

Best-practice treatment principles: Sea lice resistance management

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Introduction

In September 2000, MSD Animal Health published a technical bulletin entitled *Sea Lice Resistance Management* (with particular reference to avermectins).

Since then, salmon farms around the world have successfully used SLICE® (emamectin benzoate) to control sea lice infestations in salmon. After nearly a decade of SLICE use, some sea lice resistance or tolerance to in-feed treatments with SLICE has been reported in several countries, with the exception of Canada's West Coast.

Still today, SLICE remains effective in many areas; it is the treatment of choice and is preferred over bath treatments due to its ease of application, duration of efficacy and effect on all life stages of sea lice.

After long-term exclusive use of any chemotherapeutant, reduced susceptibility may be expected. It then becomes more important than ever to employ best-practice treatment procedures to ensure maximum efficacy. This bulletin is a guide to best-practice principles based on observation of field results over the course of many years, as well as emerging techniques that are now being applied to help with the treatment decision process. A guide like this cannot, however, cover all the variables that a veterinarian must consider when making treatment decisions.



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BEST-PRACTICE TREATMENT PRINCIPLES

1. Collaboration

- Strictly apply area management agreements that include all-in/all-out stocking and fallowing to eliminate the transfer of sea lice from one generation of fish to the next.
- Monitor the sea lice population within the whole area to help determine the best time to treat.
- Follow established treatment thresholds or consult local recommendations, and for maximum effectiveness, agree on product selection, timing and rotation options. Develop a written agreement so everyone is clear about the protocols.
- Hold meetings and share data with other farmers in the area.

continued

2. Planning (See Figure 1)

- ▶ Develop a sea lice control strategy within a Veterinary Health Plan (VHP) that is specific to each site in the area, but also consider the VHPs of all sites within the area. Regarding sea lice management, these should include, but not be restricted to, the following:
- ▶ Seek regulatory permission to use all available licensed medicines, even if one or more may not be considered for use at the outset.
- ▶ Consider the use of non-medicinal techniques, such as wrasse.
- ▶ Use the best available techniques to determine the sensitivity of sea lice to the medicines being considered for use. (See the section on bioassays.)
- ▶ Prepare a treatment plan prior to stocking the site with fish. This should include the medicines to be used and their rotation. (See the section on the rotation of chemotherapeutants.)
- ▶ Coordinate the timing of treatments for the selected medicines.
- ▶ Have trained staff monitor sea lice numbers weekly throughout the year in accordance with published protocols.

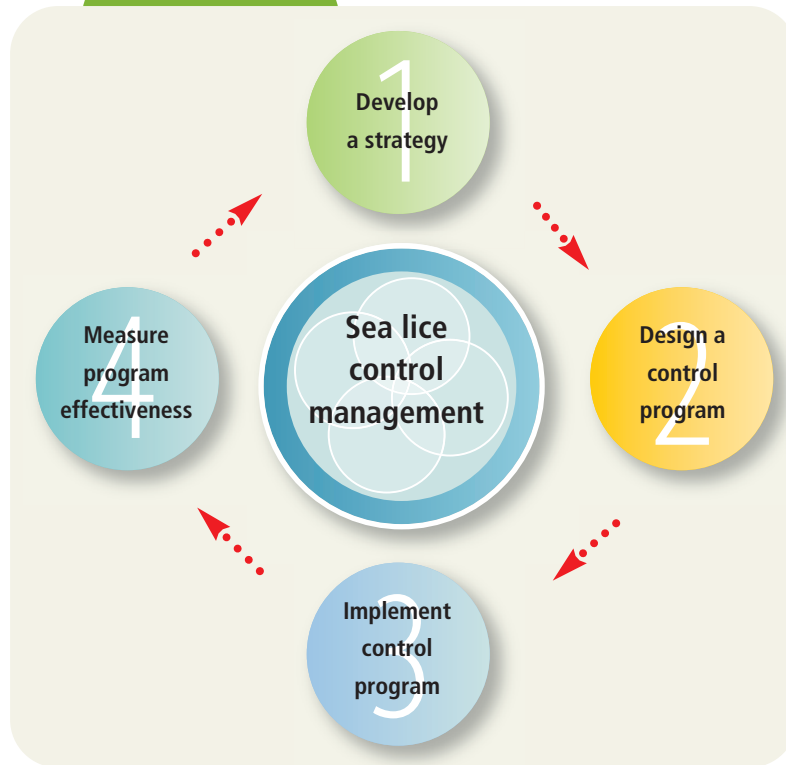
- ▶ Where not stipulated by legislative authority, establish trigger levels for treatment based on the numbers of sea lice.

3. Sensitivity Monitoring — Bioassays

- ▶ Bioassays are recommended as part of best-practice principles, but they are not a definitive tool to be used when making treatment decisions.
- ▶ Field experience has made it clear that the LC₅₀ or EC₅₀ values determined from bioassays on sea lice are not an entirely accurate predictor of resistance, but bioassay values are among the best tools currently available.
- ▶ Bioassays should be viewed as one tool among several that veterinarians should use to decide when a particular medicine may or may not be effective and when it is time to consider changing to a treatment with a different mode of action.
- ▶ The routine use of bioassays, coupled with treatment monitoring as described in the next section, should make it possible to produce records that can be used to correlate treatment success with bioassay results.



FIGURE 1



1

Develop a strategy

- Form area management agreement
- Decide on stocking policy
- Coordinate fallowing
- Agree on lice-monitoring protocol
- Adjust strategy in light of the database information

2

Design a control program

- Embed control program into veterinary health plan
- Obtain permission for all available licensed medicines
- Include non-medicinal measures
- Determine sensitivity of sea lice to available medicines and parameters of use
- Write down treatment regimen to be used for whole cycle
- Prepare a rotation plan

3

Implement control program

- Write standard operating procedure (SOP) for program management procedures
 - Lice counting
 - Sampling
 - Feeding
 - Treatment triggers
- Provide training; implement SOPs
- Carry out bioassays in all areas to be farmed
- Coordinate treatments
- Carry out treatments in accordance with plan

4

Measure program effectiveness

- Record all bioassay results
- Analyze feed and record
- Analyze flesh and record
- Monitor and record every treatment according to plan
- Record any deviation from plan and reason
- Create database of all information
- Regularly review information; adjust strategy as needed

How to use Bioassays

- Ideally, bioassays should be conducted according to a published protocol. Further information on protocols can be found within the *Sealice Resistance to Chemotherapeutants — A handbook in resistance management, Search Project* (QKK2-CT-00809) or within the paper entitled “Optimization and field use of a bioassay to monitor sea lice *Lepeophtheirus salmonis* sensitivity to emamectin benzoate” by Jillian D. Westcott, Henrik Stryhn, John F. Burka and K. Larry Hammell in *Diseases of Aquatic Organisms*, Vol. 79:119–131, 2008.
- Many farm companies have their own in-house bioassay facilities and there may be subtle differences in the protocols they use, which may or may not affect end results. With so many variables, it may be difficult to compare results among laboratories using different protocols, but the fundamental rationale for using bioassays remains.

4. Monitoring

- ▶ Record the results of the bioassay to check the sensitivity of sea lice in the area to be treated.
- ▶ Record sea lice numbers weekly and, particularly, prior to each treatment.

- ▶ Analyze feed that was administered to fish to ensure the target dose was included in the diet.
- ▶ Take samples of flesh 24 hours post-treatment and freeze. Then, if required, analyze the samples to check for therapeutic levels of emamectin.
- ▶ Record sea lice numbers 3 weeks post-treatment and compare against the pre-treatment number and bioassay results.
- ▶ Analyze the results and make adjustments, if necessary, to the strategy and medication employed.

5. General Husbandry

- ▶ Administer the correct dose of the licensed formulation for the full treatment period as described in the manufacturer’s data sheet. Any deviations should be recorded.
- ▶ Keep nets clean to ensure good water exchange, prevent the build-up of sea lice within the pen and facilitate good clearance of medicines after bath treatments.
- ▶ Do not use holding cages at harvest stations; it may unnecessarily harbor sea lice.



BEST-PRACTICE TREATMENT PRINCIPLES

▶ Whenever fish are moved using fish pumps, use sea lice filters on the pumps.

▶ Well boats used to move fish out of a management area should be operated only with closed valves.

6. Medicated Feeding

▶ Make sure fish are eating before treating with an oral medicine. Bacterial or viral disease, heavy sea lice infestation or environmental conditions can reduce fish appetite and feed consumption. Treating orally when fish have reduced appetites is not advised because they may not consume enough feed to get the proper dose rate.

▶ Remove, where possible, non-feeders within the population being treated, since they can harbor sea lice after an in-feed treatment.

▶ Check the accuracy of the biomass to ensure that the correct dosage is calculated.

▶ Avoid making changes in your regular feeding practices during oral treatment. Changing feed type or pellet size, for example, may negatively affect intake and absorption of SLICE.

▶ Simultaneously treat all fish on the farm to reduce the likelihood of leaving a reservoir of untreated lice.

▶ Feed medicated with SLICE should be the sole source of feed for the 7-day treatment period.

▶ Withhold feed from the population for 24 hours before treatment.

▶ Carefully monitor the feeding response.

▶ Carry out sea lice counts for 3 weeks post-treatment; if the efficacy is not as desired, consider immediate use of a bath treatment (i.e., a treatment with a different mode of action on the same cohort of sea lice).

7. The Rotation of Chemotherapeutants with Different Modes of Action

▶ Sea lice, like other parasites on farmed animals, have the ability to develop tolerance or resistance to the active ingredients in the medicines used to control them. To slow the development and minimize the impact of resistance, it is suggested that strategic rotation of chemotherapeutants/medicines be employed.

continued



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BEST-PRACTICE TREATMENT PRINCIPLES

- ▶ Veterinary health plans should contain a site-specific product rotation program and subsequent monitoring programs. Analysis of the data collected under the program will help to improve future recommendations for product rotation within the farm management area.
- ▶ The strategic rotation of treatments with different modes of action remains at the discretion of the attending veterinarian.

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