- Residential Handler Pet Product Risk Summary:
  - No risks of concern identified (all MOEs ≥ LOC of 300)
  - Cancer Risk Estimates Ex. 5 Deliberative Process (DP) $10^{-8}$ range

- Residential Post-application Pet Product Risk Summary:
  - Dusts/Powders:
    - Risks of concern identified for all dust/powder products
    - MOEs range from 98- 640
    - Cancer risk estimates range from $10^{-7}$ to $10^{-6}$
  - Pump/Trigger Sprays
    - No risks of concern identified
    - MOEs range from 1,600 – 15,000
    - Cancer risk estimates are all $10^{-7}$
  - Pet Collars
    - Incorporated trimming adjustment to application rate for collars (20% - minimum value from efficacy study data provided by Hartz)
    - Updated fraction transfer values (recalculated Davis study value excluding residues from petting simulations over the collar):
      - Davis study and Hartz study now provide the same fraction transfer factor for use in non-cancer assessment: 0.0017
      - Davis study also provides value for use in cancer assessment of 0.00092
    - Risks of concern identified:
      - MOEs range from Ex. 5 Deliberative Process (DP)
      - Cancer risk estimates range from $10^{-7}$ to $10^{-6}$

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## Appendix C – Summary of Residential Handler Non-Cancer Exposures and Risks

**Table C.1. Residential Handler Non-Cancer Dermal and Inhalation Doses Assuming a Liquid or Dust Formulation for Pet Collars.**

| Exposure Scenario | Reg. No. (Target Animal) | Dermal Unit Exposure (mg/lb ai) | Inhalation Unit Exposure (mg/lb ai) | Maximum Application Rate[1] (lb ai/pet) | Amount Handled Daily (animals treated per day)[2] | Dermal Dose (mg/kg/day)[3] | Inhalation Dose (mg/kg/day)[4] |
|---|---|---|---|---|---|---|---|
| **Assume Liquid Formulation -- Use of Spot-On Exposure Data (based on 2012 Residential SOPs)** | | | | | | | |
| Application of TCVP Collars | 2596-49 (Cat) | 120 | Negligible | 0.0029 | 2 | 0.0010 | Negligible |
| | 2596-50, 62 (Dog) | | | 0.0049 (small collar) | | 0.0016 | |
| | | | | 0.0082 (large collar) | | 0.0027 | |
| | 2596-63 (Cat) | | | 0.0039 (small collar) | | 0.0013 | |
| | | | | 0.0044 (large collar) | | 0.0015 | |
| | 2596-83 (Cat) | | | 0.0031 (small collar) | | 0.0010 | |
| | | | | 0.0064 (large collar) | | 0.0021 | |
| | 2596-84 (Dog) | | | 0.0049 (small collar) | | 0.0016 | |
| | | | | 0.0082 (large collar) | | 0.0027 | |
| | 2596-139 (Cat) | | | Ex. 5 Deliberative Process (DP) | | Ex. 5 Deliberative Process (DP) | |
| | 2596-139 (Dog) | | | | | | |
| **Assume Dust Formulation -- Use of TCVP Dust Applicator Exposure Data (MRID 45519601)** | | | | | | | |
| Application of TCVP Collars | 2596-49 (Cat) | 1,700 | 3.1 | 0.0029 | 2 | 0.014 | 0.00026 |
| | 2596-50, 62 (Dog) | | | 0.0049 (small collar) | | 0.023 | 0.00044 |
| | | | | 0.0082 (large collar) | | 0.039 | 0.00074 |
| | 2596-63 (Cat) | | | 0.0039 (small collar) | | 0.018 | 0.00035 |
| | | | | 0.0044 (large collar) | | 0.021 | 0.00039 |
| | 2596-83 (Cat) | | | 0.0031 (small collar) | | 0.015 | 0.00028 |
| | | | | 0.0064 (large collar) | | 0.030 | 0.00058 |
| | 2596-84 (Dog) | | | 0.0049 (small collar) | | 0.023 | 0.00044 |
| | | | | 0.0082 (large collar) | | 0.039 | 0.00074 |
| | 2596-139 (Cat) | | | Ex. 5 Deliberative Process (DP) | | Ex. 5 Deliberative Process (DP) | |
| | 2596-139 (Dog) | | | | | | |

1 Based on registered TCVP pet product labels and an adjustment for 20% of the collar being removed due to trimming (see Table A2). Application rate (lb ai/pet) = (collar weight in grams adjusted for 20% trimming ÷ 454 lb/g conversion factor) * percent ai in collar.

2 Based on HED's 2012 Residential SOPs (http://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/standard-operating-procedures-residential-pesticide).

3 Dermal Dose = Dermal Unit Exposure (mg/lb ai) × Application Rate (lb ai/pet) × Area Treated or Amount Handled (pets/day) × Dermal Absorption Factor (9.6 %) ÷ Body Weight (69 kg).

4 Inhalation Dose = Inhalation Unit Exposure (mg/lb ai) × Application Rate (lb ai/pet) × Area Treated or Amount Handled (pets/day) ÷ Body Weight (69 kg).

| Table C.2. Residential Handler Non-cancer Risk Estimates Assuming 99.62% Liquid/0.38% Dust Ratio Formulation Pet Collars. LOC = 300 | | | | | | |
|---|---|---|---|---|---|---|
| Exposure Scenario | Reg. No. (Target Animal) | Maximum Application Rate[1] (lb ai/pet) | Amount Handled Daily (animals treated per day)[2] | Combined 99.62%/0.38% Liquid/Dust Dermal Dose (mg/kg/day)[3] | Combined 99.62%/0.38% Liquid/Dust Inhalation Dose (mg/kg/day)[4] | Combined 99.62%/0.38% Liquid/Dust Ratio Inhalation MOE **(LOC = 300)**[5] |
| Application of TCVP Collars | 2596-49 (Cat) | 0.0029 | 2 | 0.0010 | 0.0000010 | 1,300,000 |
| | 2596-50, 62 (Dog) | 0.0049 (small collar) | | 0.0017 | 0.0000017 | 780,000 |
| | | 0.0082 (large collar) | | 0.0029 | 0.0000028 | 470,000 |
| | 2596-63 (Cat) | 0.0039 (small collar) | | 0.0013 | 0.0000013 | 990,000 |
| | | 0.0044 (large collar) | | 0.0015 | 0.0000015 | 880,000 |
| | 2596-83 (Cat) | 0.0031 (small collar) | | 0.0011 | 0.0000011 | 1,200,000 |
| | | 0.0064 (large collar) | | 0.0022 | 0.0000022 | 600,000 |
| | 2596-84 (Dog) | 0.0049 (small collar) | | 0.0017 | 0.0000017 | 780,000 |
| | | 0.0082 (large collar) | | 0.0029 | 0.0000028 | 470,000 |
| | 2596-139 (Cat) | Ex. 5 Deliberative Process (DP) | | Ex. 5 Deliberative Process (DP) | | |
| | 2596-139 (Dog) | | | | | |

1 Based on registered TCVP pet product labels and an adjustment for 20% of the collar being removed due to trimming. (see Table A2). Application rate (lb ai/pet) = (collar weight in grams adjusted for 20% trimming ÷ 454 lb/g conversion factor) * percent ai in collar.
2 Based on HED's 2012 Residential SOPs (http://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/standard-operating-procedures-residential-pesticide).
3 Combined 99.62%/0.38% Liquid/Dust Dermal Dose = (Liquid dermal dose * 0.9962) + (Dust dermal dose * 0.0038).
4 Combined 99.62%/0.38% Liquid/Dust Inhalation Dose = (Liquid inhalation dose * 0.9962) + (Dust inhalation dose * 0.0038).
5. No dermal MOE estimated due to lack of dermal hazard. Inhalation MOE = Inhalation HED (1.31 mg/kg/day) ÷ Combined 99.62%/0.38% Liquid/Dust Inhalation Dose (mg/kg/day).

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**Table C.3. Residential Handler Non-cancer Exposure and Risk Estimates from Use of TCVP Dust/Powder and Pump/Trigger Spray Products.**

| Exposure Scenario | Reg. No. (Target Animal) | Dermal Unit Exposure (mg/lb ai) | Inhalation Unit Exposure (mg/lb ai) | Maximum Application Rate[1] (lb ai/pet) | Amount Handled Daily (animals treated per day)[2] | Dermal | | Inhalation | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Dose (mg/kg/day)[3] | MOE[4] | Dose (mg/kg/day)[5] | MOE **(LOC = 300)**[6] |
| Application of TCVP Dusts/Powders | 47000-123 (Dog) | 1,700 | 3.1 | 0.00037 (small animal) | 2 | 0.0018 | N/A, No Dermal Hazard | 0.000034 | 39,000 |
| | | | | 0.00094 (medium animal) | | 0.0044 | | 0.000084 | 16,000 |
| | | | | 0.0015 (large animal) | | 0.0071 | | 0.00013 | 9,700 |
| | 47000-123 (Cat) | | | 0.000094 (small animal) | | 0.00044 | | 0.0000084 | 160,000 |
| | | | | 0.00023 (medium animal) | | 0.0011 | | 0.000020 | 65,000 |
| | | | | 0.00034 (large animal) | | 0.0016 | | 0.000030 | 43,000 |
| | 2596-78 (Cat) | | | 0.00062 (small animal) | | 0.0029 | | 0.000056 | 24,000 |
| | | | | 0.0010 (large animal) | | 0.0049 | | 0.000093 | 14,000 |
| | 2596-79 (Dog) | | | 0.0010 (small animal) | | 0.0049 | | 0.000093 | 14,000 |
| | | | | 0.0021 (medium animal) | | 0.0097 | | 0.00019 | 7,100 |
| | | | | 0.0026 (large animal) | | 0.0122 | | 0.00023 | 5,600 |
| Application of TCVP Pump/Trigger Sprays | 2596-126, -140 (Cat) (Trigger) | 820 | 3.3 | 0.00055 (small animal) | | 0.0013 | N/A, No Dermal Hazard | 0.000053 | 25,000 |
| | | | | 0.00077 (medium animal) | | 0.0018 | | 0.000074 | 18,000 |
| | 2596-140 (Cat) (Pump) | | | 0.00011 (small animal) | | 0.00026 | | 0.000011 | 120,000 |
| | | | | 0.00016 (large animal) | | 0.00036 | | 0.000015 | 87,000 |
| | 2596-125, -140 (Dog) (Trigger) | | | 0.00077 (small animal) | | 0.0018 | | 0.000074 | 18,000 |
| | | | | 0.00088 (medium animal) | | 0.0020 | | 0.000084 | 16,000 |
| | | | | 0.0015 (large animal) | | 0.0035 | | 0.00015 | 8,900 |

1 Based on registered TCVP pet product labels.
2 Based on HED's 2012 Residential SOPs (http://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/standard-operating-procedures-residential-pesticide)
3 Dermal Dose = Dermal Unit Exposure (mg/lb ai) × Application Rate (lb ai/pet) × Area Treated or Amount Handled (pets/day) × Dermal Absorption Factor (9.6%) ÷ Body Weight (69 kg). Dermal dose presented only for purpose of calculation of cancer risks for residential handlers.
4 No dermal MOE estimated due to lack of dermal hazard.

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5 Inhalation Dose = Inhalation Unit Exposure (mg/lb ai) × Application Rate (lb ai/pet) × Area Treated or Amount Handled (pets/day) ÷ Body Weight (69 kg).
6 Inhalation MOE = Inhalation HED (1.31 mg/kg/day) ÷ Inhalation Dose (mg/kg/day).

## Appendix D – Summary of Residential Handler Cancer Exposure and Risk Estimates

**Table D.1. Residential Handler Cancer Exposure and Risk Estimates from TCVP Pet Collar Products Using 99.62% Liquid/0.38% Dust Ratio.**

| Reg No./ Animal Type | Animal Size | Lifestage | Liquid LADD[1] | Dust LADD[2] | 99.62% Liquid / 0.38% Dust Cancer Risk Estimate[3] |
|---|---|---|---|---|---|
| 2596-49 (Cat) | Any | Adult | 6.8E-06 | 9.8E-05 | 1.3E-08 |
| 2596-50, 62 (Dog) | Small | | 1.1E-05 | 1.7E-04 | 2.2E-08 |
| | Medium, Large | | 1.9E-05 | 2.8E-04 | 3.7E-08 |
| 2596-63 (Cat) | Small | | 9.0E-06 | 1.3E-04 | 1.7E-08 |
| | Medium, Large | | 1.0E-05 | 1.5E-04 | 2.0E-08 |
| 2596-83 (Cat) | Small | | 7.2E-06 | 1.0E-04 | 1.4E-08 |
| | Medium, Large | | 1.5E-05 | 2.2E-04 | 2.9E-08 |
| 2596-84 (Dog) | Small | | 1.2E-05 | 1.7E-04 | 2.2E-08 |
| | Medium, Large | | 1.9E-05 | 2.8E-04 | 3.7E-08 |
| 2596-139 (Cat) | Any | | Ex. 5 Deliberative Process (DP) | | |
| 2596-139 (Dog) | Any | | | | |

1 Liquid LADD = [Inhalation + Dermal Dose (mg/kg/day)] × [Days per year of exposure (4 days/yr) ÷ 365 days/year] × [Years per lifetime of exposure (50 yrs) ÷ Lifetime expectancy (78 yrs)]. Inhalation exposures considered negligible based on use of spot-on data for liquid pet collar formulation.
2 Dust LADD = [Inhalation + Dermal Dose (mg/kg/day)] × [Days per year of exposure (4 days/yr) ÷ 365 days/year] × [Years per lifetime of exposure (50 yrs) ÷ Lifetime expectancy 78 (yrs)].
3 Cancer risk estimates = [(Liquid LADD * 0.9962) + (Dust LADD * 0.0038)] × $Q_1^*$, where $Q_1^* = 1.83 \times 10^{-3}$ $(mg/kg/day)^{-1}$

**Table D.2. Residential Handler Dermal and Inhalation Cancer Exposure and Risk Estimates from Dust/Powder and Pump/Trigger Spray Products.**

| Reg No./ Animal Type | Animal Size | Lifestage | Total LADD[1,2] | Cancer Risk Estimate[3] |
|---|---|---|---|---|
| **Dust/Powder** | | | | |
| 47000-123 (Dog) | Small | Adult | 1.9E-05 | 3.5E-08 |
| | Medium | | 4.7E-05 | 8.7E-08 |
| | Large | | 7.6E-05 | 1.4E-07 |
| 47000-123 (Cat) | Small | | 4.7E-06 | 8.7E-09 |
| | Medium | | 1.1E-05 | 2.1E-08 |
| | Large | | 1.7E-05 | 3.1E-08 |
| 2596-78 (Cat) | Small | | 3.1E-05 | 5.7E-08 |
| | Medium | | 5.2E-05 | 9.6E-08 |
| 2596-79 (Dog) | Small | | 5.2E-05 | 9.6E-08 |
| | Medium | | 1.0E-04 | 1.9E-07 |
| | Large | | 1.3E-04 | 2.4E-07 |
| **Pump/Trigger Sprays** | | | | |
| 2596-126, -140 (Cat) (Trigger) | Small | Adult | 1.4E-05 | 2.5E-08 |
| | Large | | 1.9E-05 | 3.5E-08 |
| 2596-140 (Cat) (Pump) | Small | | 2.8E-06 | 5.1E-09 |
| | Large | | 3.9E-06 | 7.2E-09 |
| 2596-125, -140 (Dog) (Trigger) | Small | | 1.9E-05 | 3.5E-08 |
| | Medium | | 2.2E-05 | 4.0E-08 |
| | Large | | 3.9E-05 | 7.0E-08 |

1 Total Lifetime Average Daily Dose (LADD, mg/kg/day) = Dermal LADD (mg/kg/day) + Inhalation LADD (mg/kg/day).
2 Dermal and Inhalation LADD equations provided in Appendix B.
3 Cancer risk estimates = Total LADD × $Q_1^*$, where $Q_1^* = 1.83 \times 10^{-3}$ $(mg/kg/day)^{-1}$



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## Appendix E – Summary of Residential Post-Application Non-Cancer Exposure and Risk Estimates

**Table E.1. Residential Post-application Non-cancer Incidental Oral Dose Assuming a Liquid or Dust Formulation for Pet Collars.**

| Animal Type | Animal Size | Application Rate (mg ai) | $F_{ai hands}$ | DE<br>Dermal Exposure (mg) | $SA_H$<br>Surface area of 1 hand ($cm^2$) | HR<br>Hand residue loading ($mg/cm^2$) | $F_m$<br>Fraction of hand mouthed | ET<br>Exposure Time (hours/day) | Replenish-ment interval (min) | N_Replen<br># replenish-ment intervals per hour (intervals/hr) | SE<br>Fraction Saliva Extraction | Freq_HtM<br>Number of hand-to-mouth contacts events per hour (events/hr) | Incidental oral Absorbed Dose (mg/kg/day) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Assume Liquid Formulation** | | | | | | | | | | | | | |
| Cat (2596-49) | small | 1,320 | 0.04 | 2.1 | 150 | 0.0003 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0019 |
| | medium | 1,320 | 0.04 | 1.3 | 150 | 0.0002 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0011 |
| | large | 1,320 | 0.04 | 0.8 | 150 | 0.0001 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0007 |
| Dog (2596-50,62) | small | 2,219 | 0.04 | 1.8 | 150 | 0.0002 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0016 |
| | large | 3,738 | 0.04 | 0.8 | 150 | 0.0001 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0007 |
| Cat (2596-83) | small | 1,402 | 0.04 | 2.2 | 150 | 0.0003 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0020 |
| | large | 2,920 | 0.04 | 1.7 | 150 | 0.0002 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0016 |
| Cat (2596-139) | small | 584 | 0.04 | 0.9 | 150 | 0.0001 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0008 |
| | medium | 584 | 0.04 | 0.6 | 150 | 0.0001 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0005 |
| | large | 584 | 0.04 | 0.3 | 150 | 0.00005 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0003 |
| Dog (2596-84) | small | 2,219 | 0.04 | 1.8 | 150 | 0.0002 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0016 |
| | large | 3,738 | 0.04 | 0.8 | 150 | 0.0001 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0007 |
| Dog (2596-139) | small | 2,920 | 0.04 | 2.3 | 150 | 0.0003 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0021 |
| | medium | 2,920 | 0.04 | 1.0 | 150 | 0.0001 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0009 |
| | large | 2,920 | 0.04 | 0.6 | 150 | 0.0001 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0006 |
| Cat (2596-63) | small | 1,752 | 0.04 | 2.8 | 150 | 0.0004 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0025 |
| | large | 1,986 | 0.04 | 1.2 | 150 | 0.0002 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.0011 |
| **Assume Dust Formulation** | | | | | | | | | | | | | |
| Cat (2596-49) | small | 1,320 | 0.37 | 57 | 150 | 0.0701 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.48 |
| | medium | 1,320 | 0.37 | 34 | 150 | 0.0421 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.29 |
| | large | 1,320 | 0.37 | 21 | 150 | 0.0263 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.18 |
| Dog (2596-50,62) | small | 2,219 | 0.37 | 48 | 150 | 0.0589 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.40 |
| | large | 3,738 | 0.37 | 22 | 150 | 0.0271 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.18 |
| Cat (2596-83) | small | 1,402 | 0.37 | 60 | 150 | 0.0744 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.51 |
| | large | 2,920 | 0.37 | 47 | 150 | 0.0582 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.40 |
| Cat (2596-139) | small | 584 | 0.37 | 25 | 150 | 0.0310 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.21 |
| | medium | 584 | 0.37 | 15 | 150 | 0.0186 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.13 |
| | large | 584 | 0.37 | 9 | 150 | 0.0116 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.08 |
| Dog (2596-84) | small | 2,219 | 0.37 | 48 | 150 | 0.0589 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.40 |
| | large | 3,738 | 0.37 | 22 | 150 | 0.0271 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.18 |
| Dog (2596-139) | small | 2,920 | 0.37 | 63 | 150 | 0.0775 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.53 |



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**Table E.1. Residential Post-application Non-cancer Incidental Oral Dose Assuming a Liquid or Dust Formulation for Pet Collars.**

| Animal Type | Animal Size | Application Rate (mg ai) | $F_{aihands}$ | DE | $SA_H$ | HR | $F_m$ | ET | Replenish-ment interval (min) | N_Replen | SE | Freq_HtM | Incidental oral Absorbed Dose (mg/kg/day) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dermal Exposure (mg) | Surface area of 1 hand ($cm^2$) | Hand residue loading ($mg/cm^2$) | Fraction of hand mouthed | Exposure Time (hours/day) | | # replenish-ment intervals per hour (intervals/hr) | Fraction Saliva Extraction | Number of hand-to-mouth contacts events per hour (events/hr) | |
| | medium | 2,920 | 0.37 | 27 | 150 | 0.0332 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.23 |
| | large | 2,920 | 0.37 | 17 | 150 | 0.0211 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.14 |
| Cat (2596-63) | small | 1,752 | 0.37 | 75 | 150 | 0.0931 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.63 |
| | large | 1,986 | 0.37 | 32 | 150 | 0.0395 | 0.13 | 1 | 15 | 4 | 0.48 | 20 | 0.27 |

1. Application rates are label defined and adjusted for 20% removal of the pet collar. Refer to Table A.2.
2. Dermal Exposure (mg/day) = [Transfer Coefficient ($cm^2$/hr)] * [Application Rate (label defined) * Fraction Application Rate (0.0017; Davis, M. et. al and MRID 50881801) ÷ Surface Area of Cat/Dog (Cat: Small, 1,500; Medium, 2,500; Large, 4,000 $cm^2$ - Dog: Small, 3,000; Medium, 7,000; Large, 11,000 $cm^2$)] x [Exposure Time (Adults, 0.77 hours/day; Children, 1.0 hours/day))
3. Incidental Oral Dose (mg/kg/day) = [Hand Residue Loading ($mg/cm^2$)] × [Fraction of Hand Mouthed (0.13) × Surface Area of 1 Child Hand (150 $cm^2$ )] x [Exposure Time (1.0 hrs/day) × # of Replenishment Intervals/hr (4 int/hr)) × (1-((1-Saliva Extraction Factor (0.5))^(Number of Hand-to-Mouth Events per Hour (20 events/hr) ) ÷ ( # of Replenishment Intervals/hr))] / [Body Weight (11 kg child 1 to < 2 years old years old)]
   Where the Hand Residue Loading ($mg/cm^2$) = [$Fai_{hands}$ (Solid, 0.37; Liquids; 0.040) x Dermal Exposure (mg/day)] ÷ [Surface Area of 1 Child Hand (150 $cm^2$) x 2]

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| Table E.2. Residential Post-Application Non-Cancer Incidental Oral Exposure Risk Estimates from TCVP Pet Collars Using 99.62% Liquid/0.38% Dust Ratio. | | | | | | |
|---|---|---|---|---|---|---|
| EPA Reg. No./ Animal | Lifestage | Application Rate (mg ai)[1] | Animal Size | Liquid Incidental Oral Dose (mg/kg/day)[2] | Dust Incidental Oral Dose (mg/kg/day)[3] | 99.62% Liquid/0.38% Dust Combined Incidental Oral MOE (**LOC = 1000**)[4] |
| 2596-49: Cat | Children 1 < 2 | 1,320 | Small | 0.0019 | 0.48 | **750** |
| | | | Medium | 0.0011 | 0.29 | 1300 |
| | | | Large | 0.0007 | 0.18 | 2000 |
| 2596-50, 62: Dog | Children 1 < 2 | 2,219 | Small | 0.0016 | 0.40 | **900** |
| | | 3,738 | Large | 0.0007 | 0.18 | 2000 |
| 2596-83: Cat | Children 1 < 2 | 1,402 | Small | 0.0020 | 0.51 | **710** |
| | | 2,920 | Large | 0.0016 | 0.40 | **910** |
| 2596-139: Cat | Children 1 < 2 | Ex. 5 Deliberative Process (DP) | Small | Ex. 5 Deliberative Process (DP) | | |
| | | | Medium | | | |
| | | | Large | | | |
| 2596-84: Dog | Children 1 < 2 | 2,219 | Small | 0.0016 | 0.40 | **900** |
| | | 3,738 | Large | 0.0007 | 0.18 | 2000 |
| 2596-139: Dog | Children 1 < 2 | Ex. 5 Deliberative Process (DP) | Small | Ex. 5 Deliberative Process (DP) | | |
| | | | Medium | | | |
| | | | Large | | | |
| 2596-63: Cat | Children 1 < 2 | 1,752 | Small | 0.0025 | 0.63 | **570** |
| | | 1,986 | Large | 0.0011 | 0.27 | 1300 |

1. Application rates are label defined. Refer to Table A.2.
2. Liquid and Dust HTM Doses from Table E.1.
3. 99.62% Liquid/0.38% Dust Combined MOE = Incidental Oral NOAEL (2.8 mg/kg/day) ÷ [(Liquid HtM Dose * 0.9962) + (Dust HtM Dose * 0.0038)].

| Table E.3. Residential Post-Application Non-Cancer Exposure and Risk Estimates from TCVP Dust/Powder and Pump/Trigger Spray Formulations. | | | | | | |
|---|---|---|---|---|---|---|
| EPA Reg. No./ Animal | Lifestage | Application Rate (mg ai)[1] | Animal Size | Dermal Exposure (mg/day)[2] | Incidental Oral Dose (mg/kg/day)[3] | Incidental Oral MOE (**LOC = 1000**)[4] |
| **Dusts/Powders** | | | | | | |
| 47000-123: Dog | Children 1 < 2 | 170 | Small | 1.0 | 0.0087 | **320** |
| | | 430 | Medium | 1.1 | 0.0093 | **300** |
| | | 680 | Large | 1.1 | 0.0095 | **300** |
| 47000-123: Cat | Children 1 < 2 | 43 | Small | 0.52 | 0.0043 | **640** |
| | | 100 | Medium | 0.74 | 0.0063 | **450** |
| | | 150 | Large | 0.70 | 0.0059 | **480** |
| 2596-78: Cat | Children 1 < 2 | 280 | Small | 3.4 | 0.0287 | **98** |
| | | 470 | Large | 2.1 | 0.0180 | **160** |
| 2596-79: Dog | Children 1 < 2 | 470 | Small | 2.9 | 0.0240 | **120** |
| | | 940 | Medium | 2.4 | 0.0205 | **140** |
| | | 1,200 | Large | 1.9 | 0.0163 | **170** |
| **Pump/Trigger Sprays** | | | | | | |
| 2596-126, 140: Cat (Trigger) | Children 1 < 2 | 250 | Small | 1.9 | 0.00172 | 1,600 |
| | | 350 | Large | 0.99 | 0.00090 | 3,100 |
| 2596-140: Cat (Pump) | Children 1 < 2 | 51 | Small | 0.39 | 0.00035 | 8,000 |
| | | 71 | Large | 0.20 | 0.00018 | 15,000 |



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| **Table E.3. Residential Post-Application Non-Cancer Exposure and Risk Estimates from TCVP Dust/Powder and Pump/Trigger Spray Formulations.** | | | | | | |
|---|---|---|---|---|---|---|
| EPA Reg. No./ Animal | Lifestage | Application Rate (mg ai)[1] | Animal Size | Dermal Exposure (mg/day)[2] | Incidental Oral Dose (mg/kg/day)[3] | Incidental Oral MOE **(LOC = 1000)**[4] |
| 2596-125, -140: Dog (Trigger) | Children 1 < 2 | 350 | Small | 1.3 | 0.00120 | 2,300 |
| | | 400 | Medium | 0.65 | 0.00059 | 4,800 |
| | | 700 | Large | 0.72 | 0.00066 | 4,300 |

1. Application rates are label defined. Refer to Table A.2.
2. Dermal Exposure (mg/day) = [Transfer Coefficient ($cm^2$/hr)] * [Application Rate (label defined) * Fraction Application Rate (Dust, 0.00048; Spray, 0.0081) ÷ Surface Area of Cat/Dog (Cat: Small, 1,500; Medium, 2,500; Large, 4,000 $cm^2$ - Dog: Small, 3,000; Medium, 7,000; Large, 11,000 $cm^2$)] x [Exposure Time (Adults, 0.77 hours/day; Children, 1.0 hours/day))]
3. Incidental Oral Dose (mg/kg/day) = [Hand Residue Loading (mg/$cm^2$)] × [Fraction of Hand Mouthed (0.13) × Surface Area of 1 Child Hand (150 $cm^2$ )] x [Exposure Time (1.0 hrs/day) × # of Replenishment Intervals/hr (4 int/hr)) × (1-((1-Saliva Extraction Factor (0.5))^(Number of Hand-to-Mouth Events per Hour (20 events/hr) ) ÷ ( # of Replenishment Intervals/hr))] / [Body Weight (11 kg child 1 to < 2 years old years old)]
   Where the Hand Residue Loading (mg/$cm^2$) = [$Fai_{hands}$ (Dusts, 0.37; Liquids; 0.040) x Dermal Exposure (mg/day)] ÷ [Surface Area of 1 Child Hand (150 $cm^2$) x 2]
4. MOE = Incidental Oral NOAEL (2.8 mg/kg/day) ÷ Incidental Oral Dose (mg/kg/day).

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## Appendix F – Summary of Residential Post-Application Cancer Exposure and Risks

**Table F.1. Residential Post-Application Cancer Exposure and Risk Estimates from TCVP Pet Collar Using 99.62% Liquid/0.38% Dust Ratio – USING DAVIS STUDY (2008).**

| Animal Type | Animal Size | Lifestage | Liquid LADD[1] | Dust LADD[2] | Combined 99.62% Liquid/0.38% Dust LADD[3] | Cancer Risk Estimate[4] |
|---|---|---|---|---|---|---|
| 2596-49: Cat | Small | Adult | 1.4E-03 | 3.8E-02 | 1.6E-03 | 2.9E-06 |
| | Medium | | 8.5E-04 | 2.3E-02 | 9.4E-04 | 1.7E-06 |
| | Large | | 5.3E-04 | 1.4E-02 | 5.9E-04 | 1.1E-06 |
| 2596-50,62: Dog | Small | | 1.2E-03 | 3.2E-02 | 1.3E-03 | 2.4E-06 |
| | Large | | 5.5E-04 | 1.5E-02 | 6.0E-04 | 1.1E-06 |
| 2596-83: Cat | Small | | 1.5E-03 | 4.1E-02 | 1.7E-03 | 3.0E-06 |
| | Large | | 1.2E-03 | 3.2E-02 | 1.3E-03 | 2.4E-06 |
| 2596-139: Cat | Small | | Ex. 5 Deliberative Process (DP) | | | |
| | Medium | | | | | |
| | Large | | | | | |
| 2596-84: Dog | Small | | 1.2E-03 | 3.2E-02 | 1.3E-03 | 2.4E-06 |
| | Large | | 5.5E-04 | 1.5E-02 | 6.0E-04 | 1.1E-06 |
| 2596-139: Dog | Small | | Ex. 5 Deliberative Process (DP) | | | |
| | Medium | | | | | |
| | Large | | | | | |
| 2596-63: Cat | Small | | 1.9E-03 | 5.1E-02 | 2.1E-03 | 3.8E-06 |
| | Large | | 8.0E-04 | 2.2E-02 | 8.8E-04 | 1.6E-06 |

1 Liquid LADD = [Dermal Dose (mg/kg/day)] × [Days per year of exposure (180 days/yr) ÷ 365 days/year] × [Years per lifetime of exposure (50 yrs) ÷ Lifetime expectancy (78 yrs)]. Dermal dose calculated using fraction transferred value from Davis study of 0.00092.

2 Dust LADD = [Dermal Dose (mg/kg/day)] × [Days per year of exposure (180 days/yr) ÷ 365 days/year] × [Years per lifetime of exposure (50 yrs) ÷ Lifetime expectancy (78 yrs)]

3 Combined 99.62% Liquid/0.38% Dust LADD = (Liquid LADD * 0.9962) + (Dust LADD * 0.0038).

4 Cancer risk estimates = Combined 99.62% Liquid/0.38% Dust LADD × $Q_1^*$, where $Q_1^* = 1.83 \times 10^{-3}$ $(mg/kg/day)^{-1}$

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| Table F.2. Residential Post-Application Cancer Exposure and Risk Estimates from TCVP Pet Products. | | | | |
|---|---|---|---|---|
| Animal Type | Animal Size | Lifestage | LADD[1,2] | Cancer Risk Estimate[3] |
| **Dust/Powder** | | | | |
| 47000-123: Dog | Small | Adult | 5.9E-04 | 1.1E-06 |
| | Medium | | 6.3E-04 | 1.2E-06 |
| | Large | | 6.4E-04 | 1.2E-06 |
| 47000-123: Cat | Small | | 2.9E-04 | 5.4E-07 |
| | Medium | | 4.2E-04 | 7.8E-07 |
| | Large | | 4.0E-04 | 7.3E-07 |
| 2596-78: Cat | Small | | 1.9E-03 | 3.6E-06 |
| | Large | | 1.2E-03 | 2.2E-06 |
| 2596-79: Dog | Small | | 1.6E-03 | 3.0E-06 |
| | Medium | | 1.4E-03 | 2.5E-06 |
| | Large | | 1.1E-03 | 2.0E-06 |
| **Pump/Trigger Spray** | | | | |
| 2596-126, 140: Cat (Trigger) | Small | Adult | 5.3E-04 | 9.6E-07 |
| | Large | | 2.8E-04 | 5.1E-07 |
| 2596-140: Cat (Pump) | Small | | 1.1E-04 | 2.0E-07 |
| | Large | | 5.6E-05 | 1.0E-07 |
| 2596-125, -140: Dog (Trigger) | Small | | 3.7E-04 | 6.7E-07 |
| | Medium | | 1.8E-04 | 3.3E-07 |
| | Large | | 2.0E-04 | 3.7E-07 |

1 Total Lifetime Average Daily Dose (mg/kg/day) = Dermal LADD (mg/kg/day) + Inhalation LADD (mg/kg/day).
2 Dermal and Inhalation LADD equations provided in Appendix B.
3 Cancer risk estimates = Total LADD × Q1*, where Q1* = $1.83 \times 10^{-3}$ $(mg/kg/day)^{-1}$

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