Scottish Salmon Watch, 17 March 2020

SCOTTISH SALMON WATCH

CHEMICALS

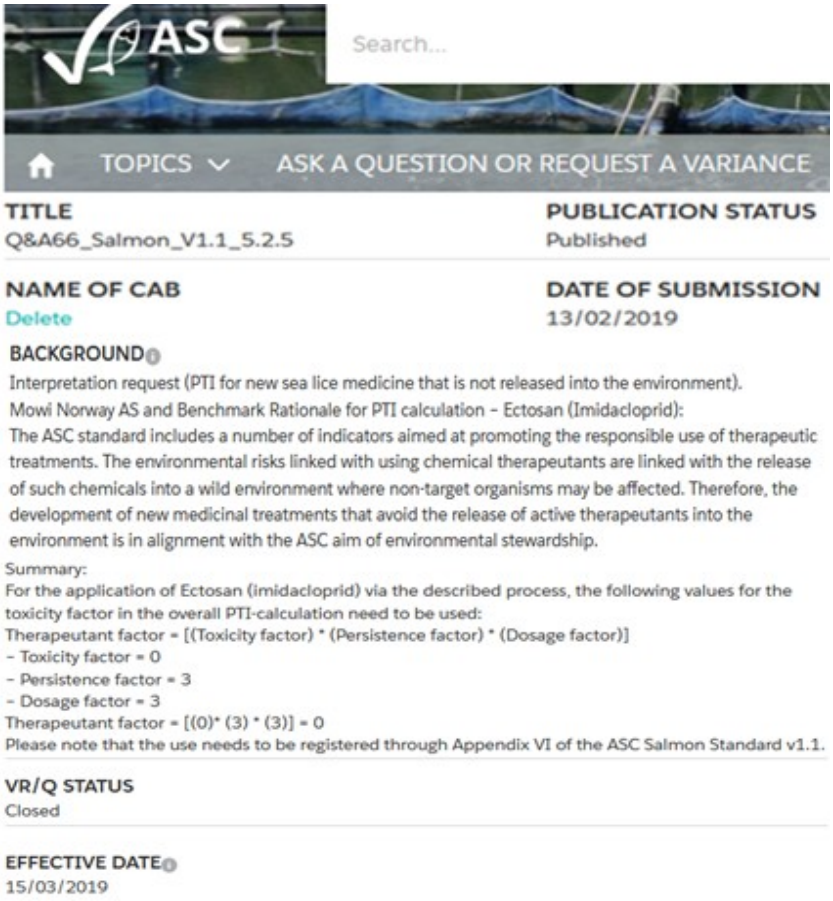
Revealed: Toxic Neonicotinoid Insecticide Used to 'CleanTreat' Lousy Salmon

- 'New generation' chemical marketed as BMK08 & Ectosan unmasked as Imidacloprid
- Imidacloprid classified as 'Very Toxic to Aquatic Life' & an 'Environmental Hazard'
- "Can lead to potentially life-threatening complications & acute poisoning"
- Imidacloprid was banned in the UK for use in agriculture due to impacts on bees
- Benchmark in fight to keep documents secret citing commercial confidentiality
- SEPA & Marine Scotland refused to disclose documents via FOI
- Scottish Salmon Watch appealed to the Scottish Information Commission in Feb 2020
- Mowi asked the Aquaculture Stewardship Council for authorisation back in Feb 2019
- FOI disclosure revealed that Mowi "wants to get this off the ground as soon as possible" & Cabinet Secretary for Rural Economy lobbied to "speed things up"
- Trials at five salmon farms in Norway & maybe already in Scotland
- Launched as D10 Aquatic Blast in 2014 in Canada

Campaigners are calling on the Scottish Environment Protection Agency (SEPA) and the Scottish Government to come clean on plans by Benchmark to use the controversial and "Very Toxic" neonicotinoid insecticide Imidacloprid in Scottish salmon farming. Last month Scottish Salmon Watch filed an appeal with the Scottish Information Commissioner to force disclosure of documents on Benchmark's secret 'CleanTreat' system and BMK08/Ectosan.

Benchmark (owned by Norwegian investors including FERD and Kverva - also the largest shareholder in SalMar which owns Scottish Sea Farms - and the Royal Bank of Scotland) have refused to publicly name the ingredients in Ectosan (re-branded as BMK08 in 2019) since it was first publicised in 2017. Scottish Salmon Watch stumbled on the deeply

disturbing news that Ectosan is Imidacloprid via a tip-off last week pointing to a post on the Aquaculture Stewardship Council's web-site **[1]**.



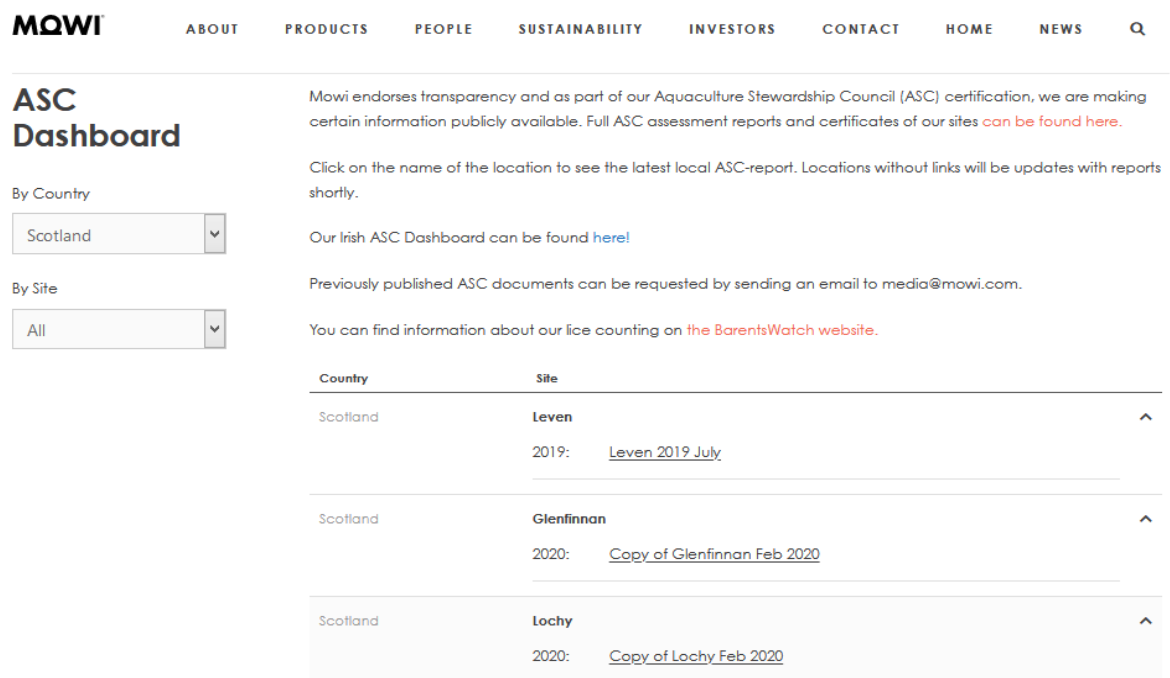
Imidacloprid is a controversial neonicotinoid insecticide launched by Bayer in 1991 as 'Gaucho' (other trade names include Kohinor, Admire, Advantage, Merit, Confidor, Hachikusan, Premise, Prothor, and Winner) and is still the world's No. 1 seed-applied insecticide despite peer-reviewed scientific evidence showing lethal impacts on bee populations. Bayer bought Monsanto in 2018 and manufacture the carcinogenic weedkiller glysophate (Roundup) which is the subject of billion dollar lawsuits.

Imidacloprid is classified as an 'Environmental Hazard' with the warning that it is "very toxic to aquatic life with long lasting effects" and "hazardous to the aquatic environment, long-term hazard". Imidacloprid has also been linked to human health impacts with a scientific paper published in 2017 reporting that it "can lead to potentially life-threatening complications and acute poisoning".

In April 2018, the European Commission (following an assessment by the European Food Safety Authority) banned Imidacloprid for use on outdoor crops due to risks to bees. "Unless the scientific evidence changes, the government will maintain these increased restrictions post-Brexit," stated DEFRA in a press release in April 2018. In December 2017, the Rivers Trust reported that "Aquatic insects are just as vulnerable to neonicotinoid insecticides as bees and flying insects..... 88% of sites in Britain were contaminated with neonicotinoids, eight rivers in England exceeded recommended chronic pollution limits, and two were acutely polluted." **[2]**.

Norwegian Fish Farmer magazine reported back in 2016 that an international patent had been obtained in 2015 for the use of Imidacloprid in salmon farming citing an investors presentation in 2014 calling the chemical D10 Aquatic Blast **[3]**. The Inverness-based Fish Vet Group (owned by Benchmark) appear to have registered Ectosan as a patent in Norway back in 2013 (via intellectual property company Zacco Norway) under "Veterinary preparations; disinfectants; preparations for destroying vermin; pesticides".

Norwegian-owned Mowi (re-named in 2019 due to "negative consumer perception" over the name Marine Harvest) is gearing up to certify all their salmon farms in Scotland by the end of the year - with three sites in Loch Leven, Glenfinnan and Lochy believed to be already currently certified via the ASC.



Mowi Scotland boss Ben Hadfield (right) talks to ASC chief Chris Ninnes at a Mowi farm

Mowi currently has 65 salmon farms in Norway, 26 in Canada, 8 in Chile and 4 in Ireland certified via the ASC - an organisation which claims to promote "responsible aquaculture".

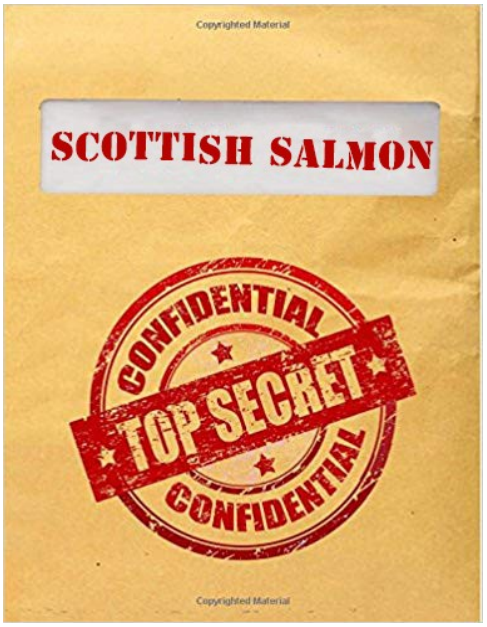
Benchmark's Executive Chairman stated in their 2019 Annual Report published in December 2019 (read more about Benchmark via **[4]**):

"Benchmark should buzz off back to their Norwegian investors and pack all their tankers full of toxic chemicals with them," said Don Staniford, Director of Scottish Salmon Watch. "Given the toxicity of Imidacloprid and the controversy of neonicotinoids, it is not surprising that Benchmark wanted to keep the ingredients of Ectosan - renamed BMK08 - top secret. Shame on SEPA and the Scottish Government for protecting commercial confidentiality rather than protecting the environment."

"Silence speaks volumes," continued Staniford who last month filed an appeal with the Scottish Information Commissioner over SEPA's refusal to disclose information. "The abject failure to inform the public - including fishermen, shellfish farmers and tourist operators - about the use of such a toxic chemical is scandalous. Once the public find out about the dirty secret of Imidacloprid, Benchmark's 'CleanTreat' system will be dead in the water. Has Benchmark informed investors - including the Royal Bank of Scotland - about their toxic investments in Imidacloprid which was banned for use in terrestrial agriculture in 2018?"

Scottish Salmon Watch today (17 March 2020) wrote to Scottish Ministers and SEPA demanding to know whether Imidacloprid has already been used by the salmon farming industry in Scotland and how the toxic chemical wastes were disposed of.

"Over twenty years ago SEPA allowed a secret trial of the lobster-killing chemical Teflubenzuron in the waters around the Isle of Skye and that ended badly with contamination of sediments and withdrawal from the market in 2015," continued Staniford, author of 'Silent Spring of the Sea' **[5]**. "Now it seems that secret trials of Imidacloprid have already taken place in Scottish waters or will soon be unleashed. The Scottish Information Commissioner must surely force SEPA to come clean on BMK08 and how the CleanTreat process works."



Documents disclosed by the Scottish Government via FOI suggest secret trials of BMK08/Ectosan have already taken place in Scotland without public consultation and raise red flags over the discharge and disposal of chemical wastes via 'CleanTreat'.

"We are re-starting trials next week," wrote Benchmark in an email dated April 2019.

A redacted email in February 2019 from Marine Scotland 'Re: Benchmark - CleanTreat' discussed the need for further information on "the permits required in Norway for your trial there"; "more detail on the proposed activity in the marine area (i.e. - what is proposed to be deposited in the sea") and "sensitivity of the testing to LOD etc. to understand what the output might contain".

A redacted email marked 'Sensitive' dated December 2018 referred to a meeting between Benchmark and Fergus Ewing (Cabinet Secretary for Rural Economy) and "a discussion with Benchmark on the acceptability of their CleanTreat proposal where it might involve transport from site for remote discharge of effluent water" and "the work plan element where we're tasked at looking at 'discharge zones'".

A Cabinet Briefing in September 2019 for a meeting in the Scottish Parliament between Fergus Ewing (as Cabinet Secretary for Rural Economy) and Benchmark stressed that Benchmark was invited "to ensure that such sustainable technologies, like CleanTreat, are not

only developed in Scotland, but that Scotland is also an attractive place to trial such technologies".

In terms of 'next steps' the Cabinet Briefing in September 2019 stated that: "Marine Scotland is facilitating a number of meetings with BAHL [Benchmark], regulators and advisers to ensure BAHL is clear on the next steps and regulators and advisers will continue to work with BAHL, to enable them to submit the required evidence and provide the required assurances to determine an application for a trial".

In late September 2019, Benchmark invited the Scottish Government, SEPA and the Veterinary Medicines Directorate to an 'urgent' visit of the CleanTreat wellboat (understood to be docked in Leith). "This is the last opportunity ahead of any trials in the UK, as we have now completed our planned trials in Norway," wrote Benchmark in an email dated 24 September 2019.

SEPA was lobbied by the Scottish Salmon Producers Organisation (SSPO) to conduct field trials of CleanTreat in Scotland after being "trialled successfully in Norway". "You undertook to look again at the potential for trials of novel lice treatment methods and the barriers in the way of Scottish trials for the CleanTreat innovation which the developers believe has no environmental impact at sea," wrote the Chief Executive of the Scottish Salmon Producers Organisation to the Terry A'Hearn, Chief Executive of SEPA in May 2019. "The novel approach has been trialled in Norway successfully and now requires field trials in Scotland....We understand that there have been discussions with the company involved though no progress has been made to take forward trials in Scotland."

FOI documents disclosed by the Scottish Government in December 2019 via FOI-19-01398 reveal that in April 2019, the Cabinet Secretary of Rural Economy (Fergus Ewing) met with "four key Scottish salmon producers" (six companies - all foreign controlled - comprise 99% of Scottish salmon farming production: Mowi, Scottish Sea Farms, The Scottish Salmon Company, Grieg Seafood, Cooke Aquaculture and Loch Duart) interested in the potential of 'CleanTreat'. "[Redacted] were concerned at an over-reliance on SLICE, which would inevitably lead to greater resistance to the chemical over time - there needed to be a basket of around 3 licensed anti-lice medicines in play."

The FOI documents disclosed by the Scottish Government detail heavily redacted minutes of a meeting with Benchmark in October 2018 with a document citing "field trials in Scotland".

CONFIDENTIAL

Use of [redacted] Clean Treat in the UK- Final Meeting Minutes

Meeting: 9th October 2018, 1-3.30pm, BAHL, Bush House, Edinburgh

[Redacted]

[Redacted]

Benchmark Animal Health Limited
& Cleantreat, Effective Sea Lice Treatment with Proven Prevention of Environmental Impact, for Field Trials in Scotland.

An email dated November 2018 referred to a request from Fergus Ewing (Cabinet Secretary for the Rural Economy) for information on CleanTreat stating that "the company wish to push forward with trials in Scotland (trials already happening in Norway) - and that Marine Harvest [redacted] as partner wants to get this off the ground as soon as possible.....progress with regulators was slow and that they wished to speed things up":

From: [Redacted]
Sent: 29 November 2018 10:02
To: [Redacted]
Cc: [Redacted]
Subject: Aquaculture - CleanTreat

Hi [redacted]

1. I understand [redacted] assed on Mr Ewing's request for details about outstanding CAR applications – grateful for an update please.

2. We have also had a request from Mr Ewing for information about the situation regarding the following:

"Mr Ewing would like advice from SEPA + MS LOT on the current progress of Benchmark's application for field trials of CleanTREAT + [redacted] in Scotland. For those who are not aware of the system - CleanTREAT is a system which 'cleans' the sea lice treatment chemical (in this case a new product [Redacted]) from water before the water is discharged. http://www.benchmarkplc.com/articles/cleantreat-by-benchmark/ .

[Redacted] outlined that the company wish to push forward with trials in Scotland (trials already happening in Norway) – and that Marine Harvest [Redacted] as partner wants to get this off the ground as soon as possible. It was claimed that neither SEPA nor MS LOT could confirm to the company who the regulatory lead on their application would be. [Redacted] said that progress with regulators was slow and that they wished to speed things up. Hence Mr Ewing's request for immediate advice."

Happy to discuss – by phone if appropriate

Thanks
[redacted]
[Redacted]

A redacted email dated June 2019 to Marine Scotland attached a 'Confidential' document titled 'CleanTreat [redacted] Trials, Scotland 2019 Overview' (authored it appears by Benchmark's Animal Health Division in Edinburgh on 14 March 2019).

[Redacted]

From: [Redacted]
Sent: 19 June 2019 12:45
To: MS LOT Business and Operational Delivery
Subject: FW: Benchmark - Cleantreat
Attachments: Cleantreat [redacted] Trials, Scotland 2019 Overview. CONFIDENTIAL.pdf

[Redacted]

Animal Health Division
[Redacted]

Benchmark Animal Health
Bush House, Edinburgh Technopol, Edinburgh, EH26 0BB

When asked by Scottish Salmon Watch for a site visit to the CleanTreat operation and specific information on BMK08, Benchmark (who also sell the toxic chemical Azamethiphos) replied that it is "commercially sensitive" and that "the CleanTreat system is demobilised until further trials are planned".

From: **Rachel Aninakwah** <rachel.aninakwah@bmkholdings.com>
Date: Thu, Jan 23, 2020 at 8:21 AM
Subject: Re: Visit to CleanTreat's operations in early 2020?
To: salmonfarmingkills@gmail.com <salmonfarmingkills@gmail.com>

Dear Don,

Many thanks for your interest in Benchmark's CleanTreat purification system.

Our new sea lice treatment, BMK08, is currently in development phase and is therefore commercially sensitive and due to regulations we are constrained about the extent to which we can provide information. The CleanTreat system is demobilised until further trials are planned so we are unable to offer a visit at this time.

We would be happy to share with you the publicly available information on CleanTreat in the meantime. The CleanTreat webpage here explains the CleanTreat process in more detail.

Kind regards,
Rachel

RACHEL ANINAKWAH
COMMUNICATIONS MANAGER

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rachel.aninakwah@bmkholdings.com
benchmarkplc.com
14 Red Lion Square, London WC1R 4QH

The Fish Site reported in March 2018:

John Marshall, head of Benchmark Animal Health, which developed the system at their Ardtoe Marine Laboratory, explained the latest updates at this week's Fish Vet Society conference, near Edinburgh.

CleanTreat is, he explained, "suitable for all currently available bath treatments used against sea lice, other than hydrogen peroxide" and uses a unique purification system to compound and solidify the chemicals used in the treatments. These solids, he added, can then be incinerated at one of the world's three specialist processing plants for these operations.

If has, so far, been trialled with a number of sea lice treatments compounds including pyrethroids, deltamethrin, azamethiphos, and Benchmark's new trial bath treatment.

However, he also believes that – as the treatment water is processed through CleanTreat's unique triple purification system before being released back into the sea clean and free of medicinal residues – the system could open up a very wide range of treatment options.

"There are at least two new products it could bring to market and I think it could open the door to other products not yet considered – perhaps from other areas, depending on regulations," he said.

In November 2019, SEPA refused a FOI request on CleanTreat but conceded:

We confirm that SEPA has attended meetings with Benchmark on 9 October 2018, 11 April 2019, 30 May 2019, 20 September 2019 and 30 September 2019

Last month, Scottish Salmon Watch filed an appeal with the Scottish Information Commissioner following SEPA's refusal to disclose information on CleanTreat (including BMK08/Ectosan).

Appeal by Scottish Salmon Watch re. SEPA's F0191198

Scottish Salmon Watch's appeal dated 21 February 2020 included:

> Scottish Salmon Watch argues that SEPA's review refusal dated 13 December 2019 wrongly concluded that commercial confidentiality took precedence over public disclosure:
>
> > B. - *Commercial interests – Regulation 10(5)(e) of the EIRs – Question 6*
> >
> > Regulation 10(5)(e) states that a Scottish public authority may refuse to make environmental information available to the extent that its disclosure would, or would be likely to, prejudice substantially the confidentiality of commercial or industrial information where such confidentiality is provided for by law to protect a legitimate economic interest.
>
> Scottish Salmon Watch believes that there is a clear public interest in disclosure as well as a growing public interest in this issue. For example, The Sunday Times reported on 29 December 2019: "Official fears revealed over toxic threat of salmon trade".
>
> Scottish Salmon Watch considers such a refusal by SEPA is unreasonable and does not see an overriding public interest in protecting commercial or industrial information. The public interest is surely served best by disclosing specific details on CleanTreat (including the active ingredients in BMK08 & Ectosan - the subject of another FOI to SEPA and the Scottish Government which have been refused). Secret trials took place two decades ago in Scotland in relation to Calicide (Teflubenzuron) and that did not end well.
>
> The public case for disclosure is much stronger than the case for protecting commercial confidentiality. It is obvious that Benchmark (as the manufacturer of the CleanTreat system) is a company which wants to maximise investment, profit and economic returns by delaying disclosure.
>
> However, SEPA's duty is not to the shareholders of Benchmark but to the Scottish environment and the Scottish public whose livelihoods may be impacted by the Norwegian and other foreign investors controlling Benchmark.

Scottish Salmon Watch asked for an internal review of another FOI refusal by SEPA in a letter dated 21 February 2020:

21 February 2020

Review re. F0191311 re. BMK08 & Ectosan

Please consider this a formal request for a review of SEPA's refusal dated 7 January 2020 (via F0191311) to Scottish Salmon Watch's FOI request dated 5 December 2019 (received by SEPA on 10 December 2019). For easy reference please find enclosed below the Appendix the FOI request and refusal.

Scottish Salmon Watch strongly objects to SEPA's refusal which cited commercial confidentiality; namely:

Response
SEPA holds a small amount of correspondence which falls into the scope of the request.

This information is excepted under Regulation 10(5)(e) of the EIRs. The text of which is reproduced below;

(5) *A Scottish public authority may refuse to make environmental information available to the extent that its disclosure would, or would be likely to, prejudice substantially:-*

(e) *the confidentiality of commercial or industrial information where such confidentiality is provided for by law to protect a legitimate economic interest;*

Feedback had been sought from the third party who confirmed that disclosure of information would cause substantial prejudice to their commercial interests. We recognise that Regulation 10(2)(b) requires SEPA to apply a presumption favour of disclosure. In the specific circumstances of this request, SEPA considers that the release of the correspondence and documentation would cause a substantial prejudice to the commercial undertaking and economic interest. SEPA therefore contends that the public interest in the release of the information is outweighed by the public interest in maintaining the exception under the terms of Regulation 10(5)(e) of the EIRs

Scottish Salmon Watch's review letter to SEPA concluded:

The public interest is surely better served by disclosure rather than the dubious excuse of protecting commercial interests.

Surely SEPA should be placing environmental protection ahead of the protection of economic interests?

It seems that SEPA, by aiding and abetting privacy, are effectively promoting rogue/insider trading. Benchmark, by failing to publicly disclose basic information on BMK08 & Ectosan, are guilty of potentially misleading investors and the public alike.

Surely the public has a right to know what BMK08 actually is; how it is going to be used and how it is going to be discharged in Scotland? Only then, with full disclosure, can investors and the public make a wholly informed decision as to the acceptability of BMK08 & Ectosan. SEPA has no jurisdiction blocking public scrutiny.

SEPA should also be aware that later today Scottish Salmon Watch will be filing an appeal in relation to F0191198 on CleanTreat with the Scottish Information Commissioner. Scottish Salmon Watch looks forward to taking a similar case in relation to F0191311.

SEPA have repeatedly refused to disclose information on CleanTreat, Ectosan & BMK08 **[6]**.

Scottish Salmon Watch also asked for an internal review of the Scottish Government's FOI refusal in a letter dated 21 February 2020:

Scottish Government
Via email: directormarinescotland@gov.scot

21 February 2020

Review re. FOI-19-02626 - BMK08 & Ectosan

Please consider this a formal request for a review of the Scottish Government's refusal dated 19 December 2019 to Scottish Salmon Watch's FOI request dated 5 December 2019 (enclosed via the Appendix).

Scottish Salmon Watch strongly objects to the Scottish Government's refusal which cited commercial confidentiality; namely claiming they had no information on BMK08 and could not disclose information on Ectosan "because disclosure of this particular information would, or likely to, prejudice substantially the confidentiality of commercial information provided by Benchmark Holdings plc and thus case substantial harm to their commercial interests":

ANNEX

REASONS FOR NOT PROVIDING INFORMATION

Exceptions apply

1. Under the terms of the exception at regulation 10(4)(a) of the EIRs (information not held), the Scottish Government is not required to provide information which it does not have. The Scottish Government does not have the information you requested with regard to BMK08.

This exception is subject to the 'public interest test'. Therefore, taking account of all the circumstances of this case, we have considered if the public interest in disclosing the information outweighs the public interest in applying the exception. We have found that, on balance, the public interest lies in favour of upholding the exception. While we recognise that there may be some public interest in information about BMK08, clearly we cannot provide information which we do not hold.

2. Under the terms of the exception at regulation 10(5) (e) of the EIRs (the confidentiality of commercial or industrial information where such confidentiality is provided for by law to protect a legitimate economic interest).

An exception under regulation 10(5) (e) (confidentiality of commercial or industrial information) of the EIRs applies to the information you have requested with regard to Ectosan. This exception applies because disclosure of this particular information would, or would likely to, prejudice substantially the confidentiality of commercial information provided by Benchmark Holdings plc and thus cause substantial harm to their commercial interests.

This exception is subject to the 'public interest test'. Therefore, taking account of all the circumstances of this case, we have considered if the public interest in disclosing the information outweighs the public interest in applying the exception. We have found that, on balance, the public interest lies in favour of upholding the exception. We recognise that there is a public interest in disclosing information as part of open and transparent and accountable government, and to inform public debate. However, there is a greater public interest in protecting the commercial interests of companies when substantial harm can be made to their commercial interests.

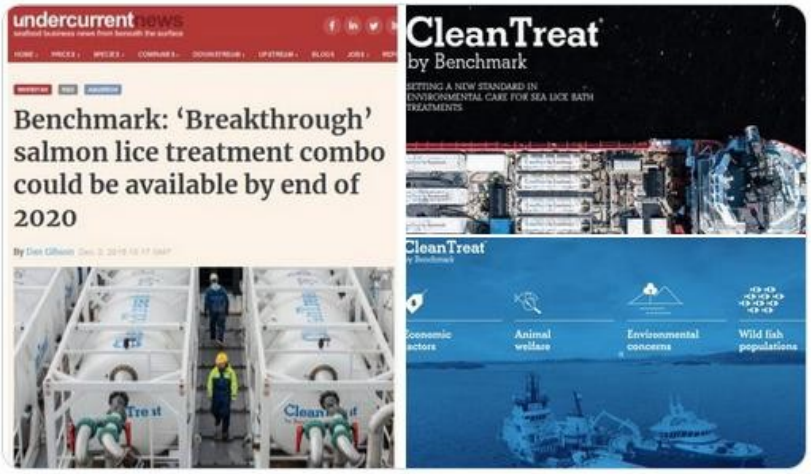
In comparison to SEPA, the Scottish Government has at least disclosed some information on CleanTreat and Ectosan **[7]**. In December 2019, the Veterinary Medicines Directorate refused a FOI request on BMK08/Ectosan and CleanTreat citing 'commercial confidentiality' **[8].** When Ectosan was first publicised in 2017 it was thought to be Azamethiphos-based **[9]**. Benchmark may have changed the name of Ectosan (registered as a patent in Norway in 2013 and filed as a US tradmark in 2019) to BMK08 in 2019 to distance itself from the ASC's

posting naming Ectosan as Imidacloprid or maybe because there was already an insectide called Ectosan on the market (in Ukraine for use in cows) **[10]**.

Whatever the name of the Imidacloprid insecticide for use in salmon farming (the name BMK08 first surfaced in Benchmark's Trading Update on 29 November 2019), Fish Farming Expert reported (28 February 2020) that it was "in the hands of regulators":

Don Staniford
@TheGAAIA

Please come clean on BMK08! Why is @ScottishEPA & @GreenerScotland refusing to disclose details on Clean Treat? @WeAreBenchmark tinyurl.com/wlmyx8q Whilst investors pump in £££££s the public are kept in the dark @FOIScotland @undercur @thefishsite @IntraFishNorge @SSPOsays



11:44 AM · Feb 27, 2020 · Twitter Web App

Don Staniford
@TheGAAIA

Benchmark makes £2m loss tinyurl.com/txszcg7 @salmonfarming1 "Increased expenditure related to launch preparations for its new lice treatment, BMK08" @WeAreBenchmark Regulatory dossier submitted @ScottishEPA @marinescotland Still no public disclosure!! tinyurl.com/wlmyx8q

11:16 AM · Feb 28, 2020 · Twitter Web App

Don Staniford
@TheGAAIA

Benchmark plans share issue to fund CleanTreat scale-up fishfarmingexpert.com/article/benchm... @ewangkennedy @SalmonFeedlots @ScottishEPA @WeAreBenchmark What is BMK08?

Benchmark plans share issue to fund CleanTreat scale-up - FishFarmingExpert.com

Aquaculture health, nutrition and genetics business Benchmark Holdings has revealed plans to raise a net sum of £41.5 million through share issues.

fishfarmingexpert.com

4:22 PM · Jan 30, 2020 · Twitter Web App

Ewan Kennedy
@ewangkennedy

Now a magic solution to cleaning the discharge from wellboats that currently gets dumped untreated into the sea, via CleanTreat from Benchmark. Is this the next thing the taxpayer will be backing, @FergusEwingMSP? We see you're an "avid supporter". @TheGAAIA @ScotSalmonTank

Top Lines

- **Congratulations on winning this year's innovation award at AquaNOR.** I am proud that the award has been won by a Scottish company for two consecutive years.
- You will be aware of the recent Scottish Parliamentary Inquiries in Scotland, parts of which focussed on the environmental impacts of salmon farming. That is why I have invited you here today – to ensure that such sustainable technologies, like CleanTreat, are not only developed in Scotland, but that Scotland is also an attractive place to trial such technologies.
- **Grateful to hear about your experiences in Scotland** in progressing to trials of the CleanTreat system and how we can support you
- I understand you have recently met with SEPA, MS-LOT and the VMD, to progress the assessment of a future application for a trial, **please continue to actively engage with that process.**
- There is absolutely no doubt that aquaculture is important for the Scottish economy, contributing £620 million per year in GVA and supporting over 12,000 jobs.
- I am an avid supporter of the industry in Scotland and regularly attend the Aquaculture Industry Leadership Group which is looking to sustainability grow and double the value of aquaculture production in Scotland.
- **Sea lice management, and the tools to do so, are essential to support a thriving Scottish fish farming industry**, that is why Scottish Government published Scotland's 10 Year Farmed Fish Health Framework this year, a Programme for Government commitment in 17/18.
- The industry reported that sea lice levels in 2018 were at their lowest level for 6 years, however we are not complacent and **we have recently strengthened the sea lice regulatory framework, and are committed lowering the sea lice intervention thresholds further in 2021.**
- In order to do so, we must continue to innovate and explore new management methods, particularly those with reduced environmental impacts such as CleanTreat.
- **I commend your commitment that this technology will be open for all** – which will have huge benefits for fish health across the salmon farming nations.

11:44 AM · Dec 29, 2019 · Twitter Web App

In December 2019, Scottish Salmon Watch reported:

Scottish Salmon Watch, 29 December 2019

Cleaning Tox-Sick Scottish Salmon

SCOTTISH SALMON WATCH CHEMICALS

- Benchmark's "game changing technology" set for launch in Scotland during 2020?
- Redacted FOI reveals Benchmark wish to push forward with trials in Scotland & Mowi "wants to get this off the ground as soon as possible" (Benchmark 're-started' trials in Scotland in May 2019 & submitted more documents in December 2019)
- Cabinet Secretary for Rural Economy lobbied to "speed things up" & offered "further support to reach a position wherby trials could be started in Scotland"
- FOI reveals toxic chemicals discharged by wellboats at salmon farms around Scotland including illegal discharge by The Scottish Salmon Company in Loch Roag
- 'CleanTreat' used alongside the top secret BMK08 (perhaps also called Ectosan), Azamethiphos & Deltamethrin but not toxic Hydrogen Peroxide
- SEPA refuse FOI but concedes it met with Benchmark five times since October 2018
- VMD refuse FOI on BMK08 citing commercial confidentiality
- CleanTreat may involve "remote discharge of effluent water" in so-called 'discharge zones' (Benchmark claims that chemical wastes are collected & then incinerated)
- SEPA yet to publish Scottish Pollutant Release Inventory data on wellboat use in 2018
- Ten-fold increase in toxic chemicals used on salmon farms from 2006 to 2016

An 'environmentally and welfare friendly' method of lice treatment developed in Scotland is "expected" by the end of 2020 according to a recent trading update from Norwegian-controlled Benchmark. The 'CleanTreat' purification system would be used with the "next generation sea lice treatment" BMK08 which the manufacturer claims has "no environmental impact" [1].

Benchmark's CleanTreat system won the aquaculture innovation award at Aquaflor 2019, and is set for commercial release next year. Credit: Benchmark Holdings

The press release dated 29 December 2019 included:

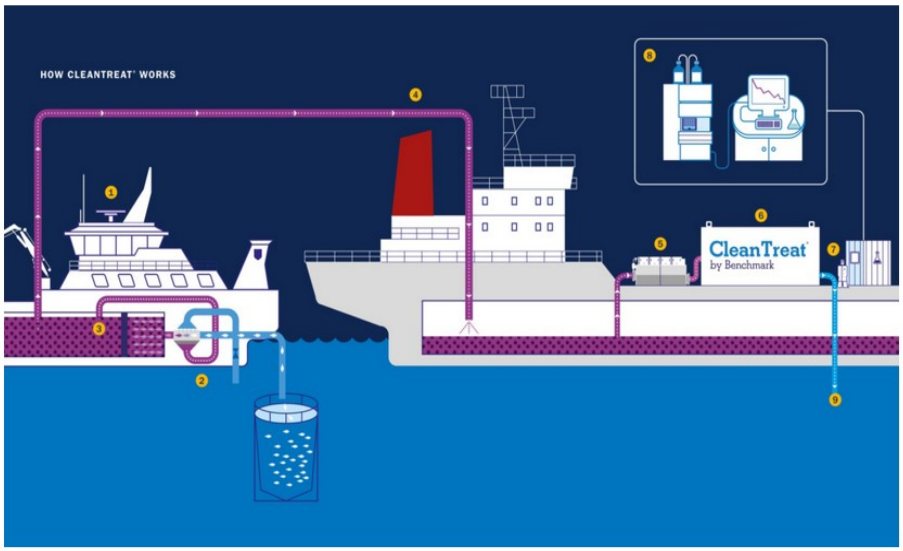
"Scottish salmon does not leap up waterfalls onto your plate but is bathed in a lethal cocktail of toxic chemicals which are currently discharged untreated into Scotland's pristine waters," said Don Staniford, Director of Scottish Salmon Watch. "Scotland should follow Norway's lead and ban toxic chemicals used on salmon farms near shellfish spawning grounds. Benchmark's 'CleanTreat' purification system could very well be a 'game-changer' but BMK08 is still shrouded in secrecy. CleanTreat could be a Trojan horse designed to open the floodgates to ever more toxic chemicals."

"The public surely have a right to know about any secret trials taking place in Scottish waters," continued Staniford (author of 'Silent Spring of the Sea'). "The Scottish Government and SEPA must come clean on the chemically embalmed nature of Scottish salmon by disclosing data on all the chemicals used on salmon farms and in wellboats. If 'CleanTreat' is all that it is cracked up to be then shellfish across Scotland can safely take off their gas masks and crack open the Champagne. Consumers meanwhile should never treat themselves to toxic Scottish salmon!"

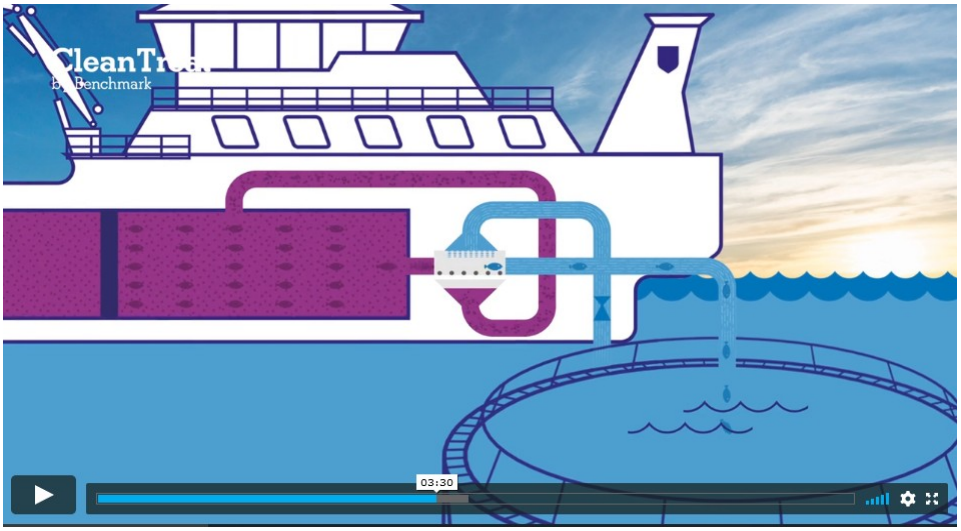
Is CleanTreat as squeaky clean as it is portrayed or are there dirty secrets?

Scottish Salmon Watch has been monitoring the new development in sea lice control since December 2017 when 'Ectosan' was first publicised and described by the Scottish Government as "a significant game-changer". In September 2018, CleanTreat's purification system was described as a "game changing technology" by Benchmark in an email to Fergus Ewing, the Cabinet Secretary for Rural Economy (who has lobbied to speed up the approval process).

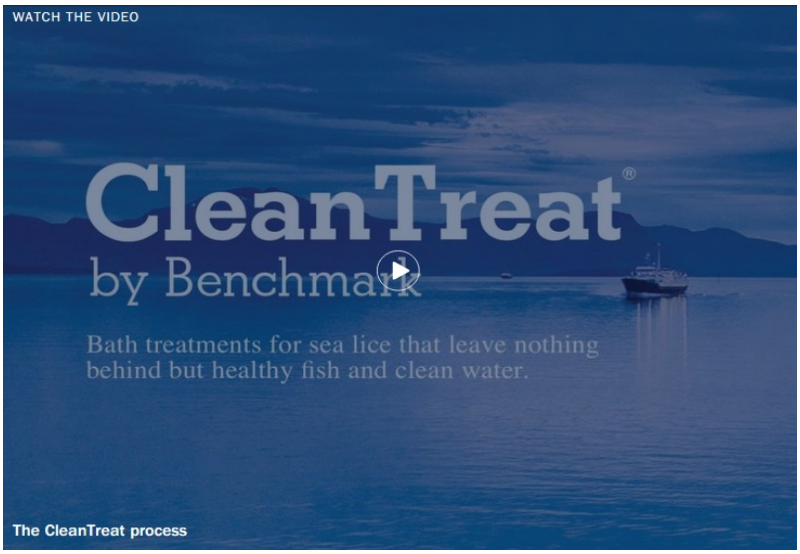
Click here to find out more about CleanTreat



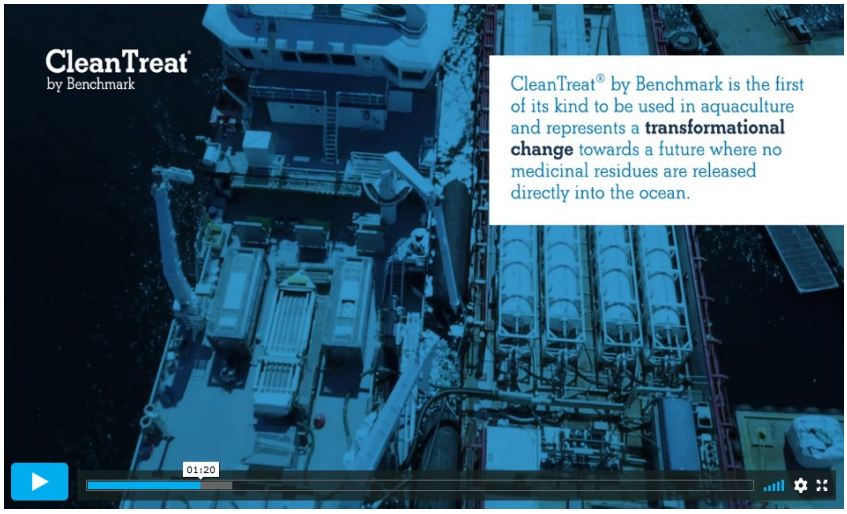
BMK08 has "excellent animal welfare and environmental credentials" claimed Benchmark in November 2019. Benchmark's largest shareholder is Norwegian-owned Ferd Capital - controlled by Norwegian investor and Norway's fifth richest person Johan Henrik Andresen. Benchmark's second largest shareholder is Norwegian-owned Kverva who owns salmon farming giant SalMar (which itself co-owns Norskott Havbruk, owner of Scotland's second largest salmon farmer Scottish Sea Farms). In December 2019, Benchmark announced losses of £83.1 million but in 2017 estimated "£40-50m peak sales potential for next generation sea lice treatment".



"There are at least two new products it could bring to market and I think it could open the door to other products not yet considered – perhaps from other areas, depending on regulations," admitted John Marshall, head of Benchmark Animal Health, in March 2018.



Benchmark claimed in 2018 that CleanTreat is "suitable for all currently available bath treatments used against sea lice, other than hydrogen peroxide" and "has been trialled with a number of sea lice treatments compounds including pyrethroids, deltamethrin, azamethiphos, and Benchmark's new trial bath treatment". It "uses a unique purification system to compound and solidify the chemicals used in the treatments" and "these solids can then be incinerated at one of the world's three specialist processing plants for these operations," said John Marshall, head of Benchmark Animal Health. "There are at least two new products it could bring to market and I think it could open the door to other products not yet considered – perhaps from other areas, depending on regulations," he said.



"After a tough 2019 financial year, Benchmark has listed the commercial launch of CleanTreat and their novel sea lice treatment BMK08 as top priorities for 2020," reported The Fish Site (23 December 2019).

Further information was collated via CleanTreat: FOI Disclosures by the Scottish Government to Scottish Salmon Watch

"CleanTreat was developed by Benchmark Animal Health at its Ardtoe Marine Laboratory in Scotland," reported Fish Farming Expert in October 2018. "So far CleanTreat has been trialled with a number of sea lice treatments compounds including pyrethroids, deltamethrin, azamethiphos, as well as Ectosan. According to Benchmark, the system is working well in field trials."

In July 2019, Scottish Salmon Watch visited Benchmark's FAI Aquaculture laboratory at Ardtoe (a polite request for an official site visit was not replied to):

Today (17 March 2020), Scottish Salmon Watch filed FOI requests with SEPA, the Scottish Government, the Veterinary Medicines Directorate and the Norwegian Government in relation to Imidacloprid use in salmon farming. Scottish Salmon Watch also wrote to SEPA's Chief Executive Terry A'Hearn asking him to reconsider SEPA's policy of secrecy on Imidacloprid.

The Sunday Times reported (29 December 2019):

THE SUNDAY TIMES | Today's sections | Past six days | My articles | Times+

Official fears revealed over toxic threat of salmon trade

Briefing note on water purification tech highlights potential danger to marine life from pesticides

Mark Macaskill

December 29 2019, 12:01am,
The Sunday Times

Internal emails show that in 2018, Scottish government officials described CleanTreat, which removes medicines from treatment water before returning the "cleaned" water to the sea, as a "game-changer". The industry's umbrella body, the Scottish Salmon Producers' Association, has been lobbying ministers to allow the technology, which has been tested successfully in Norway, to be tested in Scottish waters.

The documents suggest that executives at CleanTreat have been coached by civil servants in recent months to ensure their proposal for trials in Scotland wins approval from bodies such as Marine Scotland and the Scottish Environment Protection Agency.

A Scottish government spokeswoman said: "This is a potentially ground-breaking treatment which has been developed in Scotland and which should be trialled in Scotland with relevant and appropriate safeguards and monitoring in place."

In 2017, 2018 and 2019, Rob Edwards revealed in a series of articles published in The Sunday Herald and The Ferret how salmon farmers, the chemical giant Merck and the Scottish Government had fought off a ban on the lobster-killing chemical Emamectin benzoate in a scandal dubbed 'Slicegate'.

How the Scottish Government 'nuanced' away fish farm pesticide ban

The Scottish Government put pressure on its environmental watchdog to drop a plan to ban a toxic pesticide so as not to upset the fish farming industry.

The Ferret

In May 2019, BBC Panorama reported that Mowi (formerly Marine Harvest) was "one of a number of firms under investigation for possible misreporting of chemical use".

In 2013, The Guardian and The Sunday Herald revealed how toxic chemicals used by salmon farms were contaminating the sea-bed. In 2017, The Sunday Herald followed up with a front-page news story on how 45 lochs across Scotland had been contaminated with toxic chemicals used by salmon farms.

In 2009, Rob Edwards revealed that Marine Harvest (re-named Mowi in 2019 due to negative consumer perception in the name Marine Harvest) apologised for offering to reward officials at Scotland's environment watchdog with smoked salmon for giving the go-ahead for a new toxic pesticide (Deltamethrin) in record time.

In 1996, a secret trial of the toxic chemical Teflubenzuron was carried out on the Isle of Skye leading to the deaths of lobsters. In 2015, Teflubenzuron was finally "withdrawn from the market after scientists found that that it can leak into lochs and kill crabs, shrimps and lobsters".

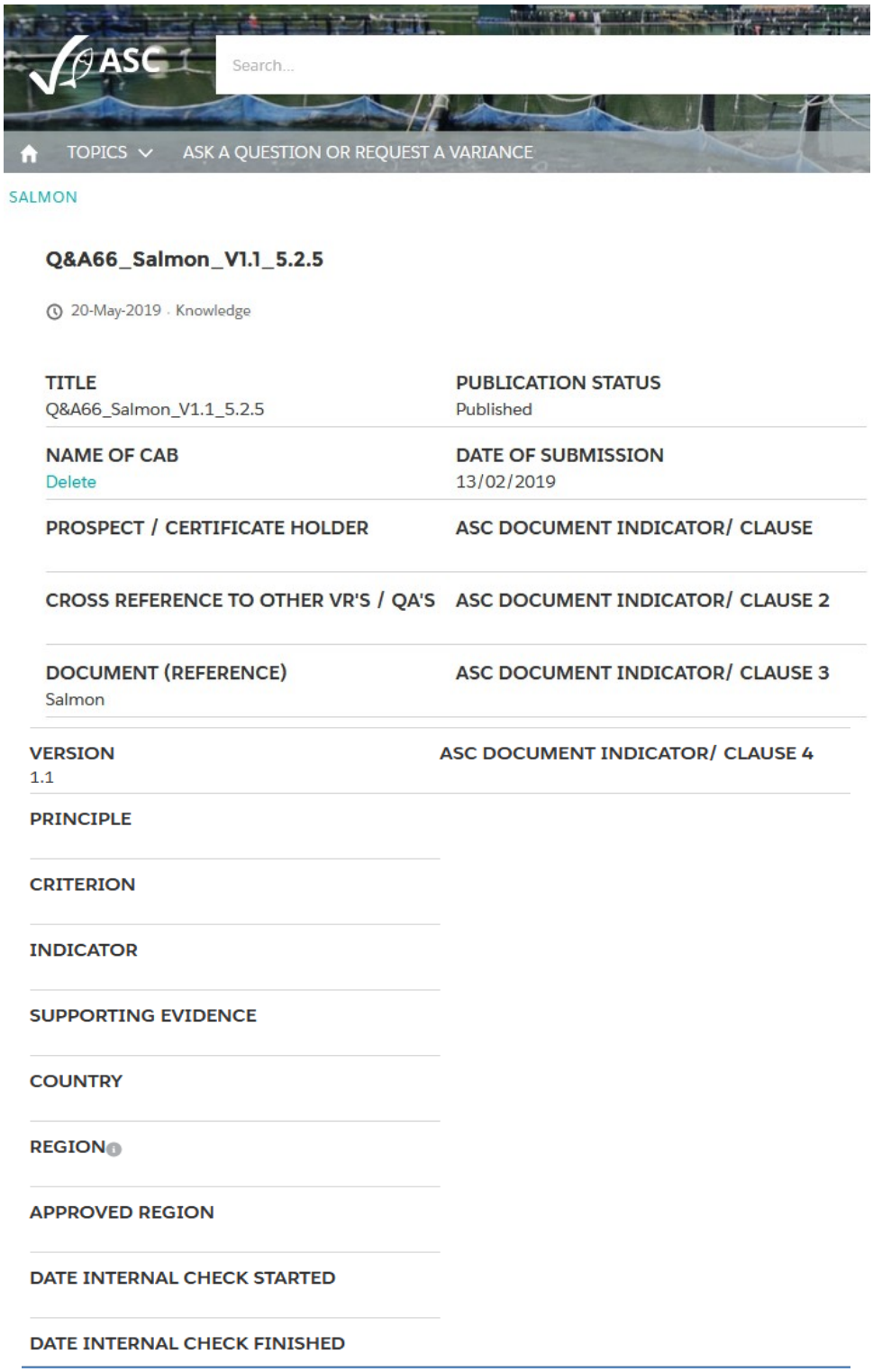
Read more via:
Please Come Clean on BMK08!
Media Backgrounder: Chemically Embalmed Scottish Salmon
Sunday Times: "Official fears revealed over toxic threat of salmon trade"
Cleaning Tox-Sick Scottish Salmon
CleanTreat FOI Disclosures by the Scottish Government to Scottish Salmon Watch
The Sunday Times: "Chemical fears at Scots fish farms"
EXPOSED: Scottish Salmon's Cascading Use of Cancer-Causing Chemical
Salmon farming giant Mowi probed over chemical use
Fish farming industry bids to relax limits on toxic pesticide
Wildlife widely damaged by fish farm pesticides, says Sepa
All is Not Well With Sick Scottish Salmon
Effects of pharmaceuticals used to treat salmon lice on non-target species: Evidence from a systematic review
Slicegate: Anatomy & Chronology of an Environmental Lobotomy - How the Scottish Environmental Protection Agency was Sliced to death by the Scottish Government and salmon farming lobby
How the Scottish Government 'nuanced' away fish farm pesticide ban
Pesticide report suppressed after freedom of information warning
Scottish Government under fire for helping block pesticide ban
Revealed: secret role of US drug company in fish farm pesticide row
Ban on polluting pesticide dropped after complaint from fish farmers
Scottish Government Overdoses on Toxic Scottish Salmon - SEPA's proposed chemical ban (along with Scotland's lobsters) is Sliced to death
Mapped: the 45 lochs polluted by fish farm pesticides
The Sunday Times: "Salmon industry toxins soar by 1000 per cent"
Scottish Salmon's Lethal Legacy - Ten-fold Increase in Toxic Chemical Use in Ten Years
Scientific Backgrounder: Ecotoxicity & Chemical Resistance
Media Backgrounder: Scotland's 'Silent Spring' of the Sea

Contact:

Don Staniford: 07771 541826 (salmonfarmingkills@gmail.com)

Notes to Editors:

[1] The Aquaculture Stewardship Council's web-site provides information on Ectosan:



BACKGROUND

Interpretation request (PTI for new sea lice medicine that is not released into the environment).
Mowi Norway AS and Benchmark Rationale for PTI calculation – Ectosan (Imidacloprid):
The ASC standard includes a number of indicators aimed at promoting the responsible use of therapeutic treatments. The environmental risks linked with using chemical therapeutants are linked with the release of such chemicals into a wild environment where non-target organisms may be affected. Therefore, the development of new medicinal treatments that avoid the release of active therapeutants into the environment is in alignment with the ASC aim of environmental stewardship.
Ectosan is a new therapeutic treatment against sea lice which fulfills this intention. Ectosan is administered as a bath treatment in wellboats or other closed contained treatment vessels only. This allows for accurate dosing of the medicine, control of water quality parameters, monitoring of fish welfare and the capture and retention of all treatment water. The fish are pumped into the wellboats with the medicine administered after all fish are onboard. Once the exposure period is completed, the fish are pumped out of the wellboat over a dewatering system fitted with a rinse bar to both separate fish from treatment water and ensure no residues of treatment water remain on the exterior of the fish. All water, including all rinse water, is collected and returned to the wells. Once all fish have been discharged over this system the treatment water is then transferred through CleanTreat, Benchmark's novel water purification system, whereby the medicine is removed from the water prior to the water being discharged back to the environment. The purified water is measured continuously using onboard equipment to ensure levels remain below quantifiable limits.
The Parasiticide Treatment Index (requirement 3.1.7) has been developed during the Aquaculture Salmon Dialogues (ASD) with the aim of "The ultimate goal would be that farms could meet the ASC Salmon Standard without using therapeutants or without the risk of those therapeutants negatively impacting the environment." (page 47 of the ASC salmon standard v1.1). As mentioned earlier the use of Ectosan does not lead to any release of chemical therapeutants into the environment. In addition, the toxicity factor of the active ingredient used in Ectosan (Imidacloprid) has already been established as 85 mg/l (LC 50 for Daphnia, Fossen, 2016) which is higher compared with H2O2 (7.7 mg/l, which is given a toxicity factor of 0 in the ASC-PTI calculation). Therefore, the therapeutant factor for Ectosan will be zero and as a result so will the PTI.

DNV GL response to ASC:
DNV GL can not find PTI calculation values for the therapeutant Ectosan (Imidacloprid) in the ASC Salmon Standard v1.1 – April 2017, Appendix VII: Parasiticide Treatment Index and therefore needs clarification and determination from ASC related to which values shall be used when PTI is calculated.
The text below is from page 95 in the ASC Salmon Standard v1.1 – April 2017, Appendix VII: Parasiticide Treatment. DNV GL interpretation of this text is that it is ASC and the Technical Advisory Groups responsibility to determine which values shall be used when PTI is calculated for use of therapeutant Ectosan (Imidacloprid). DNV GL can not approve the given values from the user or producer of the therapeutant Ectosan (Imidacloprid) without a clarification and determination with acceptance of the given values from ASC.

(page 95 in the ASC Salmon Standard v1.1 – April 2017)

QUESTION

(page 95 in the ASC Salmon Standard v1.1 – April 2017)
Updating PTI with new information:
If new therapeutants become available for sea lice treatment, or if new treatment method are developed, the Technical Advisory Group of the ASC may be asked to determine a therapeutic factor or treatment factor for that new parasiticide or new method, following guidelines for assignment of factors left by the SAD SC.

ASC INTERPRETATION

The PTI-index is calculated using the following formula:
PTIi= [(therapeutant factor) * (treatment factor) * (resistance factor) * (sensitive time factor)]
Within this formula, the therapeutant factor and treatment factor vary per used active ingredient. The resistance factor and sensitive time factor are based on other variables (i.e. number of treatments applied and lobster presence).
For the therapeutant factor, a classification of the parasiticides used at the time of the Aquaculture Dialogues is given in the table on page 93 (v1.1). This table does not include Imidacloprid (Ectosan). For this susbstance to qualify, the parameters that contribute to the toxicity factor need to be determined. These are:
1. Treatment mechanism (bath or oral)
2. Toxicity factor (0-2)
3. Daphnia LC50 (µg/L)
4. Persistence factor (0-3)
5. Dosage factor (0-3)

The final therapeutant factor is calculated as following:
Therapeutant factor = [(Toxicity factor) * (Persistence factor) * (Dosage factor)]
1. Treatment mechanism
Ectosan is applied through a bath treatment. It is noted that the treatment is applied within a well boat and treatment water is purified before released back into the environment.
2. Toxicity factor (0-2) and 3. Daphnia LC50 (µg/L)
The table on page 93 (v1.1) does not reference the sources from which the Daphnia LC50-scores are derived. In order to find consistency in toxicity scoring, the Pesticide Properties Database (PPDB – https://sitem.herts.ac.uk/aeru/ppdb/index.htm) was consulted to verify the referenced values in the ASC Standard. The majority of listed LC50-scores where confirmed by this database and as such this database is used as a proxy to derive ecotoxicity values from.
The toxicity factor of the active ingredient used in Ectosan (imidacloprid) has been established as 85 mg/L (Fossen, 2016). This score was confirmed by the PPDB-database (https://sitem.herts.ac.uk/aeru/iupac/Reports/397.htm).

As this score is 11 times less toxic as the stated value for H2O2 (7.7 mg/L), a similar rating as H2O2 for toxicity should be given as well (i.e. toxicity factor “0”).
4. Persistence factor (0-3)
According to the PPDB-database, imidacloprid has a water-sediment and water phase only DT50-score (“half-life time”) of 129 and 30 days, respectively. Compared to the other parasiticides listed in the table on page 93, these values are considered high (i.e. slow breakdown). For this reason a persistence factor of 3 is given.
5. Dosage factor (0-3)
As there is no information available on the dosage applied – a (maximum) score of 3 is given from a precautionairy approach.
Summary:
For the application of Ectosan (imidacloprid) via the described process, the following values for the toxicity factor in the overall PTI-calculation need to be used:
Therapeutant factor = [(Toxicity factor) * (Persistence factor) * (Dosage factor)]
- Toxicity factor = 0
- Persistence factor = 3
- Dosage factor = 3

Therapeutant factor = [(0)* (3) * (3)] = 0
Please note that the use needs to be registered through Appendix VI of the ASC Salmon Standard v1.1.

VR/Q STATUS

Closed

EFFECTIVE DATE

15/03/2019

URL NAME

Q-A66-Salmon-V1-1-5-2-5

[2] Imidacloprid is a controversial neonicotinoid insecticide.

Imidacloprid

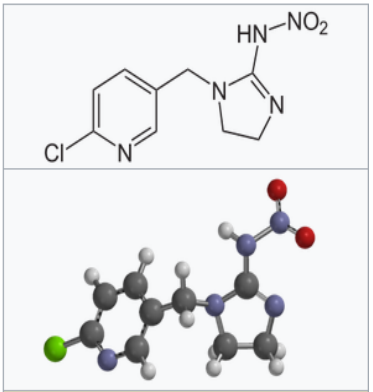
From Wikipedia, the free encyclopedia

Imidacloprid is a systemic insecticide that acts as an insect neurotoxin and belongs to a class of chemicals called the neonicotinoids which act on the central nervous system of insects. The chemical works by interfering with the transmission of stimuli in the insect nervous system. Specifically, it causes a blockage of the nicotinergic neuronal pathway. By blocking nicotinic acetylcholine receptors, imidacloprid prevents acetylcholine from transmitting impulses between nerves, resulting in the insect's paralysis and eventual death. It is effective on contact and via stomach action.[1] Because imidacloprid binds much more strongly to insect neuron receptors than to mammal neuron receptors, this insecticide is more toxic to insects than to mammals.[2]

As of 1999, imidacloprid was the most widely used insecticide in the world.[3] Although it is now off patent, the primary manufacturer of this chemical is Bayer CropScience (part of Bayer AG). It is sold under many names for many uses; it can be applied by soil injection, tree injection, application to the skin of the plant, broadcast foliar, ground application as a granular or liquid formulation, or as a pesticide-coated seed treatment.[4][5] Imidacloprid is widely used for pest control in agriculture. Other uses include application to foundations to prevent termite damage, pest control for gardens and turf, treatment of domestic pets to control fleas,[2] protection of trees from boring insects,[6] and in preservative treatment of some types of lumber products.[7]

Contents [hide]

Imidacloprid[1]



Names

IUPAC name

N-{1-[(6-Chloro-3-pyridyl)methyl]-4,5-dihydroimidazol-2-yl}nitramide

PubChem Imidacloprid (Compound)

12 Safety and Hazards

12.1 Hazards Identification

12.1.1 GHS Classification

Showing 1 of 4 View More

Pictogram(s)	 Irritant Environmental Hazard
Signal	Warning
GHS Hazard Statements	H302: Harmful if swallowed [Warning Acute toxicity, oral] H400: Very toxic to aquatic life [Warning Hazardous to the aquatic environment, acute hazard] H410: Very toxic to aquatic life with long lasting effects [Warning Hazardous to the aquatic environment, long-term hazard]

Imidacloprid has been linked to human health impacts with a [scientific paper published in 2017 reporting] that it "can lead to potentially life-threatening complications and acute poisoning".

Indian J Crit Care Med. 2017 Nov; 21(11): 786–788.
doi: 10.4103/ijccm.IJCCM_152_17
PMCID: PMC5699009
PMID: 29279642

Imidacloprid Poisoning: An Emerging Cause of Potentially Fatal Poisoning

Sanjay A. Mundhe, Siddheshwar V. Birajdar, Sheshrao S. Chavan, and Nikhil R. Pawar

Author information Copyright and License information Disclaimer

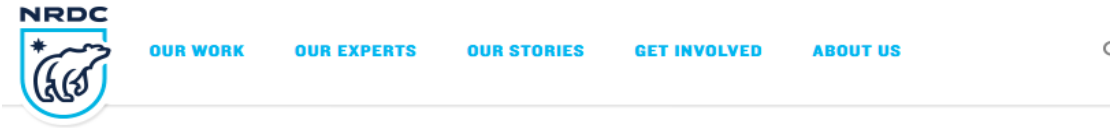
Abstract

Go to:

There are a variety of pesticides that are used to control the pests in agricultural lands and other places. Newer pesticides, developed as an alternative to highly toxic organophosphates such as imidacloprid including other neonicotinoid compounds, are being increasingly used considering their less harmful effects in case of human exposures. Though it is considered relatively safer to human beings, it can lead to potentially life-threatening complications and acute poisoning with these compounds may be fatal in large ingestion. We report a case of poisoning with imidacloprid compound presenting with a variety of systemic features including respiratory failure and patient's improvement with conservative management.

Keywords: Imidacloprid, neonicotinoid, respiratory arrest, suicide, ventilatory support

NRDC [reported in November 2017]:



EXPERT BLOG › JENNIFER SASS

NRDC to EPA: Red Flags on Imidacloprid Health Risks

November 29, 2017 | Jennifer Sass

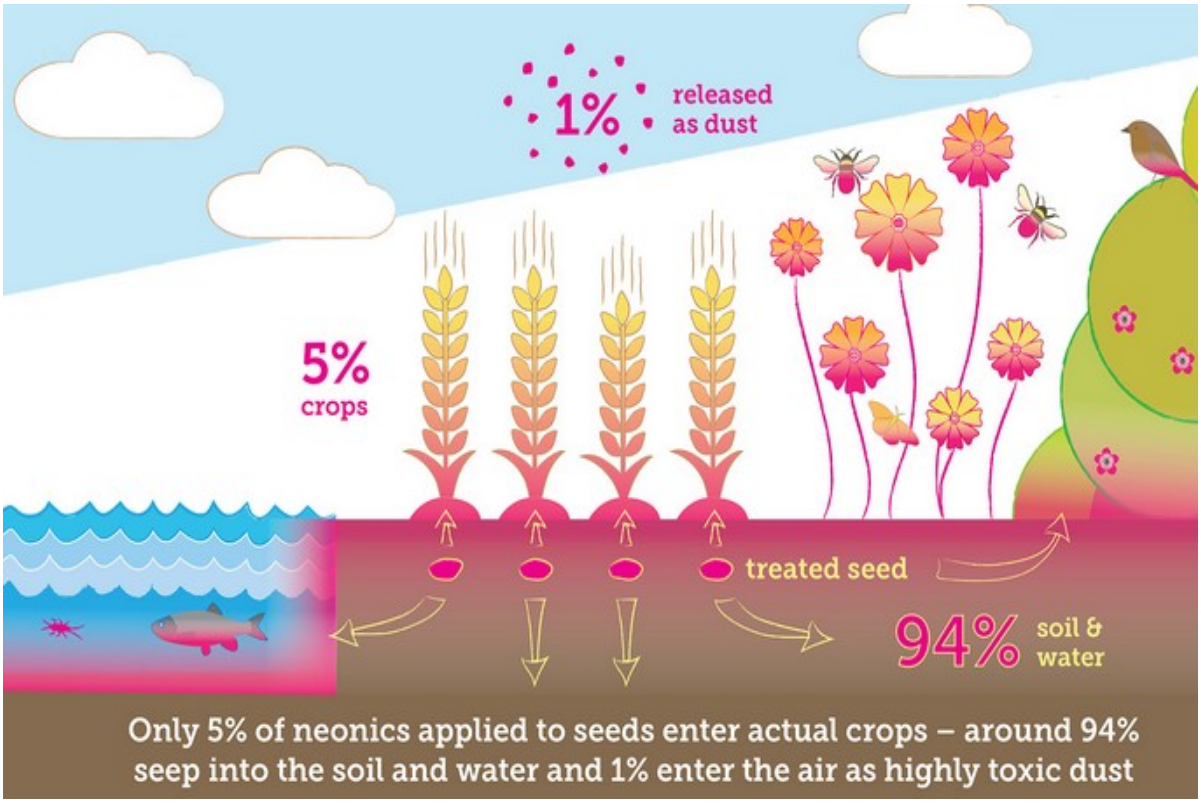
Imidacloprid is one of the most popular and widespread insecticides in the U.S. The neonicotinoid or "neonic" pesticides are used to treat soil, seeds and foliage to control sucking insects such as rice hoppers, aphids, thrips, whiteflies, turf insects, soil insects and some beetles. Imidacloprid kills insects by debilitating their central nervous system. It mimics nicotine and binds to nicotinic acetylcholine receptors, blocking the receptor and thereby preventing nerve cell transmission, leading to paralysis and death in insects. In humans these receptors are found in neuromuscular junctions and the central nervous system.

In November 2017 NRDC comments to U.S. EPA raised the following human health concerns:

Imidacloprid residue on baby and children's foods

Imidacloprid is most commonly used on the following crops: rice, cereal, corn, potatoes, vegetables, sugar beets, fruit, cotton, hops and turf. New and disturbing evidence shows that imidacloprid is making its way into our food supply. According to the Pesticide Action Network publicly searchable database, "What's On My Food", using data aggregated from public sources including the USDA PDP 2012 data, imidacloprid was detected in the following baby foods and common children's foods: baby food—applesauce (0.3% of samples); baby food—pears (13.6% of samples); bananas (1.8% of samples); apples (20% of samples); cherries (14% of samples); and grapes (48% of samples). Moreover, the pesticide's systemic nature means it cannot just be washed off the surface of these foods prior to consumption. (See U.S. FDA 2015 report)

The Scottish Wildlife Trusts called for a ban on pesticides containing Imidacloprid back in 2012. The Soil Association (which certify salmon farms in Scotland as 'organic') are vehemently opposed to the use of Imidacloprid and other neonicotinoids.



In 2013, the Scottish Government called for a ban on neonicotinoids to be delayed. "The Scottish government is patronising us, trying to put a gloss on the fact it is gambling with our food supplies," said Alison Johnstone MSP. "Yet again we see SNP ministers care about big business more than the long-term health of our environment. We need a moratorium on the use of these pesticides as soon as possible."

"The weight of evidence now shows the risks neonicotinoids pose to our environment, particularly to the bees and other pollinators which play such a key part in our £100bn food industry, is greater than previously understood," said UK environment secretary Michael Gove in November 2017. "I believe this justifies further restrictions on their use."

In December 2017, the Rivers Trust reported that "Aquatic insects are just as vulnerable to neonicotinoid insecticides as bees and flying insects..... 88% of sites in Britain were contaminated with neonicotinoids, eight rivers in England exceeded recommended chronic pollution limits, and two were acutely polluted."

In April 2018, the European Commission (following an assessment by the European Food Safety Authority) banned Imidacloprid for use on outdoor crops due to risks to bees. "Unless the scientific evidence changes, the government will maintain these increased restrictions post-Brexit," stated DEFRA in a press release in April 2018.

In September 2018, The Ferret reported that Fergus Ewing supported the judicious use of acetamiprid (another nicotine-based insecticide) in Scotland's forestry sector. Read more via "Fergus Ewing should stop Michael Russell on pesticides, says leaked email".

Neonicotinoid pesticides killing songbirds by turning them 'anorexic'," reported The Daily Telegraph in September 2019.

A scientific paper - "*Acute Toxicity of Imidacloprid on the Developmental Stages of Common Carp Cyprinus carpio*" - published in October 2019 concluded: "The results suggest that the minimum concentration of 10 µg/L imidacloprid in the aquatic environment may have adverse effects on the embryonic and larval stages of common carp".

A scientific paper - "*Effects of insecticides, fipronil and imidacloprid, on the growth, survival, and behavior of brown shrimp Farfantepenaeus aztecus*" - published in PLOS One in October 2019 reported: "Under imidacloprid, survivorship decreased from 100% in the control to 33.33% in the 320.0 µg/L treatment..... We conclude that, at the corresponding EPA benchmark concentrations, fipronil had more lethal effects than imidacloprid, and imidacloprid had more sub-lethal effects than fipronil. Both effects are of serious concern, and we suggest monitoring is necessary in estuaries."

Read more on the toxicity of Imidacloprid via:

"Contamination of the Aquatic Environment with Neonicotinoids and its Implication for Ecosystems" (Frontiers in Environmental Science, November 2016)

"Effects of neonicotinoids and fipronil on non-target invertebrates" (Environ. Sci. Pollu. Res. Int., September 2015)

The European Commission reported in 2015:

Science for Environment Policy

Neonicotinoid and fipronil insecticides harm birds and fish and reduce their food supply

Neonicotinoid and fipronil insecticides have a range of impacts on birds, mammals and fish, a new review of scientific literature has found. A house sparrow would need to eat just one and a half beet seeds treated with a common neonicotinoid to receive a lethal dose, for instance. The insecticides may also have equally important effects on vertebrate wildlife, such as reducing insect prey and hence food supply.

Neonicotinoids and fipronil are important insecticides, designed to affect a broad range of insect pests by disrupting the functioning of the central nervous system. Both are systemic chemicals, absorbed by plants, commonly after seed treatment or soil application.

However, laboratory research has found that they can also have direct toxic effects on non-target species, such as birds and mammals, resulting in reduced growth and reproduction, or even death. They can also have indirect effects on these animals in the wild, for example, by reducing the amount of insect prey available, which in turn may affect their growth, breeding success and survival.

The researchers reviewed 150 studies on the direct and indirect effects of fipronil and the neonicotinoids imidacloprid and clothianidin, on vertebrate species, i.e. mammals, birds, fish, amphibians and reptiles.

The researchers classified the effects of the insecticides on different vertebrates using the US Environmental Protection Agency's ecotoxicity classification system. All three insecticides were directly toxic to vertebrates, the results showed. Imidacloprid, for example, was moderately to highly toxic to many birds. Clothianidin was moderately to practically non-toxic to rats, mice and birds and practically non-toxic to fish. Fipronil was highly toxic to game birds and fish.

Furthermore, all three insecticides had sub-lethal effects, impairing growth, development and reproduction of mammals, birds, fish and amphibians. Other sub-lethal impacts found included damage to genetic material and cells and abnormal behaviour.

Some species of bird may be particularly at risk from eating seeds treated with imidacloprid or clothianidin. One study revealed that grey partridges (*Perdix perdix)* would only need to eat six beet seeds coated with 0.9 mg of imidacloprid to die. House sparrows (*Passer domesticus)* would only have to eat one and a half seeds. Moreover, house sparrows would experience sub-lethal effects after eating only a quarter of a treated seed.

Levels of imidacloprid and clothianidin likely to be found in freshwater are not high enough to kill fish and amphibians, the researchers found. However, sub-lethal effects could still occur, including damage to DNA and the immune system.

A small number of studies reviewed also show the indirect effects of imidacloprid or fipronil on mammals, birds, fish and reptiles. For example, in one study, fipronil and imidacloprid affected the growth and development of the fish medaka (*Oryzias latipes*) in rice fields, most likely by reducing populations of insects that the fish feed on.

5 February 2015
Issue 402

Source: Gibbons, D., Morrissey, C. & Mineau, P. (2014). A review of the direct and indirect effects of neonicotinoids and fipronil on vertebrate wildlife. *Environmental Science and Pollution Research*. DOI: 10.1007/s11356-014-3180-5. This study is free to view at: http://link.springer.com/article/10.1007%2Fs11356-014-3180-5

Contact: david.gibbons@rspb.org.uk

Read more about: Agriculture, Biodiversity, Chemicals

[3] The use of Imidacloprid in salmon farming has been in the pipeline for years.

Norwegian Fish Farmer magazine reported in June 2016 that Novartis had obtained a US patent for Clothianidin in 2014 and cited the 2015 US patent on Imidacloprid for use in salmon farming.

Patentert metode

To av dem som står bak AVSI, som er den kanadiske samarbeidspartneren i prosjektet, John O'Halloran og John Terence Drost, har nemlig patentert en fremgangsmåte for å belegge fiskefôr med en «bærer» som skal sørge for at legemidler i neonikotinoid-klassen i langt større grad blir spist og tatt opp av fisken når de gis i fôret.

I patentet viser de til et forsøk Novartis har beskrevet i deres patentsøknad for et neonikotinoid-middel som heter «clothianidin».

Der konkluderer Novartis med at det kun er clothianidin av neonikotinoidene de testet som gir full effekt. Og at for eksempel at et annet velkjent middel, imidacloprid, dermed ikke er egnet som fôrbasert lakselusmiddel. Se tabellen her

I patentet til O'Halloran og Drost hevder de derimot at de har funnet en bærersubstans som også gjør de andre stoffene egnet. Derfor krever de i patentet at denne metoden skal gjelde stoffer som imidacloprid, acetamiprid dinotefuran, nitenpyram, thiacloprid, thiamethoxam.

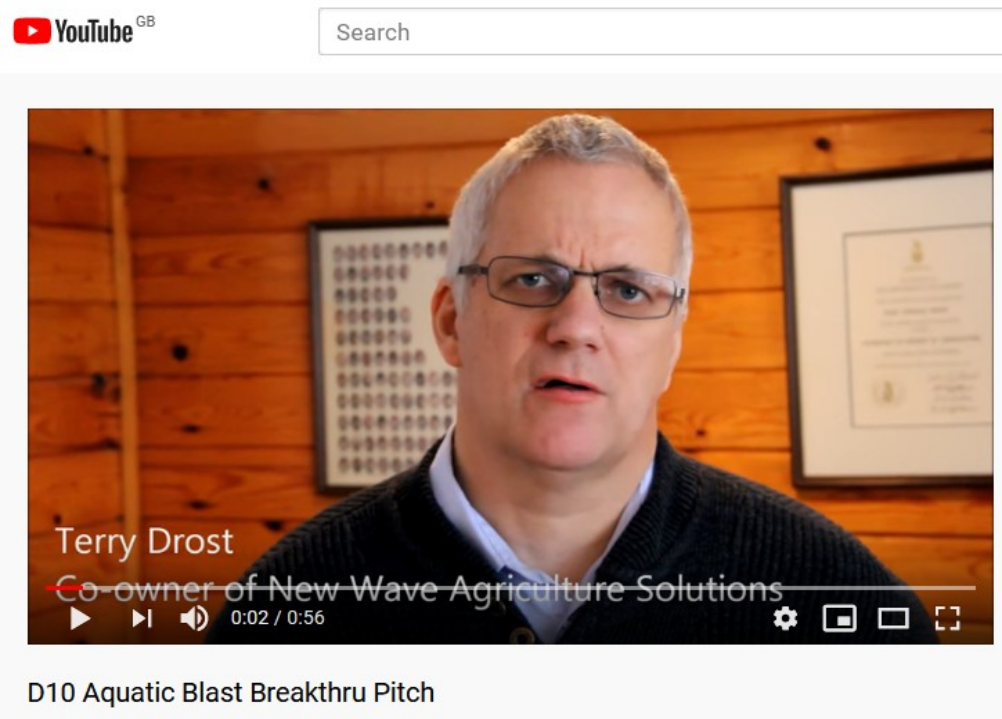
Selv om patentet ramser opp en rekke neonikotinoider, er det varianten «**imidalcloprid**» som vies mest fokus i patentet. Kyst.no spør Rikhardsen om det er dette konkrete virkestoffet det jobbes med?

- Jeg kan bare bekrefte at det i patentet er beskrevet en rekke varianter, men jeg kan verken bekrefte eller avkrefte at det er akkurat imidalcoprid, sier han.

Compound	Reduction of total sea lice [%]	Reduction of total sea lice [%]	Reduction of total sea lice [%]
Dose [mg/kg/day]	10	5	1
Control	0	0	0
Acetamiprid	85	64	53
Clothianidin	99	98	90
Imidacloprid	81	94	91

The article ended by directing readers to a [You Tube presentation dated December 2014 by Terry Drost of New Wave Agriculture Solutions] which included:

"We have developed a new treatment for sea lice called D10 Aquatic Blast. D10 Aquatic Blast is based on a compound used in agriculture for the last 20 years. We are using it in salmon feeds in the marine environments for the first time in the world. We would like to talk to you about how we can get D10 Aquatic Blast approved for use in Canada and the rest of the world."



Fiskeribladet/Tekfisk [reported in June 2018]:

The article links to another article [published in Intrafish in June 2018]():

IntraFish Priser Stillinger FoU Kalender Ordforklaringer

Søker to FoU-tillatelser for nytt lusemiddel

Det nyetablerte selskapet Salmo Pharma har søkt Fiskeridirektoratet om to FoU-tillatelser for utprøving av et nytt fôrbasert legemiddel mot lakselus.

28. juni 2016 7:38 CET *OPPDATERT 28. juni 2016 7:38 CET*
Av **Anders Furuset**

Det fremgår av dokumenter IntraFish har fått innsyn i. Deler av dokumentene, som hele søknaden til Statens Legemiddelverk, er imidlertid unntatt innsyn grunnet forretningskritiske

It is difficult to access any information on New Wave Agriculture Solutions but there is an [online listing for J Terry Drost at tech funding start up F6S]():

F6S

F6S
where founders grow together
Finance · Jobs & Recruiting · Startups

J Terry Drost
Aquaculture Industry professional for 29 years.
General Business • Marketing Fredericton, Canada

EXPERIENCE

New Wave Pharmaceuticals • Co-Founder
Aquaculture Pharmaceutical Company

Terry Drost, Vice-President/COO New Wave Pharmaceuticals Inc (based in New Brunswick in Canada) told Salmon Business in August 2018:

"Once a sea lice outbreak hits them, they are faced with the choice of doing nothing and allowing up to 100% of their fish to be eaten alive by sea lice or applying mechanical treatments that can result in large amounts of fish damaged or killed..... we need to be allowed the emergency use of innovative, safe and efficacious new treatments to control sea lice."

Imidacloprid, according to the Material Safety Data Sheet of one of the insecticide formulations on the market, is "highly toxic to aquatic invertebrates" and the chemical company warns users "do not apply directly to water" and "do not contaminate water when disposing of equipment washwaters".

MATERIAL SAFETY DATA SHEET
Quali-Pro® Imidacloprid 2F Turf & Ornamental

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL HAZARDS: This product is highly toxic to aquatic invertebrates. Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters.

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

This chemical demonstrates the properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.

Another Imidacloprid formulation warns:

Kohinor 350 SC

Synonyms	Imidacloprid 350 SC

Signal word	Warning
Hazard Statements	H410 - Very toxic to aquatic life with long lasting effects
Precautionary Statements	P102 - Keep out of reach of children P501 - Dispose of contents/ container to an approved waste disposal plant

More information on 'Marine Pollutant' labelling is available via ChemSafe Pro:

Environmentally hazardous substance mark

Read more via "Environmentally Hazardous Labels":

LABELLING & MARKING MARINE POLLUTANTS

If a package containing a marine pollutant is to travel by sea at any time during transport, you must comply with the more stringent IMO regulations and label and mark as such.

The Fish Site reported in June 2017:

Patent sought for neonicotinoid-based sea louse treatment

HEALTH · NUTRITION

by Rob Fletcher
2 June 2017, at 12:00am

Details of an application for a patent concerning a neonicotinoid-based in-feed sea louse treatment have been recently published in the US.

The treatment has been developed by two Canada-based scientists – John O'Halloran and John Terence Drost – and is set to be administered orally, via medicated feeds, to salmon ranging from 50 g to 5 kg. Trials conducted by the scientists have shown it to be effective against both Lepeophtheirus and Caligus lice species, although the principle target is *Lepeophtheirus salmonis*. According to the patent application, salmon can be safely harvested and consumed within 21-25 days after treatment, or when the neonicotinoid residue in the fish is below 0.02 parts per million.

Although the patent is still pending, independent research into the possible efficacy of noenicitinoids against sea lice has also been promising. Indeed, a paper published in the Journal of Fish Diseases last year by Aaen and Horsberg, from the Sea Lice Research Centre at the NMBU School of Veterinary Science, showed the nicotinic (neuronal) acetylcholine receptor (nAChR) to be a suitable target for compounds such as neonicotinoids.

These compounds consist of seven separate insecticides – imidacloprid, thiacloprid, thiamethoxam, acetamiprid, nitenpyram, clothianidin and dinotefuran – and are used to combat pest organisms
on a wide range of crops, as well as parasites on animals. In Australia and New Zealand, products containing compounds from this group are available for use on sheep; otherwise, companion animals are the main consumers of these substances.

A prominent feature of neonicotinoids is their specificity to invertebrate nAChR compared to vertebrate
nAChR and this group of compounds is reported to induce toxic effects on crustaceans when distributed in extremely low concentrations.

Despite this, neonicotinoids are not without controversy, as their use as pesticides on crops has been linked to a steep decline in bee numbers, while their relatively long persistence in aquatic environments could, the scientists suggest, complicate their use as antiparasitic compounds. Nevertheless their trials showed that imidacloprid – which is the compound included in the current patent application – was highly effective against *L. salmonis*. Exposing lice to imidacloprid for 30 minutes at a concentration of 50 mg L(-1), or for 24 hours at 5 mg L(-1) generated a high level of immobilization.

Although another neonicotinoid, nitenpyram, did not yield a similar effect, the researchers concluded that the nicotinic acetylcholine receptor was a sensitive target for novel salmon lice medicines.

Further details of the US patent for Imidacloprid are available [online here]

Google Patents

Fish feed compositions containing a neonicotinoid for preventing and treating parasite infections

Abstract

The present disclosure relates to methods of preventing or treating parasite infection in a plurality of fish in need thereof, comprising administering to the fish an effective amount of a medicated fish feed. The medicated fish feed comprises fish feed granules or pellets coated with a composition comprising a neonicotinoid such as imidacloprid and a carrier having a high apparent digestibility coefficient such as a processed/cooked corn protein concentrate.

Classifications

A61K9/167 Agglomerates; Granulates; Microbeadlets ; Microspheres; Pellets; Solid products obtained by spray drying, spray freeze drying, spray congealing,(multiple) emulsion solvent evaporation or extraction with an outer layer or coating comprising drug; with chemically bound drugs or non-active substances on their surface

View 12 more classifications

US20170135956A1
United States

Download PDF | Find Prior Art | Similar

Inventor: John O'Halloran, John Terence DROST

Worldwide applications

2015 • EP US CA WO 2016 • CL

Application US15/321,896 events

2014-06-24 • Priority to US201462016389P

2015-06-24 • Application filed by John O'Halloran, John Terence DROST

2015-06-24 • Priority to US15/321,896

2015-06-24 • Priority to PCT/IB2015/054749

2017-05-18 • Publication of US20170135956A1

US 20170135956A1

(19) **United States**

(12) **Patent Application Publication**

O'HALLORAN et al.

(10) **Pub. No.: US 2017/0135956 A1**

(43) **Pub. Date: May 18, 2017**

(54) **FISH FEED COMPOSITIONS CONTAINING A NEONICOTINOID FOR PREVENTING AND TREATING PARASITE INFECTIONS**

(71) Applicants: **John O'HALLORAN**, Old Ridge (CA); **John Terence DROST**, Douglas (CA)

(72) Inventors: **John O'HALLORAN**, Old Ridge (CA); **John Terence DROST**, Douglas (CA)

(21) Appl. No.: **15/321,896**

(22) PCT Filed: **Jun. 24, 2015**

(86) PCT No.: **PCT/IB2015/054749**

§ 371 (c)(1),
(2) Date: **Dec. 23, 2016**

Related U.S. Application Data

(60) Provisional application No. 62/016,389, filed on Jun. 24, 2014.

Publication Classification

(51) **Int. Cl.**

A61K 9/16	(2006.01)
A61K 9/00	(2006.01)
A23K 20/10	(2006.01)
A23K 20/158	(2006.01)
A23K 10/30	(2006.01)
A61K 31/4439	(2006.01)
A23K 50/80	(2006.01)

(52) **U.S. Cl.**

CPC ***A61K 9/167*** (2013.01); ***A61K 31/4439*** (2013.01); ***A61K 9/1617*** (2013.01); ***A61K 9/1658*** (2013.01); ***A61K 9/0053*** (2013.01); ***A23K 50/80*** (2016.05); ***A23K 20/158*** (2016.05); ***A23K 10/30*** (2016.05); ***A23K 20/10*** (2016.05)

(57) **ABSTRACT**

The present disclosure relates to methods of preventing or treating parasite infection in a plurality of fish in need thereof, comprising administering to the fish an effective amount of a medicated fish feed. The medicated fish feed comprises fish feed granules or pellets coated with a composition comprising a neonicotinoid such as imidacloprid and a carrier having a high apparent digestibility coefficient such as a processed/cooked corn protein concentrate.

A PhD thesis - "Chemotherapeutants against salmon lice Lepeophtheirus salmonis – screening of efficacy" - published by the Norwegian University of Life Sciences in 2016 identified Imidacloprid as a 'Test Substance':

Table 2. List of substances utilized in the studies, grouped according to the IRAC mode of action classification.

IRAC group	Substance	General mode of action	Mode of action	Substance group	Project candidate
1A	Propoxur	Nervous system	Acetylcholinesterase inhibitor	Organophosphates	Test substance
1B	Azamethiphos	Nervous system	Acetylcholinesterase inhibitor	Organophosphates	Model substance
2B	Pyriprole	Nervous system	GABA-gated chloride channel blocker	Phenylpyrazoles	Test substance
3	Cypermethrin	Nervous system	Sodium channel modulator	Pyrethroids	Model substance
4A	Imidacloprid	Nervous system	Nicotinic acetylcholine	Neonicotinoids	Test substance

Table 6: Concentrations immobilizing 50 (EC_{50}) and 90 (EC_{90}) % of preadult *L. salmonis* parasites exposed to neonicotinoids for 24 hours. The 90 % confidence intervals are provided in brackets when applicable.

Substance	EC_{50} (µg/L)	EC_{90} (µg/L)
Imidacloprid	97.6 (74.2-148.6)	334.2 (152.3-733.75)

A scientific paper - "A screening of multiple classes of pharmaceutical compounds for effect on preadult salmon lice Lepeophtheirus salmonis" - published in the Journal of Fish Diseases in October 2016 included:

J Fish Dis. 2016 Oct;39(10):1213-23. doi: 10.1111/jfd.12463. Epub 2016 Apr 1.

A screening of multiple classes of pharmaceutical compounds for effect on preadult salmon lice Lepeophtheirus salmonis.

Aaen SM[1], Horsberg TE[1].

Author information

Abstract

The salmon louse, Lepeophtheirus salmonis Krøyer, is the major obstacle facing a sustainable future for farmers of salmonids in the North Atlantic Ocean. Medicinal compounds have been the most utilized tool to prevent salmon lice infestation; however, the active compounds have become less effective or considered environmentally unfriendly in the past years. Novel medicinal compounds are thus highly desired. In two experiment series, 26 medicinal compounds were screened for their efficacy against salmon lice, in a 30-min exposure and 24-h exposure, respectively. Pyriprole, imidacloprid, cartap and spinetoram were effective at 50 mg L(-1) in the short-time exposure. In the 24-h exposure, pyriprole, propoxur, cartap, imidacloprid, fenoxycarb, pyriproxyfen, nitenpyram, spinetoram, spiromesifen and diflubenzuron induced a high level of immobilization at 5 mg L(-1) . The EC50 values of the effective compounds were calculated in further titration studies for both exposure periods. Several physiological and biochemical pathways were discovered as possible targets for medicinal intervention against the salmon louse.

Results included:

Table 2 The number of alive and immobilized parasites exposed to 50 mg L^{-1} of the test substance for 30 min or 5 mg L^{-1} for 24 h

IRAC no.	Substance	30-min exposure (live/immobilized)	24-h exposure (live/immobilized)
1	Propoxur	13/3	0/17
1	Azamethiphos	2/13	0/14
2	Pyriprole	0/9	0/25
3	Cypermethrin	0/11	0/17
4	Imidacloprid	0/7	0/17
4	Nitenpyram	11/4	2/12
5	Spinetoram	3/9	1/12
5	Spinosad	13/0	19/4
6	Emamectin benzoate	0/8	0/12

Table 3 Cohorts of sea lice exposed to declining concentrations of antiparasitics, with the outcome being immobilized or alive. Exposure period of 30 min, followed by 20- to 24-h residence in clean seawater with constant aeration. EC_{50} values (in mg L^{-1}) calculated with probit analysis in JMP (90% confidence intervals in brackets where available)

Substance	EC_{50}	EC_{90}
Pyriprole	0.108 mg L^{-1}	0.118 mg L^{-1}
Imidacloprid	8.4 (3.2–22.3) mg L^{-1}	46.3 (7.4–289.6) mg L^{-1}
Cartap	4.9 (0.7–33.9) mg L^{-1}	38.2 (11.5–127.0) mg L^{-1}
Spinetoram[a]	51.0 (13.0–199.6) mg L^{-1}	1845.0 (77.3–44 049.5) mg L^{-1}

[a]Not well dissolved.

Table 4 Cohorts of sea lice exposed to declining concentrations of antiparasitics, with the outcome being immobilized or alive. Exposure period of 24 h with constant aeration. Medicinal compounds presented with decreasing EC_{50} values (in µg L^{-1}, calculated with probit analysis in JMP), with 90% confidence intervals in brackets (where available)

Substance	EC_{50}	EC_{90}
Pyriprole	0.9 (0.5–1.6) µg L^{-1}	2.2 (0.9–5.0) µg L^{-1}
Propoxur	<10 µg L^{-1}	
Cartap	5.2 (1.2–22.3) µg L^{-1}	152.6 (57.3–406.0) µg L^{-1}
Imidacloprid	97.6 (74.1–148.6) µg L^{-1}	334.2 (152.3–733.7) µg L^{-1}

The scientific paper continued:

The nicotinic (neuronal) acetylcholine receptor (nAChR) proved to be a suitable target for medicines in these experiments. One group of compounds acting on this receptor are the neonicotinoids. Consisting of seven separate insecticides, imidacloprid, thiacloprid, thiamethoxam, acetamiprid, nitenpyram, clothianidin and dinotefuran, the neonicotinoids are used to combat pest organisms on a wide range of crops (codex alimentarius: http://www.codexalimentarius.net/pestres/data/pesticides/details.html;jsessionid=208EB91253CF44C876A52B43153128D8?d-16497-o=2&id=206&d-16497-s=3) and parasites on animals. In Australia and New Zealand, products containing compounds from this group are available for use on sheep; otherwise, companion animals are the main consumers of these substances. A prominent feature of neonicotinoids is their specificity to invertebrate nAChR compared to vertebrate nAChR (Matsuda *et al.* 2001). Furthermore, this group of compounds is reported to induce toxic effects on crustaceans when distributed in extremely low concentrations (Morrissey *et al.* 2015).

Neonicotinoid compounds have become quite controversial recently, especially as they have been linked to the massive decline in bee hives (Whitehorn *et al.* 2012). Their relatively long persistence in aquatic environments complicates its use as an antiparasitic compound (reviewed by Morrissey *et al.* 2015; Goulson 2013). In our experiment, imidacloprid was highly effective against *L. salmonis*; however, the related compound nitenpyram did not yield an similar effect. This indicates that the nicotinic acetylcholine receptor displays properties affecting the affinity of the ligands, connecting a high degree of specificity to this receptor.

Norwegian Fish Farmer magazine [reported in April 2017](#) (translated as "The Authorities Are the Bottleneck for New Drugs":

The article cites Imidacloprid:

Slit å måtte rettferdiggjøre arbeidet

Salmo Pharma er et lite selskap som bl.a. jobber med å tilgjengeliggjøre helt nye lakselusmidler. Et av midlene, med virkemiddelet imidalcloprid, ble nylig beskrevet i rapporten fra SLRC som svært effektivt. Men kampen for å få det registrert som legemiddel til laks, føles ofte som en kamp mot mer enn bare lakselusen.

Translated as:

Salmo Pharma is a small company that is working to make entirely new salmon lice available. One of the agents, using the drug imidalcloprid, was recently described in the report by SLRC as very effective. But the battle to get it registered as a medicine for salmon often feels like a battle against more than just salmon lice.

The article linked to another article in Norwegian Fish Farmer published in April 2017 which cited the 2016 Annual Report of the SLRC (Sea Lice Research Centre) - including reference to the use of Imidacloprid to kill sea lice parasites on salmon farms.

WP1: Chemotherapy and resistance

Principal Investigator: Tor Einar Horsberg, NMBU

This work package has two parts: 1) To explore possible new treatment methods and chemicals, and 2) To develop robust assay methods for resistance testing against chemotherapeutants. These are interconnected, as the current widespread resistance towards available chemotherapeutants has highlighted the need for rapid and reliable resistance tests, and the need for new treatment options.

New treatments

A set of test tools have previously been developed to screen new active ingredients for their efficacy towards salmon lice. These are based on bioassays on different developmental stages: a) egg strings to explore effects on hatching, b) nauplii to explore effects on molting, and c) preadults to explore direct effects on larger parasites. A wide range of insecticides with different modes of action have been tested using these assays. The testing program has partly been on model substances, partly on experimental substances provided by Elanco. The results from the model substance tests have been published in two papers in Journal of Fish Diseases in 2016. One PhD candidate successfully defended his work on this project in 2016. As a conclusion, egg strings were generally quite unaffected by most substances at concentrations relevant for application to fish. One exception was hydrogen peroxide, which effectively killed the embryos at concentrations down to 25% of recommended treatment doses. A few compounds inhibited development from nauplius I / II to copepodids: diflubenzuron, fenoxycarb, pymetrozine, pyriprole and tebufenozide. Several compounds had a direct effect on preadult parasites, even on parasites resistant towards currently used treatments. Some of these, or other substances within the same class, might be good candidates for novel treatments. The most effective compounds tested were pyriprole, propoxur, cartap, imidacloprid, fenoxycarb, pyriproxyfen, nitenpyram, spinetoram and spiromesifen. These experiments point to several sensitive targets for chemical interference, as illustrated in Figure 1.

A study of efficacy of all compounds within the neonicotinide class, which are agonists on the acetyl choline receptor, was conducted in 2016. The study revealed that some of these agents are highly effective when administered through the feed. In one experiment, close to 100% clearance was achieved after a single oral imidacloprid dose of 5 mg/kg. The compound was rapidly excreted, and no residual effect was seen one week after treatment. Attempts to describe this receptor in salmon lice are still ongoing.

The Northwest Center for Alternatives to Pesticides [reported in June 2017]():

Best Management Practices to Protect Water and Fish

IMIDACLOPRID

Insecticide/miticide, some restricted use labels

Selected Agricultural Products Include: Acceleron, Admire, Couraze, Criterion, Dominion, Gaucho, Merit, Malice, Marathon, Montana, Nuprid, Provado **Home and Garden products:** Numerous products made by Bonide, Fertilome, Hi-Yield, Ortho, and others **Pet products:** Numerous products
Total of 391 products registered in Oregon

IMIDACLOPRID IS A CONCERN IN OREGON'S WILLAMETTE VALLEY STREAMS

- Imidacloprid moves into streams easily and is one of the top ten most frequently detected pesticides in streams of the north Willamette Valley, detected in almost 20% of samples collected between 2010-2015.[1]
- Average concentrations of imidacloprid measured in Willamette Valley streams between 2010-2015 exceed levels known to harm key salmon and steelhead prey.[2]

The Chemical Properties of Imidacloprid Predispose It to Be a Water Pollutant

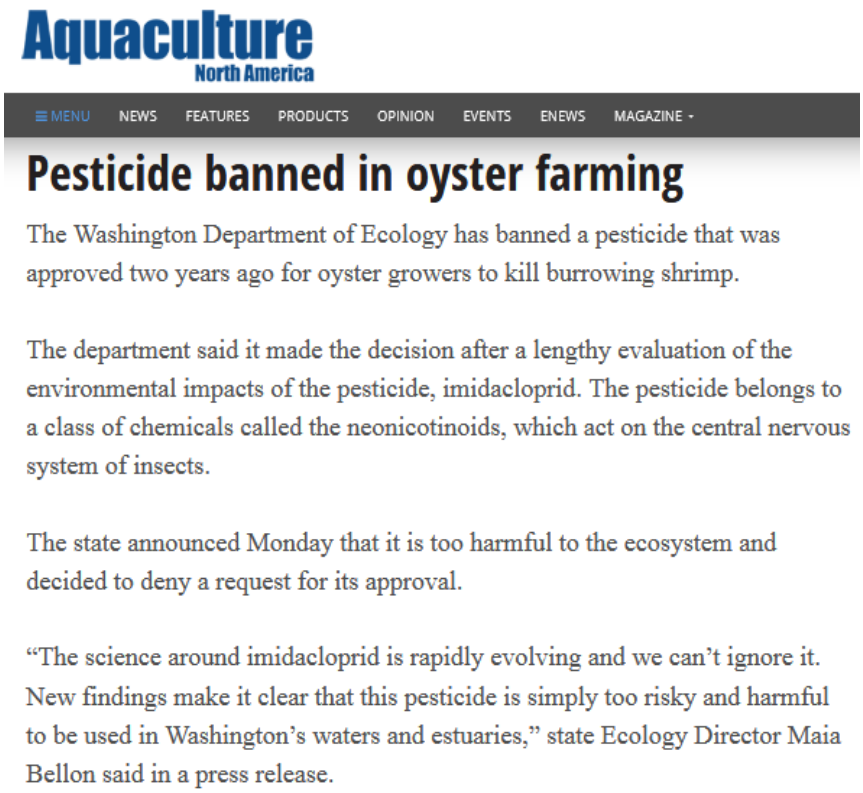
Chemical Property	Imidacloprid Rank[3]	Why It Matters for Pollution
Solubility	Moderate	More soluble pesticides dissolve easily in water, moving with rainfall or soil water into streams or groundwater.
Soil Persistence (half-life)	Persistent	More persistent pesticides stick around, with increased opportunities to get carried to streams.
Potential to Leach	High	More leachable pesticides tend to show up in groundwater.

Rank: red – yellow – green shading above indicates relative risk of pollution (red high).

Harmful Effects of Imidacloprid to Salmon, Steelhead or Their Habitat

- Aquatic insects, especially mayflies, midges and stoneflies (all important food for salmon and steelhead) are especially sensitive to imidacloprid.[4] Mayflies can be immobilized at very low levels, below the average imidacloprid concentrations detected in Willamette Valley streams between 2010-2015. Effects on survival, growth and emergence rate for other prey, such as midges, have been documented within the range of concentrations detected in the Willamette Basin stream samples.[5]
- Foliar applications, followed by soil applications at shallow depths (<0.75 inch) are most likely to cause high concentrations in nearby streams. Some of the highest stream residue concentrations are expected after foliar applications to tree fruits, Christmas trees, tree plantations, and nurseries, partly due to the higher rates allowed for these uses. Application scenarios involving a combination of foliar, soil or seed coating applications also are expected to result in concerning levels of off-site contamination for all crops, with combined treatments in root and tuberous vegetables and some leafy greens being of particular concern.[6]

North America Aquaculture reported in April 2018:



Aquaculture North America

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Pesticide banned in oyster farming

The Washington Department of Ecology has banned a pesticide that was approved two years ago for oyster growers to kill burrowing shrimp.

The department said it made the decision after a lengthy evaluation of the environmental impacts of the pesticide, imidacloprid. The pesticide belongs to a class of chemicals called the neonicotinoids, which act on the central nervous system of insects.

The state announced Monday that it is too harmful to the ecosystem and decided to deny a request for its approval.

"The science around imidacloprid is rapidly evolving and we can't ignore it. New findings make it clear that this pesticide is simply too risky and harmful to be used in Washington's waters and estuaries," state Ecology Director Maia Bellon said in a press release.

The Associated Press reported in December 2019:

Oyster growers abandon push to use imidacloprid, a controversial insecticide

| Associated Press
Updated 2:46 AM EST Dec 13, 2019

LONG BEACH, Wash. (AP) — A southwest Washington oyster growers association has abandoned a drive to use a controversial insecticide that combats burrowing shrimp, a creature that can make tidelands unfit for shellfish farming.

The Seattle Times reports that in a settlement reached last week, the Willapa Grays Harbor Growers Association agreed to accept a 2018 state Ecology Department denial of the proposed use of imidacloprid and drop an appeal to the state Pollution Control Hearings Board.

The growers wanted to use the insecticide to spray up to 500 annually of the more than 12,000 acres of tidelands used for shellfish cultivation in Willapa Bay and Grays Harbor. Without the spray, the growers say they lose productive tidelands to the shrimp, which churn up sediment and can cause oysters, as well as clams, to suffocate in the muck.

Marine Environment Research reported in October 2019:

Marine Environmental Research
Volume 151, October 2019, 104765

Imidacloprid and formulated product impacts the fatty acids and enzymatic activities in tissues of Sydney rock oysters, *Saccostrea glomerata*

Endurance E. Ewere [a, b], Amanda Reichelt-Brushett [a], Kirsten Benkendorff [a]

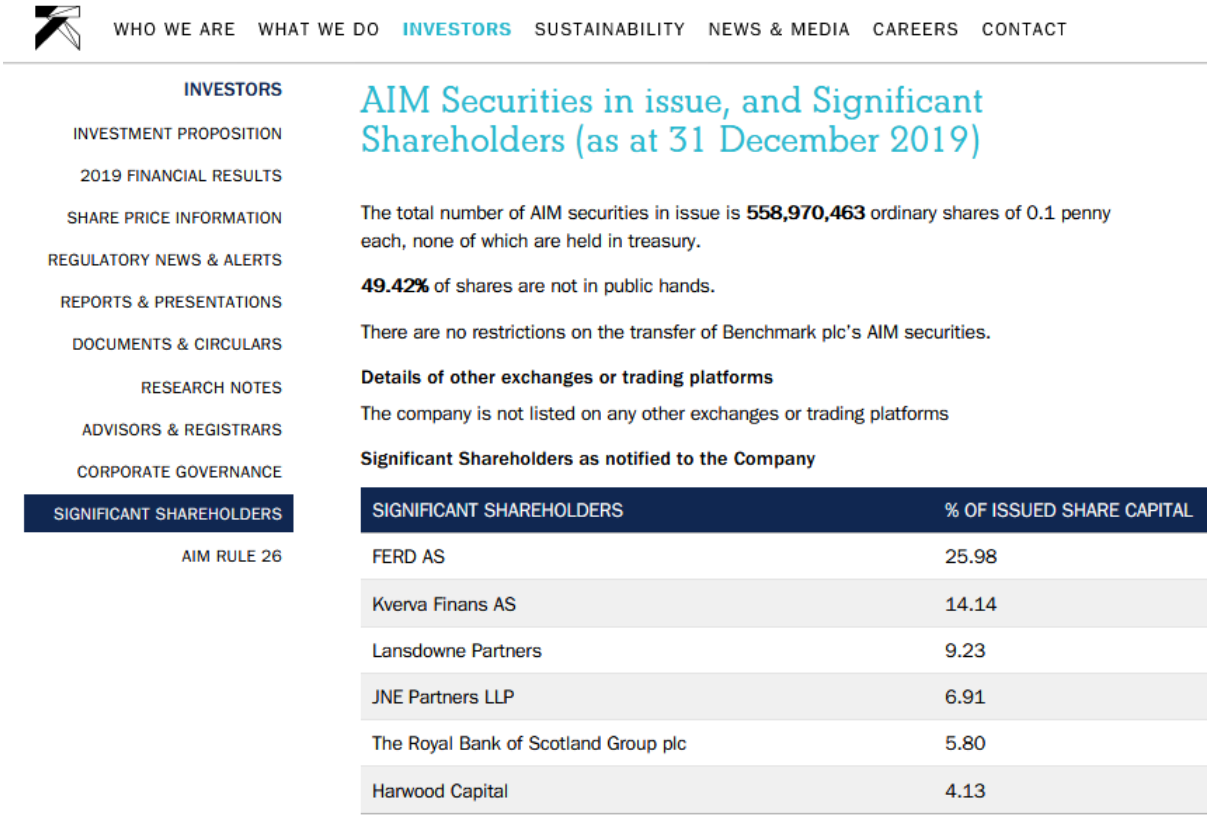
Highlights

- Imidacloprid (IMI) accumulates in the tissues of Sydney rock oysters (SRO) exposed to formulated or pure IMI.

Abstract

The use of imidacloprid (IMI) and its formulated products in agriculture is a risk to aquatic organisms due to deposition into waterways from runoff and aerial spraying. However, there is limited information on the potential effects of this pesticide on commercially important shellfish, such as oysters. We investigated the impacts of IMI and Spectrum 200SC (IMI formulation) on the activity of the enzymes Glutathione-S-transferase (GST), Catalase (CAT) and Acetylcholinesterase (AChE), in different oyster tissues including the gill, adductor muscle and digestive gland. We also investigated the condition index and fatty acid composition of the flesh of oysters after 2 weeks exposure. The concentrations of IMI in the different tissues was assessed using Liquid Chromatography-Mass Spectrometry (LC-MS) after QuEChERS extraction. Higher concentrations of IMI residues were detected in the adductor muscle of the oysters, followed by the gills and with the lowest amounts recovered from the digestive gland across all the concentrations tested. IMI and Spectrum 200SC significantly affected the gill AChE activity at 2 mg/L, but digestive gland CAT, and gill and digestive gland GST were impacted at environmentally relevant concentrations (0.01 and 0.05 mg/L). In the whole oyster, 2 weeks exposure to IMI (≥0.01 mg/L) resulted in a proportional increase in saturated fatty acids (SFA), altered the polyunsaturated fatty acid (PUFA) to SFA ratio and altered the omega 3 fatty acids (*n*-3) to omega 6 fatty acids (*n*-6) ratio, but there were no effects on the condition index of the oyster. Although the oysters responded differently to the formulated product, there was no consistent difference in the sublethal effects of analytical IMI and Spectrum 200SC. This study showed that exposure to IMI and Spectrum 200SC can significantly affect the biochemical processes and metabolites in oysters, with implications for food quality and safety.

[4] Benchmark is [controlled by Norwegian investors](#) led by [FERD](#).



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AIM Securities in issue, and Significant Shareholders (as at 31 December 2019)

The total number of AIM securities in issue is **558,970,463** ordinary shares of 0.1 penny each, none of which are held in treasury.

49.42% of shares are not in public hands.

There are no restrictions on the transfer of Benchmark plc's AIM securities.

Details of other exchanges or trading platforms

The company is not listed on any other exchanges or trading platforms

Significant Shareholders as notified to the Company

SIGNIFICANT SHAREHOLDERS	% OF ISSUED SHARE CAPITAL
FERD AS	25.98
Kverva Finans AS	14.14
Lansdowne Partners	9.23
JNE Partners LLP	6.91
The Royal Bank of Scotland Group plc	5.80
Harwood Capital	4.13

Companies House

BENCHMARK HOLDINGS PLC

Company number **04115910**

Date	Description	View / Download
05 Mar 2020	**Group of companies' accounts** made up to 30 September 2019	View PDF (193 pages)

1 active person with significant control / 0 active statements

Mr Johan Henrik Andersen ACTIVE

Correspondence address
Ferd Capital, Strandvein 50, P.O. Box 34, No-1324 Lysaker, Norway

Notified on
7 December 2018

Date of birth
July 1961

Nationality
Norwegian

Nature of control
Ownership of shares – More than 25% but not more than 50%

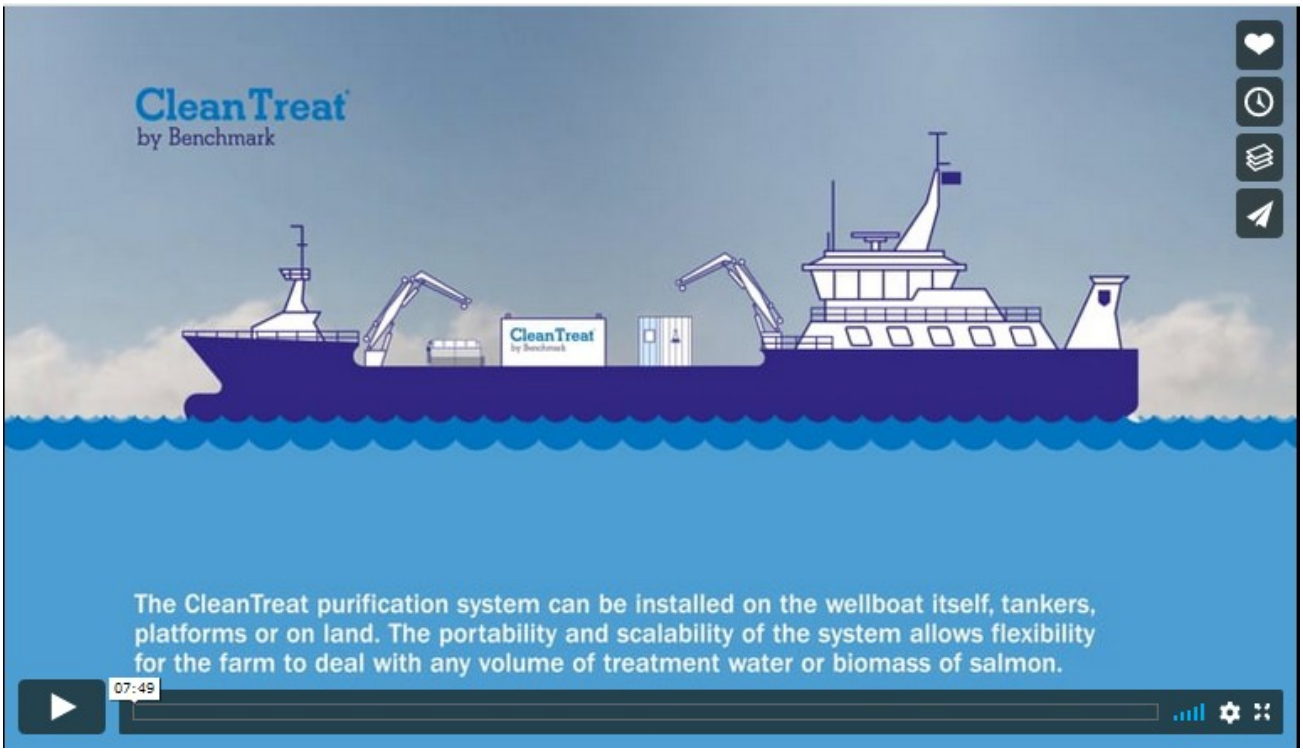
Ownership of voting rights - More than 25% but not more than 50%

Country of residence
Norway

Benchmark manufactures the Azamethiphos chemical treatment Salmonsan Vet. In 2018, Benchmark's claims that Neptune Pharma executives exploited trade secrets involving Salmosan were rejected by the Norwegian Court of Appeal with Benchmark ordered to pay NOK 1.6 million.

Benchmark's submission to the Scottish Parliament's salmon farming inquiry in 2018 included:

> Purification systems- systems which remove therapeutants from treatment water prior to discharge - have been proposed as a solution to this environmental challenge. Benchmark's CleanTreat® system - developed by our team in Scotland - is the culmination of many years of research and investment and is the first of its kind to be used in aquaculture.
>
> CleanTreat® ensures the safe use of compounds in the marine environment by removing therapeutants in discharge water following treatment to undetectable levels. CleanTreat® will be used in conjunction with Benchmark's next generation sea lice treatment, which is currently undergoing field trials in Norway. This represents a transformational change in the battle against one of the industry's greatest challenges, and a big step towards a future where no medicinal residues are discharged directly into the oceans. CleanTreat® can be used on well boats, tankers and platforms, is effective against most available bath treatments for sea lice and prevents treated lice from going back into the environment so that they do not contribute to resistance. More information can be found here: http://www.benchmarkplc.com/articles/cleantreat-by-benchmark/



[Benchmark's](#) ['Trading Update'](#) (29 November 2019) included:

Benchmark's 2018 Annual Report filed with Companies House in April 2019 included:

This year we made significant progress towards the commercialisation of our next generation sea lice treatment and CleanTreat®. Our new solution addresses the biggest challenge in salmon farming and represents a transformational change towards a future where no medicinal residues are discharged directly into the oceans.

John Marshall
Head of Animal Health

Successful field trials for next generation sea lice treatment

- Conducted commercial field trials with three of the world's largest salmon producers showing close to 99%+ efficacy, excellent fish welfare and no environmental impact.
- Breakthrough product for single largest reported issue in salmon production.
- Expanding trials into new markets in 2019; process to obtain marketing authorisation progressing as planned.

Environmental protection — continued optimisation of CleanTreat® technology

- Benchmark's CleanTreat® technology addresses industry-wide need to eliminate discharge of medicinal residues from bath treatments into the water.
- Core element of the Group's next generation sea lice treatment with potential to expand use to other medicinal treatments.
- Efficiency of the system has increased significantly during 2018, doubling throughput.

Benchmark reported to investors at a 'Capital Markets Day' presentation in March 2018:

Experienced team across disciplines to commercialise BMK pipeline

John Marshall
Head of Animal Health

- 20 years' experience in pharma
- Significant experience taking new products to market
- Ex **Novartis**

R&D

Robin Wardle

- 30+ years in aquaculture product development and commercial operations
- Ex **Merck**

Manufacturing

Bob Long

- 35+ years experience in animal and human health
- Ex **Novartis**

Regulatory

Dr. Lindsey Toon

- 20 years experience in pharma
- **Ex Merck**

Diagnostics

Dr. Hamish Rodger

- 30+ years experience as an aquatic veterinarian (Phd & Msc)
- Founding member of EU College of Aquatic Animal Health
- Specialist consultant to global salmon farming

In-house R&D

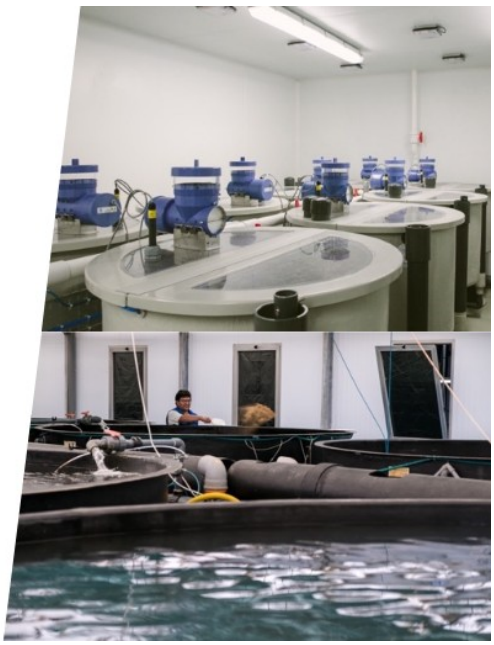
Speeding development of pipeline products

Cold water trials: Scotland

- Species: Salmon and lumpfish
- Successfully delivered trials for Ectosan & CleanTreat
- Home office licensed

Warm water trials: Thailand and Italy

- Species: Shrimp, tilapia and marine finfish
- Experimental scale shrimp hatchery
- Commercial scale testing



Top core opportunities

		Peak projected sales	Risk Weighted
1	**Ectosan — Salmon lice**	£45m	£36m
2	**Salmon vaccines portfolio**	£99m	£26m
3	**Sea bass/sea bream portfolio**	£46m	£24m

1 Salmon lice: Ectosan + CleanTreat

- **100% efficacy** including in populations resistant to other medicines
- **No detectable medicine discharged**. Safe for most sensitive marine species
- **Superior safety profile** even at high exposure level
- **Excellent fish welfare**

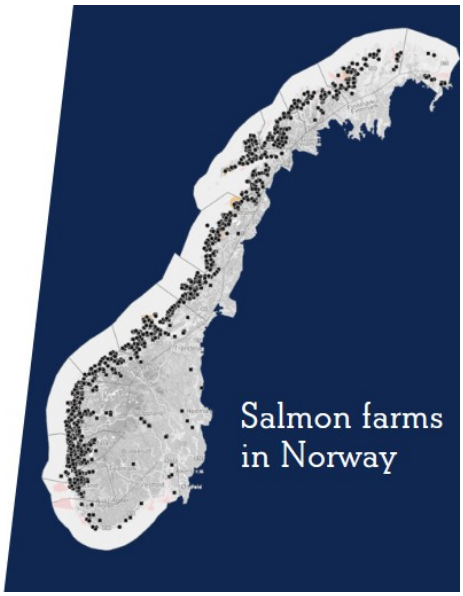
Overview of current sea lice treatments

	Efficacy	Welfare	Environment
Ectosan	100%	✔	None
Pyretheroids	Low	✔	Long
Azamethiphos	Moderate	✔	Short
Avamectin	Low	✔✔	Long
H202	Moderate	✘✘	Short
Fresh water	Declining	✘	None
Mechanical	Moderate	✘✘✘	None

Source: Company analysis

Ectosan + CleanTreat
Large opportunity initially in Norway with significant return potential

- Estimated annual peak revenue: £45m based on conservative assumptions:
  - Treatment market size: 1.1mtons
  - Market penetration: 25%
  - Treatments/year/farm: one
  - Premium price vs treatments in the market
  - Years to reach peak sales (from MA): 2yrs
- Target IRR: 50%



Ectosan roll-out plan

2018

- Field trials in Norway
- Great interest from producers to participate in trial extension
- Obtaining approvals to conduct field trials in other markets.
- Exploring CleanTreat opportunities

2019

- Field trials:
  - UK, Ireland and Faroe Islands
  - Canada
  - Chile

2020

- MA in place

Summary

Key growth drivers

Disease is aquaculture's greatest limiting factor

- Unmet disease solutions in salmon
  - Sea lice greatest restriction on salmon industry growth
  - Virus and bacterial diseases cost to industry over $1bn
- Unmet disease solutions in marine fish
  - Nodavirus and Photobacterium
  - Parasites

Capabilities

- Group track record of commercialising
- New technologies allows first mover advantage
- State of the art manufacturing capacity
- Programmes showing superior performance
- Holistic solutions with BMK synergies

Main opportunities

Salmon

- Ectosan: Commercial trials in Norway, Faroe Islands, UK & Canada
- Exploit CleanTreat for current bath medicines & 'own' future medicines
- Novel Salmon Vaccine portfolio launch — oral vaccines, SRS, PD

Marine Fish

- Mediterranean Vaccine portfolio launch
- Strengthen commercial structure globally
- Global vaccines (VAQ028)

52

Benchmark's [2019 Annual Report] (published in December 2019) included:

Overview

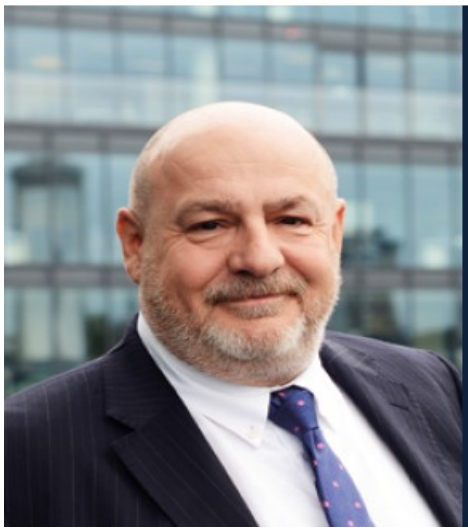
Good progress was made towards the launch of the Group's next generation sea lice treatment (product candidate BMK08) which, together with its co-dependant technology CleanTreat®, has the potential to be transformational, addressing one of the industry's biggest challenges, with a highly efficacious solution with strong environmental and animal welfare credentials.

Operational Highlights

Animal Health (see page 40)

- Next generation sea lice treatment (BMK08) continued to show >99% efficacy in commercial scale trials with top salmon producers across multiple sites in Norway.
- The Group is preparing for commercial launch in Q1 of calendar year 2021, however regulatory timings are not within the Group's control.
- Winner of the AquaNor Innovation Award for CleanTreat®, Benchmark's breakthrough purification system which removes medicinal residues from bath treatments, including, but not limited to BMK08 (see page 42).
- Increased sales of Salmosan® as a result of high levels of sea lice, particularly in Chile; this is indicative of the potential for the Company's product candidate BMK08.

CHALLENGING MARKET CONDITIONS



During the year the Company made good progress towards the launch of BMK08 which, together with its co-dependent technology CleanTreat®, has the potential to be transformational for the industry, delivering a solution with strong environmental and animal welfare credentials.

Peter George
Executive Chairman

During the year the Company made good progress towards the launch of its next generation sea lice treatment, product candidate BMK08, which, together with its co-dependent technology CleanTreat®, has the potential to be transformational for the industry, delivering a solution with strong environmental and animal welfare credentials. The Company is considering the optimal strategy to scale up CleanTreat® given its importance to product candidate BMK08 and its broader industry wide applications.

Animal Health

Progress towards launch of BMK08

I am pleased with the progress made towards the launch of BMK08 supported by our proprietary water purification system, CleanTreat®. During the year the Company conducted additional large-scale trials with new customers which continued to show high levels of efficacy and excellent animal welfare and environmental credentials. The Group is preparing for commercial launch in Q1 2021CY, however regulatory timings are not within the Group's control.

There is increasing recognition in the industry of the breakthrough nature of our sea lice treatment and increasing interest from customers as we approach commercial launch. Sea lice continues to represent the industry's most important biological challenge, resulting in production losses and reputational impact; the market for the treatment and prevention of sea lice is estimated to be £2–£3bn.

Innovation award for CleanTreat®

CleanTreat®, the Company's proprietary system that removes medicinal residues from treatment water, and which is integral to the delivery of BMK08, was awarded a prestigious industry innovation award at the world's largest aquaculture technology exhibition, AquaNor. CleanTreat® addresses one of the biggest concerns in the salmon industry regarding the environmental impact of bath treatments. CleanTreat® has broad potential applications in the aquaculture industry beyond sea lice with the potential to eliminate detectable medicinal residues across bath treatments. The Company is considering the optimal strategy to scale up CleanTreat® given its importance to product candidate BMK08 and its broader applications, including alternative funding strategies with support from its major shareholders.

BMK08 in combination with CleanTreat® is potentially transformative, addressing the urgent need for a highly efficacious treatment that protects the environment and animal welfare.

Streamlining of animal health pipeline and trial facilities

During the year the Company conducted a further review of the health pipeline, led by incoming CSO Alex Raeber, and made the decision to focus efforts on a smaller number of products. We stopped development in projects outside of our core species and in projects that have not passed the proof of concept stage. We also phased out some of our programmes. The Company's main opportunities continue to be product candidate BMK08, and the vaccine portfolios for sea bass/sea bream and salmon. The review extended to the Company's in-house trial facilities and led to the decision to restructure these. The positive impact from this effort will come through from FY2020 onwards.

The Company experienced longer timescales than anticipated in the development of its sea bass/sea bream vaccines, and in establishing the commercial trials of certain pipeline products, which had an impact on Group revenues and on the expected timing of commercial launch of certain products. In addition, it was established that fewer trials of BMK08 were required for its regulatory process than previously anticipated. The Company is adopting a more conservative approach to forecasting development timescales and revenues from new products. It is expected that the first vaccine for the sea bass/sea bream market will be launched in the first half of the calendar year 2020.

Strategic Progress

Progress towards commercialisation of pipeline products

Next generation sea lice treatment (BMK08)

- BMK08 continued to show >99% efficacy in two sets of commercial trials across multiple farms in Norway conducted during the year with new customers.
- Preparing for commercial launch in Q1 calendar year 2021, however regulatory timings are not within the Group's control
- Increased efficiency to maximise the number of tonnes of fish treated per day, a key metric for our customers.

CleanTreat®

- Winner of Aquaculture the AquaNor Innovation Award for CleanTreat®, the Company's breakthrough purification system which removes medicinal residues from bath treatments including BMK08.
- Began trials to test additional molecules with the CleanTreat® system to widen market uptake.
- Further optimisation of CleanTreat® system resulting in a more robust and efficient system ahead of commercial launch.

Neil Robertson
Benchmark's Head of CleanTreat®

How has CleanTreat® advanced since it was first launched in 2017?

Since 2017, the CleanTreat® water purification system has been deployed in Norway to support trials of our next generation sea lice treatment (BMK08). During this time our teams have worked extensively to optimise the operational aspects of the system to meet the needs of our customers.

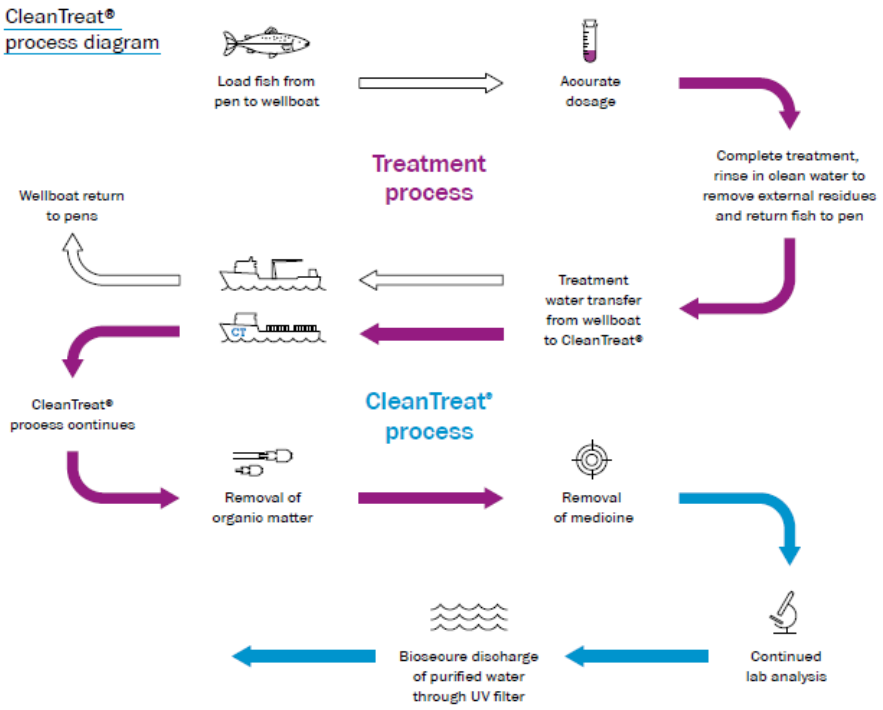
Since the first system has been in operation we have increased the capacity and through-put by more than four times. The current system has purified more than 400,000m^3 of treatment water during field trials in Norway — the equivalent to the amount of water that would be contained in 160 Olympic-size swimming pools.

Our ongoing in-house research has demonstrated that CleanTreat® can be applied broadly in medicinal treatments across the industry. We are very excited by this development which can have a significant impact on the sustainability of the whole aquaculture industry.

What stage is CleanTreat® at in terms of market readiness?

CleanTreat® is already supporting commercial farms and as such is market ready. The current focus of the system is to support trials of BMK08 but we anticipate the system being used more widely in the medium term.

By supporting producers in delivering effective treatments with minimal environmental impact we are creating a new milestone in sustainable aquaculture.


CleanTreat®
process diagram
Load fish from
pen to wellboat
Accurate
dosage
Complete treatment,
rinse in clean water to
remove external residues
and return fish to pen
Treatment
process
Wellboat return
to pens
Treatment
water transfer
from wellboat
to CleanTreat®
CleanTreat®
process continues
CleanTreat®
process
Removal of
organic matter
Removal
of medicine
Continued
lab analysis
Bioscoure discharge
of purified water
through UV filter


STRATEGY IN ACTION
CleanTreat®
by Benchmark
CleanTreat
by Benchmark
WINNER
Nor-Fishing Foundation's
Innovation Award 2019
Benchmark is setting a new environmental standard in the use of medicinal bath treatments. Medicines that are released into the sea are one of the biggest concerns in the aquaculture industry and represent a barrier to future growth.
CleanTreat® — Benchmark's water purification system removes medicines from treatment water before being discharged back into the ocean. The system also filters and removes the organic material from the treatment water including sea lice, egg strings, fish scales and faecal matter, which is an essential development in combating parasitic resistance to medicines.
This new technology provides a significant step towards a future in which no chemicals are discharged into the sea.

Biographies

John Marshall – Head of Animal Health

John is Technical Director of Fish Vet Group (FVG) & Benchmark Vaccines Limited (BVL). John has a degree in Agricultural and Environmental Science (honours in Crop Protection) from Newcastle University and an MBA from Open University with Business Finance and Acquisition Strategy from Harvard University.

He has 20 years' experience in the animal health industry working in R&D, sales and marketing, business development, business unit leadership and leads the Group's R&D teams working on the development, sales and marketing of new animal health vaccines, medicines and biocides. John joined FVG from Novartis Animal Health in 2011 where he was their Head of European Business unit Aquaculture and Head of Global Technical Services – Aquaculture, spending the past 12 years growing the Novartis Aquaculture business and taking to market many new vaccines and pharmaceutical products.

Neil Robertson – Head of CleanTreat

Neil is a veterinary surgeon and has 10 years' experience in the aquaculture industry, including time spent in technical and commercial roles in Norway, UK, Ireland and the Faroe Islands with Novartis Animal Health. More recently, he was European Commercial Manager of Elanco's Aquaculture Division, based in Norway.

He was also an active board member of the Sea Lice Research Centre (SLRC) in Bergen, Norway, representing Novartis Animal Health, and then Elanco.

Neil will work with Benchmark Animal Health's development and commercial teams to support ongoing work towards commercialisation of CleanTreat alongside the launch of Benchmark's next generation sea lice product and third party commercial opportunities.

Media coverage of Benchmark's 'CleanTreat', Ectosan and BMK08:

Fish Farming Expert [reported (28 February 2020)]:

New lice treatment now in hands of regulators

BMK08 is designed to be used in conjunction with CleanTreat, which removes chemical and lice residues from treatment water. Photo: Benchmark.

The arrival of a new salmon lice treatment is a step closer after its maker completed a regulatory dossier on the product as part of the process to win permission to use it.

By Gareth Moore

The BMK08 lice treatment made by aquaculture health, nutrition and genetics business Benchmark Holdings has proved 99% effective in extensive trials in Norway but needs separate approval in each of the different countries where it might be used.

In a report on the first quarter of its 2020 financial year, which runs from October 2019, Benchmark wrote that the dossier had been submitted but didn't say where the submission was made. Regulatory approval is often sought in one country at a time, rather than in several at once, so that any alterations made during the process can then be included in subsequent applications in other jurisdictions.

Prioritised path

A Benchmark spokesperson told Fish Farming Expert: "We need to apply for market authorisations in individual markets. We have prioritised our path, but we cannot say at this point which jurisdictions we have applied in."

Asked how long the regulatory process would take, the spokesperson said the company was preparing for commercial launch in the first half of calendar year 2021, "however regulatory timings are not within our control".

BMK08 is designed to be used with CleanTreat, Benchmark's filtration system used to remove all chemical and lice residues from water used to treat farmed salmon infested with lice.

Commercial launch

CleanTreat, which is also effective on other lice treatments, won the prestigious Innovation Award at the world's biggest aquaculture trade show, Aqua Nor, in Norway last year.

Benchmark recently raised net proceeds of £42 million through a share issue and will use some of the money to scale up CleanTreat ahead of the commercial launch of BMK08.

In the Q1 report, Benchmark executive chairman Peter George said: "The submission of our regulatory dossier for BMK08, our novel sea lice treatment, is a significant milestone. Following the recent fundraise we are in a strong financial position to prepare for the commercial launch."

Benchmark triumphs in Aqua Nor innovation contest

Aquaculture health, breeding and nutrition business Benchmark's CleanTreat system has today won the prestigious Innovation Award at the...

Published 28.02.2020 15:38 *(Updated 28.02.2020 15:48)*

Fish Farming Expert reported (21 February 2020):

fishfarmingexpert

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Community Fish Health Lice Politics & Government Production Archive Opinion

Home > News > Boss backs Benchmark with £½m share buy-up

Boss backs Benchmark with £½m share buy-up

Peter George spent more than £500,000 on Benchmark shares. Photo: Benchmark.

Peter George, the executive chairman of aquaculture health, nutrition and genetics business Benchmark Holdings, invested more than £½ million in the company during its recent fund-raising share offer.

By Gareth Moore

George spent £527,287.60 to buy 1,318,219 shares priced at 40 pence, according to a market disclosure by Benchmark.

Chief financial officer Septima Maguire bought 250,000 shares for £100,000, and non-executive director Yngve Myhre spent £80,000 on 200,000 shares. Myhre is a former chief executive of Norwegian salmon farmer SalMar and current boss on Nova Austral, a US/Norwegian owned salmon farmer in the far south of Chile.

Three other non-executive directors – Susan Searle (100,000 shares), Hugo Wahnish (75,000) and Kevin Quinn (25,000) - also bought shares in the offer, as did chief scientific officer Alex Raeber (7,658).

CFO Septima Maguire bought 250,000 shares. Photo: Benchmark.

In total, the directors and Raeber, who are all classed as persons discharging managerial responsibilities, invested £790,350.80.

The share offer raised £43 million for Benchmark, which intends to spend £19m scaling up its CleanTreat water treatment system in preparation for the roll-out of its BMK08 sea lice treatment once that wins permission for use from regulatory authorities.

Benchmark raises £43m from share sale

Aquaculture health, nutrition and genetics business Benchmark Holdings today announced that it conditionally raised £43 million by selling shares...

Published 21.02.2020 12:33 *(Updated 21.02.2020 12:40)*

Undercurrent News [reported (18 February 2020)]:

undercurrentnews
seafood business news from beneath the surface

COMPANIES ATLANTIC SALMON AQUATECH

Benchmark raises £43m to scale up sea lice treatment

By Undercurrent News Feb. 18, 2020 09:43 GMT

Benchmarks CleanTreat system won the aquaculture innovation award at AquaNor 2019, and is set for commercial release next year. Credit: Benchmark Holdings

The UK aquaculture health, nutrition and genetics service Benchmark Holdings has raised a sum of £43 million ($55.8m) in order to scale up its sea lice treatment system, it announced in a press release.

According to Benchmark, the company issued an open offer and a placing on the London stock exchange, at an issue price of £0.40 per ordinary share.

The open offer, announced Jan. 30, formally closed on Feb. 13, selling 30.6m open offer shares and 91m placing shares. These are subject to "passing the relevant resolutions at the general meeting to be held later today," Benchmark said.

The money raised will now be used by Benchmark to scale up its CleanTreat system, which uses wellboats to provide medicine to salmon while removing sea lice in a contained system. The company plans to use this in conjunction with its upcoming medicinal treatment, BMK08, to limit the release of residue and resistant sea lice back into the sea.

Fish Farmer magazine [reported in February 2020]():

Fish Farmer

Sea Lice CleanTreat

Norwegian scale up for award winning UK innovation

11 Feb 2020

THE company behind the prize winning CleanTreat filtration technology that cleanses treatment water after delousing is looking to scale up the system. Benchmark Holdings said last month it plans to invest £19 million in the breakthrough innovation ahead of the launch of its new sea lice medicine, BMK8 (formerly known as Ectosan), due in the first half of 2021.

Over the past 24 months, more than 35,000 tonnes of salmon in five Norwegian farms have been treated with BMK08, achieving approximately 99 per cent efficacy, said Benchmark.

The compound must be used in conjunction with CleanTreat, which removes medicinal residues from treatment water.

Benchmark said there is growing interest from customers for the product and it estimates that BMK08/CleanTreat sales could reach £50 million in Norway alone and £75 million globally.

However, there have been no trials of the products in Scotland yet, due to regulatory bottlenecks. The slow pace of Scottish bureaucracy emerged during the Aqua Nor show in Trondheim last August, when Benchmark won the coveted Innovation Award for CleanTreat.

John Marshall, head of Animal Health at Benchmark, said at the time that his company had been approached by all the Scottish producers, interested in deploying CleanTreat at their farms, and he hoped there would be Scottish trials soon.

Marshall and head of CleanTreat Neil Robertson held meetings during Aqua Nor with Scotland's rural economy minister Fergus Ewing and Graham Black, director of Marine Scotland, to try to speed up Scottish trials.

Roberston said after the discussions: 'We're encouraged by the positive message from the minister and from Marine Scotland. I think there is a really strong incentive to support us from the industry, and certainly from government as well.'

Left: Benchmark's John Marshall (left) and Neil Robertson at Aqua Nor last August

Marshall added: 'The Innovation Award has helped in that everybody is saying this really works now, it's got that big stamp of approval.

'It's not a case of having to have new regulation. I think there is regulation in Scotland to deal with it but, of course, regulations are interpreted and it's about the interpretation of how you use the current regulation along with CleanTreat.'

CleanTreat, developed over a 10-year period at Ardtoe in Scotland, has the potential to be used on well boats, tankers, platforms and onshore, and has proven to be effective on most available bath treatments for sea lice, including pyrethroids, deltamethrin, and azamethiphos. The solution also removes treated sea lice, so they will not spread resistance.

Chemical based bath treatments that are released into the water are one of the biggest grounds for objections to the aquaculture industry.

Some farm sites have to treat over an extended period due to low discharge consents, but the CleanTreat system would allow treatments to be carried out over a reduced time as the

Medicine has been removed from the water before discharge.

Ewing, whose office met the Benchmark team shortly after Aqua Nor, said he wanted to ensure that such sustainable technologies like CleanTreat are not only developed in Scotland but that Scotland is also an attractive place to trial such technologies.

'Given the environmental benefits and sustainability credentials of the CleanTreat system, and huge potential for improvements in fish health, we would like to offer further support to reach a positon whereby trials could be started in Scotland.'

Representatives from Marine Scotland and the Scottish Environment Protection Agency (Sepa) toured a vessel fitted with the CleanTreat system last September, when it was docked in Leith before sailing for Norway to work on Norwegian salmon farms.

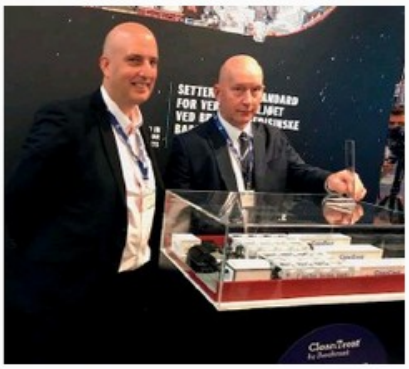
Norwegian agencies have been strongly supportive of the system's development and it will be the first market for a commercial roll-out.

Scotland was the preferred next market, but this is dependent on the regulatory process, said Benchmark.

'We continue to actively work with the various authorities to bring this innovative process to our Scottish and Norwegian customers,' said Robertson.

> "We have been meeting with Benchmark to guide them through the regulatory framework"

At Aqua Nor, they had had meetings with potential customers in the other big salmon producing countries.



'Many of our customers based in Norway certainly have interests in Chile and Canada as well, and the Faroe Islands,' said Robertson during the exhibition.

Marshall added that their system is 'revolutionising the way that we use medicines and we want to make it available for everybody'.

Benchmark has revealed plans to raise a net sum of £41.5 million – to fund CleanTreat and other business- through share issues.

Executive chairman Peter George said last month: 'We are preparing to launch BMK08, our novel medicinal treatment to combat sea lice, one of the main biological challenges in salmon farming.

'This requires scaling up CleanTreat, our proprietary system that removes medicinal residues from treatment water, and which is integral to the delivery of BMK08.

'Having reviewed a number of funding options, we strongly believe that an equity raise is the optimal funding strategy to deliver this scale.'

A Marine Scotland spokesman told Fish Farmer in January: 'At the moment we and Scottish Environmental Protection Agency and the Veterinary Medicines Directorate have been meeting with Benchmark on a regular basis to guide them through the regulatory framework to allow trials to start in Scotland; this work is ongoing.'

Proactive Investors reported (5 February 2020):

Health

view Benchmark Holdings PLC

Benchmark team discuss £43mln raise and commercial development of CleanTreat

Andrew Scott

12:29 Wed 05 Feb 2020

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Finance

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4 days, 23 hours ago

Mining

Benchmark Holdings PLC's (LON:BMK) Peter George and Septima Maguire discuss with Proactive's Andrew Scott some of the detail around their planned £43mln fundraise which is being carried out by way of a share placing and open offer.

The raise is being done to fund the commercial development of its CleanTreat system.

It's a proprietary system that removes medicinal residues from treatment water and which is integral to the commercial delivery of product candidate BMK08, the company's novel sea lice treatment for sea lice.

Fish Farming Expert reported (30 January 2020):

Benchmark plans share issue to fund CleanTreat scale-up

Benchmark's CleanTreat system is essential for the roll-out of its anti-lice treatment BMK08. Photo: Benchmark.

Regulatory approval

Benchmark' executive chairman Peter George said: "We are preparing to launch BMK08, our novel medicinal treatment to combat sea lice, one of the main biological challenges in salmon farming.

"This requires scaling up CleanTreat, our proprietary system that removes medicinal residues from treatment water, and which is integral to the delivery of BMK08. Having reviewed a number of funding options, we strongly believe that an equity raise is the optimal funding strategy to deliver this scale."

Peter George: "An equity raise is the optimal funding strategy."

Benchmark said it anticipates launching BMK08 in the first half of 2021 following its anticipated regulatory approval, and that this will require scaling up CleanTreat, with an associated funding requirement.

The Fish Site reported (30 January 2020):

Benchmark seeks millions more for novel sea lice treatments

BREEDING & GENETICS · SEA LICE · HEALTH

by The Fish Site
30 January 2020, at 8:54am

Benchmark has targeted raising £43 million in order to scale up and speed up the commercialisation of its novel sea lice treatment system CleanTreat.

The aquaculture health, nutrition and genetics business, has announced this morning that it has conditionally raised £36.4 million by way of a placing at an issue price of 40p per ordinary share and intends to raise up to a further £6.6 million by way of an open offer to qualifying shareholders at an issue price of 40p per ordinary share.

Benchmark hopes to raise £19 million to speed up the commercialisation of CleanTreat

The company has earmarked £19 million to fund the commercial development of CleanTreat, which removes medicinal residues from treatment water, in order to support the launch of the its novel sea lice medication, which is currently known as BMK08. The group is preparing to launch the two systems in the first half of 2021, subject to receipt of regulatory approval for the treatment product.

Over the last 24 months, over 35,000 tonnes of salmon in Norway have been treated with BMK08 in combination with CleanTreat - with the former achieving approximately 99 percent efficacy,

Benchmark's directors believe there is demonstrable and growing interest from customers for the product and estimates that the BMK08 / CleanTreat solution could reach peak annual sales of £50 million in Norway alone and £75 million globally.

The directors have said that they "strongly believe" that raising the extra funds "represents the optimal scale-up strategy for CleanTreat ahead of the anticipated BMK08 regulatory approval" by increasing its speed to market, delivering a higher expected return-on-investment and maximising value for Benchmark shareholders by retaining full ownership of CleanTreat.

Peter George, executive chairman of Benchmark, commented: "We are preparing to launch BMK08, our novel medicinal treatment to combat sea lice, one of the main biological challenges in salmon farming. This requires scaling up CleanTreat, our proprietary system that removes medicinal residues from treatment water, and which is integral to the delivery of BMK08. Having reviewed a number of funding options, we strongly believe that an equity raise is the optimal funding strategy to deliver this scale."

Intrafish reported (30 January 2020):

IntraFish Aquaculture Fisheries Processing Markets Feed Opinion

Aquaculture biotech group Benchmark raises $50 million to launch new sealice treatment

Some directors have subscribed to buy shares in the offering.

30 January 2020 9:00 GMT *UPDATED 30 January 2020 13:26 GMT*
By **Demi Korban**

Aquaculture biotechnology firm Benchmark secured £36.4 million (€43 million/$47 million) in a stock offer to support the launch of its new products.

The UK-based company also intends to raise an additional £6.6 million (€7.7 million/$8.5 million) through an open offer to support product launches.

The sale price of the London-listed stock was £0.40 (€0.47/$0.52) per ordinary share. The company did not disclose who bought shares through the offer, however, some unnamed directors expected to buy shares in the private placement.

The company intends to use a big chunk of the raised capital to fund the development of its CleanTreat system, which removes medicinal residues from treatment water.

This comes prior to the commercial delivery of BMK08, the company's new sealice treatment.

Another part of the raised money -- £16 million (€19 million/$21 million) -- will be secured for a general increase in working capital in the group.

The biggest farmed salmon escapes of 2019
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Scottish salmon farmers are spending 47% less on medicines thanks to sealice-eating cleanerfish
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7 January 2020 23:41 GMT

Benchmark shares take 10% plunge after disappointing 2019 performance
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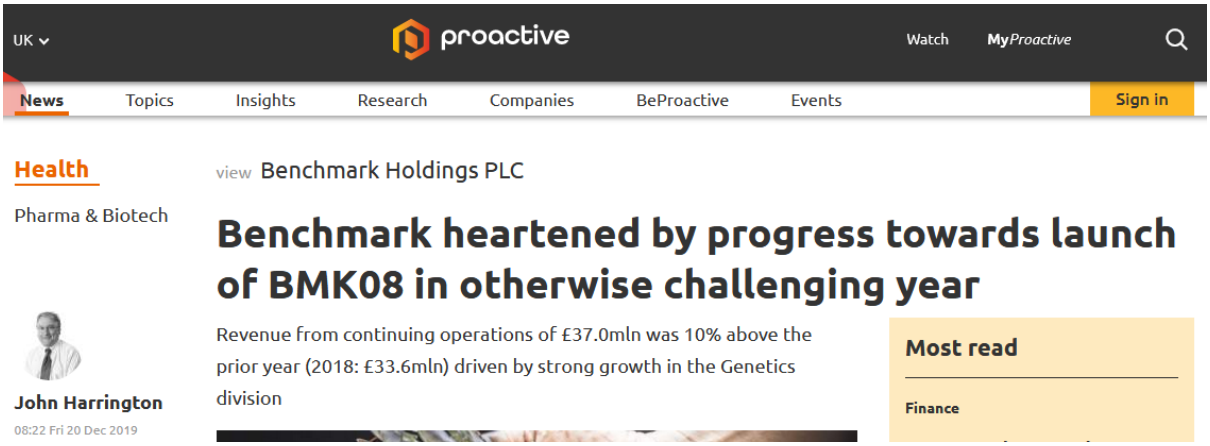
Marketplace
12 December 2019 21:12 GMT

Private equity-backed company moving forward with Canada's first lumpfish hatchery
Aquaculture
12 December 2019 23:13 GMT

Proactive Investors reported (20 December 2019):



"During the year the company made good progress towards the launch of BMK08 which, together with its co-dependent technology CleanTreat, has the potential to be transformational for the industry, delivering a solution with strong environmental and animal welfare credentials," said Peter George, the executive chairman of Benchmark.

Fish Farming Expert reported (20 December 2019):

Benchmark losses rise to £83m after tough year

CleanTreat on test in Norway. Gaining regulatory approval for CleanTreat and BMK08 are priorities for 2020. Photo: Benchmark.

Aquaculture health, advanced nutrition and genetics business Benchmark Holdings has placed the launch of its new BMK08 lice treatment as a priority in 2020 after a tough year in which losses increased to £83 million from £4.4m in 2018.

By Pål Mugaas Jensen

Revenue dropped slightly to £127m in 2019 (fiscal year ended September 30) compared to the £132m earned in 2018.

"Following these disappointing results, and the management changes announced in August, our priorities for the coming year are to deliver the programme of disposals and restructuring, to obtain regulatory approval and prepare for launch of BMK08 and CleanTreat and to execute our strategy in our core business areas of Genetics and Advanced Nutrition, including the launch of SPR (specific pathogen resistant) shrimp and the expansion of our health and specialist diets segments in Advanced Nutrition," said executive chairman Peter George in a comment accompanying Benchmark's full-year results today.

Treatment residues

CleanTreat, which removes all treatment residues from water used to treat salmon for lice, won the Innovation Award at the world's biggest aquaculture trade show, Aqua Nor, in Trondheim in August.

BMK08, which Benchmark previously called Ectosan, must be used in conjunction with the CleanTreat system, but CleanTreat can be used without BMK08 to remove residues of other treatments.

Undercurrent News reported (2 December 2019):

undercurrentnews
seafood business news from beneath the surface

WHITEFI$H R&D AQUATECH

Benchmark: 'Breakthrough' salmon lice treatment combo could be available by end of 2020

By Dan Gibson Dec. 2, 2019 10:17 GMT

Benchmarks CleanTreat system won the aquaculture innovation award at AquaNor 2019, and is set for commercial release next year. Credit: Benchmark Holdings

ucn HOME › PRICE$ › $PECIE$ › COMPANIE$ › DOWN$TREAM ›

UK animal health and genetics services provider Benchmark Holdings has set a rough guideline for the full commercial release of its anticipated sea lice treatment product, with the regulatory process "progressing towards approval in late calendar year 2020".

The product candidate, named BMK08, has continued to show around 99% effectiveness as well as "excellent animal welfare and environmental credentials" in tests, Benchmark said in its Q4 financial update.

"There is increasing recognition in the industry of the breakthrough nature of our solution and growing interest from customers while the regulatory approval process is progressing according to plan," the firm said.

Nevertheless, revenues from commercial-scale field trials were lower than in 2018, as the program of trials for BMK08 draws to a close.

Meanwhile, the company's CleanTreat system, which won the Aquaculture Innovation award at AquaNor 2019, is also planned to move from trial mode to full commercial release next year.

CleanTreat, a water purification system, removes organic material and medicines from salmon treatment water before releasing the water back to the sea. In this way, Benchmark hopes it can remove treatment-resistant sea lice from farms, preventing them from spreading and building resistance among other lice.

"During the year the group made good progress towards the launch of product candidate BMK08 which, together with its co-dependant technology CleanTreat, has the potential to be transformational for the industry, delivering a solution with zero environmental impact to one of the industry's biggest challenges," said executive chairman Peter George in the firm's update.

"The company is considering the optimal strategy to take CleanTreat from trial to commercial-scale given its importance to product candidate BMK08 and its broader industry-wide applications," George added, "including alternative funding strategies with support from its major shareholders".

In Chile this year Benchmark claims to have seen increased sales of its existing sea lice treatment, Salmosan, which it said is indicative of the potential demand for BMK08.

Fish Farming Expert reported in October 2018:

fishfarmingexpert

Two-year wait for 'next generation' lice treatment

A new lice treatment developed by UK-based aquaculture genetics, health and nutrition company Benchmark is unlikely to be available before the end of 2020 or early 2021.

By Daniella Balin

Ectosan has proven to be 100% effective in commercial trials in Norway, but Benchmark has warned it will take time to secure the patents or authorisations for it. It is waiting to complete regulatory procedures.

The chemical, which Benchmark describes as its "next generation" lice treatment, is used on wellboats in conjunction with the company's CleanTreat filtration system, which removes any detectable trace of medication from the treatment water before it is discharged into the sea, generating zero impact.

New molecule

Benchmark chief executive Malcolm Pye, visiting Chile for the Aquasur trade show, told Fish Farming Expert's Chilean sister site, Salmonexpert.cl, that Ectosan is a product that includes a new molecule and innovative technology.

Pye said Benchmark is in the process of patenting Ectosan in Norway and globally. "We still have work to do regarding patents and authorisations," he explained.

A clean break

- CleanTreat was developed by Benchmark Animal Health at its Ardtoe Marine Laboratory in Scotland.
- It uses a unique purification system to compound and solidify the chemicals used in bath treatments. These solids can then be incinerated at a specialist processing plant.
- So far CleanTreat has been trialled with a number of sea lice treatments compounds including pyrethroids, deltamethrin, azamethiphos, as well as Ectosan.

The CleanTreat system, which is available now, cannot be used with hydrogen peroxide but is suitable for all other currently available bath treatments used against sea lice, as well as several additional chemical classes.

According to Benchmark, the system is working well in field trials and will be available imminently for use with other chemicals. Benchmark is continuing to optimise its performance in terms of speed and efficiency.

Pye continued: "Our intention is that there will be no impacts on the sea after performing antiparasitic treatments on the fish.

"This is a step that the industry has wanted to take some time, to move away from carrying out treatments and discharging water containing antiparasitic products in the open sea."

The Fish Site reported in March 2018:

Innovative treatment system gets an upgrade

by Rob Fletcher
22 March 2018, at 12:00pm

A new vessel which has been modified and fitted with an increased capacity for the use of Benchmark's CleanTreat system set sail for Norway from Scotland this week.

It's the second vessel to be fitted with the pioneering system, which allows a range of chemical bath treatments to be used to treat farmed fish infected with ectoparasites such as sea lice without any chemical residues being discharged into the water. And the new vessel has capacity up to 1200m^3 per hour, allowing it to clean the water used for treatments in a 3000m^3 wellboat in under three hours, a marked improvement on the speed of the previous CleanTreat vessel.

John Marshall, head of Benchmark Animal Health, which developed the system at their Ardtoe Marine Laboratory, explained the latest updates at this week's Fish Vet Society conference, near Edinburgh.

CleanTreat is, he explained, "suitable for all currently available bath treatments used against sea lice, other than hydrogen peroxide" and uses a unique purification system to compound and solidify the chemicals used in the treatments. These solids, he added, can then be incinerated at one of the world's three specialist processing plants for these operations.

If has, so far, been trialled with a number of sea lice treatments compounds including pyrethroids, deltamethrin, azamethiphos, and Benchmark's new trial bath treatment.

However, he also believes that – as the treatment water is processed through CleanTreat's unique triple purification system before being released back into the sea clean and free of medicinal residues – the system could open up a very wide range of treatment options.

"There are at least two new products it could bring to market and I think it could open the door to other products not yet considered – perhaps from other areas, depending on regulations," he said.

Fish Farming Expert reported in December 2017:

fishfarmingexpert

New lice bath '100% effective' and pollution-free

Aquaculture health, nutrition, and genetics business Benchmark has announced that a new bath treatment has proved 100% effective against sea lice in commercial trials in Norway.

By Gareth Moore

The treatment, Ectosan, which has been developed by the UK-based company, was delivered through the company's CleanTreat filtering system - which removes any detectable traces of medicine from treatment water before it is discharged into the sea - meaning that the treatments had no environmental impact.

Benchmark believes that Ectosan can eventually achieve worldwide sales of £40-50 million annually. It will continue field trials in key markets through 2018 and 2019.

Transformational change

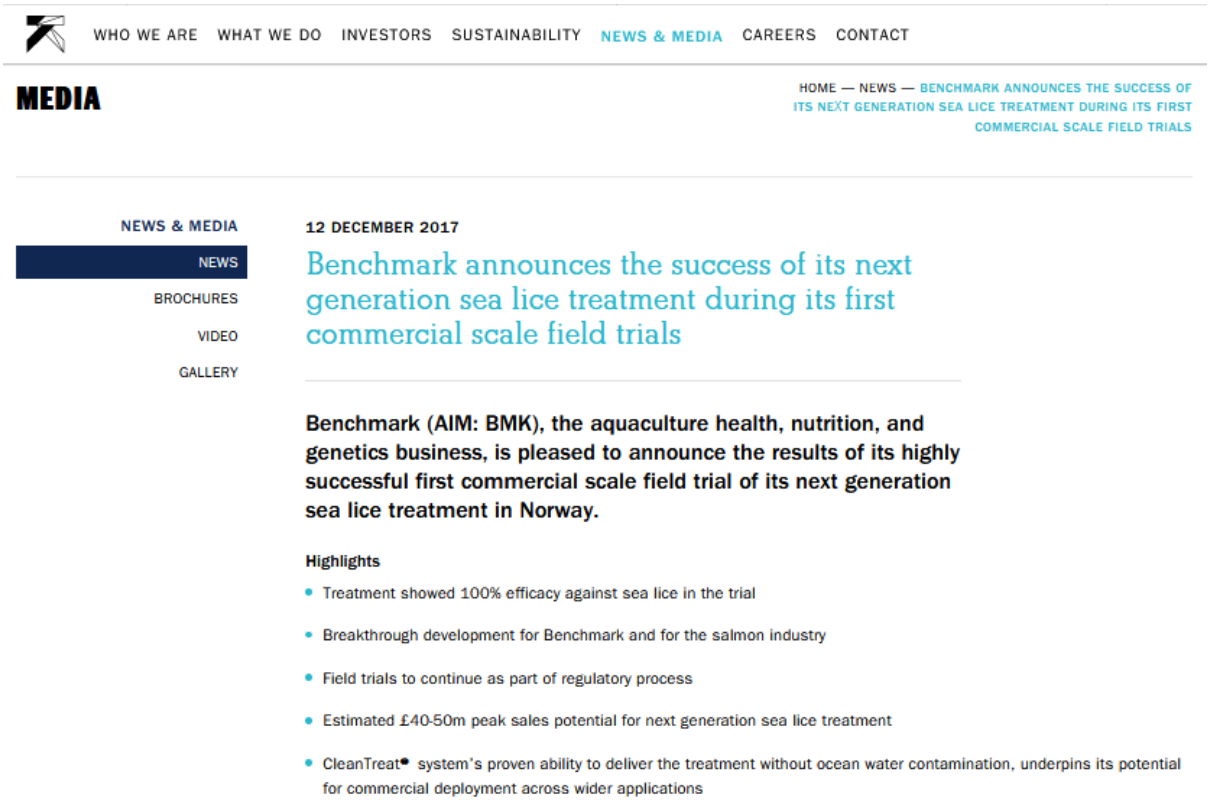
Chief executive Malcolm Pye said: "This is major breakthrough for Benchmark and the salmon industry. The combination of our next generation sea lice treatment, together with CleanTreat represents a transformational change in the battle against one of the industry's greatest challenges, and a big step towards a future where no medicinal residues are discharged directly into the oceans.

"Given its significance to the industry and interest expressed by our customers, we expect to see substantial demand for the treatment and look forward to providing the treatment more widely upon regulatory approval."

Benchmark would not comment further on Ectosan or how it works.

The company launched CleanTreat at Aqua Nor in Trondheim in August. A Benchmark spokesperson said: "CleanTreat can also be used with other bath treatments. Essentially CleanTreat could transform the salmon industry in terms of reducing environmental impact. There isn't another system like it, it's the first of its kind."

It seems that Benchmark re-wrote the original press release in December 2017 expunging the reference to Ectosan. Here's the [press release on Benchmark's web-site]:



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MEDIA

HOME — NEWS — BENCHMARK ANNOUNCES THE SUCCESS OF ITS NEXT GENERATION SEA LICE TREATMENT DURING ITS FIRST COMMERCIAL SCALE FIELD TRIALS

NEWS & MEDIA
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VIDEO
GALLERY

12 DECEMBER 2017

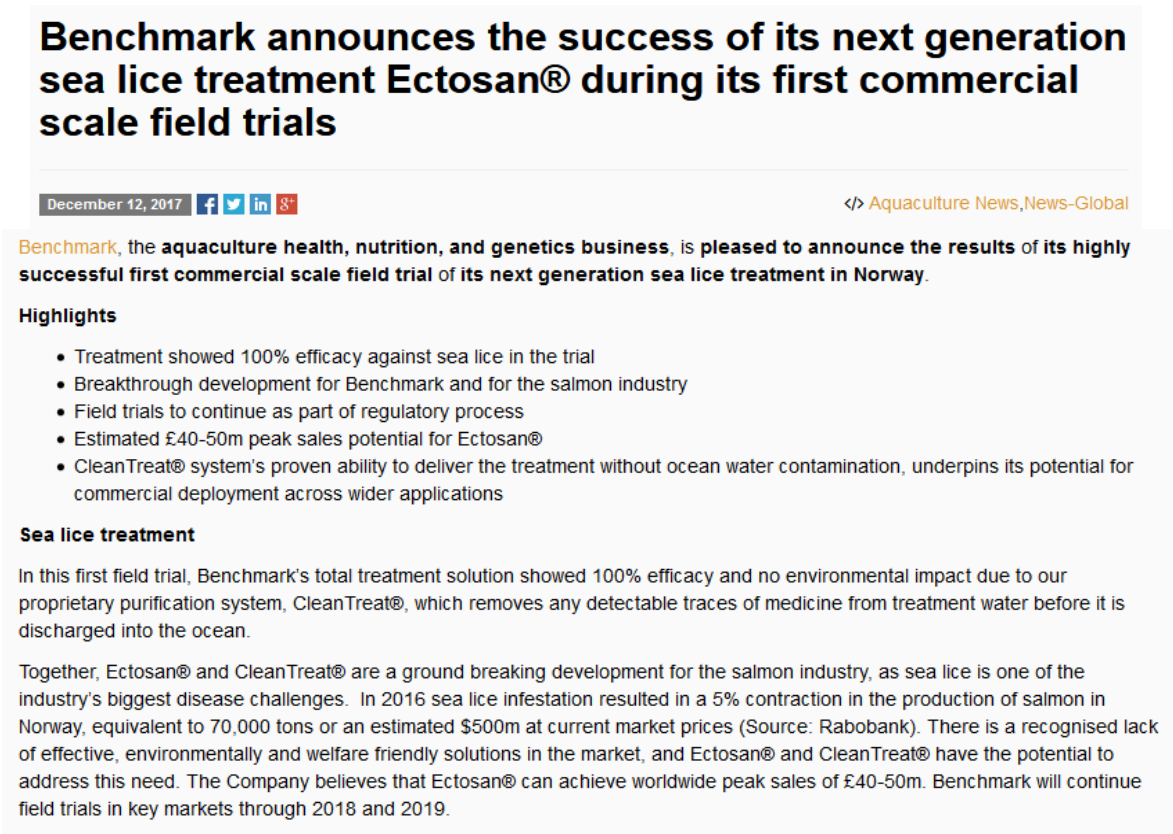
Benchmark announces the success of its next generation sea lice treatment during its first commercial scale field trials

Benchmark (AIM: BMK), the aquaculture health, nutrition, and genetics business, is pleased to announce the results of its highly successful first commercial scale field trial of its next generation sea lice treatment in Norway.

Highlights

- Treatment showed 100% efficacy against sea lice in the trial
- Breakthrough development for Benchmark and for the salmon industry
- Field trials to continue as part of regulatory process
- Estimated £40-50m peak sales potential for next generation sea lice treatment
- CleanTreat® system's proven ability to deliver the treatment without ocean water contamination, underpins its potential for commercial deployment across wider applications

Here's [media coverage via the Aquaculture Directory]:



Benchmark announces the success of its next generation sea lice treatment Ectosan® during its first commercial scale field trials

December 12, 2017

</> Aquaculture News,News-Global

Benchmark, the **aquaculture health, nutrition, and genetics business**, is **pleased to announce the results** of **its highly successful first commercial scale field trial** of **its next generation sea lice treatment in Norway**.

Highlights

- Treatment showed 100% efficacy against sea lice in the trial
- Breakthrough development for Benchmark and for the salmon industry
- Field trials to continue as part of regulatory process
- Estimated £40-50m peak sales potential for Ectosan®
- CleanTreat® system's proven ability to deliver the treatment without ocean water contamination, underpins its potential for commercial deployment across wider applications

Sea lice treatment

In this first field trial, Benchmark's total treatment solution showed 100% efficacy and no environmental impact due to our proprietary purification system, CleanTreat®, which removes any detectable traces of medicine from treatment water before it is discharged into the ocean.

Together, Ectosan® and CleanTreat® are a ground breaking development for the salmon industry, as sea lice is one of the industry's biggest disease challenges. In 2016 sea lice infestation resulted in a 5% contraction in the production of salmon in Norway, equivalent to 70,000 tons or an estimated $500m at current market prices (Source: Rabobank). There is a recognised lack of effective, environmentally and welfare friendly solutions in the market, and Ectosan® and CleanTreat® have the potential to address this need. The Company believes that Ectosan® can achieve worldwide peak sales of £40-50m. Benchmark will continue field trials in key markets through 2018 and 2019.

[5] 'Silent Spring of the Sea' (a chapter in the award-winning book 'A Stain Upon the Sea' published in 2004) includes:

Teflubenzuron (Calicide)—A hazardous, wasteful and persistent marine pollutant

Teflubenzuron is a highly hazardous marine pollutant, lethal to shellfish in tiny doses, extremely persistent in the sediment under salmon cages and in the flesh of farmed salmon, and a suspected carcinogen. Hardly a suitable candidate for use on sea cage salmon farms, yet that is what salmon farmers reached for when they needed to replace dichlorvos and azamethiphos.

Teflubenzuron is a benzoylphenyl urea insecticide, initially introduced in 1984 to protect fruit, vegetables and cotton. By the 1990s, though, chemical resistance was already being reported in land-based pests,[173] so Nutreco (owners of Marine Harvest), in conjunction with the US chemical giant American Cynamid, developed teflubenzuron (trade name Calicide) for aquaculture. Sea cage fish farming is in danger of becoming a dumping ground for chemicals which are past their sell by date on land.

SEPA's role in authorizing teflubenzuron is typical of the manner in which governments in Norway, Canada, Chile and Ireland have allowed private profit to outweigh the public interest. SEPA's current policy on teflubenzuron was published in July 1999 and is based almost exclusively on Nutreco's unpublished private and confidential reports. The impact of teflubenzuron on crustacea such as lobsters is of primary concern, and SEPA's policy admits that teflubenzuron "is potentially highly toxic to any species which undergo moulting in their life cycle." As SEPA points out in the "environmental risk assessment": "This will therefore include some commercially important marine animals such as lobster, crab, shrimp and some zooplankton species."[196] In spite of this, SEPA began handing out licences to use teflubenzuron in 2000 and by March 2004 had issued 212.[197]

Meanwhile, the case against teflubenzuron is building all the time.[198] Little wonder then that salmon farmers want to bury the evidence. When a secret trial on its environmental impact was conducted in 1996 in the waters around the Isle of Skye, the first the locals knew about it was when their shellfish started dying. "We were unaware of the use of teflubenzuron until massive crab, prawn, squat lobster, and sea urchin deaths were observed in Lochbay," claims Aileen Robertson, who runs a diving centre in the area. "Scallop divers had to move to another sea loch, and the creel fisherman had to stop fishing. Even staff at the fish farm were alarmed to hear what was going on and gave us labels for the medicated food they had been given to use. We got the safety data, worked it out, and called the Scottish Environment Protection Agency. They had given consent for its sea trial with no public notification or advertisement. How do they get away with it?!"(Aileen Robertson, pers. comm.)

Read more via Rob Edwards writing in The Sunday Herald in 2015: "Salmon farm drug that kills wildlife to be withdrawn from market"

[6] SEPA have refused to provide information on Ectosan, BMK08 & CleanTreat on numerous occasions:

SEPA Disclosure Log

Click to view the SEPA General Data Reuse Statement

From date: 01/01/2005 To date: 16/03/2020 Apply Date Filters Clear All Filters

Ref Number	Title	Date
F0191595	Formal Review of F0191311 BK08 and Ectosan	13/03/2020

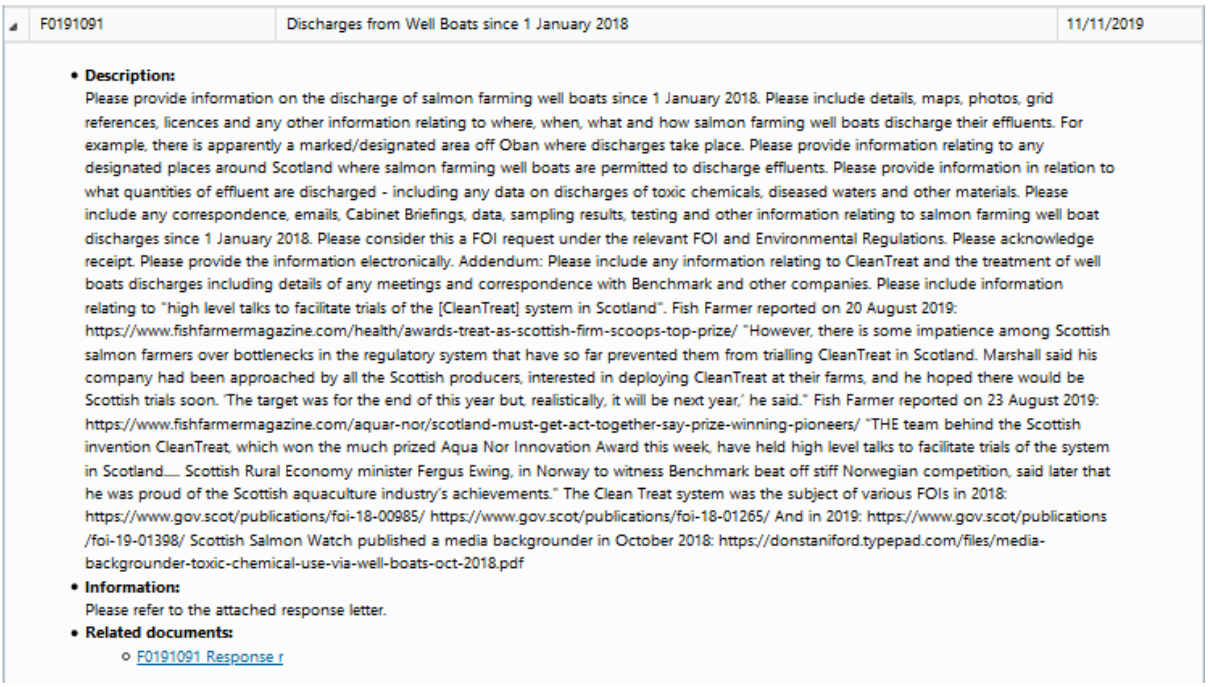
- **Description:**
  [...] strongly objects to SEPA's refusal which cited commercial confidentiality. [...]considers such a blanket refusal unreasonable and does not see an overriding public interest in protecting commercial or industrial information. The public interest is surely served best by disclosing specific details including the active ingredients in BMK08 and Ectosan. Secret trials took place two decades ago in Scotland in relation to Calicide (Teflubenzuron) and that did not end well. The public case for disclosure is much stronger than the case for protecting commercial confidentiality. It is obvious that Benchmark (as the manufacturer of BMK08 and Ectosan) is a company which wants to maximise investment, profit and economic returns by delaying disclosure. However, SEPA's duty is not to the shareholders of Benchmark but to the Scottish environment and the Scottish public whose livelihoods may be impacted by the Norwegian and other foreign investors controlling Benchmark.
- **Information:**
- **Related documents:**
  - 2020130 F0191198 Q6 redactions v1.0 redacted
  - F0191595 FR (EIR) Response r
  - F0191595 Review Officer Report

F0191465	Formal Review of F0191380 CleanTreat	24/02/2020

- **Description:**
  I regret that I have to request a review in relation only to part 4 of the request, relating to the Clean Treat correspondence. I would argue that if the process devised by this company is truly novel steps will surely have been taken to protect any intellectual property. There is surely an overwhelming public interest in finding out if there is a way of dealing with sealice that does not involve adding to the burden of pollution? SEPA may be interested to see the annexed exchange.
- **Information:**
- **Related documents:**
  - 2020130 F0191198 Q6 redactions v1.0 redacted
  - F0191465 FR (EIR) Response r
  - F0191465 Review Officer Report

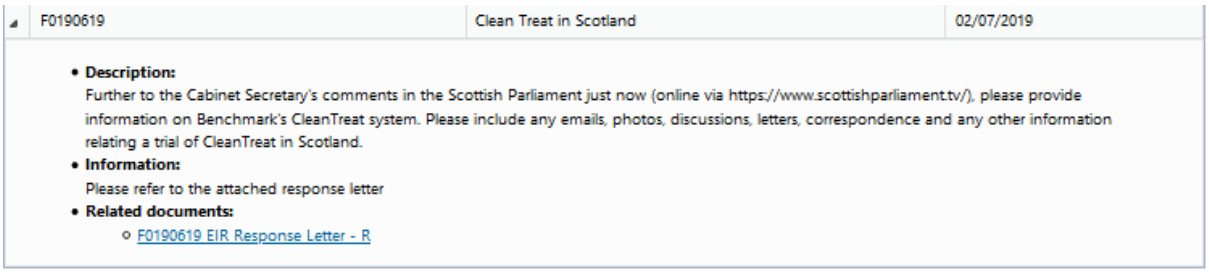
F0191311	BMK08 & Ectosan	07/01/2020

- **Description:**
  Please provide information on BMK08 and Ectosan (which may be one of the same) since 1 January 2018.
- **Information:**
  Please refer to response letter.
- **Related documents:**
  - F0191311 Response r



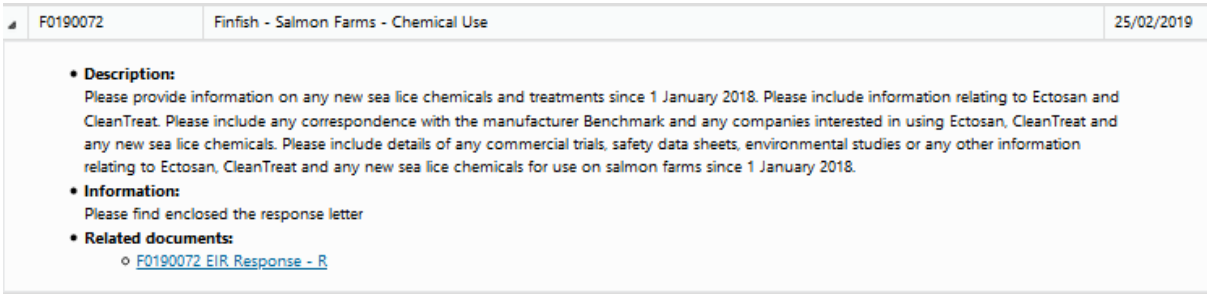
F0191091	Discharges from Well Boats since 1 January 2018	11/11/2019

- **Description:**
  Please provide information on the discharge of salmon farming well boats since 1 January 2018. Please include details, maps, photos, grid references, licences and any other information relating to where, when, what and how salmon farming well boats discharge their effluents. For example, there is apparently a marked/designated area off Oban where discharges take place. Please provide information relating to any designated places around Scotland where salmon farming well boats are permitted to discharge effluents. Please provide information in relation to what quantities of effluent are discharged - including any data on discharges of toxic chemicals, diseased waters and other materials. Please include any correspondence, emails, Cabinet Briefings, data, sampling results, testing and other information relating to salmon farming well boat discharges since 1 January 2018. Please consider this a FOI request under the relevant FOI and Environmental Regulations. Please acknowledge receipt. Please provide the information electronically. Addendum: Please include any information relating to CleanTreat and the treatment of well boats discharges including details of any meetings and correspondence with Benchmark and other companies. Please include information relating to "high level talks to facilitate trials of the [CleanTreat] system in Scotland". Fish Farmer reported on 20 August 2019: https://www.fishfarmermagazine.com/health/awards-treat-as-scottish-firm-scoops-top-prize/ "However, there is some impatience among Scottish salmon farmers over bottlenecks in the regulatory system that have so far prevented them from trialling CleanTreat in Scotland. Marshall said his company had been approached by all the Scottish producers, interested in deploying CleanTreat at their farms, and he hoped there would be Scottish trials soon. 'The target was for the end of this year but, realistically, it will be next year,' he said." Fish Farmer reported on 23 August 2019: https://www.fishfarmermagazine.com/aquar-nor/scotland-must-get-act-together-say-prize-winning-pioneers/ "THE team behind the Scottish invention CleanTreat, which won the much prized Aqua Nor Innovation Award this week, have held high level talks to facilitate trials of the system in Scotland..... Scottish Rural Economy minister Fergus Ewing, in Norway to witness Benchmark beat off stiff Norwegian competition, said later that he was proud of the Scottish aquaculture industry's achievements." The Clean Treat system was the subject of various FOIs in 2018: https://www.gov.scot/publications/foi-18-00985/ https://www.gov.scot/publications/foi-18-01265/ And in 2019: https://www.gov.scot/publications/foi-19-01398/ Scottish Salmon Watch published a media backgrounder in October 2018: https://donstaniford.typepad.com/files/media-backgrounder-toxic-chemical-use-via-well-boats-oct-2018.pdf
- **Information:**
  Please refer to the attached response letter.
- **Related documents:**
  - F0191091 Response r



F0190619	Clean Treat in Scotland	02/07/2019

- **Description:**
  Further to the Cabinet Secretary's comments in the Scottish Parliament just now (online via https://www.scottishparliament.tv/), please provide information on Benchmark's CleanTreat system. Please include any emails, photos, discussions, letters, correspondence and any other information relating a trial of CleanTreat in Scotland.
- **Information:**
  Please refer to the attached response letter
- **Related documents:**
  - F0190619 EIR Response Letter - R



F0190072	Finfish - Salmon Farms - Chemical Use	25/02/2019

- **Description:**
  Please provide information on any new sea lice chemicals and treatments since 1 January 2018. Please include information relating to Ectosan and CleanTreat. Please include any correspondence with the manufacturer Benchmark and any companies interested in using Ectosan, CleanTreat and any new sea lice chemicals. Please include details of any commercial trials, safety data sheets, environmental studies or any other information relating to Ectosan, CleanTreat and any new sea lice chemicals for use on salmon farms since 1 January 2018.
- **Information:**
  Please find enclosed the response letter
- **Related documents:**
  - F0190072 EIR Response - R

[7] A FOI reply from the Veterinary Medicines Directorate in January 2018 claimed to have no information on CleanTreat or Ectosan.

A further FOI request was refused in December 2019.

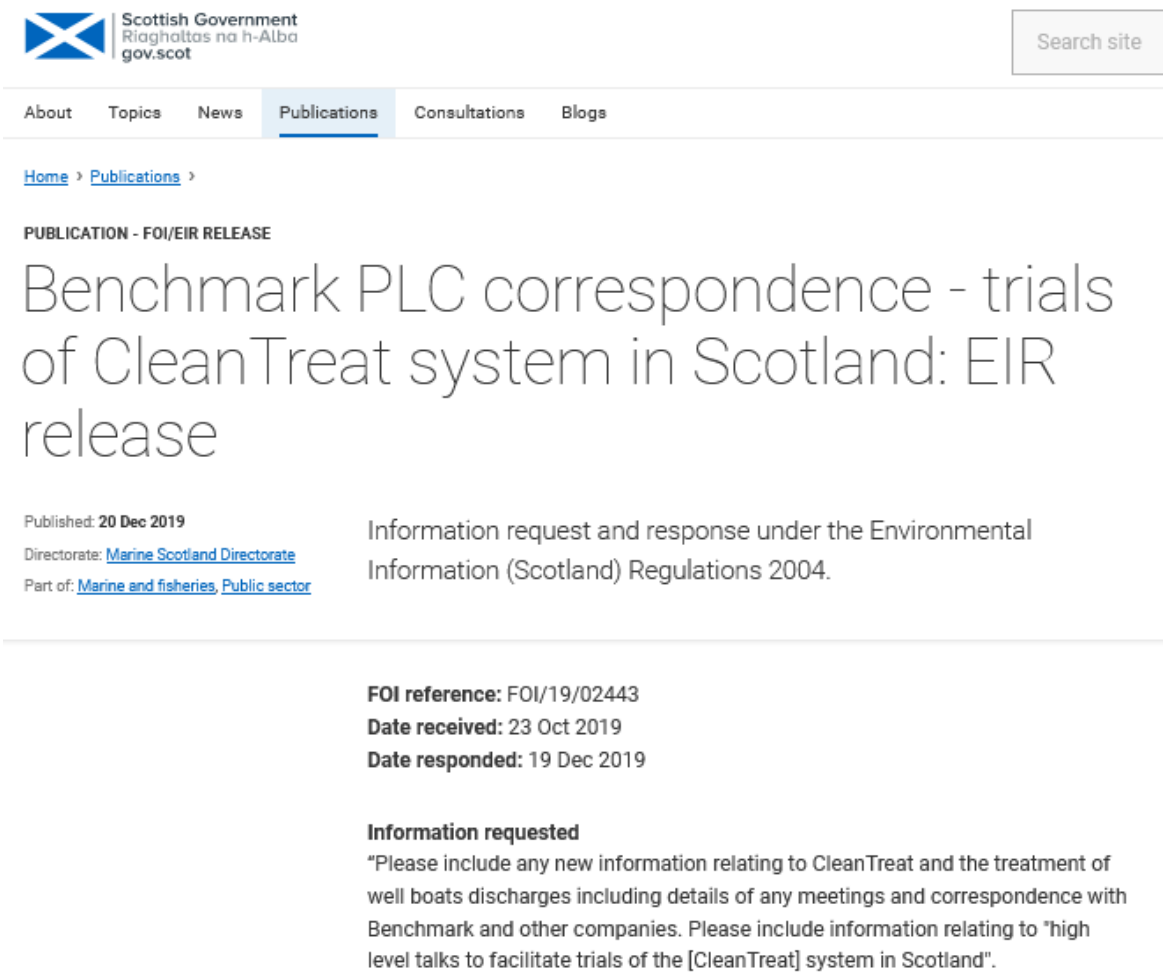
"We fully recognise and respect the obligations imposed by the FOIA on the VMD to act in a manner that is transparent and open in the public interest," wrote the VMD in a letter dated 20 December 2019. "However, the very real harm likely to ensue from the disclosure of the information you request warrants the balance to be taken in favour of non-disclosure".

"We consider that the disclosure of the information would be likely to prejudice the commercial interests of Marketing Authorisation holders and that Section 43 applies here," continued the VMD. "Through the marketing authorisation system, the VMD receives information from commercial entities that constitutes trade secrets and information protected

by patent, the publication of which would create significant commercial harm to the manufacturer. The commercial entities are required by law to provide the information and are put to great expense to generate it. In this case, the information you request could be used by other manufacturers to formulate, develop or market products that would compete with these products. We consider such factors weigh against the public interest in disclosing the information in question."

"We also judge that Section 41 of the FOIA applies to this request. Section 41 is an absolute exemption and it is engaged in this case because the information carries the necessary quality of confidence. In this instance publishing such information could undermine the veterinary pharmaceuticals industry's trust in the regulatory process as well as the companies' commercial position. This could lead to companies becoming unwilling to place product on the UK market, which would have a detrimental impact on animal welfare. Further, the market as a whole benefits from establishing and upholding a robust process for marketing authorisations; this in turn requires appropriate protection of confidentiality, and the honouring of expectations of confidentiality."

[9] The Scottish Government has disclosed various information on CleanTreat & Ectosan but refused other information due to commercial confidentiality including on BMK08:



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PUBLICATION - FOI/EIR RELEASE

Benchmark PLC correspondence - trials of CleanTreat system in Scotland: EIR release

Published: **20 Dec 2019**
Directorate: Marine Scotland Directorate
Part of: Marine and fisheries, Public sector

Information request and response under the Environmental Information (Scotland) Regulations 2004.

FOI reference: FOI/19/02443
Date received: 23 Oct 2019
Date responded: 19 Dec 2019

Information requested
"Please include any new information relating to CleanTreat and the treatment of well boats discharges including details of any meetings and correspondence with Benchmark and other companies. Please include information relating to "high level talks to facilitate trials of the [CleanTreat] system in Scotland".

PUBLICATION - FOI/EIR RELEASE

Trial of Benchmark's Clean Treat system: EIR release

Published: **5 Jul 2019**
Directorate: Marine Scotland Directorate
Part of: Marine and fisheries, Public sector

Information request and response under the Environmental Information (Scotland) Regulations 2004.

FOI reference: FOI/19/01398
Date received: 5 Jun 2019
Date responded: 3 Jul 2019

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PUBLICATION - FOI/EIR RELEASE

Correspondence regarding chemical usage in salmon farming: EIR release

Published: **17 May 2018**
Directorate: Marine Scotland Directorate

Information request and response under the Environmental Information (Scotland) Regulations 2004.

FOI reference: FOI/18/00985
Date received: 27 March 2018
Date responded: 23 April 2018

Information requested

Information requested on the use of chemicals via well boats including the 'Clean Treat' system since 1 January 2017. Please include data on the use of Azamethiphos, Deltamethrin, Hydrogen Peroxide and any other chemicals used via well boats. Please include correspondence with salmon farming and chemical companies (including Benchmark - the manufacturer of 'Clean Treat'), Government agencies such as SEPA and SNH and internal Scottish Government correspondence. Please include discussions regarding the 'Clean Treat' system in particular and the treatment, capture and disposal of chemicals used via well boats.

[8] FOI documents disclosed by the Scottish Government in April 2018 included an email dated December 2017 from the Scottish Aquaculture Innovation Centre describing Ectosan as a "follow on product to Salmosan" spectulating that it could also be Azamethiphos-based.

From: [Redacted] [redacted]
Sent: 13 December 2017 14:01
To: [Redacted]
Cc: [Redacted]
Subject: RE: Ectosan sea lice treatment

Hi [Redacted]

Thanks for the Ectosan press release.

I note that Benchmark describe Ectosan as a follow on product to Salmosan. There's no publicly available on active ingredients, but I wonder if it's also azamethiphos-based, with the associated regulatory controls and need to avoid sea lice resistance, etc?

Regarding CleanTreat, this water purification system was presented at a SSPO meeting last week – again, no details provided on how the tech works, which made some of the audience a bit sceptical. Interestingly, it was mentioned that the shipping container-based modules would need to be multiplied up to enable treatment of commercial scale water volumes. As I understood things, this would in turn need a secondary vessel alongside the well boat. Finally, it was mentioned that initial discussion have been had with SEPA, but no indication as to how advanced these are.

I hope this is of some help!

Best regards,

[Redacted]

[Redacted]
[Redacted]
Scottish Aquaculture Innovation Centre
(t) [Redacted] (m) [Redacted] (w) scottishaquaculture.com Connect+Collaborate

[10] It appears that Benchmark's Fish Vet Group in Inverness registered Ectosan as a patent in Norway in 2013:

ECTOSAN

(541) Merket er et **ordmerke i standard font**
(730) **Innehaver:**
FVG Ltd, 22 Carsegate Road, GB-IV38EX
INVERNESS, Storbritannia
(740) **Fullmektig:**
Zacco Norway AS, Postboks 2003 Vika, 0125 OSLO, Norge
(511) **Vare-/ tjenestefortegnelse:**
Klasse:5 Veterinary preparations; disinfectants; preparations for destroying vermin; pesticides.
Besluttet gjeldende dato i Norge:
2013.03.13
(450) **Kunngjøringsdato:** 2013.03.18

And [FVG filed for a U.S. federal trademark in August 2019]:

ECTOSAN Trademark Information

FVG Limited

Veterinary preparations for destroying parasites; veterinary preparations for the prevention and treatment of diseases and infections caused by parasites in farmed fish and livestock; pesticides

This is a brand page for the ECTOSAN trademark by FVG Limited in **Inverness, , IV38EX.**

Status Update! On Tuesday, February 25, 2020, status on the ECTOSAN trademark changed to PUBLISHED FOR OPPOSITION.

On Monday, August 26, 2019, a U.S. federal trademark registration was filed for ECTOSAN. The USPTO has given the ECTOSAN trademark serial number of 88593064. The current federal status of this trademark filing is PUBLISHED FOR OPPOSITION. The correspondent listed for ECTOSAN is LISA M. DUROSS of HARNESS, DICKEY & PIERCE, P.L.C., 5445 CORPORATE DR., STE. 200, TROY, MI 48098 . The ECTOSAN trademark is filed in the category of Pharmaceutical Products . The description provided to the USPTO for ECTOSAN is *Veterinary preparations for destroying parasites; veterinary preparations for the prevention and treatment of diseases and infections caused by parasites in farmed fish and livestock; pesticides.*

Benchmark may have re-branded Ectosan to BMK08 in 2019 to distance itself from the ASC's posting naming Ectosan as Imidacloprid or maybe because there was already an Ectosan insectide on the market in Ukraine for use in cows (containing a combination of pyrethroid alphacypermethrin and pyperonil butoxyde):

Theoretical and Applied Veterinary Medicine

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Original researches

Repellent properties "Ektosan-pudra™" for insect *Diptera*

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Abstract. Development and research of new insecticides safe for nature is the actual problem of modern scientific works. The article is devoted to establishment of insecticide-repellent activity of the preparation "Ektosan-pudra™" (production of LLC "Brovafarma", Ukraine) concerning the flies species of *Stomoxys calcitrans* Linnaeus, 1758. Flies of *Stomoxys calcitrans* are permanent and dominant (~ 90%) representatives of the entomological fauna on the territory of the animal husbandry enterprises of Ukraine and especially in Rivne region. The high mass activity of these flies is observed in September (at a daily average temperature of air +19-21°C and at night – +8-12 °C). This occurs despite the satisfactory sanitary condition of the experimental farm territory. The main place of flies' localization (46.3%, $p<0.05$) on the body of cows is usually the anterior limbs – the area of metacarpal bone. "Ektosan-pudra™" is a combined insecticide based on alpha-cypermethrin (0.5%), purified sulfur (0.45%) and geraniol (0.6%). The research were conducted by testing the preparation on the cows in the conditions of stable nursing system of cattle. Powder was applied to the animals from the experimental group individually once by means of rubbing in the haircoat from head to tail and internal areas of the limbs. The cows from the control group were intact. The observation for the flies' number after the cow's treatment have shown that the high repellent effect of the remedy was kept during two days: the scare factor (SF) in 34 hours after the treatment was 78.7%. Relative protective action of "Ektosan-pudra™" lasts up to four days (SF 72.9%). The insecticidal effect of the preparation is increasing with the rise in ambient temperature to 20°C and increased activity of flies (from 17.4 to 30.1 units / animal) than in the case of an attack on individual cows and temperatures below 10 °C. According to preliminary studies, the preparation excretion with milk is non-specific, which allows the use this insecticide without restrictions, depending on the need. However, due to the complexity of insecticide powder applying for cows it is recommended to apply the preparation in the farms with a small number of livestock.

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CONTROL OF ZOOPHILIC FLIES' ATTACKING DAIRY COWS IN LIVESTOCK PREMISES

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Parasitic insects are a significant problem for dairy farming in Ukraine as well as all over the world. Losses of livestock from midges in some countries can reach several million dollars. Treatment of animals with insecticides, among which the group of synthetic pyrethroids should be separately distinguished, is considered to be the most effective way to protect against midges The aim of the paper was to study insecticidal-repellent efficacy of "Ectosan-plus™" (LLC "Brovafarma") in different dilutions against zoophilic flies. "Ectosan-plus™" consists of two synergistic active ingredients: alfametryn (7.5 %) and piperonil-butoxide (10.5 %), and a mixture of essential oils of lemon and rose (10 %). "Ectosan-plus™" is a transparent oily liquid of yellowish color with a mild pleasant specific odor. The parasitological research on testing the impact of insecticide "Ectosan-plus™" in dilutions of 1:1000 and 1:750 on flying insects was conducted on three groups of cows. At first, the increased activity of the stable fly, Stomoxys calcitrans, was established on the experimental farm under the following weather conditions: the average daytime air temperature was + 19–21 °C, the nighttime one – +8–12 °C. It was proved that the water solution (1:750) of "Ectosan-plus™" should be used once every two days for the effective protection of dairy cows against the stable flies' attack in the farm premises. The insect repellent effectiveness (IRE) of the spray material is more than 80 %. The rate of the preparation consumption is 250 cm^3 per animal. Repeated treatment of animals with the solution increases the insecticidal activity of the preparation up to three days, which indicates its probable cumulative effect. In case of a moderate or low intensity of the zoophilic flies' attack on cows, the sufficient treatment is once every three days; in case of high intensity – every two days. The water solution of "Ectosan-plus™" in the dilution of 1:1000 does not provide sufficient protection of cows during daylight time as the SF reduces to 69,0 % in 6 hours after the treatment. Throughout all the experiment period, no external signs of intoxication were detected in the test animals.

Key words: *"Ectosan-plus™", zoophilic flies, insecticide, dairy cows.*

Рис. Обробка тварин розчином «Ектосан-плюс™»

Cut through the bullshit coming from the Scottish salmon farming industry via 'Scottish Scamon'