ANNEX I

SUMMARY OF PRODUCT CHARACTERISTICS

1. NAME OF THE VETERINARY MEDICINAL PRODUCT

Marbodug 100 mg/ml solution for injection for cattle and pigs (UK, (NI) and IE)
Odimar 100 mg/ml solution for injection for cattle and pigs (BE, NL, LU, ES, PT, DE, AT)

2. QUALITATIVE AND QUANTITATIVE COMPOSITION

Each ml contains:

Active substance: Marbofloxacin 100.0 mg

Excipients:

Qualitative composition of excipients and other constituents	**Quantitative composition if that information is essential for proper administration of the veterinary medicinal product**
Metacresol	2.0 mg
Monothioglycerol	1.0 mg
Disodium edetate	0.1 mg
Gluconolactone	
Water for injections	

Clear yellowish solution.

3. CLINICAL INFORMATION

3.1 Target species

Cattle and pigs (sows).

3.2 Indications for use for each target species

Cattle:
Treatment of respiratory infections caused by sensitive strains of *Pasteurella multocida*, *Mannheimia haemolytica, Histophilus somni* and *Mycoplasma bovis.*

Treatment of acute mastitis caused by *E. coli* strains sensitive to marbofloxacin during the lactation period.

Pigs (sows):
Treatment of Metritis Mastitis Agalactia syndrome (postpartum dysgalactiae syndrome, PDS) caused by susceptible strains of organisms.

3.3 Contraindications

Do not use in cases of hypersensitivity to the active substance or to any other quinolone or to any of the excipients

Do not use in cases where the pathogen involved is resistant to other fluoroquinolones (cross resistance).

3.4 Special warnings

Efficacy data have shown an insufficient efficacy of the veterinary medicinal product for the treatment of acute mastitis caused by Gram positive strains.

3.5 Special precautions for use

Special precautions for safe use in the target species:

Official and local antimicrobial policies should be taken into account when the veterinary medicinal product is used. Fluoroquinolones should be reserved for the treatment of clinical conditions which have responded poorly, or are expected to respond poorly, to other classes of antimicrobials. Whenever possible, fluoroquinolones should only be used based on susceptibility testing. Use of the veterinary medicinal product deviating from the instructions given in the SPC may increase the prevalence of bacteria resistant to the fluoroquinolones and may decrease the effectiveness of treatment with other quinolones due to the potential for cross resistance.

Special precautions to be taken by the person administering the veterinary medicinal product to animals:

People with known hypersensitivity to (fluoro)quinolones should avoid any contact with the veterinary medicinal product.
If the veterinary medicinal product comes into contact with the skin or eyes, rinse with large amounts of water.
Avoid accidental self-injection, since this can cause local irritation. Wash hands after use.
In case of accidental self-injection or ingestion, seek medical advice immediately and show package leaflet or the label to the physician.

Special precautions for the protection of the environment:

Not applicable.

3.6 Adverse events

Cattle and pigs (sows):

Very rare (<1 animal / 10,000 animals treated, including isolated reports):	Injection site lesion[1,2] Injection site reactions[2] (e.g. injection site pain, injection site inflammation and injection site swelling).

[1]Transient inflammation without clinical impact with following intramuscular or subcutaneous injection.
[2] May persist for at least 12 days after intramuscular injection.

Reporting adverse events is important. It allows continuous safety monitoring of a veterinary medicinal product. Reports should be sent, preferably via a veterinarian, to either the marketing authorisation holder or its local representative or the national competent authority via the national reporting system. See the package leaflet for respective contact details.

3.7 Use during pregnancy, lactation or lay

Pregnancy and lactation:
Laboratory studies in rats and rabbits have not produced any evidence of a teratogenic, foetoxic or maternotoxic effects.

Dose of 2 mg/kg body weight:
The safety of the veterinary medicinal product has been established in pregnant and lactating cows and sows.

Dose of 8 mg/kg body weight:
The safety of the veterinary medicinal product has not been established in pregnant cows or in suckling calves when used in cows. Therefore, in pregnant and lactating animals this dose regimen should be used only according to the benefit-risk assessment by the responsible veterinarian.

3.8 Interaction with other medicinal products and other forms of interaction

None known.

3.9 Administration routes and dosage

Pigs: i.m.
Cattle: s.c., i.m. or i.v.
To ensure a correct dosage, body weight should be determined as accurately as possible.

Cattle:
Respiratory infections:
This veterinary medicinal product may be administered as a single dose given on one day only or as a multiple dose injection given over 3-5 days.

Single dose – Intramuscular use:
The recommended dosage is 8 mg/kg bodyweight (i.e. 2 ml of veterinary medicinal product /25 kg bodyweight in a single injection). This optimised dosing regimen should be considered as the dosing regimen of choice in the treatment of cattle respiratory disease with the exception of the situations listed below.

Multiple dose – Intramuscular, intravenous or subcutaneous use:
The recommended dosage is 2 mg/kg bodyweight (i.e. 1 ml of veterinary medicinal product /50 kg bodyweight in a single daily injection for 3-5 days). This dosing regimen should be used for treatment of specific cases such as those which require intravenous treatment or infections caused by *Mycoplasma bovis*).

Acute mastitis:
- Intramuscular or subcutaneous use:
The recommended dosage is 2 mg/kg bodyweight (i.e. 1 ml of veterinary medicinal product/ 50 kg bodyweight in a single daily injection, for 3 consecutive days.
The first injection may also be given by the intravenous route.

Pigs (sows):
- Intramuscular use:
The recommended dosage is 2 mg/kg bodyweight (i.e. 1 ml of veterinary medicinal product/ 50 kg bodyweight in a single daily injection, for 3 consecutive days).

It is preferable to inject cattle and pigs in the neck.

If the volume to be injected is more than 20 ml, it should be divided between two or more injection sites.

In order to reduce the risk of particulate contamination of the veterinary medicinal product, it is recommended that a draw-off needle be used to reduce the number of times the septum is punctured.

Do not broach the 100 ml-vial more than 25 times and a 250 ml-vial more than 50 times.

3.10 Symptoms of overdose (and where applicable, emergency procedure and antidotes)

No severe side-effects are to be expected at doses up to 3 or 5 times the recommended dose in cattle and pigs respectively.

Overdosage may cause acute signs in the form of neurological disorders which would have to be treated symptomatically.

3.11 Special restrictions for use and special conditions for use, including restrictions on the use of antimicrobial and antiparasitic veterinary medicinal products in order to limit the risk of development of resistance

Not applicable.

3.12 Withdrawal periods

	Meat and offal	Milk
Cattle 2 mg/kg for 3 to 5 days **(i.v./i.m./s.c.**)	6 days	36 hours
Cattle 8 mg/kg on a single occasion **(i.m.)**	3 days	72 hours
Pigs	4 days	

4. PHARMACOLOGICAL INFORMATION

4.1 ATC Vet code: QJ01MA93

4.2 Pharmacodynamics

Marbofloxacin is a synthetic, bactericidal antimicrobial, belonging to the fluoroquinolone group. It acts by inhibition of DNA gyrase and shows concentration dependant bactericidal activity. It has a broad-spectrum activity against Gram-positive bacteria and Gram-negative bacteria (e.g. *Pasteurella multocida*, *Mannheimia haemolytica*, *Histophilus somni*, *E. coli*) as well as against mycoplasmas (*Mycoplasma bovis*).
The marbofloxacin *in vitro* activity against pathogens isolated in 2004 from bovine respiratory diseases during a clinical field trial in France, Germany, Spain and Belgium, is good: MIC values are comprised between 0.015 and 0.25 µg/ml for *M. haemolytica* (MIC90 = 0.124 µg/ml; MIC50 = 0.025 µg/ml), between 0.004 and 0.12 µg/ml for *P. multocida* (MIC90 = 0.022 µg/ml; MIC50 = 0.009 µg/ml) and between 0.015 and 2 µg/ml for *Histophilus somni*. Strains with MIC $\leq$ 1 µg/ml are sensitive to marbofloxacin whereas strains with MIC $\geq$ 4 µg/ml are resistant to marbofloxacin.
Resistance to fluoroquinolones occurs mostly by chromosomal mutation with three mechanisms: decrease of the bacterial wall permeability, expression of efflux pump or mutation of enzymes responsible for molecule binding.

4.3 Pharmacokinetics

After subcutaneous or intramuscular administration in cattle and intramuscular administration in pigs at the recommended dose of 2 mg/kg body weight, marbofloxacin is readily absorbed and reaches maximal plasma concentrations of 1.5µg/ml within less than 1 hour. Its bioavailability is close to 100%.

After a single intramuscular administration in cattle at the recommended dose of 8 mg/kg body weight, the maximum plasma concentration of marbofloxacin (C_{max}) is 7.3 µg/ml reached in =

0.78 hours (T_{max}). Binding to plasma proteins is about 30%. Marbofloxacin is eliminated slowly ($t_{½}$ β = 15.60 hours), predominantly in the active form in urine and faeces.

It is weakly bound to plasma proteins (less than 10% in pigs and 30% in cattle), extensively distributed and in most tissues (liver, kidney, skin, lung, bladder, uterus, digestive tract) it achieves a higher concentration than in plasma.

In cattle, marbofloxacin is eliminated slowly in pre-ruminating calves ($t_{½}$ β = 5-9 hours) but faster in ruminant cattle ($t_{½}$ β = 4-7 hours) predominantly in the active form in urine (3/4 in pre-ruminating calves, 1/2 in ruminants) and faeces (1/4 in pre-ruminating calves, 1/2 in ruminants). In pigs, marbofloxacin is eliminated slowly ($t_{½}$ β = 8-10 hours) predominantly in the active form in urine (2/3) and faeces (1/3).

5. PHARMACEUTICAL PARTICULARS

5.1 Major incompatibilities

In the absence of compatibility studies, this veterinary medicinal product must not be mixed with other veterinary medicinal products.

5.2 Shelf life

Shelf life of the veterinary medicinal product as packaged for sale: 3 years.
Shelf life after first opening the immediate packaging (20, 50, 100, 250 ml vials): 28 days.
Shelf life after first opening the immediate packaging (10 ml): use immediately.

5.3 Special precautions for storage

Keep the container in the outer carton in order to protect from light.
This veterinary medicinal product does not require any special temperature storage conditions.

10 ml vials: Vial must be used immediately after opening. Following withdrawal of the required dose, the remainder to the contents of the vial should be discarded.

5.4 Nature and composition of immediate packaging

Packaged in Amber type II glass vials of 10, 20, 50 ml 100 and 250 ml.
The vials are closed with a fluorinated bromobutyl rubber stopper oversealed with an aluminium cap. Each vial is packaged in a cardboard box.
Not all pack sizes may be marketed.

5.5 Special precautions for the disposal of unused veterinary medicinal products or waste materials derived from the use of such products

Medicines should not be disposed of via wastewater or household waste.
Use take-back schemes for the disposal of any unused veterinary medicinal product or waste materials derived thereof in accordance with local requirements and with any national collection systems applicable to the veterinary medicinal product concerned.

6. NAME OF THE MARKETING AUTHORISATION HOLDER

Emdoka

7. MARKETING AUTHORISATION NUMBER(S)

8. DATE OF FIRST AUTHORISATION

9. DATE OF THE LAST REVISION OF THE SUMMARY OF THE PRODUCT CHARACTERISTICS

10. CLASSIFICATION OF VETERINARY MEDICINAL PRODUCTS

Veterinary medicinal product subject to prescription.

Detailed information on this veterinary medicinal product is available in the Union Product Database *(https://medicines.health.europa.eu/veterinary*).

LABELLING AND PACKAGE LEAFLET

A. LABELLING

PARTICULARS TO APPEAR ON THE OUTER PACKAGE

CARTON (10 ml, 20 ml, 50 ml, 100 ml and 250 ml sizes)

1. NAME OF THE VETERINARY MEDICINAL PRODUCT

Marbodug 100 mg/ml solution for injection

2. STATEMENT OF ACTIVE SUBSTANCES

Each ml contains:

Marbofloxacin 100.0 mg

3. PACKAGE SIZE

10 ml
20 ml
50 ml
100 ml
250 ml

4. TARGET SPECIES

Cattle, pigs (sows).

5. INDICATIONS

6. ROUTES OF ADMINISTRATION

Cattle: 1 ml/50 kg **i.m.**, **s.c.** or **i.v.** once daily for 3 to 5 days OR alternatively one single i.m. injection of 2 ml/25kg when treating respiratory infections
Pigs: 1 ml/50 kg **i.m.** once daily for 3 days.

7. WITHDRAWAL PERIODS

Withdrawal period:

	Meat and offal	Milk
Cattle 2 mg/kg for 3 to 5 days **(i.v./i.m./s.c.)**	6 days	36 hours
Cattle 8 mg/kg on a single occasion (**i.m.)**	3 days	72 hours
Pigs	4 days	

8. EXPIRY DATE

Exp. {mm/yyyy}

Once broached, use by…
Shelf life after first opening the immediate packaging (20 ml, 50ml, 100 ml, 250 ml): 28 days.
Shelf life after first opening the immediate packaging (10 ml): use immediately.

9. SPECIAL STORAGE PRECAUTIONS

Keep the container in the outer carton in order to protect from light.

10 ml vials: Vial must be used immediately after opening. Following withdrawal of the required dose, the remaining contents of the vial should be discarded.

10. THE WORDS "READ THE PACKAGE LEAFLET BEFORE USE"

Read the package leaflet before use.

11. THE WORDS "FOR ANIMAL TREATMENT ONLY"

For animal treatment only.

12. THE WORDS "KEEP OUT OF THE SIGHT AND REACH OF CHILDREN"

Keep out of the sight and reach of children.

13. NAME OF THE MARKETING AUTHORISATION HOLDER

Emdoka

14. MARKETING AUTHORISATION NUMBERS

15. BATCH NUMBER

Lot {number}

MINIMUM PARTICULARS TO APPEAR ON SMALL IMMEDIATE PACKAGING UNITS
10 ml, 20 ml and 50 ml Vials

1. NAME OF THE VETERINARY MEDICINAL PRODUCT

Marbodug 100 mg/ml solution for injection

2. QANTITATIVE PARTICULARS OF THE ACTIVE SUBSTANCES

Each ml contains:

Marbofloxacin 100 mg/ml

3. BATCH NUMBER

Lot {number}

4. EXPIRY DATE

Exp. {mm/yyyy}
Once broached, use by…
Shelf life after first opening the immediate packaging (20 ml, 50ml): 28 days.
Shelf life after first opening the immediate packaging (10 ml): use immediately

PARTICULARS TO APPEAR ON THE IMMEDIATE PACKAGE

100 ml and 250 ml Vials

1. NAME OF THE VETERINARY MEDICINAL PRODUCT

Marbodug 100 mg/ml solution for injection

2. STATEMENT OF ACTIVE AND OTHER SUBSTANCES

Each ml contains:

Marbofloxacin 100.0 mg

3. TARGET SPECIES

Cattle.
Pigs (sows).

4. ROUTES OF ADMINISTRATION

Cattle: **s.c.**, **i.m.** or **i.v.**
Pigs: **i.m.**

Read the package leaflet before use.

5. WITHDRAWAL PERIODS

Withdrawal period:

	Meat and offal	Milk
Cattle 2 mg/kg for 3 to 5 days **(i.v./i.m./s.c.**)	6 days	36 hours
Cattle 8 mg/kg on a single occasion **(i.m.)**	3 days	72 hours
Pigs	4 days	

6. EXPIRY DATE

Exp. {mm/yyyy}
Once broached, use by…

Shelf life after first opening the immediate packaging: 28 days.

7. SPECIAL STORAGE PRECAUTIONS

Keep the container in the outer carton in order to protect from light.

8. NAME OF THE MARKETING AUTHORISATION HOLDER

Emdoka

9. BATCH NUMBER

Lot {number}

B. PACKAGE LEAFLET

PACKAGE LEAFLET

1. Name of the veterinary medicinal product

Marbodug 100 mg/ml solution for injection for cattle and pigs

2. Composition

Each ml contains:

Active substance: Marbofloxacin 100.0 mg

Excipients:
Metacresol 2.0 mg
Monothioglycerol 1.0 mg
Disodium edetate 0.1 mg

Clear yellowish solution.

3. Target species

Cattle and pigs (sows).

4. Indications for use

Cattle:
Treatment of respiratory infections caused by sensitive strains of *Pasteurella multocida*, *Mannheimia haemolytica, Histophilus somni* and *Mycoplasma bovis*.

Treatment of acute mastitis caused by *E.coli* strains sensitive to marbofloxacin during the lactation period.

Pigs:
Treatment of Metritis Mastitis Agalactia syndrome (postpartum dysgalactiae syndrome, PDS) caused by susceptible strains of organisms.

5. Contraindications

Do not use in cases of hypersensitivity to the active substance or to any other quinolone or to any of the excipients.

Do not use in cases where the pathogen involved is resistant to other fluoroquinolones (cross resistance).

6. Special warnings

Special warnings:

Efficacy data have shown an insufficient efficacy of the veterinary medicinal product for the treatment of acute mastitis caused by Gram positive strains.

Special precautions for safe use in the target species:

Official and local antimicrobial policies should be taken into account when the product is used. Fluoroquinolones should be reserved for the treatment of clinical conditions which have responded poorly, or are expected to respond poorly, to other classes of antimicrobials. Whenever possible, fluoroquinolones should only be used based on susceptibility testing. Use of the product deviating from the instructions given in the SPC may increase the prevalence of bacteria resistant to the fluoroquinolones and may decrease the effectiveness of treatment with other quinolones due to the potential for cross resistance.

Special precautions to be taken by the person administering the veterinary medicinal product to animals:

People with known hypersensitivity to (fluoro)quinolones should avoid any contact with the veterinary medicinal product.
If the veterinary medicinal product comes into contact with the skin or eyes, rinse with large amounts of water.
Avoid accidental self-injection, since this can cause local irritation. Wash hands after use.
In case of accidental self-injection or ingestion, seek medical advice immediately and show package leaflet or the label to the physician.

Pregnancy and lactation:

Laboratory studies in rats and rabbits have not produced any evidence of a teratogenic, foetoxic or maternotoxic effects.

Dose of 2 mg/kg body weight:
The safety of the veterinary medicinal product has been established in pregnant and lactating cows and sows

Dose of 8 mg/kg body weight:
The safety of the veterinary medicinal product has not been established in pregnant cows or in suckling calves when used in cows. Therefore, in pregnant and lactating animals this dose regimen should be used only according to the benefit-risk assessment by the responsible veterinarian.

Overdose:

No severe side-effects are to be expected at doses up to 3 or 5 times the recommended dose in cattle and pigs respectively. Overdosage may cause acute signs in the form of neurological disorders which would have to be treated symptomatically.

Major incompatibilities:

In the absence of compatibility studies, this veterinary medicinal product must not be mixed with other veterinary medicinal products.

7. Adverse events

Cattle and pigs (sows):

Very rare (<1 animal / 10,000 animals treated, including isolated reports):	Injection site lesion[1,2] Injection site reactions[2] (e.g. injection site pain, injection site inflammation, injection site swelling)

[1]Transient inflammation without clinical impact following intramuscular or subcutaneous injection.
[2] May persist for at least 12 days after intramuscular injection.

Reporting adverse events is important. It allows continuous safety monitoring of a product. If you notice any side effects, even those not already listed in this package leaflet, or you think that the medicine has not worked, please contact, in the first instance, your veterinarian. You can also report any adverse events to the marketing authorisation holder or the local representative of the marketing authorisation holder using the contact details at the end of this leaflet or via your national reporting system:{national system details}.

8. Dosage for each species, routes and method of administration

Pigs: Intramuscular use (**i.m.)**
Cattle: Subcutaneous use (**s.c**.), Intramuscular use (**i.m.)** or Intravenous use (**i.v.)**

To ensure a correct dosage, body weight should be determined as accurately as possible.

Cattle:
Respiratory infections:
This veterinary medicinal product may be administered as a single dose given on one day only or as a multiple dose injection given over 3-5 days.

Single dose – Intramuscular use:
The recommended dosage is 8 mg/kg bodyweight (i.e. 2 ml of veterinary medicinal product /25 kg bodyweight in a single injection). This optimised dosing regimen should be considered as the dosing regimen of choice in the treatment of cattle respiratory disease with the exception of the situations listed below.

Multiple dose – Intramuscular, intravenous or subcutaneous use:
The recommended dosage is 2 mg/kg bodyweight (i.e. 1 ml of veterinary medicinal product/ 50 kg bodyweight in a single daily injection for 3-5 days). This dosing regimen should be used for treatment of specific cases such as those which require intravenous treatment or infections caused by *Mycoplasma bovis*).

Acute mastitis:
- Intramuscular or subcutaneous use:
The recommended dosage is 2 mg/kg bodyweight (i.e. 1 ml of veterinary medicinal product/ 50 kg bodyweight in a single daily injection, for 3 consecutive days.
The first injection may also be given by the intravenous route.

Pigs (sows):
- Intramuscular use:
The recommended dosage is 2 mg/kg bodyweight (i.e. 1 ml of veterinary medicinal product/ 50 kg bodyweight in a single daily injection, for 3 consecutive days).

9. Advice on correct administration

If the volume to be injected is more than 20 ml, it should be divided between two or more injection sites.

It is preferable to inject cattle and pigs in the neck.

In order to reduce the risk of particulate contamination of the veterinary medicinal product, it is recommended that a draw-off needle be used to reduce the number of times the septum is punctured.

Do not broach the 100 ml-vial more than 25 times and a 250 ml-vial more than 50 times.

10. Withdrawal periods

	Meat and offal	Milk
Cattle 2 mg/kg for 3 to 5 days **(i.v./i.m./s.c.)**	6 days	36 hours
Cattle 8 mg/kg on a single occasion (**i.m.**)	3 days	72 hours
Pigs	4 days	

11. Special storage precautions

Keep out of the sight and reach of children.
Do not use this veterinary medicinal product after the expiry date which is stated on the label after Exp. The expiry date refers to the last day of that month.
Shelf-life after first opening the immediate packaging (20, 50, 100, 250 ml vials): 28 days.
Shelf life after first opening the immediate packaging (10 ml): use immediately.

When the container is broached (opened) for the first time, using the in-use shelf-life which is specified on this package leaflet, the date on which any product remaining in the container should be discarded should be worked out. This discard date should be written in the space provided on the carton/label.

Keep the container in the outer carton in order to protect from light.
This veterinary medicinal product does not require any special temperature storage conditions.
<u>For the 10 ml vial only:</u>
Vial must be used immediately after opening. Following withdrawal of the required dose, the remaining contents of the vial should be discarded.

12. Special precautions for disposal

Medicines should not be disposed of via wastewater or household waste.
Use take-back schemes for the disposal of any unused veterinary medicinal product or waste materials derived thereof in accordance with local requirements and with any applicable national collection systems. These measures should help to protect the environment.
Ask your veterinary surgeon or pharmacist how to dispose of medicines no longer required.

13. Classification of veterinary medicinal products

Veterinary medicinal product subject to prescription.

14. Marketing authorisation numbers and pack sizes

Packaged in Amber Type II glass vials of 10, 20, 50, 100 and 250 ml.
Not all pack sizes may be marketed.

15. Date on which the package leaflet was last revised

MM/YYYY

Detailed information on this veterinary medicinal product is available in the Union Product Database (https://medicines.health.europa.eu/veterinary).

16. Contact details

Marketing authorisation holder and contact details to report suspected adverse reactions:
Emdoka, John Lijsenstraat 16, B-2321 Hoogstraten, Belgium
+32 (0) 3 315 04 26, info@emdoka.be

Manufacturer responsible for batch release:
Produlab Pharma B.V., Forellenweg 16, 4961 SJ Raamsdonksveer, Netherlands

17. Other information

Marbofloxacin is a synthetic, bactericidal antimicrobial, belonging to the fluoroquinolone group. It acts by inhibition of DNA gyrase and shows concentration dependant bactericidal activity. It has a broad-spectrum activity against Gram-positive bacteria and Gram-negative bacteria (e.g. *Pasteurella multocida, Mannheimia haemolytica, Histophilus somni, E. coli*) as well as against mycoplasmas (*Mycoplasma bovis*).
The marbofloxacin in vitro activity against pathogens isolated in 2004 from bovine respiratory diseases during a clinical field trial in France, Germany, Spain and Belgium, is good: MIC values are comprised between 0.015 and 0.25 µg/ml for *M. haemolytica* (MIC90 = 0.124 µg/ml; MIC50 = 0.025 µg/ml), between 0.004 and 0.12 µg/ml for *P. multocida* (MIC90 = 0.022 µg/ml; MIC50 = 0.009 µg/ml) and between 0.015 and 2 µg/ml for *Histophilus somni*. Strains with MIC $\leq$ 1 µg/ml are sensitive to marbofloxacin whereas strains with MIC $\geq$ 4 µg/ml are resistant to marbofloxacin.
Resistance to fluoroquinolones occurs mostly by chromosomal mutation with three mechanisms: decrease of the bacterial wall permeability, expression of efflux pump or mutation of enzymes responsible for molecule binding.

After subcutaneous or intramuscular administration in cattle and intramuscular administration in pigs at the recommended dose of 2mg/kg body weight, marbofloxacin is readily absorbed and reaches maximal plasma concentrations of 1.5µg/ml within less than 1 hour. Its bioavailability is close to 100%.

After a single intramuscular administration in cattle at the recommended dose of 8 mg/kg body weight, the maximum plasma concentration of marbofloxacin (C_{max}) is 7.3 µg/ml reached in = 0.78 hours (T_{max}). Binding to plasma proteins is about 30%. Marbofloxacin is eliminated slowly ($t_{½}\beta$ = 15.60 hours), predominantly in the active form in urine and faeces.

It is weakly bound to plasma proteins (less than 10% in pigs and 30% in cattle), extensively distributed and in most tissues (liver, kidney, skin, lung, bladder, uterus, digestive tract) it achieves a higher concentration than in plasma.

In cattle, marbofloxacin is eliminated slowly in pre-ruminating calves ($t_{½}\beta$ = 5-9 hours) but faster in ruminant cattle ($t_{½}\beta$ = 4-7 hours) predominantly in the active form in urine (3/4 in pre-ruminating calves, 1/2 in ruminants) and faeces (1/4 in pre-ruminating calves, 1/2 in ruminants).
In pigs, marbofloxacin is eliminated slowly ($t_{½}\beta$ = 8-10 hours) predominantly in the active form in urine (2/3) and faeces (1/3).