



U.S. Fish & Wildlife Service

Aquatic Animal Drug Approval Partnership

DRUG RESEARCH INFORMATION BULLETIN

Calculations to Determine the Amount of Terramycin® 200 for Fish (Oxytetracycline Dihydrate) Type A Medicated Article to Add to Fish Feed

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Terramycin® 200 for Fish (Oxytetracycline Dihydrate) Type A Medicated Article (TM200; Phibro Animal Health, Ridgefield Park, NJ) contains 200 g active oxytetracycline (OTC)/lb and is approved for use in U.S. aquaculture for the following indications: (1) control of ulcer disease (causative agent, *Hemophilus piscium*), furunculosis (causative agent, *Aeromonas salmonicida*), bacterial hemorrhagic septicemia (causative agent, *A. liquefaciens*), and pseudomonas disease (causative agent, *Pseudomonas* spp.) in salmonids; (2) control of mortality in freshwater-reared salmonids due to coldwater disease (causative agent, *Flavobacterium psychrophilum*); (3) control of mortality in all freshwater-reared *Oncorhynchus mykiss* due to columnaris disease (causative agent, *F. columnare*); (4) control of hemorrhagic septicemia and pseudomonas disease in catfish; (5) marking of skeletal tissue in Pacific salmon; and (6) control of gaffkemia (causative agent, *Aerococcus viridans*) in lobster.

For indications (1) and (4), TM200 is administered orally in feed at 2.5 – 3.75 g OTC/100 lbs fish/day (55.1 – 82.7 mg OTC/kg fish/day) for 10 consecutive days. For indications (2) and (3), TM200 is administered orally in feed at 3.75 g OTC/100 lbs fish/day for 10 consecutive days. For indication (5), TM200 is administered orally in feed at 11.35 g OTC/100 lbs fish/day (250 mg/kg fish/day) for 4 consecutive days. For indication (6), TM200 is administered at 1 g OTC/lb feed/d for 5 consecutive days. Also, work is underway to expand the product label to include administering TM200 orally in feed for the skeletal marking of all freshwater-reared salmonids.

Currently, TM200 can be incorporated into fish feed by a commercial feed manufacturer or purchased “over-the-counter” and top-coated onto fish feed. The product label lists the pounds of TM200 to add per ton of feed to achieve dose rates of 2.5 and 3.75 g OTC/100 lbs fish/day when fish are fed at 1, 2, 3, ..., 10 and 15% mean body weight (BW). However, in many cases, fish culturists might top-coat TM200 onto a relatively small amount of feed (e.g., ≤ 50-lb or 20-kg bags) and feed fish at a percent BW not listed on the product label. As such, in this bulletin, the mathematical relations between (a) percent BW to feed and (b) percent TM200 to add per unit of feed to achieve doses of 2.5 and 3.75 g OTC/100lbs fish/day are described. Also, it is shown how to calculate the grams of TM200 to add to any amount of feed to achieve doses of 2.5 – 3.75 g/100 lbs fish/day when fish are fed at any body weight between 1 and 15%.

Methods

For each of 2.5 and 3.75 g OTC/100 lbs fish/day, pounds of TM200 per ton of feed were first converted to percent TM200 per unit of feed at feeding rates of 1, 2, 3, ..., 10 and 15% BW, and then grams of TM200 to add to 50-lb and 20-kg bags of feed were calculated (Tables 1 and 2). The percent TM200 per unit of feed was plotted against percent BW to feed, and a first-order, inverse polynomial equation was fit to the plotted points. Fits were verified by predicting grams of TM200 to add to 50-lb and 20-kg bags of feed at 1, 2, 3, ..., 10 and 15% BW (data not shown). Finally, examples are provided to show (a) how to calculate the grams of TM200 to add to 20 kg of feed when feeding at 5% BW and treating at 2.5 or 3.75 g OTC/100 lbs fish/day and (b) how to adjust the result of the 3.75-g dose calculation to treat at any dose between 2.75 and 3.75 g OTC/100 lbs fish/day.

Results

For 2.5 g OTC/100lbs fish/day, the relation ($r^2 = 1$) between percent BW and percent TM200 (Figure 1) is described by the equation:

$$\%TM200 = (1.250 \div \%BW) + 0.00008115$$

For 3.75 g OTC/100lbs fish/day, the relation ($r^2 = 1$) between percent BW and percent TM200 (Figure 1) is described by the equation:

$$\%TM200 = (1.875 \div \%BW) + 0.00008781$$

For either 2.5 or 3.75 g OTC/100 lbs fish/day, determining the grams of TM200 to add to any amount of feed when feeding at 1 – 15% BW is a simple, three-step process (as follows): (1) enter percent BW into the equation to calculate percent TM200 to add to feed; (2) convert percent TM200 to a decimal fraction; and (3) **multiply the result by the grams of medicated feed to prepare.**

Example 1: Dose = 2.5 g OTC /100 lbs fish/day

If fish are fed at 5% BW and one 20-kg bag of medicated feed needs to be prepared, the percent TM200 to add to feed = $(1.250 \div 5) + 0.00008115 = 0.250008\%$, which equates to a decimal fraction of 0.0025. Finally, $(0.0025 \times 20,000 \text{ g}) = 50.0 \text{ g}$ TM200 to add to one 20-kg bag of feed.

Example 2: Dose = 3.75 g OTC/100 lbs fish/day

If fish will be fed at 5% BW and one 20-kg bag of medicated feed needs to be prepared, the percent TM200 to add to feed = $(1.875 \div 5) + 0.00008781 = 0.3750009\%$, which equates to a decimal fraction of 0.00375. Finally, $(0.00375 \times 20,000 \text{ g}) = 75.0 \text{ g}$ TM200 to add to one 20-kg bag of feed.

Note: In Example 2, if the dose was reduced to 3.00 g OTC/100 lbs fish/day and the feeding rate was held at 5% BW, the grams of TM200 to add to one 20-kg bag of feed would be proportionally reduced from 75 to 60 g (as follows): $75 \text{ g} \times (3.00 / 3.75) = 60 \text{ g}$. Such proportional reduction will work for any dose between 2.75 and 3.75 g OTC/100 lbs fish/day.

Table 1. Target dose = 2.5 g OTC/100 lbs fish/day: To determine amount of TM200 to add to either a 50-lb (22,680 g) or 20-kg (20,000 g) bag of feed, find the percent body weight (%BW) at which to feed, go to the fourth or fifth row of the table, and read the amount (g) of TM200 to add.^a

%BW	1	2	3	4	5	6	7	8	9	10	15
%TM200	1.2500	0.6250	0.4165	0.3125	0.2500	0.2085	0.1785	0.1565	0.1390	0.1250	0.0835
Amount (g) of TM200 to add to either a 50-lb or 20-kg bag of feed											
50lb	283.5	141.7	94.5	70.9	56.7	47.3	40.5	35.5	31.5	28.3	18.9
20kg	250.0	125.0	83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	16.7

^aAmount (g) of TM200 to add to a specific amount (g) of feed = [(amount (g) of feed to be treated) \times (percent TM200 to add \div 100)].

Table 2. Target dose = 3.75 g OTC/100 lbs fish/day: To determine amount of TM200 to add to either a 50-lb (22,680 g) or 20-kg (20,000 g) bag of feed, find the percent body weight (%BW) at which to feed, go to the fourth or fifth row of the table, and read the amount (g) of TM200 to add.^a

%BW	1	2	3	4	5	6	7	8	9	10	15
%TM200	1.875	0.9375	0.6250	0.4690	0.3750	0.3125	0.2680	0.2345	0.2085	0.1875	0.1250
Amount (g) of TM200 to add to either a 50-lb or 20-kg bag of feed											
50lb	425.2	212.6	141.7	106.4	85.0	70.9	60.8	53.2	47.3	42.5	28.3
20kg	375.0	187.5	125.0	93.8	75.0	62.5	53.6	46.9	41.7	37.5	25.0

^aAmount (g) of TM200 to add to a specific amount (g) of feed = [(amount (g) of feed to be treated) \times (percent TM200 to add \div 100)].

Figure 1. Relation between percent TM200 to add to feed and percent BW to feed to achieve doses of 2.5 and 3.75 g oxytetracycline/100 lbs fish/day.

