

The AACTING-network (www.aacting.org) presents:

**DESCRIPTION OF EXISTING MONITORING SYSTEMS FOR COLLECTION,
ANALYSIS, BENCHMARKING AND REPORTING OF FARM-LEVEL
VETERINARY ANTIMICROBIAL USAGE**

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ABBREVIATION LIST

AGES	Austrian Agency for Health and Food Safety
AMU	Antimicrobial usage
ANSES	French Agency for Food, Environmental and Occupational Health & Safety
BVL	Bundesamt für Verbraucherschutz und Lebensmittelsicherheit
CIPARS	Canadian Integrated Program for Antimicrobial Resistance Surveillance
DDDA	Defined Daily Dose for animals
DCDA	Defined Course Dose for animals
DDDvet	Defined Daily Dose for animals defined by EMA in the scope of the ESVAC project
DCDvet	Defined Course Dose for animals defined by EMA in the scope of the ESVAC project
IDELE	Institut de l'élevage
IFIP	French Institute for pig and pork Industry
IFTA	Index of Frequency of Treatments with Antibiotics
IZSLER	Itituto Zooprofilattico Sperimentale della Lombardia e Dell'Emilia Romagna
PCU	Population Correction Unit
SDa	Netherlands Veterinary Medicines Institute
TF	Treatment frequency
UDD	Used Daily Dose
UCD	Used Course Dose
VMD	Veterinary Medicines Directorate
VMP	Veterinary medicinal product
ZnO	Zinc Oxide

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AUSTRIA

➤ PHAROS

– General

The PHAROS database in Austria is run by the Austrian Agency for Health and Food Safety (AGES). The provision of data is regulated by the law ‘Veterinär-Antibiotika-Mengenströme-Verordnung’ BGBl. II Nr. 83/2014. Due to its statutory nature, it is relevant to 100% of the farms in the following animal sectors:

- a) Pigs
- b) Dairy cows
- c) Beef cattle
- d) Broilers
- e) Laying hens
- f) Turkeys
- g) Goats
- h) Sheep

– Data collection

Animal (sub)categories: Weight categories are distinguished only in pigs: sows, finishers, weaners and others. For poultry, data are collected at batch level.

Input: The role of vets is to provide the amount of AMU dispensed to the farm or batch. Farmers can voluntarily provide health data of poultry and dairy cattle. In addition to data from vets and farmers, PHAROS receives data, to calculate the Austrian AMU indicator, on the number of animals on farms on a specific cut-off date from the following organisations: Agrarmarkt Austria Marketing database, the Veterinary Information System database, the cattle data network and the Poultry Health Data organisation. The number of animals on farm is then multiplied with the estimated number of animal movements to calculate the Austrian indicator.

– Analysis

Analysis at farm level is done using the dose-based unit of measurement DDDvet as defined by EMA¹. The associated indicator n DDDvet/kg/year is calculated using animal liveweights established at national level by the AGES.

¹ http://www.ema.europa.eu/docs/en_GB/document_library/Other/2016/04/WC500205410.pdf

– **Benchmarking and reporting**

At the moment a benchmark system for vets is under development and shall be included in the PHAROS data base by the end of the year. Farm-level results are not communicated directly back to the farms. A general report is published once a year on the AGES website. Results are discussed at the meeting of the chief veterinary officers of the federal provinces (Bundesländer) and are also presented at the annual antibiotic awareness day and at the annual meeting of the pharmaceutical industry and wholesalers.

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BELGIUM

➤ AB REGISTER

– General

AB Register is an online platform established by Belpork, the owner of the Belgian pig meat quality label Certus. It covers approx. 65% of Belgian pig farms and 80% of Belgian pork production. Halfway 2017, AB Register has expanded with poultry, including turkeys, with support of the Belgian quality label Belplume, covering 95% of chicken production in Belgium.

– Data collection

Animal (sub)categories: Four weight categories are distinguished in pigs: sows/boars, finishers, weaners and sucklers. Among poultry, seven animal types are distinguished: laying hens, broilers, laying dams, broiler dams, breeding laying dams, breeding broiler dams, breeding layers and turkeys.

Input: The quality assurance schemes oblige the farmers to use AB Register; however, doing the actual registrations is a task for the providers of the antibiotics, which in Belgium can be vets, feed mills and pharmacists. Farmers have the authority and the responsibility to check the validity of the registrations and can make changes to a limited number of fields. Data input can be automatic (software-to-software) or manual. The animal occupation numbers used in the calculation of the indicator are obtained from governmental databases.

In addition to antibiotics, data on the usage of zinc oxide (ZnO), authorised for prevention of diarrhoea in weaners, need to be registered.

– Analysis

The dose-based unit of measurement DDD_{bel} (defined for Belgium at product-level) is used in the calculation of the farm-level indicator BD_{100} (treatment days per 100 days). The BD_{100} is an indicator representing the exposure of animals to AMU. To calculate the (kg) animals at risk of treatment, standard weights of the pig subcategories proposed by EMA² are used.

– Benchmarking

Benchmarking is currently only applied in pigs. It is performed with a frequency of twice/year and with a time frame of one year (= the time at risk of treatment of the population at risk of treatment). It is done per weight category, with all farms in AB Register that harbour the respective categories as the reference group (the benchmark population). The AMU as such is benchmarked, by comparing and

² http://www.ema.europa.eu/docs/en_GB/document_library/Scientific_guideline/2012/12/WC500136456.pdf

categorising farms' results in three zones corresponding to two threshold values [median (P50) and 90th percentile (P90)] of the benchmark population. Hence, a farm can receive up to four benchmark results, depending on the number of weight categories present on the farm.

In addition, also the type of antimicrobials used is benchmarked. Three colour codes of antimicrobials are distinguished: yellow, orange and red, the latter including the 3rd/4th gen. cephalosporins and the fluoroquinolones. The percentage of each colour code in the total AMU in each weight category is compared to the mean percentage of each colour code over all farms.

– **Reporting**

Farm-level results are communicated to the farms twice/year through an individual report (with the results of all weight categories present at the farm) made available in the AB Register portal as a pdf. Farmers can opt to share their reports with all vets delivering antimicrobials to their farm. The report can also be made directly available for the herd veterinarian.

General results are presented at various (inter)national events (e.g. conferences, workshops, study days, press conferences, etc.) and are also summarized in reports for the contributing quality labels.

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➤ **BIGAME**

– **General**

Bigame is an online platform developed by ARSIA asbl and AWE that aims to collect and integrate various animal health related information at farm level, including data on AMU. Though being principally available to all Belgian farmers, its primary target are Walloon dairy and beef cattle farmers. It's a voluntary system, currently reaching < 0,1% farms in the sector.

– **Data collection**

Animal (sub)categories: The system has the possibility to detail the specific age of the animal.

Input: Input is done by the veterinarian. Data input can be automatic (software-to-software) or manual. The animal occupation numbers used in the calculation of the indicator are obtained from the governmental database SANITEL. The system allows to link AMU to an individual animal in the farm.

– **Analysis**

AMU is calculated as mg used and can be normalised by a standard animal weight at treatment.

– **Benchmarking**

Results of each farm is compared to similar results of all farms that are using the system.

– **Reporting**

Farmers have access to their results through the online portal.

➤ **SANITEL-MED**

– **General**

The Sanitel-Med system is owned and financed by the Belgian Federal Agency for Medicines and Health Products. The system is operational since mid-2016; however, legal obligation (RD 2017/20207) to use it commenced early 2017, and accounts for pig farms, veal calf farms, broiler farms and laying hens. In addition to the sectors obliged to register their AMU, the dairy and beef sector can use it voluntarily.

– **Data collection**

Animal (sub)categories: There are five categories in pigs: sows, finishers, gilts, weaners and sucklers. Data input can be automatic (software-to-software) or manual.

Input: The veterinarians are legally obliged to report AMU: they have to register what they prescribe, deliver at the farms or dispense to the animals. The farmers can check and validate the registrations but can also wait for automatic validation at the data-lock points, at each quarter of a year. The farmers have the authority to change all registration data in Sanitel-Med relevant for their farm.

Sanitel-Med is linked to SANITEL, a database used for epidemiological surveillance and owned by the Belgian Federal Agency for the Safety of the Food Chain. From SANITEL, the farm capacity numbers are extracted to be used in the analysis of the AMU (population at risk).

In addition of antibiotics, data on the usage of ZnO, authorised for prevention of diarrhoea in weaners, need to be registered.

– **Analysis**

Similar as in AB Register, the BD_{100} is calculated as the indicator at farm level, using standard weights proposed by EMA³ as well.

Also veterinarians will be benchmarked but an indicator still needs to be established.

– **Benchmarking**

Farms are benchmarked per weight category in a similar way as in AB Register (frequency twice/year, window of one year, P50 and P90 defining threshold values) but with the benchmark population situated at national level.

– **Reporting**

Farmers receive their benchmarking report 2x/year. Reports are made mutually available for the involved farmers and vets. In addition to farm-level communication, general results of Sanitel-Med are

³ http://www.ema.europa.eu/docs/en_GB/document_library/Scientific_guideline/2012/12/WC500136456.pdf

presented at various (inter)national events (e.g. conferences, workshops, study days, press conferences, etc.).

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➤ **SGS-BVK VEAL CALVES**

– **General**

The SGS-BVK veal calves system has been developed by SGS at the request of 'Beroepsvereniging voor de Belgische Kalfsvleessector vzw (BVK vzw)' for monitoring the antimicrobial usage in Belgian veal calves. It is operational since 2015.

– **Data collection**

Animal (sub)categories: Four production types are distinguished: all-in all-out milk, all-in all-out double muscled Belgian blue, all-in all-out crossbreds, and starters.

Input: Input is done by the veterinarian, per batch of animals set-up. In addition to registering the antimicrobials used also the number of animals set up needs to be provided.

– **Analysis**

AMU is calculated as the BD_{100} per batch.

– **Benchmarking**

Per quarter, the results are compared of all batches from a certain production type that have finished off in that quarter. Thresholds are set on the P90 of the distribution of all batches in a quarter (high users: above the P90).

– **Reporting**

Farmers receive the benchmarking results of their respective batches through the integrations they are part of and the vets associated with the integrations; high users are expected to reduce their AMU.

CANADA

➤ CIPARS

– General

The Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS) of the Public Health Agency of Canada monitors AMU in animals, as well as AMR in select bacteria from humans, animals, and food. CIPARS has active surveillance of AMU on volunteer sentinel farms for grower-finisher pigs, broiler chickens, and turkeys, with AMU research underway in other animal species or production stages. Farm-level surveillance started in 2006 for grower-finisher pigs, expanded in 2013 for broiler chickens and includes a pilot project for turkeys.

– Data collection

AMU data are collected from a sample of farms using a questionnaire. The number of farms sampled each year is approximately 100 for pigs, 140 for chickens, and 75 for turkeys.

Selection criteria:

Swine: Herds must be Canadian Quality Assurance (CQA®) validated, produce more than 2000 market pigs per year, and be representative of the characteristics and geographic distribution of herds in the veterinarian's swine practice. Exclusion criteria include 1) being regarded as organic, 2) animals having been fed edible residual material or 3) the animals were raised on pasture.

Broiler chickens: The inclusion criteria involve being 'Safe, Safer, Safest™' compliant and a quota-holding broiler operation. Selected flocks are reflective of the veterinarian's practice profile, representative of hatcheries supplying chicks, and representative of feed mills supplying feeds in the province/region. Exclusion criteria include being a pasture, backyard or small-sized farm. Inclusion and exclusion criteria are similar for *turkeys*.

Animal (sub)categories:

AMU information for pigs is collected from the grower-finisher production stage and for chickens from the broiler stage of production; the questionnaire does also request information (if known) about AMU at the hatchery-level.

Input:

Data are manually provided to CIPARS by the veterinarians who administer the questionnaire to the farmers.

– **Analysis**

Analysis is conducted using count-based, weight-based and dose-based units of measurement and indicators. Both Canadian and EMA⁴ standards for the average daily dose are used. The animal weights to determine the kg animal at risk of treatment are from EMA⁵ or specific to Canada, based on input from the Canadian industry.

– **Benchmarking and reporting**

CIPARS does not perform farm-level benchmarking at the moment.

Annual results are communicated to the farm industries and veterinarians. CIPARS hosts a multi-commodity stakeholder webinar during the Global Antibiotic Awareness Week each year. When emerging issues are identified, CIPARS communicates these findings via surveillance bulletins and/or holds *ad hoc* meetings with affected parties. CIPARS also presents findings at local, national, and international fora and publishes select findings in peer-reviewed journals.

⁴ http://www.ema.europa.eu/docs/en_GB/document_library/Other/2016/04/WC500205410.pdf

⁵ http://www.ema.europa.eu/docs/en_GB/document_library/Scientific_guideline/2012/12/WC500136456.pdf

– Stewardship

CIPARS farm-level surveillance indicated that a change in antimicrobial use policy on broiler chicken farms across Canada appears to be having the desired goal of reducing use of critically important antimicrobials, in particular the use of 3rd generation cephalosporins (Figure 1).

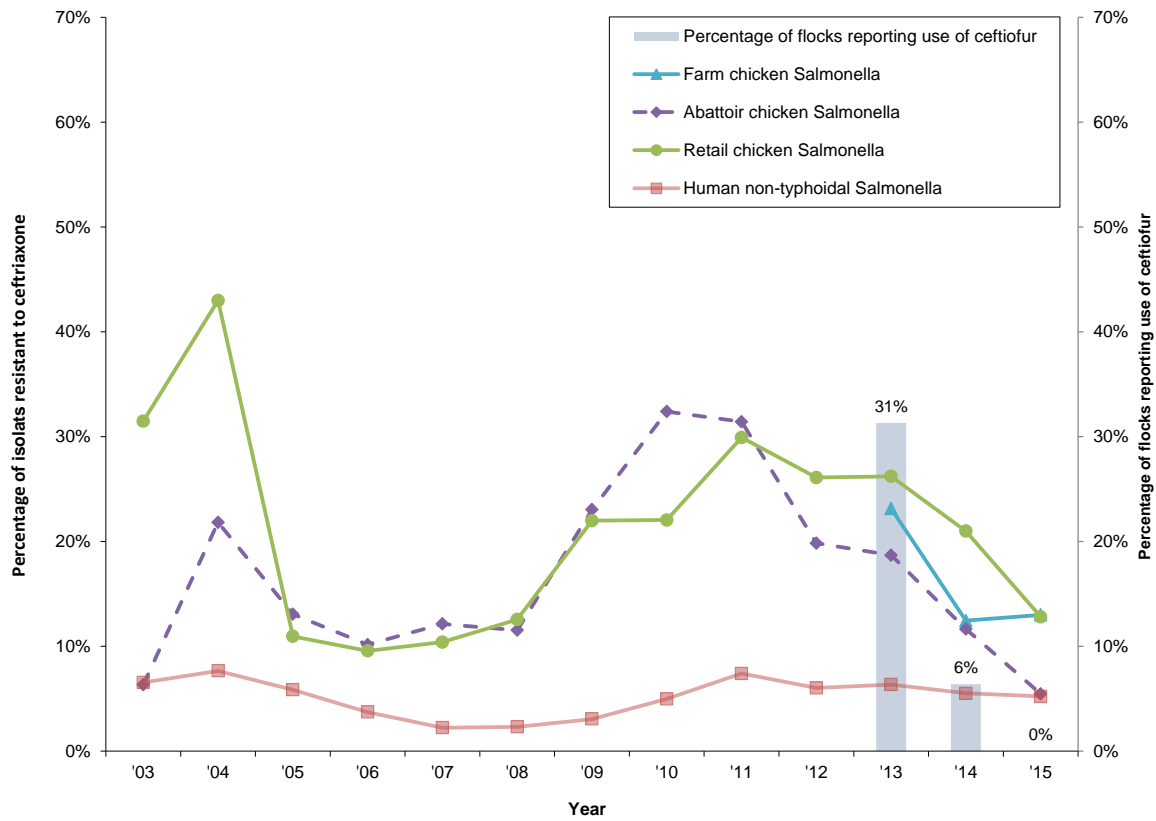


Figure 1. Reduction in reported use of ceftiofur on farm and changing resistance to ceftriaxone in non-typhoidal Salmonella from humans and chicken sources, Canada 2003–2015.

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CZECH REPUBLIC

➤ DLN CATTLE

– General

The Czech Veterinary Research Institute financed by the Ministry of Agriculture is the administrator of the Register of treatment and indications, of which a pilot project in dairy cattle has started in January 2017. All Czech dairy cattle herds can participate on a voluntary base.

– Data collection

Animal (sub)categories: Three weight categories are distinguished: calves, heifers and dairy cows.

Input: Through an online database. Farmers as well as vets can log in and are identified as such. The system has been updated with an interface that allows the uploading of data important for farmers and the farm/health status of the herd management [genetics, productivity, diagnosis, veterinary medicinal products used (VMPs), withdrawal periods].

– Analysis, benchmarking and reporting

The antimicrobial use is quantified well as the use of other VMPs at farm level. A benchmarking item has been introduced. Raw use data at farm level are provided through the online tool. Trainings of vets/farmers to spread the system were organised in 2017/18. Summarizing results are also presented through workshops and seminars. VMPs used are linked to indications (international code ICAR). Cross checking is possible with invoices system (sales data in national database provided by wholesalers).

– Note

A similar project as DLN cattle will start for pigs in 2019.

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➤ Q VET – PIGS

– **General**

Private subjects project – selected pig farms (2016, 2017).

– **Data collection**

Animal (sub)categories: Three weight categories are distinguished: weaners, finishers, sows.

Input: Through an online database. Responsible person nominated in farm can log in.

– **Analysis**

The dose-based unit of measurement ADD (animal daily dose; defined per product at the active substance level) is used to calculate the indicator ADD per 100 animals per day. Statistics comparing to previous period (e.g. one year).

– **Benchmarking and reporting**

One threshold value is defined per each category (weaners, finishers, sows), to which the average ADD/100 animals/day calculated over the time frame is referenced. Same system as used in DK for pigs. Reports are available for the owners of the farm/individual husbandries in the holding. Benchmarking comparisons (with others farms) is done anonymously (using codes).

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DENMARK

➤ VETSTAT

– General

The Danish VetStat database was established in 2000. It is owned and managed by the Danish Veterinary and Food Administration agency of the Ministry of Environment and Food of Denmark. VetStat was among the first data collection systems to become operational in retrieving detailed data on sales of prescribed drug for animals, hence product packages specific. Data comprises all animals, although the detailing level of production animals is considerably higher, with data at herd level, than the equivalent data for horses and pets.

– Data collection

Animal (sub)categories: of pigs: breeding animals (sows, boars, gilts and sucklers), finishers and weaners (< 30 kg); of cattle: cows, bulls, heifers and steers > 24 months, calves < 12 months and youngster between 12 and 24 months; of sheep/goats: animals < or > 12 months; and of poultry: broilers, layers and breeding stock.

Input: Pharmacies and feed-mills are obliged to report sold amount of drugs, and vets the amount used for production animals in veterinary practice. Livestock owners do not provide data, however, they are obliged to register prescribed medicine usage and store these registrations for five years in the farm. In analysis, the needed number of animals can be obtained from the Central Husbandry Register and represent capacity numbers.

– Analysis

The dose-based unit of measurement ADD (animal daily dose; defined per product at the active substance level) is used to calculate the indicator ADD per 100 animals per day. Recently, weighted ADD values have been established, in order to discourage the use of certain types of antibiotics and encourage the use of others. The kg animal at risk of treatment is determined using standard weights defined nationally. The use for companion animals is calculated based on the sales of veterinarian products from pharmacies to veterinarians.

– Benchmarking

Benchmarking is currently applied to pigs and cattle. One threshold value is defined per weight category, above which the average ADD/100 animals/day calculated over the last nine months (time frame) may not pass to prevent inhibitory measures becoming in force. This is for pigs referred to as the 'yellow card scheme'. For cattle a similar system is in place. As the system is online available, farms

can follow their position relative to the threshold at any time – hence, there is no defined frequency for the benchmarking.

– **Reporting**

VetStat has an interface for vets with graphs and data, as well as an internet based presentation to farmers. Vets can however apply own benchmarking programmes, the results of which however are secondary to those of the official methodology and results.

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FINLAND

➤ SIKAVA

– General

SIKAVA is an online health classification register for Finnish pig farms run by Animal Health ETT. Data on antimicrobial usage can voluntarily be registered since 2008. This has become obligatory since 2016 for 90% of Finnish pig farms.

– Data collection

Animal (sub)categories: Four weight categories are distinguished: sows, finishers, weaners and sucklers.

Input: Farmers and vets have equal roles in data collection: provide the amount of medicines they give to the animals. Yet, virtually 100% of the data in SIKAVA originate from farmers.

– Analysis, benchmarking and reporting

Benchmarking of farms is currently being developed.

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➤ **ANIMAL HEALTH ETT (POULTRY)**

– **General**

Animal Health ETT (poultry) manually collects data about antimicrobial usage on Finnish poultry farms. The voluntary system, operational since 2007, includes broilers and turkeys and covers >99% of the poultry meat production in Finland.

– **Data collection**

Animal (sub)categories: Data are collected for broilers and broiler parents, and turkeys and turkey parents. Data on broiler grandparents has been collected until 2016.

Input: In Finland nearly all poultry farms have a production contract with a slaughterhouse company, which delivers the chicks to the farm and takes the poultry back to slaughter. These companies and their vets are responsible for reporting the antimicrobial treatment data to Animal Health ETT. The data is collected per flock on a yearly basis, in Excel tables.

Recorded data include the treated number of flocks, the indication for use, which antibiotics are used and the amount that has been used (since 2008, kg of active ingredient). Since 2013 also the treated kg poultry, the used dosage (mg/kg) and the days of treatment are recorded.

– **Analysis, benchmarking and reporting**

Results are analysed as the indication-based yearly number of treated flocks per total number of flocks. Farms are currently not being benchmarked.

The results are reported on the [website](#) of Animal Health ETT (in Finnish, Swedish and English), as well as to the [Finnish Food Safety Authority](#) and the [Finnish Medicines Agency](#).

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FRANCE

➤ CLIPP

– General

CLIPP is the French professional Rabbit Council, which has established a plan for the reduction of antimicrobial use in rabbits. Part of this plan was to install an indicator to follow-up the antimicrobial use in rabbit farms. A sample representing about 75% of French rabbit farms voluntarily report data since 2011 in the frame of the technical-economic data collection performed by the French applied research and development institute (ITAVI) and supported by governmental funds.

– Data collection

Data are collected at the batch level (e.g. n = 4339 batches from 567 farms in 2014).

Animal (sub)categories: Two are distinguished: mother rabbits and fattening rabbits.

Input: Info on the treatments [in the form of the calculated Index of Frequency of Treatments with Antibiotics (IFTA)] can be provided by vets, farmers as well as technicians. As no animal population is used for standardisation of the usage, no animal numbers need to be reported for the analysis.

– Analysis

Treatments are directly converted to the IFTA, an indicator developed in collaboration with the French National Institute for Agricultural Research (INRA) and based on counts of actual number of treatment days reported in relation to the rearing period length in days.

– Benchmarking and reporting

Collective references are calculated at the national and production organisation level and are made available for professionals. Individual farm results can be compared to these references.

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➤ **GVET**

– **General**

GVET is a voluntary, computerised register for all the treatments in pig farms. It is active since early 2017, and is run by the French Institute for pig and pork Industry (IFIP) in cooperation with The French Agency for Veterinary Medicinal Products, the French Agency for Food, Environmental and Occupational Health & Safety (ANSES) and Isagri, a private software company.

– **Data collection**

Animal (sub)categories: Four weight categories are distinguished: sows, fatteners, weaners and sucklers.

Input: Farmers give the input about antibiotic treatments thanks to drop-down lists available in the software: they select the veterinary drug among a standardized list where all medicines are linked with a unique identifier, which allows to know its strength and thus to calculate the weight of active ingredient. Then, farmers either validate the pre-set dosage (according to SPC) or register the actual dosage with one of the pre-set units (g/animal or g/100 kg of body weight for example). There are also pre-defined lists for the other characteristics of the treatment (dates of administration, duration, reasons of treatment, number of treated animals...). All the input about the denominator is already registered in the same software and in the national database for other purposes: either in the GTE (the technical-economic results of the farm) or in the GTTT (Technical management for breeding herds, where sows are individually identified and linked with their physiological stage and reproductive performances). Thus, this automatic link between different databases (GVET, GTE and GTTT) simplifies the work of the farmers and allows to perform technical, economic and epidemiological impact studies for the measures applied under AMU stewardship.

Vets are supposed to bring technical support to the farmers.

– **Analysis**

Different indicators are calculated once a year:

- For the farmers, results are expressed in ‘number of treatment days’ and ‘number of treatments’ per animal per weight group, two count-based indicators using the number of treatment days, the number of treated animals and the population at risk.
- For national and European purposes (e.g. ESVAC project), the systems also allow to use dose-based units of measurement (UDD, UCD, DDD and DCD; DDDvet, DCDvet). They are used to calculate two indicators: the number of daily doses per animal and

the number of course doses per animal. The weights at treatment of the animals are national standard values, with plans to replace this with real weights at treatment.

- **Benchmarking**

Benchmarking will be performed when a sample of farms deemed large enough to be representative has participated in GVET. Meanwhile, farmers can follow their own evolution of AMU over time. Thus, they can see the impact on AMU of the implementation of a vaccine or biosecurity for example

- **Reporting**

Farmers securely access their results on an online interface of IFIP (GT-Direct) which already allows them to consult and analyse their technical and economical results.

- **Contact**

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➤ INAPORC

– **General**

The INAPORC panel is a random voluntary sample of 160 pig farms (approx. 1% of the total number in France). The simple random sampling started in 2010 and has been renewed in 2013 and in 2016. Sampling is performed in the exhaustive national swine database of identification, BDPORC, of which are selected farms inside mainland France with > 49 sows, and farms with < than 50 sows but with > 99 places in post-weaning and/or fattening units. The representativeness of the sample is confirmed post hoc (χ^2) through confrontation of the farms characteristics (production orientation, geographic distribution, membership to a production structure and number of sows) to those in the national agricultural census. The collection, analysis and communication is managed by IFIP, ANSES and stakeholders representatives.

– **Data collection**

Animal (sub)categories: Four weight categories are distinguished: sows, fatteners, weaners and sucklers.

Input: This is the responsibility of the IFIP staff, based on data provided by vets, feed mills and farmers. Data collection is manual.

Vets and feed mills, designated by the farmers, provide the detailed list of VMPs containing antimicrobials having been sold to each farmer over the reference year [the complete products' name, presentation, concentration and quantities dispensed; for medicated feed: volume (tons), active substance(s) and proportion (in ppm)].

Farmers provide data allowing to estimate animal at risk of being treated (number of sows, number of sold/bought piglets/pigs at each weight group). For each antimicrobial they bought, farmers also describe, during a phone call, their antimicrobial usage pattern [the weight group treated and the indications of treatment (digestive, respiratory...)].

– **Analysis**

The system uses dose-based units of measurement (DDD and DCD based on national SPC; DDDvet, DCDvet from EMA⁶). They are used to calculate two indicators: the number of daily doses per animal and the number of course doses per animal. The weights at treatment of the animals are national, standard values (250 kg for a sow, 2 kg for a suckling piglet, 15 kg for a weaner and 50 kg for a fatterer).

⁶ http://www.ema.europa.eu/docs/en_GB/document_library/Other/2016/04/WC500205410.pdf

- **Benchmarking**

The farms participating in the INAPORC Panel can compare their own results to overall reference values (= average AMU of each third of the sample). This is purely meant as feedback and bears no consequences for the farmers.

- **Reporting**

Each farmer receives his own results at the end of the study, in the form of a table where he can compare his results to the national reference.

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➤ **PERMANENT OBSERVATORY OF ANTIBIOTICS IN VEAL CALF FARMS**

– **General**

The monitoring has started in 2016 involving a panel of volunteer farmers (n = 40 in 2017) and is run by the Institut de l'élevage (IDELE) in cooperation with ANSES.

– **Data collection**

Animal (sub)categories: fattening veal calves < 6 months from specialized farms.

Input: For each farm, the veterinary records and the farm health register are analysed by IDELE and ANSES.

The veterinarian has to provide the antimicrobial product sold and the number of units sold for each batch. The farmer has to provide, for each antimicrobial treatment, the number of treated animals, the antimicrobial name, the date of beginning of treatment, the dose, administration frequency and duration of treatment, and the intention of treatment.

The farmers provide the number of animals, their age of entry in the farm and their particular breed.

– **Analysis**

Per batch the number of antimicrobial treatments per calf, the number of antimicrobial treatment days per calf, the total quantity of active ingredient per calf and the Animal Level of Exposure to Antimicrobials (ALEA, obtained by dividing the number of course doses by the biomass of the animal population potentially treated) are calculated.

– **Benchmarking**

No benchmarking is performed up to now.

– **Reporting**

Each veterinarian and each farmer receive their own results.

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GERMANY

➤ HIT

– General

There is a legal requirement to report antimicrobial use in livestock in Germany to a central database. The HIT database is owned by the Bayern Ministry for the Food Chain, Agriculture and Forestry, with results published by the 'Bundesamt für Verbraucherschutz und Lebensmittelsicherheit' (BVL). It is active since July 1st 2014. The system does not cover 100% of the sectors, as selective criteria are applied: only farms with > 250 piglets / > 250 fatteners / > 20 beef calves / > 20 beef cattle / > 10.000 broilers / > 1000 fattening turkeys are included.

– Data collection

Animal (sub)categories: Both in pigs and cattle two categories are distinguished: respectively piglets ≤ 30 kg and fatteners > 30 kg, and fattening calves ≤ 8 months and fattening cattle > 8 months.

Input: Vets and farmers have equal roles in data input: they need to provide the number of treated animals, number of treatment days and the antimicrobial product used. If the vet reports, the farmer has to confirm that antimicrobials have been applied as reported. In addition, farmers need to provide the information to calculate the number of animal days at risk for treatment.

– Analysis

No dose- or weight-based unit of measurement is used in analysis. The indicator 'treatment frequency' (TF) is count-based, using the number of treatment days, the number of treated animals, the number of different products administered and the population at risk. Consequently, the analysis does not require the use of animal weights at treatment.

– Benchmarking

Farmers are compared to national benchmark values of TF – separate for each animal species and production group. The median value and the upper quartile are calculated and used for categorising farms. Calculation is performed twice a year, for a period of six months each.

– Reporting

The national values are published by BVL. Each farmer receives the half-year values and is obliged to compare their results with the national values.

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➤ QS

– **General**

The QS system exists since 2012 and is run by Qualität und Sicherheit GmbH, a sectoral quality system for various food products. Data collection covers ca. 95% of German broiler, veal, and pork production, and also includes turkeys and ducks.

– **Data collection**

Animal (sub)categories: Three weight categories/animal subtypes are distinguished among pigs: sows + sucklers, fatteners and weaners.

Input: Vets need to provide the number of treated animals, number of treatment days and the antimicrobial product used, whereas farmers need to provide the number of pig places per farm and, specifically for poultry, data on production location. For poultry, the farmer needs to provide data allowing the assessment of the animal population for each cycle.

– **Analysis**

As in HIT, no dose- or weight-based unit of measurement is used in analysis but a count-based indicator similar to the 'treatment frequency' is calculated, called the 'therapy index', hence neither requiring the use of animal weights at treatment. In addition to the farm-level result in total, a separate therapy index for fluoroquinolones and 3rd/4th generation cephalosporins is calculated.

– **Benchmarking**

Benchmarking is done every three months, for a period of six months (= time-frame). All QS-adhering farms having the respective weight category are included in the reference population. The median and upper quartile are calculated as reference values.

– **Reporting**

Farmers are informed quarterly on their therapy index and the distribution of therapy indexes in the respective animal group.

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➤ VETCAB-S

– **General**

The VetCAB study (Veterinary Consumption of Antibiotics) is a research project executed by the University of Veterinary Medicine (Hannover) and sponsored by the German Federal Institute for Risk Assessment (Berlin) which is carried out to describe the use of antibiotics in farm animals in Germany. The project started as a feasibility study in 2007 and was continued in 2011 as pilot project in a cross-sectional approach. Based on this cross-sectional data since 2013, the VetCAB-Sentinel project runs as a longitudinal study with ongoing participant recruitment and data collection. Its results are used in order to generate and test research hypotheses and to provide scientific input for changes in legal regulation.

Aim of the study is to evaluate how often livestock animals are treated with antibiotics during a defined time period, using the treatment frequency (TF) i.e. # treated animals x # treatment days / # animals per farm. Furthermore, it is investigated, if regions or farm sizes differ regarding antibiotic usage or which substances are used most frequently.

– **Data collection**

Animal (sub)categories:

- **Pigs:** sows, finishers, weaners and sucklers
- **Poultry:** broilers
- **Cattle:** dairy cows, beef cattle and fattening calves

Input: Participating veterinarians and farmers voluntarily provide information about consumption of antibiotics on farm level by official application and delivery forms, which are transferred into a database. For the latter, the number of treated animals, number of treatment days, name and amount of the antimicrobial product used, the route of application and the indication are collected. At the end of 2017 more than 250,000 records for pigs, cattle and poultry of the years 2011, 2013, 2014, 2015, 2016 and 2017 were included into the database.

– **Analysis**

As in HIT and QS, a count-based indicator is calculated, called the 'treatment frequency', which has a similar outcome as a treatment incidence based on UDD. This does not require the use of animal weights at treatment.

– **Benchmarking**

Seen the aim of the work, benchmarking is not applied.

– **Reporting**

Farmers and vets receive results of own animals as a confidential report as well as overall results. Results of the project as well as methodological issues are reported via scientific publication. For details click here: <https://ibei.tiho-hannover.de/vetcab/pages/41>.

– **More information**

<https://ibei.tiho-hannover.de/vetcab/>

– **Contact**

Svetlana.Kasabova@tiho-hannover.de and Katharina.Hommerich@tiho-hannover.de

– **References**

- Schaeckel F, May T, Seiler J, Hartmann M, Kreienbrock L. 2017. Antibiotic drug usage in pigs in Germany-Are the class profiles changing? PLoS One. 12: e0182661.
- van Rennings L, von Münchhausen C, Ottilie H, Hartmann M, Merle R, Honscha W, Käsbohrer A, Kreienbrock L. 2015. Cross-sectional study on antibiotic usage in pigs in Germany. PLoS One. 10: e0119114.

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IRELAND

➤ TEAGASC AMU CALCULATOR (PIGS) / UCD AMU POULTRY DATABASE (BROILERS)

– General

The system for pigs covers data for 2016 and the system for broilers covers data from Feb 2017 and will be completed in Feb 2019. Both are part of a project funded by the Department of Agriculture Food and the Marine (DAFM) and the data is being used to establish the DAFM permanent database on AMU to be launched in 2019 as part of the iNAP (Irish National Action Plan). The system for pigs is owned by the Irish Agriculture and Food Development Authority. This pilot covers approx. 80 pig farms and 133 poultry farms (out of approx. 280 of each country-wide).

– Data collection

Animal (sub)categories: All weight categories for pigs are distinguished when collecting data but not reporting. Data from farms is available from the productive performance recording system ran by teagasc eProfit Monitor.

Input: Research personnel and advisors perform data collection. Data on use is obtained from farmers records on drugs delivered (with assistance from veterinary practices and feed mills). Information is available separately for in-feed, oral and injectable antibiotics.

– Analysis, benchmarking and reporting

AMU in pigs is processed into the weight-based indicators mg and mg/kg but is available in different units for benchmarking with other countries. Pig farmers are benchmarked but no thresholds are established. Benchmarking is based on total use and also critically important antimicrobials separately. The pig farm-level results are then discussed with the farmers. All pig farmers in the database received an individual report and a benchmarking report for their farms combined with information in production, biosecurity and slaughter house findings. Data has been further analyzed combined with operational data to identify risk factors for high use.

Poultry data is only used internally as all farms are owned by the same company.

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ITALY

➤ CLASSYFARM

– General

The sample/survey system ClassyFarm, developed by the Istituto Zooprofilattico Sperimentale della Lombardia e Dell'Emilia Romagna (IZSLER) is owned by the Italian Ministry of Health. It started in 2014 for pigs and in 2016 for dairy cattle, and in 2019 poultry farms will be included too. Currently, it is based on a convenience sample of 150-200 pig and dairy farms each. A full integration with the Italian electronic prescription system is planned in 2019.

– Data collection

Animal (sub)categories: The distinguished weight categories in pigs are sows/boars, finishers, weaners and sucklers; in dairy cattle cows, heifers and calves are distinguished and in poultry broilers, turkeys and laying hens.

Input: This is the responsibility of the IZLER staff, with assistance of vets and farmers. Data sources of consumption are treatment registries, invoices and prescriptions.

– Analysis

The dose-based units of measurement $DDDA_{it}$ and $DCDA_{it}$ are used to calculate respectively the number of days and courses per animal per period (which can be a semester or a year = the time-frame). Each active ingredient is considered as a single treatment, whether it is part of a combination product or not. The main indicator is days of treatment per animal per year; other indicators, such as days per semester and courses per time frames, are provided as additional information. For finishers and the cattle subcategories, weights at treatment are standard estimations set on national level. For the other weight categories, EMA⁷ weights are used.

– Benchmarking

Farm consumption is compared to the median of all farms at weight group-level and is also classified according to its quartile. Usage of “critical” antimicrobials (fluoroquinolones, 3rd and 4th generation cephalosporins and colistin) are highlighted. The methodology is however currently under review. Particularly, Italian pig production differs substantially from other countries; pigs are slaughtered at 160 – 170 kg and a new age group (i.e. pre-finishers) may be introduced in the next few years.

⁷ http://www.ema.europa.eu/docs/en_GB/document_library/Scientific_guideline/2012/12/WC500136456.pdf

– **Reporting**

Farmers, vets and farmer groups/associations receive written reports and an oral presentation. Interactive dashboards for pig production are available for authorised veterinary officers, with dashboards for species and user profiles being developed.

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THE NETHERLANDS

➤ MARAN

The MARAN collection of herd-level AMU by the Wageningen University started in 2004 for samples of pig, cattle and broiler farms. In 2012 however, this system was replaced with the sectoral databases, overviewed by the Netherlands Veterinary Medicines Institute (SDa).

➤ SECTOR QUALITY SYSTEMS AND SDA

– General

Several quality assurance systems have sectoral databases in which sector-specific AMU data is collected. The quality systems are run by the respective sector organisations. The SDA, financed partially by governmental sources and private sources, receives the totality of the sectoral AMU. Each quality system has its own analysis, benchmarking and communication system. However, they all have to apply to the analysis and benchmarking criteria as established by the SDA. SDA also receives the sales data from FIDIN, the branch organization for veterinary pharmacy products. SDA reports on an annual basis on trends in sales and usage data. The SDA performs analysis on the combined data of consumption and animal numbers delivered to SDA by the sectors. All systems together cover 100% of AMU in the targeted sectors. In addition to this, SDA also monitors the AMU in sheep, goats, mink, horses and pets by regular surveys.

– Data collection

Animal (sub)categories: in pigs, by age categories: sows + piglets, fatteners + gilts, weaners; in calves, by farm types: white veal, red veal start-up, red veal fattening, red veal combi; in cattle, by gender and age category: dairy cows, suckler cows, bulls for meat, rearing animals; in rabbits: doe + kits, growing does, fattening rabbits.

Input: amount of antibiotics prescribed needs to be provided by the vets. The quality systems provide the average number of animals present over a period of a year, collected annually by inspection visits, or by using the compulsory 'Identification & Registration System (I&R)' for registration of animals.

– Analysis

Data is analysed using the nationally defined dose-based unit of measurement DDDA, established at product level. From this UM, the indicator 'animal daily doses per year' is calculated per animal category. The weights at treatment are estimated and nationally defined. In broilers and turkey weight curves are applied since 2017 to estimate the weight at treatment. For all-in-all-out veal farms, a DDDA per animal group is calculated next to animal daily doses per year. Growth curves are applied to

estimate weight at treatment for the DDDA per animal group calculation, a standardized weight is used for the daily doses per year.

For vets, the DDDA per vet and the veterinary benchmark indicator are calculated – see below.

– **Benchmarking**

Benchmarking for overall AMU is done for farms as well as vets. The basis for the farm is the #DDDA/year. This is presented to the farmers through the online interfaces of the different systems. SDa itself does not provide benchmarking reports for vets or farmers but instead outlines the national criteria based on the farm-level results.

In general, the benchmarking is developed according to the principle that there are two threshold values (warning and action), that define three zones. The thresholds are defined by the SDa and depend on the animal and category. If a party finds itself in the action zone, the action that needs to be performed and the possible penalties depend on the sector.

Vets are benchmarked on a specific indicator calculated for that purpose: the Veterinary Benchmark Indicator (VBI). This is based on the DDDA/year of the farms they have a 1-1 relationship with divided by the action benchmark value for the particular type of farm, leading to the relative prescription ratio for each farm. Depending on the number of farms in the action zone and the degree of exceeding the action threshold, the VBI will increase. It reflects the likelihood the vet has a farm in the action zone.

The benchmark values for critical antimicrobials (fluoroquinolones and 3rd and 4th gen. cephalosporins) are 0. These antimicrobials can only be used after sensitivity testing of infectious strains. SDa follows the proposed benchmark value for colistin as proposed by the European Medicine Agency (EMA).

The benchmarking system will undergo several changes at the end of 2017, early 2018.

– **Reporting**

SDa produces an annual report, published on the [SDa website](#), with information on:

- trends in antimicrobial sales data and AMU sector-specific data;
- distribution of farms and vets over the different benchmark categories;
- use of critical antimicrobials.

Farmers and vets have online access to the results.

– **More information and contact**

The Netherlands Veterinary Medicines Institute (SDa) [website](#) or info@autoriteitdiergeenmiddelen.nl

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NORWAY

➤ VETREG

– General

VetReg was established for farmed fish in 2011 and for terrestrial animals in 2012. The VetReg database is owned by the Norwegian Food Safety Authority. Reporting to VetReg is mandatory by legislation and applies to veterinarians, pharmacies and feed mills. Veterinarians and feed mills are required to report all prescriptions for food producing animal species (including horses). Reporting prescriptions for companion and fur animals to VetReg is voluntary. Pharmacies are obligated to report all dispensed prescriptions, including those for use in the veterinarians' own practice.

– Data collection

Animal (sub)categories: Data are collected at individual animal level for dairy cattle and at herd level for other food producing animals. For farmed animals also production stage has to be reported.

Input: The veterinarians report their antibiotic usage in amounts (ml, g etc.) of antimicrobial VMP administered to the animal or handed out to the farmer, the pharmacies report number of packages of antibiotic VMP dispensed to animal owners, and the feed mills reports amounts (kg) antibiotics prescribed. In Norway, feed mills only dispense medicated feed for use in farmed fish. As pharmacies report all antibiotic VMPs sold to veterinarians to VetReg, this allows for assessing if the veterinarians are compliant with the legal requirement of reporting to VetReg. Farmers have no role in the data collection for VetReg.

– Analysis, benchmarking and reporting

Unit of measurement (numerator) to express the usage is currently mg but it is planned to also use DDDvet and DCDvet values from EMA⁸. Indicator for benchmarking has not yet been decided on and thus benchmarking has not yet been implemented as a tool for antibiotic stewardship.

– Contacts

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Norwegian Veterinary Institute: kari.grave@vetinst.no; kari.helgesen@vetinst.no

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⁸ http://www.ema.europa.eu/docs/en_GB/document_library/Other/2016/04/WC500205410.pdf

SPAIN

➤ NATIONAL DATABASE OF VETERINARY ANTIBIOTIC PRESCRIPTIONS

– General

In the context of the Spanish National Plan against Antibiotic Resistance, the Spanish Ministry of Agriculture, Fisheries, Food and Environment in collaboration with the Spanish Agency of Medicines and Medical Devices has defined a policy for the development of a database, which will collect data on consumption of antibiotics in Spain and which is set to start at the beginning of 2018. It will include data on all the antibiotics prescribed to all food producing animals.

– Data collection

Animal (sub)categories: The collection of data will include the species (food producing animals), age, weight, veterinarian and farm data and diagnosis.

Input: Vets will be responsible for periodically declaring the veterinary antibiotic prescriptions. The PRAN recommends the use of different electronic prescription systems to make the declaration of prescriptions, and in this way facilitate the obtaining of information.

– Analysis, benchmarking and reporting

AMU will be calculated as mg/Population Correction Unit (PCU). Benchmarking and reporting are currently not planned.

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➤ ANTIBIOTIC REDUCTION PROGRAMS

– General

The Spanish National Plan against Antibiotic Resistance in collaboration with Spanish animal industry and taking into account all the antecedents related to the consumption of antibiotics in some food producing animals sectors, has created four programs aiming to Reduce the Use of Antibiotics in Pigs, Rabbits, Poultry and Bovine.

These programs summarize the following points:

- a) The main objective of the Program is to reduce the consumption of antibiotics. The reduction is established in sections and depending on the species.
- b) The specialized veterinarians and farmers are voluntarily adhered to the program.
- c) The consumption data is being declared every six months by a web-application.

– Data collection

Animal (sub)categories: Pigs, Rabbits, Poultry and Bovine of the farms that belong to the programs.

Input: Vets will be responsible for every six months declaring the veterinary antibiotic consumption by a web-application.

– Analysis, benchmarking and reporting

AMU will be calculated as mg/PCU. Benchmarking and reporting are done every six months and a report is published with the comparison in time, by antibiotic and animal species.

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SWEDEN

➤ SWEDISH BOARD OF AGRICULTURE (SBA)

– General

The Swedish 'Djursjukdata DAWA' is owned by the Swedish Board of Agriculture (SBA). It is the oldest data collection system of antimicrobial use at farm level. A computer-based system was gradually introduced from 1982 and was launched at a national level January 1, 1984. The system was introduced through a general agreement between the government and the Federation of Swedish Farmers. The system was first introduced on a test basis in one county already in 1971, and in a second country from 1977. It covers 100% of farm animals and horses.

– Data collection

Animal (sub)categories: In pigs: adults, fatteners, weaners, sucklers; in cattle: calves less than 2 months, calves 2-6 months, calves over 6 months, adults; in horses: foals < 4 months, foals 4-12 months, 1-3 years, adults; in sheep/goats: lambs < 2months, 2-5 months; 5-12 months; > 1 year; in poultry: broilers (or corresponding), pullets, laying hens, other breeding animals.

Input: It is mandatory for vets to provide treatment data. Record keeping at the farm is mandatory for farmers but they do not provide any data.

– Analysis, benchmarking and reporting

Data are not further analysed at farm level in general. However, Växa Sverige, the Swedish Dairy Association, extracts data from the SBA for dairy farms affiliated to Växa which is reported yearly. No benchmarking of results is however performed.

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➤ SWEDISH POULTRY MEAT ASSOCIATION

– **General**

From 2011, the Swedish Poultry Meat Association (SPMA) requests their members to report all treatments of broilers, parents and grandparents as part of the Poultry health control programme. It covers > 95% of the commercial poultry meat production.

– **Data collection**

Animal (sub)categories: differentiation between grandparents, parents and production animals is made. Producers are responsible for submitting antibiotic use data. Vets are obliged to report to the SBA. The number of flocks treated is recorded.

– **Analysis, Benchmarking and reporting**

Indication based AMU is reported as the number of treated flocks per total number of flocks. Farm-level benchmarking is not performed because of very low treatment incidence but data are reported to the SBA and to the National Veterinary Institute (SVA) and summary data are published in the yearly report Swedres-Svarm, accessible at:

(<http://www.sva.se/om-sva/publikationer/antibiotikaresistens?lid=32744>).

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SWITZERLAND

➤ IS-ABV

– General

The Swiss system for monitoring prescription based veterinary-level antimicrobial prescription is planned to be implemented on January 1st, 2019. It will be managed by the Federal Food Safety and Veterinary Office and it will cover AMU in all animal species and 100% of animals.

– Data collection

Animal (sub)categories: in pigs: sows/boars, fatteners, weaners, sucklers; in beef cows: veal calves, breeding beef; dairy cows, others (such as yak, buffalo); in chickens: laying hens, broilers; turkeys; goats; sheep; rabbits; horses; in pets: cats, dogs, other pets.

Input: The data collection is the responsibility of the vets, based on their prescriptions.

– Analysis, benchmarking and reporting

Benchmarking and reporting is in development and planned for implementation in 2020. The analyses that are foreseen will principally use dose-based units of measurement and indicators, in particular the prescribed daily dose and the treatment intensity.

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➤ SUISSANO

– **General**

The Project was established by the Suisag Organisation, a service centre for pig producers in collaboration with the porcine sanitary service. Preliminary and pilot studies took place in the years 2014 and 2015. Start of the system is planned for January 1st, 2018. The herd coverage is estimated at 80 to 100% (20% in the pilot phase).

– **Data collection**

Animal (sub)categories: Piglets, weaners, fatteners and sows.

Input: Producers/Farmers are responsible for submitting data via electronic treatment journal. Data submitted are age group, number of animals treated, weight of animals treated, duration of treatment, amount of product, number of pigs housed on farm.

– **Analysis**

DCDvet⁹/animal/year; proportion of pigs treated/year (animal treatment index; factorisation of less desirable preparations). Proportion of pigs treated per year; factorisation of critical antibiotics or products (such as HPCIA, triple-combination-products).

– **Benchmarking and reporting**

This is planned. Thresholds as well as factors concerning critical ingredients and products will be determined by stakeholders (farmer, veterinarians, government, and university) in corporate action.

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⁹ http://www.ema.europa.eu/docs/en_GB/document_library/Other/2016/04/WC500205410.pdf

UK

➤ BPC-ASG

– General

The British Poultry Council (BPC) run an antibiotic stewardship scheme that covers 90% of the meat poultry (chicken, turkey and duck) industries. As part of this scheme, antibiotic usage is collated on an annual basis and aggregate data published in the BPC annual report and the UK Veterinary Antimicrobial Resistance, Sales and Surveillance (VARSS) report.

– Data collection

Animal (sub)categories: No subcategories in the three animal species are distinguished.

Input: Producers have been asked to submit quarterly (chickens) or annual (turkeys and duck) AMU data in the form of an aggregate spreadsheet. This may be from farm records, but in some cases the data comes from the vet. BPC then collate the data.

– Analysis

The data is presented as the overall annual amount of antibiotic active ingredient used (in tonnes), which includes breeders and producers. For the producers, this is then compared with the population at risk of treatment to create a mg/kg usage figure.

BPC calculates the population at risk of treatment by using annual slaughter numbers. The EMA PCU guidelines¹⁰ are followed for broilers (1 kg per slaughtered broiler) and turkeys (6.5 kg per slaughter turkey). For ducks, where there are no ESVAC weights assigned, a weight of 1.75 kg has been used.

– Benchmarking and reporting

No farm level benchmarking is carried out as part of this scheme.

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➤ eMB-PIGS

– **General**

The electronic Medicine Book for pigs is managed by the Animal and Horticultural Development Board – Pigs (AHDB-Pigs) – in conjunction with key industry players through an industry steering group, and with support from VMD.

It was launched in April 2016, and data for 2016 covers 62% of UK pig production. In the future, the amount of antibiotic usage data being added are set to increase as the use of eMB is now a requirement by the farm assurance schemes Quality Meat Scotland (QMS) and, as of 11th November 2017, Red Tractor.

– **Data collection**

Animal (sub)categories: When collecting data, producers are asked to specify whether it has been given to a piglet, weaner-grower, finisher or breeding pig.

Input: Producers are responsible for uploading antibiotic data annually (as a minimum) or every quarter. This is obtained either from their own usage records and/or from data on drugs delivered (for example from veterinary practices).

– **Analysis**

The data is presented as the overall annual amount of antibiotic active ingredient used (in tonnes). This is then compared with the population at risk of treatment to create a mg/kg usage figure. The EMA PCU guidelines¹¹ are followed, assigning a weight of 65 kg for slaughter pigs and 240 kg for livestock sows.

– **Benchmarking**

Farms are not yet benchmarked. Benchmarking farms is planned for the beginning of 2018. The benchmarking metric is still being finalised, but will be calculated using a mg/kg measure based on the average number of sows and the number of animals leaving the farm for either slaughter or fattening.

– **Reporting**

Producers can see and download reports on their farm/ farm group's usage data directly from eMB-pigs. With permission, this data is also available to their veterinary surgeon.

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