



# Developing BAT/BEP with respect to hazardous substances for sustainable aquaculture operations in the Baltic Sea region



# Introduction

## Hazardous substances:



Veterinary medicines



Antifouling agents



Cleaning and disinfection agents

## Impact on environment:

- Hazardous substances pose a risk to the environment
- Accumulation in sediment
- Toxicity to non-target species

# Veterinary medicines



**Purpose:** Treatment of infections and diseases

**Types:** Therapeutants, disinfectants, vaccines and anaesthetics

Country	Disease occurrence
Denmark	Red mouth disease, furunculosis vibriosis, Red Mark Syndrome, Bacterial Kidney Disease (BKD), PRV-3, IPN, costiasis
Finland	Flavobacteriosis, Enteric red mouth disease
Estonia	Viral Haemorrhagic Septicaemia (VHS), Infectious Haematopoietic Necrosis Virus (IHNV)
Poland	Viral Haemorrhagic Septicaemia (VHS), Infectious Haematopoietic Necrosis Virus (IHNV), Koi herpesvirus disease (KHVD)

*No data available for pharmaceutical inputs to the Baltic Sea from aquaculture*

## Methods:

- Bath treatment
- Dip treatment
- In-feed treatment

## Examples:

*Marine aquaculture:* emamectin benzoate, formalin, azamethiphos, cypermethrin, benzocaine, 2-phenoxyethanol, teflubenzuron, diflubenzuron, amoxicillin, oxolinic acid and florfenicol

*Land-based aquaculture:* formalin, antimicrobials

## **BAT/BEP summary:**

- Preventive health management
  - Good management practices
  - Site selection and production planning
  - Vaccination
  - Immunostimulants
- Treatment
  - Correct use
  - Alternative treatment (e.g. cleaner fish)
  - Integrated disease management
  - Use appropriate administration method
- Regulations
  - Planning and permitting
  - Regulation of treatment frequency
  - Monitoring and record keeping

# Antifouling

**Purpose:** Prevention of growth of unwanted organisms on surfaces of man-made structures immersed in the sea

**Fouling organisms:** bladder wrack, blue mussel, estuarine barnacle, zebra mussel, freshwater hydroid



## Methods:

- Biocidal coating
- Cleaning practices
  - Air drying of infrastructure
  - In situ mechanical cleaning (disk cleaners)
  - Onshore washing of nets
  - Jet washing (shellfish trays, nets)
  - Manual cleaning (shellfish trays)
- Biological control
- Coloured/Polymer/ Copper alloy nets

## BAT/BEP summary:

- Biocide free antifouling strategies
  - Net changing and cleaning regimes
  - Cleaning on land
  - Colour of net
- Biocidal antifouling strategies
  - Correct use according to suppliers instructions
  - Use of novel netting with no or less treatment
  - Copper free or treatment with low-concentrations are preferred
  - Avoid in-situ cleaning
  - Proper storage and disposal

# Cleaning and disinfection



**Purpose:** Reduce pathogen risk and control diseases in the aquaculture industry

**Use:** Personal hygiene, reduction of feed spoilage, pest and odours, water treatment, routine sanitary measures and disease eradication

**Types:** Detergents, formaldehyde, chlorine products, alcohols, hydrogen peroxide, phenol derivatives and iodophors

## BAT/BEP summary:

- Storage
  - Proper labelling
  - Proper storage
- Use of agents
  - Only use registered products
  - Use products with less environmental impact (e.g.biodegradable)
  - Appropriate application method and dosage
  - Avoid residues on surfaces
- Spills
  - Prevention of spills
- Disposal
  - Proper disposal of products and containers
- Staff training

# CONTACT DETAILS



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## BAT/BEP recommendations:

### Preventive health management

- ▶ Apply good management practices to reduce the stress experienced by fish, and therefore their susceptibility to infections.
  - Ensure water quality control parameters such as dissolved oxygen, salinity, temperature, and pH are maintained.
  - Stock only healthy fish at correct densities (varies by species and size) in the first instance reducing the likelihood of infections.
  - Welfare and hygiene procedures should be carried out to minimising the risk of infection, such as regular net washing and drying, removing mortalities, and ensuring food is stored correctly and disposed of if it gets contaminated or becomes mouldy or stale.

## BAT/BEP recommendations:

### Preventive health management

- ▶ Careful planning and permitting of new farms should be done in order to reduce the need for veterinary medicines. Site selection criteria should include water flow/exchange, distance from other farms, and encourage production methods that allow for adequate fallow periods between growth cycles, and careful planning of growth cycle timing (seasonal/temperature dependent), ensuring that the site has adequate water quality to sustain healthy fish production and installing predator deterrents to help reduce stress to the fish.
- ▶ If available, use vaccination against relevant diseases to improve fish specific immunity. Vaccinations are an extremely effective preventative measure utilised in aquaculture. Vaccines contribute to the success of salmon production and the use of vaccines results in a decline in antibiotic use. In the Baltic region, vaccines are available for fin fish such as salmon and trout.
- ▶ Another alternative and preventative therapy are immunostimulants added to fish feeds. Immunostimulants work by stimulating the immunological response of fin fish species, therefore increase their resistance against pathogen diseases.

## BAT/BEP recommendations:

### Treatments

- ▶ Only use medicines as they are prescribed, in the correct dosage and application method.
- ▶ Regularly train staff to ensure that medicines are administered, and the treatment is recorded correctly.
- ▶ For health problems that arise seasonally, a treatment strategy should be developed, and regional co-ordination can also take place.
- ▶ Alternative treatments such as cleaner fish for the control of external parasites can also be explored, reducing the need for medicinal treatment. Cleaner fish such as lump sucker fish are produced in large scale aquaculture systems specifically for use as cleaner fish, and readily feed on sea lice parasites in marine cages.
- ▶ Unused or expired veterinary medicines should be disposed of properly to avoid contamination of fresh water and marine ecosystems. Standards for disposal methods should be in place and enforced. A simple waste disposal method for veterinary medicines is 'take-back' schemes, where unused pharmaceuticals are returned to the pharmacy. Some countries have waste collection points for medicines.

## BAT/BEP recommendations:

### Treatments

- ▶ Integrated management in areas where aquaculture is taking place could prove effective especially in the case of contagious infections and external parasites. If neighbouring farms communicate any issues and co-ordinate their treatments it could also reduce the number of treatments required to treat fish, which reduces the stress for the fish and the loading of medicines into the environment.
- ▶ Bath treatments are associated with the direct discharge of therapeutants into the surrounding environment. As such, alternative methods of administration should be given priority. Dip-treatments can be used with a much reduced, or even eliminated discharge of therapeutants, when treatment water is disposed of properly.
- ▶ Considerations should be made for land-based aquaculture to allocate allowed discharge concentrations, durations, and frequency, managed by catchment area.

## BAT/BEP recommendations:

### Regulation

- ▶ Veterinary medicines that pose an environmental risk should be included in initial permitting. This means assessing the use of veterinary medicines as part of the planning stages of an aquaculture production site. Regulators and producers can carry out modelling to predict the behaviour of different treatments in the environment before a site is permitted to begin production.
- ▶ Treatment frequency and spatial impacts should be regulated. This means maximum allowable concentrations should be set for different time spans following treatment and for multiple distances on the seabed from the farms.
- ▶ Regular monitoring and audits of record keeping, and medicine storage should be carried out to ensure compliance and good practice. As part of these audits, data collation about treatment frequency, treatment type, dosage, and treatment dates and duration can be carried out by the regulator. Aquaculture producers should collect this information and can submit it to regulators on a regular basis.

## BAT/BEP recommendations:

### Biocide free antifouling strategies

- ▶ Management of antifouling should be coordinated by experienced staff. Knowledge of biofouling season, in addition to monitoring of plankton and spat-fall, enables appropriate net changing and infrastructure cleaning regimes. The most important factor in managing biofouling is the possibility to accurately predict the incidence of fouling episodes, such as mussel spat-fall.
- ▶ Cleaning of nets and other infrastructures should be done on land. On land net cleaning sites must have suitable effluent treatment systems in place. Biological waste must be stored and/or disposed of appropriately.
- ▶ The colour of netting should be selected depending on the local conditions and presence of fouling species.
- ▶ Mussels should be cleaned as part of post-harvest processing or the use of biological control should be explored.

## BAT/BEP recommendations:

### Biocidal antifouling strategies

- ▶ Only approved antifouling agents should be used. Cage farms using biocidal antifoulants have to obtain all necessary authorizations for their use. Land-based farms shall obtain any required discharge permits from government agencies.
- ▶ Use of antifouling agents should follow suppliers' instructions to avoid bioaccumulation in fish and aquatic organisms.
- ▶ Nettings made of novel materials requiring less or no antifouling treatment should be preferred, but only if they offer effective treatment and demonstrably reduced environmental impacts.
- ▶ Emerging antifouling strategies should be preferred when relevant. Copper free or antifouling treatment with lower concentrations (<7%) of di-copper oxide should be preferred.

## BAT/BEP recommendations:

### Biocidal antifouling strategies

- ▶ In situ mechanical cleaning of biocidal coatings should be avoided, to prevent contamination of marine sediments. Blasting technologies are not recommended on biocidal coatings. When in situ cleaning is necessary, methods (using vacuum system) must be applied to ensure retention of the materials.
- ▶ Nets coated with biocidal antifouling products should be stored and disposed of properly to avoid environmental contamination.
- ▶ Where copper (treated) nets are used, monitoring of copper levels outside the Allowable Zone of Effect (AZE) must be undertaken and within acceptable limits.

# Cleaning and disinfection



## BAT/BEP recommendations:

### Storage

- ▶ Containers must be properly labelled with expiry date, use instruction and risk indicators (explosive, toxic etc.).
- ▶ Cleaning and disinfection agents should be stored in a safe and responsible manner in a dry, well-ventilated, and lockable store to prevent direct or indirect danger to the environment.
- ▶ The store area should be clearly marked.

## BAT/BEP recommendations:

### Use of agents

- ▶ Only use products that are legally registered for the intended application.
- ▶ Only use cleaning and disinfectant agents when necessary. Reduce volume used as much as possible.
- ▶ Use the most appropriate type of product for the situation.
- ▶ Products with less environmentally hazardous properties should be chosen (eco-label if applicable):
  - For cleaning, use biodegradable soaps
  - Use disinfectants that have no or minimal impact on the environment, such as products containing chlorine products, hydrogen peroxide or peracetic acid.

# Cleaning and disinfection



## BAT/BEP recommendations:

### Use of agents

- ▶ Use appropriate application method and dosage, amount or concentration as specified on the label.
- ▶ When using commercial biocides, aquatic test strips are mostly available and can be used to determine the concentrations within a given solution.
- ▶ Potential residues of cleaning and disinfectant agents on surfaces should be avoided. Surfaces should be rinsed and dried after cleaning and disinfection.

### Spills

- ▶ Precautions should be taken to prevent spills. Procedures and containment plans should be in place for managing spills of cleaning and disinfection agents. Supplies needed for cleaning up spills should be available.

# Cleaning and disinfection



## BAT/BEP recommendations:

### Disposal

- ▶ Do not discharge soaps or disinfectants directly into the aquatic environment.
- ▶ Follow manufacturers recommendation for disposal of disinfectants.
- ▶ Empty containers should be turned over to a waste management company.
- ▶ Disposal of unused chemicals should be done according to applicable national regulations.

### Staff training

- ▶ Staff should be trained on the proper use of cleaning and disinfection agents.
- ▶ Staff should be trained to manage spills.