Previous News SLRC

09 December: New scentific paper: Difference in skin immune responses to infection with salmon louse (*Lepeophtheirus salmonis*) in Atlantic salmon (*Salmo salar* L.) of families selected for resistance and susceptibility

Atlantic salmon is susceptible to the salmon louse (Lepeophtheirus salmonis)and the variation in susceptibility within the species can be exploited in selective breeding programs for louse resistant fish. In this study, lice counts were completed on 3000 siblings from 150 families of Atlantic salmon identified as high resistant (HR) and low resistant (LR) families in two independent challenge trials. Skin samples behind the dorsal fin (nearby lice attachment) were collected from ten extreme families (HR or LR) and analyzed by qPCR for the expression of 32 selected genes, including a number of genes involved in T helper cell (Th) mediated immune responses, which have been previously implied to play important roles during salmon louse infections.

Link to publication: http://www.sciencedirect.com/science/article/pii/S1050464814004124

19 November: New scientific paper: Distribution of EP4 receptor in different Atlantic salmon (*Salmo salar* L.) tissues

Prostaglandin E2 (PGE2) is an important lipid mediator that has diverse physiological and immunological effects. PGE2 is found in the sea lice saliva and is thought to play role in lice-induced immune modulation of host responses. Diverse immune modulatory effects can be induced by PGE2 depending of the type of receptor bound. Information about the receptor diversity and expression is therefore important to understand function of PGE2 as immune modulator. We have investigated the expression of the EP4 receptor, the only identified PGE2 receptor in Atlantic salmon so far, in different tissues of Atlantic salmon. We show that the receptor is highly expressed in immune organs (headkidney and spleen) and is associated with immune cells in different tissues. This is the first report about PGE2 expression in Atlantic salmon and the findings presented suggest the involvement of EP4 receptor in mediating immune responses as previously shown for mammalian species.

Link to publication: http://www.sciencedirect.com/science/article/pii/S0145305X14002456

04. November: New scientific paper: Mutated salmon louse DNA spread throughout the North Atlantic in 11 years or less

A recent study published in Bmc Genomics has demonstrated that genetic changes giving the salmon louse partial resistance towards one of the most commonly used delousing chemicals in marine aquaculture (emamectin benzoate – Slice) have spread to salmon lice in the entire North Atlantic in a maximum of just 11 years. This is the first time that scientists have managed to

simultaneously document that a mutation that arose in just one or few animals in the marine environment have spread to the whole population, and at the same time managed to document how long this process took.

What´s unique here is that we have managed to document that a trait can spread to the entire North Atlantic in such a short period of time, says Kevin Glover who is the research group leader for the population genetics group at the Institute of Marine Research, and a professor at the Sea lice Research Centre at the University of Bergen.

However, Glover cautions – even though the trait has been spread to the entire population of salmon lice in the North Atlantic, this does not mean that all lice carry the mutation(s).

The scientific paper is open access and available on this link:
http://www.biomedcentral.com/1471-2164/15/937/abstract

16. October: New scientific paper: Instar growth and molt increments in *Lepeophtheirus salmonis* (Copepoda: Caligidae) chalimus larvae. By Christiane Eichner, Lars Are Hamre and Frank Nilsen, Sea Lice Research Centre, Department of Biology, University of Bergen, Norway

Until recently the life cycle of salmon louse was described with 4 chalimus stages. Knowing that there are only two chalimus stages it is obvious that this confusion was due to substantial morphological variation within each of the two chalimus stages. This paper provides details on how the chalimus larvae grow and show that as much as 40-50% of the total length growth during the chalimus phase takes place between molts. It is also shown that sexual size dimorphism arise during the molt to the chalimus 2 stage as the females increase significantly more in length compared to males. It is also shown that sex at this stage can be determined based on cepalothorax length. Details on duration of chalimus stages and the differential developmental rate of males and females is also provided.
Link to publication

19 September: Stand at Forskningsdagene 2014

12 September: Winner of the Young Scientist Award at Sea Lice 2014

 Kiranpreet Kaur, postdoc at the Sea Lice Research Centre, was the winner of the prestigious Young Scientist Award at the Sea Lice 2014 conference in Portland, Maine in September 2014. Kiran had studied the mechanisms behind resistance development against a commonly used treatment, azamethiphos. The jury, an independent panel of expert judges from industry and academia, emphasized that the results of the studies could have immediate practical applications, that they were carefully conducted and that she had used many advanced experimental techniques in her studies. Kiran was invited to the Novartis experimental station in St. Aubin, Switzerland, to meet with Novartis scientists, learn about their work regarding screening of compounds for antiparasitic effect and experimental methods that could be utilized in upcoming studies.
http://www.worldfishing.net/news101/industry-news/young-scientist-award-winner-announced

28 August: New Scientific Paper: Production of lice families reveals valuable insights into pesticide resistance in lice

Scientists at the Institute of Marine Research, and the Salmon Louse Research Centre at the University of Bergen, both located in Norway, have for the first time produced families of sea lice in order to investigate resistance development in salmon lice. The ground-breaking work was conducted under the Norwegian Research Council funded project PrevenT, with PhD student Lina Ljungfelt leading the experiment.

Pesticide resistance represents a global challenge to food production. Specifically for the Atlantic salmon aquaculture industry, salmon lice and their developing resistance to delousing chemicals, for example emamectin benzoate, represents a challenge to sustainability. Therefore, it is important to quantify the degree of resistance development within lice, and understand its underlying genetic mechanisms. In the present study, researchers produced full-sibling families of salmon lice for the first time. This involved pairing sexually mature virgin females with males, mixing thousands of their offspring together to infect salmon, then implementing DNA parentage testing to identify the lice surviving chemical treatment with emamectin benzoate. Results from the study demonstrated increased genetic resistance tolerance in families produced from strains suspected to have decreased emamectin benzoate susceptibility. Furthermore, no fitness cost to the lice, measured as reduced survival under the experimental conditions, was observed with the resistance mechanism. The latter strongly suggests that when resistance to this chemical develops, it will be difficult to eradicate within wild lice populations. Finally, while this

experiment provided a unique insight into emamectin benzoate sensitivity among lice families, the experimental design represents a novel methodology to experimentally address both resistance development and other evolutionary questions in parasitic copepods. The article is open online and available here: http://www.biomedcentral.com/1471-2148/14/108

1 April: SLRC Annual Report 2013

The Annual Report presents all the activities for Sea Lice Research Centre in 2013. Progress is good, and interesting scientific discoveries have been published through the year. Read more or dowload the report from Results

31 March: New Scientific Paper

A method for stable gene knock-down by RNA interference in larvae of the salmon louse (Lepeophtheirus salmonis). By Christiane Eichner, Frank Nilsen, Sindre Grotmol, Sussie Trine Dalvin

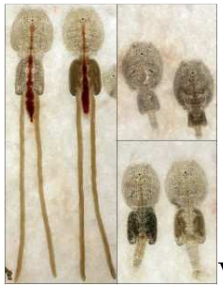
RNA interference is a molecular method used to investigate the function of genes. This method has been used in adult salmon louse to acquire functional data and evaluate potential vaccine targets. This article presents a new method to perform RNA interference in salmon louse larval stages, hence RNA intereference can now also be used to study genes with a potential role early in development and in molting.

The scientific paper can be found here (requires log-in):
http://www.sciencedirect.com/science/article/pii/S0014489414000484

26 February: Visit by the Minister of Fisheries

The Minster of Fisheries, Elisabeth Aspaker, visited SLRC at the beginning of this week. Frank Nilsen, Director at SLRC, gave a presentation of the research in SLRC and how industry and researchers are collaborating in the centre. The Minister was especially interested in the current challenges with increase in the number of salmon lice and resistance against existing treatments. The emerging medicine resistance situation is calling for new treatment tools and SLRC has contributed with newly discovered genetic markers for resistance. The participants discussed the progress of SLRC research and what could be expected in the future. Increased funding was also an issue and it was emphasized from SLRC that it is crucial to be able to keep highly skilled people funded in the centre.

1 February: New Scientific Paper



Vaccination of farmed fish is one of the strategies that are pursued to fight the growing threat that salmon lice pose against the aquaculture industry and wild populations. Developing vaccines against ectoparasites like the salmon louse is not a straight-forward task. Finding new vaccination targets is one of the main tasks SLRC researchers are working with. To do so, a technique called “RNA interference” is used. Employing this technique, the researchers are able to “screw down” the synthesis of a specific targeted protein in living salmon lice, leading to more or less pronounced effects on the animals. In a recent publication, the outcomes of such RNA interference experiments targeting two proteins named LSKDELR and LsCOPB2 are described. Both LsCOPB2 and LsKDELR knockdown in adult females caused disturbed digestion and the lice were unable to produce egg strings. For the first time, significant mortality caused by RNA interference in salmon lice was observed after the knockdown of LsCOPB2. These strong effects mark the potential of both proteins as possible anti-lice vaccine targets.

The scientific paper can be found here (requires log-in):
http://www.sciencedirect.com/science/article/pii/S1096495913002133

16 January: New Scientific Paper

Reduced sensitivity against the traditional medicinal products with effect against sea lice has led to an increased use of hydrogen peroxide (H_2O_2) as delousing agent in salmon farms. This compound is effective against mobile stages of the parasite. The treatment has mainly been performed in well boats, but in later years, treatments in open cages have also been applied. For several reasons, the viability of salmon louse egg strings after such a treatment has been questioned: Well boats must discharge residual water from the treatment 3 km downstream from the farm, affecting economical and practical aspects of the procedure comprehensively. Methods for minimizing the parasite’s reproductive output would prove a great asset to reduce the general sea lice infection level in salmon farm areas.

In an SLRC-study performed at the Norwegian School of Veterinary Science, the viability of salmon lice egg strings after exposure to hydrogen peroxide was investigated. Egg strings were collected before and after a field treatment procedure. Hatching and development of subsequent larvae was monitored in a laboratory for 18 days after treatment. In another study, egg strings were exposed to ascending concentrations of the compound, followed by monitoring of hatching and development for 15 days. The study showed that exposure to concentrations even as low as 470 mg/l for 36 minutes severely affected hatching and larval development.

The scientific paper can be found here (requires log-in):
http://www.sciencedirect.com/science/article/pii/S0044848613006455