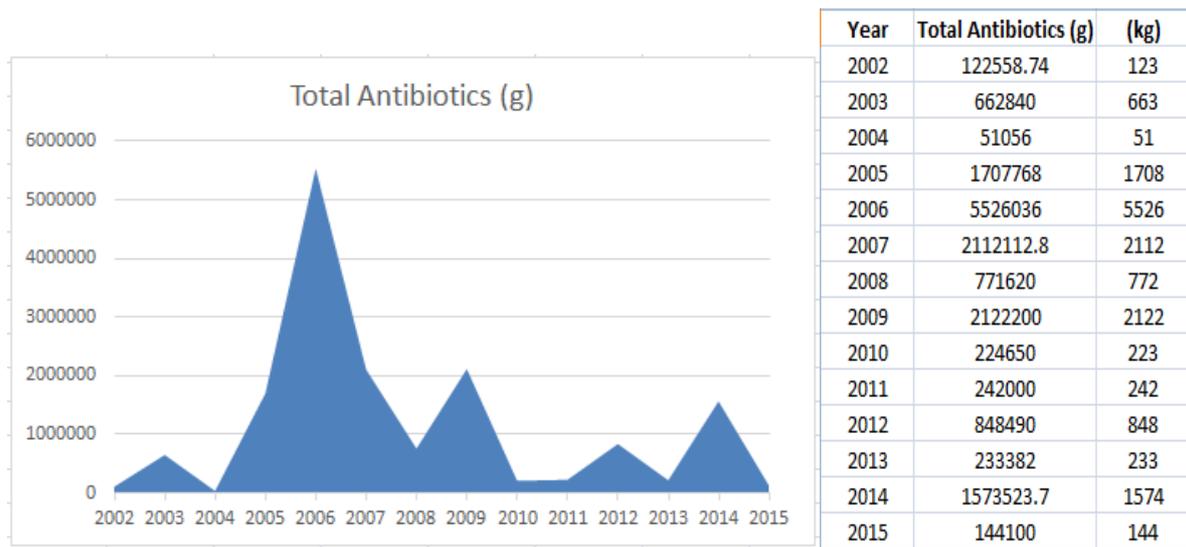


The Global Alliance Against Industrial Aquaculture, 20 February 2017

Antibiotic-ridden Scottish salmon - FOI reveals use of Oxytetracycline, Florfenicol, Amoxicillin & Fenbendazole

Exclusive data obtained via Freedom of Information (FOI) from the Scottish Environment Protection Agency (SEPA) reveals that Scottish salmon farms are still using significant quantities of antibiotics - with drug use higher in 2015 than in 2002 and 2004. Antibiotic use on Scottish salmon farms peaked at over 5,500 kilograms in 2006 but still stood at over 1,500 kilograms in 2014. The drugs used at over 130 salmon farms since 2002 were Oxytetracycline, Florfenicol, Amoxicillin, Fenbendazole, Oxolinic acid and Sarafloxacin hydrochloride [1].



Download the antibiotics data as an Excel spreadsheet [online here](#)

Read more in today's Press & Journal via "[Fish 'hooked on drugs'](#)"

22 NEWS

THE PRESS AND JOURNAL
Monday, February 20, 2017



"Wild salmon don't do drugs," said [Don Staniford](#) of the [Global Alliance Against Industrial Aquaculture](#). "Farmed salmon are addicted to a cocktail of hazardous chemicals including antibiotics. The use of antibiotics in salmon farming is a threat not only to the environment but also to public health. Antibiotic contamination of sediments and shellfish has been reported for over two decades and antibiotic resistance means that the drugs don't work anymore. Just say no to drugs, say no to Scottish farmed salmon!"



This is the first time that data on the use of antibiotics in Scottish salmon farming has been reported publicly (in contrast to Norway which [publishes data for chemical use online](#)). In 2014, the Veterinary Medicines Directorate [refused to provide data on antibiotic use citing commercial confidentiality](#). "To do so would breach confidentiality agreements with the individual manufacturers who supplied their commercially sensitive data and breach the Section 43 exemption in the FOIA, which covers information whose disclosure would be likely to prejudice the commercial interests of any person," wrote the VMD in a letter to GAAIA [2].

Between 2002 and 2015, a total of 136 salmon farms used antibiotics with 147 cases of antibiotic use during a year period (it is not known how many prescriptions were issued as

drug use was reported by SEPA as a yearly figure for each site). 2007 was the worst year for the use of antibiotics with 21 salmon farms reporting use (with 24 cases - a few sites used more than one type of antibiotic).

Year	# of cases	# of farms
2002	6	5
2003	4	4
2004	5	5
2005	14	13
2006	17	15
2007	24	21
2008	8	7
2009	19	18
2010	5	5
2011	4	4
2012	12	12
2013	12	11
2014	11	11
2015	6	5
Total	147	136

To put antibiotic use into context, [according to the Scottish Government's annual fish farm survey](#) there were 158 active salmon farms in Scotland in 2007 falling to 150 in 2009 and 139 in 2015. Hence, 13% of salmon farms used antibiotics in 2007, 12% in 2009, 8% in 2014 and 4% in 2015.

By far the most widely used antibiotic was Oxytetracycline (trade name Aquatet) - which represented 93% of all antibiotics used (2002-2015):

Aquatet (g)	15,156,121
Panacur 4% powder (g)	508,802
Florocol (g)	385,758
Vetremox (g)	220,200
Aquacil (g)	40,000
Florfenicol (g)	14,000
Sarafin (g)	9,000
Fenbendazole (g)	7,056
Aqualinic (g)	1,400

Marine Harvest accounted for 87% of all antibiotics used (2002-2015) with Kames, Loch Duart, Grieg Seafood, Scottish Seafarms and Cooke Aquaculture using lesser quantities (the Scottish Salmon Company and Wester Ross Fisheries reported zero use of antibiotics):

	Total Antibiotic Use (g)
Marine Harvest	14,153,064
Kames	379,404
Loch Duart	284,166
Grieg Seafood	248,830
Scottish Seafarms	123,411
Cooke Aquaculture	123,050

Aquatet (Oxytetracycline) was used by 101 salmon farms - here's the top 20 biggest users (Marine Harvest accounts for 19 out of the top 20):

Site ID	Year	Site Name	Licence	Operator	Local Authority	Aquatet (g)
ARDT1	2006	Ardintoul Bay	WPC/N/61833(01)	Marine Harvest (Scotland) Ltd	Highland	4039400
GORS2	2007	Gorsten North	WPC/N/73270	Marine Harvest (Scotland) Ltd	Highland	789000
ARDG1	2014	Ardgour (Linnhe)	CAR/L/1009970	Marine Harvest (Scotland) Ltd	Highland	761500
PORL1	2014	Portnalong	CAR/L/1002889	Marine Harvest (Scotland) Ltd	Highland	743400
CAS1	2007	Creag an Sagairt	WPC/N/61327(02)	Marine Harvest (Scotland) Ltd	Highland	575000
DUI1	2006	Duich	WPC/N/61865(01)	Marine Harvest (Scotland) Ltd	Highland	480000
CAS1	2009	Creag an Sagairt	CAR/L/1001816	Marine Harvest (Scotland) Ltd	Highland	480000
ARDG1	2008	Ardgour (Linnhe)	CAR/L/1009970	Marine Harvest (Scotland) Ltd	Highland	440500
MBM1	2009	Marulaig Bay	CAR/L/1028518	Marine Harvest (Scotland) Ltd	Eilean Siar	429000
GORS1	2005	Gorsten	WPC/N/70151	Marine Harvest (Scotland) Ltd	Highland	420000
ARDG1	2005	Ardgour (Linnhe)	WPC/N/61830(00)	Marine Harvest (Scotland) Ltd	Highland	375000
CAG1	2003	Camus Glas	WPC/N/0070126	Marine Harvest (Scotland) Ltd	Highland	337500
DUI1	2005	Duich	WPC/N/61865(00)	Marine Harvest (Scotland) Ltd	Highland	329985
FFMC04N	2012	Port na Moine North	CAR/L/1020918	Meridian	Argyll and Bute	316250
KING1	2006	Kingairloch	WPC/N/61831(01)	Marine Harvest (Scotland) Ltd	Highland	298800
INV1	2005	Invasion Bay	WPC/N/61386	Marine Harvest (Scotland) Ltd	Highland	274000
CAL1	2009	Camas an Leim	CAR/L/1010002	Marine Harvest (Scotland) Ltd	Highland	240500
INV1	2009	Invasion Bay	CAR/L/1009162	Marine Harvest (Scotland) Ltd	Highland	220000
ACAM1	2009	An Camus	CAR/L/1003078	Marine Harvest (Scotland) Ltd	Eilean Siar	216000
LAG1	2003	Laga Bay	WPC/N/62120(00)	Marine Harvest (Scotland) Ltd	Highland	195000

Florocol (Florfenicol) was used by 25 salmon farms - with the largest use taking place in 2015 at over 50 kilograms at Pegal Bay in Orkney:

Site ID	Year	Site Name	Licence	Operator	Local Authority	Florocol (g)
PEG1	2015	Pegal Bay	CAR/L/1003961	Cooke Aquaculture Scotland	Orkney Islands	52750
COLED1	2013	Cole Deep	CAR/L/1003004	Hjaltland Seafarms Ltd	Shetland Islands	44000
LYR1	2015	Lyrawa Bay	CAR/L/1003960	Cooke Aquaculture Scotland	Orkney Islands	31800
FERR1	2006	Ferramus	WPC/N/70838	Marine Harvest (Scotland) Ltd	Eilean Siar	22000
ARDT1	2006	Ardintoul Bay	WPC/N/61833(01)	Marine Harvest (Scotland) Ltd	Highland	20000
SOA1	2014	Stead of Aithness	CAR/L/1004195	Cooke Aquaculture Scotland	Shetland Islands	19250
SOA1	2015	Stead of Aithness	CAR/L/1004195	Cooke Aquaculture Scotland	Shetland Islands	19250
GORS2	2007	Gorsten North	WPC/N/73270	Marine Harvest (Scotland) Ltd	Highland	18000
GORS2	2006	Gorsten North	WPC/N/73270	Marine Harvest (Scotland) Ltd	Highland	18000
SKIO1	2013	Skipport Outer (Ornis	CAR/L/1001968	Marine Harvest (Scotland) Ltd	Eilean Siar	16000
FFMC19	2007	Creran A	WPC/N/30294	Scottish Sea Farms Ltd	Argyll and Bute	16000
CAG1	2008	Camus Glas	CAR/L/1009965	Marine Harvest (Scotland) Ltd	Highland	14000
CAG1	2015	Camus Glas	CAR/L/1009965	Marine Harvest (Scotland) Ltd	Highland	14000
GRE1	2014	Greshornish	CAR/L/1002890	Marine Harvest (Scotland) Ltd	Highland	14000
ARDT1	2015	Ardintoul	CAR/L/1001806	Marine Harvest (Scotland) Ltd	Highland	13800
IOEWE2	2014	Isle of Ewe	CAR/L/1002963	Marine Harvest (Scotland) Ltd	Highland	12000
KYL1	2007	Kyles Vuia East	WPC/N/61928	Fjord Seafood Scotland Farming	Eilean Siar	8000
WHA2	2014	North Voe	CAR/L/1002998	Hjaltland Seafarms Ltd	Shetland Islands	7000
COLEN1	2013	Coleness	CAR/L/1003005	Hjaltland Seafarms Ltd	Shetland Islands	5000
WHA2	2012	North Voe	CAR/L/1002998	Hjaltland Seafarms Ltd	Shetland Islands	4800
ARDN1	2006	Ardnish	WPC/N/70124(01)	Marine Harvest (Scotland) Ltd	Highland	4000
ARDN1	2008	Ardnish	CAR/L/1002887	Marine Harvest (Scotland) Ltd	Highland	4000
FFMC36	2005	Eilean Coltair	CD 9393(N1)	Kames Fish Farming Ltd	Argyll and Bute	3715
HAC1	2009	Djuba Wick	CAR/L/1003873	Mainstream Scotland Ltd	Shetland Islands	2400
FFMC37	2014	Kames Bay	CAR/L/1000237	Kames Fish Farming Ltd	Argyll and Bute	1993

Florfenicol was used by another three salmon farms - all in the Outer Hebrides in 2004-2005:

Site ID	Year	Site Name	Licence	Operator	Local Authority	Florfenicol (g)
GRA1	2004	Gravir Inner	WPC/N/62133(01)	WISCO	Eilean Siar	6000
ODH1	2005	Gravir Outer	WPC/N/61931(03)	Fjord Seafood Scotland Farming	Eilean Siar	4000
SGSG1	2005	Tolsta	WPC/N/61932(02)	Fjord Seafood Scotland Farming	Eilean Siar	4000

Panacur (Fenbendazole) was used by 10 salmon farms - with Loch Duart and Drumbeg Salmon by far the biggest users (all in 2007):

Site ID	Year	Site Name	Licence	Operator	Local Authority	Panacur 4% powder (g)
REI2	2007	Reintraid	WPC/N/70216	Drumbeg Salmon	Highland	129600
CALB1	2007	Calbha Site 7	WPC/N/61566	Loch Duart Ltd	Highland	115665
CALD1	2007	Calbha Site 5	WPC/N/61548	Loch Duart Ltd	Highland	94896
TOR1	2007	Torgawn	WPC/N/61143	Drumbeg Salmon	Highland	76000
CALC1	2007	Calbha Site 6	WPC/N/61565	Loch Duart Ltd	Highland	73605
STOU1	2005	Stoull	WPC/N/62318(02)	Scottish Sea Farms Ltd	Highland	10000
BOA1	2012	Boatsroom Voe	CAR/L/1004038	Hjaltland Seafarms Ltd	Shetland Islands	7630
VIDM2	2012	Vidlin Outer	CAR/L/1003907	Scottish Sea Farms Ltd	Shetland Islands	1327
ARDN1	2007	Ardnish	WPC/N/70124(01)	Marine Harvest (Scotland) Ltd	Highland	60
OLNA1	2002	Olnafirth South	WPC/N/62069(02)	Gonfirth Salmon Ltd	Shetland Islands	19

Fenbendazole was used by another two salmon farms - both in 2004:

Site ID	Year	Site Name	Licence	Operator	Local Authority	Fenbendazole (g)
ARDVO1	2004	Ardvourlie	WPC/N/62139(01)	WISCO	Eilean Siar	4416
MAAR1	2004	Maaruig	WPC/N/62253(01)	WISCO	Eilean Siar	2640

Vetremox (Amoxicillin) was used by three salmon farms in 2006 and 2009:

Site ID	Year	Site Name	Licence	Operator	Local Authority	Vetremox (g)
APT1	2009	Aird Point	CAR/L/1018068	Kames Fish Farming Ltd	Argyll and Bute	82500
FFMC84	2009	Port na Mine	CAR/L/1010366	Kames Fish Farming Ltd	Argyll and Bute	82500
TARI1	2006	Tarner Island	WPC/N/70297	Marine Harvest (Scotland) Ltd	Highland	55200

Aquacil (Amoxycillin) was used by one salmon farm - in 2002:

Site ID	Year	Site Name	Licence	Operator	Local Authority	Aquacil (g)
BRU1	2002	East of Bruna Ness	WPC/N/70289	Scottish Sea Farms Ltd	Shetland Islands	40000

Aqualinic (Oxolinic acid) was used by one salmon farm - in 2010:

Site ID	Year	Site Name	Licence	Operator	Local Authority	Aqualinic (g)
GNH1	2010	Gob na Hoe	CAR/L/1033775	Kames Fish Farming Ltd	Highland	1400

Sarafin (Sarafloxacin hydrochloride) was used by one salmon farm in - in 2002:

Site ID	Year	Site Name	Licence	Operator	Local Authority	Sarafin (g)
FFMC31	2002	Ardchattan Bay	CD 11288(N1)	Aquascot Seafarms Ltd	Argyll and Bute	9000

Read the data as an Excel spreadsheet [online here](#)

Earlier this year, GAAIA published damning data on staggering increases in the use of toxic chemicals - including Azamethiphos, Deltamethrin, Emamectin benzoate and Hydrogen Peroxide - on Scottish salmon farms. Read more via:

[Press Release: "Sky-Rocketing Chemical Use on Scottish Salmon Farms"](#)

[The Sunday Times: "Record chemical use 'of concern' to salmon giant"](#)

[Press & Journal: "Scottish salmon farming 'fighting a losing battle' against sea lice"](#)

[Press Release: Scottish Salmon's Lethal Legacy](#)

[The Sunday Times: "Salmon industry toxins soar by 1000 per cent"](#)



Antibiotic contamination of farmed salmon has been reported all around the world. In 2007, the UK's Veterinary Residues Committee [reported](#):

- Oxytetracycline residues were detected in 2 of 84 salmon muscle samples tested in an antimicrobial screen. These were at concentrations of 1,101 and 1,880 µg/kg.
- Oxytetracycline residues were detected in 2 of 84 salmon muscle samples tested in a screen for tetracyclines (these were additional to the samples detailed immediately above). These were at concentrations of 300 and 530 µg/kg.

In 2008, the [US Food & Drug Administration](#) found Oxolinic acid and Flumequine in Chilean farmed salmon. In 2008, the [Canadian Food Inspection Agency](#) found Amphenicol in Chilean farmed salmon.

A study - "[Reconnaissance of 47 antibiotics and associated microbial risks in seafood sold in the United States](#)" - published in the Journal of Hazardous Materials in 2015 detected Oxytetracycline in farmed salmon; 4-Epioxytetracycline in farmed salmon; Ormetoprim in farmed salmon and Virginiamycin in farmed salmon that had even been marked as antibiotic-free [3].

The risks of antibiotic resistance - and threats to public health - has been long recognized by the salmon farming industry [4]. Contamination of sediments and shellfish under salmon farms with antibiotic residues has long been documented in the scientific literature [5].

Antibiotic use in Scottish salmon farming was described in 2001 as "comparable to Norway" and the [data disclosed here](#) and [published in Norway](#) indicates that may still be the case [6]. Antibiotic use in Chilean salmon farming is much higher in comparison to both Scotland and Norway [7].

Loch Duart claims on their [web-site](#) that they have "never used antibiotics" although the antibiotics data provided by SEPA does include three prescriptions/cases in 2007 for Panacur (Fenbenzadole). Fenbenzadole is [described](#) as "a broad spectrum [benzimidazole anthelmintic](#) used against gastrointestinal parasites" [8].

Following a [recent report of an increase in antibiotic use in cleaner-fish farming in Norway](#), GAAIA filed a FOI request for data on antibiotic use in cleaner-fish farming [9].

Contact:

Don Staniford: 07771 541826 (dstaniford@gaaia.org)

Notes to Editors:

[1] Here's more information on the antibiotics used by Scottish salmon farms (2002-2015):

Florocol contains **Florfenicol** - it is used for the treatment of furunculosis (*Aeromonas salmonicida*) infection and for the [treatment of vibriosis](#) (read more [online here](#)).

Aquatet contains **Oxytetracycline Hydrochloride** - it is used for the treatment and control of *Aeromonas salmonicida*, and columnaris disease (read more [online here](#)).

Aqualinic contains **Oxolinic acid** - it is used to treat furunculosis, vibriosis and enteric redmouth disease (read more [online here](#)).

Vetremox contains **Amoxicillin trihydrate** - it is used for the treatment of furunculosis (*Aeromonas salmonicida*) infection (read more [online here](#)).

A [warning note by the National Office of Animal Health](#) includes:

"Recent knowledge suggests resistance to antimicrobials in aquatic situations appears readily. It is recommended that resistance patterns in relevant pathogenic bacteria should be monitored."

Aquacil contains **Amoxicillin trihydrate** - [manufactured by Novartis](#).

Panacur contains **Fenbendazole** - it is used to treat *Eubothrium* (a stomach cestode) outbreaks in marine salmon farms (it is also used in dogs as a [de-wormer for gastrointestinal parasites](#)).

A [Guidance Note issued by SEPA in 2007](#) included:

Usage of Panacur (fenbendazole) in marine salmon farming

Panacur has been used on an occasional basis for the treatment of *Eubothrium* (a stomach cestode) outbreaks in marine salmon farms and applications have generally been made for 'one-off' treatments. Furthermore, SEPA's records indicate that the total quantity used in marine salmon farming has been small. For example, during the period 1990-99, there has only been 308 kg Panacur (equivalent to 12kg fenbendazole) use based on record returns (to 12-04-99) in SEPA's South-West Area.

Treatment regimen

Panacur 4% Powder is a powder formulation of fenbendazole for incorporation into feedstuffs for oral administration (i.e. 1g Panacur 4% powder contains 0.04g active ingredient fenbendazole). SEPA does not have detailed information on the treatment regimen. Panacur 4% Powder has been used in the few (3) cases examined. It is understood that this is mixed with feed as required on a case-by-case basis.

Toxicity of fenbendazole to marine organisms

The following is an extract from unpublished work carried out by a PhD student (Maurice Clarke) under the supervision of Ian Davies, FRS Marine Laboratory, Aberdeen.

The drug Panacur has been shown to be effective for the control of cestode infections in salmonids and is currently being used for this purpose. However its eco-toxicity in the marine environment is poorly understood. Panacur is a commercial formulation containing fenbendazole, a member of the benzimidazole group of anthelmintics, the primary action of which is the inhibition of the formation of the microtubule complex in eukaryotic cells. Panacur is administered as a feed additive in aquaculture.

Sarafin contains **Sarafloxacin hydrochloride** - a quinolone - [used to treat *Vibrio* species](#).

[2] Here's a [FOI refusal from the Veterinary Medicines Directorate in 2014](#) (following a FOI request from GAAIA):



ASSURING THE SAFETY, QUALITY & EFFICACY
OF VETERINARY MEDICINES

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ATI 297

Request

From: [Redacted under section 40 of the FOIA]
Sent: 29 April 2014
Subject: FOI on antibiotic sales and use

Could the VMD/DEFRA please provide specific data on antibiotic sales and use relating to Scottish salmon farms since 2003.

VMD Reply

Sent: 2 May 2014
To: [Redacted under section 40 of the FOIA]
Subject: FOI on antibiotic sales and use

Your Request

Thank you for your email dated 29 April 2014.

We have considered your request under the Freedom of Information Act 2000 (FOIA).

You asked for specific data on antibiotic sales and use relating to Scottish salmon farms since 2003, including a breakdown of which antibiotics are used, a list of the names and the totals used/sold per year since 2003 on salmon farms only or (at least) a list the antibiotics used/sold.

Our Reply

The use of veterinary medicinal products is not centrally recorded in the UK. The VMD collect, collate and publish figures on UK sales volumes of active antimicrobial ingredients in products authorised for use in animals. It is reasonable to assume that there is a close correlation between the reported quantities of products sold and those used in the UK in the species indicated. These data are published retrospectively on an annual basis at: http://www.vmd.defra.gov.uk/public/antimicrobial_pubs.aspx

We are unable to provide the breakdown of sales data to the level of detail you request and beyond that we have already provided you under AT1296. To do so would breach confidentiality agreements with the individual manufacturers who supplied their commercially sensitive data and breach the Section 43 exemption in the FOIA, which covers information whose disclosure would be likely to prejudice the commercial interests of any person.

In the highly competitive world of veterinary pharmaceuticals, it is widely accepted that knowledge of other companies' sales data can be used by competitors to identify opportunities for them to develop competitor products. We consider that release of sales data information could serve to weaken a company's position since it releases market-sensitive information of potential usefulness to competitors.

Companies are obliged to provide sales information to the VMD as part of the regulatory system. Such information is vital for the VMD and we must be able to ensure that companies provide us accurate sales information in the knowledge that we will not release that information.

Publishing sales information on a particular product, or where the range of products is small the product's active ingredient, 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 affect on animal welfare.

We consider such factors weigh against the public interest in disclosing sales information. In these circumstances, we consider that Section 43 of the FOIA would apply to such information and that it would not be in the public interest to release it.

Our Service

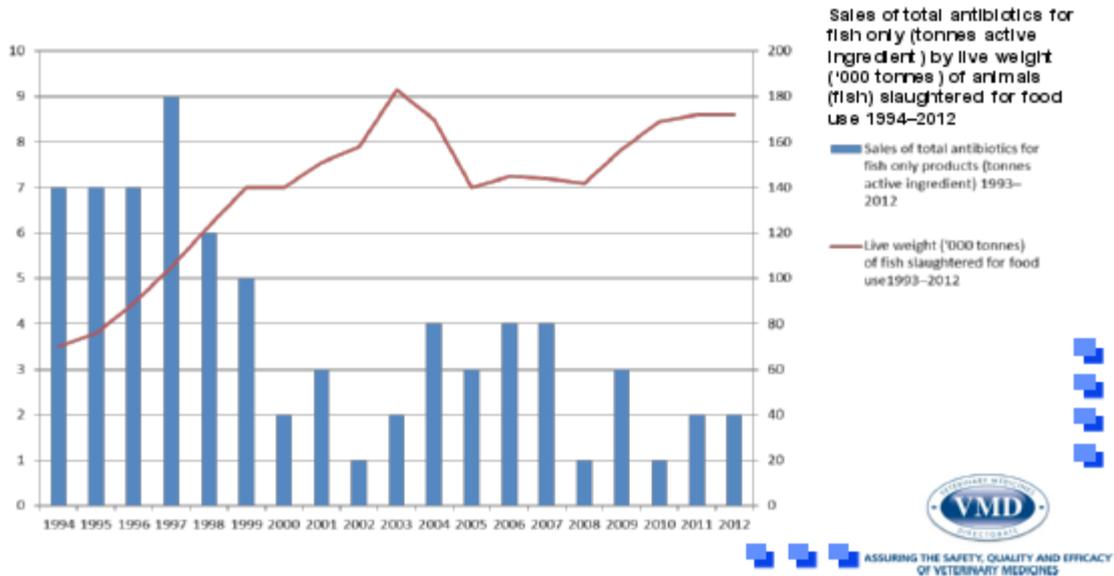
If you are unhappy with the service you have received in relation to your request and wish to make a complaint, you may request an internal review within two calendar months of the date of this e-mail. If you would like to request an internal review please write to [Redacted under section 40 of the FOIA] at the VMD via ati@vmd.defra.gsi.gov.uk. If you are not content with the outcome of the internal review you have the right to apply directly to the Information Commissioner for a decision. The Information Commissioner can be contacted at: Information Commissioner's Office

Wycliffe House
Water Lane
Wilmslow
Cheshire
SK9 5AF

In a previous FOI reply dated 28 April 2014, the VMD disclosed the following data (download as a one slide PowerPoint [online here](#)):

Figure: Sales of total antibiotics for fish only (tonnes active ingredient) by live weight ('000 tonnes) of animals (fish) slaughtered for food use 1993–2012

1994-12 Antibiotic Sales



Note: Figure provides information on the total annual quantity of antimicrobials sold that were authorised for use in fish for the period 1993-2012. Prior to this period the data on the sales of antimicrobials were not consistently collected nationally and therefore are not considered reliable. The data used to create this graph are included in the VMD annual sales data reports, and in the 1999 Advisory Committee on the Microbiological Safety of Food (ACMSF) report on 'Microbial Antibiotic Resistance in Relation to Food Safety', (<http://acmsf.food.gov.uk/acmsfrep/acmsfreports>).

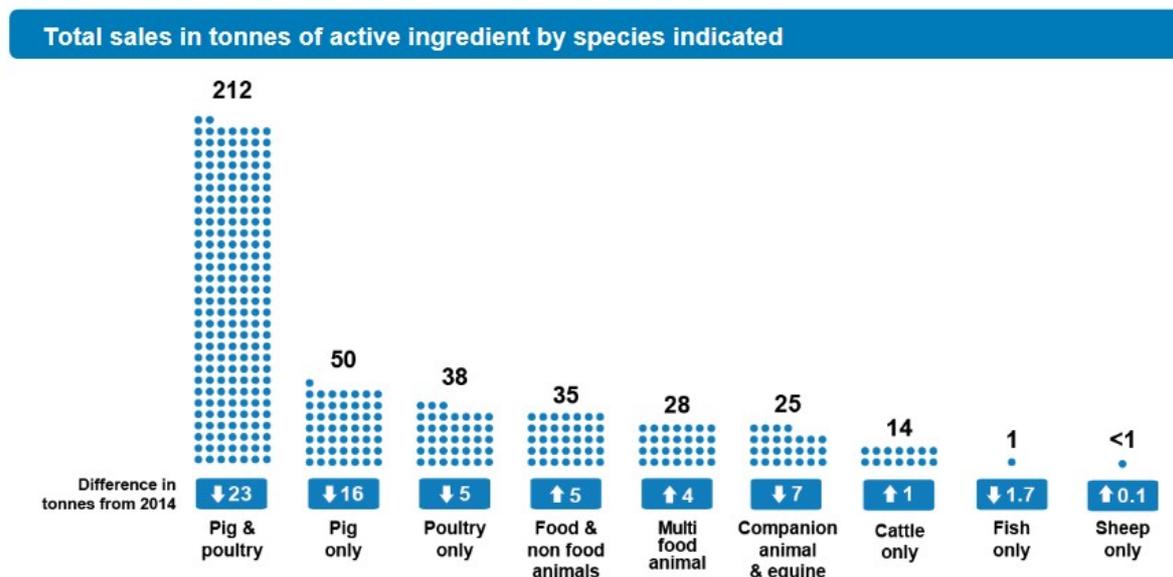
The VMD also referred GAAIA to a report titled "[UK Veterinary Antibiotic Resistance & Sales Surveillance, 2013](#)":

Table 8: Sales (tonnes active ingredient) of total antibiotics for food-producing animals only by species 2009–2013

	2008	2009	2010	2011	2012	2013
Cattle Only Products	11	11	11	12	14	14
Pig Only Products	62	62	47	62	65	61
Poultry Only Products	31	37	50	23	22	19
Sheep Only Products	<1	<1	<1	<1	<1	<1
Fish Only Products	1	3	1	2	2	1
Pig and Poultry Combined Only	195	205	252	162	245	226
Other Multi Species Products in Food Animals Only	28	31	29	29	33	34
Total	328	349	390	290	381	355

We are currently exploring alternative methods of data collection to permit a more accurate analysis of antibiotic consumption by animal species and production type, in particular for pigs and poultry (see “Future plans for data collection”).

The [UK Veterinary Antibiotic Resistance & Sales Surveillance, 2015 report](#) (published in November 2016) included:



A presentation - "[Medicines use in UK aquaculture](#)" - by CEFAS in 2012 included:

Antibacterial agents licensed for use in fish in the United Kingdom 2012 (source VMD Product Information database 12/10/2012)

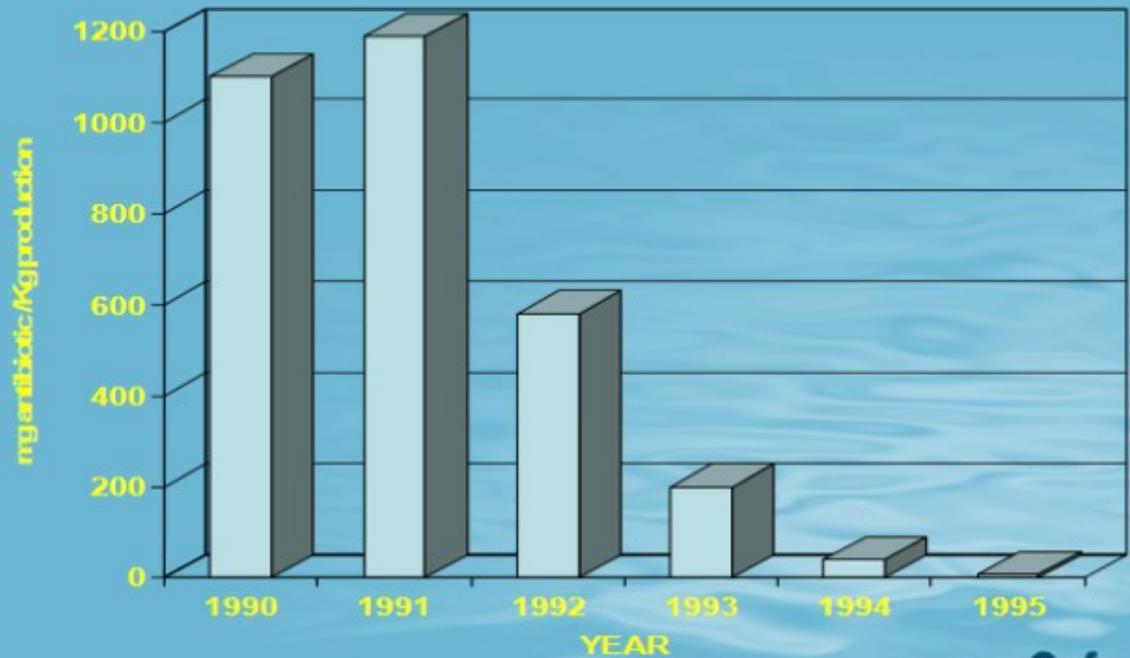
Generic name	Trade name	Fish species*	Dose (mg/kg/day)**	Withdrawal period (degree days)
Oxytetracycline	Aquatet	AS, RT	75	400
Florfenicol	florocol	AS, RT, BT AS	10-30 10-30	500 500
Amoxicillin trihydrate	Vetremox	AS	80	40

*AS = Atlantic salmon, RT = rainbow trout, AC = Arctic char, BT = brown trout
 ** usual duration of treatment is 7-10 days

Saprolegnia treatments : bronopol (Pyceze)

Cefas

Antibiotic use on Scottish salmon farm 'A'



(source Marine Laboratory Aberdeen: Annual Production Survey of Scottish Salmon Farms)

A presentation - "[Antimicrobials and Scottish salmonid aquaculture](#)" - by the Scottish Government in November 2016 included:

Antimicrobial control in Scottish Aquaculture

UK authorised antimicrobial agents for fish

- Oxytetracycline (ERM and furunculosis)
- Amoxicillin
- Florfenicol (*furunculosis*)

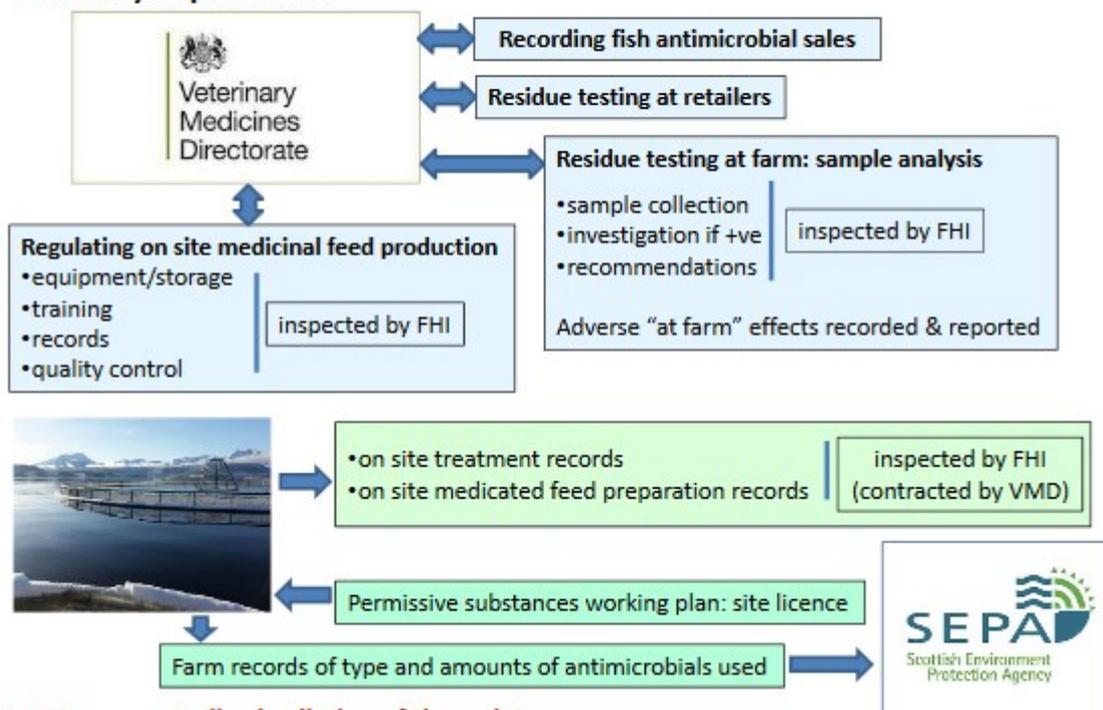
Cascade system

- alternative antimicrobials prescribed
- priority system
- longer withdrawal time often required

- antibiotics only administered under a veterinary prescription
- vet and farm is legally obligated to record use.
- in Europe the practice of non-therapeutic prophylactic use of antibiotics (growth enhancement/preventative) was banned in 2006
- however, due to nature of the system metaphylactic use is commonplace
 - treating entire population though only small percentage affected
 - oral in-feed administration
 - difficulty in catching sick animals

Antimicrobial control in Scottish Aquaculture

Statutory requirements



In UK : no centralised collation of these data

Antimicrobial control in Scottish Aquaculture

Aquaculture industry Code of Good Practice (SSPO: 2006)
<http://scottishsalmon.co.uk/cogp/>.

Scottish Salmon Farming
 Code of Good Practice
 Growing a sustainable industry

Certification schemes

- address antibiotic use within their framework
 - (ASC: use of critical antibiotics a non-compliance)
- raise awareness of AMR
- additional testing commissioned by aquaculture company to fulfil requirements



Retailer requirements

- additional testing commissioned by aquaculture company to fulfil requirements

Research on alternative treatments and improved monitoring

- EU, national, locally funded (industry and government)



Antibiotic use in UK farming sectors

	2008	2009	2010	2011	2012	2013
Cattle only	11	11	11	12	14	14
Pig only	62	62	47	62	65	61
Poultry only	31	37	50	23	22	19
Sheep only	<1	<1	<1	<1	<1	<1
Fish only	1	3	1	2	2	1
Pig + Poultry	195	205	252	162	245	226
Multispecies products	28	31	29	29	33	34
Total	328	349	390	290	381	355
% used on fish	0.30	0.86	0.26	0.69	0.52	0.28

in tonnes



- fish account for about 0.5% of antibiotics used in animal production in the UK
- antimicrobial sales for fish not provided to VMD by species/culture system

Example marine salmon veterinary practice (Scotland)

- approximately 0.02 to 0.38 g/Tonne in a given year (antibiotics use per kg harvested biomass)
- Norwegian industry approximately 0.39g/T; Chile is approximately 660g/T
- the small amount still used, predominantly in FW culture, tends to be not spread across FW production – but associated with a few sites
 - usually reflects endemic challenges on a particular site (ERM, flavobacteria, furunculosis)
- many outbreaks of bacterial disease are spotted early on and accurately by site managers
 - know the signs of endemic/common diseases on their site
- where possible, and particularly where there is recurrence of a bacterial problem, will aim to recover and test isolates
- antibiotics for use with new species (and their pathogens): extensive bacteriology/sensitivity being performed to understand what's present

Thanks to colleagues at FHI (MSS), SEPA, VMD, veterinary practices, for contributions.

Thanks for your attention.

[3] An article - "[Study identifies antibiotics in farm raised seafood](#)" - published in Aquaculture North America in 2015 reported:

"Researchers at the Arizona State University's Biodesign institute examined antibiotic use in shrimp, salmon, catfish, trout, tilapia and swai, originating from 11 countries. Of the 47 antibiotics evaluated, researchers discovered traces of just five. The fish were sourced from Bangladesh, Canada, Chile, China, Indonesia, Mexico, Panama, Scotland, Thailand, the United States and Vietnam.....The five antibiotics that showed up in detectable amounts were: oxytetracycline in farmed tilapia, salmon and trout, as well as in wild shrimp; 4-epioxytetracycline in farmed salmon; sulfadimethoxine in farmed shrimp, ormetoprim in farmed salmon, and virginiamycin in farmed salmon that had even been marked as antibiotic-free, according to the study."

Read the study in full via "[Reconnaissance of 47 antibiotics and associated microbial risks in seafood sold in the United States](#)" (Journal of Hazardous Materials, January 2015)

Science Daily [reported](#) in 2014:

"The current study offers a warning that antibiotics present at levels well below regulatory limits can still promote the development of drug-resistant microorganisms. The dramatic increase in resistant and multi-drug resistant bacterial strains documented over the past three decades indicates that much more thorough monitoring of seafood supplies is needed and a better scientific understanding of the nexus of global aquaculture, antibiotic use, drug resistance emergence, and regulatory measures."

[4] Antibiotic resistance:

The risks of antibiotic resistance - and threats to public health - has been long recognized by the salmon farming industry:

["Reconnaissance of 47 antibiotics and associated microbial risks in seafood sold in the United States"](#) (Journal of Hazardous Materials, January 2015)

["Salmon Aquaculture and Antimicrobial Resistance in the Marine Environment"](#) (PLoS One, August 2012)

["Antimicrobial Use and Resistance in Aquaculture: Findings of a Globally Administered Survey of Aquaculture-Allied Professionals"](#) (Zoonoses & Public Health, 2012)

["Antimicrobial resistance in aquaculture"](#) (Reviews of Science & Technology, April 2008)

["Heavy use of prophylactic antibiotics in aquaculture: a growing problem for human and animal health and for the environment"](#) (Environmental Microbiology, May 2006)

["Occurrence of tetracycline resistance genes tet\(M\) and tet\(S\) in bacteria from marine aquaculture sites"](#) (FEMS Microbiology Letters, August 2004)

["Distribution of oxytetracycline resistance plasmids between aeromonads in hospital and aquaculture environments: implication of Tn1721 in dissemination of the tetracycline resistance determinant Tet A"](#) (Applied & Environmental Microbiology, September 2000)

["Antibiotic use in aquaculture: development of antibiotic resistance – potential for consumer health risks"](#) (International Journal of Food Science & Technology, April 1998)

["Bacterial resistance to antimicrobial agents used in fish farming: A critical evaluation of method and meaning"](#) (Annual Review of Fish Diseases, 1994)

["Long-range changes in oxytetracycline concentration and bacterial resistance toward oxytetracycline in a fish farm sediment after medication"](#) (Science of the Total Environment, April 1992)

["Antibiotic resistance of Aeromonas salmonicida isolated from Atlantic salmon, Salmo salar L., in Scotland"](#) (Journal of Fish Diseases, May 1991)

[5] Antibiotic contamination of sediments and shellfish:

Contamination of sediments and shellfish under salmon farms with antibiotic residues has long been documented in the scientific literature:

["Salmon Aquaculture and Antimicrobial Resistance in the Marine Environment"](#) (PLoS One, August 2012)

["Transient presence of oxytetracycline in blue mussels \(Mytilus edulis\) following its therapeutic use at a marine Atlantic salmon farm"](#) (Aquaculture, March 1997)

["Is sediment deposition the dominant fate of oxytetra"cycline used in marine salmonid farms: a review of available evidence"](#) (Aquaculture, November 1996)

["Spatial distribution of oxytetracycline and elevated frequencies of oxytetracycline resistance in sediments beneath a marine salmon farm following oxytetracycline therapy"](#) (Aquaculture, October 1996)

["Antibacterial residues in marine sediments and invertebrates following chemotherapy in aquaculture"](#) (Aquaculture, October 1996)

["Concentration and persistence of oxytetracycline in sediments under a marine salmon farm"](#) (Aquaculture, June 1994)

["Long-range changes in oxytetracycline concentration and bacterial resistance towards oxytetracycline in a fish farm sediment after medication"](#) (Science of the Total Environment, April 1992)

["Effects of oxytetracycline, oxolinic acid, and flumequine on bacteria in an artificial marine fish farm sediment"](#) (Canadian Journal of Microbiology, December 1992)

["Residues of oxolinic acid in wild fauna following medication in fish farms"](#) (Diseases of Aquatic Organisms, February 1992)

[6] Intrafish [reported](#) in 2002:

Antibiotic use on Scottish salmon farms 'comparable to Norway'

Aberdeen, Scotland: Industry experts have told IntraFish that although the most recent figure for antibiotic use on UK fish farms indicates that two tonnes of antimicrobial medicines were used in farming both salmon and trout in the year 2000, the usage is probably directly comparable to the Norwegian figures.

September 11th, 2002 06:04 GMT Updated July 10th, 2012 05:03 GMT

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IntraFish reported earlier this year that Norwegian aquaculture used just 645 kilos of antibiotics in 2001, down from 685 kilos the previous year.

The UK figures for 2001 are not yet available, but the statistics published by the Veterinary Medicines Directorate (VMD) show a falling trend (apart from a 'blip' in 1997). A further decline in 2000 has been revealed in the sales of antimicrobials used in aquaculture at a time when farmed fish (salmon and trout) production remained almost constant.

In 1993, 55,000 tonnes of salmon and trout were produced and 10 tonnes of antimicrobials were sold. In 2000, 134,000 tonnes of salmon and trout were produced and two tonnes of antimicrobials sold.

UK sales of therapeutic antimicrobials (tonnes active ingredient) for use in salmon & trout farming:

Vaccines, and better husbandry The VMD states: "It has been suggested that the reduction in the sales of antimicrobials in aquaculture is due mainly to improved husbandry techniques and the use of increasingly effective vaccines."

Scottish vets from practices which specialise in fish health agree that the quantity of antibiotics used on salmon farms is very small. David Sutherland of the Westside vets group in Shetland told IntraFish: "The use of antibiotics is minimal. They would occasionally be used for treating fish with winter sores, or if a fish has got damaged somehow. The hatcheries will very occasionally use them too. Antibiotic use tends to be a treatment used with smaller fish, and of course, if it's used with fish closer to market size, then there's a withdrawal period before the fish can be harvested."

Tony Wall of the Fish Vet Group in Inverness is also involved in the collection of data on veterinary medicine use for the VMD, as he sits on the Veterinary Products Committee.

"The reasons why antibiotic use has gone right down are mainly because of the use of effective vaccines for furunculosis, and also for ERM in trout. We're also seeing the effect of much better husbandry methods - fallowing, single-year classes and so on. You could probably say that usage in trout farming has gone down, but not proportionately. However, overall we're now using just two per cent of the quantity of antibiotics per tonne of fish produced that we were using ten years ago, so it's a huge success story."

Mr Wall said that there is still some use of antibiotics in rainbow trout farms, because it is still used for RTFS (rainbow trout fry syndrome), but this is on very small fish so not much is used. Antibiotics may also see a small amount of use with salmon at the freshwater stage - before they're vaccinated - where some sites have endemic furunculosis in the fresh water system.

"The latest figure available is for 2000, because it takes a long time to collect the data. The problem is always to identify it species by species. I would imagine that, tonne for tonne, the quantity being used now in Scotland is fairly comparable with the Norwegian figures," said Tony Wall.

However, the figure for use on salmon farms is not collected or held centrally. Scottish Quality Salmon (SQS) technical consultant Dr John Webster, confirmed that SQS doesn't collect data on members' use of antibiotics on their farms. However, he added that, in his capacity as an adviser to quality accreditation body Food Certification Scotland, he sees the forms which FCS use when samples are sent off for routine residues testing.

"They take extracts from the medicines record and record those, then cross-reference them when the results come back. I can't remember the last time I saw antibiotics recorded - it's at least four or five years since I've seen it on a sample form," he said. "In the last eight or nine years, I haven't seen a single positive sample from an SQS member."

He said that this was ample proof for him that the use of antibiotics in fish farming - with the advent of good vaccines, good husbandry and cultivation techniques - has caused the use recorded 10 to 15 years ago to drop to negligible levels. "The VMD figures reflect this - it all fits the same pattern - antibiotics replaced by vaccination and good husbandry," he added.

Pattern similar to Norway "Because of the way data is recorded here - unlike Norway where it's recorded centrally - here it's [...] recorded through individual vets who have to keep their records for number of years - no-one has really collated the data to relate just to salmon. The only figures that we can go by are the individual farm's medicine records data - we see this from time to time. But the fish health issues in Norway and Scotland are broadly similar, and the techniques used to prevent the need to use therapeutants - the picture is broadly the same. So I think the Norwegian figures pretty broadly reflect the Scottish ones, pro rata."

Data on antibiotic use in Norwegian salmon farming (2005-2015) is [published by the Norwegian Institute of Public Health](#):

Tabell 1. Antibakterielle midler (kg aktiv substans)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
florfenikol	302	139	166	303	287	331	191	300	403	194
flumekin	7	18	1	1	0	0	0	0	0	0
lincomycin/ spectinomycin (1:2)	50	66	70	43	57	0	0	0	0	0
oksolinsyre	1119	406	681	926	308	212	1399	672	108	82
oksyetetracyklin	0	19	23	40	10	1	1	0	0	25

Read more via "[What Has Been Done to Minimize the Use of Antibacterial and Antiparasitic Drugs in Norwegian Aquaculture?](#)" and "[Increased use of medicines in Norwegian fish farming](#)"

Fish Farming Expert [reported](#) (2 February 2017):

An appetite for antibiotics

A clear increase in the amount of antibiotics used in cleanerfish production has been reported in Norway, although levels used in salmon themselves remain very low.

Author:  Magnus Petersen

So revealed Atle Lillehaug, of the Norwegian Veterinary Institute, at the Frisk Fisk conference in Bergen today.

"We've seen an increase in the number of printed prescriptions for cleanerfish, which appear to require drug treatments more frequently," he said.

All use and prescription of drugs for farmed fish must be reported to the Food Safety Authority (FSA) through the Vetreg system. After this was adopted in 2011, these figures – which could be compared with reported sales figures from pharmaceutical wholesalers – have shown low antibiotic use in farmed salmon.

"Initially the numbers that were reported by the salmon industry and the sales figures were not quite consistent, but these discrepancies have now been ironed out," said Lillehaug.

Lillehaug observed that two-thirds of all antibiotics in farmed fish in Norway were used on marine species, including cleanerfish, while cod, halibut, wolf fish and turbot all experienced a rise in the number of prescriptions for antibiotics issued since 2011 too, although the number of prescriptions does not necessarily equate to the volume of antibiotics used.

Figures from Vetreg show that the number of antibiotic prescriptions in 2011 was only 16, while it has increased steadily since, rising to 126 during 2016. This seems to have risen in line with the production of cleanerfish.

In 1987 about 50 tonnes of antibiotics were used by the country's aquaculture industry, but by 2015 it had fallen to 217 kg, due to the introduction of vaccines, according to the researcher.

"Data from 2011-2015 show that have been between 30-50 prescriptions for the entire aquaculture industry – about a third for use in the marine phase and two-thirds in freshwater production," he revealed.

However, in volume terms, salmon in the sea phase still use the most antibiotics – although this has fallen from just over 800 kg in 2012 to just over 100 kg in 2015.

When it comes to trout, Lillehaug says that there is practically no use of antibiotics.

[7] Antibiotic use Chile:

A report - "[Informe sobre uso de anticobianos en la salmonicultura nacional](#)" - published by the Chilean Government in 2015 included:

Tabla N° 1. Cantidad de antimicrobianos (Ton), índice consumo (%) de antimicrobianos y biomasa promedio mensual en cultivo (mil Ton), durante el período 2007-2015.

Año	Cantidad (ton)	Cosecha anual (ton)	Índice Consumo (%)*	Biomasa promedio en cultivo (mil ton)
2007	385,6	600.862	0,064	426
2008	325,6	630.647	0,051	468
2009	184,5	474.174	0,039	232
2010	143,2	466.857	0,031	256
2011	206,8	649.492	0,032	391
2012	337,9	826.949	0,041	515
2013	450,7	786.091	0,057	519
2014	563,2	955.179	0,059	569
2015	557,2	846.163	0,066**	534

*Índice de consumo calculado en base a las cantidades utilizadas y las toneladas cosechadas de especies salmónidas (Anuario estadístico de Pesca 2007-2014).

**Índice de consumo calculado en base a datos preliminares de cosechas de especies salmónidas.

Figura N° 1. Cantidad (Ton) e índice de consumo de antimicrobianos (%) durante el periodo 2007-2015.

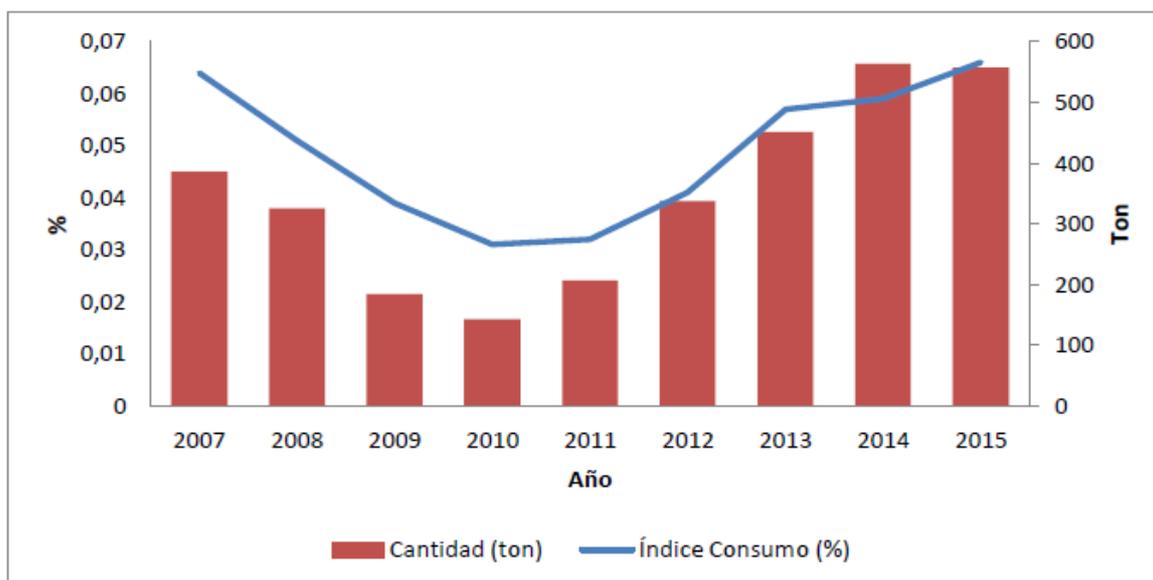
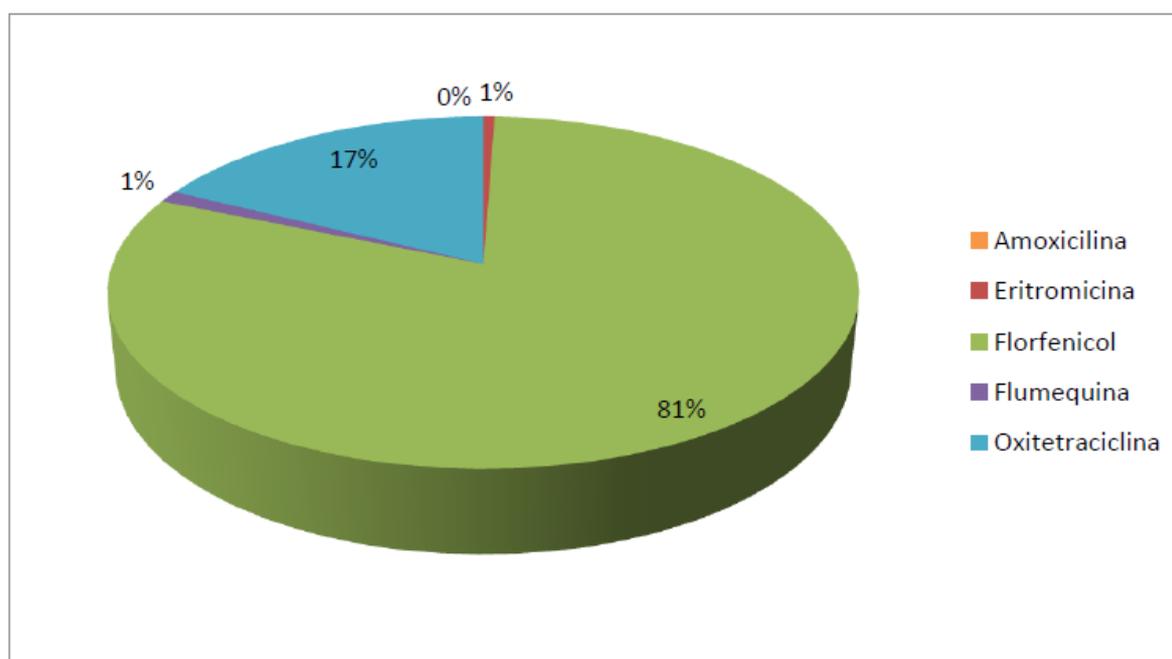


Figura N° 3. Participación porcentual de antimicrobianos utilizados en salmonicultura nacional durante el año 2015 en relación al tipo antimicrobiano.



<http://oceana.org/blog/record-antibiotic-use-concerns-mount-chile%E2%80%99s-salmon-farms-are-brewing-superbugs>

[8] Loch Duart claims on their [web-site](#) that they have "never used antibiotics":

Natural Principles of Salmon Feeding

Whatever we feed our fish will be as close to the natural diet of salmon as we can achieve, whilst meeting our principles on the environment. It is probably self-evident to say that we have never and will never use growth promoters. Loch Duart has never used antibiotics.

However, the data provided by SEPA includes the following use of Panacur (Fenbenzadole):

Year	Site Name	Licence	Operator	Local Authority	Panacur 4% powder (g)
2007	Calbha Site 7	WPC/N/61566	Loch Duart Ltd	Highland	115665
2007	Calbha Site 5	WPC/N/61548	Loch Duart Ltd	Highland	94896
2007	Calbha Site 6	WPC/N/61565	Loch Duart Ltd	Highland	73605

Fenbenzadole is [described](#) as "a broad spectrum [benzimidazole anthelmintic](#) used against gastrointestinal parasites".

A [report by SEPA in 2007](#) included:

Introduction

Panacur (active ingredient fenbendazole) has been developed by Hoechst Roussel Vet Limited as a broad spectrum anthelmintic for the removal and control of gastrointestinal parasites and lungworm in cattle. The EC safety data sheets for fenbendazole (Hoechst Roussel Vet Limited) describe the chemical as not readily degradable, and of low acute toxicity to fish and bacteria (e.g. EC50 > 500 mg/L). As a general precaution the documentation advises against uncontrolled release to soil or water ways. Panacur does not have a marketing authorisation as a fish medicine but SEPA understands that it is being prescribed by vets under the cascade principle on the rare occasions it is required.

SEPA has received a small number of applications for consent under the Control of Pollution Act 1974 (COPA) and will receive applications under the Water Environment (Controlled Activities) (Scotland) Regulations 2005 (CAR) for the use of Panacur in the treatment of salmon in marine cage salmon farms. SEPA's predecessor bodies the Scottish RPAs authorised occasional use by issuing specific letters of authorisation however this approach was thought not fully to meet the requirements of the COPA or CAR and SEPA requires to follow closely the procedure laid down by the Regulations.

This report provides an initial assessment of the toxicity risk to marine life associated with the use of Panacur for the treatment of salmon in marine salmon farms.

Usage of Panacur (fenbendazole) in marine salmon farming

Panacur has been used on an occasional basis for the treatment of *Eubothrium* (a stomach cestode) outbreaks in marine salmon farms and applications have generally been made for 'one-off' treatments. Furthermore, SEPA's records indicate that the total quantity used in marine salmon farming has been small. For example, during the period 1990-99, there has only been 308 kg Panacur (equivalent to 12kg fenbendazole) use based on record returns (to 12-04-99) in SEPA's South-West Area.

Treatment regimen

Panacur 4% Powder is a powder formulation of fenbendazole for incorporation into feedstuffs for oral administration (i.e. 1g Panacur 4% powder contains 0.04g active ingredient fenbendazole). SEPA does not have detailed information on the treatment regimen. Panacur 4% Powder has been used in the few (3) cases examined. It is understood that this is mixed with feed as required on a case-by-case basis.

[9] Here's a FOI request filed by GAAIA with the Scottish Government and SEPA:

From: Don Staniford [mailto:salmonfarmingkills@gmail.com]

Sent: 07 February 2017 20:01

To: 'ceu@scotland.gsi.gov.uk'; 'AccessToInformation'

Subject: FOI re. antibiotic use in cleaner fish (2013-2016)

Please provide information on the use of antibiotics in cleaner fish (2013-2016).

The 2015 fish farm production survey published in 2016 detailed a significant increase in the use of wrasse and lumpsucker fish: <http://www.gov.scot/Resource/0050/00505162.pdf>

Company, Site and Production Data

Table 40: Number of companies and sites producing other species in 2015, annual production of other species (tonnes) during 2012-2015 and estimated production in 2016

Species	No. of companies	No. of sites	2012 Production tonnage	2013 Production tonnage	2014 Production tonnage	2015 Production tonnage	2016 Production tonnage*
Arctic charr	1	1	0.2	0	0	†	∞
Brown trout/ Sea trout	14	18	42	44	48	42	58
Cod	0	0	0	†	†	0	0
Halibut	2	3	73	56	66	56	90
Lumpsucker	4	4	0	0	5	6	15
Wrasse spp.	3	4	†	0.1	0.1	3	7

* Industry estimates based on stocks currently being on-grown.

† Production occurred but this cannot be shown without revealing the figure for an individual company.

∞ The estimated production for 2016 cannot be shown without revealing the figure for an individual company.

Please note a recent article detailing increases in antibiotic use in cleanerfish farms in Norway:

Fish Farming Expert, 2 February 2017



Juvenile wrasse.

An appetite for antibiotics

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Author: [Magnus Petersen](#)

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When it comes to trout, Lillehaug says that there is practically no use of antibiotics.

<http://www.fishfarmingexpert.com/news/an-appetite-for-antibiotics/>

What are the comparative figures for Scotland from 2013 to 2016?

Please include data on antibiotic use in cleaner fish farms (wrasse and lumpsucker) and any correspondence on the use of antibiotics in cleaner fish farms.

Please consider this a request for information under the relevant Freedom of Information and Environmental Information Regulations including both the Freedom of Information

