



Veterinary  
Medicines  
Directorate

# Supplementary Material 1 - Sales & Usage

## UK-VARSS 2023

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### S1.1: Further details on the methodology

The European Commission has requested the European Medicines Agency (EMA) to take the lead in collating data collected on the use of antibiotic agents in animals in the European Union. The EMA has therefore developed a harmonised approach for the collection and reporting of data based on national sales figures. This is designed to be comparable with usage data of human antibiotics, to the extent possible.

Harmonised indicators for antibiotic use have also been developed by the Quadripartite (The Quadripartite partnership consist of the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (WOAH) and the United Nations Environment Programme (UNEP)). These include a core indicator measuring total volume of sales or usage based on a mg/kg biomass metric. Global data using this metric is presented by region in the WOAH's [Animuse portal](#). For the United Kingdom, 2023 data is not yet available, but 2022 data shows antibiotic use using this metric was 17.7 mg/kg. This is lower than the 25.7 mg/kg reported in UK-VARSS for 2022, as the denominator weights used are based on liveweight at slaughter, whereas the EMA methodology used in the UK-VARSS report uses lower weights that represent the average weight at time of treatment.

Published European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) reports are available from:

<https://www.ema.europa.eu/en/veterinary-regulatory/overview/antimicrobial-resistance/european-surveillance-veterinary-antimicrobial-consumption-esvac>.

UK-VARSS used a different method to calculate mg/kg (called milligram per Population Correction Unit (mg/PCU) for ESVAC purposes) compared to ESVAC until UK-VARSS 2015. Since 2015, the ESVAC mg/kg methodology has been adopted. For a full explanation please see VARSS Supplementary Material 2020.

For further details on how mg/PCU is calculated please see:

<https://www.gov.uk/government/publications/understanding-the-mgpcu-calculation-used-for-antibiotic-monitoring-in-food-producing-animals>.

The data reported in Chapter 1 of the main report are presented according to the Anatomical Therapeutic Chemical Classification System for veterinary medicinal products (ATCvet) as shown in Table S1.1.1.

**Table S1.1.1:** Categories and ATCvet codes of antibiotic veterinary medicinal products included in the data.

Veterinary antibiotic category	ATCvet codes
Antibiotics for intestinal use	QA07AA; QA07AB

Antibiotics for intrauterine use	QG01AA; QG01AE; QG01BA; QG01BE; QG51AA; QG51AG
Antibiotics for systemic use	QJ01
Antibiotics for intramammary use	QJ51
Antibiotics for antiprotozoal use (solely sulfonamides)	QP51AG

Table S1.1.2 shows the sales for other antibiotic products, which include topical preparations and those for sensory organs, for example aerosols, creams, gels, shampoos and ear and eye medications. These are not included in the ESVAC calculation.

**Table S1.1.2:** Active ingredient in tonnes of antibiotics sold for all animal species by ‘other’ routes of administration from 2014 to 2023.

Administration Route	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Other routes	2.3	1.9	2.4	2.4	2.5	2.6	2.1	2.6	2.3	2.1

## S1.2: Weight of animal population at risk

When assessing antibiotic sales, it is important that the demographics of the animal population potentially exposed to treatment are also considered, (see Annex D of the main report for data limitations). For food-producing animals, this is achieved through use of the PCU, a technical unit of measurement (where 1 PCU = 1 kg of animal treated), which is calculated by multiplying a standardised average weight at time of treatment (which can be found in Table S1.2.1) with the associated annual animal/slaughter numbers. The calculation also considers animals exported from the UK for slaughter or imported to the UK for fattening. Full details on the methodology of calculation of the PCU can be found in the 2011 ESVAC report (which includes data from 2005 to 2009):

<https://www.ema.europa.eu/en/veterinary-regulatory/overview/antimicrobial-resistance/european-surveillance-veterinary-antimicrobial-consumption-esvac>.

Table S1.2.1 shows the UK PCU value for food-producing animal species and horses. The standard formula used for calculation of the [PCU](#) for poultry does not include population figures for laying hens so the poultry PCU is an underestimate.

**Table S1.2.1:** PCU in 1,000 tonnes by food-producing animal species from 2014 to 2023

Please note that for horses, horse population data are obtained from the British Equestrian Trade Association survey which is run every 5 years.

Animal species	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Sheep and goats	2823.9	2795.6	2845.5	2903.6	2832.4	2817.1	2743.9	2730.7	2748.8	2667.0
Cattle	1731.3	1743.0	1792.3	1785.2	1787.5	1775.0	1768.5	1716.3	1736.1	1737.9
Poultry	1042.7	1082.4	1152.0	1185.0	1235.2	1205.1	1250.9	1255.0	1186.7	1209.1
Pigs	744.6	769.7	788.9	766.5	781.2	796.1	795.5	808.7	803.4	724.4
Horses	395.2	377.6	377.6	377.6	377.6	338.8	338.8	338.8	338.8	338.8
Fish	177.0	193.1	187.3	117.3	203.6	168.8	217.5	204.5	220.2	183.0
<b>Total PCU</b>	<b>6914.5</b>	<b>6961.4</b>	<b>7143.6</b>	<b>7195.2</b>	<b>7217.5</b>	<b>7100.9</b>	<b>7115.2</b>	<b>7053.9</b>	<b>7034.1</b>	<b>6860.1</b>

For cats and dogs, the weight of the population at risk is calculated in a different way and shown in table S1.2.2. This is used for the dog and cat mg/kg and DDDVet/animal calculations. Population data was sourced from the Peoples Dispensary for Sick Animals [PAW Report survey data](#), and mean adult cat and dog weights provided by the [VetCompass](#).

**Table S1.2.2:** Weights, in 1,000 tonnes of a) dogs and b) cats from 2014 to 2023

a)

Dogs	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Population (in 1,000s) heads	8,100	9,300	9,400	9,300	8,900	9,900	10,100	9,600	10,200	11,000
Mean weight (in kg)	17.6	17.1	17.0	16.8	16.7	16.6	16.4	16.4	16.3	16.1
Total weight of dogs (in 1,000 tonnes)	142.6	159.0	159.8	156.2	148.6	164.3	165.6	157.4	166.3	177.1

b)

Cats	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Population (in 1,000s) heads	10,500	11,100	11,000	10,300	11,100	10,900	10,900	10,700	11,100	11,000
Mean weight (in kg)	4.1	4.1	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Total weight of cats (in 1,000 tonnes)	43.1	45.5	46.2	43.3	46.6	45.8	45.8	44.9	46.6	46.2



**Table S1.2.3:** Average weight at time of treatment in kg used to calculate the PCU for food-producing animals.

Please note that for the category imported/exported poultry for slaughter, it's assumed this is broilers. Also, for the category slaughter sheep and goats, it's assumed this is lambs.

**a) Cattle**

Animal category	Average weight at treatment (kg)	Source
Slaughter cows	425	<a href="#">Montforts (1999)</a>
Slaughter heifers	200	<a href="#">EMA</a>
Slaughter bullocks and bulls	425	Montforts (1999)
Slaughter calves and young cattle	140	Montforts (1999); EMA
Imported/exported cattle for slaughter	425	Montforts (1999)
Imported/exported cattle for fattening	140	Montforts (1999)
Livestock dairy cows	425	Montforts (1999); EMA

**b) Pigs**

Animal category	Average weight at treatment (kg)	Source
Slaughter pigs	65	Montforts (1999)
Imported/exported pigs for slaughter	65	Montforts (1999)
Imported/exported pigs for fattening	25	M. Goll (Eurostat, personal comm.)
Livestock sows	240	Montforts (1999)

**c) Poultry**

Animal category	Average weight at treatment (kg)	Source
Slaughter broilers	1	Montforts (1999); EMA
Slaughter turkeys	6.5	Montforts (1999); EMA
Imported/exported poultry for slaughter	1	Montforts (1999); EMA

**d) Sheep and goats**

Animal category	Average weight at treatment (kg)	Source
Slaughter sheep and goats	20	Montforts (1999)
Imported/exported sheep and goats for slaughter <sup>4</sup>	20	Montforts (1999)
Livestock sheep	75	Montforts (1999)

**e) Horses**

Animal category	Average weight at treatment (kg)	Source
Living horses	400	Montforts (1999); EMA

Please note that for fish, data from Eurostat is given in 1,000 tonnes slaughtered fish as live weight.

### S1.3: Daily dose figures (DDDVet) used for calculating DDDVet/animal in dogs and cats.

**Table S1.3.1:** length of activity, average daily dose rate and DDDVet figures (in mg/kg) used for calculating the DDDVet/animal metric for dogs and cats.

#### a) Dogs

Ingredient	Formulation	Length of activity	Average daily dose rate	DDDVet (mg/kg)
Amoxicillin*	Tablets/ Oral Solution	1.0	20.0	20.0
Ampicillin	Tablets	1.0	20.0	20.0
Cephalexin	Tablets	1.0	30.0	30.0
Cefovecin	Injection	14.0	8.0	0.6
Clindamycin	Tablets/ Oral Solution	1.0	11.0	11.0
Doxycycline	Tablets	1.0	10.0	10.0
Enrofloxacin	Tablets/ Injection	1.0	5.0	5.0
Marbofloxacin	Tablets/ Injection	1.0	2.0	2.0
Metronidazole	Tablets	1.0	50.0	50.0
Metronidazole-spiramycin	Tablets	1.0	35.9	35.9
Oxytetracycline	Tablets	1.0	50	50
Pradofloxacin	Tablets	1.0	3.0	3.0
Trimethoprim-sulfadiazine	Tablets/ Injection	1.0	30.0	30.0

\* Includes those in combination with clavulanic acid, although clavulanic acid is not counted as an active ingredient

#### b) Cats

Ingredient	Formulation	Length of activity	Average daily dose rate	DDD (mg/kg)
Amoxicillin*	Tablets/ Oral Solution	1.0	20.0	20.0
Cephalexin	Tablets	1.0	30.0	30.0
Cefovecin	Injection	14.0	8.0	0.6
Clindamycin	Tablets/ Oral Solution	1.0	11.0	11.0
Doxycycline	Tablets	1.0	10.0	10.0
Enrofloxacin	Tablets/ Injection	1.0	5.0	5.0
Marbofloxacin	Tablets/ Injection	1.0	2.0	2.0
Metronidazole	Tablets/ Oral Solution	1.0	50.0	50.0
Metronidazole-spiramycin	Tablets	1.0	35.9	35.9
Pradofloxacin	Tablets	1.0	3.0	3.0
Pradofloxacin	Oral Solution	1.0	5.0	5.0
Trimethoprim-sulfadiazine	Tablets/ Injection	1.0	30.0	30.0

\* Includes those in combination with clavulanic acid – although clavulanic acid is not counted as an active ingredient)

## S1.4: Antibiotic active ingredients authorised for use in animals

**Table S1.4.1:** Antibiotic active ingredient organised by class, authorised species and administration route for 2023.

### a) Tetracyclines

Active ingredient	Authorised species	Administration route
Chlortetracycline	Cats, cattle, chickens, dogs, ducks, horses, pigs, sheep, turkeys	Oral/water, premix, topical
Doxycycline	Cats, cattle, chickens, dogs, pigs, turkeys	Oral/water, tablet
Oxytetracycline	Cats, cattle, chickens, dogs, horses, pigs, salmon, sheep, trout	Injectable, oral/water, premix, topical, tablet
Tetracycline	Cattle, chickens, pigs, turkeys	Intrauterine, oral/water

### b) Trimethoprim/sulfonamides

Active ingredient	Authorised species	Administration route
Sulfadiazine	Cats, cattle, chickens, dogs, horses, pigs, turkeys, cattle	Injectable, intramammary suspension, oral/water, premix, tablet
Sulfadimethoxine	Pigeons	Oral/water
Sulfadimidine	Cattle, pigs, sheep	Injectable
Sulfadoxine	Cattle, horses	Injectable
Sulfamethoxazole	Bearded dragon, chickens, pigeon, rabbits, pigs	Oral/water
Trimethoprim	Bearded dragon, cats, cattle, chickens, dogs, horses, pigeon, pigs, rabbits, turkeys	Injection, intramammary suspension, oral/water, premix, tablet

### c) Beta-lactams: first generation cephalosporins

Active ingredient	Authorised species	Administration route
Cefalexin	Cats, cattle, dogs	Injectable, intramammary suspension, tablet
Cefalonium	Cattle	Intramammary suspension
Cefapirin	Cattle	Intramammary suspension, intrauterine suspension

### d) Beta-lactams: third generation cephalosporins

Active ingredient	Authorised species	Administration route
Cefoperazone	Cattle	Intramammary suspension
Cefovecin	Cats, dogs	Injectable
Ceftiofur	Cattle, horses, pigs	Injectable

e) Beta-lactams: fourth generation cephalosporins

Active ingredient	Authorised species	Administration route
Cefquinome	Cattle, horses, pigs	Injectable, intramammary suspension/ointment

f) Beta-lactams: penicillins

Active ingredient	Authorised species	Administration route
Amoxicillin	Cats, cattle, chickens, dogs, ducks, pigeons, pigs, salmon, sheep, turkeys	Intramammary suspension, injectable, oral/water, premix, tablet, top dressing
Ampicillin	Cats, cattle, dogs, pigs, sheep	Injectable, intramammary suspension, tablet
Benzylpenicillin	Cattle, horses, pigs	Injectable
Cloxacillin	Cats, cattle, dogs, horses, sheep	Eye ointment, intramammary suspension,
Phenoxymethylpenicillin	Chickens, pigs	Oral/water, premix

g) Aminoglycosides

Active ingredient	Authorised species	Administration route
Apramycin	Cattle, chickens, pigs, rabbits	Oral/water, premix
Dihydrostreptomycin	Cats, Cattle, horses, pigs, sheep	Injectable, intramammary suspension
Framycetin	Cats, cattle, dogs	Injectable, intramammary suspension
Gentamicin	Cats, dogs, horses, rabbits	Ear drops, eye drops, gel, injectable
Kanamycin	Cattle	Intramammary suspension
Neomycin	Cats, cattle, dogs, duck, goose, horses, partridge, pigs, quail, sheep, turkeys	Ear drops, injectable, intramammary suspension, oral/water
Paromomycin	Cattle, chickens, goats, pigs, rabbit, sheep, turkey	Oral/water, premix
Spectinomycin	Cattle, chickens, pigs, sheep,	Injectable, oral/water, premix,
Streptomycin	Cats, Cattle, dogs, horses, sheep	Injectable, intramammary suspensions, oral/solution

h) Fluoroquinolones

Active ingredient	Authorised species	Administration route
Danofloxacin	Cattle, pigs	Injectable
Enrofloxacin	Cats, cattle, chickens, dogs, exotic animals, goats, ornamental birds, pigs, rabbits, reptiles, rodents, sheep, turkeys	Injectable, oral/water, tablet
Marbofloxacin	Cats, cattle, dogs, pigs,	Injectables, oral/water, tablet, topical
Orbifloxacin	Dogs	Ear drops
Pradofloxacin	Cats, dogs	Oral/water, tablet

**i) Macrolides**

Active ingredient	Authorised species	Administration route
Erythromycin	Chickens	Oral/water
Gamithromycin	Cattle, pigs, sheep	Injectable
Spiramycin	Cats, dogs	Tablet
Tildipirosin	Cattle, pigs	Injectable
Tilmicosin	Cattle, chickens, pigs, rabbits, sheep, turkeys	Injectable, oral/water, premix
Tulathromycin	Cattle, pigs, sheep	Injectable
Tylosin	Cattle, chickens, pigs, turkeys	Injectable, oral/water, premix
Tylvalosin	Chickens, game birds, pigs, turkeys,	Oral/water, premix

**j) Other: amphenicols**

Active ingredient	Authorised species	Administration route
Florfenicol	Cattle, dogs, pigs, salmon, sheep	Injectable, oral/water, premix, topical

**k) Other: lincomycins**

Active ingredient	Authorised species	Administration route
Lincomycin	Cats, Cattle, chickens, dogs, pigs	Injectables, intramammary solution, oral/water, premix
Clindamycin	Cats, dogs	Oral/water, tablet
Pirlimycin	Cattle	Intramammary solution

**l) Other: pleuromutilins**

Active ingredient	Authorised species	Administration route
Tiamulin	Chickens, pigs, turkeys, rabbits	Injectable, oral/water, premix

**m) Other: polymyxins**

Active ingredient	Authorised species	Administration route
Colistin	Cattle, chickens, pigs, sheep, turkeys	Oral/water, premix
Polymyxin B	Cats, dogs	Cutaneous suspensions, ear drops

**n) Other: other antibiotics**

Active ingredient	Authorised species	Administration route
Fusidic acid	Cats, dogs, rabbits	Ear drops, gel
Novobiocin	Cattle	Intramammary suspension

Certain active ingredients included in the results in chapters 3 and 4 are not authorised for use in food-producing animals. These antibiotics (listed below) are however included in the test panels to monitor emergence or risk of resistance to those antibiotics in bacteria in

people or because no breakpoints are available for the antibiotic for which testing ideally should be taking place.

Table S1.4.2: Antibiotics not authorised for use in food-producing animals.

Antibiotic class	Active ingredient
Aminoglycosides	Amikacin
Amphenicols	Chloramphenicol
Beta-lactams: 3 <sup>rd</sup> generation cephalosporins	Cefotaxime
Beta-lactams: 3 <sup>rd</sup> generation cephalosporins	Cefpodoxime
Beta-lactams: 3 <sup>rd</sup> generation cephalosporins	Ceftazidime
Beta-lactams: 4 <sup>th</sup> generation cephalosporins	Cefepime
Beta-lactams: Carbapenems	Ertapenem
Beta-lactams: Carbapenems	Imipenem
Beta-lactams: Carbapenems	Meropenem
Macrolides	Azithromycin
Fluoroquinolones	Ciprofloxacin
Quinolones	Nalidixic acid
Other anti-infectives and antiseptics	Furazolidone

## S1.5: Cascade prescribing

The Cascade is a legislative provision in the Veterinary Medicines Regulations that allows a veterinary surgeon to prescribe unauthorised medicines that would not otherwise be permitted, for example, imported medicines or a medicine licensed for another animal species or human use. The principle of the Cascade is that, if there is no suitable veterinary medicine authorised in the UK to treat a condition, the veterinary surgeon responsible for the animal may in particular circumstances (for example to avoid causing unacceptable suffering) treat with an unauthorised medicine. Food-producing animals may only be treated under the Cascade with medicines whose pharmacologically active substances are listed in the Table of Allowed Substances in Commission Regulation EU No. 37/2010.

The data used in this report do not include data on sales of imported or human antibiotics used in animals in accordance with the prescribing Cascade, as currently there is no mechanism by which such information can be obtained. The understanding is that use of human products in food-producing animal species is not extensive, due to issues with longer withdrawal periods when using such products. The VMD continues to explore methods that can accurately incorporate information on the amounts of antibiotics imported into or exported out of the UK, as well as methods that can accurately incorporate sales of antibiotics licensed for humans that are sold for animal use under the Cascade prescribing system.

## S1.6: Sales of antibiotics for food-producing animal species (mg/kg)

**Table S1.6.1:** Active ingredient in mg/kg of antibiotics sold for food-producing animals from 2014 to 2023.

Please note, the figures in the total sales row are rounded to the nearest integer. This explains any discrepancy between the overall total and the classes' totals. Also, because of the heightened interest in and the low use of HP-CIA classes, the sales of fluoroquinolones, third and fourth generation cephalosporins and colistin are presented in a separated section of the table. Total includes all classes (including HP-CIAs).

Antibiotic Class	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change since 2014
Tetracyclines	26.1	23.6	15.0	13.1	11.7	10.2	10.2	9.6	8.3	9.0	-65%
Penicillins	11.4	9.8	7.9	7.3	6.7	7.5	8.0	7.6	7.3	6.8	-41%
Aminoglycosides	3.6	3.5	2.2	2.5	2.6	3.4	3.0	3.0	3.1	2.8	-22%
Macrolides	7.2	5.5	4.0	3.2	2.3	2.3	3.0	2.7	2.3	2.5	-65%
Trimethoprim/ Sulfonamides	10.0	9.7	7.0	3.3	3.2	3.5	3.5	3.1	2.2	1.5	-85%
Pleuromutilins	1.8	2.2	1.4	1.4	1.2	2.1	1.0	0.9	1.0	1.4	-22%
Lincosamides	1.0	0.9	0.5	0.3	0.4	0.6	0.7	0.5	0.7	0.9	-12%
Amphenicols	0.4	0.4	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.7	65%
1st and 2nd generation cephalosporins	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	12%
Imidazole derivates	0	0	0	0	0	0.005	0.005	0.005	0.006	0.005	100%
Aminocoumarins	0.03	0.03	0.02	0.02	0.02	0.02	0	0	0	0	-100%
HP-CIAs	0.7	0.6	0.4	0.3	0.2	0.2	0.2	0.115	0.119	0.109	-84%
<b>Total</b>	<b>62.3</b>	<b>56.5</b>	<b>39.0</b>	<b>32.1</b>	<b>29.0</b>	<b>30.4</b>	<b>30.2</b>	<b>28.3</b>	<b>25.7</b>	<b>25.7</b>	<b>-59%</b>
HP-CIAs	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change since 2014
Fluoroquinolones	0.35	0.35	0.22	0.16	0.15	0.13	0.10	0.10	0.10	0.09	-74%
3rd and 4th generation cephalosporins	0.19	0.17	0.14	0.11	0.06	0.03	0.04	0.02	0.02	0.02	-91%
Colistin	0.12	0.13	0.02	0.0006	0.0007	0.0002	0.00007	0	0	0	-100%
<b>Total HP-CIA</b>	<b>0.67</b>	<b>0.65</b>	<b>0.38</b>	<b>0.26</b>	<b>0.21</b>	<b>0.17</b>	<b>0.14</b>	<b>0.12</b>	<b>0.12</b>	<b>0.11</b>	<b>-84%</b>

**Table S1.6.2:** Active ingredient in mg/kg of antibiotics sold for food-producing animals by route of administration from 2014 to 2023.

Please note, the In-water/milk category includes oral powders and oral solutions, and the administration route classed as “other” includes intramammary dry and lactating cow, intrauterine preparations, bolus preparations and oral pastes.

Administration route	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change since 2014
In-water/milk	16.5	15.2	11.4	9.3	9.3	11.0	11.8	11.6	11.4	12.2	-26%
In-feed	38.6	33.4	20.6	14.7	12.3	12.7	12.1	9.6	8.0	8.2	-79%
Injectable	6.4	7.1	6.3	7.5	6.7	6.3	5.9	6.6	5.9	5.0	-20%
Other	0.9	0.9	0.7	0.6	0.6	0.5	0.4	0.4	0.4	0.4	-54%
<b>Total</b>	<b>62.3</b>	<b>56.5</b>	<b>39.0</b>	<b>32.1</b>	<b>29.0</b>	<b>30.4</b>	<b>30.2</b>	<b>28.3</b>	<b>25.7</b>	<b>25.7</b>	<b>-59%</b>

## S1.7: Sales of intramammary products licensed for cattle (in courses per dairy cow)

**Table S1.7.1:** Sales of (A) dry and lactating cow intramammary products in courses per dairy cow from 2014 to 2022 and (B) HP-CIA sales of dry and lactating intramammary products in courses per dairy cow from 2014 to 2023.

**(A)** Dry and lactating cow intramammary products.

Intramammary product DCDvet	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change since 2014
Dry cow tubes	0.62	0.73	0.61	0.54	0.64	0.58	0.48	0.55	0.45	0.58	-7%
Lactating cow tubes	0.89	0.80	0.82	0.69	0.78	0.60	0.51	0.40	0.35	0.38	-58%

**(B)** HP-CIA sales of dry and lactating intramammary products.

Intramammary product DCDvet	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change since 2014
Combination of lactating and dry cow HP-CIAs	0.37	0.33	0.24	0.17	0.12	0.03	0.07	0.02	0.01	0.01	-97%



## S1.8: Total sales of antibiotics for all animals (mg/kg)

This harmonised metric will be used [across Europe](#) for the monitoring and reporting of antibiotic sales data going forward. We recognize the value of harmonised regional surveillance and, in previous years, the UK has published its sales data for food producing animals alongside other countries in Europe in the [ESVAC report](#). Publishing this new mg/kg metric for all animals in VARSS will help ensure that we can continue to compare our data when the new EU report, which will contain 2023 data, comes out by [30<sup>th</sup> June 2024](#).

**Table S1.8.1: Active ingredient in mg/kg of antibiotics sold for use in animals from 2014 to 2023.**

Metric used	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change since 2014
Mg/kg all animals	38.9	34.6	24.7	20.7	18.7	19.5	19.2	18.0	16.4	16.5	-58%

## S1.9: Total sales of antibiotics for all animals (tonnes)

**Table S1.9.1: Active ingredient in tonnes of antibiotics sold for all animals from 2014 to 2023.**

Please note, the figures in the total sales row are rounded to the nearest integer.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change since 2014
Total Sales (tonnes)	446.6	406.1	293.3	245.5	222.8	228.5	226.7	212.4	193.0	188.6	-58%

**Table S1.9.2: Active ingredient in tonnes of HP-CIAs sold for all animals from 2014 to 2023.**

Please note, the figures in the total sales row are rounded to the nearest integer.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change since 2014
Total HP-CIA sales (tonnes)	4.78	4.62	2.86	2.01	1.65	1.27	1.08	0.90	0.91	0.82	-83%

## S1.10: Total sales of antibiotics by species indication (tonnes)

**Table S1.10.1:** Active ingredient in tonnes and percentage of total sales of antibiotics sold for the animal species categories: food-producing animals, companion animals and combination of food- companion animals from 2014 to 2023.

Note that this section includes products licensed for the combination of food-producing animals and rabbits under food-producing animals. This is because these products are licensed for farmed rabbits and there are no rabbits being farmed for food in the UK. The companion animal category includes dogs, cats, reptiles, rodents, ornamental birds, cage birds, pigeons, exotic animals, reptiles, bearded dragons, rabbits and horses.

Animal species	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Food producing animals	392 (88)	356.4 (88)	239.2 (82)	197.2 (80)	182.4 (82)	186.3 (82)	189.5 (84)	171.2 (81)	155.3 (80)	154.5 (82)
Combination of food and companion animals	22.9 (5)	23.6 (6)	22.9 (8)	27.2 (11)	24.7 (11)	27.6 (12)	23.0 (10)	25.1 (12)	22.4 (12)	18.8 (10)
Companion animals	31.8 (7)	26.1 (6)	29.6 (10)	21.1 (9)	15.8 (7)	14.6 (6)	14.2 (6)	16.1 (8)	15.3 (8)	15.3 (8)

## S1.11: Harmonised outcome indicators for antibiotic use (mg/kg)

**Table S1.11.1:** Harmonised outcome indicators for antibiotic consumption in food-producing animal species in the UK; Primary indicator (A) and secondary indicators (B), 2014 to 2023.

(A)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total Sales (mg/kg)	62.3	56.5	39.0	32.1	29.0	30.4	30.2	28.3	25.7	25.7

(B)

Sales per selected antimicrobial class (mg/kg)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Fluoroquinolones	0.35	0.35	0.22	0.16	0.15	0.13	0.10	0.10	0.10	0.10
3rd and 4th generation cephalosporins	0.19	0.17	0.14	0.11	0.06	0.03	0.04	0.02	0.02	0.02
Colistin	0.12	0.13	0.02	0.0006	0.0007	0.0002	0.00007	0	0	0

### S2.1: Usage of veterinary antibiotics for pigs (in mg/kg)

**Table S2.1.1:** Usage recorded for active ingredient in mg/kg of antibiotics in eMB Pigs by antibiotic class; 2015 to 2023.

Please note that the antibiotic class referred to as “other” includes lincosamides, amphenicols, polymyxins, fluoroquinolones and third and fourth generation cephalosporins.

Antibiotic	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change 2015 to 2023
Tetracyclines	117.7	82.4	55.7	46.1	42.1	37.7	30.5	23.6	27.6	-77%
Penicillins	37.0	27.4	22.4	21.2	20.2	21.9	17.7	14.5	15.7	-58%
Aminoglycosides	3.5	3.0	3.6	5.5	6.5	8.3	8.6	8.1	11.5	229%
Trimethoprim-sulfonamides	66.2	29.2	20.8	18.3	17.9	16.5	14.0	9.2	10.0	-85%
Macrolides	31.0	28.8	16.0	10.5	9.1	11.2	9.9	8.9	9.6	-69%
Other	5.1	4.3	2.5	3.2	4.0	4.4	3.2	4.4	5.4	6%
Pleuromutilins	17.3	7.6	9.8	5.3	10.5	5.1	3.3	3.1	5.0	-71%
<b>Total</b>	<b>277.7</b>	<b>182.7</b>	<b>130.7</b>	<b>110.1</b>	<b>110.5</b>	<b>105.0</b>	<b>87.3</b>	<b>71.8</b>	<b>84.8</b>	<b>-69%</b>

**Table S2.1.2:** HP-CIA usage, depicted in active ingredient of antibiotics, in mg/kg recorded in eMB Pigs from 2015 to 2023.

Antibiotic	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change 2015 to 2023
Fluoroquinolones	0.106	0.047	0.074	0.051	0.034	0.045	0.026	0.011	0.007	-94%
Third and fourth generation cephalosporins	0.018	0.008	0.014	0.010	0.005	0.007	0.007	0.001	0.001	-97%
Colistin	0.855	0.210	0.010	0.013	0.002	0	0	0	0	-100%
<b>Total</b>	<b>0.979</b>	<b>0.266</b>	<b>0.097</b>	<b>0.074</b>	<b>0.042</b>	<b>0.052</b>	<b>0.033</b>	<b>0.012</b>	<b>0.007</b>	<b>-99%</b>

## S2.2: Usage of veterinary antibiotics for meat poultry (in tonnes and mg/kg)

**Table S2.2.1:** Active ingredient in tonnes of antibiotics used by all members of BPC Antibiotic Stewardship by antibiotic class from 2014 to 2023.

Please note, the category penicillins include amoxicillin and phenoxymethylpenicillin and antibiotics in the class referred to as “other” includes aminoglycosides, pleuromutilins, fluoroquinolones, colistin and products under the cascade. Also, both fluoroquinolones and colistin are HP-CIAs.

Antibiotic	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change 2014 to 2023
Penicillins	19.8	14.1	10.6	8.2	10.2	12.7	15.0	12.2	12.1	9.6	-51%
Tetracyclines	30.6	23.9	9.0	3.3	2.5	3.9	2.5	1.6	1.8	2.3	-93%
Lincomycins	7.1	4.8	1.4	1.2	1.7	1.5	2.2	2.5	1.7	2.3	-67%
Potentiated sulfonamides	1.2	1.0	1.6	0.9	1.2	1.1	1.0	0.9	0.8	1.1	-5%
Macrolides	2.7	1.1	0.5	0.6	0.5	0.06	0.1	0.01	0.02	0.03	-99%
Other, including:	2.1	1.4	0.6	0.2	0.1	0.3	0.1	0.01	0.04	0.04	-98%
Fluoroquinolones (kg)	1,131	540	122	38	17.3	14.4	12.1	56.6	1.3	5.1	(-1126 kg)
Colistin (kg)	121	40	8	0	0	0	0	0	0	0	(-121 kg)
<b>Total</b>	<b>63.5</b>	<b>46.2</b>	<b>23.7</b>	<b>14.4</b>	<b>16.2</b>	<b>19.7</b>	<b>21.0</b>	<b>17.3</b>	<b>16.6</b>	<b>15.4</b>	<b>-76%</b>

**Table S2.2.2:** Active ingredient in mg/kg of antibiotics used by all members of BPC Antibiotic Stewardship by species from 2014 to 2023.

Species	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change 2014 to 2023
Turkey	219.5	199.8	86.4	45.2	46.7	42.0	25.7	42.6	35.4	33.6	-85%
Chicken	48.8	27.3	17.1	9.9	12.4	17.4	16.3	13.7	14.1	13.5	-72%
Duck	15.1	8.3	3.3	3.3	1.7	1.6	2.6	1.7	0.3	0.4	-97%

## S2.3: Usage of veterinary antibiotics for laying hens (in % bird days)

**Table S2.3.1:** Antibiotic use in percentage bird days by members of the BEIC Lion Code from 2016 to 2023.

Please note, the class referred to as “other” includes fluoroquinolones, colistin (both of which are HP-CIAs), sulfonamides, and lincosamides.

Antibiotic	2016	2017	2018	2019	2020	2021	2022	2023	Change 2016 to 2023
Tetracyclines	0.26	0.31	0.33	0.41	0.26	0.18	0.14	0.13	-50%
Penicillins	0.06	0.02	0.05	0.05	0.05	0.02	0.02	0.04	-29%
Pleuromutilins	0.25	0.17	0.11	0.12	0.10	0.10	0.05	0.03	-87%
Macrolides	0.04	0.06	0.04	0.06	0.03	0.02	0.02	0.01	-83%
Aminoglycosides	0.02	0.01	0.02	0.04	0.03	0.01	0.01	0.01	-46%
Other:	0.03	0	0.0002	0.003	0.002	0.0008	0.00	0.00	-100%
Fluoroquinolones	0.002	0	0	0	0	0	0	0	
Colistin	0.03	0	0	0	0	0	0	0	
<b>Total</b>	<b>0.67</b>	<b>0.57</b>	<b>0.55</b>	<b>0.68</b>	<b>0.47</b>	<b>0.33</b>	<b>0.23</b>	<b>0.22</b>	<b>-67%</b>

## S2.4: Usage of veterinary antibiotics for gamebirds (in tonnes)

**Table S2.4.1:** Active ingredient in tonnes of antibiotics used by the gamebird industry, recorded by GFA from 2016 to 2023.

Please note the class referred to as “other” includes aminoglycosides, amphenicols, colistin, fluoroquinolones, lincomycins, macrolides, trimethoprim/sulfonamides. Also, both fluoroquinolones and colistin are HP-CIAs.

Antibiotic	2016	2017	2018	2019	2020	2021	2022	2023	Change 2016 to 2023
Tetracyclines	14.4	8.1	5.4	5.4	2.9	4.5	3.5	5.1	-65%
Pleuromutilins	3.5	3.2	2.6	2.5	1.5	2.4	2.0	3.0	-16%
Penicillins	1.2	0.8	0.8	1.3	0.8	1.5	0.8	1.6	34%
Other:	1.0	0.4	0.5	0.8	0.5	0.5	0.4	0.3	-71%
Fluoroquinolones (kg)	63	50	47	58	22	26	23	28	-56%
Colistin (kg)	0.6	0	0	0	0	0	0	0	-100%
<b>Total</b>	<b>20.0</b>	<b>12.6</b>	<b>9.2</b>	<b>10.0</b>	<b>5.7</b>	<b>8.9</b>	<b>6.7</b>	<b>9.9</b>	<b>-51%</b>

## S2.5: Usage of veterinary antibiotics for Salmon (mg/kg)

**Table S2.5.1:** Active ingredient in mg/kg of antibiotics used on Scottish salmon farms from 2017 to 2023.

Antibiotic	2017	2018	2019	2020	2021	2022	2023	Change 2017 to 2023
Oxytetracycline	13.8	3.9	10.2	25.3	37.2	12.7	10.0	-28%
Florfenicol	2.2	2.7	3.3	4.0	5.9	5.9	10.0	357%
Oxolinic acid	0.12	0.08	0.02	0.01	0.00	0.00	0.00	-100%
Amoxicillin	0.004	0	0	0	0	0	0	-100%
<b>Total</b>	<b>16.1</b>	<b>6.7</b>	<b>13.5</b>	<b>29.3</b>	<b>43.1</b>	<b>18.6</b>	<b>19.9</b>	<b>24%</b>

## S2.6: Usage of veterinary antibiotics for trout (mg/kg)

**Table S2.6.1:** Active ingredient in mg/kg of antibiotics used on a sample of trout farms from 2017 to 2023.

Antibiotic	2017	2018	2019	2020	2021	2022	2023	Change 2017 to 2023
Oxytetracycline	7.3	3.8	5.1	7.7	4.3	40.0	3.7	-49%
Oxolinic acid	6.6	5.8	2.4	4.3	3.2	2.2	1.8	-73%
Florfenicol	4.4	2.2	1.9	1.9	1.4	2.0	1.4	-67%
Amoxicillin	0.9	1.2	0.2	0	0	0	0	-100%
<b>Total</b>	<b>19.2</b>	<b>13.0</b>	<b>9.7</b>	<b>13.9</b>	<b>8.9</b>	<b>44.1</b>	<b>6.9</b>	<b>-64%</b>

## S2.7: Sales of veterinary antibiotics for cattle (mg/kg)

**Table S2.7.1:** Active ingredient in mg/kg of sales of injectable HP-CIA products licenced for cattle, 2014 to 2023.

Antibiotic	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change since 2014
Injectable HP-CIA products licenced for cattle (mg/kg)	1.10	1.08	0.92	0.70	0.50	0.26	0.29	0.24	0.20	0.19	-83%

## S2.8: Sales of veterinary antibiotics for dogs and cats (in DDDVet/kg)

**Table S2.8.1:** Active ingredient (DDDVet/kg) of antibiotics by antibiotic class sold for use in (A) dogs from 2014 to 2023 (B) cats from 2014 to 2023.

Please note, antibiotic classes listed as “other” include other aminopenicillins (amoxicillin and ampicillin), trimethoprim-sulfonamides, metronidazole-spiramycin. Some antibiotic classes have been rounded to two decimal places for ease of comparison.

### A) Active ingredient by antibiotic class sold for use in dogs.

Antibiotic Class	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change since 2014
Amoxicillin-clavulanic acid (aminopenicillin)	1.89	1.24	1.47	1.69	1.66	1.43	1.41	1.91	1.58	1.40	-26%
Cephalexin (1 <sup>st</sup> generation cephalosporin)	1.11	0.85	0.84	0.77	0.80	0.66	0.58	0.63	0.61	0.48	-56%
Clindamycin (lincosamide)	0.46	0.37	0.38	0.35	0.38	0.32	0.28	0.31	0.27	0.26	-45%
Fluoroquinolones	0.32	0.23	0.23	0.20	0.21	0.16	0.18	0.18	0.14	0.13	-59%
Metronidazole (imidazole derivative)	0.0	0.0	0.09	0.17	0.21	0.20	0.21	0.16	0.16	0.11	100%
Tetracyclines	0.16	0.15	0.13	0.15	0.08	0.06	0.08	0.11	0.08	0.08	-53%
Cefovecin (3 <sup>rd</sup> generation cephalosporin)	0.10	0.06	0.09	0.09	0.09	0.08	0.07	0.08	0.07	0.05	-50%
Other*	0.85	0.55	0.66	0.45	0.33	0.28	0.03	0.04	0.04	0.04	-95%
<b>Total</b>	<b>4.89</b>	<b>3.45</b>	<b>3.90</b>	<b>3.86</b>	<b>3.77</b>	<b>3.19</b>	<b>2.84</b>	<b>3.42</b>	<b>2.94</b>	<b>2.56</b>	<b>-48%</b>

### B) Active ingredient by antibiotic class sold for use in cats.

Antibiotic Class	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Change since 2014
Amoxicillin-clavulanic acid (aminopenicillin)	0.92	0.72	0.64	0.66	0.63	0.58	0.84	1.11	0.92	1.15	26%
Cefovecin (3 <sup>rd</sup> generation cephalosporin)	1.38	0.79	1.27	1.26	1.15	1.21	1.07	1.05	0.96	0.79	-43%
Metronidazole (imidazole derivative)	0.0	0.0	0.07	0.14	0.16	0.16	0.19	0.19	0.18	0.15	100%
Tetracyclines	0.05	0.05	0.05	0.05	0.04	0.04	0.06	0.11	0.07	0.09	79%
Clindamycin (lincosamide)	0.04	0.05	0.04	0.05	0.05	0.05	0.05	0.06	0.06	0.06	33%
Fluoroquinolones	0.06	0.05	0.05	0.05	0.12	0.04	0.05	0.05	0.04	0.05	-23%
Cephalexin (1 <sup>st</sup> generation cephalosporin)	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.01	-47%

Other	0.16	0.11	0.08	0.09	0.07	0.06	0.02	0.02	0.01	0.01	-91%
<b>Total</b>	<b>2.64</b>	<b>1.78</b>	<b>2.22</b>	<b>2.32</b>	<b>2.22</b>	<b>2.15</b>	<b>2.28</b>	<b>2.61</b>	<b>2.26</b>	<b>2.32</b>	<b>-12%</b>

## S2.9: Antibiotic Use Coverage

**Table S2.9.1:** UK coverage of antibiotic use data presented in UK-VARSS by sector (%), 2014 to 2023.

Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Salmon	N/A	N/A	N/A	100	100	100	100	100	100	100
Pigs	N/A	61	70	87	89	95	95	95	95	95
Gamebirds	N/A	N/A	90	90	90	90	90	90	90	90
Laying Hens	N/A	N/A	90	90	90	90	90	90	90	90
Trout	N/A	N/A	N/A	90	90	90	90	90	90	90
Meat Poultry	90	90	90	90	90	90	90	90	90	85
Dairy	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	32	30
Sheep	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9	11
Beef	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6	n/a