



كلية معتمدة من الهيئة القومية
لضمان جودة التعليم والإعتماد

قسم طب الأحياء المائية و رعايتها



جامعة أسيوط
كلية الطب البيطري

Dr. Hatem Soliman Curriculum Vitae

Name: Hatem Mohamed Toughan Soliman
Birth date: 01.08.1971
Place of Birth: Sohag, Egypt
Nationality: Egyptian
Marital status: Married + 4 kids
Language: Arabic, English, German
Affiliation: Department of Aquatic Animal Medicine & Managements, Faculty of Veterinary Medicine, University of Assiut, 71515 Assiut, Egypt
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Education:

1989-1993: Student at Faculty of Veterinary Medicine, Assuit University, Assuit.
1993-1994: Training in Veterinary Medicine, Faculty of Veterinary medicine, Assuit.
1994-1995: Military service at Faculty of Reserve Officers, Egyptian Armed Forces.
1995: Ass. Researcher at the Veterinary Serum and Vaccine Research Institute, Cairo.
1996-1999: Master degree studies in Diseases of Birds and Rabbits, Cairo University.
2000-2001: German language course at Goethe institute, Cairo, Egypt.
2001-2005: PhD studies at Faculty of Veterinary Medicine, LMU, Munich, Germany.
2005-2006: Researcher at Veterinary Serum and Vaccine Research Institute, Cairo.
2007-2009: Post-Doctoral fellow at Faculty of Veterinary Medicine, LMU, Germany.
2009-2012: Post-Doctoral fellow at Vienna University of Veterinary Medicine, Austria.
2012-2016: Assistant Prof. at Fac. Vet. Med. Assiut University, Assiut, Egypt.
2016 - 2020: Associate Prof. at Vienna University of Veterinary Medicine, Austria.
2020- : Professor of Fish Medicine, Fac. Vet. Med. Assiut University, Assiut, Egypt.

Degrees:

- 1993:** Bachelor of Veterinary Medical Sciences, Faculty of Veterinary Medicine, **Assiut University, Assiut, Egypt.** (Very good)
- 1999:** Master degree in Diseases of Birds and Rabbits, Faculty of Veterinary Medicine, **Cairo University, Cairo, Egypt.**
- 2005:** PhD degree in Veterinary Medicine, Faculty of Veterinary Medicine, **Ludwig-Maximilians-University, Munich, Germany**
“Construction of cDNA Library from the *Triactinomyxon* spores of *Myxobolus cerebralis*, the causative agent of salmonid Whirling Diseases”
http://edoc.ub.uni-muenchen.de/3981/1/Soliman_Hatem_Mohamed_Toughan.pdf

Experiences:

Diagnosis of Fish diseases, Fish Microbiology, Vaccine production, Molecular biology: DNA/RNA isolation, cloning, PCR, nested PCR, Real-time PCR, Rapid Amplification of cDNA Ends (RACE), RNA interference (RNAi), CRISPR/Cas9, Loop mediated isothermal amplification (LAMP), EST, In vivo-induced antigen technology (IVIAT), In Situ hybridization, primers construction, Restriction analysis, cDNA libraries construction and screening, Proteomics; SDS-PAGE, Western blot.

Scientific Achievements

- | | |
|---|-------------|
| - Scopus ID: | 12795216800 |
| - Google scholar ID | T0AAAAJ |
| - <i>h</i> - index (scopus): | 16 |
| - <i>i10</i> - index (Google scholar) | 29 |
| - Total no. of International Publications (Scopus): | 58 |
| - Citations (Scopus): | 753 |

http://scholar.google.com.eg/citations?hl=en&user=dabt_T0AAAAJ&view_op=list_works
<http://www.scopus.com/authid/detail.url?authorId=12795216800>

Awards

- The State Encouragement Prize in Agricultural Sciences 2015, Egypt
- “First Class Medal of Distinction” in Veterinary Medicine Sciences, 2017, Egypt.

+ Book chapters:

- 1- **Book title:** Veterinary Infection Biology: Molecular Diagnostics and High-Throughput Strategies, Methods in Molecular Biology, vol 1247.

Book Editors: Mónica V. Cunha & João Inácio

Publisher: Springer Science & Business Media, New York, USA.

Date of publishing: 2015

ISBN: 978-1493948123

Contributions:

1. **Chapter 12:** **Hatem Soliman**, Mona Saleh and Mansour El-Matbouli: Detection of Fish Pathogens by Loop-Mediated Isothermal Amplification (LAMP) Technique.
2. **Chapter 19:** Mona Saleh, **Hatem Soliman**, and Mansour El-Matbouli: Gold-nanoparticles as a potential tool for diagnosis of Fish diseases.

Web site: <http://www.springer.com/medicine/internal/book/978-1-4939-2003-7>

- 2- **Book title:** Climate Change and Infectious Fish Diseases

Book Editors: Patrick T.K. Woo, Jo-Ann Leong, Kurt Buchmann

Publisher: CABI, Wallingford, Oxfordshire, England, UK

Date of publishing: September 2020

ISBN: 9781789243277

Contributions:

Chapter 7: Herpesvirosis (Koi Herpesvirus)

Authors: **Hatem Soliman** and Mansour El-Matbouli

Web site: <https://www.cabi.org/bookshop/book/9781789243277/>

- 3- **Book title:** Fundamentals of Aquatic Veterinary Medicine

Book Editors: Laura Urdes, Christopher Walster, Julius Tepper

Publisher: Wily, The Atrium, Southern Gate, West Sussex PO198SQ, United Kingdom

Contributions:

- **Chapter 4:** Acacia Warren, Farah Gonul AYDIN, Fernando Mardones, Grace Karreman, Leo Foyle, Mansour El-Matbouli, Matt Longshaw, Richmond Loh, Susan Kueh, Wesley Baumgartner, **Hatem Soliman:**

Title: Pathology and Epidemiology of Aquatic Diseases

- **Chapter 5:** Adolf Maas, Farah Gonul AYDIN, Jack Kottwitz, James Bogan, Mansour El-Matbouli, Matt Longshaw, Richmond Loh, Vasile Vulpe, Mona Saleh, **Hatem Soliman:**

Title: Diagnostic and Treatment of Aquatic Animal Diseases

✚ Editorial activities

- Reviewer for the Science and Technology Development Fund (STDF), Egypt, (Veterinary Medicine proposals in year 2014).
- Reviewer for the proposals applied to **Misr El kheir Foundation** „*Utilization of modern techniques for production of veterinary vaccines and biologics* “December 2012”.

✚ Invited Reviewer to the Following International Journals:

- Veterinary Microbiology
- Journal of Dermatological Science
- Journal of Virological Methods
- Diseases of Aquatic Organisms
- Virology Journal
- Aquaculture
- Fish & Shellfish immunology

✚ Scientific activities

A. Principle Investigator to the following project:

Project title: RNA interference (RNAi) as a potential control for spring viraemia of carp virus in cultured carp and tilapia fish

Funding agency: Science & Technology Development Fund (STDF)

Project duration: June 2014- September 2016

Granted fund: 1 999 600 Egyptian pounds

B. Co-Applicant in the following projects:

1. **Project title:** RNAi to control SVC&CyHV-3 infection of cyprinid fish

Funding agency: The Austrian Science Fund, FWF project (P 23550)

Project duration: 01.10.2011- 30.09.2013

Granted fund: 152 838. 00€

2. **Project title:** In vivo-induced antigen technology of *Aeromonas salmonicida*

Funding agency: The Austrian Science Fund, FWF project (P 23850)

Project duration: 01.04.2012- 31.03.2015

Granted fund: 232 407. 00€

C. **Managed the following projects:**

1. **Project title:** Research of improved fish nutrition and fish health in upland aquaculture system in Yen Chau, Son La Province, Vietnam

Funding agency: German Research Foundation, DFG Project (SFB 564)

Project duration: 01.07.2009- 30.06.2012

Granted fund: 162 226. 00€

2. **Project title:** Gene expression and function of *Tetracapsuloides bryosalmonae*

Funding agency: The Austrian Science Fund, FWF project (P 22770)

Project duration: 01.05.2011- 30.04.2014

Granted fund: 227 335. 00€

Dr. Hatem Soliman list of Publications

1. **Soliman H.**, Geisslar K., El-Matbouli M. (2003): SDS-PAGE and western blot analysis of triactinomyxon spores of *Myxobolus cerebralis*, the cause of whirling disease in salmonid fish. *Journal of fish Diseases* **26**, 621-625.
2. El-Matbouli M., **Soliman H.** (2005): Rapid diagnosis of Tetracapsuloides bryosalmonae, the causative agent of proliferative kidney disease (PKD) in salmonid fish by a novel DNA amplification method, loop-mediated isothermal amplification (LAMP). *Parasitology Research* **96**, 277-284.
3. El-Matbouli M., **Soliman H.** (2005): Development of a rapid assay for diagnosis of whirling disease in fish and oligochaetes using Loop-mediated isothermal amplification. *Journal of fish diseases* **28**, 549-557
4. **Soliman H.**, El-Matbouli M. (2005): An Inexpensive and Rapid Diagnostic method of the Koi Herpesvirus (KHV) Infection by a Loop-Mediated Isothermal Amplification Method. *Virology Journal* **2**:83.
5. El-Matbouli M., **Soliman H.** (2006): Construction and screening of cDNA Library from the Triactinomyxon spores of *Myxobolus cerebralis*, the causative agent of salmonid Whirling Diseases. *Parasitology* **132**: 467-477.
6. **Soliman H.**, El-Matbouli M. (2006): Reverse transcription loop mediated isothermal amplification (RT-LAMP) for rapid detection of viral hemorrhagic septicaemia virus (VHS). *Veterinary Microbiology* **114**: 205-213.
7. El-Matbouli M., **Soliman H.** (2006): Development and evaluation of two molecular biology diagnostic methods for detection of *Thelohania contejeani* (Microsporidia), the causative agent of porcelain disease in crayfish. *Diseases of Aquatic Organisms* **69**: 205-211.
8. Alaa El-Kholy, **Hatem Soliman**, Adel Abdel Rahman (2007): Molecular typing of a new foot and mouth disease virus in Egypt. *Veterinary Record* **160**, 695-697.
9. Alaa A. El-Kholy, **Hatem M. T. Soliman**, Noha A. Helmy, Adel O. Abdel Rahman (2007): Genetic identification of the foot-and-mouth disease virus caused 2006 outbreak in Egypt. *The Arab Journal of Biotechnology* **10**, 193-206.
10. El-Matbouli M., Rucker U, **Soliman H** (2007): Detection of Cyprinid herpesvirus-3(CyHV-3) DNA in infected fish tissues by nested Polymerase Chain Reaction. *Diseases of Aquatic Organisms* **78**, 23-28.
11. Knowles NJ, Wadsworth J, Reid SM, Swabey KG, El-Kholy AA, Abd El-Rahman AO, **Soliman HM**, Ebert K, Ferris NP, Hutchings GH, Statham RJ, King DP, Paton DJ (2007): Foot-and-Mouth Disease Virus Serotype A in Egypt. *Emerging Infectious Diseases* **13**, 1593-1596.

12. El-Matbouli M, Saleh M, **Soliman H** (2007): Detection of Cyprinid herpesvirus type 3 in goldfish cohabitating with CyHV-3-infected koi carp (*Cyprinus carpio koi*). *Veterinary Record* **161**, 792-793.
13. Saleh M., **Soliman H.**, El-Matbouli M. (2008): Loop mediated isothermal amplification (LAMP) for rapid detection of *Renibacterium salmoninarum*, the causative agent of bacterial kidney disease. *Diseases of Aquatic Organisms* **81**, 143-151
14. Saleh M., **Soliman H.**, El-Matbouli M. (2008): Loop-mediated isothermal amplification as an emerging technology for detection of *Yersinia ruckeri* the causative agent of enteric red mouth disease in fish. *BMC Veterinary Research* **4**,31
15. El-Kholy A.A., **Soliman H.M.T.**, Abdelrahman K.A. (2008): Polymerase chain reaction for rapid diagnosis of a recent lumpy skin disease virus incursion to Egypt. *The Arab Journal of Biotechnology* **11**, 293-302.
16. El-Matbouli M., Mattes M., **Soliman H.** (2009): Susceptibility of whirling disease (WD) resistance and WD susceptible strains of rainbow trout *Oncorhynchus mykiss* to *Tetracapsuloides bryosalmonae*, *Yersinia ruckeri* and viral hemorrhagic septicemia virus. *Aquaculture* **288**, 299-304.
17. **Soliman H.**, Midtlyng P., El-Matbouli M. (2009): Sensitive and rapid detection of infectious pancreatic necrosis virus by reverse transcription loop mediated isothermal amplification. *Journal of Virological Methods* **158**, 77-83.
18. **Soliman H.**, El-Matbouli M. (2009): Immunocapture and direct binding loop mediated isothermal amplification simplify molecular diagnosis of Cyprinid herpesvirus-3. *Journal of Virological Methods* **162**, 91-95.
19. Vanessa Isabel Carmen Severin, **Hatem Soliman**, Mansour El-Matbouli (2010): Expression of immune-regulatory genes; Arginase-2 and inducible nitric oxide synthase (iNOS) in two rainbow trout (*Oncorhynchus mykiss*) strains following exposure to *Myxobolus cerebralis*. *Parasitology Research* **106**, 325-334.
20. **Soliman H.**, El-Matbouli M. (2010): Loop mediated isothermal amplification combined with nucleic acid lateral flow strip for diagnosis of Cyprinid herpes virus-3. *Molecular and Cellular Probes* **24**, 38-43.
21. Mahmoud M., Abdelrahman K., **Soliman H.** (2010): Molecular and virological studies on contagious pustular dermatitis isolates from Egyptian sheep and goats. *Research in Veterinary Science* **89**, 290-294.
22. El-Matbouli M., **Soliman H.** (2011): Transmission of Cyprinid herpesvirus-3 (CyHV-3) from goldfish to naïve common carp by cohabitation. *Research in Veterinary Science* **90**, 536-539.
23. Mona Saleh, **Hatem Soliman**, Olga Haenen, Mansour El-Matbouli (2011): Antibody coated gold-nanoparticles immunoassay for direct detection of *Aeromonas salmonicida* in fish tissues. *Journal of Fish Diseases* **34**, 845-852.

24. Melanie Keilwerth, Ilina Bühler, Rudolf Hoffmann, **Hatem Soliman**, Mansour El-Matbouli (2012): Einschlusskörperchenkrankheit der Riesenschlangen (Inclusion Body Disease, IBD) – eine hämatologische, histologische und elektronenmikroskopische Studie zur Diagnosefindung. *Berliner und Münchener Tierärztliche Wochenschrift* **125**, 10–16.
25. Mona Saleh, **Hatem Soliman**, Oskar Schachner, Mansour El-Matbouli (2012): Direct Detection of Unamplified Spring Viraemia of Carp Virus RNA Using Unmodified Gold Nanoparticles. *Diseases of Aquatic Organisms* **100**, 3-10
26. Supamattaya K., Phromkunthong W., Suanyuk N., **Soliman H.**, El-Matbouli M. (2012): Spironucleosis in Cultured Red Tilapia (a hybrid of *Oreochromis niloticus* x *O. mossambicus* and *O. aureus*). *Veterinary Record* **171**, 274.
27. Mona Saleh, **Hatem Soliman**, Henning Sørum, Aud Kari Fauske, Mansour El-Matbouli (2012): A novel gold nanoparticles-based assay for rapid detection of *Melissococcus plutonius*, the causative agent of European foulbrood. *Veterinary Record* **171**, 400.
28. Gokhlesh Kumar, Ahmed Abd-Elfattah, **Hatem Soliman**, Mansour El-Matbouli (2013): Establishment of medium for laboratory cultivation and maintenance of *Fredericella sultana* for *in vivo* experiments with *Tetracapsuloides bryosalmonae* (Myxozoa). *Journal of Fish Diseases* **36**, 81-88.
29. Kumar G, Mayrhofer R, **Hatem Soliman**, El-Matbouli M. (2013): Novel Chlamydiales associated with epitheliocystis in grass carp (*Ctenopharyngodon idella*). *Veterinary Record* **172**, 47-47.
30. Naraid Suanyuk, Suchanya Mankhakheth, **Hatem Soliman**, Mona Saleh, Mansour El-Matbouli (2013): *Euclinostomum heterostomum* infection in guppies *Poecilia reticulata* cultured in southern Thailand. *Diseases of Aquatic Organisms* **104**, 121-127.
31. Michael Gotesman, **Hatem Soliman**, Mansour El-Matbouli (2013): Antibody screening identifies 78 putative host proteins involved in Cyprinid herpesvirus-3 infection or propagation in common carp (*Cyprinus carpio*). *Journal of Fish Diseases* **36**, 721-733.
32. El-Kholy A. A., Rady D. I., Abdou E. R., Elseafy M. M., Abdelrahman K. A., **Soliman H.** (2013): Construction, Characterization and Immunogenicity of a Glycoprotein E Negative Bovine Herpesvirus-1.1 Egyptian Strain "Abu-Hammad". *Journal of Virological Methods* **194**, 74-81
33. Ahmed Abd-Elfattah, Inês Fontes, Gokhlesh Kumar, **Hatem Soliman**, Hanna Hartikainen, Beth Okamura, Mansour El-Matbouli (2014): Vertical transmission of the cryptic stages of *Tetracapsuloides bryosalmonae* (Myxozoa), the causative agent of Proliferative kidney (PKD) disease through *Fredericella Sultana* Statoblast. *Parasitology* **141**, 482-490.
34. Mansour El-Matbouli, Mona Saleh, **Hatem Soliman** (2014): Biosecurity risks associated with epizootic ulcerative syndrome and iridovirus in ornamental fishes imported into European Union. *Veterinary Record* **174**, 303.

35. Alaa El-Kholy, Khaled Abdelrahman, **Hatem Soliman** (2014): Rapid detection of BoHV-1 genomic DNA by loop-mediated isothermal amplification assay. *Journal of Virological Methods* **204**, 81-85.
36. Michael Gotesman, **Hatem Soliman**, Robert Besch, Mansour El-Matbouli (2014): In Vitro inhibition of Cyprinid Herpes virus-3 replication by RNAi. *Journal of Virological Methods* **206**, 63-66.
37. Ahmed Abd-Elfattah, Gokhlesh Kumar, **Hatem Soliman**, Mansour El-Matbouli (2014): Persistence of *Tetracapsuloides bryosalmonae* (Myxozoa) in chronically infected brown trout *Salmo trutta*. *Diseases of Aquatic Organisms* **111**, 41-49.
38. Michael Gotesman, Ahmed Abd-Elfattah, Julia Kattlun, **Hatem Soliman**, Mansour El-Matbouli (2014): Investigating the interactions of CyHV-3 with host proteins in goldfish *Carassius auratus*. *Journal of Fish Diseases* **37**, 835-841.
39. Oskar Schachner, **Hatem Soliman**, Michael Straif, Franz Schilcher, Mansour El-Matbouli (2014): Isolation and characterization of a novel reovirus from white bream *Blicca bjoerkna*. *Diseases of Aquatic Organisms* **112**, 131-138.
40. Simon Menanteau-Ledouble, **Hatem Soliman**, Gokhlesh Kumar, Mansour El-Matbouli (2014): Use of in vivo induced antigen technology to identify genes from *Aeromonas salmonicida* subsp. *salmonicida* that are specifically expressed during infection of the rainbow trout *Oncorhynchus mykiss*. *BMC Veterinary Research* **10**, 298
41. Michael Gotesman, **Hatem Soliman**, Julia Kattlun, Mansour El-Matbouli (2015): Inhibition of spring viraemia of carp Virus replication in an *Epithelioma Papulosum Cyprini* cell line by RNAi. *Journal of Fish Diseases*. **38**, 197-207.
42. Abdel-Azeem S. Abdel-Baki, **Hatem Soliman**, Mona Saleh, Saleh Al- Quraishy, Mansour El-Matbouli (2015): *Ortholinea saudii* sp. nov. (Myxosporea: Ortholineidae) in the kidney of the marine fish *Siganus rivulatus* (Teleostei) from Red Sea, Saudi Arabia. *Diseases of Aquatic Organisms* **113**, 25-32.
43. Eva Lewisch, **Hatem Soliman**, Peter Schmidt, Mansour El-Matbouli (2015): Morphological and molecular characterization of *Thelohanellus hoffmanni* sp. nov. (Myxozoa) infecting gold fish *Carassius auratus auratus*. *Diseases of Aquatic Organisms* **115**, 37-46.
44. Kattlun J., Menanteau-Ledouble S., Gotesman M., Abd-Elfattah A., Way K., **Soliman H.**, Bergmann S., El-Matbouli M. (2016): Immunogenic potential of a membrane protein encoded by the viral gene located at ORF 81 of Cyprinid Herpes-virus-3. *Wiener Tierärztliche Monatsschrift* -**103**, 3-12
45. **Hatem Soliman**, Gokhlesh Kumar, Mansour El-Matbouli (2018): *Tetracapsuloides bryosalmonae* persists in brown trout *Salmo trutta* for five years post-exposure. *Diseases of Aquatic Organisms* **127**, 151-156.

46. **Hatem Soliman**, Mansour El-Matbouli (2018): Rapid detection and differentiation of carp edema virus and cyprinid herpes virus – 3 in koi and common carp. *Journal of Fish Diseases* **41**, 761 - 772
47. **Hatem Soliman**, Gokhlesh Kumar, Mansour El-Matbouli (2018): Recombinase polymerase amplification assay combined with a lateral flow dipstick for rapid detection of *Tetracapsuloides bryosalmonae*, the causative agent of proliferative kidney disease in salmonids. *Parasites & Vectors* **11**: 234.
48. Eva Lewisch, T. Frank, **Hatem Soliman**, Oskr Schachner, Friedl Adina Mansour El-Matbouli (2018): First Confirmation of Salmonid Alphavirus Infection in Arctic Char (*Salvelinus alpinus*) and in Austria. *Diseases of Aquatic Organisms* **130**, 71-76.
49. Alexander Haselmeyer, Norbert Nowotny, Heinz Heisteringer, Jolanta Kolodziejek, Johann Homola, Katharina Nöbauer, Ebrahim Razzazi-Fazeli, **Hatem Soliman**, Mansour El-Matbouli, Karin Zitterl-Eglseer (2018): *Melissa officinalis* L. extract and its main phenolic compound rosmarinic acid as phytoprophylactic feed additives against koi herpesvirus infection in a pilot study. *Wiener Tierärztliche Monatsschrift* **105**, 175-183
50. Muhammed Majeed, **Hatem Soliman**, Gokhlesh Kumar, Mansour El-Matbouli, Mona Saleh (2018): Editing the genome of *Aphanomyces invadans* using CRISPR/Cas9. *Parasites & Vectors* **11**:554.
51. Ahmed Elsheshtawy, Nader Yehia, Maged Elkemary, **Hatem Soliman** (2019): Direct detection of unamplified *Aeromonas hydrophila* DNA in clinical fish samples using goldnanoparticle probe-based assay. *Aquaculture* **500**, 451-457
52. Alamira Marzouk Fouad, **Hatem Soliman**, Ebtsam S. H. Abdallah, Sherif Ibrahim, Mansour El-Matbouli, Ahmad A. Elkamel (2019): In-vitro inhibition of spring viremia of carp virus replication by RNA interference targeting the RNA-dependent RNA polymerase gene. *Journal of Virological Methods* **263**, 14-19.
53. Hassan Ashfaq, **Hatem Soliman**, Mona Saleh, Mansour El-Matbouli (2019): CD4: a vital player in teleost fish immune system. *Veterinary Research* **50**:1
54. Ahmed Elsheshtawy, Nader Yehia, Maged Elkemary, **Hatem Soliman** (2019): Investigation of Nile tilapia summer mortality in Kafr El-Sheikh Governorate, Egypt. *Genetics of Aquatic Organisms* **3**, 17-25.
55. **Hatem Soliman**, Eva Lewisch, Mansour El-Matbouli (2019): Identification of new genogroups in Austrian carp edema virus isolates. *Diseases of Aquatic Organisms* **136**, 193-197
56. **Hatem Soliman** (2019): *In-Vivo* replication of cyprinid Herpesvirus-3 in Goldfish. *Assiut Veterinary Medical Journal* **65**, 162.
57. Hassan Ashfaq, Mansour El-Matbouli, **Hatem Soliman** (2020): Identification and molecular characterization of CD4 genes in brown trout (*Salmo trutta*). *Developmental and Comparative Immunology* **107**, 103663

- 58.** Schachner O, Dinhopf N, Friedl A, **Soliman H**, El-Matbouli M (2020): Advanced vacuolation indicates propagation of various *salmonid alphavirus* type 2 isolates in *Acholeplasma*-infected BF-2 cells. *Diseases of Aquatic Organisms* 139, 189 – 197.
- 59.** Saleh M, Friedl A, Srivastava M, **Soliman H**, Secombes C, El-Matbouli M (2020): STAT3 / SOCS3 axis contributes to the outcome of salmonid whirling disease. *PLoS ONE* 15 (6): e0234479