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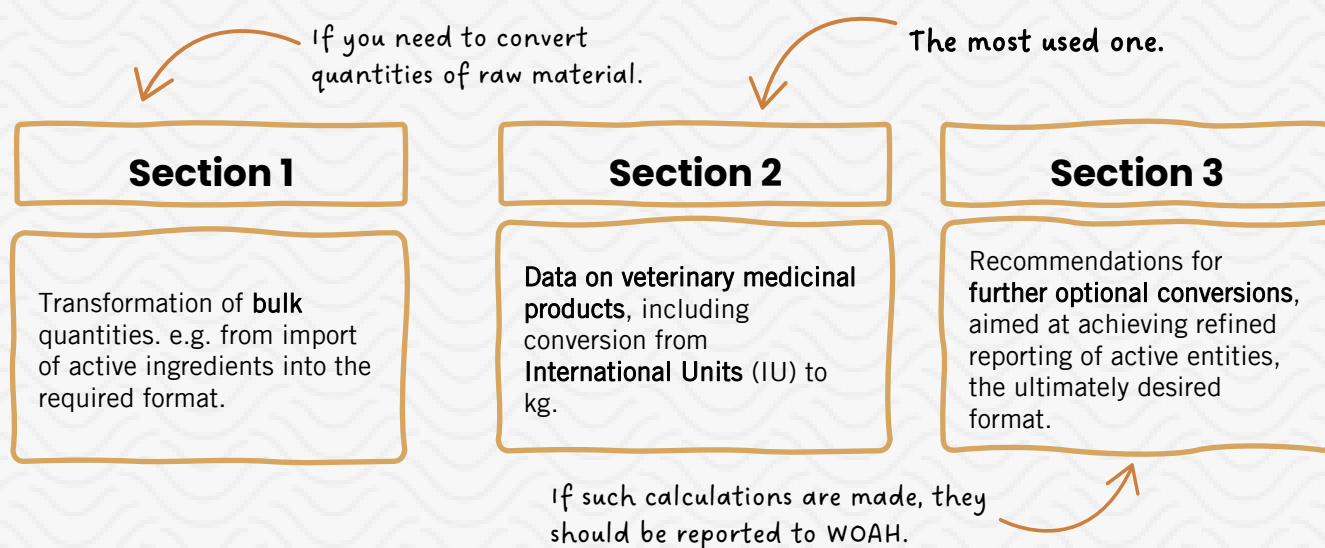
**Annex: Content Conversion of Antimicrobial
Active Ingredients in Veterinary Medicines
into Kilograms**

8th Round

Calculating the quantities to report in kilogram (kg)

Data on antimicrobial agents intended for use in animals comes in different forms. The WOH template for the collection of data on antimicrobial agents used in animals (WOAH template) is designed to collect data on the amounts of chemical compound as declared on the product label. The information may vary, ranging from bulk quantities of antimicrobial agents to numbers of packs of a veterinary medicinal product. The content of antimicrobial agents in such products can be stated in a number of possible ways. It will be necessary, where appropriate, to calculate the required data to populate the WOH template.

Detailed instructions are provided to harmonise some aspects of data reporting:



The following abbreviations and symbols will be used:



Symbol/abbreviation	Explanation
Strength	amount of antimicrobial agent per unit of veterinary product
% w/v	per cent weight per volume
mg	milligram
g	gram
kg	kilogram
t	ton (metric)
ml	millilitre
l	litre

1. For data on bulk quantities

Such information is usually sourced from customs, import or other **bulk** trading. It will likely come as a weight in a number of possible units (e.g. metric tons) of chemical compound and needs to be converted to kg. When conversion into kg is necessary, follow the steps below. If additional conversion factors are needed, please contact WOAAH at antimicrobialuse@woah.org.

Step 1: Multiply the amount of antimicrobial agent, i.e. the chemical compound as declared on the product label with the appropriate conversion factor from the table 1 below.



$$\text{Antimicrobial agent (kg)} = \text{antimicrobial agent (unit Z)} \times \text{conversion factor}$$

When data are on bulk quantities.
The weight of raw materials to
manufacture veterinary products



Table 1: Converting weight units into kg

Unit reported (unit Z)	Conversion factor to kg (for multiplication)
Metric ton	1000
Imperial ton (long)	1016
Imperial ton (short)	907.18
Stone (Imperial)	6.35
Imperial Pound	0.4536
Ounce	0.0283



2. For data on veterinary medicinal products

For **veterinary medicinal products** containing antimicrobial agents, data on quantities sold is likely to be available as numbers of **packages** of product sold or imported, with each package containing a specified quantity of medicinal product with a specified amount of antimicrobial agent.

In such cases, the amount of antimicrobial agent (chemical compound as declared on the product label) **per package** needs to be calculated first, and subsequently the result needs to be multiplied with the number of packages of the presentation sold to obtain the overall amount of antimicrobial agent, which should be reported in kg.

The most common ways to indicate the content of the antimicrobial agent(s) of a veterinary medicinal product are:

- (i) Strength in mg or g of the active ingredient per volume or weight or other unit, (for example: ml, l, kg, tablet or piece),
- (ii) Strength in International Units (IU) per weight, volume or other unit,
- (iii) Strength in per cent (%) weight per weight (w/w) or weight per volume (w/v).

Each situation requires a different kind of mathematical conversion.

2. (i) – Content of antimicrobial active ingredient (antimicrobial agent) stated in milligram per volume or weight or other unit (for example millilitre, litre, kilogram, tablet) of content

Step 1: Calculation of the content of antimicrobial agent per package

Multiply the amount of antimicrobial agent (chemical compound as declared on the product label) per unit of content, that is, the strength of the product, with the total number of units contained in the package



Content of antimicrobial agent per package
= Strength (amount antimicrobial agent per unit) x number of units per package

Example A:

Tiamulin 100 g/kg premix for medicated feeding stuff; package sizes: (a) 1 kg, (b) 5 kg and (c) 20 kg

Calculation of content of antimicrobial agent, tiamulin, per package:

- (a) *Pack content = 100 g/kg x 1 kg = 100 g*
- (b) *Pack content = 100 g/kg x 5 kg = 500 g*
- (c) *Pack content = 100 g/kg x 20 kg = 2000 g*

Example B:

Tetracycline intrauterine tablet containing 2000 mg tetracycline hydrochloride per tablet; package sizes: (a) carton with 1 blister of 5 intrauterine tablets, (b) carton with 4 blisters of 5 intrauterine tablets each (20 tablets), (c) carton with 20 blisters of 5 intrauterine tablets each (100 tablets).

Calculation of content of antimicrobial agent, tetracycline, per package:

- (a) *Pack content = 2000 mg x 5 = 2 g x 5 = 10 g*
- (b) *Pack content = 2000 mg x 20 = 2 g x 20 = 40 g*
- (c) *Pack content = 2000 mg x 100 = 2 g x 100 = 200 g*

Example C:

Tilmicosin 300 mg/ml solution for injection for cattle; package sizes: containers of 100 ml and 250 ml; packs of (a) 6, (b) 10 and (c) 12 units of 100 ml and 250 ml.

Calculation of content of antimicrobial agent, tilmicosin, per package:

- (a) Container content = 300 mg/ml x 100 ml = 30000 mg = 30 g
Pack content: (a) 6 x 30 g = 180 g
(b) 10 x 30 g = 300 g
(c) 12 x 30 g = 360 g
- (b) Container content = 300 mg/ml x 250 ml = 75000 mg = 75 g
Pack content: (a) 6 x 75 g = 450 g
(b) 10 x 75 g = 750 g
(c) 12 x 75 g = 900 g

Step 2: Sum up the antimicrobial agent contained in all presentations and packages sold or imported



Convert all contents of antimicrobial agent calculated under step 1 to the **same weight unit** and **add up the total**

Step 3: If necessary: convert the total sum of antimicrobial agent contained in all packages of all presentations sold to kg

Multiply the result from step 2 with an appropriate conversion factor to achieve the result in kg

2. (ii) – content of antimicrobial agent (chemical compound as declared on the product label) in International Units (IU) per weight, volume or other unit (for example millilitre, litre, kilogram, tablet) of content

Where the strength of the antimicrobial agent in the veterinary medicinal product is stated **International Units (IU)** per unit of finished product, **an additional conversion step is necessary** to obtain results in mg, g, or kg. Table 2 is used to convert content of antimicrobial agents declared in IU on the product label into mg for reporting to WOA: either divide the total number of IUs of an antimicrobial agent by the value in the column ‘International Units (IU) per mg’ for this agent in table 2, or, if multiplication is preferred, multiply the total number of IUs with the conversion factor listed for the agent. To convert mg values into kg, please multiply the result of the conversion with 1×10^{-6} equalling 0.000001.

For some antimicrobial agents in veterinary medicinal products, the IU content or strength may be stated in respect to the active entity rather than to the chemical compound actually included; for example: a product may contain penethamate hydroiodide, or procaine benzylpenicillin, but the stated strength in IU refers to benzylpenicillin (product X containing penethamate hydroiodide, equivalent to xx IU benzylpenicillin, or, product Y containing procaine benzylpenicillin, equivalent to yy IU benzylpenicillin). For such cases, use the conversion factor for the relevant active entity listed in table 2 (in the examples used: benzylpenicillin). To convert mg values into kg, please multiply the result of the conversion with 1×10^{-6} equalling 0.000001.

If additional conversion factors are needed or have been used, please contact WOA: antimicrobialuse@woah.org.

Step 1: Calculating the content of antimicrobial agent per package in IU

Multiply the amount of IU antimicrobial agent per unit of content with the total number of units contained in the package



Content of antimicrobial agent per package in IU
= Strength (amount IU antimicrobial agent per unit) x number of units per package

Step 2: Converting the content of antimicrobial agent per package in IU into mg



Content of antimicrobial agent per package in mg
= Content of antimicrobial agent in IU x conversion factor

Steps 3-4: Follow steps 2-3 described for (i)

Table 2: Conversion of International Units (IUs) of certain antimicrobial agents into mg and relevant active entities, based on the ESVAC conversion factors¹

¹ http://www.ema.europa.eu/ema/pages/includes/document/open_document.jsp?webContentId=WC500189269



Antimicrobial agent in the veterinary medicine	Antimicrobial active entity for reporting to WOA ²	International Units per mg	Conversion factor to mg for multiplication
Apramycin	Apramycin	552	0.00181
Bacitracin	Bacitracin	74	0.013514
Benzylpenicillin (penicillin G) ²	Benzylpenicillin	1670	0.0006
Chlortetracycline	Chlortetracycline	1000	0.001
Colistin methane sulfonate sodium (colistimethate sodium INN)	Colistin	12700	0.000079
Colistin sulfate	Colistin	20500	0.000049
Dihydrostreptomycin	Dihydrostreptomycin	777	0.00129
Erythromycin	Erythromycin	920	0.001087
Gentamicin	Gentamicin	620	0.001613
Kanamycin	Kanamycin	796	0.001256
Neomycin	Neomycin	762	0.00131
Neomycin B (Framycetin)	Neomycin B (Framycetin)	706	0.00142
Oxytetracycline	Oxytetracycline	880	0.00114
Paromomycin	Paromomycin	750	0.00133
Polymyxin B	Polymyxin B	8403	0.000119
Rifamycin	Rifamycin	887	0.001127
Spiramycin	Spiramycin	3200	0.000313
Streptomycin	Streptomycin	760	0.00132
Tetracycline	Tetracycline	982	0.00102
Tobramycin	Tobramycin	875	0.001143
Tylosin	Tylosin	1000	0.001

2. (iii) – content of antimicrobial agent (chemical compound as declared on the product label) in per cent (%) weight per weight (w/w) or weight per volume (w/v) of content

The amount of antimicrobial agent contained in a veterinary medicine concerned may be stated in per cent weight per weight (% w/w) (example 1: product X contains tylosin 100% w/w or, example 2, product Y contains amoxicillin 22.2 % w/w) or in per cent weight per volume (% w/v) (example: product Z contains procaine benzylpenicillin 30% w/v). Such figures first need to be converted into mg/g, g/g, or mg/ml, followed by the calculations described under (i).

Converting % w/w: Conversion calculations are performed by relating the content of antimicrobial agent to 1 g of the finished product. Divide the percentage value by 100 to obtain the amount of antimicrobial agent in g per g finished product.



$$\text{value antimicrobial agent in g per gram finished product} = \frac{\text{value (\%)} \times \text{g}}{100} \div 1 \text{ g (finished product)}$$

Example 1: Product X containing 100% w/w tylosin will contain $100/100 \times \text{g} = 1 \text{ g}$ tylosin per g finished product.

Example 2: Product Y containing 22.2% w/w amoxicillin will contain $22.2/100 = 0.222 \text{ g}$ amoxicillin per g finished product.

Continue with Steps 1-3 of (i)

² Applies to all derivatives/compounds of benzylpenicillin

Converting % w/v: Conversion is based on the assumption that 1 ml of the products weighs 1000 mg. Multiply the percentage value with 10 to obtain the content in mg/ml.



$$\text{value antimicrobial agent in g per ml finished product} = \frac{\text{value (\%)} \times 10 \times \text{mg}}{1 \text{ ml (finished product)}}$$

Example: Product Z containing 30% w/v benzylpenicillin will contain (30 x 10 mg)/1ml, equal to 300 mg/ml benzylpencicillin.

Continue with Steps 1-3 of (i)

3. Additional recommendations for further conversions of quantities of antimicrobial agents

For pragmatic reasons WOAAH accepts the reporting of antimicrobial agents in amounts of chemical compound as declared on the product label of the veterinary medicinal product. However, WOAAH Members **may wish to carry out further calculations to report amounts of active entity**. If such further calculations are carried out, please describe them in the WOAAH template.

Calculating the total amount expressed in weight of chemical compound as declared on the product label of a veterinary medicinal product into antimicrobial active entity (e.g. salt, ester or prodrug into base)



This step may be carried out **once the steps described in section 1 or section 2. (i)** have been **completed**.

As an example, for the antimicrobial agent tiamulin that is often available in the form of tiamulin hydrogen fumarate (the chemical compound as declared on the product label), the conversion formula to tiamulin (the active entity) would be:

Salt (including base): Tiamulin hydrogen fumarate MW 609.8

Base: Tiamulin MW 493.7

Conversion factor = MW base/MW salt (including base) = 0.81

Multiply the final result in kg obtained by following steps 1 to 3 with the appropriate conversion factor



$$\text{Content of active entity (kg)} = \text{Content of chemical compound as listed on the label (kg)} \times \text{conversion factor}$$

Taking the conversion factors of certain derivatives or compounds used by the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) program managed by the European Medicines Agency, as a starting point, table 3 lists the suggested conversion factors for relevant derivatives or compounds in order to obtain the corresponding amount of the active entity.

If additional conversion factors are needed or have been used, please contact WOAAH at antimicrobialuse@woah.org.

Table 3: Conversion of content stated in mg, g or kg of derivatives/compounds of antimicrobial agents in the veterinary product into corresponding mg, g or kg antimicrobial active entity for reporting to WOH, based on the ESVAC conversion factors³



Derivate or compound	Active entity	Conversion factor for multiplication
Benethamine benzylpenicillin ⁴	Benzylpenicillin	0.61
Benzathine benzylpenicillin ⁵	Benzylpenicillin	0.68
Cefapirin benzathine ⁶	Cefapirin	0.78
Cefalexin benzathine ⁷	Cefalexin	0.74
Cloxacillin benzathine ⁸	Cloxacillin	0.78
Oxacillin benzathine ⁹	Oxacillin	0.77
Penethamate hydriodide ¹⁰	Benzylpenicillin	0.60
Procaine benzylpenicillin ¹¹	Benzylpenicillin	0.57

Step 1–3: As described in section 2. (i)

Step 4: Multiply the final result in kg obtained by following steps 1 to 3 with the appropriate conversion factor listed in table 3



$$\begin{aligned}
 & \text{Antimicrobial agent (active entity)(kg)} \\
 & = \text{antimicrobial agent (chemical compound as declared on the product label)(kg)} \\
 & \quad \times \text{derivate or compound conversion factor}
 \end{aligned}$$

³ http://www.ema.europa.eu/ema/pages/includes/document/open_document.jsp?webContentId=WC500189269

⁴ Conversion factor for benethamine benzylpenicillin is updated from 0.65 to 0.61

⁵ Conversion factor for benzathine benzylpenicillin is updated from 0.74 to 0.68

⁶ Conversion factor for cefapirin benzathine is updated from 0.41 to 0.78

⁷ Conversion factor for cefalexin benzathine is updated from 0.36 to 0.74

⁸ Conversion factor for cloxacillin benzathine is updated from 0.43 to 0.78

⁹ Conversion factor for oxacillin benzathine is updated from 0.69 to 0.77

¹⁰ Conversion factor for penethamate hydriodide is updated from 0.63 to 0.60

¹¹ Conversion factor for procaine benzylpenicillin is updated from 0.61 to 0.57