective is to enhance food security and income-generating opportunities for fisheries workers through promoting sound management practices, environmentally sustainable development and efficient utilization of aquatic resources. Our goals include linking fisheries scientists, developing young scientists, promoting global cooperation, encouraging network formation, disseminating information, and addressing fisheries issues.

Message from
Asian Fisheries Society

This FHS-AFS conference, from the 6th to 8th September 2023 at Swissotel Ratchada, Bangkok, Thailand provides an important meeting point and forum for all with an interest in aquatic animal health, from senior experts to students and early career researchers starting in the field. I look forward to hearing about the outcomes of the conference and wish all participants well for their presentations, discussions, and networking. Thank you to the FHS-AFS, DOF-Thailand, and NACA for convening this significant meeting and to all the sponsors, organizers, and participants for supporting the conference.

Prof. Emeritus Neil Loneragan
President
Asian Fisheries Society (14th Council)

Rationale

The Fish Health Section of the Asian Fisheries Society (FHS-AFS) is one of the formidable professional societies in the world. Initiated in 1987 and formally established in 1989, the FHS-AFS has provided a unique, consistent and dedicated platform for both senior specialists and young career entrants and all others in between for the last 30 years. The FHS organized events allow members to meet and engage to share knowledge, keep abreast of new developments, expand networks, establish new partnerships, keep the burning passion of finding solutions to aquatic disease challenges, or even just catching up with small talks as part of being a colleague, mentor and mentee. One of these is the triennial Symposium on Diseases in Asian Aquaculture (DAA) which has expanded from professional engagements to being friends already spanning decades for many. With current membership of more than a hundred spread across the globe, DAA became an iconic event – no post DAA-goodbyes – just 'looking forward to' and 'see you at the next'!

The most recent DAA11, scheduled to take place in 2020 in Kuching, Sarawak, Malaysia, was postponed to 2022 due to the COVID-19 pandemic. And instead of the usual in-person event, DAA11 was successfully held in a fully virtual platform. At the 11th Triennial General Meeting of the FHS, it was decided that an in-person event should be organized prior to the holding of the DAA12 in 2025 (in India). This pre-DAA12 event is intended to create an occasion for continuing mentorship, this time the pillars handing over their future outlook and perspectives based on decade long experiences – from the 'before' when there was 'something' to the 'now' when there is almost 'everything'.

Objectives

- To provide a platform for a "meet-and-greet", exchanges of experiences and guidance from the senior experts (pillars) to the current generation of fish health enthusiasts;
- To showcase the Fish Health Section from its inception to how it became one of the reputable networks on aquatic animal health;
- To provide a venue on important issues and updates on aquatic animal health through scientific presentations and open discussions.

The FHS Pillars

Dr. J. Richard Arthur
(Canada)
Founding member

Dr. Richard Arthur is a Canadian scientist, trained in fish parasitology, and with expertise in risk analysis and strategic policy and planning. He was IDRC Asian Fish Health Network Coordinator (NC) and Project Advisor to the IDRC Fish Health Project with the Philippine Bureau of Fisheries & Aquatic Resources, based in Quezon City, from 1985 to 1988, and continued as NC during a year as IDRC Program Officer (Fisheries) based in Singapore. He returned to Canada in November 1989 as Head of the Parasitology Section of DOF's Maurice Lamontagne Institute. During his time in Southeast Asia, he initiated formation of the Fish Health Section and was involved in shaping the activities of the FHS during its early years. This included, for example, drafting the FHS ByLaws, design of the FHS logo (much of his early research was on trichodinid ciliates), and (with Indonesian colleagues) planning the Diseases in Asian Aquaculture I meeting (held in Bali, Indonesia), assisting with editing the conference proceedings, and compiling or editing several volumes of the FHS publication series. He also prepared the booklet *"10th Anniversary 1989-1999. Fish Health Section of the Asian Fisheries Society".*
After returning to Canada as a research scientist with DOF and since 1997, as an independent consultant, he has continued his interest in international work through the UNFAO, NACA, other donor agencies, and assistance to national governments. He is currently a Senior Advisor to FAO's PMP/AB programme and the Expert Advisory Group on AMR. He resides in Barriere, British Columbia with his wife Susan, 4 horses, 2 cats and a dog. (jraconsulting@xplornet.ca).

Dr. Leong Tak Seng
(Malaysia; wearing DAA1 T-shirt)
Founding member
Chairperson: First Executive Committee

Dr. Leong Tak Seng had his secondary education at Saint Thomas's School, Kuching, Sarawak. He received his Ph.D. degree in 1975 from The University of Alberta, Edmonton, Canada. He joined the School of Biological Sciences, Universiti Sains Malaysia (USM), Penang in 1975 and retired as Professor of Parasitology in 1998. His main research interest since 1980 was on fish parasites and their diseases affecting marine fish cultured in floating cages.

The FHS Pillars

Dr. Faizah Shaharom-Harrison
(Malaysia)
Founding member
Secretary/Treasurer: First Executive Committee

Dr. Faizah Shaharom-Harrison is an Emeritus Professor from UMT {University Malaysia Terengganu}. She was the IDRC coordinator for a fish parasitology project when she was appointed as Secretary/Treasurer of the First Executive Committee of FHS. She attended the first DAA in Bali and the DAA 4 in the Philippines. At that time, she was the Head of Aquaculture Department, Faculty of Fisheries and Marine Science, UPM. She was then tasked with the job of transferring the Faculty to the Terengganu branch campus, where only a few lecturers were willing to move . Most joined other faculties at UPM. During those challenging times with very limited budget, we were tasked in converting dormitories into laboratories, and large halls into lecture theaters. Hence, she was not able to attend many conferences having several administrative posts namely Director of Aquatrop, followed by Deputy Director of Institute of Oceanography at the then known College University of Science and Technology (KUSTEM), before becoming Director of the Research Management Centre at University Malaysia Terengganu. Her last post was Director of Kenyir Research Station. Despite being busy with administrative duties, she managed to secure several research grants. This enabled her to recruit several postgraduate students locally and internationally. Her fondest memories were postgraduate students from Australia, Pakistan, India, Syria, Jordan, Philippines, Vietnam and Indonesia. She also had many international links with scientists from abroad namely United Kingdom, Hungary, France, India, Czechoslovakia and China.

Prof. Mohamed Shariff
(Malaysia)
Founding member
Newsletter Editor: First Executive Committee

Professor Mohamed Shariff from Univesiti Putra Malaysia is one of the founding members of the Fish Health Section. He was the coordinator the Asian Fish Health Network, a project sponsored by International Development Research Centre of Canada. He has oganised several training programs of Fish Health, as well as the First and Second Symposium on Diseases in Asian Aquaculture (held in Bali and Phuket). Currently, he is the Editor in Chief of Asian Fisheries Science, a journal of the Asian Fisheries Society.

The FHS Pillars

Dr. Melba Bondad-Reantaso
(Philippines/Italy)
Founding member
Chairperson: 5th Executive Committee

Dr. Melba B. Reantaso is Team Leader of Food Safety, Nutrition and Health Team at the Fisheries and Aquaculture Division of FAO since 2021 and has close to 30 years combined experience in research, training, diagnostics, extension and international aid and development work on aquaculture, management of health of aquatic organisms and biosecurity. She spearheaded the development of a new initiative called Progressive Management Pathway for Improving Aquaculture Biosecurity, and leads FAO work on biosecurity, risk analysis, surveillance, national/regional aquatic organisms health strategies, AMR in aquaculture; develops and implements capacity development activities, projects, training courses, seminars/conferences; conducts investigations of disease outbreaks and mass mortality events in aquatic populations as requested by FAO members. She travels extensively (at least 75 countries to-date) for scholarly and career goals in aquaculture and biosecurity. Since joining FAO in 2004, she has developed and implemented close to 50 projects (with 11 ongoing projects) at national, regional, interregional and international levels worth over USD 30M (ranging between USD 90 000 to USD 4M). Her academic mentors include: Dr. JR Arthur (De La Salle University), Prof. Kazuo Ogawa and Prof. Tomoyoshi Yoshinaga (University of Tokyo), Prof. Kishio Hatai (RiP) (Nippon Veterinary and Life Sciences University); work mentors include Dr Sharon McGladdery (molluscan pathology), D.r Mike Phillips (NACA) and Dr. Rohana Subasinghe (FAO). She serves as referee to various peer-reviewed journals and co-editor of Diseases in Asian Aquaculture series (DAA V, VI and VII) (ORCID: https://orcid.org/0000-0002-2380-3549) and was founding member and served as Chairperson (2002-2005) and Secretary/Treasurer (1999-2002) of the FHS, Asian Fisheries Society and currently Senior Adviser.

Dr. Erlinda R. Cruz-Lacierda
(Philippines)
Founding member

Dr. Erlinda Cruz-Lacierda started her career in research at the Aquaculture Department of Southeast Asian Fisheries Development Center (SEAFDEC AQD) in 1976, beginning as Fisheries Technician (now referred to as Technical Assistant). In July 2004 and after 28 years of service, Dr. Lacierda took an early retirement from AQD as Scientist 2. In April 2006, she joined the academe through a 5-year project-based position as an Associate Professor at the Faculty of Fisheries, Kagoshima University, Japan where she did teaching, research, and extension activities. In July 2011, Dr. Lacierda joined the Institute of Aquaculture, health management, and aquatic toxicology.

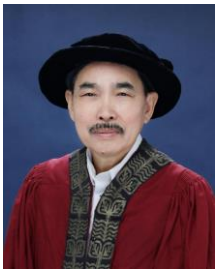
The FHS Pillars

College of Fisheries and Ocean Sciences, University of the Philippines Visayas (UPV) as an Associate Professor 2. In May 2015 to December 2016, Dr. Lacierda was on secondment as an Associate Professor at the Laboratory of Aquaculture, Faculty of Applied Biological Science, Hiroshima University, Japan. Dr. Lacierda took the mandatory retirement in September 2020 as Professor 6 from UPV with publications on aquatic parasitology, fish health management, and aquatic toxicology. Currently, Dr. Lacierda is a faculty at the Department of Biology, College of Liberal Arts, Sciences and Education, University of San Agustin, Iloilo, Philippines. She is also a freelance consultant/expert/specialist and has served for the Department of Science and Technology (DOST) - funded projects, BFAR National Fisheries Laboratory, and State Universities and Colleges.

Dr. Gilda D. Lio-Po
(Philippines)
Founding member: Asian Fisheries Society (AFS) and FHS
Member: First Executive Committee

Dr. Gilda D. Lio-Po conducted research on fish and shrimp diseases for 34 years at the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC/AQD) until her retirement in 2010. Her work focused on the Epizootic Ulcerative Syndrome (EUS), Koi Herpesvirus (KHV), Vibriosis in fish and shrimp, *Aeromonas* spp./*Pseudomonas* sp./*Edwardsiella tarda* infections in fish, as well as *Lagenidium* sp./*Haliphthoros* sp. infections in shrimp. With co-workers, she published 27 SCI-covered papers, 15 primary reports in conference proceedings, 17 book chapter contributions, two books “Health Management in Aquaculture” (First & Second editions) as senior editor and a BAMIDGEH journal proceedings as editor. She completed her Ph. D. On Aquatic Virology at the Simon Fraser University (SFU), British Columbia, Canada; Master in Public Health Microbiology at the University of the Philippines (UP); trained on Fish Pathology at Tokyo University and on Shrimp Pathology at the University of Arizona. Among her notable distinctions were the 2007 Most Outstanding Microbiologist Award by the Philippine Society of Microbiology (PSM); appointments as Diplomate and Fellow in Microbiology by the Philippine Academy of Microbiology (PAM); invitation as a Domiciano Villaluz Memorial Lecturer; and, appointment as Training Coordinator of the 7th NACA/FAO/SEAFDEC/UPV 12-month Training Programme for Senior Aquaculturists in Asia/Pacific. Moreover, she organized/conducted hands-on Fish Health training programs for local/international trainees; recommended her 5 former research assistants in pursuit of successful M.Sc. & Ph.D. degree programs; and nurtured her 4 offspring to successful degrees/careers.

The FHS Pillars



Dr. James L. Torres
(Philippines)
Founding member

After his early retirement as Professor at the University of the Philippines Visayas, Dr. Torres went on to teach at the University of Health Sciences Antigua (UHSA) in the Caribbean. There, he was Dean of Academics and one-time Vice-President for Academic Affairs, all these for a total of 13 years. At present he is Chair of the Department of Biology, University of San Agustin, Iloilo City, Philippines. Dr. Torres' contribution to science include studies on motile *Aeromonas* spp. associated with epizootic ulcerative syndrome-positive fish. His studies led to the discovery of a *Aeromonas pastoria* which merited a special mention in Bergey's manual as a possible new species. Dr. Torres finished his Ph.D. under the mentorship of Prof. Dr. Mohamed Shariff in 1991. His other research interest include *Salmonella* surveillance in food and food products, and microbial degradation of hydrocarbons and plastics.

Dr. Rohana Subasinghe
(Sri Lanka/United Kingdom)
Founding member
Chairperson: 2nd Executive Committee

Dr. Rohana Subasinghe is a founding member of the Fish Health Section of the Asian Fisheries Society. A former teacher at the University of Colombo and the Universiti Putra Malaysia, Rohana worked at the Food and Agriculture Organization of the United Nations for 23 years. He is an honorary life member of the World Aquaculture Society and the Asian Fisheries Society. He is also the Co-Founder and Director of FUTUREFISH (www.futurefish.org) and a strong advocate of inclusive growth of aquaculture.

The FHS Pillars

Dr. Supranee Chinabut
(Thailand)
Founding member
Chairperson: 4th Executive Committee

Dr. Supranee Chinabut has over 40 years of experience in aquatic animal health research, diagnosis, and teaching in both national and international courses. She was the Chairperson of Fish Health Section/Asian Fisheries Society from 2001-2003. At present, Dr. Supranee is a member of the NACA's Asia Regional Advisory Group on Aquatic Animal Health and a committee member of the Agricultural Research Development Agency, ARDA (Public Organization).

Dr. Kamonporn Tonguthai
(Thailand)
Founding member
Vice Chairperson: First Executive Committee

Dr. Kamonporn Tonguthai is popularly known as Dr. Lek. After graduating from Kasetsart University in Thailand, she started her career on Fish Health with the Department of Fisheries Thailand (DoF) in 1980 as a Fish Pathologist. When the FHS was formed she was elected as the Vice-Chairperson of the First Executive Committee (1989-1992) and became one of the pillars of the Section. She continued to participate the FHS events especially the DAA series until she retired from DoF at the age of 60. She is now 82.

Dr. Celia R. Lavilla-Pitogo
(Philippines)
Chairperson: 3rd Executive Committee

Dr. Celia R. Lavilla-Pitogo became a member of the Fish Health Section in 1990, joined the Executive Committee in 1993-1996, and became its Chairperson in 1996-1999. Celia and the team at SEAFDEC Aquaculture Department organized the Fourth Symposium on Diseases in Asian Aquaculture (DAA IV) in Cebu, Philippines in 1999 and edited its proceedings. While a scientist at SEAFDEC, she did extensive work on shrimp and fish vibriosis, and published well-cited publications in international journals earning her a Google Scholar h-index of 26 with 2,590 citations. At present, she works as a consultant for the Food and Agriculture Organization, and mentors young fish health staff at Feedmix Specialists Inc. II, the largest fully integrated aquaculture company in the Philippines.

The FHS Pillars

Prof. Takashi Aoki
(Japan)
Chairperson: 6th Executive Committee

Dr. Takashi Aoki received his Ph. D. in Agriculture from the University of Tokyo in March 1973. After completing graduate school, he became a JSPS Fellowship Fellow. He was appointed as an Assistant Professor at the Faculty of Medicine, Keio University (1974) and Faculty of Agriculture, University of Miyazaki (1975). He became a Professor in the same university in 1990, then at Tokyo University of Fisheries in 1993. After his retirement from Tokyo University of Marine Science and Technology, he served as a specially-appointed professor of the same university until March 2012. He also served as a specially-appointed professor at Gyeongsang National University in Korea from 2008 to 2013. Most of his research are on microbial infections of fish and shellfish that occur in aquaculture and cause significant economic damage to related businesses. He was one of the first to introduce molecular and genetic research into the field of fisheries science, and his research career began with genetic studies of drug resistance mechanisms in fish pathogenic bacteria. In April 1988, he was awarded the Fisheries Society of Japan Award for Encouragement for his research on drug resistance in fish pathogens. He also conducted research on the pathogenic mechanisms of fish pathogenic bacteria which have led to the development of vaccines against fish pathogenic microorganisms including a series of DNA vaccines. In March 2007, he was awarded the Fisheries Society of Japan Award for his contribution to the development of fish and shellfish immunology research. Prof. Aoki has contributed to the editing and management of international research journals including Fisheries Science, Fish Pathology, Journal of Fish Diseases, Diseases of Aquatic Organism, Marine Biotechnology, Fish and Shellfish Immunology, and Thai Journal of Veterinary Medicine. He also served as president of the Japanese Society of Fish Pathology, an academic society in his research field of fish diseases and contributed to the development of fish diseases in Japan and abroad.

Dr. Chu-Fang Lo
(Taiwan)
Chairperson: 7th Executive Committee

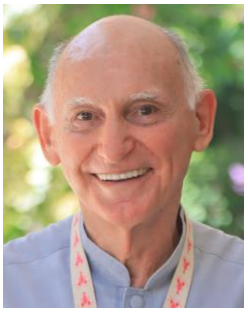
Dr. Chu-Fang Lo is an Emeritus Chair Professor as well as a National Chair Professor at the Department of Biotechnology and Bioindustry Sciences, National Cheng Kung University (NCKU), Taiwan. Since 1994, Dr. Lo's work has focused on the study of shrimp diseases, particularly White Spot Syndrome Virus (WSSV), the causative agent of one of the most serious shrimp diseases in the world. Dr. Lo's pioneering work focused not only on the virus itself, but also on pathogenesis, host-virus interactions, and control measures. Her research also includes another

rapidly spreading shrimp disease, acute hepatopancreatic necrosis (AHPND), caused by a pathogenic strain of the opportunistic marine bacterium Vibrio parahaemolyticus. She continues her efforts to highlight the importance of marine pathogens and their unique characteristics compared to viruses, bacteria, and other organisms that inhabit terrestrial environments. Dr. Lo currently also holds other responsibilities as a principal investigator of the International Center for the Scientific Development of Shrimp Aquaculture (ICSDSA), NCKU, which is led by Professor Han-Ching Wang. The goal of ICSDSA is not restricted to providing high-impact scientific results or high-quality black tiger shrimp, but offer a unique hands-on learning experience to students and researchers in aquaculture with a vision of developing sustainable and eco-friendly aquaculture for the future.

Dr. C.V. Mohan
(India)
Chairperson: 8th Executive Committee

Dr. Chadag Vishnumurthy Mohan is a Principal Scientist at WorldFish. WorldFish is part of One CGIAR, the world's largest agricultural innovation network. WorldFish is a Public International Organization that creates, advances and translates scientific research on aquatic food systems into scalable solutions with transformational impact on human wellbeing and the environment. He joined WorldFish in April 2014 and leads the aquatic animal health research cluster and One Health Initiative of One CGIAR. He holds PhD in aquatic animal pathology from the University of Stirling, UK. His expertise includes aquatic food systems, nutrition-sensitive fisheries and aquaculture, one health encompassing health of animals, environment and people, epidemiology and surveillance, antimicrobial resistance and biosecurity governance. He comes from a strong academic background of 21 years at the College of Fisheries, University of Agricultural Sciences, Mangalore, India. He worked for Inter-governmental Network of Aquaculture Centres in the Asia Pacific (NACA) based in Bangkok for 11 years, supporting sustainable aquaculture and aquatic animal health R&D programs in 18 Asia Pacific countries. He served as the Chairperson of Fish Health Section (FHS) of Asian Fisheries Society (AFS) for the period 2011-2014. He has authored/co-authored over 155 research papers.

The FHS Pillars



Prof. Timothy Flegel
(Canada/Thailand)
Member: 2nd Executive Committee

Prof. Tim Flegel was born and educated in Canada and is currently located at the Center of Excellence for Shrimp Molecular Biology and Biotechnology (Centex Shrimp) that is jointly operated by the Faculty of Science Mahidol University and the Thai National Center for Genetic Engineering and Biotechnology (BIOTEC) under the National Science and Technology Development Agency (NSTDA). In 2010, he became a naturalized Thai and retired from Mahidol University to become an advisor to NSTDA at Centex Shrimp where he has done research on shrimp pathology and shrimp defense mechanisms, particularly for viral pathogens until today (36 years). For most of that period, he has been a member of the Fish Health Section (FHS) of the Asian Fisheries Society and the World Aquaculture Society, and has been active in regional and international activities related to shrimp health management. His most recent award was the Dushdi Mala Medal presented by HM King Rama X in March 2019. This is the highest Thai award recognizing lifetime achievements in science and the arts.

Dr. Susan Gibson-Kueh
(Singapore)
Newsletter Editor: 8th Executive Committee

Dr Susan Gibson-Kueh has an in-depth understanding of diseases in Asian aquaculture. Dr Kueh is an international authority on diseases of warm water aquaculture species, including Asian seabass or barramundi, groupers, and red snapper. She published the first reports on two important diseases of Asian seabass, scale drop and big belly, and recently described the pathology of Lates calcarifer herpesvirus. Dr Kueh has over three decades of experience in diagnostic fish pathology and veterinary epidemiology. Pathology and epidemiology are key disciplines in the study of disease in the fish host and disease dynamics in the population. She brings together a wealth of expertise in fish disease research to establish baseline information to better understand health in cultured Asian seabass to allow early intervention and prevent disease outbreaks.

The FHS Pillars

Prof. Indrani Karunasagar
(India)
Head of Secretariat: 8th DAA Symposium

Prof. Indrani Karunasagar is a microbiologist by training, having obtained her Masters and Ph.D. degrees fro Mysore University and carried out postdoctoral research at University of Maryland, USA, University of Sterling, UK and University of Wuerzburg, Germany. She held various academic positions at University of Agricultural Sciences, Bangalore and Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar. During her academic career, she carried out extensive research on diseases affecting both finfish as well as shrimp and worked on a range of pathogens – bacterial, viruses, parasites and fungi. Her research led to development of new diagnostics and health management tools like bacteriophages, vaccines and RNAi technology. She was designated by UNESCO as Director, Microbial Resources Center (MIRCEN) in aquatic organisms. She has served in various expert committees of FAO/WHO, NACA, UNESCO, WOAH and other international organisations. Currently she heads the FAO Reference Center for Antimicrobial Resistance and Aquatic Biosecurity at Nitte University, Mangalore. She is one of the founding members of Fish Health Section (FHS) and was organizing Secretary for Diseases in Asian Aquaculture 9 (DAA-9) at Mangalore in 2011.

Dr. Iddya Karunasagar
(India)
Active scientist on Fish Health and supporter of FHS

Dr. Iddya Karunasagar obtained his Masters and doctoral degrees from Mysore University and carried out postdoctoral research at University of Maryland, USA, University of Sendai, Japan and University of Wuerzburg, Germany. He served in various academic positions at University of Agricultural Sciences, Bangalore and Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar, where he was the Director of Research. During the academic career, Iddya Karunasagar worked on various diseases affecting fin fish as well as shellfish and the research led to development of various technologies for health management in aquaculture – molecular diagnostics, phage therapy, antimicrobial resistance, risk analysis in aquaculture. His group published extensively in the area of Aquatic Animal Health. He moved to Food and Agriculture Organisation of UN as Senior Fisheries Officer and led a team on fish safety and quality. He has edited and contributed to a number of FAO Fisheries and Aquaculture Technical papers in the area of fish safety, quality and aquatic animal health. He served as Member of WHO Advisory Group on Critically important antimicrobials in human medicine. He serves on the Editorial Board of Asian Fisheries Science and is Associate Editor of the Journal of World Aquaculture Society.

The FHS Pillars

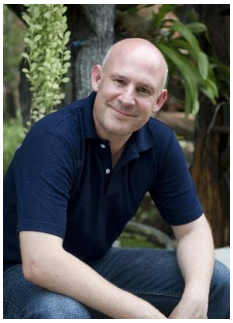
Other Founding Members, First Executive Committee and Pillars

- Dr. Ian Anderson (Australia)
- Dr. Michael Pearce (Australia)
- Dr. Pan Jin Pei + (PR China)
- Dr. Dasappa Seenapa (India)
- Dr. Sri Lestari Angka (Indonesia)
- Dr. Oman Komaruddin (Indonesia)
- Dr. Hariyadi Mangunwiryo + (Indonesia)
- Dr. Ahkmed Rukyani + (Indonesia)
- Dr. Hambali Supriyadi (Indonesia)
- Dr. Mariana Nor Shamsudin (Malaysia)
- Dr. Wong See Yong (Malaysia)
- Dr. Siti Zaharah Abdullah (Malaysia)
- Dr. Daud Hasan (Malaysia)
- Dr. Juan Deanon Albaladejo (Philippines)
- Dr. Cecilia L. Baticados-Gueco (Philippines)
- Dr. Nelson Gerundo (Philippines)
- Dr. L.K.S.W. Balasuriya (Sri Lanka)
- Dr. Temduong Somsiri (Thailand)
- Dr. Takahisa Kimura + (Japan)
- Dr. Susan Lim + (Malaysia)
- Dr. Lila Ruangpan (Thailand)

Plenary Speakers

Prof. Ikuo Hirono
Tokyo University of Marine Science and Technology
Japan
“Fish Immunology Research for Fish Vaccine Development”

Prof. Ikuo Hirono has been participating the Diseases in Asian Aquaculture (DAA) events since the first DAA meeting in Bali, Indonesia, when he was still a graduate student under the advisorship of Professor Aoki. His research areas include the shrimp immune system, disease pathogenesis in fish and shrimp, effects of dietary supplements in aquatic animals, and development of vaccines against various aquatic diseases. He has been part of the editorial team of several journals, such as co-editor in chief of Fish and Shellfish Immunology, associate editor of Review in Fisheries and Fish Biology, associate editor of Fisheries Science, editorial board member of Journal of Fish Diseases and Fish Pathology. Most of his research work involves international research collaborations under governments and in the private sector. He has supervised many international students from Columbia, Egypt, China, India, Indonesia, Philippines, Singapore, South Korea, Thailand, and Vietnam. He also has many international research collaborations under governments.



Prof. Andy Shinn
INVE Aquaculture
Thailand
“Translocation of tilapia’s tiny terrors: Nile tilapia and its parasites”

Prof. Andy Shinn is a Global Technical Expert with INVE/Benchmark and has >30 years' experience in aquatic parasitology and animal health. He is passionate about aquatic animal health, especially parasites. His work focuses on rapid methods of parasite identification, taxonomy, host impacts, and management in aquaculture through biosecurity and chemical/non-chemical measures.

Plenary Speakers

Assoc. Prof. Win Surachetpong
Faculty of Veterinary Medicine, Kasetsart University
Thailand
"New Challenges, New Solutions: Mitigating Emerging Diseases in Aquatic Animal Health"

Dr. Win Surachetpong is an Associate Professor at Kasetsart University, Thailand, specializing in Veterinary Microbiology and Immunology. His research focuses on Tilapia Lake Virus (TiLV) and Tilapia Parvovirus (TiPV). He earned his Doctor of Veterinary Medicine with honors from Chulalongkorn University, followed by a Master of Science degree in Pathobiology from the University of Arizona. Dr. Surachetpong obtained a Ph.D. in immunology from the University of California, Davis. His current research explores various aspects of TiLV and TiPV, including epidemiology, diagnostics, host-pathogen interactions, risk factors, biosecurity, and vaccine development.

Mr. Amorn Luengnaruemitchai
Manit Genetics
Thailand
"Practical Biosecurity Measures in Tilapia Hatchery"

Mr. Amorn Luengnaruemitchai is currently the Managing Director of Manit Genetics Co., Ltd., in Thailand. The first-generation descendants of family-owned aquaculture business established in 1968. He spearheaded the mass production, research and development of Super Black and Super Red strains through selective breeding program since 2007. Under his leadership, Manit Genetics (formerly Manit Farm) was awarded with "Outstanding Genetic Management of Tilapia Broodstock and Farm Management" at a national level from the Department of Fisheries in 2010, and Best Aquaculture Practices (BAP) certification since 2019. He established the Manit Aquaculture Health Laboratory (MAHL),

Plenary Speakers

one of the most sophisticated laboratories for aquatic animal health research and disease diagnostic services. Mr. Luengnaruemitchai also serves as the President of Tilapia Association in Thailand in 2022. He also served as guest speakers in several national and international symposiums. Mr. Amorn Luengnaruemitchai received his Bachelor of Science Degree in Aquaculture from Kasetsart University, Thailand of which he was awarded as an Outstanding Alumni in 2015. He has also a master's degree in Aquaculture and Aquatic Resource Management from Asian Institute of Technology (AIT), Thailand. As an aquaculture enthusiasts and entrepreneur, he continuously pursues for the growth and success of the Tilapia farmers and sustainability and economic expansion of the Tilapia industry.

Dr. Chalor Limsuwan
Faculty of Fisheries, Kasetsart University
Thailand
"Challenges and Diseases Management in Shrimp Aquaculture"

Dr. Chalor Limsuwan is currently a faculty member of the Aquaculture Business Research Centre (ABRC), Faculty of Fisheries, Kasetsart University. He has a PhD degree on Fish Pathology from Auburn University (USA), MSc in Zoology from Middle Tennessee State University (USA), and BSc in Fisheries from Kasetsart University (Thailand). He also undertook post-doctoral research on fish pathology at Auburn University. He is presently teaching and doing research on shrimp culture and disease prevention, and has been invited as keynote speakers of most seminars for shrimp farmers in Thailand since 1987. Additionally, he has been invited as speaker for shrimp management in several countries Asia, Australia and the Americas.

Plenary Speakers

Prof. Grace Chu-Fang Lo
National Cheng Kung University
Taiwan
"Passing on the Torch of Wisdom in Shrimp Aquaculture Research"

Prof. Dr. Grace Chu-Fang Lo is a Chair Professor of National Cheng Kung University (Taiwan) and has been studying the white spot syndrome virus (WSSV), which causes an extremely lethal disease in shrimp. In recent years, she has also been actively involved in research for acute hepatopancreatic necrosis disease (AHPND) wherein her laboratory was designated as WOAH Reference Laboratory for this new shrimp disease. With her transfer from National Taiwan University to NCKU around ten years ago, she began research on breeding specific pathogen resistant (SPR) shrimp and specific pathogen free (SPF) shrimp and founded the International Center for the Scientific Development of Shrimp Aquaculture. She built scientifically designed shrimp farms with the goal of promoting global innovations in shrimp farming industry management. Prof. Lo has been a recipient of many awards for her accomplishments and breakthroughs on shrimp disease diagnostics, including the World Organisation for Animal Health (WOAH founded as OIE) Meritorious Award in 2020. Prof. Lo retired in February, 2020, but her enthusiasm for shrimp research has not diminished. She is currently building the first standardized shrimp farm with smart facilities for aquaculture in Taiwan, where she will continue to contribute dedicate her life's work in shrimp research to society and improve Taiwan's shrimp farming industry

Plenary Speakers

Prof. Han-Ching Wang
National Cheng Kung University
Taiwan

"Taking up the Torch of Wisdom: An Interdisciplinary Cooperation of Science, Implementation and Vision for Shrimp Aquaculture Animal Health"

Prof. Han-Ching Wang started her career as a shrimp researcher in 2000 as a Master student and continued to obtain her Ph.D. in 2007 from National Taiwan University (NTU), Taiwan. She extensively used proteomics and structural biology to study the pathogenesis of white spot syndrome virus (WSSV) that caused white spot disease (WSD) in shrimps, and focused on shrimp immunity and transcriptomics during her post-doctoral stint at the Tokyo University of Marine Science and Technology. She joined National Cheng Kung University (NCKU) in 2008 and became a Distinguished Professor by 2020. Apart from research, she currently holds the University Library Curator position at NCKU (2019-2023). Dr. Wang and her team have published over 70 SCI research papers since 2008.
Dr. Wang is recognized as an outstanding young researcher and has received several awards from her university, as well as from regional/international associations. Dr. Wang currently an expert for OIE reference laboratories for white spot disease (WSD) and acute hepatopancreatic necrosis disease (AHPND), and is highly active in several international and regional organizations.

Plenary Speakers

Dr. Kallaya Sritunyalucksana
National Center for Genetic Engineering and Biotechnology (BIOTEC)
Thailand
“Scientific, Technological and Social Solutions for Sustainable Aquaculture”

Dr. Kallaya Sritunyalucksana is recently a research fellow and principle researcher of Aquatic Animal Health Research Team, National Center for Genetic Engineering and Biotechnology (BIOTEC), Integrative Aquaculture Biotechnology Research Group, National Science and Technology Development Agency (NSTDA), Thailand. She has finished her PhD in comparative physiology from Uppsala University in Sweden and PhD in Biotechnology from Mahidol University in Thailand. She has long experience in research with her H-index of 38 and citation index of more than 6,000, which leads her to be the world’s top 2% scientists in Fisheries for the citation impact in a single calendar year of three years in a role from 2019-2022 reported by Standford University, USA. Her research goal is to support the sustainability of shrimp aquaculture industry at local and global level with scientific knowledge obtained from research & development, technology, and innovation to overcome the economic loss from emerging and re-emerging shrimp diseases. Dr. Kallaya has her networks at national and international level and closely with industry, farmers and competent authority such as Department of Fisheries, Thailand.

Abstracts

Oral Presentations

Basic to Modern Diagnostic Technologies: A Key to Risks Assessment of Shrimp Diseases along the Value Chain

Joseph Carlo V. Vergel[a*]; Eduardo M. Leaño[b]; Victoria Alday-Sanz[c]; Melba G. Bondad-Reantaso[d]

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[b] Network of Aquaculture Centres in Asia-Pacific (NACA), Suraswadi Building, Department of Fisheries Compound, Kasetsart University Campus, Bangkok, Thailand

[c] Department of Biosecurity, Breeding Program and Research and Development, National Aquaculture Group (NAQUA), Al Lith, 21961, Saudi Arabia

[d] Fisheries and Aquaculture Division, Food and Agriculture Organization of the United Nations (FAO), Rome, Italy

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Abstract

Diagnostics plays a significant role in maintaining a healthy shrimp aquaculture industry. Some diagnostic techniques are used to screen healthy shrimps in the value chain to ensure that they are not carrying any disease/pathogen at sub-clinical levels. This is mostly applied on health assessment of post larvae prior to stocking, during health monitoring in grow-out culture, and on live shrimps and shrimp products destined for international trade. Diagnostics are also used to identify the cause of unfavorable health condition or abnormalities in order to formulate appropriate mitigation measures. Shrimp value chain faces many risks including high mortality due to diseases, bad farming practices, and climate change impacts topping the list. Basic to modern diagnostic technologies are key and essential measure for risks assessment of diseases along the value chain. There are three levels of diagnostics based on Asia Regional Technical Guidelines on Health Management for the Responsible Movement of Live Aquatic Animals and the Beijing Consensus and Implementation Strategy published by the Food and Agriculture Organization (FAO) of the United Nations and Network of Aquaculture Centres in Asia-Pacific (NACA). Level 1 includes farm/production site observations and record keeping and health management of shrimp ponds. Level 2 includes laboratory procedures involving parasitology, histopathology, bacteriology, and mycology. Level 3 includes advanced diagnostic specialization involving virology, electron microscopy, molecular biology, and immunology. There are also available low-cost diagnostic field kits for farm or pond-side use which can be classified under Level 3. In this paper, we discuss the value of Level 1 observation combined with Levels 2 and 3 to make an accurate diagnosis for risks assessment in the shrimp value chain. Lastly, we also discuss emerging technologies on the horizon and how these technologies can be transferred to farmers for a healthy shrimp aquaculture industry.

Keywords: basic diagnostics, emerging technologies, shrimp, disease, value chain

Short Biography

Mr. Joseph Carlo V. Vergel, MSc, FPIPP is a Lecturer at Far Eastern University Philippines. He obtained his Master's degree in Biological Sciences and BS Biology degree from the University of Santo Tomas Philippines. He obtained Diploma in Management Development Program from Ateneo Graduate School of Business Philippines and Diploma in International and Business Law from Yokohama National University Japan.

Use of the Viral Accommodation Mechanisms to Control Viral Diseases in Shrimp

Suparat Taengchaiyaphum*, Kallaya Sritunyalucksana and Timothy W. Flegel
Aquatic Animal Health Research Team (AQHT), Integrative Aquaculture Biotechnology Research Group, National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency (NSTDA), 73/1 NSTDA building, Yothi office, Rama VI, Rd., Phayathai, Ratchathevi, Bangkok 10400, Thailand.
*Corresponding author: suparat.tae@biotec.or.th

Abstract

The shrimp farming industry worldwide is threatened by viral diseases that can cause serious economic losses, so there is an urgent need for effective control strategies. Recent genome research has proven that endogenous viral elements (EVE) originating from shrimp viruses, including extant white spot syndrome virus (WSSV) and infectious hypodermal and hematopoietic tissue necrosis virus (IHHNV), occur in the shrimp genome. This was hypothesized in the 2009 viral accommodation hypothesis (VAH-2009) as a mechanism allowing shrimp and insects to tolerate persistent viral infections without signs of disease. As predicted, it has been shown that EVE arise via host reverse transcriptase (RT) recognition of viral messenger RNA leading to variable viral copy DNA (vcDNA) fragments that may be linear (lvcDNA) or circular (cvcDNA) in form. Some vcDNA fragments are endogenized via host integrase (IN) and produce negative sense-RNA transcripts that are protective via the RNA interference (RNAi) pathway. Protective EVE that occur in germ cells constitute a mechanism for heritable, adaptive immunity. We have revealed EVE and their cognate transcripts in domesticated *P. monodon* broodstock and proven their Mendelian inheritance. We also discovered that cvcDNA extracted from shrimp can reveal the presence of cognate EVE. In addition, cvcDNA extracted from IHHNV-infected *P. monodon* was shown to inhibit IHHNV replication when injected into *P. vannamei* challenged with IHHNV. Taken together, the mechanisms of VAH-2009 open potential strategies for shrimp vaccination and for selection of viral tolerance in shrimp breeding stocks.

Keywords: Viral accommodation, Persistent infection, Endogenous Viral Element(s) (EVE), viral copy DNA (vcDNA), RNA interference (RNAi), shrimp, viral diseases

White Spot Syndrome Virus Facilitates and Relies on Host *de novo* Nucleotide Synthesis to Support Viral Pathogenesis

Cong-Yan Chen[a], Der-Yen Lee[b], Shih-Shun Lin[c], Chun-Hung Liu[d], Han-Ching Wang[a,e]

[a] Department of Biotechnology and Bioindustry Sciences, National Cheng Kung University, Tainan, Taiwan

[b] Graduate Institute of Integrated Medicine, China Medical University, Taichung, Taiwan

[c] Institute of Biotechnology, National Taiwan University, Taipei, Taiwan

[d] Department of Aquaculture, National Pingtung University of Science and Technology, Pingtung, Taiwan

[e] International Center for Scientific Development of Shrimp Aquaculture, National Cheng Kung University, Tainan, Taiwan

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Abstract

In Asia, the shrimp industry has substantial commercial value and potential as a solution to address food demands, particularly with a burgeoning population. However, it is currently facing substantial economic losses due to pathogens, especially white spot syndrome virus (WSSV). Although multi-omics approaches have yielded insights into how WSSV hijacks and dysregulates host metabolism, how WSSV modulates host *de novo* nucleotide synthesis is not fully known. As key contributors to *de novo* nucleotide synthesis, glucose and glutamine are speculated to have crucial roles during WSSV infection. Nevertheless, their activation and dedication to WSSV replication require further investigation. Here, we aim to ascertain the role and impact between host *de novo* nucleotide synthesis and WSSV replication during infection. First, we verified that a metabolic flux in the pentose phosphate pathway and purine/pyrimidine synthesis was significantly induced during WSSV replication, using LC-ESI-MS-based stable isotope tracking analysis. Expression of genes involved in nucleotide metabolism was also up-regulated. To confirm the importance of de novo nucleotide synthesis, dsRNA-mediated gene silencing was used to clarify the dependence between WSSV factors and enzymes involved in *de novo* nucleotide synthesis. After confirming involvement of nucleotide metabolism in WSSV replication, we further investigated the [Ras]-PI3K-Akt-mTOR signaling pathway, reported to induce host metabolism rerouting during WSSV pathogenesis. There was a negative regulation of *de novo* nucleotide synthesis by this pathway at the mRNA level. Furthermore, we verified that the WSSV protein can interact with host nucleotide metabolism proteins. However, underlying mechanisms of protein-protein interactions between the host and viral proteins need to be further explored. In conclusion, this research produced evidence linking host *de novo* nucleotide metabolism and WSSV pathogenesis, contributing novel insights regarding control of WSSV outbreaks.

Keywords: White spot syndrome virus (WSSV), Warburg effect, Nucleotide synthesis

Short Biography

Mr. Cong-Yan Chen is currently working as a PhD student at the National Cheng Kung University. He received his BSc degree in 2020 from National University of Kaohsiung. His research is focused on how white spot syndrome virus (WSSV) modulates and facilitates de novo nucleotide synthesis in shrimp to promote viral pathogenesis.

Shrimp pva-miR-166 and *PvProsaposain* Participate in Hemocyte Homeostasis in White-spot Syndrome Virus Induction by Modulating Apoptosis

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Abstract

A tiny controller called a microRNA (miRNA) inhibits the expression of genes and controls biological processes. The 60 differentially expressed miRNAs (DEMs) from *Litopenaues vannamei* hemocytes with White spot syndrome virus infection from small RNA sequencing were annotated and validated by qRT-PCR. The WSSV-responsive miRNAs' target genes were predicted to come from a variety of pathways. Our interest is aroused by pva-miR-166, the most significantly raised miRNA among 60 DEMs. At 24 hours post-infection (hpi), the negative expression association of pva-miR-166 and its expected target, *PvProsaposin*, was quantified. The pva-miR-166/*PvProsaposin* confirmation data show a reduction in luciferase activity. The loss of *PvProsaposin* reduced the survival rate of WSSV-infected shrimp. The total hemocytes counts (THC) have also reduced, which could be linked to the apoptotic process, as demonstrated by an increase in caspase 3/7 activity. Notably, the administering of the pva-miR-166 mimic to WSSV-infected shrimps resulted in a lower level of *PvProsaposin* transcripts, a significant loss of THC, an increase in caspase 3/7 activity, and a remarkable decrease in WSSV copy number. Presumably, during viral infection, pva-miR-166 is likely transcriptionally controlling the hemocytes homeostasis effector, *PvProsaposin*, to keep their healthy hemocytes and kill the WSSV-infected hemocytes cell via apoptosis.

Keywords: Prosaposin, pva-miR-166, hemocytes homeostasis, WSSV, *Litopenaeus vannamei*

Short Biography

Ms. Chantaka Wongdontri is a Ph.D. student at the Chulalongkorn University. She received her Bachelor's degree from Chulalongkorn University. She then directly continues her doctoral degree under the same field. She recently has authored publications in journals. Her publications reflect her research interests in the White spot syndrome virus- responsive miRNA during the viral infection in penaeid shrimp. She is now currently studying the miRNA degradation mechanism in WSSV infected *Litopenaeus vannamei*.

A glance into the Evolution of the White spot Syndrome Virus Isolated from Farmed *Penaeus japonicus* (Kuruma shrimp) in Japan

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Abstract

White spot syndrome virus (WSSV) causes significant economic losses in shrimp aquaculture. To evaluate the virulence and genetic diversity of recent WSSV outbreaks in Japan, we collected infected shrimp from Okinawa, Miyakojima, and Miyazaki and obtained 1, 4, and 2 isolates respectively.

We challenged healthy Kuruma shrimp using the injection of WSSV isolates. We assessed the mortality and calculated a lethal dose 50% (LD50) endpoint. Genomic analysis of the isolate was performed by extracting total genomic DNA, preparing libraries, sequencing using ONT, performing QC, assembling the whole genome, and performing comparative genomics.

LD50 ranged from 3.0×10^3 to 1.9×10^4 copy number/mL, with Miyakojima-2019 showing the highest LD50 while Miyazaki-2000 showed the lowest LD50. The genomic size of our isolates ranged from 288 to 299 Kbp with overall nucleotide identity from 99.74% to 99.91% based on the reference genome (CN01: NC_003225.3). The isolates showed similar structural architecture with minimal gaps. We detected 1,197 variant forms within our isolates with SNPs forming the biggest proportion. Miyakojima isolates contained the highest number of variants. Frameshift mutations were dominant in all isolates and were observed to have the highest effect on ORFs. Phylogenetic analysis of our isolates including 8 published WSSV isolates showed all Miyakojima isolates clustered together.

The result suggests that our isolates induced mortality with a relatively similar WSSV concentration, which we attribute to similar outbreak intensity. The genomic sizes of our isolates were relatively lower compared to the reference genome. This is an indication that WSSV is evolving through time by shading some of its genetic material. We observed high frameshift mutation in wsv403 ORF, which is a viral E3 ubiquitin ligase, a latency-associated gene. We speculate that this mutation has a key role in the observed outbreaks in Miyakojima among other genes.

Keywords: White spot syndrome virus, virulence, complete genome, genetic variation

Short Biography

Ms. Pattama is currently studying Master's degree at Tokyo University of Marine Science and Technology, Tokyo, Japan

Novel Multiplex PCR Assay for the Detection of Three Major Viruses Affecting Global Tilapia Aquaculture

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Abstract

The recent emergence of RNA and DNA viruses affecting global tilapia aquaculture has highlighted an urgent need for efficacious methods to control and prevent these diseases. Although polymerase chain reaction (PCR) based molecular assays have been developed for single detection of important virus, multiplex PCR techniques for simultaneous detection of multiple viruses have not yet been explored. This study presents the development and validation of a multiple PCR assay of three important viruses in tilapia; namely, Tilapia Parvovirus (TiPV), Infectious spleen and kidney necrosis virus (ISKNV), and Tilapia lake virus (TiLV). The assay, which involves the concurrent extraction of RNA and DNA, is capable of detecting as few as 1,000 virus copies per reaction with remarkable specificity. A thorough examination of this multiplex PCR assay, performed with clinical samples, had its robustness, sensitivity and specificity in screening for either single or concurrent viral infections in tilapia. Overall, this assay offers a potent and cost-effective diagnostic tool for important tilapia diseases.

Keywords: Tilapia viruses, multiplex PCR, diagnosis, emerging diseases

Short Biography

Miss Suwimon Paimeeka is currently pursuing a master's degree in animal health and biomedical Sciences at the Faculty of Veterinary Medicine, Kasetsart University, Thailand. With a strong academic background, she has successfully completed her bachelor's degree in microbiology at the Faculty of Science, Chiang Mai University, Thailand.

Highly Sensitive and Specific Detection of Tilapia Lake Virus in Fish Tissues and Environmental Samples using Droplet Digital Polymerase Chain Reaction

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Abstract

Tilapia lake virus (TiLV) causes high mortality in farmed and wild tilapia more than 17 countries. Here, we developed a highly specific and sensitive droplet digital polymerase chain reaction (ddPCR) assay to detect TiLV. The ddPCR assay demonstrated a lower detection limit at 100 fg cDNA, equivalent to 3.3 copies of TiLV, and a 10-fold higher sensitivity compared to the reverse transcription-quantitative polymerase chain reaction method. Notably, the ddPCR assay showed 100% diagnostic sensitivity and specificity, without cross-reactivity with other viruses or bacteria commonly found in tilapia. The ddPCR assay also had high reproducibility and low variability within and between measurements (correlation coefficient: 0.998). This sensitive assay was able to detect TiLV in various sample types, including mucus, water, and infected tissue samples. Additionally, the results of clinical samples tested with the ddPCR assay indicated a higher detection rate compared to the RT-qPCR method. Overall, the ddPCR method presents a highly promising approach for the accurate and sensitive detection of TiLV in carrier fish and environmental samples with low viral concentrations.

Keywords: tilapia lake virus, quantification, ddPCR, environmental RNA, water epidemiology

Short Biography

Ms. Prasartset is currently working as research assistant at the Department of Veterinary Microbiology and Immunology, Faculty of Veterinary Medicine, Kasetsart University, Bangkok. She received her Master degree on Biotechnology from Mahidol University, Thailand. Ms. Prasartset completed her Bachelor on Marine technology from the Burapha University, Thailand. Ms. Prasartset has authored several publications in various journals. Her publications reflect her research interests in Fish/shrimp diseases and detection methods.

Fish Vaccination: Benefits and Impact in the Tilapia Industry

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Abstract

Vaccination in the fish industry has played a massive impact within salmon farming in the last 30 years. Vaccines helped to drastically reduce the spread of viral and bacterial disease, considerably reducing the usage of antibiotics and improving fish welfare. Only 10% of the world's farmed Tilapia is vaccinated, and ASIA counts only 1% of this total amount. In the last few years, Virbac has started a large campaign of vaccination in the three major continents where Tilapia is farmed, and ASIA is firmly on the top priority on these projects. Currently registered in three countries of APAC, Virbac Tilapia Vaccine range has proved that vaccination can create benefits to the industry, not only by reducing the mortality pressure on the crops, but providing solid economical advantages. The presentation will show the role of vaccination, how it is performed and the correlated economical advantages of the procedure, with an eye on the current husbandry practice and the future technologies applied to it.

Cell-mediated and humoral Immune Responses of Goldfish after Live-attenuated Virus Vaccination and High-water Temperature Treatment against Herpesviral Hematopoietic Necrosis (HVHN)

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Abstract

A live attenuated vaccine (P7-P8) was developed against HVHN in goldfish, caused by cyprinid herpesvirus-2 (CyHV-2), and shown to be effective at various water temperatures (Presented at DAA11). However, the mechanism of immunity acquired after vaccination remains unclear. In this study, the immune response of vaccinated and high-water temperature (HT) treated goldfish was studied by investigating the CD4-1$^+$ and CD8α$^+$ lymphocyte dynamics, as well as the anti-CyHV-2 antibody levels.

Goldfish were vaccinated using the showering vaccination method (1:100 diluted vaccine; holding fish on net for 10 s) or HT-treated (raise water temperature of a virulent CyHV-2 infected fish to 34°C from 2 to 8 days post-inoculation (dpi)). Fish were challenged with a virulent CyHV-2 by immersion after 21 dpi and observed. Meanwhile, the trunk-kidney (TK) and spleen (SP) leukocytes were isolated up to 26 dpi to determine the CD4-1$^+$ and CD8α$^+$ lymphocyte dynamics by flow cytometry. The serum was collected for ELISA using purified virus particles to determine the antibody titer.

The vaccinated and HT-treated groups showed 100% and 95% survival after virus challenge. The CD4-1$^+$ lymphocytes of both groups first showed increment in SP followed by TK in subsequent days. In addition, the CD4-1$^+$ lymphocytes in TK peaked at 26 dpi and 24 dpi for the respective groups. Although the CD8α$^+$ lymphocytes in TK and SP increased after virus challenge for both groups, the vaccinated group maintained high levels of CD8α$^+$ lymphocytes up to 26 dpi. At 22 dpi, the CD4-1$^+$ and CD8α$^+$ lymphocytes in TK of the HT-treated group are significantly higher than the vaccinated group. For ELISA, HT-treated group showed significant higher antibody titer compared to the vaccinated group at 22 dpi. These results suggest that in vaccinated goldfish, the cell-mediated immunity can play a more important role than the humoral immunity against this disease.

Keywords: Live attenuated vaccine, cell-mediated immunity, humoral immunity, CD4-1, CD8α

Short Biography

Saito Hiroaki is currently studying for his PhD in Tokyo University of Marine Science and Technology. He completed his Masters in the same university by studying the characteristic of a live attenuated vaccine against Cyprinid herpesvirus-2 in goldfish. In his PhD studies, he focused on genomic changes in the live attenuated vaccine and studied on the immunological responses of fish after administration of the vaccine.

Dynamics of infectious hematopoietic necrosis virus (IHNV) in rainbow trout *Oncorhynchus mykiss* during maturation

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Abstract

Infectious hematopoietic necrosis (IHN) has caused significant loss in rainbow trout aquaculture in Japan. The causative agent IHNV is detected from brood fish at spawning season. A scenario in which depression of fish immunity at maturation process may permit the virus re-activation in fish has been considered. However, our recent epidemiological study suggests that brood fish can be re-infected with IHNV during maturation. In this study, we studied virus dynamics in rainbow trout during maturation at the Nagano Prefectural Fisheries Experiment Station in 2021 and 2022. Organs (kidney, spleen, pancreas-pyloric caeca, liver, heart, brain, and gonad), ovarian fluid (spawner), and serum were sampled from brood fish in the course of maturation. The organs and ovarian fluid were used to isolate IHNV in EPC cells and the virus infective titre in the samples were determined. Neutralizing antibody titre in the serum was measured using the isolated virus. As the result, no virus was isolated from fish with gonad-somatic index (GSI) ranging from 0.1 to 17.5 (12 fish in 2021, 17 fish in 2022), except the ovary of one individual with GSI of 18.9, at just before spawning, in 2022. Virus was isolated from the ovarian fluid of spawned fish (7/12 fish in 2021, 4/12 fish in 2022), and 3 of 7 and 2 of 4 virus-positive fish showed infective titre over 10^5 $TCID_{50}$/mL in the ovarian fluid and also at $10^{4\text{-}5}$ $TCID_{50}$/g levels in other organs. However, no virus was isolated from the kidney of all fish including spawner. In addition, no or low neutralizing antibody titre were detected in the serum. The results suggest that IHNV re-infects at gonad in brood fish, in which neutralizing antibodies disappear, at just before spawning and, in case the virus propagates over 10^5 $TCID_{50}$/mL level in the gonad, the virus spreads to other organs.

Keywords: Infectious hematopoietic necrosis virus, Infection dynamics, Rainbow trout, Brood fish, Maturation

Short Biography

Mr. Ryota Shimizu is currently a master course student of the Graduate School of Marine Science and Technology, Tokyo University of Marine Science and Technology. He is studying on infectious hematopoietic necrosis of rainbow trout. He worked on a bacterial disease of *Pinctada fucata martensii* at an undergraduate student in the Toyama University.

Cracking the Code of Tilapia Lake Virus Replication: Unleashing the way to inhibit the virus

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Abstract

Tilapia Lake virus (TiLV) poses a significant economic threat to the tilapia industry worldwide. In this study, we investigated two key aspects of TiLV replication and immune responses: the role of the MAPK/ERK pathway during infection and the antiviral potential of ribavirin. On the first study, findings revealed distinct patterns of ERK phosphorylation (p-ERK) in two fish cell lines, E-11 and TiB, upon TiLV infection. While p-ERK levels remained constant in E-11 cells, a significant decrease was observed in TiB cells after 24 hours of infection. Suppression of p-ERK using the inhibitor PD0325901 resulted in reduced TiLV load and attenuated expression of immune-related genes, *mx* and *rsad2* genes in TiB cells during early infection. These results highlight the critical role of the MAPK/ERK pathway in TiLV infection and offer insights into cellular mechanisms involving the viral replication and the host immune response. Our second study demonstrated the antiviral efficacy of ribavirin against TiLV replication. Ribavirin, an inhibitor of nucleoside synthesis, efficiently attenuated TiLV-induced cytopathic effects in fish cells at concentrations above 100 μg/mL, improving cell survival and reducing viral load. These findings underscore the potential of ribavirin and PD0325901 as antiviral agents for TiLV. Understanding these secrets of TiLV will aid in the development of effective strategies to combat this devastating virus and protect the global tilapia industry.

Keywords: Immune responses, MAPK/ERK pathway, ribavirin, Tilapia Lake virus, viral replication

Short Biography

Dr. Lertwanakarn is currently working as lecturer at the Department of Physiology, Faculty of Veterinary Medicine, Kasetsart University, Bangkok. He received his PhD on Animal Physiology from Chulalongkorn University, Thailand. Dr Lertwanakarn completed his bachelor's degree as Doctor of Veterinary Medicine from the same univesity. Currently, Dr. Lertwanakarn has authored several publications in various journals. His publications reflect his research interests in pathophysiology of viral diseases in fish.

Molecular Epidemiology of *Megalocytivirus* in Freshwater Angelfish (*Pterophyllum scalare*) from Malaysia

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Abstract

Malaysia has more than 630 culturists that are involved in the ornamental fish industry for culturing 250 species including local and exotic species. However, megalocytiviruses have been associated globally with severe systemic disease and economic loss in ornamental fish. Thus, this study aimed to detect the occurrence of *Megalocytivirus* while discovering its associated risk factors and the genotypes of its causative agent in an ornamental fish farm in Malaysia. A total of seven pairs of freshwater angelfish broodstock were used in this study to follow the fish's life stages from eggs to market size. The water samples and other samples such as mucus swabs, gill swabs, freshwater angelfish eggs, fries, juvenile, snail, snail eggs, live feed (tubifex worms/*Moina* sp.), sediment and wild fish were collected periodically for initial environmental sampling and from day 0 to day 60. Nested PCR amplifications were carried out on megalocytiviruses-related sequences. The phylogenetic tree was inferred from the major capsid protein (MCP) genes from all known Iridoviridae species using Molecular Evolutionary Genetics Analysis (MEGA). Pearson's correlation coefficient values used to determine the strength of the correlation between the presence of megalocytiviruses in *P. scalare* samples and its associated risk factors. A total of 312 samples out of 935 pooled and individual samples, demonstrated positive results in tests for the presence of megalocytiviruses-related sequences except snail eggs and wild fish (*Poecilia reticulata*). Detection of *Megalocytivirus*-associated viruses in water samples demonstrated evidence of horizontal transmission of the disease. All the nucleotide sequences found in this study had high nucleotide identities of 95% to 99 % to each other and were closely related with *Megalocytivirus* genotype I infectious spleen and kidney necrosis (ISKNV). Overall, this study was the first to confirm the existence of different possible routes of megalocytiviruses distribution in the ornamental fish farm in Malaysia.

Keywords: Epidemiology, ISKNV, *Megalocytivirus*, Ornamental fish, Risk factors

Short Biography

Mr. Che Azarulzaman is currently pursuing his study as master's degree in science (Aquaculture) at the Universiti Malaysia Terengganu, Malaysia. Mr. Che Azarulzaman completed his bachelor's degree in agrotechnology (Aquaculture) from the Universiti Malaysia Terengganu, Malaysia. Mr. Che Azarulzaman has authored several publications in various journals. His publications reflect his research interests in molecular detection of aquatic viruses.

Effect of Water Temperature Fluctuation on the Occurrence of Betanodavirus Infection in Asian seabass (*Lates calcarifer*)

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Abstract

The aquaculture sector in Malaysia has grown rapidly contributing 11% of the national agriculture gross domestic product (GDP). Mariculture is the main contributor to the aquaculture industry with a total production of 311,284 mt and 2.52B Malaysian Ringgit (MYR) of value in the year 2021. However, the mariculture industry has many obstacles that can slow down its growth and diseases are one of the major threats. Betanodavirus is a pathogen that affects various fish species, including Asian seabass (*Lates calcarifer*), causing a viral nervous necrosis disease commonly known as viral nervous necrosis (VNN). VNN is an important disease in cultured marine fish and was considered the biggest problem in cultivating Asian seabass (*Lates calcarifer*) in Malaysia nowadays. Multiple studies had revealed the ability of the disease to transmit via both horizontal and vertical modes. Horizontal transmission is coming from the culture environment especially the seawater itself, while vertical transmission is sourced from the infected broodstock. The predisposing factors that led to VNN in Asian seabass are still unclear although recent studies speculated stress or primary infection by the marine bacterium *Vibrio* sp. consequentially had led to the secondary infection by betanodavirus. A survey study involving several nurseries was conducted in a district located in the east coast region of peninsular Malaysia, which is the largest production hub for Asian seabass seed in Malaysia to know the possible predisposing factors. The results indicated 100% of fish farmers reported the temperature fluctuation as a predisposing factor for VNN, followed by stocking density (71.42%) and seed quality (42.86%). Based on this finding, an experiment was done to confirm the claim that temperature fluctuation is the main predisposing factor for VNN in Asian seabass. At the start, Asian seabass fingerling was divided into two groups with duplicates; Group 1 is considered a control group where the fingerling was reared in the non-fluctuated water temperature prior to challenge with betanodavirus, while Group 2 is a treatment group where the fingerling was reared in the fluctuated water temperature. After thirty days, 11.25% of cumulative mortality was recorded in Group 1 (control) and 72.5% of cumulative mortality in Group 2 (treatment). Thus, the study confirmed that temperature fluctuation is a main predisposing factor for VNN in Malaysia.

Keywords*:* Asian seabass, mariculture, VNN, betanodavirus, temperature fluctuation

An Experimental Animal Model of Yellowfin Seabream (*Acanthopagrus latus*) for *Amyloodinium ocellatum* Infection

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Abstract

Amyloodinium ocellatum is a worldwide distributed protozoan that infects almost all marine fish species, causing fatal amyloodiniosis. However, highly effective antiparasitic agents for controlling amyloodiniosis are lacking. This study was conducted to establish a laboratory model of *A. ocellatum* infection, facilitating the development of alternative treatment options and immunostimulants for *A. ocellatum* using yellowfin seabream (*Acanthopagrus latus*) as the experimental host. The life cycle and preservation strategies of *A. ocellatum*, the stability of dinospore infection in *A. latus*, and the tolerance of *A. latus* to *A. ocellatum* infection were observed and evaluated. Under suitable conditions (temperature: 27 ± 1 ℃; salinity: 30 ± 1‰), *A. ocellatum* completes its life cycle on *A. latus* in 4–5 d and peak trophont detachment from *A. latus* occurs at 44–52 h post-infection. The peak period when tomonts release dinospores occurs 51–60 h after incubation at 28 ℃. Dinospores have high vitality and infectivity within 6 h of release from tomonts. The infection model developed in this study is stable, with a 39.85–44.68% dinospore infection rate. Additionally, gills were the main *A. ocellatum* infection site, accounting for 70.49–72.68% of the total trophonts in infected *A. latus*. The maximal tolerance dose (MTD) and lethal concentration 50 (LC50) of *A. ocellatum* to *A. latus* were 14,686 and 28,901 dinospores per fish, respectively. Tomonts can be preserved for at least 3 months at 12 ℃. This study established an *A. ocellatum* infection model under laboratory conditions, which is potentially helpful in exploring alternative treatments and investigating the pathogenic mechanisms of amyloodiniosis.

Keywords: *Amyloodinium ocellatum*, *Acanthopagrus latus*, infection model, life cycle, preservation

Short Biography

Dr. Anxing Li is currently working as professor at the Sun Yat-Sen University. He received his Doctoral degree or PhD on Veterinary Medicine from the University of China Agricultural University. He has authored several publications in various journals and books. His publications reflect his research interests in fish parasite disease and streptococcicosis. Dr Zhicheng Li completed his Masters on Aquaculture from the Sun Yat-sen University in 2021. He then worked at the Sun Yat-Sen University, served as doctoral student.

Morphological Identification of Parasites in Spotfin Bigeye, *Priacanthus tayenus* from the East Coast of Peninsular Malaysia

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Abstract

Priacanthus tayenus, also known as Spotfin Bigeye is a reddish or silvery white bigeye with pink tinges, pinkish fins and distinctive deep purple to ink-black spots on the pelvic-fin membranes, including large spots on the membrane joining the abdomen. The species has relatively tall soft dorsal and anal fins, and filamentous tips on the tail. These fish species are commercially caught and mostly processed for commercial seafood products. The prevalence and diagnosis of the parasites of *P. tayenus* were investigated. The average sizes (n=50) for length and weight of *P. tayenus* with 13.3 + 2.1cm and 58.6 + 27.6g were recorded respectively. Ten species of parasite were observed which included six types of ectoparasites and four types of endoparasites. There were three species of trematode, two species of ectoparasites and one species of endoparasite. Three species of crustacean parasites were found with two of the species specifically identified as *Pseudolernanthropus epinepheli* and *Lernanthropus priacanti* and the others can only be identified up to genus (*Caligus* sp.). Other species are monogenean, digenea, *Hysterothylacium* sp. (nematode), cysts of Myxosporea and the cestode; larvae of *Trypanorhyncha*. More studies need to be carried out related to the parasite of *P. tayenus* especially for the distribution of the parasites during different seasons. This is important information for commercial fish to make sure the quality of the fish is guaranteed in line with the food safety procedures.

Keywords: Food security, endoparasites, ectoparasites, pelagic fish and food quality.

Short Biography

Dr Mohd Ihwan Bin Zakariah graduated with his PhD in Universiti Putra Malaysia (UPM), Malaysia in Aquatic Animal Health. He is now a Senior Research Officer at Universiti Malaysia Terengganu (UMT). His field focuses on aquaculture, marine biology and fish parasitology. He published more than 27 publications in high-impact journals and has a H-index of 5.

Characterization of Thioredoxin Glutathione Reductase in *Cryptocaryon irritans* as a Target for Medicine Discovery

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Abstract

Marine cultured fish often suffer from *Cryptocaryon irritans* infection, which causes enormous mortality. *C. irritans* is resistant against oxidative damage induced by zinc. To develop an effective drug to control infection, a putative thioredoxin glutathione reductase (CiTGR) from *C. irritans* was cloned and characterized. CiTGR was designed as a target to screen for thioredoxin reductase (TrxR) activity inhibitors by molecular docking. The selected inhibitors were tested both *in vitro* and *in vivo*. The results showed that CiTGR localizes in the nucleus of the parasite, possesses a common pyridine-oxidoreductases redox active center, and lacks a glutaredoxin active site. Recombinant CiTGR showed high TrxR activity but low glutathione reductase activity. Shogaol was found to significantly suppress TrxR activity and impose strong toxicity on *C. irritans* ($P < 0.05$). The abundance of *C. irritans* on the fish body decreased significantly after oral administration of shogaol ($P < 0.05$). These results identified CiTGR as a promising and available target to screen for drugs that weaken resistance of *C. irritans* to oxidative stress thus controlling infection. This paper deepens the understanding of the interaction between ciliated parasites and oxidative stress.

Keywords: *Cryptocaryon irritans*, thioredoxin glutathione reductase, inhibitors, molecular docking, shogaol

Short Biography

Dr. Anxing Li is currently working as professor at the Sun Yat-Sen University. He received his Doctoral degree or PhD on Veterinary Medicine from the University of China Agricultural University. He has authored several publications in various journals and books. His publications reflect his research interests in fish parasite disease and streptococcicosis. Dr Zhicheng Li completed his Masters on Aquaculture from the Sun Yat-sen University in 2021. He then worked at the Sun Yat-Sen University, served as doctoral student.

Ammonia-nitrogen Removal and Microbial Community Dynamics in an Outdoor HDPE-lined Shrimp Pond with no Water Discharge

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Abstract

This study assessed characteristics of a zero-discharge outdoor high-density polyethylene (HDPE)-lined, demonstration aquaculture pond (400 m^2) in terms of water quality variables, total ammonia nitrogen (TAN) removal and oxygen net primary production (NPP) indices, and photosynthetic microbiome over a 76-day crop cycle. The shrimp harvest yield was 4.1 t/ha/crop with an average daily gain (ADG) of 0.15 g/day and a feed conversion ratio (FCR) of 1.49. During shrimp cultivation with a semi-intensive stocking density (40 shrimp/m^2), there were low levels of TAN (<1.01 mg-N/L), nitrite (<0.21 mg-N/L), and nitrate (<2.79 mg-N/L). Ammonia removal was mainly mediated by photoautotrophic uptake, as evidenced by the consistent estimated TAN uptake rate of 0.05±0.02 g-N/m^3 h, which was calculated based on photosynthesis. The overall TAN removal rate of 0.10±0.08 g-N/m^3 h was maintained by suspended microorganisms in water, which exceeded that of microorganisms attached to the HDPE liner surface. A positive oxygen NPP of 0.24–1.16 g-O_2/m^3 h during light availability indicated prevailing autotrophic conditions. The bacterial community in the water was dominated by Phyla Pseudomonadota (Proteobacteria; 16–32%), Bacteroidota (Bacteroidetes; 15–29%), Cyanobacteria (7–35%), and Actinomycetota (Actinobacteria; 3–39%). The chloroplast amplicon sequence variants (ASVs) indicated abundances of Bacillariophyta (27–97%) and Chlorophyta (0.4–67%). High centric diatom populations (Bacillariophyta) were detected throughout cultivation, while the proportion of green algae (Chlorophyta) was positively correlated with increased TAN availability when feeding was increased. The findings enabled estimations of TAN removal and oxygen NPP rates and provided an understanding of correlations between environmental variables and bacterial and phytoplankton populations in the outdoor lined shrimp pond.

Keywords: Ammonia removal, Carrying capacity, Phytoplankton, Microbiome, Outdoor shrimp pond

Short Biography

Anuphap PRACHUMWAT, PhD, is a senior researcher at National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency (NSTDA) in Thailand. He received his doctorate in Genetics from University of Chicago, USA. He is interested in utilizing genomic sequences to better understand interactions between shrimp, their pathogens and microbiomes. He analyzes genomes and transcriptomes of several shrimp pathogens for developing detection methods and strategies to control infections and reduce virulence. He and his colleagues investigate microorganisms and pathobiomes of shrimp aquaculture systems for shrimp health and pathogen discovery of current and potential future emerging shrimp diseases.

The Effect of Oral Immunization Using Palm Oil Adjuvanted Vaccine Against Streptococcosis in Cage-Cultured Red Hybrid Tilapia

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Abstract

Streptococcosis poses a considerable threat to tilapia farming, necessitating the urgent development of an effective vaccine. Previously, we have demonstrated the potential usage of palm oil as a vaccine adjuvant in the feed-based streptococcosis vaccine following laboratory trials. The present study further investigated the vaccine's efficacy using a similar formulation under field conditions. A total of 6,000 red tilapia were equitably distributed into six cages. Fish from Group 1 in cages 1 and 2 were not vaccinated, serving as a negative control. Group 2 in cages 3 and 4 were vaccinated twice on week 0 and week 2 (single booster), while Group 3 in cages 5 and 6 were vaccinated thrice on week 0, week 2, and week 6 (double booster). The palm oil adjuvanted bacterin vaccine was administrated orally at an average of 5% body weight. Blood serum and organ samples of the eye, brain, and kidney were collected every two weeks until the conclusion of the 16-week trial period to measure immunoglobulin M (IgM), lysozyme, complement-3, and bacterial isolation. Following vaccination and the first booster, there was a significant (p<0.05) increase in IgM levels in all vaccinated groups from week 2 that peaked at week 4 before gradually declining. However, an additional booster on week 6 significantly (p<0.05) increased the IgM levels, which remained high until the end of the study period. Similarly, an increasing lysozyme and complement-3 activity were observed following each administration, especially in the double booster group. The average isolation rate of *S. agalactiae* was 19.6 ± 20.2%, 11.5 ± 11.3%, and 8.2 ± 9.4% from unvaccinated, single, and double booster groups, respectively. At the end of the study period, the mortality rate was 23.6 ± 1.8% for unvaccinated, 14.5 ± 5.9% for single booster, and 6.4 ± 0.4% for double booster groups. These results indicate that oral administration of palm oil adjuvanted vaccine stimulates both specific and non-specific immune responses, reduces the incidence of streptococcosis to 11.4%, and improves the survival rate to 93.6%.

Keywords: Vaccination trial, Oral vaccine, Tilapia, Streptococcosis, *Streptococcus agalactiae*,

Short Biography

Mr. Mohd Syafiq Mohammad Ridzuan is devoted to fish health R&D. He currently serves as a Research Officer at the National Fish Health Research Center, Department of Fisheries Malaysia. With an extensive experience of 9 years and ongoing, he has established a strong foundation in the field. Concurrently, he is pursuing a master's degree at the International Islamic University Malaysia. His publications reflect his research interests in fish diseases and aquaculture vaccines.

Enhance Resistance to Acute Hepatopancreatic Necrosis Disease in Heat Stressed Shrimp by Peroxiredoxin4

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Abstract

Non-lethal heat shock (NLHS) is known to enhance resistance to acute hepatopancreatic necrosis disease caused by *Vibrio parahaemolyticus* (VP_{AHPND}) in the Pacific white shrimp *Penaeus vannamei*. Generally, cell damage induced by stress leads to the release of damage-associated molecular patterns (DAMPs), molecules that act as endogenous danger signals to promote immune response. Peroxiredoxin (Prx), an antioxidant enzyme involved in the regulation of reactive oxygen species, has been reported as danger signals in mammals but not in shrimp. This research aims to characterize the function of *Lv*Prx on activation of immune response against VP_{AHPND} infection. Among them, the expression level of peroxiredoxin-4 (*Lv*Prx4), was highly expressed upon NLHS treatment. Release of *Lv*Prx4 into hemolymph upon NLHS treatment has been confirmed. Recombinant *Lv*Prx4 protein (r*Lv*Prx4) possessed peroxidase activity and could prevent the nicking of DNA in vitro. r*Lv*Prx4 could prolong the survival of VP_{AHPND}-challenged shrimp and induce the expression of the immune-related genes via the activation of Toll-like receptor 1/2. Moreover, we fed shrimp with the r*Lv*Prx4-supplemented diet for 3 weeks and found that it could induce the expression of immune-related genes, *LvPEN4* and *LvVago5*, in shrimp hemocytes. The intestinal microbiome characterization indicated the similarity in the bacterial richness of r*Lv*Prx4-treated and control groups, but Rhodobacteraceae which was reported as potential probiotics was increased after feeding with r*Lv*Prx4-supplemented diet. Our data suggests that *Lv*Prx4 could act as DAMP and stimulate shrimp immunity resulting in enhancing AHPND resistance and altering the bacterial community structure in the shrimp intestine.

Keywords: peroxiredoxin, Pacific white shrimp, non-lethal heat shock, bacterial resistance, microbiome

Short Biography

Miss Supitcha is currently working as researcher at Center of Excellence for Molecular Biology and Genomics of Shrimp. She received her Doctoral degree or PhD on Biochemistry from Chulalongkorn University. Miss Supitcha has authored several publications in various journals and books. Her publications aim to conduct research to solve problems in shrimp diseases for sustainable aquaculture by using molecular biology technologies.

Effects of Probiotic and Nutrient Supplementations on Growth Performance and Gut Microbiota of Stinging Catfish, *Heteropneustes fossilis*

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Abstract

The effects of different probiotics and nutrient supplementations on growth, gut microbiota and intestinal histomorphology of stinging catfish, *Heteropneustes fossilis* were investigated by a 90 days long feeding trial. Fifteen earthen ponds categorized into five treatments each with three replications were used. A total of 750 fingerlings (1.03 ± 0.11g) were stocked in each of the pond (30 m^2). Three experimental diets were prepared for Treatment-1 (T1), Treatment-2 (T2) and Treatment-3 (T3) with the recommended dose of gut probiotic Zymetin, gut nutrient Mutagen, and laboratory-prepared Spirulina powder, respectively. Treatment 4 (T4) was supplemented with the recommended dose of soil probiotic Super PS with a regular basal diet. Only a commercial basal diet was used for the last treatment, T5 as control. Water quality parameters, body weight of fish and gut bacterial load were measured fortnightly. Villi lengths of intestine of experimental fish were measured in the initial and final stage of the experiment. At the end of the experiment, net weight gain of T_1, T_2, T_3 and T_4 were 33.18±0.825 g, 24.78±0.578 g, 19.86±0.327 g, 21.79±1.068 g and 11.02±0.511 g respectively. Weight gain in probiotic and nutrient supplemented group were significantly higher than control (T_5) group, where T_1 had showed the highest growth performance among five treatments. The highest gut bacterial load was also observed in T1 (1.9×10^5 CFU/mL) on the 90th day while the lowest load was counted in T3 (1.9×10^4 CFU/mL) on the second sampling day. Intestinal histomorphology showed significant increase in the intestinal villi length in respect to control group. Our findings thus revealed the effectiveness of the gut probiotic supplementation on the growth and enhancing intestinal bacterial load of stinging catfish.

Keywords: Probiotic, Nutrient, Growth, Microbiota, *Heteropneustes fossilis*

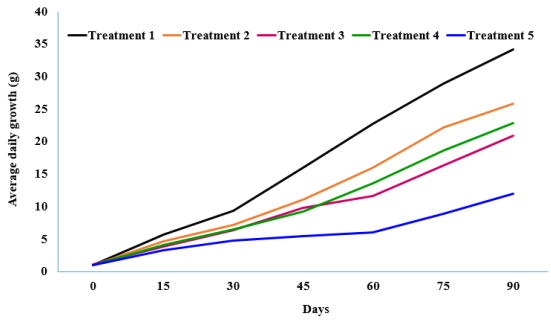

Fig. The mean fortnightly growth response of *H. fossilis* under different probiotic and nutrient supplementations supplemented diets

Short Biography

Dr. Md. Ali Reza Faruk is currently working as a Professor and Head of Department of Aquaculture at the Bangladesh Agricultural University (BAU), Mymensingh. He received his PhD degree on Fish Disease and Immunology from the University of Stirling, UK and completed his Post-doctoral studies from the University of Aberdeen, UK. Dr. Faruk was a recognized Teacher of the University of Stirling, UK for the MSc in Aquatic Resource Management course between University of Stirling and BAU. Dr. Faruk has authored several publications in various journals and books. His research interests include strategy development for fish health management, characterization of aquatic pathogen and fish pharmacology.

Abstracts

Poster Presentations

Influence of Environment and Genetics on Fish Behaviour and Microbiome

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Abstract

Influence of rearing environment on fish phenotypic variations has been found to shaping genetic architecture and cognitive behaviour from its early life stage. Enriched environment and diet have been observed to lower stress and increase the scope for more natural behaviours in fish. But there is very limited research in this field in fish compared to mammals, especially regarding the homeostasis in fish behavioural and physiological response due to genotype by environment (diet and rearing environment) interactions. Probiotic has been found to modulate microbiome-gut-brain axis and shoaling behaviour in zebrafish. However, the effect of probiotic diet and rearing environment has not been explored yet to compare the gene-environment interplay in fish behaviour. Therefore, the main aim of this research was to investigate for the first-time evidence of the relative role of fish genotype and environment (different rearing environments and diets) on behaviour and gut-microbiome using highly naturally inbred mangrove killifish (*Kryptolebias marmoratus*) as a biological model. Novel object exploration and Basal metabolic rate (BMR) was tested for behavioural response measurements and 16S rRNA gene metabarcoding was followed for the gut-microbiome investigation. Fish from probiotic diet group were found to spend more time on exploration. The main findings clearly show the main and interactive effects of fish genotype, diet, and environment on behaviour but none on their basal metabolic rate (BMR) results. Overall, our results on killifish (*K. marmoratus*) gut microbiome demonstrates the wider diversity in both alpha and beta composition across all samples. This finding will be useful to explore further genotype by environment impacts on the improved survival, fitness, and better health management of fish.

Keywords: Environment, genotype, *Kryptolebias marmoratus*, probiotic, microbiome

Short Biography

Ishrat Zahan Anka is currently pursuing her PhD in Biological Sciences as a Commonwealth Scholar at Swansea University in the UK. Earlier, she completed Erasmus Mundus Joint master's degree in Aquaculture, Environment and Society (EU funded Erasmus Mundus Scholarship). She has been working as Assistant Professor in the Department of Aquaculture at Chittagong Veterinary and Animal Sciences University (CVASU), Bangladesh since 2013. Her research works and publications reflect her research interest on fish health and environmental impacts on fish in aquaculture.

Estimation of Infectious Hematopoietic Necrosis (IHN) Virus Dynamics by Molecular Epidemiology

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Abstract

IHN frequently occurs in trout farms in Japan, but the virus dynamics in the facility is not fully understood. In this study, we conducted a molecular epidemiological study on IHN virus in rainbow trout *Oncorhynchus mykiss* at the Nagano Prefectural Fisheries Experimental Station (Nagano Institute) and the Fuji Trout Hatchery, Shizuoka Prefectural Research Institute of Fishery and Ocean (Fuji Institute) to estimate the virus dynamics. IHN virus was isolated from the dead fry and the ovarian fluid of spawner from 2019 to 2022. Phylogenetic trees were created from the virus N and G protein gene partial sequences (1,085 bp in total) to investigate the relationship of the isolates. In addition, fry surviving artificial infection with known virus strains were grown up, and the ovarian fluid was collected during the first spawning period to examine isolated viruses. In Nagano Institute, cases of IHN outbreaks in fry were caused by various genetically different viruses, and the isolates differed depending on the year. In Fuji Institute, isolates from the dead fry were less diverse, and similar isolates were found over time. From the ovarian fluid of spawner, in Nagano Institute, the isolates tended to differ in each year even in the same fish group, but in Fuji Institute, the difference of the isolates between years was not evident. From survivors in artificial infection, no inoculated virus was isolated during the spawning season at both facilities, and the isolated virus were similar to those detected in spawner in the year. Viruses derived from the dead fry and spawner in Nagano Institute formed genetically different clades. These results suggest that the virus that infect fry are once cleared from the fish during the fish grow phase, and subsequently matured fish re-infect with virus that are genetically different from the strain detected from fry.

Keywords: Infectious hematopoietic necrosis, Rainbow trout, *Oncorhynchus mykiss*, Virus epidemiology, Infection dynamics

Short Biography

Dr. Sano is currently working at as a professor at TUMSAT. He received his PhD on Fisheries Science from the Tokyo University of Fisheries. He has authored many publications in various journals and books. His publications reflect his research interests in fish virus and host interaction.

EPMA of the Deposit on the Inner Surface Shells and Gene Expression Analysis of the Mantle Tissue Infected with Summer Atrophy Virus in the Akoya Pearl Oyster (*Pinctada fucata*)

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Abstract

The Akoya pearl oyster, *Pinctada fucata*, is the major species used for pearl culture in Japan. A massive mortality of juvenile and mantle atrophy of adult *P. fucata* has occurred during summer in major pearl production areas in Japan since 2019. The disease named "summer atrophy" causes formation of brown substance deposit on inner shell surface and mainly at the edge of the mantle tissue, and a non-enveloped virus tentatively categorized as a birnavirus is reported as the causative pathogen. In this study, we conducted experimental infection and time course analyses of the brown deposit by an electron probe microanalyzer (EPMA) and of gene expression in the infected mantle tissue by qPCR. The body fluid of diseased *P. fucata* was inoculated into the adductor muscle of three-year-old *P. fucata*. Each four *P. fucata* were sampled from an aquarium at 0 (before injection), 1, 3, 6, 10, 14, 21, and 35 days post-injection. Material composition of the deposits on inner shell surface of the affected shell was analyzed by an EPMA. In cluster analysis of the elemental composition ratio, the brown deposits belonged with the cluster of a melanin standard, showing the brown deposits are consisted of melanin. The gene expression analysis in the infected mantles by qPCR targeting shell matrix protein genes (*msi31* and *msi60*), tyrosinase genes involved in melanin formation (*OT47* and *pfty1*), and superoxide dismutase (*SOD*) was carried out. A general linear model was created using the presence of deposits as an objective variable, with virus gene copy numbers in the body fluid and mantle and expression levels of the above five genes as explanatory variables. Consequently, an optimal model selected *OT47, msi60,* and *SOD* as explanatory variables. The results suggest that virus infection induced up-regulation of SOD and tyrosinase, inducing melanization on the inner surface of shells.

Keywords: *Pinctada fucata*, summer atrophy, melanization, viral diseases

Short Biography

Dr. Natsumi Sano is currently working as research fellow at the Mie University. She received her PhD on fish pathology from the Tokyo University of Fisheries. Dr. Natsumi Sano has authored several publications in various journals. She publications reflect her research interests in the pearl oyster diseases and aquaculture and genetics of bivalves.

Lymphocystis Disease Virus Infection on Snakehead Fish (*Channa striata*) in Indonesia

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Abstract

Snakehead fish is an important and popular fish species in Asian An outbreak on snakehead fish *Channa striata* was reported in South Kalimantan, the important producer in Indonesia. The disease fish showed the presence on wart at the surface of the body. The fishes were collected and observed on the clinical symptoms. The warts were fixed in neutral formalin buffer for histology, and in ethanol for molecular analysis. The major capsid protein (MCP), DNA polymerase (DNAPol) and myristylated membrane protein (MMP) genes were amplified by PCR followed by sequencing. Histology analysis showed enlarged lymphocytes of with various diameters are present in the wart tissue. Central and peripheral lymphocytes contain basophilic intracytoplasmic inclusion bodies enclosed by a thick hyaline capsule. PCR reaction produced specific bands indicated the presence of the Lymphocystis Disease Virus (LCDV) in wart tissue samples. This LCDV shared high homology with LCDV Oc-Btm from *Amphiprion percula* based on nucleotide sequences of MCP and MMP as 97,62% and 97,55% respectively. Among the established species, this LCDV showed highest homology with LCDV-1, but the homology based MCP, DNAPol and MMP genes are quite low as 90.59%, 87.05%, and 88.15% respectively. Those results may indicated that that this LCDV may become a new species LCDV.

Keywords: DNA polymerase, histology, major capsid protein, myristylated membrane protein, wart

Short Biography

Dr. Murwantoko is currently working as lecturer at the Department of Fisheries Universitas Gadjah Mada. He received his Doctoral degree on Molecular Biology from the Nara Institute of Science and Technology in Japan. Dr. Murwantoko has authored several publications in various journals and books. His publications reflect his research interests in molecular biology and fish disease.

The Potential of Photosynthetic Bacteria against Pathogen in Tilapia (*Oreochromis niloticus*)

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Abstract

Aquaculture has been recognized as an important industry for providing food, and the demand for high-quality and sustainable aquaculture products is increasing nowadays. Tilapia (*Oreochromis niloticus*) is the most popular fish culture in Thailand according to the fast growing and high adaptation in each water quality. However, the tilapia culture has encountered the serious diseases outbreak for decades and caused the massive economic loss around the world e.g., Tilapia Lake Virus (TiLV) infection, Streptococosis mainly from *Streptococcus agalactiae* infection, Aeromoniasis from *Aeromonas* spp. infection. Photosynthetic bacteria (PSB) of which under the purple non-sulfur bacteria (PNSB) group e.g., *Rhodopseudomonas* spp., *Rhodobacter* spp. which can be found in wastewater ponds, sediments, moist soils, marine ecosystems, etc. have been studied for their potential application in aquaculture due to their ability to fix nitrogen, produce oxygen, and synthesize various compounds beneficial for aquatic organisms as a bioremediation agent. Only a few studies have been discovered that PSB has an ability to promote growth performance and innate immune response in red tilapia. Nevertheless, the potential of PSB against fish pathogens is still unclear and the application of PSB in aquaculture is still in its early stages and requires further research to fully understand its potential and limitations. This study conducted by isolated PSB from water, soil, and fish in tilapia, and climbing perch pond, then performed an inhibition test. The result surprisingly showed that 50% (5/10) of PSB isolates got an interesting dose-dependent uncleared zone on *Aeromonas sobria* isolated from tilapia. This unexpected result led us to the further study of the component of PSB which could inhibits the fish pathogen and to develop the alternative prevention of disease in tilapia culture industry.

Keywords: Photosynthetic bacteria (PSB), Tilapia, *Oreochromis niloticus*, pathogen, inhibition test

Short Biography

Dr.Chiranan Sudpraseart is currently working on her Doctoral degree or Ph.D. on the aquatic animal production medicine program in the faculty of Veterinary Science, Mahidol University, Thailand. Dr.Chiranan Sudpraseart completed her Master of Science (Aquatic animal health) from National Pingtung University of Science and Technology, Taiwan R.O.C. and her Doctor of Veterinary Medicine (D.V.M.) and Bachelor's degree from the faculty of Veterinary Science, Mahidol University, Thailand. Dr.Chiranan Sudpraseart has publications reflect her research interests in Aquatic animal production.

Molecular Detection of T4-like Myoviruses in Marine Sponges, *Xestopongia* sp and *Aaptos* sp. from Terengganu Islands, Malaysia

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Abstract

Sponges are important in nutrient cycles in coral reef systems. Viruses are ubiquitous biotic components of pelagic and benthic ecosystems and is important in the ecosystem by carrying out nutrient recycling. Cyanobacteria are the main source of oxygen supplies, nutrient cycling and provide coloration to the sponge. The T4-like phages is a complex group of the lytic phages and a significant member of the Myoviridae that are known to infect cyanobacteria. These symbiotic relationship of sponges-cyanobacteria can be disrupted by the presence or infection of cyanophages that can kill the cyanobacteria. The aim of this study was to detect the presence of T-4 like Myoviruses in marine sponges such as *Xestospongia* sp. and *Aaptos* sp. from Bidong Island and Karah Island, Terengganu, Malaysia. A total of 228 replicates including sponge (n=120), water (n = 60) and sponge mucus (n=48) were subjected to PCR assays. A total of 17 sponge samples (*Aaptos* sp. and *Xestospongia* sp.) and 38 replicates of water samples (1X DNA dilution and 10X DNA dilution) were positive for the presence of major capsid protein of T-4 like Myovirus and psbA viral encoded genes. Among the different methods, the psbA viral encoded genes primers' showed the best results for the detection of Myoviruses in all of the samples. The phylogenetic analysis showed that the positive water samples belonged to *Prochlorococcus* and *Synechococcus* phages, *Xestospongia* sp. positive sample classified as *Prochlorococcus* phage and *Aaptos* sp. samples belonged to the *Synechococcus* phage and Myoviridae family. This is the first detection of T-4 like Myoviruses in both sponge species, *Xestospongia* sp., *Aaptos* sp. and seawater in Malaysia.

Keywords: T-4 like Myoviruses; *Aaptos* sp.; *Xestospongia* sp.; *Prochlorococcus* phage; *Synechococcus* phage; Malaysia

Short Biography

Assoc Prof Dr. Sandra Catherine Zainathan is currently working as an associate professor at the Universiti Malaysia Terengganu, Malaysia. She received her PhD on Aquaculture (Virology) from the University of Tasmania, Australia. She then worked at Universiti Malaysia Terengganu for the past 11 years and currently the Aquaculture Head of Department at the Faculty of Fisheries and Food Science. Assoc Prof Dr. Sandra Catherine Zainathan has authored several publications in various journals and books. Her publications reflect her research interests in aquatic virology and aquatic animal health.

Emerging Bacterial Infections in Thai Cultivated Freshwater Fish: Lessons from Outbreak in Giant Snakehead and Snakeskin Gourami Farms

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Abstract

Intensive aquaculture practices in Thailand have revolutionized fish farming but also brought new challenges in maintaining the health and sustainability of cultivated freshwater fish species. In this study, we investigated two outbreaks involved emerging bacterial infections in the highly valued giant snakehead (*Channa micropeltes*) and snakeskin gourami (*Trichogaster pectoralis*). These studies provide crucial insights into the causes, clinical manifestations, and implications of these infections, emphasizing the need for proactive management strategies to safeguard the industry. The first study focused on a disease outbreak in farmed giant snakehead, resulting in a 52.5% mortality rate over two months. Infected fish displayed lethargy, anorexia, and hemorrhages in the skin and eyes. Bacterial analysis identified two bacteria, *Streptococcus iniae* and *Aeromonas veronii*. Necropsy findings revealed liver congestion, pericarditis, and renal and hepatic granulomas. Antibiotic susceptibility tests demonstrated the antibiotic susceptibility of *S. iniae* to various antibiotics, while *A. veronii* only showed resistance to amoxicillin. The second study investigated unexplained mortality in snakeskin gourami farms, with moribund fish displaying darkened skin, erratic swimming, exophthalmos, and skin hemorrhage. Necropsy findings included an enlarged liver, anterior kidney and spleen, internal organ hemorrhage, pericarditis, and brain congestion with meningeal infiltration and cerebral parenchyma. The predominant bacterial isolate was *S. agalactiae*. Experimental challenges with *S. agalactiae* resulted in similar clinical signs, lesions, and pathological changes, with a mortality rate exceeding 60% and the bacteria was recovered from spleen, kidneys and liver of all challenges fish. These studies demonstrated the importance of emerging bacterial infections in cultivated freshwater fish, emphasizing the necessity of proactive disease prevention, early detection, and effective management strategies in Thai aquaculture farms. Understanding the causes and implications of these infections is vital for addressing the challenges posed by emerging bacterial pathogens and ensuring the long-term success of freshwater fish farming.

Keywords: Antibiotic susceptibility, Emerging bacterial diseases, Giant snakehead, Snakeskin gourami, Thai aquaculture

Short Biography

Dr. Lertwanakarn is currently working as lecturer at the Department of Physiology, Faculty of Veterinary Medicine, Kasetsart University, Bangkok. He received his PhD on Animal Physiology from Chulalongkorn University, Thailand. Dr Lertwanakarn completed his bachelor's degree as Doctor of Veterinary Medicine from the same univesity. Currently, Dr. Lertwanakarn has authored several publications in various journals. His publications reflect his research interests in pathophysiology of viral diseases in fish.

Isolation, Characterization and Biocontrol Efficacy of Potential Probiotic and Bacteriophage against *Aeromonas hydrophila* Infection in *Labeo rohita*

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Abstract

This study isolated and characterized potential probiotic and bacteriophage strains for biocontrol against *Aeromonas hydrophila* infection in rohu (*Labeo rohita*). Among 67 gut endosymbionts, four isolates identified as *Bacillus amyloliquefaciens*, *B. licheniformes*, *B. subtilis*, and *Pseudomonas entomophila*, demonstrated potent antimicrobial activity against 14 different indicator bacteria. They exhibited tolerance to pH levels (2–9) and bile salt concentrations (2.5–10%). The isolates displayed significant adhesion properties, along with auto and co-aggregation capacity. Isolates were non-hemolytic, produced extracellular enzymes, and showed free radical scavenging activity. In challenge studies, the strains proved non-pathogenic, later *B. amyloliquefaciens* (strain COFCAU_P1; MN880150) was selected for further *in vivo* evaluation based on the *in vitro* characterization. Dietary administration of *B. amyloliquefaciens* (at 10^7, 10^8, and 10^9 CFU g^{-1} diet) significantly enhanced non-specific immune responses, biochemical responses, mRNA expression of immune genes *IL-1β* and *TNF-α*, and survivability of rohu against *A. hydrophila* infection. The best responses were observed at the 10^9 CFU g^{-1} diet. For the *A. hydrophila*-specific bacteriophage, 24 phages were isolated from aquaculture pond water, showing high titre values (10^9–10^{10} PFU ml^{-1}) and a wide host range (12.5–75%). Seven phages were selected for further evaluation based on host range and cross-infectivity levels. AvP-2, a selected phage, effectively lysed bacterial cells at MOI level 10. Administered through injection, immersion, and oral routes, AvP-2 significantly enhanced rohu survival against *A. hydrophila* infection. Additionally, transmission electron microscopy and nucleic acid analyses revealed AvP-2 as an icosahedral DNA phage, likely belonging to the order Caudovirales and family Myoviridae. In conclusion, *B. amyloliquefaciens* COFCAU_P1 and AvP-2 are promising probiotic and bacteriophage strains with biocontrol attributes against *A. hydrophila* infection in rohu. These findings offer potential for developing biocontrol strategies in aquaculture to combat bacterial infections and enhance fish health.

Keywords: Probiotic, Bacteriophage, Biocontrol, *Aeromonas hydrophila*, *Labeo rohita*.

Short Biography

Dr. Khan is currently working as a Postdoctoral researcher at Chulalongkorn University, Thailand. He received his Doctoral degree on July 2021 from the College of Fisheries, Central Agricultural University, India. Dr Khan completed his Masters in Aquatic Animal Health from the Central Agricultural University, India. He then worked on the biocontrol efficacy of probiotics and bacteriophages in aquaculture. Dr Khan has authored several publications in various journals and books. His publications reflect his research interests in "Aquatic Animal Health Management.

Black soldier fly larval meal improves the growth, innate immune parameters, and resistance to *Vibrio parahaemolyticus* infection of Pacific white shrimp (*Litopenaeus vannamei*)

Arunothai Keetanon, Niti Chuchird, Putsucha Phansawat, Natnicha Chongprachavat, Parattagorn Kachapol, Wiranya Suanploy, and Tirawat Rairat*

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Abstract

The purposes of the current study were to evaluate the effects of black soldier fly (*Hermetia illucens*) larval (BSFL) meal as a fish meal (FM) replacement on the growth performance, immune responses, and resistance to *Vibrio parahaemolyticus* infection in Pacific white shrimp (*Litopenaeus vannamei*) fed a low FM diet (12% FM). Four experimental diets were formulated: 0 (control), 2, 5, and 10% BSFL meal. Shrimp post-larvae were divided into four groups and fed four times daily for 45 days. Ten shrimp were randomly sampled and weighted. In each group, the hemolymph were collected from five shrimp and their innate immune parameters including total hemocyte count (THC), phagocytic activity, phenoloxidase activity, and superoxide dismutase activity were assessed. The surviving shrimp were challenged with *V. parahaemolyticus* by immersion at a concentration of 10^5 colony-forming units/mL and were fed with the same diets for another 7 days to evaluate the disease resistance capability. It was revealed that the average body weight of the 5-10% BSFL meal group (2.29-2.32 g) were significantly higher ($p<0.05$) than the control group (1.83 g). The shrimp fed 2-10% BSFL meal had significantly enhancement in ($p<0.05$) all immune parameters. For example, the THC of the BSFL groups were in the range of 2.80-2.98 × 10^6 cell/mL, whereas those of the control was 2.49 × 10^6 cell/mL. The same was true for the disease resistance. At the end of the trial, the survival rates after the bacterial challenge of the shrimp that were fed 2-10% BSFL meal were in the range of 62.5-63.3%, significantly ($p<0.05$) higher compared to the positive control (50.00%). In conclusion, 5-10% BSFL meal can be used to improve the growth, immunity, and disease resistance of shrimp.

Keywords: Insect meal, *Hermetia illucens*, *Litopenaeus vannamei*, Fish meal replacement, Shrimp nutrition

Short Biography

Ms. Arunothai Keetanon is currently a PhD student at the Faculty of Fisheries, Kasetsart University, Thailand. She received her Master of Science (Fisheries Science) from the Kasetsart University, Thailand. Ms. Arunothai Keetanon has authored several publications in various journals. Her publications reflect his research interests in shrimp aquaculture, aquatic animal health, and feed additives in aquaculture.

Effects of sugarcane extract on growth performance, immune responses, and resistance to *Vibrio parahaemolyticus* of Pacific white shrimp (*Litopenaeus vannamei*)

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Abstract

The objectives of the current study were to investigate the effects of sugarcane extract, a product of sugarcane molasses, as a feed additive on the growth performance, immune responses, and resistance to *Vibrio parahaemolyticus* infections of Pacific white shrimp (*Litopenaeus vannamei*). The post-larvae were divided into 5 groups (80 shrimp/tank) and fed pelleted feeds with sugarcane extract at the rate of 0 (control), 0.2, 0.4, 0.6, and 0.8% diets four times daily for 60 days. The body weight and innate immune responses including total hemocyte count, phagocytic activity, phenoloxidase activity, and superoxide dismutase activity were evaluated. After that, they were challenged with *V. parahaemolyticus* via immersion 10^5 colony-forming units/mL for 7 days. The results showed that the shrimp fed 0.8% sugarcane extract had significantly higher ($p<0.05$) average body weight (3.69 g) than the control (3.51 g). Regarding the immune responses, all immune parameters evaluated were significantly enhanced ($p<0.05$) in the 0.4-0.8% sugarcane extract groups. Shrimp that fed 0.4-0.8% sugarcane extract were also more resistant to *V. parahaemolyticus* infection; the survival rates after bacterial challenge of the 0.4-0.8% sugarcane extract groups were 70.0-73.3%, significantly higher ($p<0.05$) than the positive control shrimp (45.6%). Our findings suggested that the supplementation of 0.4-0.8% sugarcane extract in the shrimp diets was useful for enhancing the shrimp health and preventing *V. parahaemolyticus* infection.

Keywords: Feed additive, *Saccharum officinarum*, *Litopenaeus vannamei*, Molasses, Shrimp aquaculture

Short Biography

Mr. Parattagorn Kachapol is a Master degree student at the Faculty of Fisheries, Kasetsart University, Thailand. He received his Bachelor of Science (Fisheries) from the Kasetsart University, Thailand.

Radical Thermal Therapy against Infection with Decapod Iridescent Virus 1 (DIV1)

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Abstract

Decapod iridescent virus 1 (DIV1) is a newly discovered double-stranded DNA virus that can potentially inflict massive losses in aquaculture. In this study, the thermal treatment and temperature restoration (TT/TR) protocol was used to assess the ability of thermal therapy to treat and cure the disease, namely infection with DIV1 (iDIV1), in *Penaeus vannamei*. The intramuscular injection of the DIV1 strain SHIV20141215 was followed by a 15-day TT at various temperatures ranging from 28 to 38 ° C and a 15-day TR at 28 ° C for the shrimp in each group. With confirming iDIV1 by TaqMan qPCR, histological H&E staining and ISDL, and cytopathological TEM, all shrimp in groups with TT below 32 ° C perished quickly within 5d post-infection (dpi). At 34 ° C, iDIV1 development was suppressed but revived following TT to 28 ° C. The same survival curve as the unchallenged control group, no replication of DIV1 DNA copies, and negative findings for clinical symptoms, histology, ISDL, and TEM during the TT/TR procedure were used to validate the elimination of DIV1 at 36 ° C. The removal of DIV1 from the challenged shrimp was confirmed by the reproducibility validation of TT/TR at 36 ° C. This is the first report of radical thermal treatment for the newly discovered illness iDIV1 utilizing TT at 36 ° C, which offers a novel approach to treat the deadly viral infection, particularly for the larvae and broodstock of shrimp varieties with special genetic characteristics.

Keywords: Infection with decapod iridescent virus 1 (iDIV1), Thermal treatment, Temperature restoration, Radical cure, *Penaeus vannamei*

Short Biography

Ms. Xiao-Meng Guo, a graduate student jointly trained by Shanghai Ocean University (SHOU) and the Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences (YSFRI). Intern at BIOTEC of the National Science and Technology Development Agency (NSTDA), Thailand, supported by the CAS-NSTDA Joint Research Project and the "Agreement for Study Abroad for CSC Sponsored Chinese Citizens" sponsored by China Scholarship Council (CSC). She has actively worked as an intern and post-graduate student for six years in Prof. Huang's group on the research of shrimp diseases. She has valuable publications related to infection with DIV1 and other shrimp diseases.

Susceptibility of *Artemia franciscana* to the Infection with *Enterocytozoon hepatopenaei* (EHP)

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Abstract

Artemia franciscana juveniles were challenged with immersion (IM) in a homogenate suspension of *Penaeus vannamei* hepatopancreas infected with *Enterocytozoon hepatopenaei* (EHP) and oral administration (PO) with chlorella soaked in EHP-infected hepatopancreatic homogenate suspension. Using TaqMan probe-based quantitative PCR, we found that loads of EHP in Artemia juveniles from both the IM and PO groups were about ~10^1 copies/μL after 3 days post-infection (3 dpi). However, no EHP was detected in Artemia juveniles at 7 dpi. Nested PCR targeting the EHP spore wall protein gene also did not produce a target band in Artemia juveniles at either 3 dpi or 7 dpi. In situ DIG-labelling-loop-mediated DNA amplification on Artemia sections showed a small amount of blue-purple positive signals appeared at 3 dpi, but not at 7 dpi. The results confirmed that Artemia is not a susceptible species to EHP.

Keywords: *Artemia franciscana*, *Enterocytozoon hepatopenaei*, Susceptibility.

Short Biography

Ms. Xiao-Meng Guo, a graduate student jointly trained by Shanghai Ocean University (SHOU) and the Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences (YSFRI). Intern at BIOTEC of the National Science and Technology Development Agency (NSTDA), Thailand, supported by the CAS-NSTDA Joint Research Project and the "Agreement for Study Abroad for CSC Sponsored Chinese Citizens" sponsored by China Scholarship Council (CSC). She has actively worked as an intern and post-graduate student for six years in Prof. Huang's group on the research of shrimp diseases. She has valuable publications related to infection with DIV1 and other shrimp diseases.

Chitinase and Proteinase K Treatments Rule DNA Extraction from Microsporidium *Enterocytozoon hepatopenaei* Spores

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Abstract

Microsporidium *Enterocytozoon hepatopenaei* (EHP) spores were purified from the hepatopancreas of *Penaeus vannamei* infected with EHP by percoll density gradient centrifugation and differential centrifugation. Chitinase digestion caused weakened fluorescence of chitin and a blurred edge of EHP spores stained with calcofluor white under a fluorescence microscope. Different combinations of pretreatment with DNase I, chitinase, or proteinase K followed DNA extraction with phenolic chloroform from EHP spores showed significant increases in the copy number of EHP per spore in the chitinase and proteinase K treatment groups. Treatment with chitinase and proteinase K resulted in a significant difference in EHP copies in the DNA extracted from faeces and hepatopancreas of *P. vannamei*. The study proved that DNA extraction from EHP spores requires chitinase and proteinase K treatments.

Keywords: *Enterocytozoon hepatopenaei* (EHP), spore, DNA extraction, chitinase

Short Biography

Ms. Xiao-Meng Guo, a graduate student jointly trained by Shanghai Ocean University (SHOU) and the Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences (YSFRI). Intern at BIOTEC of the National Science and Technology Development Agency (NSTDA), Thailand, supported by the CAS-NSTDA Joint Research Project and the "Agreement for Study Abroad for CSC Sponsored Chinese Citizens" sponsored by China Scholarship Council (CSC). She has actively worked as an intern and post-graduate student for six years in Prof. Huang's group on the research of shrimp diseases. She has valuable publications related to infection with DIV1 and other shrimp diseases.

Severe outbreak of *Saprolegnia* infection in snakehead (*Channa punctatus*, Bloch 1793): Clinical assessment, mitigation strategies, and insights into therapeutic effects

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Abstract

This study investigated the outbreak of a severe fungal infection caused by fluffy white cotton-like appearance on 150 *Channa Punctatus* in which fungal hyphae were found in several major organs where *Saprolegnia* spp. identified as the causative agent through clinical signs assessment, wet mount examination. Significant clinical signs observed in infected fish included drowsiness, floating in a head-down position in the water column, cloudy eyes, skin burns, and deep lesions with broken caudal regions in some cases. The prevalence of infection was determined to be 85%. Czapek-Dox Agar (CDA) medium was used for further growth analysis of fungal hyphae. The average body weight and length of the fish were (74.41 ± 1.32) gm and (14.38 ± 0.84) cm respectively. Following length and weight measurements, 120 infected fish were evenly distributed (10 fish/tank) into glass aquaria (90×60×1) cm containing 70L of water. Four different therapeutic agents including (a) Control group (T1); (b) T2 (Ivermectin, 2.5 ppm + NaCl, 2%); (c) T3 ($CuSO_4$ 1 ppm + Iodine 3 mL) and (d) T4 (Aquarium heater, 30 °C + NaCl, 2%). Significant recovery was observed in T4, where the cotton-like structures completely disappeared within 10 days. Additionally, hematological-biochemical indices revealed significant differences between T1 and T4. Histological studies reveal significant structural abnormalities such as granuloma development, dermal layer degeneration in the skin, glomerular shrinkage, melanomacrophage center, intracellular oedema, hyperplasia, and other notable modifications in the kidney, liver, spleen, and gill. Kaplan-Meier curve interpret the most favorable survival rate of *C. Punctatus* in T4 was achieved by elevating the water temperature along with the addition of NaCl where the survival rate was 70%. This study provides valuable insights into the effective treatment and management of *Saprolegnia spp.* infections in *C. Punctatus*, emphasizing the significance of water temperature and salt concentration as potential therapeutic agents.

Evidence of shrimp with DIV1-ATPase PCR positive, but showed no pathognomonic lesion of DIV1 infection

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Abstract

Decapod iridescent virus 1 (DIV1) is a virulent virus with high mortality in white leg shrimp *Penaeus vannamei*. The World Organization for Animal Health (WOAH) recommends the DIV1-PCR detection method targeting the DIV1-ATPase gene. We used this method for a surveillance program for shrimp DIV1 in Thailand. The prevalence of 50% of DIV1-ATPase PCR positive were found in the healthy juvenile shrimp submitted to our laboratory. These PCR positive shrimp showed no gross signs of disease caused by DIV1 infection reported from China (Qiu et al., 2017). PCR amplicon from ATPase-positive shrimp with no sign of disease were subjected to sequencing, and the results showed 99% identity to its corresponding region in the DIV1 genome deposited at the GenBank (accession no. KY681040.1). Histological analysis of the ATPase-PCR positive shrimp showed no disease. It revealed no pathognomonic DIV1 lesions in the hematopoietic tissue (HPT) and no typical accompanying lesions in the lymphoid organ (LO) of *P. vannamei*. Altogether, these results indicate the possibility that a non-pathogenic strain of DIV1 called "DIV2" exists in Thailand and gives a false positive PCR test result for pathogenic DIV1 using the currently recommended WOAH-PCR method. There is some urgency to revise the WOAH methods to prevent trade restrictions arising from false-positive PCR test results for DIV1.

Keywords: Decapod iridescent virus (DIV1), non-pathogenic DIV2, whiteleg shrimp, *Penaeus vannamei*

Short Biography

Jitchana received her B.Sc. degree in Marine Technology from Burapha University, Thailand in 2019. Jitchana worked as a research assistant at Aquatic Animal Health Team, BIOTEC, Thailand. Jitchana now studies in Fisheries Science at Kasert University and current research interests include shrimp disease and molecular detection methods.

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