# Draxxin™
(tulathromycin)
Injectable Solution

Antibiotic
100 mg of tulathromycin/mL

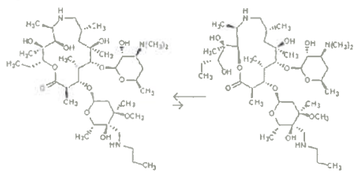
**For subcutaneous injection in beef and non-lactating dairy cattle and intramuscular injection in swine only.**

**CAUTION:** Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

## DESCRIPTION
DRAXXIN Injectable Solution is a ready-to-use sterile parenteral preparation containing tulathromycin, a semi-synthetic macrolide antibiotic of the subclass, triamilide. Each mL of DRAXXIN contains 100 mg of tulathromycin as the free base in a 50% propylene glycol vehicle, monothioglycerol (5 mg/mL), with citric and hydrochloric acids added to adjust pH.

DRAXXIN consists of an equilibrated mixture of two isomeric forms of tulathromycin in a 9:1 ratio. Structures of the isomers are shown below.

**Figure 1.**



The chemical names of the isomers are (2R,3S,4R,5R,8R,10R,11R,12S,13S,14R)-13-[(2,6-dideoxy-3-C-methyl-3-O-methyl-4-C-[(propylamino)methyl]-α-L-ribo-hexopyrano-syl)oxy]-2-ethyl-3,4,10-trihydroxy-3,5,8,10,12,14-hexamethy-11-[[3,4,6-trideoxy-3-(dimethylamino)-β-D-xylo-hexopyranosyl]oxy]-1-oxa-6-azacyclopentadecan-15-one and (2S,3S,6R,8R,9R,10S,11S,12R)-11-[(2,6-dideoxy-3-C-methyl-3-O-methyl-4-C-[(propylamino)methyl]-α-L-ribohexopyranosyl)oxy]-2-[(1R,2R)-1,2-dihydroxy-1-methylbutyl]-8-hydroxy-3,6,8,10,12-pentamethyl-9-[[3,4,6-trideoxy-3-(dimethylamino)-β-D-xylohexopyranosyl]oxy]-1-oxa-4-azacyclotridecan-13-one, respectively.

## INDICATIONS
**Cattle**
DRAXXIN Injectable Solution is indicated for the treatment of bovine respiratory disease (BRD) associated with *Mannheimia haemolytica*, *Pasteurella multocida*, and *Histophilus somni (Haemophilus somnus)*, and for the control of respiratory disease in cattle at high risk of developing BRD, associated with *Mannheimia haemolytica*, *Pasteurella multocida* and *Histophilus somni (Haemophilus somnus)*.

**Swine**
DRAXXIN Injectable Solution is indicated for the treatment of swine respiratory disease (SRD) associated with *Actinobacillus pleuropneumoniae*, *Pasteurella multocida*, *Bordetella bronchiseptica* and *Haemophilus parasuis*.

## DOSAGE AND ADMINISTRATION
**Cattle**
Inject subcutaneously as a single dose in the neck of cattle at a dosage of 2.5 mg/kg (1.1 mL/100 lb) body weight (BW). Do not inject more than 10 mL per injection site.

**Table 1.** DRAXXIN Cattle Dosing Guide

| Animal Weight (Pounds) | Dose Volume (mL) |
|---|---|
| 100 | 1.1 |
| 200 | 2.3 |
| 300 | 3.4 |
| 400 | 4.5 |
| 500 | 5.7 |
| 600 | 6.8 |
| 700 | 8.0 |
| 800 | 9.1 |
| 900 | 10.2 |
| 1000 | 11.4 |

**Swine**
Inject intramuscularly as a single dose in the neck of swine at a dosage of 2.5 mg/kg (0.25 mL/22 lb) BW. Do not inject more than 2.5 mL per injection site.

**Table 2.** DRAXXIN Swine Dosing Guide

| Animal Weight (Pounds) | Dose Volume (mL) |
|---|---|
| 15 | 0.2 |
| 30 | 0.3 |
| 50 | 0.6 |
| 70 | 0.8 |
| 90 | 1.0 |
| 110 | 1.3 |
| 130 | 1.5 |
| 150 | 1.7 |
| 170 | 1.9 |
| 190 | 2.2 |
| 210 | 2.4 |
| 230 | 2.6 |
| 250 | 2.8 |
| 270 | 3.1 |
| 290 | 3.3 |

## CONTRAINDICATIONS
The use of DRAXXIN Injectable Solution is contraindicated in animals previously found to be hypersensitive to the drug.

## WARNINGS
**FOR USE IN ANIMALS ONLY. NOT FOR HUMAN USE.**
**KEEP OUT OF REACH OF CHILDREN.**
**NOT FOR USE IN CHICKENS OR TURKEYS.**

## RESIDUE WARNINGS
**Cattle**
Cattle intended for human consumption must not be slaughtered within 18 days from the last treatment. Do not use in female dairy cattle 20 months of age or older. A withdrawal period has not been established for this product in preruminating calves. Do not use in calves to be processed for veal.

**Swine**
Swine intended for human consumption must not be slaughtered within 5 days from the last treatment.

## PRECAUTIONS
**Cattle**
The effects of DRAXXIN on bovine reproductive performance, pregnancy and lactation have not been determined. Subcutaneous injection can cause a transient local tissue reaction that may result in trim loss of edible tissue at slaughter.

**Swine**
The effects of DRAXXIN on porcine reproductive performance, pregnancy and lactation have not been determined. Intramuscular injection can cause a transient local tissue reaction that may result in trim loss of edible tissue at slaughter.

## ADVERSE REACTIONS
**Cattle**
In one field study, two calves treated with DRAXXIN at 2.5 mg/kg BW exhibited transient hypersalivation. One of these calves also exhibited transient dyspnea, which may have been related to pneumonia.

**Swine**
In one field study, one out of 40 pigs treated with DRAXXIN at 2.5 mg/kg BW exhibited mild salivation that resolved in less than four hours.

## CLINICAL PHARMACOLOGY
At physiologic pH, tulathromycin (a weak base) is approximately 50 times more soluble in hydrophilic than hydrophobic media. This solubility profile is consistent with the extracellular pathogen activity typically associated with the macrolides.[1] Marked-ly higher tulathromycin concentrations are observed in the lungs as compared to the plasma. The extent to which lung concentrations represent free (active) drug was not examined. Therefore, the clinical relevance of these elevated lung concentrations is undetermined.

Although the relationship between tulathromycin and the characteristics of its antimicrobial effects has not been characterized, as a class, macrolides tend to be primarily bacteriostatic, but may be bactericidal against some pathogens.[2] They also tend to exhibit concentration independent killing, the rate of bacterial eradication does not change once serum drug concentrations reach 2 to 3 times the MIC of the targeted pathogen. Under these conditions, the time that serum concentrations remain above the MIC becomes the major determinant of antimicrobial activity. Macrolides also exhibit a post-antibiotic effect (PAE), the duration of which tends to be both drug and pathogen dependent. In general, by increasing the macrolide concentration and the exposure time, the PAE will increase to some maximal duration. Of the two variables, concentration and exposure time, drug concentration tends to be the most powerful determinant of the duration of PAE.

Tulathromycin is eliminated from the body primarily unchanged via biliary excretion.

[1] Carbon, C. Pharmacodynamics of Macrolides, Azalides, and Streptogramins: Effect on Extracellular Pathogens. *Clin Infect Dis* 1998; 27:28-32.
[2] Nightingale, CJ. Pharmacokinetics and Pharmacodynamics of Newer Macrolides. *Pediatr Infect Dis J* 1997; 16:438-443.

**Cattle**
Following subcutaneous administration into the neck of feeder calves at a dosage of 2.5 mg/kg BW, tulathromycin is rapidly and nearly completely absorbed. Peak plasma concentrations generally occur within 15 minutes after dosing and product relative bioavailability exceeds 90%. Total systemic clearance is approximately 170 mL/hr/kg. Tulathromycin distributes extensively into body tissues, as evidenced by volume of distribution values of approximately 11 L/kg in healthy ruminating calves.[1] This extensive volume of distribution is largely responsible for the long elimination half-life of this compound [approximately 2.75 days in the plasma (based on quantifiable terminal plasma drug concentrations) versus 8.75 days for total lung concentrations (based on data from healthy animals)]. Linear pharmacokinetics are observed with subcutaneous doses ranging from 1.27 mg/kg BW to 5.0 mg/kg BW. No pharmacokinetic differences are observed in castrated male versus female calves.

[1] Clearance and volume estimates are based on intersubject comparisons of 2.5 mg/kg BW administered by either subcutaneous or intravenous injection.

**Swine**
Following intramuscular administration to feeder pigs at a dosage of 2.5 mg/kg BW, tulathromycin is completely and rapidly absorbed ($T_{max}$ = 0.25 hour). Subsequently, the drug rapidly distributes into body tissues, achieving a volume of distribution exceeding 15 L/kg. The free drug is rapidly cleared from the systemic circulation (Cl systemic = 787 mL/hr/kg). However, it has a long terminal elimination half-life (60 to 90 hours) owing to its extensive volume of distribution. Although pulmonary tulathromycin concentrations are substantially higher than concentrations observed in the plasma, the clinical significance of these findings is undetermined. There are no gender differences in swine tulathromycin pharmacokinetics.

## MICROBIOLOGY
**Cattle**
*In vitro* activity of tulathromycin has been demonstrated against *Mannheimia haemolytica*, *Pasteurella multocida* and *Histophilus somni (Haemophilus somnus)*, the three major pathogens associated with BRD.

All minimum inhibitory concentration (MIC) values were determined using the 9:1 isomer ratio of this compound. The MICs of tulathromycin were determined for isolates obtained from animals enrolled in field studies in the U.S. during 1999.

**Table 3.** Tulathromycin MIC values from field studies evaluating BRD in the U.S.

| Organism | No. Isolates | $MIC_{90}$[†] (µg/mL) | MIC range (µg/mL) |
|---|---|---|---|
| *Mannheimia haemolytica** | 642 | 2.0 | 0.5 to 64.0 |
| *Pasteurella multocida** | 221 | 1.0 | 0.25 to 64.0 |
| *Histophilus somni (Haemophilus somnus)** | 36 | 4.0 | 1.0 to 4.0 |
| *Mycoplasm bovis*** | 35 | 1.0 | ≤0.063 to 2.0 |

[†]The minimum inhibitory concentration for 90% of the isolates
*Clinical isolates supported by clinical data and indications for use
**The correlation between in vitro susceptibility data and clinical response has not been confirmed.

**Swine**
*In vitro* activity of tulathromycin has been demonstrated against *Actinobacillus pleuropneumoniae*, *Pasteurella multocida*, *Bordetella bronchiseptica*, and *Haemophilus parasuis*, commonly isolated pathogens associated with SRD.

All minimum inhibitory concentration (MIC) values were determined using the 9:1 isomer ratio of this compound. The MICs of tulathromycin were determined for isolates obtained from swine enrolled in SRD field studies in the U.S. and Canada during 2000 through 2002.

**Table 4.** Tulathromycin MIC values from field studies evaluating SRD in the U.S. and Canada.

| Organism | No. Isolates | $MIC_{90}$[†] (µg/mL) | MIC range (µg/mL) |
|---|---|---|---|
| *Actinobacillus pleuropneumoniae* | 135 | 32.0 | 16.0 to 32.0 |
| *Haemophilus parasuis* | 31 | 2.0 | 0.25 to >64.0 |
| *Pasteurella multocida* | 55 | 2.0 | 0.5 to >64.0 |
| *Bordetella bronchiseptica* | 42 | 8.0 | 2.0 to 8.0 |

[†]The minimum inhibitory concentration for 90% of the isolates.

## EFFECTIVENESS
**Cattle**
In a multi-location field study, 314 calves with naturally occurring BRD were treated with DRAXXIN. Responses to treatment were compared to saline-treated controls. A cure was defined as a calf with normal attitude/activity, normal respiration, and a rectal temperature of ≤104°F on Day 14. The cure rate was significantly higher ($P \leq 0.05$) in DRAXXIN-treated calves (79%) compared to saline-treated calves (24%). There were two BRD-related deaths in the DRAXXIN-treated calves compared to nine BRD-related deaths in the saline-treated calves.

In another multi-location field study with 399 calves at high risk of developing BRD, administration of DRAXXIN resulted in a significantly reduced incidence of BRD (11%) compared to saline-treated calves (59%). Effectiveness evaluation was based on scored clinical signs of normal attitude/activity, normal respiration, and a rectal temperature of ≤104°F on Day 14. There were no BRD-related deaths in the DRAXXIN-treated calves compared to two BRD-related deaths in the saline-treated calves.

**Swine**
In a multi-location field study, 266 pigs with naturally occurring SRD were treated with DRAXXIN. Responses to treatment were compared to saline-treated controls. Success was defined as a pig with a normal attitude, normal respiration, and a rectal temperature of ≤104°F on Day 7. The treatment success rate was significantly greater ($P \leq 0.05$) in DRAXXIN-treated pigs (70.5%) compared to saline-treated pigs (46.1%).

## ANIMAL SAFETY
**Cattle**
Safety studies were conducted in feeder calves receiving a single subcutaneous dose of 25 mg/kg BW, or 3 weekly treatments of 2.5, 7.5 or 12.5 mg/kg BW. In all groups, transient indications of pain after injection were seen, including head shaking and pawing at the ground. Injection site swelling, discoloration of the subcutaneous tissues at the injection site and corresponding histopathologic changes were seen in animals in all dosage groups. These lesions showed signs of resolving over time. No other drug-related lesions were observed macroscopically or microscopically.

An exploratory study was conducted in feeder calves receiving a single subcutaneous dose of 10, 12.5 or 15 mg/kg BW. Macroscopically, no lesions were observed. Microscopically, minimal to mild myocardial degeneration was seen in one of six calves administered 12.5 mg/kg BW once and two of six calves administered 15 mg/kg BW once.

A safety study was conducted in calves 13 to 27 days of age receiving 2.5 mg/kg BW or 7.5 mg/kg BW once subcutaneously. With the exception of minimal to mild injection site reactions, no drug-related clinical signs or other lesions were observed macroscopically or microscopically.

**Swine**
Safety studies were conducted in pigs receiving a single intramuscular dose of 2.5 mg/kg BW, or 3 weekly intramuscular doses of 2.5, 7.5 or 12.5 mg/kg BW. In all groups, transient indications of pain after injection were seen, including restlessness and excessive vocalization. Tremors occurred briefly in one animal receiving 7.5 mg/kg BW. Discoloration and edema of injection site tissues and corresponding histopathologic changes were seen in animals at all dosages and resolved over time. No other drug-related lesions were observed macroscopically or microscopically.

## STORAGE CONDITIONS
Store at or below 25°C (77°F).

## HOW SUPPLIED
DRAXXIN Injectable Solution is available in the following package sizes:
100 mL vial
250 mL vial
500 mL vial

U.S. Patents: See US 6,329,345; US 6,420,536; US 6,514,945; US 6,583,274; US 6,777,393

NADA 141-244, Approved by FDA

*Distributed by:*
**Pfizer Animal Health**
Division of Pfizer Inc, NY, NY 10017

To report a suspected adverse reaction call **1-800-366-5288.**
To request a material safety data sheet call **1-800-733-5500.**
For additional DRAXXIN product information call **1-888-DRAXXIN** or go to **www.DRAXXIN.com**

TAKE TIME — OBSERVE LABEL DIRECTIONS

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# Technical Bulletin

July 2005

# DRAXXIN™ (tulathromycin injectable solution) for Use in Swine: Pharmacokinetic and Pharmacodynamic Attributes

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**New York, NY 10017**

DRAXXIN is a novel single-dose antimicrobial from Pfizer indicated for the treatment of swine respiratory disease (SRD). Tulathromycin, the active ingredient of Draxxin, is the first of a unique macrolide class, the triamilides, synthesized and developed by Pfizer scientists as a highly effective, single-dose antibiotic for the treatment of respiratory disease in swine and cattle.

DRAXXIN provides potent activity against the major bacterial pathogens that cause respiratory disease in swine *(Actinobacillus pleuropneumoniae, Pasteurella multocida, Bordetella bronchiseptica, Haemophilus parasuis).* When administered as a single intramuscular (IM) dose of 2.5 mg/kg body weight (1 mL/88 lb), DRAXXIN achieves rapid and prolonged lung tissue concentrations, delivering a complete treatment against complex SRD.

This *Technical Bulletin* describes the pharmacokinetic behavior of DRAXXIN and *in vitro* accumulation of the drug in swine immune cells.

## Key Points

- DRAXXIN is the novel triamilide antimicrobial for swine that delivers complete treatment with a *single dose* against complex swine respiratory disease.
- Pharmacokinetic research demonstrates that DRAXXIN is rapidly released from the IM injection site, readily distributed through the body, and is highly bioavailable.
- DRAXXIN is extensively distributed to lung tissues, achieving high, prolonged lung concentrations *61-times* the plasma AUC, with a 6-day elimination half-life.
- DRAXXIN is not extensively metabolized and is slowly eliminated, principally unchanged, in feces and urine.
- Accumulation of tulathromycin in immune cells such as neutrophils and macrophages may elevate drug concentrations in the immediate vicinity of target pathogens.

## IV/IM Plasma Study

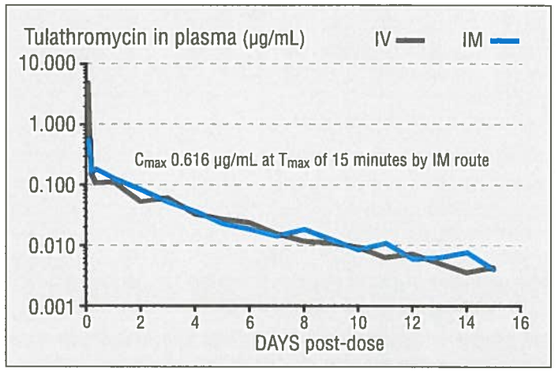
***Experiment Design***

The pharmacokinetic behavior of tulathromycin in swine was investigated in two studies.[1] The first study evaluated plasma drug concentrations following intravenous (IV) and IM administration of DRAXXIN to healthy pigs. Collected data were then used to compute basic pharmacokinetic parameters, including bioavailability (F).

Twenty pigs (10 male, 10 female) 2 to 3 months of age (46-69 lb) were purchased from a single commercial supplier and acclimatized at research facilities for 7 days. Animals were randomly assigned by gender to 4 treatments groups. On the first day of the study (day 0), each pig was

Pfizer Animal Health

Figure 1. Plasma drug concentrations after IV and IM administration.



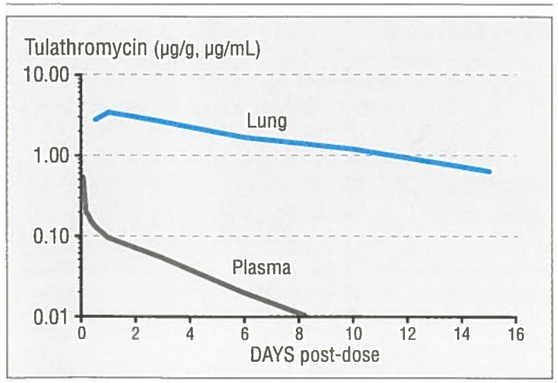

Clinical relevance of these data has not been established.

Table 1. Plasma pharmacokinetics of DRAXXIN in swine after IV and IM administration at 2.5 mg/kg body weight.

| Tulathromycin | IV | IM |
|---|---|---|
| $T_{max}$ (hours) | – | 0.25 |
| $C_{max}$ (µg/mL) | – | 0.616 |
| $t_{1/2}$ (hours) | 67.5 | 75.6 |
| $AUC_{0\text{-inf }h}$ (ng·h/mL) | 14,000 | 15,600 |
| $V_{SS}$ (L/kg) | 13.2 | |
| F (%) | | 87.7% |

$T_{max}$ = time to maximum concentration; $C_{max}$ = maximum concentration; $t_{1/2}$ = half life; AUC = area under conc.-time curve; $V_{SS}$ = apparent volume of distribution at steady state; F = bioavailability. Clinical relevance of these data has not been established.

Figure 2. Lung and plasma drug concentrations after IM administration.




Clinical relevance of these data has not been established.

administered a single dose of DRAXXIN at the recommended dosage of 2.5 mg/kg body weight. The distinction between treatment groups was the route of administration. Two groups (T1 and T2) received the drug by IV injection into an ear vein (4 and 6 pigs/ group, respectively). The remaining 2 groups (T3 and T4) received IM administration in the neck musculature (4 and 6 pigs/group, respectively). An additional 2 pigs were left untreated as controls.

Blood samples were obtained predose and at numerous time-points post-dosing. Animals in the T1 and T3 groups were sampled up to 168 hours (7 days) after treatment, while pigs in the T2 and T4 groups were sampled up to 360 hours (15 days). Tulathromycin concentrations in plasma samples were determined by HPLC and mass spectrometry, and pharmacokinetic parameters calculated using appropriate methods.

***Results***

Study results summarized in Figure 1 and Table 1 show that IM plasma concentrations were similar to IV plasma levels. Tulathromycin was rapidly released from the IM injection site as evidenced by the achievement of $T_{max}$ in 15 minutes. Furthermore, the drug was extensively distributed, as indicated by the high apparent volume of distribution, and was highly bioavailable (88%). The clinical relevance of these results has not been demonstrated.

## Plasma/Lung Study

***Experiment Design***

A second pharmacokinetic study evaluated drug concentrations in plama and lungs following IM administration of DRAXXIN to healthy pigs. The study involved 36 pigs (16 male, 16 female) obtained and acclimatized in the same manner as the first study, and randomly assigned to 6 treatments groups within gender, with males and females equally represented. On the first day of the study (day 0), each pig was administered a single dose of DRAXXIN at the recommended dosage of 2.5 mg/kg body weight by IM injection into neck musculature.

Blood samples were collected from all pigs predose and at multiple timepoints post-dosing during the first 12 hours. At this time, pigs in one group were euthanized and lungs collected for determination of tulathromycin concentration (homogenates of entire lungs). Sampling continued in other groups until scheduled necropsy times assigned to each group (24, 72, 144, 240, and 360 hours post-dosing). Tulathromycin concentrations in plasma samples and lung homogenates were quantified and pharmacokinetic parameters calculated. An additional 2 pigs served as untreated controls and were euthanized on day 2.

***Results***

The plasma/lung comparison study results are summarized in Figure 2 and Table 2. Following IM administration, tulathromycin was extensively distributed to lung tissues, achieving high, prolonged lung concentrations 61-times the plasma AUC. Peak lung concentration of approximately 3.47 µg/g was achieved 24 hours post-dosing (early lung samples were obtained only at 12 and 24 hours post-treatment), far exceeding the mean peak plasma concentration of 0.581 µg/mL in these pigs. The elimination half-life in the lung was extremely long at approximately 6 days.



## Metabolism/Elimination

The metabolic profile of tulathromycin was investigated in 16 pigs treated with a single IM injection of DRAXXIN at the recommended dosage of 2.5 mg/kg body weight. Quantitative and qualitative analyses were conducted on a variety of body tissues, as well as feces and urine. Results indicate that tulathromycin is not extensively metabolized and the drug is principally eliminated unchanged. The elimination of tulathromycin via feces and urine during a 35-day post-treatment period is summarized in Figure 3.

## Cellular Accumulation

Scientists have previously demonstrated that the human azalide macrolide antibiotic azithromycin accumulates in immune cells (macrophages, neutrophils) which migrate to sites of infection.[2] Recent research indicates that immune cell accumulation is also a powerful attribute of tulathromycin, with the drug accumulating in alveolar macrophages and neutrophils and subsequently being released slowly from these cell types.[3]

A study conducted to investigate this attribute of tulathromycin involved the incubation of swine neutrophils labeled with [$^{14}$C]-tulathromycin or [$^{14}$C]-erythromycin (a positive-control macrolide). Uptake of the drugs by neutrophils and alveolar macrophages was monitored for 4 hours, with cellular accumulation expressed as the ratio of intracellular to extracellular drug concentration (I/E).

Study results (Figure 4) show that drug accumulation in neutrophils and alveolar macrophages was significantly ($P < 0.03$) higher for tulathromycin compared to the control erythromycin, with I/E ratios approximately 6- and 4-times higher for tulathromycin, respectively.

## Conclusions

Single-dose DRAXXIN demonstrated rapid absorption with high bioavailability after IM administration, followed by extensive distribution to lung tissue where high drug concentrations were sustained for a prolonged period (the clinical relevance of these results has not been demonstrated). The AUC in lung tissue was 61-times that of plasma. In addition, accumulation of tulathromycin in immune cells such as neutrophils and macrophages may elevate drug concentrations in the immediate vicinity of target pathogens.

Intramuscular injection in swine may produce transient local tissue reaction which persists beyond the 5-day withdrawal period.

## References

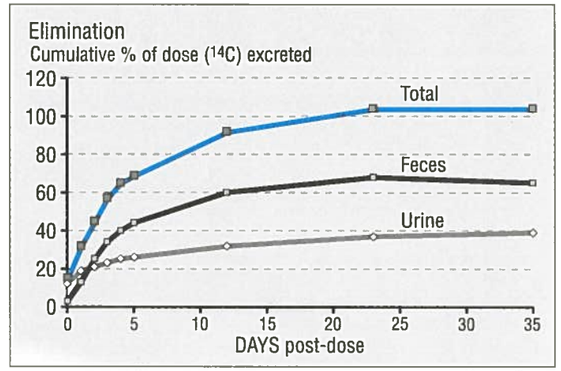

1. Benchaoui, HA, Nowakowski M, Sherington J et al. Pharmacokinetics and lung tissue concentrations of tulathromycin in swine. *J Vet Pharm Therapeutics* 2004; 27:203-210.
2. Gladue RP, Bright GM, Isaacson RE, et al. *In vitro* and *in vivo* uptake of azithromycin (CP- 62,995) by phagocytic cells: possible mechanisms of delivery and release at sites of infection. *Antimicrobial Agents Chemotherapy* 1989; 33:277-282.
3. Siegel TW, Earley DL, Smothers CD, et al. Cellular uptake of the triamilide tulathromycin by bovine and porcine phagocytic cells *in vitro*. *J Animal Science* 2004; 82 (Suppl. 1):186.


Table 2. Plasma and lung pharmacokinetics of DRAXXIN in swine after IM administration at 2.5 mg/kg body weight.

| Tulathromycin | Plasma | Lung |
|---|---|---|
| $T_{max}$ (hours) | 0.92 | 24 |
| $C_{max}$ (µg/mL) | 0.581 | 3.47 |
| $t_{1/2}$ (hours) | 49-91 | 142 |
| $AUC_{0\text{-inf }h}$ (ng·h/mL) | 12,200 | 749,000 |
| Lung AUC / plasma AUC | – | 61.4 |

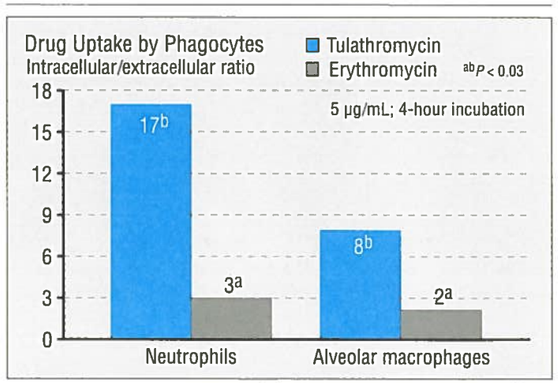
$T_{max}$ = time to maximum concentration; $C_{max}$ = maximum concentration; $t_{1/2}$ = half life; AUC = area under conc.-time curve. Clinical relevance of these data has not been established.

Figure 3. Elimination of DRAXXIN from swine.




Clinical relevance of these data has not been established.

Figure 4. Accumulation of tulathromycin in immune cells.




Clinical relevance of these data has not been established.