Standard operating procedure

Calculation of the DDDA for antimicrobials by the SDa for the cattle, veal, pig, broiler, turkey and rabbit farming sectors

February 2019

Autoriteit Diergeneesmiddelen

Version management

Version	Date	Changes
1	June 2013	-
2	February 2020	- Change in benchmarking methodology and values - Updated calculations for $DDDA_F$ (former DDD/J per farm) by sector - Rabbit farming sector added

Autoriteit Diergeneesmiddelen

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Introduction

Since 2011 the antimicrobial usage in the different livestock sectors is reported by the SDa. During the past years several adjustments were made to the methods and new livestock sectors and animal categories were added. This SOP was established to transparently communicate the methods used by SDa to calculate annual antimicrobial usage in the different livestock sectors.

The aim of the standard operating procedure (SOP) is to describe the calculation methods used by the Veterinary Medicines Institute (SDa) to calculate the $DDDA_{NAT}$ and $DDDA_{F}$. The different livestock sectors, animal categories and methods used to calculate annual usage on farm and national level are described. Sales data is also reported annually by the SDa and is described in this SOP. This SOP contains a general part and a sector specific part.

General part

Data collection

Two sources of data are collected by the SDa for the calculation of the daily dosages at farm level: the average number of animals present on a farm and the prescriptions of antimicrobials by the veterinarian to a farm. Parties involved in the delivery of both data sources are representatives of the animal sectors and administrators of the data.

Veterinarians are obliged to record all antimicrobial prescriptions in the sectoral database. Most veterinarians record their prescriptions in their Practice Management System (PMS), a computer program used for the administration of the veterinary practice. Data can be submitted to the sectoral through three different ways: indirectly via a central datahub called VetCIS, directly from the PMS into the sectoral database or through manual submission.

To ensure completeness and quality of the data provided by the sectors to the SDa, the data has to be delivered according to a delivery format that is established by the SDa (Appendix I). For the calculation of daily dosages on a national level animal counts are obtained from the Central Board of Statistics (CBS) and EUROSTAT.

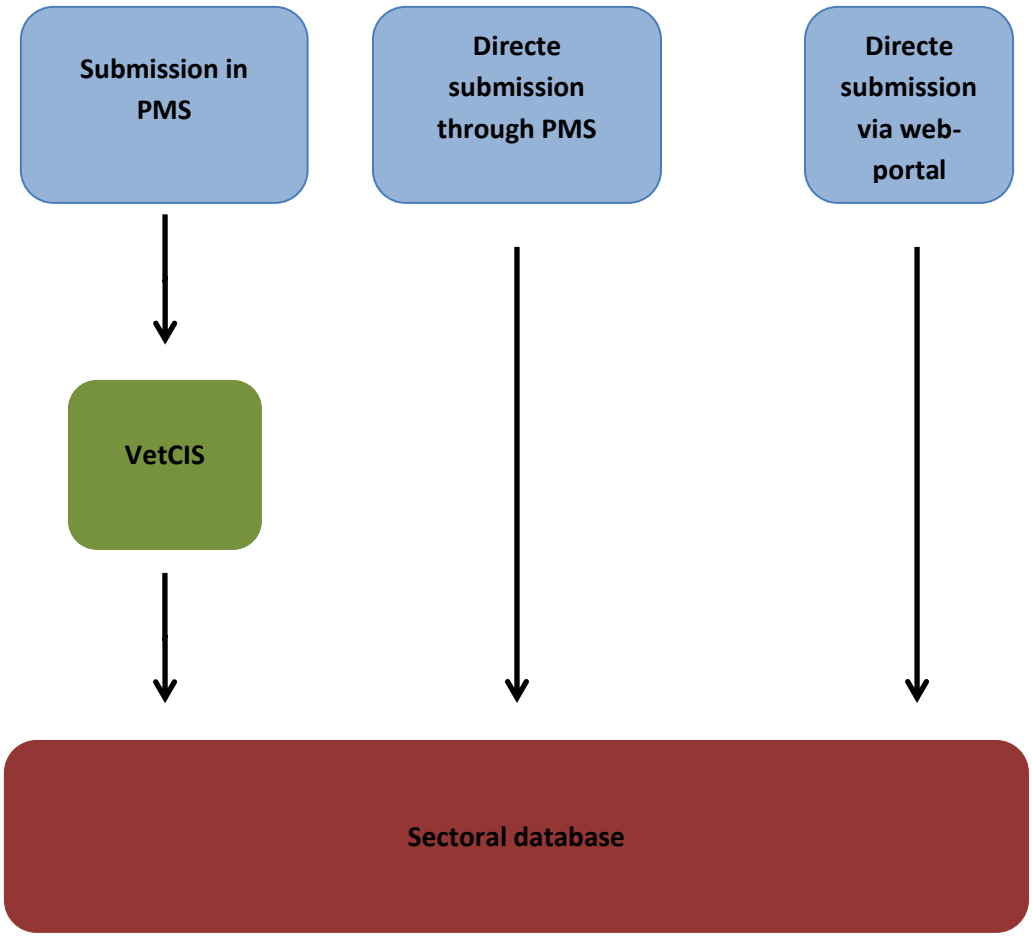

Figure 1: Collection of antimicrobial prescriptions by the livestock sectors.

Antimicrobial usage on a national level

The indicator used to asses antimicrobial usage at a national level by the SDa is the $DDDA_{NAT}$. This figure is calculated by dividing the number of treated kilograms within a livestock sector for a particular year (the numerator) by the average number of kilograms of animals present within the livestock sector concerned (the denominator). The $DDDA_{NAT}$ represents the average number of days an animal, within a particular livestock sector, is treated with antimicrobials. It is similar to the parameter DDD per 1,000 person-days used in human medicine when multiplied by 1,000/365. The $DDDA_{NAT}$ is used to observe trends in antimicrobial usage in a particular livestock sector.

$$DDDA_{NAT} = \frac{\Sigma \text{ treated kg}_{i,j} * \text{amount}_{i,j}}{\text{number of animals}_j * std\ weight_j} \qquad \textbf{(formula 1)}$$

***Treated kg$_i$**: the number of treated kilograms of a single package of antimicrobial i in livestock sector j*
***Amount$_i$**: the number of packages prescribed of antimicrobial i in livestock sector j*
***Number of animals j**: the number of animals present on average in livestock sector j*
***Std weight j**: the standardized weight of an animal in livestock sector j*

The numerator

SDa uses a database, called the "DG-standard", that contains dosages for all antimicrobials registered as veterinary medicine. The livestock sector specific number of kilograms animal that can be treated with a single package of antimicrobials is also listed in the DG-standard. Next to dosages the DG-standard also contains information on: active substances, European Article Number (EAN), a unique Dutch registration number (REGNL), therapeutical group, package unit and size, type of treatment (individual or group), administration route and a correction faction for long acting antimicrobials.
The livestock sectors monitored by SDa annually provide data on the number of packages of antimicrobials prescribed to farms within a particular livestock sector during a one year period. Combined with the information in the DG-standard the total number of treated kilograms of animal within a livestock sector can be calculated.

The denominator

The animal population at risk of antimicrobial treatment is represented in the denominator. The denominator is calculated by multiplying the number animals present within a livestock sector by a standardized weight that is determined by SDa (table 1). Information on the number of animals present within a livestock sector is obtained from the CBS for the rabbit, veal and poultry farming sectors and from EUROSTAT for the pig and cattle farming sectors.

Sales data

FIDIN, the association of veterinary medicine, provides SDa with data on the number of packages sold for each antimicrobial. Using the previously described DG-standard the amounts of active ingredient in kilograms can be calculated. The kilograms of active ingredient are then reported by pharmacotherapeutic groups, as defined by SDa. Reduction goals set by the Dutch government are evaluated using sales data. Sales data are not reported by species, as most antimicrobials are registered for multiple species.

Table 1. Standardized average body weights used for determining the $DDDA_{NAT}$ figures, by livestock sector and production category

Livestock sector	**Production category**	**Standardized body weight in kg[1]**
Veal farming sector	Veal calves	172
Pig farming sector	Piglets (<20 kg)	10
	Sows	220
	Fattening pigs	70.2
	Other pigs	70
Broiler farming sector	Broilers	1
Turkey farming sector	Turkeys	6
Cattle farming sector	Dairy cattle	600
	Non-dairy cattle	500
Rabbit farming sector	Weaned meat rabbits	1.8
	Breeding does with kits	8.4

[1] Body weights as defined by LEI Wageningen UR, determined at the start of the agricultural census in the Netherlands. The standardized body weights are to be multiplied by the numbers of animals reported by CBS/EUROSTAT.

Sector specific part

Antimicrobial usage at farm level

The indicator used to evaluate antimicrobial usage at farm level is the $DDDA_F$. Similar to the $DDDA_{NAT}$ the $DDDA_F$ is calculated by dividing the number of treated kilograms on a farm for a particular year (the numerator) by the average number of kilograms of animals present on that particular farm (the denominator). It reflects the number of days an animal is treated on average at that particular farm. The numerator is calculated by summing the number of treated kilograms for each antimicrobial described by farm. The denominator is calculated by multiplying the average number of animals present with a standardized weight (table 2). The result of formula 2 needs to be corrected for the time no animals are present at the farm, which occurs at all-in all-out farms between production cycles. This is done by multiplying the result with 365/(365-number of days with no animals present). It can also be done by correcting the denominator.

$$DDDA_F = \frac{\Sigma \text{ treated kg}_{i,j} * \text{amount}_{i,j}}{\text{number of animals}_j * std\ weight_j} \qquad \textbf{(formula 2)}$$

***Treated kg$_i$**: the number of treated kilograms of a single package of antimicrobial i on farm j, based on information in the DG-standard*
***Amount$_i$**: the number of packages prescribed of antimicrobial i on farm j*
***Number of animals j**: the number of animals present on average on farm j*
***Std weight j**: the standardized weight of an animal on farm j*

Animal categories and standardized weights

For the calculation of the antimicrobial usage at farm level, several animal categories are distinguished per livestock species, each having their own standardized weight (table 2). Standardized were determined in consultation with representatives of the concerned livestock sectors and represent the average of start and end weight of an animal within that particular animal category. For the broiler and turkey farming sectors growth curves are used to determine the weight of the animals at treatment. Farms are benchmarked within their production category, which allows for a meaningful comparison.

Table 2: Standardized average body weights used by the SDa for determining the $DDDA_F$ figures, by livestock sector and production category

Livestock sector	Production category	Further specification	Age group	Standardized body weight in kg[1]
Veal farming sector	Calves at white veal farms		0-222 days	160
	Calves at rosé veal starter farms		0-98 days	77.5
	Calves at rosé veal fattening farms		98-256 days	232.5
	Calves at rosé veal combination farms		0-256 days	205
Pig farming sector	Sows/piglets	Sows (all females that have been inseminated), breeding boars and heat-check boars		220
		Suckling piglets	0-25 days	4.5
		Replacement gilts	7 months - 1st insemination	135
	Weaner pigs	Weaned piglets	25-74 days	17.5
	Fattening pigs/gilts	Fattening pigs	Until ready for slaughter	70
		Gilts	74 days – 7 months	70
Broiler farming sector[2]	Conventional broilers		0-42 days	n/a
Turkey farming sector[2]	Toms			n/a
	Hens			n/a
Cattle farming sector[3]	Dairy cattle		>2 years	600
	Heifers		1-2 years	440
	Yearlings		56 days – 1 year	235
	Calves (female)		<56 days	56.5
	Beef bulls		>2 years	800
	Beef bulls		1-2 years	628
	Beef bulls		56 days – 1 year	283
	Calves (male)		<56 days	79
Rabbit farming sector	Breeding does/kits		>4 months and <4.5 weeks	8.4
	Weaned meat rabbits		4.5-12 weeks	1.8
	Replacement breeding does		12 weeks – 4 months	3.4

[1] Body weights (in kilograms) as determined in consultation with the livestock sectors concerned. They may be adjusted if deemed necessary (e.g. in response to refinement of the benchmarking approach).

[2] As of 2017, the body weights used for determining poultry farms' $DDDA_F$ value are based on the age of the animals at the time of treatment.

[3] Livestock farms in the cattle farming sector are categorized based on whether or not they produce milk. They are classified as either dairy cattle farms or non-dairy cattle farms. Non-dairy cattle farms include rearing farms (with <40% of cattle present being male and none of the animals being over 2 years of age), suckler cow farms (with <40% of cattle present being male and some of the animals being over 2 years of age) and beef farms (with >40% of cattle present being male).

Benchmarking by sector

New benchmarking values

As of 2019 a new benchmarking method was implemented. Livestock farms are assigned to one of three (cattle farming sector) or two (all others livestock sectors) usage level categories. For all sectors one action threshold is set. This threshold can either be a benchmark threshold representing acceptable use or a provisional benchmark threshold. Benchmark thresholds representing acceptable use are used for livestock sectors whose antibiotic usage patterns are characterized by very low usage levels, limited variation between individual livestock farms in the amounts of antibiotics used, and limited usage level fluctuations over time. However, long-tailed DDDAF distributions might still be observed for some of these sectors, indicating the presence of (a limited number of) farms with high usage levels. The benchmark thresholds that represent acceptable use will probably require no or only minor adjustments in the future. As the sectors eligible for application of a benchmark threshold representing acceptable use are characterized by the absence of substantial structural between-farm differences, prescription patterns of the various veterinarians active within these sectors will show little variation as well.

If the action threshold is exceeded, the livestock farm is included in the action zone. A usage level below the action threshold results in the livestock farm being included in the target zone. Provisional benchmark thresholds have no long-term applicability and require regular reevaluation to assess the attainability of a more stringent threshold.

The SDa expert panel has not been able to define any resistance-informed benchmark thresholds (for details, consult the SDa report on usage of antibiotics in 2016). Consequently, the expert panel decided to continue establish benchmark thresholds based on detailed analysis of usage pattern developments and usage level distributions, which show how the individual farms within a monitored livestock sector have performed in terms of the amounts of antibiotics used.

Broiler farming sector

As of February 2017, body weight at the time of treatment is used to determine poultry farms' antibiotic usage levels in terms of defined daily doses animal. The $DDDA_F$ calculation method is set out in a Standard Operation Procedure (SOP) by the sector. In addition, the SDa has started integrating growth curves in its calculations. The treatment weight, according to the growth curve, is used in formula 2 instead of a standardized weight. Within broilers two breeds can be distinguished conventional breeds and alternative slower growing breeds, for both breeds a benchmark threshold reflecting acceptable use is set at 8 $DDDA_F$.

Turkey farming sector

Similar to the broiler farming sector body weight at the time of treatment (based on a growth curve) is used to determine turkey farms' antibiotic usage levels in $DDDA_F$. A provisional benchmark threshold is set at 10.

Cattle farming sector

For the cattle farming sector new benchmark thresholds were already presented in the 2016 report. Only a signaling threshold was introduced for all production categories (dairy cattle farms, rearing farms, suckler cow farms and beef farms). If this threshold is exceeded for two consecutive years, action is required. Due to the differences with the SDa's new proposals, the cattle farming sector's current benchmarking method will be evaluated in 2020. In consultation with the cattle farming sector, the SDa expert panel will assess whether some minor technical adjustments are required in order to harmonize its benchmarking approach with other livestock sectors.

Pig farming sector

For the pig sector three production categories are defined, within these categories a further specification is made based on age. Each age category has its own standardized weight (table 2). For the production categories sows/piglets and fattening pigs benchmarking thresholds are defined. A provisional threshold is defined for the weaner pigs, this category was introduced in 2015.

Veal farming sector

For the veal farming sector the $DDDA_F$ is calculated based on the antibiotic usage over the past 1.5 years to correct for seasonal fluctuations. The result is then multiplied by 2/3 to get the annual antibiotic usage. Provisional benchmark thresholds are set for rosé veal starter farms and white veal farms, while a threshold reflecting acceptable use is set for the white veal farms. For veal farms a correction for the time no animals are present is made by multiplying the $DDDA_F$ result by 365/(365-number of days with no animals present).

Rabbit farming sector

No benchmark threshold has been set for rabbit farming, a threshold is expected to be set during 2020.

Table 3: Benchmark thresholds representing acceptable use will be valid from 2019 to 2024. Provisional benchmark thresholds will be valid during the 2019-2020 period

		Benchmark thresholds, with specification of the type of threshold	
Livestock sector	Type of farm/ production category	Type of benchmark threshold	Action threshold
Veal farming sector*	White veal farms	Provisional	23
	Rosé veal starter farms	Provisional	67
	Rosé veal fattening farms	Representing acceptable use	4
	Rosé veal combination farms	This category will cease to exist	
Pig farming sector	Sows/piglets	Representing acceptable use	5
	Weaner pigs	Provisional	20
	Fattening pigs	Representing acceptable use	5
Poultry farming sector	Broiler farms	Representing acceptable use	8
	Turkey farms	Provisional	10¥
Rabbit farming sector	Rabbit farms	Provisional	**
Cattle farming sector	Dairy cattle farms	Representing acceptable use	6§
	Rearing farms	Representing acceptable use	2§
	Suckler cow farms	Representing acceptable use	2§
	Beef farms	Representing acceptable use	2§

* The benchmark thresholds are based on a 1.5-year period

** No benchmark threshold can be determined based on the currently available data

¥ Determined using the new, growth curve-based calculation method

§ Threshold for inclusion in the signaling zone; cattle farms are included in the action zone if their usage level has exceeded the signaling threshold two years in a row

Appendix I

Example of a format for the data to be delivered to the SDa (veal farming sector).

Variable name	Description	Variable type	Length	Specific remarks
UBN	UBN-number	Number	7	
TSTART	Start date: date at which the farm was registered with the quality system.	Date	10	
TEND	End date: date at which the farm ended the contract with the quality system.	Date	10	
AS	Animal species	Text	8	
FTYPE	Farm type (1= white, 2= rosé start, 3= rosé finisher, 4= rosé closed)	Number	2	
TDELIV	Registered delivery date of the antibiotic	Date	10	
EAN	EAN-code of package	Number	13	- max. 13 digit - not in exponential format
AMOUNT	Number of packages	Number	4.5	Are high amounts correct?
EMPTY	Number of days no animals were present at the farm	Number	Min 1 Max 3	
COUNT	Number of animals present on average on a farm, calculated over the period animals were present.	Number	Min 1 Max 7	