AQUA EXCEL 2020

AQUAculture infrastructures for EXCELlence in European fish research towards 2020 — AQUAEXCEL2020

D4.4e Face-to-face training course 5
DTU, CSIC, UoS, NAIK, AquaTT

Executive Summary

Objectives

To educate a new generation of aquaculture researchers and industry stakeholders who focus on sustainable exploitation of their new knowledge, skills and tools to advance an innovative European aquaculture sector. The set-up of the training courses will centre on fostering a culture of cooperation between all parties involved.

Rationale:

To foster and build the human capital of the European aquaculture sector several goals are set by the Strategic Research and Innovation Agenda of EATiP to which AQUAEXCEL[2020] contributes. All AQUAEXCEL[2020] training courses are multi-partner collaborations bringing together unique knowledge, tools and skills to create innovative modules that promote and enable peer-to-peer networking and collaboration. Participative training design ensures exchange and mutual learning between trainers and participants from both academia and industry. New models and partnerships for learning are explored for future recurrence, encouraging career development and innovation in the sector. Access to Research Infrastructures (knowledge, facilities and experience) will add value to the training. The AQUAEXCEL[2020] training courses are state-of-the-art, transferring new knowledge and insights originating from the research and services carried out and created by AQUAEXCEL[2020], and building upon outputs, tools and achievements from FP7-AQUAEXCEL.

Main Results:

The AQUAEXCEL[2020] training course "Planning and Conducting Experimental Infection Trials in Fish" was the fifth face-to-face course in the AQUAEXCEL[2020] training course series and was provided by Danmarks Tekniske Universitet (DTU) Aqua (Denmark) with the assistance and expertise of Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC) (Spain), Nemzeti Agrárkutatási és Innovációs Központ (NAIK) (Hungary) and University of Stirling (UoS) (United Kingdom). The objective of this course was to train participants in the considerations needed for both the planning phase and conduction of experimental infection trials (including viruses, bacteria and parasites) in fish. Husbandry and management of typical freshwater and saltwater species (e.g. salmonids, carp, marine non-salmonids) was also covered in order to train participants how to properly manage fish health during the study and how to comply with humane endpoints. General considerations when designing an infection trial including infection methods, sampling methods, sampling size, diagnostic procedures, statistical considerations and survival analysis were also introduced.

This AQUAEXCEL[2020] training course took place in November 2019 with 26 participants attending, who were selected based on their submitted applications. The course included lectures, practical exercises, a visit to DTU's facilities and a mini industry seminar. The mini industry seminar focused on the importance of infections studies in different industries and

showing the necessity of collaboration between universities and industry to achieve the best solutions to a scientific question and achieve a mutual benefit and gave the participants the opportunity to exchange with industry professionals in the fish infection field.

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Contents

Introduction

AQUAEXCEL[2020] aims to foster a culture of cooperation between European aquaculture Research Infrastructures (RIs), the associated research community, the aquaculture industry and other relevant stakeholders, which will help develop a more efficient and attractive European aquaculture Research Area leading to a sustainable and globally competitive European aquaculture sector. One of AQUAEXCEL[2020]'s specific aims is to provide state-of-the-art unique training courses to educate a new generation of aquaculture researchers and industry stakeholders who focus on sustainable exploitation of their new knowledge, skills and tools to advance an innovative European aquaculture sector. Work package 4 of AQUAEXCEL[2020] has a dedicated task focused on training a new generation of aquaculture researchers and industry stakeholders.

Nine technical training courses in total are organised by different AQUAEXCEL[2020] partners offered to people within and outside the partnership. The courses focus on different aspects of aquaculture experimentation to foster a culture of cooperation between all parties involved. These training sessions aim to transfer new knowledge and insights originating from the research and services carried out and created by AQUAEXCEL[2020].

This AQUAEXCEL[2020] training course, which was titled "Planning and conducting experimental infection trials in fish", was a five-day face-to-face course. Key learning objectives of this course were the considerations needed for both the planning phase and conduction of experimental infection trials (including viruses, bacteria and parasites) in fish. Husbandry and management of typical freshwater and saltwater species (e.g. salmonids, carp, marine non-salmonids) was also covered in order to train participants in how to properly manage fish health during the study and to comply with humane endpoints. General considerations when designing an infection trial including infection methods, sampling methods, sampling size, diagnostic procedures, statistical considerations and survival analysis were also introduced.

Planning and conducting infection trials in fish requires a number of serious considerations, including fish welfare. The training course provided a generic approach to performing infection trials in fish with a specific focus on infection of salmonids, cyprinids, and seabass/ seabream with viruses, bacteria and parasites. The training course included planning trials in prophylaxis and treatment.

Eight tutors and five guest speakers contributed to this training course (see Annex 4). Five tutors were from DTU (Niccolo Vendramin, Niels Jørgen Olesen, Niels Lorenzen, Peter V. Skov, Anders Stockmarr), one tutor was from UoS (Alexandra Adams), one tutor was from NAIK (Laszlo Ardo) and one tutor was from CSIC (Oswaldo Palenzuela). These experts presented on: i) Experimental infection fish trials, ii) Fish health and physiology, iii) Husbandry of carps, salmonids and marine non-salmonid species, iv) Sampling procedures v) Survival analysis, vi) Sample size, vii) Designing trials. The course included lectures and

practical design exercises, along with a trip to DTU's facilities and a mini industry seminar. This mini seminar featured several guest speakers. Carlos Zarza presented on in-vivo research activities on fish health at SkrettingARC, Niels Henrik Henriksen (Danish Aquaculture) presented on the importance of experimental studies for Danish Aquaculture and Joao Lima (IMAQUA) presented on challenge models for experimental infections in crustaceans at IMAQUA. Louise van Gerdoff (DACAD - Dansk Center for Akvatisk Dyresundhed, KU – Copenhagen University) spoke about dissecting immune response to ectoparasites using zebra fish models, and finally, Asma Mohammad-Karami (DACAD, KU) spoke about breeding programmes for fish disease resistance TECHFISH project. Coffee breaks allowed for the interaction and networking of speakers and course participants.

1. Face-to-face course 5

1.1   Pre-course activities

AquaTT developed a promotional leaflet to promote the Training Course "Planning and Conducting Experimental Infection Trials in Fish" and the course announcement was distributed through several channels such as the AquaTT aquaculture mailing lists, the European Aquaculture Society (EAS) distribution channels, Federation of European Aquaculture Producers (FEAP) and European Aquaculture Technology and Innovation Platform (EATiP) distribution channels, EuroMarine (the European marine science network), the project website (Figure 2a and b), the project Twitter account and the partners' channels. Annex I shows the promotional leaflet.

Figure 1: Promotional leaflet for AQUAEXCEL[2020] Fish Infection training course

Figure 2a and b: Screenshots of website promotion and application details for Fish Infection training course- **https://aquaexcel2020.eu/training-courses/upcoming-training-courses-apply-now**

The application period of the course was open from 24 June 2019 until 22 July 2019 and applicants were required to complete a registration form (Annex 2) and a letter of motivation and email both together with their CV to aquaexcel@aquatt.ie.

The target audience was primarily PhD students, researchers, fish farm health managers, and research employees such as those in the pharma industry with an interest in experimental studies of infectious diseases.

36 individuals in total applied to participate in this training course, while the maximum number of participants possible was 25. As one participant could only attend the first two days, a 26th participant was allowed to join, as the limited resources that meant only 25 could attend occurred in the final days of the training course (not the first two days). A selection procedure to create a shortlist was put in place by DTU to evaluate applicants based on their CVs and motivation letters. The training programme from the AQUAEXCEL[2020] project is set up to improve the research capacity across Europe. The programme is targeted at training a new generation of aquaculture researchers and industry representatives working in the field in one of the EU member states or new members and associated states of the enlarged EU, facilitating access with special focus on young researchers. Based on this, participants were selected based on the criteria: focus on candidates based in EU and new member states but with the option of including a few non-EU candidates where increased collaborations could be of benefit to Europe, and professionals and scientists working in the fish infection field with the ability to contribute to improving the planning and conducting of experimental trials in fish across Europe.

1.2   Course activities

26 participants attended the bioinformatics training course. The activities during the training course are presented in detail in the course agenda in Annex 3 and course tutors and their contact details are listed in Annex 4. During the training course, theoretical lectures were interspersed with practical assignments and a technical field trip. In that way, scientific concepts could be verified by the course participants and put into a practical context enabling participants to "learn-by-doing". Higher cognitive levels of learning were gained in discussions throughout the course as well as during the mini industry seminar.

The training as well as the seminar provided good interaction with top specialists, who had innovative examples and are active in the field of infection trials in fish (from Denmark, the UK, Hungary and Spain) (see participant list of industry seminar in Annex 6).

All course training lectures were uploaded to the ShareDTU platform (SharePoint) where they will be available to participants for download for several months.

After a short introduction explaining the context of the training course each participant introduced him/herself briefly. This was followed by a coffee break and then a session on using animals for research and, specifically, using fish for disease research. The following session on the different biosecurity levels for experimental facilities included a technical visit to DTU's high security tank facilities. In the afternoon, the participants attended a session on general considerations when designing infection models for diseases (pathogenicity trial,

pathogenesis study, mode of infections, samplings) which included a practical example. The day finished with a lecture on salmonid husbandry and physiology.

The second day included lectures in trail design (statistical considerations when planning trials), survival analysis (compiling and understanding data) and survival analysis with time dependent covariates. The afternoon involved a practical exercise on survival analysis.

The third day of the training course began with an introduction to common carp husbandry and physiology. This was followed by a session on designing a trial with common carp and other cyprinids and use of isogenic carp for fish infection models. In the afternoon, lectures included husbandry of marine non-salmonid species and considerations of designing trials with endo- and ectoparasites in marine non-salmonids.

Day 4 began with a lecture on infection models in vaccinology and immunology. This was followed by a lecture on considerations when designing trials in unconventional species. The next session focused on the alternatives to using fish in experiments. The afternoon involved a practical session on designing for pathogenicity and pathogenesis studies based on cases/papers.

Figure 3: Participants of the AQUAEXCEL[2020] Fish Infection training course.

The final day consisted of a mini industry seminar. Carlos Zarza of Skretting's Aquaculture Research Centre (ARC) discussed in-vivo research activities on fish health at Skretting ARC. Following this, Niels Henrik Henriksen of Danish Aquaculture presented on the importance of experimental studies for Danish aquaculture. Joao Lima of IMAQUA discussed challenge models for experimental infections in crustaceans at IMAQUA. Louise van Gerdoff of DACAD KU presented on dissecting immune response to ectoparasites using zebrafish models. Finally, Asma Mohammad-Karami DACAD, KU discussed breeding programmes for fish disease resistance TECHFISH project.

Figure 4: Participants of the AQUAEXCEL[2020] Fish Infection training course attending the industry seminar.

1.3   Post-course activities

After completion of the course, participants were asked for feedback via an online survey (Figure 5), of which the results are given in Annex 7. These results will help the training course organisers to improve future AQUAEXCEL[2020] training courses, and evaluate the need for future fish infection training courses. The results of this evaluation exercise were confidential and anonymous so participants could be honest in their comments. The survey was online and took about 15 minutes to complete.

Figure 5: Print screen of welcome page of the online evaluation survey.

Participants were given a certificate of participation if requested upon completion of the course (Annex 8). Training material was also made available to participants after the course on SharePoint.

AquaTT organised pre- and post-course activities, such as finalising course design, developing promotional leaflets and practical information documents, assisting in the organisation, managing the registrations, publishing and promoting the training courses, as well as carrying out and analysing the evaluations. AquaTT also developed the deliverable report.

2. Conclusions

Most respondents heard about the course from the AQUAEXCEL[2020] website (42%) and from colleagues/their institute (46%). 4% of respondents heard about the course through the AQUAEXCEL[2020] Twitter and 8% found the course through an internet search. While the online survey states that it was accessed by 30 people, none of the questions are answered by more than 26 people (the total number attending the course) and all results are included in Annex 7.

Almost half (46%) of the respondents received travel and subsistence funding to attend this course through their employer, while 39% used project/grant funding. 15% were either fully or partially self-funded.

The training course achieved the desired objectives of focusing on considerations needed for both the planning phase and conduction of experimental infection trials (including viruses, bacteria and parasites) in fish. This is evident as the percentage of respondents with expert knowledge increased from 4% to 15% after the course and the percentage of respondents with moderate knowledge of infection trials increased from 32% before the course to 38% after the course. Before the training course 48% of respondents had no knowledge of infection trials. After the training course, no respondents selected the "basic knowledge" option.

The respondents' answers showed very positive feedback of the course. 88% agreed or strongly agreed that the duration of the course was good, 100% agreed that the procedure for registration was clear and simple, and 92% agreed that the information leaflet about the course was informative and visually attractive. 96% agreed or strongly agreed that the communication of the course (programme, announcements) was good and 88% that the information at the start of the course was clear. The main conclusion from this feedback is that future AQUAEXCEL^{2020} and AQUAEXCEL3 training courses should follow the steps taken for this infection trials course in terms of registration, course duration, promotional leaflet and communication.

The training course achieved a very successful grade from the respondents, with 44% awarding it the highest grade (excellent) and 30% awarding it a grade of good; totalling 74%. No participants rated the course poor or below average.

Some examples of reasons for the excellent grades were:

- *"Great DTU facilities. Trainers and lecturers were well prepared and knowledgeable. I got a lot information on how to plan and perform infection trials with aquatic animals. I appreciated also the lectures of companies (transfer of research into the practice). I made new contacts and friends from different fields (researchers, academics, veterinaries, PhD students, technicians from companies)."*
- *"I was really happy about the level of expertise provided and also the work put into arranging the course flow."*
- *"The content of the course was great, and all the lecturers were extremely knowledgeable in their field, which is fantastic."*

Respondents were also very positive about the mini industry seminar. 90% reported that it was either a good or excellent opportunity to exchange with industry professionals. This emphasises the importance of including a mini industry seminar in all AQUAEXCEL^{2020} training courses and the value participants place on this aspect of the course.

When deciding to enrol for the training course, 92% respondents valued course content as a very or extremely important factor. 62% valued the course trainers as a very or extremely important factor, 69% valued the course as free to enrol as a very or extremely important factor and, 62% valued the course organisers as very or extremely important.

The best things about the training course which were mentioned by participants in the survey included:

- *"Course was very interactive. Organizers were so kind and managed very well."*
- *"I really appreciated the broad community of people researchers, PhD students, academics, company workers, technicians, veterinaries. That was nice to discuss the topic from various points of view."*
- *"Nice team for the organization"*
- *"Good methods of teaching overall"*
- *"Impressive facility and its presentation"*
- *"Strong knowledge of teachers and they are all eager to share"*
- *"Seminar (interesting speakers)"*

Areas were there were suggestions for improvement for future AQUAEXCEL[2020] training courses included:

- More practical work
- Change to the approach to the statistics (specific to this AQUAEXCEL[2020] training course)

For future infection trials courses participants suggested the following topics:
- Safety requirements
- Pathogen's conservation, cultivations, quantification, routine virulence testing
- Short overview of genetics challenge that focus on heritability of pathogens resistance

The overall results from the online survey show that the vast majority of participants were very satisfied with their experience and increased their knowledge of planning and conducting experimental infection trials. 78% of respondents indicated that they would be interested in attending a follow-up course. 91% said that they would recommend this course to a fellow student/colleague. The survey results demonstrate how worthwhile and beneficial the participants found the course and how it has successfully increased infection trials knowledge in the aquaculture industry.

Glossary

AQUAEXCEL[2020]: AQUAculture Infrastructures for EXCELlence in European Fish Research towards 2020

DTU: Danmarks Tekniske Universitet

UoS: University of Stirling

NAIK: Nemzeti Agrárkutatási és Innovációs Központ

CSIC: Agencia Estatal Consejo Superior de Investigaciones Cientificas

EAS: European Aquaculture Society

FEAP: Federation of European Aquaculture Producers

EATiP: European Aquaculture Technology and Innovation Platform

DACAD: Dansk Center for Akvatisk Dyresundhed

KU: Copenhagen University

Document information

EU Project N°	652831	**Acronym**	AQUAEXCEL[2020]
Full Title	AQUAculture Infrastructures for EXCELlence in European Fish Research towards 2020		
Project website	www.aquaexcel2020.eu		

Deliverable	**N°**	D4.4e	**Title**	**Face-to-face training course 5**
Work Package	**N°**	4	**Title**	**Integration, training, dissemination and cooperation**

Date of delivery	**Contractual**		11/2019 (Month 50)	**Actual**		11/2019 (Month 50)
Dissemination level	x	**PU Public, fully open, e.g. web**				
		CO Confidential, restricted under conditions set out in Model Grant Agreement				
		CI Classified, information as referred to in Commission Decision 2001/844/EC.				

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Version log			
Issue Date	**Revision N°**	**Author**	**Change**

Annex 1: Promotional Leaflet

AQUA EXCEL 2020

AQUAculture infrastructures for EXCELlence in European fish research towards 2020

FACE-TO-FACE TRAINING COURSE: PLANNING AND CONDUCTING EXPERIMENTAL INFECTION TRIALS IN FISH

FREE TRAINING COURSE

DATE: 11-15 NOVEMBER 2019
LOCATION: DANMARKS TEKNISKE UNIVERSITET (DTU) AQUA, DENMARK

TARGET AUDIENCE

This course may be of interest to PhD students, researchers, fish farm health managers, and research employees such as those in the pharma industry with an interest in experimental studies of infectious diseases.

COURSE ORGANISERS

Danmarks Tekniske Universitet (DTU) Aqua (Denmark) with the assistance and expertise of Agencia Estatal Consejo Superior de Investigaciones Cientificas (CSIC) (Spain), Nemzeti Agrárkutatási és Innovációs Központ (NAIK) (Hungary) and University of Stirling (UoS) (United Kingdom).

COURSE TUTORS

Below is a list of the tutors involved with this course. For more information and for contact details of these tutors, please visit the website.

- Niccolo Vendramin, DTU Aqua
- Niels Jørgen Olesen, DTU Aqua
- Niels Lorenzen, DTU Aqua
- Peter V. Skov, DTU Aqua
- Anders Stockmarr, DTU Compute
- Alexandra Adams, UoS
- Laszlo Ardo, NAIK
- Oswaldo Palenzuela, CSIC

PRACTICAL INFORMATION

Location: DTU Aqua, Lyngby, Denmark
Date: Monday 11 November (09:00hrs) – Friday 15 November 2019 (15:00hrs)
Application deadline: 22 July 2019
Language of instruction & material: English
Fees: Course attendance is free, thanks to European Union Horizon 2020 funding. Selected participants are expected to pay for their own travel, subsistence and accommodation. Complementary coffee and tea will be served twice daily.
Maximum Participants: 25

REGISTRATION

Official registration forms and additional course information can be found on the AQUAEXCEL[2020] website at: https://aquaexcel2020.eu/training-courses/upcoming-training-courses-apply-now

Note: Please do not make travel arrangements unless you have received official confirmation of selection.

🐦 @aquaexcel2020
www.aquaexcel2020.eu

Designed and developed by AquaTT

Annex 2: Application form for training course

AQUA EXCEL 2020

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towards 2020

Registration Form for AQUAEXCEL[2020] Face-to-Face Training Course

Course Title: PLANNING AND CONDUCTING EXPERIMENTAL INFECTION TRIALS IN FISH

Organiser(s): Danmarks Tekniske Universitet (DTU) Aqua (Denmark) with the assistance and expertise of Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC) (Spain), Nemzeti Agrárkutatási és Innovációs Központ (NAIK) (Hungary) and University of Stirling (UoS) (United Kingdom).

Dates: 11 – 15 November 2019

Location: DTU Aqua, Lyngby, Denmark

Course attendance is free, thanks to EC H2020 funding. Participants are expected to pay for their own travel, subsistence and accommodation. Places will be confirmed, at the latest, two months before the start of the training course. Admittance to the course will be confirmed officially through e-mail. **Please do not make travel arrangements unless you have received official confirmation.**

To submit your registration request, please send the following

- Completed Registration Form
- CV / Résumé
- Letter of Motivation
- Completed and signed GDPR Consent Form

to aquaexcel@aquatt.ie, with the following subject line: AQUAEXCEL2020 /TrainingCourse_Infection_DTU by the 22nd of July 2019.

Any questions about the course or application process should be sent to aquaexcel@aquatt.ie

We look forward to welcoming you to the course.

Contact details

Title:	
Surname:	
First Name(s):	
Email:	
Telephone:	
Date of Birth:	
Gender:	

AQUAculture infrastructures for EXCELlence in European fish research towards 2020

Relevant information

Organisation Name:	
Organisation Type: • University • Research Institute • SME • Private Company • Other (please specify)	
Country:	
Position:	

Highest Qualification: • PhD • DVM or equivalent • MSc or equivalent • BSc or equivalent • Other (please specify)	
Research Category: • Postgraduate • Postdoctoral • Expert • Technician • Other (please specify)	
Previous Relevant Experience:	
Additional Support:	

Please complete all sections of this form and email it to: aquaexcel@aquatt.ie, along with your CV, letter of motivation and completed and signed GDPR form, indicating in subject: AQUAEXCEL2020 /TrainingCourse_Infection_DTU

Annex 3: Course Agenda

Day 1 11. Nov	Day 2 12. Nov	Day 3 13. Nov	Day 4 14. Nov	Day 5 15. Nov
9:00-10:00 - Niels Jørgen Olesen Welcome and practical information Participants will present themselves Course introduction – why this course and which questions to ask yourself when embarking into the world of experiments in fish. *10:00-10:30 - Coffee Break* **10:30-11:15 – Niels Jørgen Olesen** Use of animal for research Use of fish for fish disease research **11:15-11:45 – Niels Jørgen Olesen** The different biosecurity levels for experimental facilities including visit to DTUs high security tank facilities.	**9:00-10:00** - Anders Stockmarr Trial design: Statistical considerations when planning trials including sample size calculation Survival analysis Compiling and understanding data *10:00-10:30 - Coffee Break* **10:30-11:45 – Anders Stockmarr** Survival analysis with time dependent covariates	**9:00-10:00** - László Ardó An introduction to common carp husbandry and physiology *10:00-10:30 - Coffee Break* **10:30-11:00** - László Ardó Designing a trial with common carp and other Cyprinids **11:00-11:45** - László Ardó Use of isogenic fish for infection models	**9:00-10:00** – Niels Lorenzen / Sandra Adams Infection models in vaccinology and immunology *10:00-10:30 - Coffee Break* **10:30-11:15** - Sandra Adams Considerations when designing trials in unconventional species (e.g. wrasse) **11.15-11.45** - Sandra Adams Alternatives to experiments in fish	**9:00- 11:45** Industry seminar *10:00-10:30 - Coffee Break* **10:30-11:45** Industry seminar continued
Lunch 11.45 -12:45	*Lunch 11.45 -12:45*	*Lunch 11.45 -12:45*	*Lunch 11.45 -12:45*	*Lunch 11.45-12:45*
12:45-14:00 – Niccolò Vendramin General considerations when designing infection models for diseases: Pathogenicity trial, Pathogenesis study, Mode of infections, Sampling **14:00-14:30 – Lone Madsen** Practical example – RTFS *14:30-15:00 - Coffee Break* **15:00-16:30 – Peter V. Skov** Salmonid husbandry and physiology	**12:45 – 14:00** - Anders Stockmarr Survival analysis continued *14:00-14:30 - Coffee Break* **14:30-16:30** - Anders Stockmarr Survival analysis in practice	**12:45- 14:00** - Oswaldo Palenzuela Husbandry of marine non-salmonid species <u>Coffee Break14:00-14:30</u> **14:30-16:30** - Oswaldo Palenzuela Considerations of designing infection trials with endo- and ectoparasites in marine non-salmonid species	**12:45 -16:30 – Niels Jørgen Olesen, Niccolò Vendramin, László Ardó, Niels Lorenzen, Oswaldo Palenzuela, Sandra Adams** Practical exercise. Designing for pathogenicity and pathogenesis studies based on cases/papers <u>Coffee Break 14:00-14:30</u> Practical exercise. Designing for pathogenicity and pathogenesis studies based on cases/papers	**12:30-14:00** Industry seminar continued **14:00-14:30** Evaluation

Annex 4: Course Tutors

Annex 5: Participant List: Training Course

Annex 6. Participant list: Industry seminar

Annex 7. Survey results

Summary Report

AQUAEXCEL2020_Planning and Conducting Experimental Infection Trials in Fish

1. 1. What is your current research category?
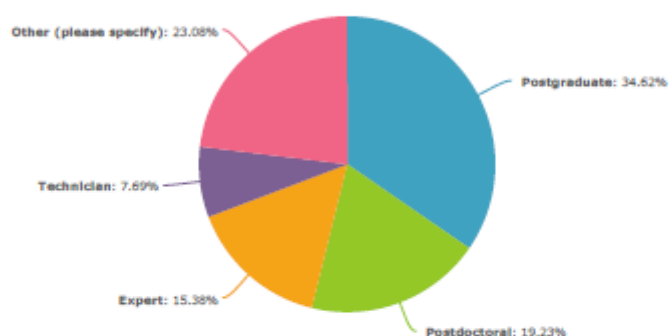
Postgraduate	34.62%	9
Postdoctoral	19.23%	5
Expert	15.38%	4
Technician	7.69%	2
academic	3.85%	1
Ph.D.	3.85%	1
PhD	3.85%	1
PhD student	3.85%	1
researcher	3.85%	1

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siencist	3.85%	1
	Total Responses	26
	Skipped	5

2. 2. How did you hear about this course?
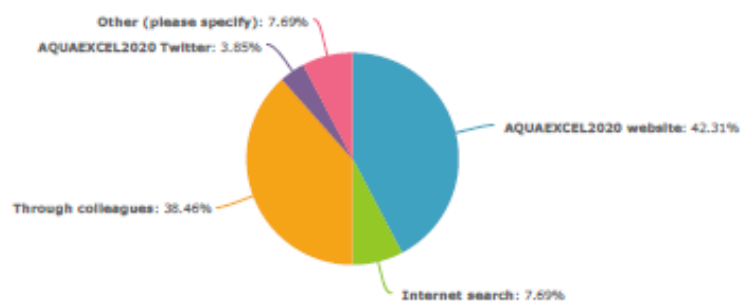
AQUAEXCEL2020 website	42.31%	11
Internet search	7.69%	2
Through colleagues	38.46%	10
AQUAEXCEL2020 Twitter	3.85%	1
DTU website	3.85%	1
My current institute	3.85%	1
	Total Responses	26
	Skipped	5

3. 3. How would you rate your knowledge of infection trials in fish:
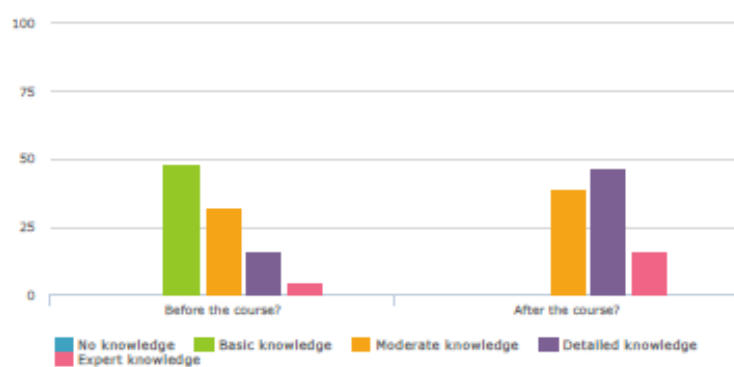
	No knowledge	Basic knowledge	Moderate knowledge	Detailed knowledge	Expert knowledge	Responses
Before the course?	0 0.00%	12 48.00%	8 32.00%	4 16.00%	1 4.00%	25
After the course?	0 0.00%	0 0.00%	10 38.46%	12 46.15%	4 15.38%	26

Total Responses	26
Skipped	5

4. 4. How important were the following factors for you when deciding to enrol into this training course?

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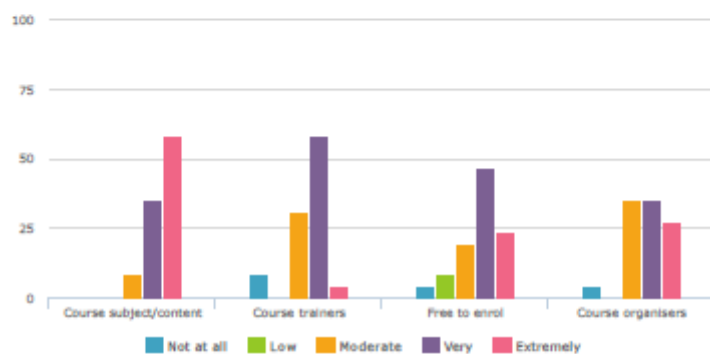
	Not at all	Low	Moderate	Very	Extremely	Responses
Course subject/content	0 0.00%	0 0.00%	2 7.69%	9 34.62%	15 57.69%	26
Course trainers	2 7.69%	0 0.00%	8 30.77%	15 57.69%	1 3.85%	26
Free to enrol	1 3.85%	2 7.69%	5 19.23%	12 46.15%	6 23.08%	26
Course organisers	1 3.85%	0 0.00%	9 34.62%	9 34.62%	7 26.92%	26

Total Responses	26
Skipped	5

5. 5. How were you funded/how did you fund the travel and subsistence expenses?
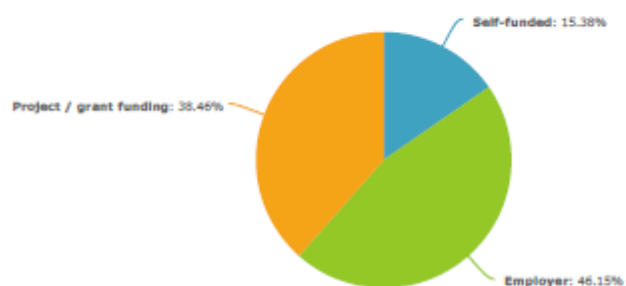
Self-funded	15.38%			4
Employer	46.15%			12
Project / grant funding	38.46%			10
		Total Responses		26
		Skipped		5

6. 6. Please read the following statements and indicate how they correspond to your experience of the course organisation.
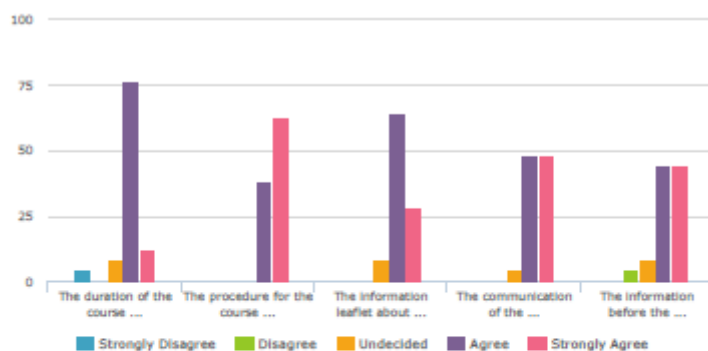
	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Responses
The duration of the course was good.	1 4.00%	0 0.00%	2 8.00%	19 76.00%	3 12.00%	25
The procedure for the course registration was clear and simple.	0 0.00%	0 0.00%	0 0.00%	9 37.50%	15 62.50%	24
The information leaflet about the course was informative and visually attractive.	0 0.00%	0 0.00%	2 8.00%	16 64.00%	7 28.00%	25
The communication of the course (announcements, programme, etc.) was good.	0 0.00%	0 0.00%	1 4.00%	12 48.00%	12 48.00%	25
The information before the start of the course was clear.	0 0.00%	1 4.00%	2 8.00%	11 44.00%	11 44.00%	25

Total Responses	25
Skipped	6

8. 8. Please read the following statements and indicate how they correspond to your experience of the course.
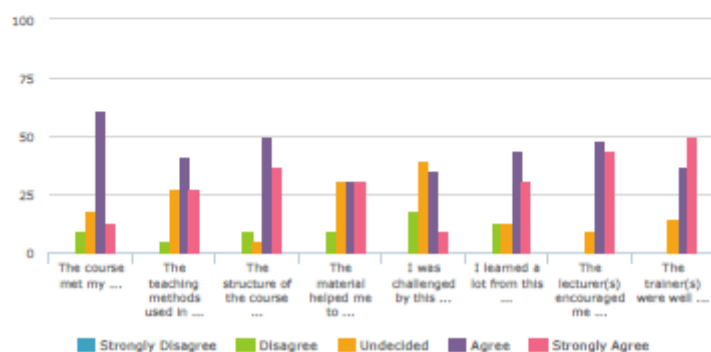
	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Responses
The course met my expectations.	0 0.00%	2 8.70%	4 17.39%	14 60.87%	3 13.04%	23
The teaching methods used in this course helped me achieve the course's learning outcomes.	0 0.00%	1 4.55%	6 27.27%	9 40.91%	6 27.27%	22
The structure of the course was logical.	0 0.00%	2 9.09%	1 4.55%	11 50.00%	8 36.36%	22
The material helped me to master the content.	0 0.00%	2 8.70%	7 30.43%	7 30.43%	7 30.43%	23
I was challenged by this course.	0 0.00%	4 17.39%	9 39.13%	8 34.78%	2 8.70%	23
I learned a lot from this course.	0 0.00%	3 13.04%	3 13.04%	10 43.48%	7 30.43%	23
The lecturer(s) encouraged me to think about the subject matter.	0 0.00%	0 0.00%	2 8.70%	11 47.83%	10 43.48%	23
The trainer(s) were well prepared and knowledgeable.	0 0.00%	0 0.00%	3 13.64%	8 36.36%	11 50.00%	22

Total Responses	23
Skipped	8

9. 9. If you look at all aspects of the course, which grade would you award this course?
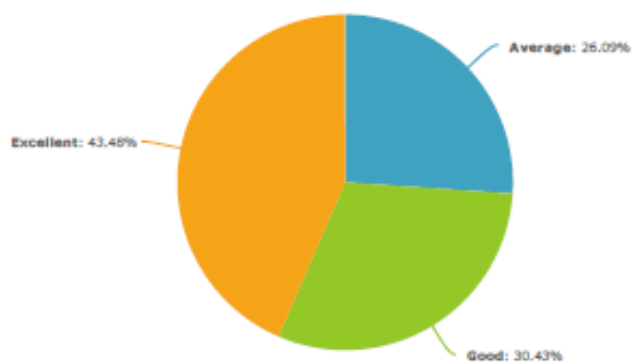
Poor	0.00%		0
Below Average	0.00%		0
Average	26.09%		6
Good	30.43%		7
Excellent	43.48%		10
		Total Responses	23
		Skipped	8

10. 10. Please comment on the grade you gave the course (question number 9):

11. 11. The best thing(s) about this course was/were:

Count	Response
1	- Nice team for the organization - Good methods of teaching overall - Impressive facility and its presentation - Practice work of thursday afternoon - Strong knowledge of teachers and they are all eager to share - Seminar (interesting speakers)
1	Course was very interactive. Organizers were so kind and managed very well.
1	discussion was largely encouraged both with the teacher and with other participants
1	Experienced teachers Logical structure of the classes/topics Provision/description of relevant experimental examples on baterial/viral/parasitic diseases Opportunity of interaction with teachers and among participants Opportunity to visit the facilities
1	I really appreciated the broad community of people - researchers, PhD students, academics, company workers, technicians, veterinaries. That was nice to discuss the topic from various points of view. It was nice to see the facility of DTU, where the infection trials are done. How their recirculating systems works etc.
1	I saw the settlement of experimental infection facility. I met people about all around the world. And I had to chance sharing knowledge with other people.
1	Meet experts personally. Having discussion on any question raised during the lectures.

1	no comment
1	organization lecturers
1	Practical examples from lecturers Practical exercise session Industrial session
1	Practicals exercices
1	The precise intel on the subject
1	The best thing about the course was to contrast approaches for decision making on experimental designs and to assess the common difficulties that are encountered in this kind of work.
1	The courage to go for challange tests
1	the exercises on last afternoon and the industry seminar
1	The experts and the institute.
1	The practical exercise based on cases or published papers. Very interactive and positive.
1	The proper managemnent and the friendly enviroment was one of the best aspect of the course.
1	The roughly equal inclusion of the main types of challenges/pathogens/fish species

Total Responses	19
Skipped	12

12. 12. The thing(s) to be improved was/were:

Count	Response
1	- Course of statistics should be improved and adapted to our context - Course of statistics should contain more practical example instead of mathematical demonstration - Salmonid husbandry was good but need to include more than water parameters (sound like research works resentation). Need more practical information like the presentation of the veteriniranian on danish aquaculture and so on
1	As mentioned above, in my opinion, the peripheral issues (Genetics, husbandry), should have taken much lesser time, whereas more nuclear issues, such statistics, should have been divided into two core blocks: 1: approaches for experimental design and 2: data treatment, with real data related to the subject (this was more the case in the afternoon of the second day. Adding a block on pathogen's conservation, cultivations, quantification .
1	As we know, Course was for the beginners then it should be consider as that trainers are beginners. Statistical analysis should be more elaborate, so, trainers can take more advantage of the course.
1	I wonder if there is a way to organise the topics so there is a day for bacteriology, a day for virology, a day for parasitology etc. This isn't too important though, the course still worked very well as it was
1	Implementation of the statistical approach addressed to the analysis of the immunological data obtained after vaccination or after challenge (deriving from in vitro evaluations such as ELISA, functional tests with leukocytes...)
1	In my opinion, lecture of statistics was good, but too much informative. It could be done step-by-step with participants, who could use R-program on their computers. Participants could follow the teacher step-by-step and to try apply formulas and create the results/graphs by themselves. Thereafter, it could be fine to let participants to statistically evaluate some data from infection fish trials. Generally, to teach them how they can use/do it alone later, when they will be at home.
1	Maybe some practical work would organized.
1	Maybe the teaching hours should have been shorter.
1	more applied content
1	More suited approach about the statistics (maybe more oriented toward fishs exemplars)
1	more time on the statistics.
1	no comment

1	statistical part of the course have to be improved. more practical exercise in setting up a challenge could be improved as well
1	Statistics class should be more subject orientated, with practical examples related with the subject of the course and with a more "biological" approach. I would suggest a separation of the sessions/days by pathogen type instead of fish species/group (ex: virus challenges day1, bacteria challenges day2, parasites challenges day 3, ...)
1	the session of statistic could be more adapted to the background of the participants
1	The statistics part, even if I am aware that it is difficult to reach all the people (mainly because of the different level of knowlede of the audience). I would have appreciated a more "applicative" point of view.
1	There should be more practical activities on the subject.

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Total Responses	17
Skipped	14

13. 13. Did you miss any subjects/topics?

Please indicate any topics that, in your opinion, should have been included in the course:

Count	Response
1	about diseases uotbreaks and how to mannage it in RAS.
1	Adding a block on pathogen's conservation, cultivations, quantification, routine virulence testing. Requirements to work under pharmacopeia vs experimental work. Biosecurity facilities block: design, needs depending on the context (exotic pathogens, zoonotic, etc) . Assessing biosecurity conditions (water and animal disposal) , monitoring of the facilities to assure bio confinement and avoid cross contaminations, etc,
1	As far as, we consider about classes. we had all the classes realated to infection trials.
1	I think for the limited time available the main subjects were covered.
1	Labor safety requirements for infection work.
1	Main topics were presented.
1	Maybe a short overview of genetics challenge that focus on heretability of pathogens resistance
1	maybe a visit for some farms

1	More hands-on statistical exercise of real data
3	No
1	Probably a more detailed presentation about selective breeding for disease reistance/genetic variance of this complex trait.
1	RAS
1	Statistical examples must be in this course

Total Responses	15
Skipped	16

14. 14. How would you rate the quality of the following parts from Day 1?

	Poor	Below Average	Average	Good	Excellent	Responses
Introduction - **presentation and materials**	0 0.00%	0 0.00%	3 13.04%	9 39.13%	11 47.83%	23
Introduction - **relevance**	0 0.00%	0 0.00%	2 9.09%	9 40.91%	11 50.00%	22
Use of animals for research - **presentation and materials**	0 0.00%	0 0.00%	2 8.70%	12 52.17%	9 39.13%	23
Use of animals for research - **relevance**	0 0.00%	0 0.00%	1 4.76%	10 47.62%	10 47.62%	21
Use of fish for fish disease research - **presentation and materials**	0 0.00%	0 0.00%	2 8.70%	8 34.78%	13 56.52%	23
Use of fish for fish disease research - **relevance**	0 0.00%	0 0.00%	3 13.04%	8 34.78%	12 52.17%	23
Visit to DTU's high security tank facilities - **organisation of visit**	0 0.00%	0 0.00%	3 13.04%	5 21.74%	15 65.22%	23
Visit to DTU's high security tank facilities - **relevance**	0 0.00%	0 0.00%	2 8.70%	6 26.09%	15 65.22%	23
General considerations when designing infection models for diseases - **presentation and materials**	0 0.00%	0 0.00%	1 4.35%	10 43.48%	12 52.17%	23
General considerations when designing infection models for diseases - **relevance**	0 0.00%	0 0.00%	1 4.35%	7 30.43%	15 65.22%	23
Salmonid husbandry and physiology - **presentation and materials**	0 0.00%	1 4.35%	2 8.70%	12 52.17%	8 34.78%	23
Salmonid husbandry and physiology - **relevance**	0 0.00%	0 0.00%	3 13.64%	11 50.00%	8 36.36%	22

Total Responses	23
Skipped	8

15. 15. How would you rate the quality of the following parts from Day 2?
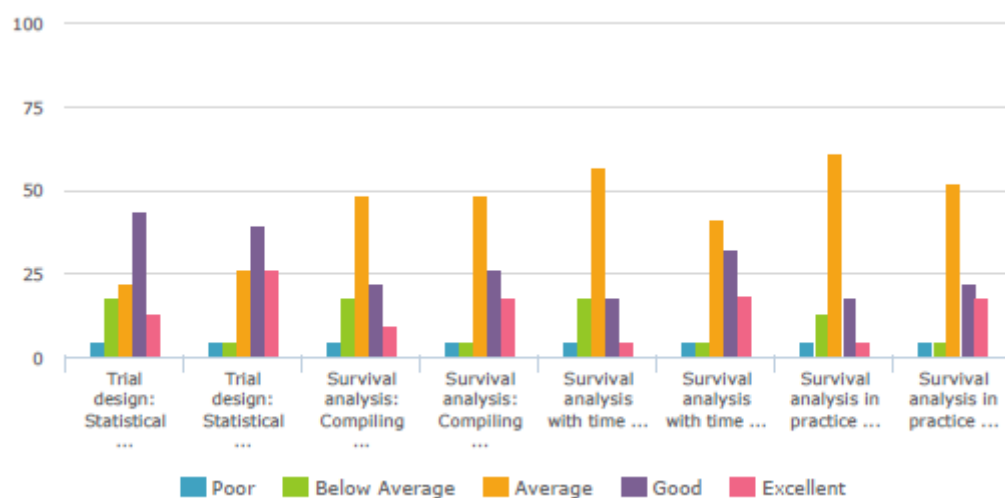
	Poor	**Below Average**	**Average**	**Good**	**Excellent**	**Responses**
Trial design: Statistical considerations when planning trials - **presentation and materials**	1 4.35%	4 17.39%	5 21.74%	10 43.48%	3 13.04%	23
Trial design: Statistical considerations when planning trials - **relevance**	1 4.35%	1 4.35%	6 26.09%	9 39.13%	6 26.09%	23
Survival analysis: Compiling and understanding data - **presentation and materials**	1 4.35%	4 17.39%	11 47.83%	5 21.74%	2 8.70%	23
Survival analysis: Compiling and understanding data - **relevance**	1 4.35%	1 4.35%	11 47.83%	6 26.09%	4 17.39%	23
Survival analysis with time dependent covariates - **presentation and materials**	1 4.35%	4 17.39%	13 56.52%	4 17.39%	1 4.35%	23
Survival analysis with time dependent covariates -	1 4.55%	1 4.55%	9 40.91%	7 31.82%	4 18.18%	22

relevance						
Survival analysis in practice - **presentation and materials**	1 4.35%	3 13.04%	**14** 60.87%	4 17.39%	1 4.35%	23
Survival analysis in practice - **relevance**	1 4.35%	1 4.35%	**12** 52.17%	5 21.74%	4 17.39%	23

Total Responses	23
Skipped	8

16. 16. How would you rate the quality of the following parts from Day 3?
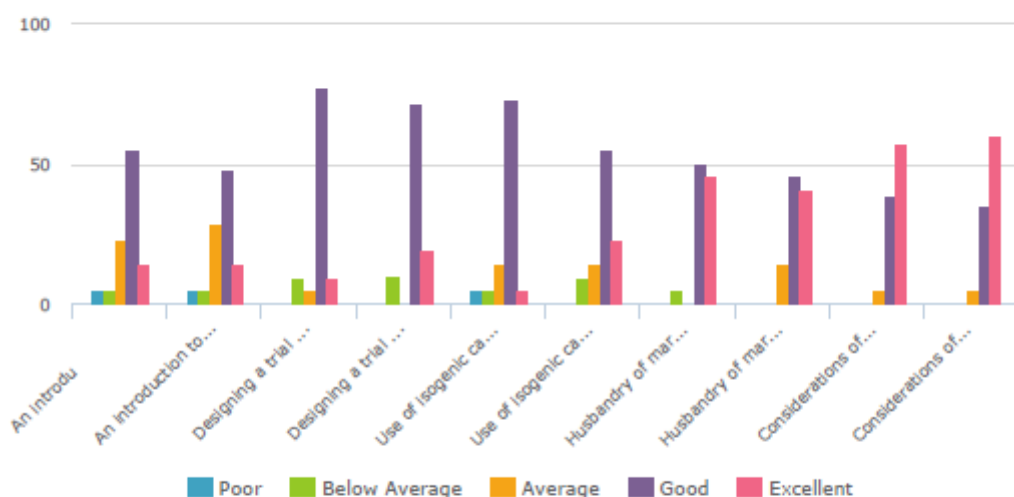
	Poor	Below Average	Average	Good	Excellent	Responses
An introduction to common carp husbandry and physiology - **presentation and**	1 4.55%	1 4.55%	5 22.73%	**12** 54.55%	3 13.64%	22

materials						
An introduction to common carp husbandry and physiology - **relevance**	1 4.76%	1 4.76%	6 28.57%	10 47.62%	3 14.29%	21
Designing a trial with common carp and other Cyprinids - **presentation and materials**	0 0.00%	2 9.09%	1 4.55%	17 77.27%	2 9.09%	22
Designing a trial with common carp and other Cyprinids - **relevance**	0 0.00%	2 9.52%	0 0.00%	15 71.43%	4 19.05%	21
Use of isogenic carp for fish infection models - **presentation and materials**	1 4.55%	1 4.55%	3 13.64%	16 72.73%	1 4.55%	22
Use of isogenic carp for fish infection models - **relevance**	0 0.00%	2 9.09%	3 13.64%	12 54.55%	5 22.73%	22
Husbandry of marine non-salmonid species - **presentation and materials**	0 0.00%	1 4.55%	0 0.00%	11 50.00%	10 45.45%	22
Husbandry of marine non-salmonid species - **relevance**	0 0.00%	0 0.00%	3 13.64%	10 45.45%	9 40.91%	22
Considerations of designing infection trials with endo- and ectoparasites in marine non-salmonid species - **presentation and materials**	0 0.00%	0 0.00%	1 4.76%	8 38.10%	12 57.14%	21
Considerations of designing infection trials with endo- and ectoparasites in marine non-salmonid species - **relevance**	0 0.00%	0 0.00%	1 5.00%	7 35.00%	12 60.00%	20

Total Responses	22
Skipped	9

17. 17. How would you rate the quality of the following parts from Day 4?
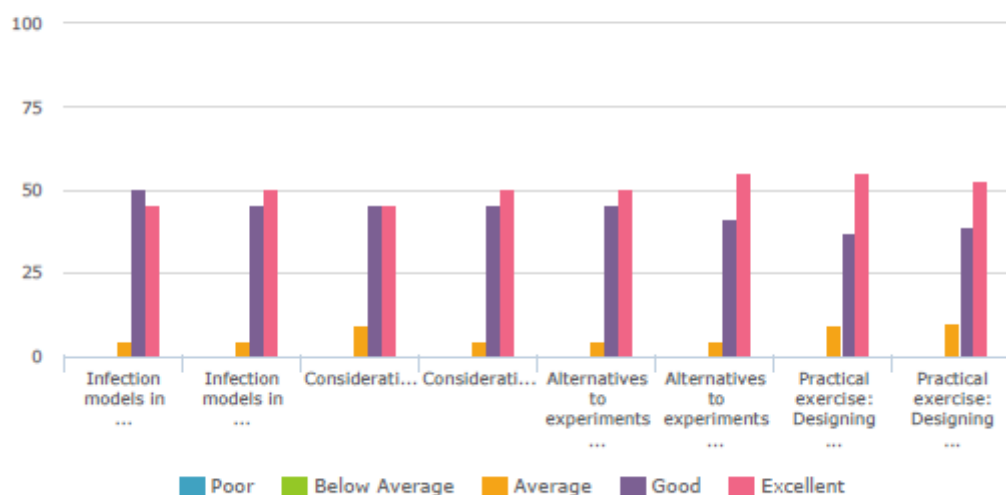
	Poor	Below Average	Average	Good	Excellent	Responses
Infection models in vaccinology and immunology - **presentation and materials**	0 0.00%	0 0.00%	1 4.55%	11 50.00%	10 45.45%	22
Infection models in vaccinology and immunology - **relevance**	0 0.00%	0 0.00%	1 4.55%	10 45.45%	11 50.00%	22
Considerations when designing trials in unconventional species - **presentation and**	0 0.00%	0 0.00%	2 9.09%	10 45.45%	10 45.45%	22

materials

Considerations when designing trials in unconventional species - **relevance**	**0** 0.00%	**0** 0.00%	**1** 4.55%	**10** 45.45%	**11** 50.00%	22
Alternatives to experiments in fish - **presentation and materials**	**0** 0.00%	**0** 0.00%	**1** 4.55%	**10** 45.45%	**11** 50.00%	22
Alternatives to experiments in fish - **relevance**	**0** 0.00%	**0** 0.00%	**1** 4.55%	**9** 40.91%	**12** 54.55%	22
Practical exercise: Designing for pathogenicity and pathogenesis studies based on cases **instruction and materials**	**0** 0.00%	**0** 0.00%	**2** 9.09%	**8** 36.36%	**12** 54.55%	22
Practical exercise: Designing for pathogenicity and pathogenesis studies based on cases - **relevance**	**0** 0.00%	**0** 0.00%	**2** 9.52%	**8** 38.10%	**11** 52.38%	21

Total Responses	22
Skipped	9

18. 19. How would you rate the quality of the Industry Mini Seminar on Day 5?
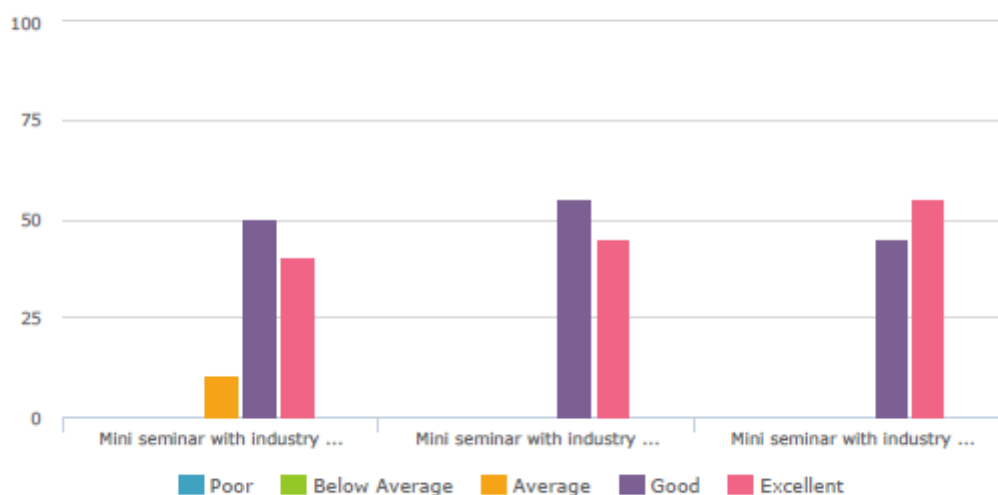
	Poor	Below Average	Average	Good	Excellent	Responses
Mini seminar with industry partners - **opportunities for exchange**	0 0.00%	0 0.00%	2 10.00%	10 50.00%	8 40.00%	20
Mini seminar with industry partners - **representation of industry experts**	0 0.00%	0 0.00%	0 0.00%	11 55.00%	9 45.00%	20
Mini seminar with industry partners - **concept**	0 0.00%	0 0.00%	0 0.00%	9 45.00%	11 55.00%	20

Total Responses	20
Skipped	11

19. 20. How beneficial was the opportunity to exchange with industry professionals for you personally during the Industry Seminar on Day 5?
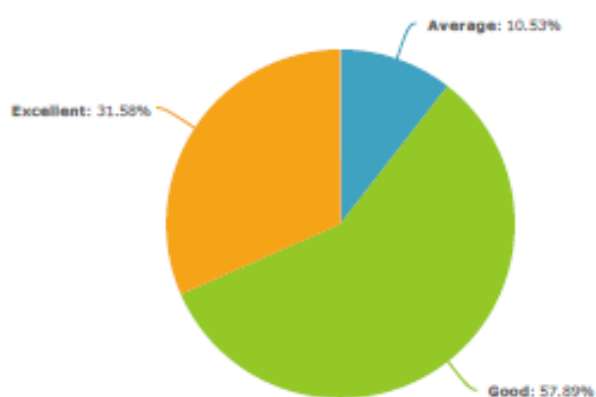
Poor	0.00%		0
Below Average	0.00%		0
Average	10.53%		2
Good	57.89%		11
Excellent	31.58%		6
		Total Responses	19
		Skipped	12

21. 22. Would you like to attend a follow-up course in the future?
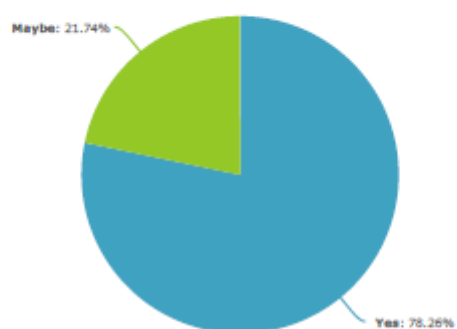
Yes	78.26%		18
No	0.00%		0
Maybe	21.74%		5
		Total Responses	23
		Skipped	8

22. 23. Would you recommend this course to a fellow student/colleague?
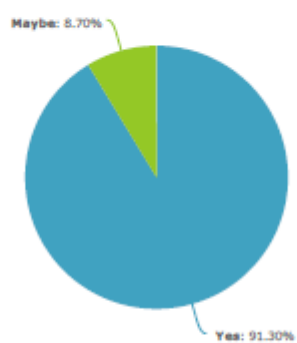
Yes	91.30%		21
No	0.00%		0
Maybe	8.70%		2
		Total Responses	23
		Skipped	8

23. **24. Please describe your learning experience in "Twitter" style (280 characters or less):**

| Count	Response
1	Excellent training course on the topic of experimental infection challenges in numerous fish species. Great coverage of relevant material!
1	Good time at Aquaexcel2020 "Planning and conducting experimental infection trials in fish". DTU perfect location and high level speakers. Happy to have deepened this interesting topic: a broad point of view for my future research!
1	I have gained more theoretical experience but less practical
1	I learned how to plan and conduct infection trials in freshwater and marine fishes. What are the difficulties that is better to avoid during conducting trials. How to do sampling and evaluation of results. As well as how to transfer the results into practice and carried out experiments in the field (at fish farms).
1	Interesting and needed course for the scientific community and industry. Helped to learn and share experiences and highlighted need for consensus.
1	Interesting and useful training on experimental infection trials in DTU Danemark
1	it will solve most of your experimental problems
1	Nice course for the ones that are using or aiming to use infection trials in fish for several purposes. A good opportunity to share knowledge among several countries and research/industrial entities, with different perspectives and technology. Worth for future courses.
1	No comment
1	this course is helpful for everyone interested in this topic. teachers are professionals with great expertise in their field and ability to share it with others. Although some contents have to be improved, the course give tools to actually improve setting up challenges with fish and obtain datas in the right way.
1	very good experience, peoples are very sympathetic, the event was well organized.

Total Responses	11
Skipped	20

24. 25. The Planning and Conducting Experimental Infection Trials in Fish was subsidised. What would be the maximum amount you/your company could afford to pay for a similar course?
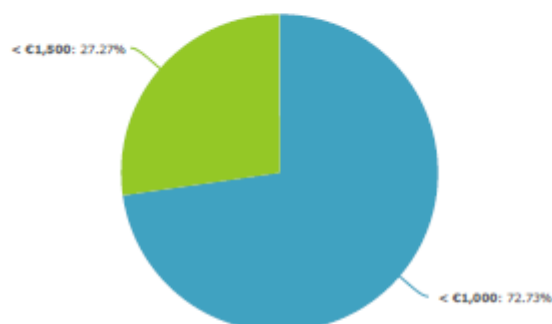
< €1,000	72.73%		16
< €1,500	27.27%		6
< €2,000	0.00%		0
< €3,000	0.00%		0
> €3,000	0.00%		0
		Total Responses	22
		Skipped	9

25. 26. Would you or your institute be interested in future Experimental Infection Trials in Fish courses organised by DTU, CSIC, NAIK and UoS at the cost indicated by you above?
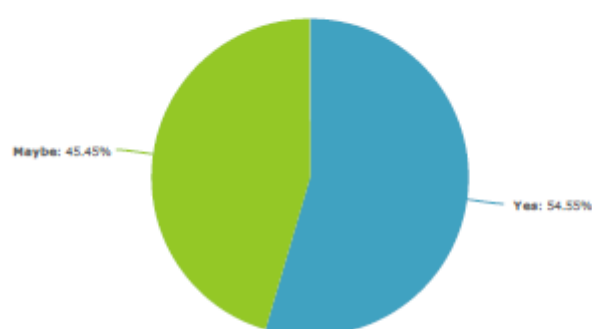
Yes	54.55%		12
No	0.00%		0
Maybe	45.45%		10
		Total Responses	22
		Skipped	9

26. 27. Do you have any other suggestions or feedback?

Count	Response
1	Bigger class room
1	Generally, I am very satisfied. Thank you for providing these courses.
1	Include more practical exercises with open discussion Have more time for the facilities visit which was a very interesting part Extend the industry seminar to one day
1	Just to say thank you to all involved, the course was very useful as an introduction to many essential principles, and a good reresesentation of the issues to consider when planning and conducting experiments.
1	NO
1	none
1	RAS
1	The industry seminar could have lasted 1 day instead of half a day for more opportunities to interact with the speakers.. Overall, the course was very interesting and well organised.

Total Responses	8
Skipped	23

Annex 8: Certificate of Participation

AQUAculture Infrastructures for EXCELlence in European fish research towards 2020

Training Course: Planning and Conducting Experimental Infection Trials in Fish

CERTIFICATE OF PARTICIPATION

This certificate confirms that the following candidate participated in the AQUAEXCEL[2020] Training Course: **"Planning and Conducting Experimental Infection Trials in Fish",** provided by Danmarks Tekniske Universitet (DTU) Aqua (Denmark), with the assistance and expertise of Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC) (Spain), Nemzeti Agrárkutatási és Innovációs Központ (NAIK) (Hungary) and University of Stirling (UoS) (United Kingdom), from 11 – 15 November 2019.

NAME HERE

Training Course Details
- This face-to-face training course focused on considerations needed for both the planning phase and conduction of experimental infection trials (including viruses, bacteria and parasites) in fish.
- A half day industry mini seminar gave the course participants an opportunity to exchange with industry professionals.
- The 5 day-course was taught by tutors from DTU, CSIC, NAIK and UoS.
- For more details, see www.aquaexcel2020.eu and / or contact the DTU contact person below.

_____

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Danmarks Tekniske Universitet (DTU)
timi@aqua.dtu.dk

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Annex 9: Check list

Deliverable Check list (to be checked by the "Deliverable leader")

	Check list		Comments
BEFORE	I have checked the due date and have planned completion in due time		*Please inform Management Team of any foreseen delays*
	The title corresponds to the title in the DOW		*If not please inform the Management Team with justification*
	The dissemination level corresponds to that indicated in the DOW		
	The contributors (authors) correspond to those indicated in the DOW		
	The Table of Contents has been validated with the Activity Leader		*Please validate the Table of Content with your Activity Leader before drafting the deliverable*
	I am using the AQUAEXCEL[2020] deliverable template (title page, styles etc)		*Available in "Useful Documents" on the collaborative workspace*
	The draft is ready		
AFTER	I have written a good summary at the beginning of the Deliverable		*A 1-2 pages maximum summary is mandatory (not formal but really informative on the content of the Deliverable)*
	The deliverable has been reviewed by all contributors (authors)		*Make sure all contributors have reviewed and approved the final version of the deliverable. You should leave sufficient time for this validation.*
	I have done a spell check and had the English verified		
	I have sent the final version to the WP Leader, to the 2nd Reviewer and to the Project coordinator (cc to the project manager) for approval		*Send the final draft to your WPLeader, the 2nd Reviewer and the coordinator with cc to the project manager on the 1st day of the due month and leave 2 weeks for feedback. Inform the reviewers of the changes (if any) you have made to address their comments. Once validated by the 2 reviewers and the coordinator, send the final version to the Project Manager who will then submit it to the EC.*