Rick Scott
Governor

H. Frank Farmer, Jr., M.D., Ph.D.
State Surgeon General

April 14, 2011

Mr. Anthony Dennis
Environmental Health Director
Alachua County Health Department
P.O. Box 1327 (32602-1327)
224 S. E. 24th Street
Gainesville, FL 32641

RE: Stephen Foster Neighborhood Chicken Egg Dioxin Evaluation

Dear Mr. Dennis:

The Florida Department of Health (DOH) evaluated potential health risks for a family near the Cabot-Koppers site from dioxins in homegrown chicken eggs. Florida DOH determined the current levels of dioxins in the eggs are not harmful.

Florida DOH evaluates the public health significance of Florida hazardous waste sites through a cooperative agreement with the US Agency for Toxic Substances and Disease Registry (ATSDR).

Background and Statement of Issues

The Koppers hazardous waste site is at 200 N.W. 23rd Blvd. northwest of the intersection of NW 23rd Avenue and North Main Street in Gainesville, Alachua County, Florida 32609 (Figures 1 and 2). The 90-acre Koppers site occupies the western part of the larger 140-acre Cabot-Koppers hazardous waste site.

The Koppers site has been used for wood treatment since 1916. Koppers preserved wood utility poles and timber using three different chemicals: creosote, pentachlorophenol (PCP) and chromated copper arsenate (CCA). Past waste disposal caused soil and groundwater contamination. Contaminants from Koppers have impacted soil west of the site.

In May 2009, the Alachua County Health Department (CHD) hand delivered letters to 20 nearby residences advising them to keep their children from playing in the City easement just west of Koppers. The City of Gainesville posted “keep out” and “no trespassing” signs along this easement. Contractors for the responsible party erected a temporary fence to discourage trespassing on this easement.

In June 2009, the Florida DOH, Alachua CHD, the U.S. Environmental Protection Agency (EPA), and Florida Department of Environmental Protection held an open house meeting attended by about 120 nearby residents.

In June 2009, ATSDR published a soil health consultation [ATSDR 2009]. In June 2010, ATSDR published a soil health consultation for this site evaluating 2009 dioxin surface soils along the roads in the Stephen Foster neighborhood west of Koppers [ATSDR 2010]. In June 2010, the Florida DOH drafted a creek sediment health consultation. In these reports, Florida DOH found low levels of dioxins in residential surface soil and creek sediments near the Koppers site.

In October 2010, the Florida DOH conducted an open house with the community and Alachua CHD, EPA and DEP.

Community Health Concerns

For many years nearby residents, especially those in the Stephen Foster neighborhood west of Koppers, have been concerned about the health threat from contact with contaminated soil in their neighborhood. Nearby residents have been concerned about contaminants in sediments of the creeks that drain the site. In October 2010, a Stephen Foster resident requested Florida DOH test for dioxins in his homegrown chicken eggs

Discussion

In October 2010, a Stephen Foster neighborhood resident living on Springstead Creek 0.25 mile northwest of the site contacted Florida DOH and requested testing for dioxins in homegrown chicken eggs. He wanted to know if the eggs were safe to eat. The resident's chickens are in cages at night and roam the ½-acre property during the day. He is concerned that the chickens could ingest contaminated surface soil or contaminated sediments from Springstead Creek that drains the Cabot-Koppers site thus contaminating the eggs they lay.

In November 2010, the Alachua CHD collected two chicken eggs from the resident's backyard and shipped them to Pace Analytical Laboratories. The laboratory tested the eggs for 17 congeners ("dioxin-like" compounds) called chlorinated dibenzo-p-dioxins (CDDs). Of these 17 congeners, 2,3,7,8-tetrachlordibenzo dioxin (TCDD) is the most toxic. The laboratory did not find any 2,3,7,8-TCDD over its detection limit of 0.00012 micrograms per kilogram (µg/kg). For all dioxins combined: toxicity equivalence (TEQ), the laboratory found 0.00057 µg/kg (Table II).

Health Risk Analysis

Ingestion of chicken eggs is a current potential exposure pathway from dioxin-contaminated soil or sediments (Table 1).

Non-cancer risk – The level of dioxins in egg from home-raised chickens near the Koppers site is not likely to cause any non-cancer illness.

In order to determine the risk of non-cancer illness from eating eggs from chickens near the Koppers site, the Florida DOH first estimated dioxin doses for both a child and an adult. First, we estimated a dioxin dose for the specific dioxin congener 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). Since the level of 2,3,7,8-TCDD in the eggs were below the laboratory

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detection limit, we estimated the dose using the detection limit. Second, we estimated a dioxin dose for all the "dioxin-like" compounds by comparing their toxicity relative to TCDD and summing them in a method called toxic equivalence (TEQ). We then compared these two dioxin doses 2,3,7,8-TCDD and dioxin-TEQ to ATSDR's minimal risk level (MRL) (Table 2) (Appendix A). We evaluated the risk for the family (2 adults and 2 children) from 2009 to present.

For 2,3,7,8-TCDD alone, the child and adult dose of for both egg-eating scenarios (12 eggs per week for the family and 28 eggs per week for the family) are less than ATSDR's MRL and are thus not likely cause any non-cancer illness (Table 2) (Appendix A).

For the dioxin-TEQ, both the child and adult doses for 12 eggs/week for the family are below the ATSDR MRL and are not likely to cause any non-cancer illness. The adult dioxin-TEQ dose for 28 eggs/week for the family is also below the ATSDR MRL. The child dioxin-TEQ dose for 28 eggs/week for the family, however, is slightly (2x) higher than the MRL but 25 times less than the No Observable Adverse Effect Levels (NOAEL) based on developmental effects in monkeys [ATSDR 1998]. Therefore, even the child dioxin-TEQ dose for the 28 eggs/week for the family scenario is not likely to cause any non-cancer illness (Table 2) (Appendix A).

Cancer risk - Florida DOH cannot predict cancer risk for this family from past exposure to homegrown eggs because one and a half years (summer 2009 to present) is too short a time to estimate a cancer risk. Florida DOH can, however, predict cancer risk if the family continues to eat the homegrown chicken eggs for 35 years. This estimate assumes the concentrations of dioxins in the chicken eggs do not change over time. If they continue to eat 12 eggs per week, there is a "very low" increased cancer risk over the 35 years. If they increase to 28 eggs per week for 35 years, there is a "low" (1 in 10,000) increased cancer risk (Table 2) (Appendix A).

Dioxins

Chlorinated dibenzo-p-dioxins (CDDs) are found at very low levels in the environment. These levels are measured in nanograms and picograms. One nanogram (ng) is one billionth of a gram, and one picogram (pg) is one trillionth of a gram. Nanograms per kilogram (ng/kg) also equal one part per trillion (ppt) [ATSDR 1998].

CDDs are found everywhere in the environment. Most people are exposed to very small background levels of CDDs when they breathe air, consume food or milk or have skin contact with materials contaminated with CDDs. The actual intake of CDDs from food for any one person will depend on the amount and type of food consumed and the level of contamination. For the general population, more than 90% of the daily intake of CDDs, dibenzofurans (CDFs), and other dioxin-like compounds come from food, primarily meat, dairy products and fish [ATSDR 1998].

When a site is contaminated with dioxins, the effects of all "dioxin-like" compounds are assumed to be additive due to a similar mode of action. A mathematical method called Toxic Equivalents (TEQ) is used to assess the risk of exposure to this mixture of "dioxin-like" compounds. The Toxic Equivalent Factor (TEF) for tetrachlorodibenzo-p-dioxin (TCDD) is defined as one, whereas TEF values for all other TCDD-like compounds are less than one. A TEQ is defined as the product of the concentration of an individual "dioxin-like compound" in a

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complex environmental mixture and the corresponding TCDD toxicity equivalency factor TEF for that compound. The total TEQ is the sum of the TEQs for each of the congeners in a given mixture.

In the United States, there are no legal limits on dioxin levels in eggs. However, the US Food and Drug Administration (FDA), in one incident removed eggs from stores when levels exceeded 0.001 µg/kg (in whole eggs) [CDHS 2004].

Two studies in the United States found 0.002 to 0.004 µg/kg dioxin-TEQ in homegrown chicken eggs near contaminated sites. People were advised not to eat chicken eggs at levels above 0.001 µg/kg dioxin-TEQ. In two other studies with no known industrial sources of dioxins, the egg dioxin-TEQ level was 0.00057 µg/kg [CDHS 2004].

Conclusions

Currently, the family eating homegrown chicken eggs near the Cabot Koppers site is not likely to suffer harm from exposure to dioxins.

- For non-cancer risk, if the resident's family continues to eat less than 12 eggs per week, the levels of dioxins in the eggs are below the MRL and the levels are not considered harmful. If the family eats 28 eggs per week, the dioxin levels in the eggs for a child are considerably lower than any observable effect in a lab study; again, the levels are not estimated to be harmful to their health.

- Florida DOH is unable to estimate the past cancer risk from eating these homegrown chicken eggs because of the short exposure time (summer of 2009 to present). However, if the family continues to eat 12 eggs per week there is a "very low" increased cancer risk over 35 years. If they eat 28 egg per week for 35 years, the increased cancer risk is "low" (Table 2).

Recommendations

Florida DOH does not have any recommendations at this time.

Public Health Action Plan

Florida DOH has notified the family of these findings. Florida DOH will continue to evaluate environmental data at the Cabot Koppers site.

References

[ACEPD 2009]. Alachua County Environmental Protection Department. Sediment Quality in Springstead and Hogtown Creeks Near the Cabot-Koppers Superfund Site. May 2009.

[ATSDR 1998]. Agency for Toxic Substances and Disease Registry Toxicological Profile for Chlorinated Dibenzo-p-dioxins (CDDs). Atlanta: US Department of Health and Human Services. December 1998.

[ATSDR 2009]. Agency for Toxic Substances and Disease Registry. Health Consultation Off-Site Surface Soil, Koppers Hazardous Waste Site. Gainesville, Alachua County, Florida. U.S. Department of Health and Human Services. Atlanta, GA. July 17, 2009.

[ATSDR 2010]. Agency for Toxic Substances and Disease Registry. Health Consultation Additional Off-Site Surface Soil, Koppers Hazardous Waste Site. Gainesville, Alachua County, Florida. U.S. Department of Health and Human Services. Atlanta, GA. June 17, 2010.

[CDHS 2004]. California Department of Health Services Environmental Health Investigations Branch. Backyard Chicken Eggs in California: Reducing Risks – Questions and Answers. August 2004.

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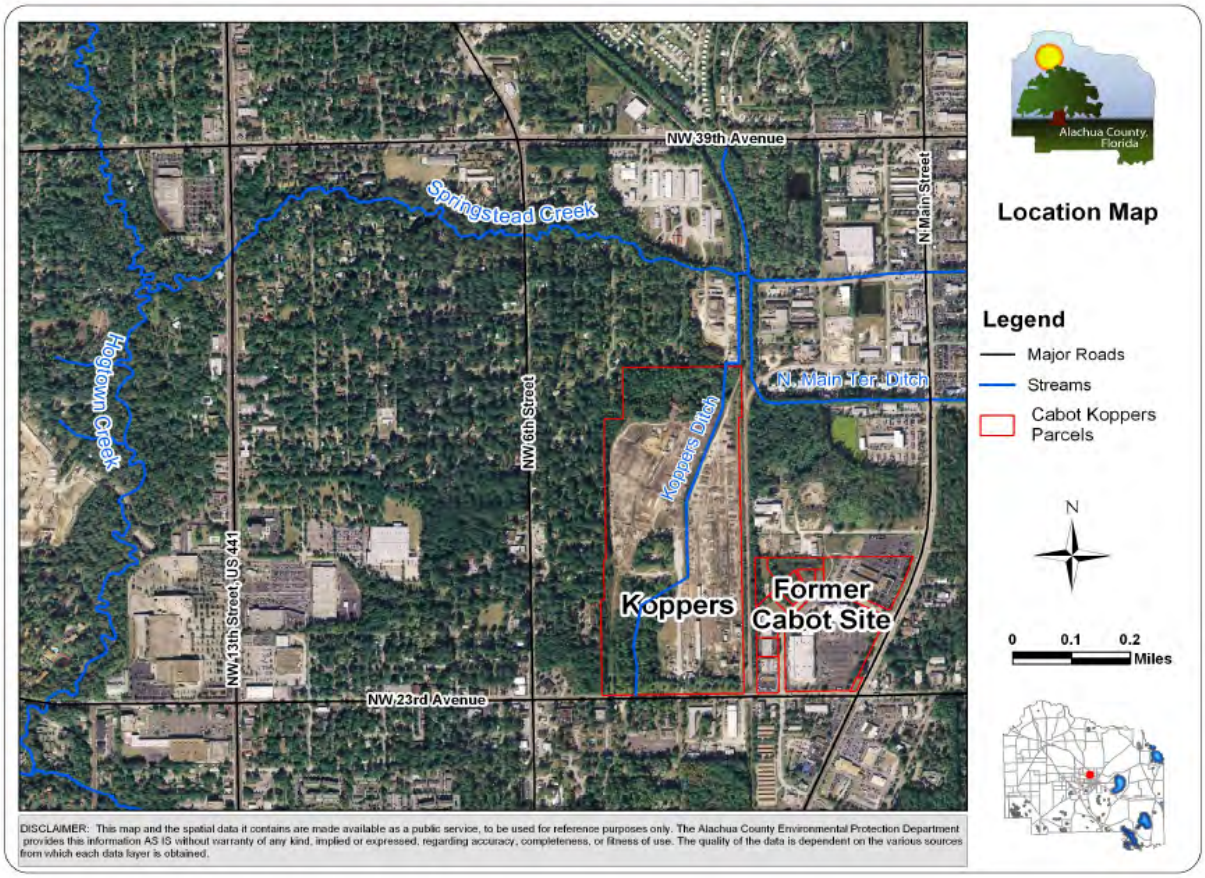
Figure 1. Cabot-Koppers Site Location Map



Reference: [ACEPD 2009]

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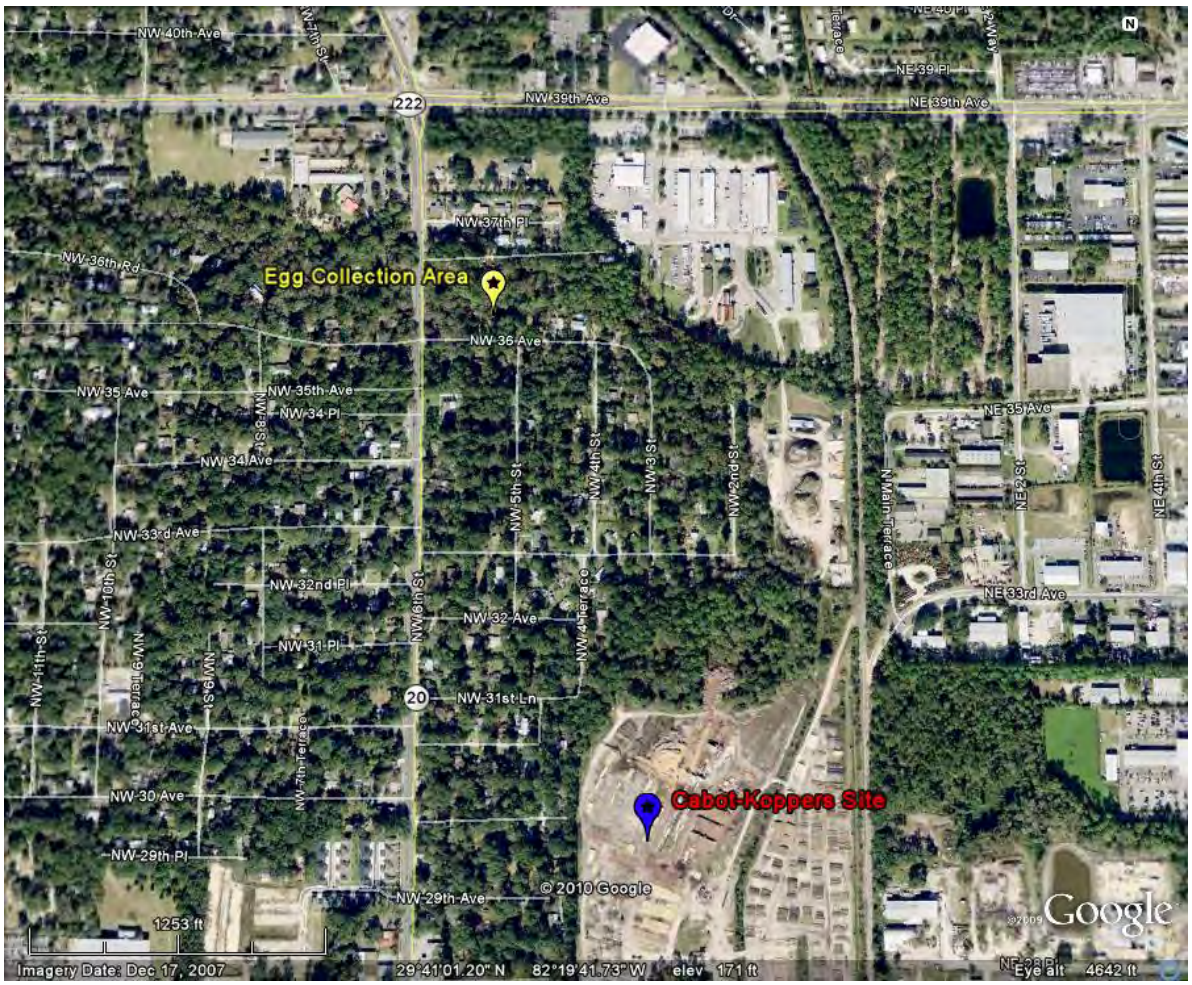
Figure 2. Chicken Egg Collection Area



Reference: Google Earth, 2011

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Table 1. Potential Exposure Pathways

	Exposure Pathway Elements					
Pathway Name	Source	Biota Medium	Point of Exposure	Potentially Exposed Population	Route of Exposure	Time Frame
Chicken Eggs	Contaminated Soil or Sediments from the Koppers site	Chicken Eggs	Nearby Residential Yard	Nearby Residents	Ingestion	2009-2011

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Table 2. Egg Dioxin Concentrations, Comparison Values, Estimated Current and Future Maximum Dose and Increased Lifetime Cancer Risk Eating Dioxin in Eggs

Contaminant	Ingestion Scenario	Maximum Egg Dioxin Concentration (µg/kg)	Estimated Maximum Dose (µg/kg/day)	ATSDR MRL Comparison Value (µg/kg/day)	EPA IRIS Oral Cancer Slope Factor $(\mu g/kg/day)^{-1}$	Theoretical Increased Future Lifetime Cancer Risk
2,3,7,8-TCDD	12 eggs/week	Less than 0.00012	child – 1.2×10^{-7} adult – 5.7×10^{-8}	1×10^{-6}	N/A	N/A
2,3,7,8-TCDD	28 eggs/week	Less than 0.00012	child – 4.3×10^{-7} adult – 9.8×10^{-8}	1×10^{-6}	N/A	N/A
Dioxin TEQ	12 eggs/week	0.00057	child – 5.7×10^{-7} adult – 2.7×10^{-7}	1×10^{-6}	150	4×10^{-5} "very low"
Dioxin TEQ	28 eggs/week	0.00057	child – 2.0×10^{-6} adult – 4.6×10^{-7}	1×10^{-6}	150	7×10^{-5} "low"

µg/kg = micrograms per kilogram
µg/kg/day = micrograms per kilogram per day
2,3,7,8-TCDD = 2,3,7,8-tetrachlordibenzo-p-dioxin
TEQ = Toxicity Equivalence
MRL = ATSDR minimal risk level
EPA IRIS = US Environmental Protection Agency Integrated Risk Information System [EPA 2010b]

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Appendix A

Assumptions and Calculations

Calculations for the family living near near Cabot Koppers eating homegrown chicken eggs

Overall Assumptions:

4 people in the family (2 adults and 2 children)
Family has been eating their homegrown eggs since summer 2009
Everyone in the family eats the whole egg (not just the white or the yolk)
1 egg = 2 ounces = 0.057 kilogram (kg)
Pace Lab's detection limit for 2,3,7,8-TCDD is 0.00012 µg/kg
The lab did not detect 2,3,7,8-TCDD in the eggs, so for these calculations we assume the 2,3,7,8-TCDD concentration is 0.00012 µg/kg rather than zero.
ATSDR chronic Minimal Risk Limit (MRL) for chronic oral ingestion for 2,3,7,8-TCDD = 0.000001 µg/kg/day = 1.0×10^{-6}µg/kg/day [ATSDR 1998]
Observable Adverse Effect Levels (NOAEL) and Lower Observable Adverse Effect Levels (LOAEL) for chronic oral ingestion for 2,3,7,8-TCDD = 0.00005 µg/kg/day = 5.0×10^{-5} µg/kg/day [ATSDR 1998]
TEQ= toxic equivalents

The amount of egg per day and kg of egg for all Scenario 1's are calculated as follows:

$$\frac{(6 \text{ eggs})}{(7 \text{ days})}(2 \text{ days}) = 1.7 \text{ eggs/day/family}$$

Since 2 adults are eating 2 eggs 2 x a week and the 2 children are eating 1 egg 2 x a week, we divide 1.7/6 = 0.283 eggs/day. Therefore, the adults are eating 0.57 eggs per day (2 x 0.283) and the kids are eating 0.283 eggs per day assuming they eat a total of 6 eggs one day a week and then 6 eggs another day of that same week.

So if 1 egg = 0.057 kg, then 0.57 egg = 0.033 kg and 0.283 egg = 0.016 kg

The amount of egg per day and kg of egg for all Scenario 2's are calculated as follows:

4 eggs/day/family

1 egg = 0.057 kg, so each family member is eating 0.057 kg egg/day

Non-cancer Risk

2,3,7,8-TCDD concentration

1st Scenario: Chickens lay 12 eggs per week and the family eats all 12 homegrown eggs. Each adult eats 2 eggs and each child eats one egg two times a week.

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Adult Dose of Dioxins from Eggs = $\frac{(0.00012\ \mu g/kg\ 2,3,7,8\text{-TCDD})(0.033\ kg\ egg/day)}{70\ kg} = 5.7 \times 10^{-8}\ \mu g/kg/day$

Child Dose of Dioxins from Eggs = $\frac{(0.00012\ \mu g/kg\ 2,3,7,8\text{-TCDD})(0.016\ kg\ egg/day)}{16\ kg} = 1.2 \times 10^{-7}\ \mu g/kg/day$

2nd Scenario: Chickens lay 28 eggs per week so adults and children eat one egg every day.

Adult Dose of Dioxins from Eggs = $\frac{(0.00012\ \mu g/kg\ 2,3,7,8\text{-TCDD})(0.057\ kg\ egg/day)}{70\ kg} = 9.8 \times 10^{-8}\ \mu g/kg/day$

Child Dose of Dioxins from Eggs = $\frac{(0.00012 \mu g/kg\ 2,3,7,8\text{-TCDD})(0.057\ kg\ egg/day)}{16\ kg} = 4.3 \times 10^{-7} \mu g/kg/day$

Conclusion: The above calculated doses for adults and children for both egg-eating scenarios are less than ATSDR's MRL for 2,3,7,8-TCDD. Therefore, eating eggs with these dioxin levels for these scenarios are not likely to cause illness.

Dioxin TEQ (toxic equivalents)

1st Scenario: Chickens lay 12 eggs per week and the family eats all 12 homegrown eggs. Each adult eats 2 eggs and each child eats one egg two times a week.

Adult Dose of Dioxins from Eggs = $\frac{(0.00057\ \mu g/kg\ dioxin\ TEQ)(0.033\ kg\ egg/day)}{70\ kg} = 2.7 \times 10^{-7}\ \mu g/kg/day$

Child Dose of Dioxins from Eggs = $\frac{(0.00057 \mu g/kg\ dioxin\ TEQ)(0.016\ kg\ egg/day)}{16\ kg} = 5.7 \times 10^{-7}\ \mu g/kg/day$

2nd Scenario: Chickens lay 28 eggs per week so adults and children eat one egg every day.

Adult Dose of Dioxins from Eggs = $\frac{(0.00057\ \mu g/kg\ dioxin\ TEQ)(0.057\ kg\ egg/day)}{70\ kg} = 4.6 \times 10^{-7}\ \mu g/kg/day$

Child Dose of Dioxins from Eggs = $\frac{(0.00057\ \mu g/kg\ dioxin\ TEQ)(0.057\ kg\ egg/day)}{16\ kg} = 2.0 \times 10^{-6}\ \mu g/kg/day$

Conclusion: The above calculated doses for adults and children except for the second child dose scenario are less than ATSDR's MRL for 2,3,7,8-TCDD. For the second scenario the child dose is 25 times less than the No Observable Adverse Effect Levels (NOAEL) and the Lower

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Observable Adverse Effect Levels (LOAEL). Therefore eating eggs with these dioxin levels for these scenarios are not likely to cause illness.

Cancer Risk

Overall Assumptions:

dioxin TEQ = 0.57 part per trillion (ppt) = 0.00057 µg/kg (microgram/kilogram)
EPA's oral (ingestion) cancer slope factor = 1.5×10^{5} mg/kg/day^{-1}
Note: cancer risk is divided by two as cancer risk is usually for 70 year exposure

Theoretical increased cancer risk descriptions:

1 in 1,000,000 (10^{-6})	"extremely low" increased risk
1 in 100,000 (10^{-5})	"very low" increased risk
1 in 10,000 (10^{-4})	"low" increased risk
1 in 1,000 (10^{-3})	"moderate" increased risk
1 in 100 (10^{-2})	"high" increased risk
1 in 10 (10^{-1})	"very high" increased risk

1st Scenario: Chickens lay 12 eggs per week and the family eats all 12 homegrown eggs. Each adult eats 2 eggs and each child eats one egg two times a week.

Dose of Dioxins from Eggs = $\frac{(0.00057\ \mu g/kg\ \text{dioxin TEQ})(0.033\ kg\ \text{egg/day})}{70\ kg} = 2.7 \times 10^{-7}$ µg/kg/day

$= 2.7 \times 10^{-10}$ mg/kg/day

Increased Cancer Risk for 35 years = $(2.7 \times 10^{-10}\ \text{mg/kg/day})(1.5 \times 10^{5}\ \text{mg/kg/day}^{-1})$(35 years/70 years) = 2×10^{-5} = "very low" increased cancer risk

2nd Scenario: Chickens lay 28 eggs per week so adults and children eat one egg every day.

Dose of Dioxins from Eggs = $\frac{(0.00057\ \mu g/kg\ \text{dioxin TEQ})(0.057\ kg\ \text{egg/day})}{70\ kg} = 4.6 \times 10^{-7}$ µg/kg/day

$= 4.6 \times 10^{-10}$ mg/kg/day

Increased Cancer Risk for 35 years = $(4.6 \times 10^{-10}\ \text{mg/kg/day})(1.5 \times 10^{5}\ \text{mg/kg/day}^{-1})$(35 years/70 years) = 4.0×10^{-5} = "very low" increased cancer risk

Reference: [ATSDR 1998]. Agency for Toxic Substances and Disease Registry Toxicological Profile for Chlorinated Dibenzo-p-dioxins (CDDs). Atlanta: US Department of Health and Human Services. December 1998.

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Certification

The Florida Department of Health, Bureau of Environmental Public Health Medicine prepared this health consultation report. Florida DOH followed approved methodologies and procedures existing at the time it began its assessment. Florida DOH completed an editorial review of this document. This report was supported by funds from a cooperative agreement with the Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services. This document has not been reviewed and cleared by ATSDR.

Susan Skye
Biological Scientist
Florida Department of Health

Randy Merchant
Environmental Administrator
Florida Department of Health