

US EPA ARCHIVE DOCUMENT

Data Requirement:	PMRA DATA CODE	
	EPA DP Barcode	D301500
	OECD Data Point	
	EPA MRID	45710218
	EPA Guideline	§71-4a
	OPPTS Guideline	850.2300

Test material: Chlorothalonil **Purity:** 99.18%
Common name: Chlorothalonil
Chemical name: IUPAC: 2,4,5,6-Tetrachloro-1,3-benzodicyanitrile
CAS name: Not reported
CAS No.: Not reported
Synonyms: None reported

Primary Reviewer: Christie E. Padova **Signature:**
Staff Scientist, Dynamac Corporation **Date:** 5/26/04

QC Reviewer: Teri S. Myers, Ph.D. **Signature:**
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Primary Reviewer: Contractor Draft Copy

Secondary Reviewer(s): **Date:**
{EPA/OECD/PMRA}

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Date Evaluation Completed:

CITATION: Redgrave, V. 1993. Chlorothalonil: Bobwhite Quail Dietary Reproduction and Tolerance Studies. Unpublished study performed by Huntingdon Research Centre Ltd., Huntingdon, Cambridgeshire, England. Laboratory Project No. VCM 11/930496. Study sponsored by Vischim S.r.l. Milano, Italy. Study initiated March 30, 1992 and submitted December 10, 1993.

EXECUTIVE SUMMARY:

The one-generation reproductive toxicity of chlorothalonil to groups (24 pens/treatment level) of one male and one female, 6-month old Northern Bobwhite quail was assessed over approximately 22 weeks. Chlorothalonil was administered to the birds in the diet at nominal concentrations of 0 (negative control), 40, 160, or 640 ppm. Mean-measured concentrations were <1.5 (<LOD, control), 41, 153, and 624 ppm a.i., respectively.

A treatment-related reduction in the number of eggs laid/hen and thus in the number of 14-day old survivors/hen were observed at the 624 ppm a.i. level. The number of eggs laid/hen was 62.0 for the control group, and 62.4, 68.9, and 51.0 for the 41, 153, and 624 ppm a.i. test groups, respectively. The number of 14-day old survivors/hen was 37.2 for the control group, and 42.8, 42.2, and 30.4 for the 41, 153, and 624 ppm a.i. test groups, respectively. Although not statistically-significant, these findings were of biological significance. There were no other treatment-related effects on any adult or offspring parameter.

This study is scientifically sound, fulfills guideline requirements for the reproductive toxicity of chlorothalonil to Northern Bobwhite quail (§71-4a), and is classified as CORE.

Results Synopsis

Test Organism Size/Age: Approximately 6 months old at test initiation (167-233 g)

NOEC: 153 ppm a.i.

LOEC: 624 ppm a.i.

Endpoint(s) Affected: Egg production.

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: The study protocol was based on procedures of the U.S. EPA Pesticide Assessment Guidelines, §71-4 (1982).
Deviations from §71-4 are:

- Mortality of the quail during acclimation was not described.
- The reduced initial photo-period was only maintained for 4 weeks, instead of the recommended 8 weeks.
- Humidity levels maintained during egg storage and hatching were not reported.

These deviations do not affect the validity or acceptability of the study.

COMPLIANCE: Signed and dated GLP, Quality Assurance, and Data Confidentiality statements were provided. This study was conducted in accordance with United States, United Kingdom, EC, OECD, and Japan GLP standards (p. 3).

A. MATERIALS:

1. Test Material Chlorothalonil

Description: White powder

Lot No./Batch No.: 71

Purity: 99.18%

Stability of Compound

Under Test Conditions: The stability of chlorothalonil was verified in treated feed stored for up to 4 days under animal room conditions, or for up to 4 days under frozen (-20°C) conditions followed by 3 days under animal room conditions (actual use).

In Trial 1 stability assessment, samples of treated feed were stored under animal room conditions for 7 and 14 days. Although chlorothalonil was stable in the 640 ppm feed, losses of 14 and 19% were observed after 7 and 14 days, respectively, in the 40 ppm feed (Table 4 of Appendix 17, p. 293). In Trial 2 stability assessment, samples were stored for 4 days under animal room or frozen conditions and the frozen samples were analyzed, then stored a further 3 days under animal room conditions. Chlorothalonil was relatively stable (losses of ≤8.3%) under these actual use conditions (Table 4 of Appendix 17, p. 294).

Storage conditions

of test chemical: Room temperature in the dark

OECD requires water solubility, stability in water and light, pK_a , P_{ow} , and vapor pressure of the test compound. OECD requirements were not reported.

2. Test organism:

Table 1: Test organism.

Parameter	Details	Remarks
		Criteria
Species (common and scientific names):	Northern Bobwhite quail (<i>Colinus virginianus</i>)	<i>EPA requires: a wild waterfowl species, preferably the mallard, Anas platyrhynchos, or an upland game species, preferably the northern bobwhite, Colinus virginianus.</i>
Age at Study Initiation:	Approximately 6 months	It was stated that birds were approaching their first breeding season. <i>EPA requires: birds should be approaching their first breeding season.</i>
Body Weight: (mean and range)	Males: Overall range (n=96) 167 to 233 g, with group means of 191 to 200 g. Females: Overall range (n=96) 168 to 220 g, with group means of 191 to 196 g.	Individual body weights were recorded at Weeks -2, 0, 2, 4, 6, 8 and 22 (test termination). <i>EPA requires that body weights should be recorded at test initiation and at biweekly intervals up to week eight or up to the onset of egg laying and at termination.</i>
Source:	B.C. Potter Rosdean, Woodhurst, Cambridgeshire, England	Birds were phenotypically indistinguishable from wild birds. Prior to receipt, the birds received a

Parameter	Details	Remarks
		Criteria
		routine course of anti-coccidial and anti-protozoal medication and the supplier reported no health problems (p. 15). <i>EPA requires that all birds should be from the same source.</i>

B. STUDY DESIGN:

1. Experimental Conditions

a. Range-finding Study - A 4-week preliminary study (November-December 1991) was conducted using three replicates (one male and one female) per level at nominal test concentrations of 0 (negative control), 30, 150, and 600 ppm chlorothalonil (Part II, pp. 302-314). All birds were observed daily for mortality and clinical signs. Body weights were measured on Days -7, 1 (prior to treated diet introduction), 7, 14, 21, and 28 (test termination). Food consumption was recorded weekly for each replicate.

No mortalities occurred and all birds remained in good health throughout the study. There were also no treatment-related effects on body weight or food consumption.

b. Definitive Study

Table 2: Experimental Parameters.

Parameter	Details	Remarks
		<i>Criteria</i>
Acclimation period: Conditions (same as test or not): Feeding: Health (any mortality observed):	2 weeks Same as test Water and feed were provided <i>ad libitum</i> . Pre-test mortality was not reported.	The study author reported that at the start of the 2-week pre-treatment period, all birds appeared to be in good health. Quail were fed Special Diets Services (SDS) Quail Layers Diet (batch numbers 7279, 7543, 7755, 7871, and 7973; Witham, Essex, England; Appendix 1, pp. 35-39), and provided domestic quality potable water (Anglian Water; Appendix 2, pp. 40-45). EPA recommends a 2-3 week health observation period prior to selection of birds for treatment. Birds must be generally healthy without excess mortality. Feeding should be <i>ad libitum</i> , and sickness, injuries or mortality be noted.
Test duration pre-laying exposure: egg-laying exposure: withdrawal period, if used:	10 weeks 12 weeks None	EPA requires <u>Pre-laying exposure duration</u> At least 10 weeks prior to the onset of egg-laying. <u>Exposure duration with egg-laying</u> At least 10 weeks

Parameter	Details	Remarks
		<i>Criteria</i>
		<i><u>Withdrawal period</u></i> <i>If reduced reproduction is evident, a withdrawal period of up to 3 weeks should be added to the test phase.</i>
Pen (for parental and offspring) size: construction materials: number:	Parents (one pair) were housed in battery breeding cages measuring 0.31 x 0.39 x 0.24 m, with sloping floors and 0.1-m egg catchers. Offspring (by set and group) were housed in wooden box floor pens (size not reported). Polythene coated steel wire 24 parental pens/treatment level	Chick bedding consisted of wood shavings. <i><u>Pens</u></i> <i>Adequate room and arranged to prevent cross contamination</i> <i><u>Materials</u></i> <i>Nontoxic material and nonbinding material, such as galvanized steel.</i> <i><u>Number</u></i> <i>At least 5 replicate pens are required for mallards housed in groups of 7. For other arrangements, at least 12 pens are required, but considerably more may be needed if birds are kept in pairs. Chicks are to be housed according to parental grouping.</i>
Number of birds per pen (male:female)	2 birds/pen (1 male:1 female)	<i>EPA requires one male and 1 female per pen. For quail, 1 male and 2 females is acceptable. For ducks, 2 males and 5 females is acceptable.</i>
Number of pens per group/treatment	20 pens	

Parameter	Details	Remarks
		<i>Criteria</i>
negative control: solvent control: treated:	N/A 20 pens/treatment	<i>EPA requires at least 12 pens, but considerably more if birds are kept in pairs. At least 16 is strongly recommended.</i>
Test concentrations (ppm diet) nominal: measured:	0 (negative control), 40, 160, and 640 ppm <1.5 (<LOD, control), 41, 153, and 624 ppm	The analytical report is provided in Appendix 17, pp. 280-301. Mean-measured concentrations were reviewer-calculated from individual results of analysis of freshly-prepared diets for Weeks 1, 12, and 22 (Table 2 of Appendix 17, p. 291). Mean-measured results were adjusted for procedural recoveries (p. 289). <i>EPA requires at least two concentrations other than the control are required; three or more are recommended.</i>
Maximum labeled field residue anticipated and source of information:	Not specified	<i>EPA requires that the highest test concentrations should show a significant effect or be at or above the actual or expected field residue level. The source [i.e., maximum label rate (in lb ai/A & ppm), label registration no., label date, and site should be cited]</i>

Parameter	Details	Remarks
		<i>Criteria</i>
Solvent/vehicle, if used type: amount:	None used	<i>EPA requires corn oil or other appropriate vehicle not more than 2% of diet by weight</i>
Was detailed description and nutrient analysis of the basal diet provided? (Yes/No)	Yes	The composition of SDS avian layer diet (various batches) is provided in Appendix 1, pp. 35-39). Offspring received HRC chick diet in meal form (Batches 8, 9, 10, and 11) or crumb form (Batch 2) supplied from Parker Brothers Ltd., Lark Mills, Suffolk, England, without the addition of test substance (p. 20).
		<i>EPA requires a commercial breeder feed (or its equivalent) that is appropriate for the test species.</i>
Preparation of test diet	A pre-mix was prepared weekly by mixing the appropriate amount of test substance directly with untreated basal diet in a Turbula mixer for at least 5 minutes (premix, p. 16). Final diets were also prepared weekly by direct dilution of the prepared pre-mix. The appropriate	<i>A premixed containing the test substance should be mechanically mixed with basal diet. If an evaporative vehicle is used, it must be completely evaporated prior to feeding.</i>

Parameter	Details	Remarks
		<i>Criteria</i>
	<p>quantity of pre-mix was combined with additional basal ration and mixed for at least 7 minutes in a double-cone blender prior to offering.</p> <p>Prepared diets were fed twice weekly with fresh diet formulation for the first 4 days and replaced mid-week with diet formulation stored in the freezer (p. 289).</p>	
Indicate whether stability and homogeneity of test material in diet determined (Yes/No)	Yes	
Were concentrations in diet verified by chemical analysis?	Yes	Samples were analyzed from feed prepared for Weeks 1, 12, and 22 (Table 2 of Appendix 17, p. 291).
Did chemical analysis confirm that diet was stable? and homogeneous?	<p>Yes, for up to 4 days under animal room conditions, or for up to 4 days under frozen (-20°C) conditions followed by 3 days under animal room conditions.</p> <p>Yes</p>	<p>Stability and homogeneity were assessed prior to the definitive study in treated feed prepared at 40 and 640 ppm (p. 17).</p> <p>In Trial 1 stability assessment, samples of treated feed were stored under animal room conditions for 7 and 14 days. Although chlorothalonil was stable in the 640 ppm feed, losses of 14 and 19% were</p>

Parameter	Details	Remarks
		<i>Criteria</i>
		<p>observed after 7 and 14 days, respectively, in the 40 ppm feed (Table 4 of Appendix 17, p. 293). In Trial 2 stability assessment, samples were stored for 4 days under animal room or frozen conditions and the frozen samples were analyzed, then stored a further 3 days under animal room conditions. Chlorothalonil was relatively stable (losses of $\leq 8.3\%$) under these actual use conditions (Table 4 of Appendix 17, p. 294).</p> <p>For homogeneity assessment, duplicate random samples were collected from the top, middle, and bottom of each prepared batch. Coefficients of Variation among the six locations were 2.79% at the 40 ppm level and 0.43% at the 640 ppm level (Table 3, of Appendix 17, p. 292).</p>
Feeding and husbandry	Feeding and husbandry conditions appeared to be adequate, given guideline recommendations.	
Test conditions (pre-laying) temperature:	23-25°C (mean daily min	Light intensity ranged from 80 to 120 lux (p. 16).

Parameter	Details	Remarks
relative humidity: photo-period:	and max temperature) 84% (mean daily relative humidity) 7 hr light/day up through Week 4; 16 hr light/day thereafter.	<p align="center"><i>Criteria</i></p> <p><i>EPA Requires</i> <i>Temperature:</i> <i>About 21 °C (70 °F)</i> <i>Relative humidity:</i> <i>About 55%</i> <i>Lighting</i> <i>First 8 weeks: 7 h per day.</i> <i>Thereafter: 16-17 h per day.</i> <i>At least 6 foot candles at bird level.</i></p>
Egg Collection and Incubation		
Egg collection and storage collection interval: storage temperature: storage humidity:	Daily 16°C Not reported	<p><i>EPA requires eggs to be collected daily; egg storage temperature approximately 16 °C (61 °F); humidity approximately 65%.</i></p>
Were eggs candled for cracks prior to setting for incubation?	Yes	<p><i>EPA requires eggs to be candled on day 0</i></p>
Were eggs set weekly?	Yes	
Incubation conditions temperature: humidity:	37.7°C 55%	Eggs were allowed to reach room temperature prior to incubation.
When candling was done for fertility?	Day 11 for embryo viability and Day 18 for embryo survival.	<p><i>EPA requires:</i> <i>Quail: approx. day 11</i> <i>Ducks: approx. day 14</i></p>
When the eggs were transferred to		

Parameter	Details	Remarks
		<i>Criteria</i>
the hatcher?	Day 21	<i>EPA requires: Bobwhite: day 21 Mallard: day 23</i>
Hatching conditions temperature: humidity: photo-period:	37.5°C Not reported 17 hours light/day (hatchlings)	<i>EPA requires: temperature of 39°C (102°F) humidity of 70%</i>
Day the hatched eggs were removed and counted	All hatched chicks were transferred to floor pens within 24 hours of hatching. Any unhatched eggs remaining after 3 days (Day 24) were classed as dead in shell, with a record made of whether or not the shells had been pipped.	<i>EPA requires Bobwhite: day 24 Mallard: day 27</i>
Were egg shells washed and dried for at least 48 hrs before measuring?	Yes, shells were washed and air-dried for at least 48 hours.	
Egg shell thickness no. of eggs used: intervals: mode of measurement:	The first egg laid from each replicate. The first day of Weeks 12, 14, 16, 18, 20, and 22. Four points around the equatorial circumference were measured to the nearest 0.01 mm.	<i>EPA requires newly hatched eggs be collected at least once every two weeks. Thickness of the shell plus membrane should be measured to the nearest 0.01 mm; 3 - 4 measurements per shell.</i>
Reference chemical, if used	None used	

2. Observations:

Table 3: Observations.

Parameter	Details	Remarks/Criteria
Parameters measured		
Parental: (mortality, body weight, mean feed consumption)	<ul style="list-style-type: none"> - mortality - body weight - food consumption - signs of toxicity - necropsy 	<i>EPA requires:</i> <ul style="list-style-type: none"> · Eggs laid/pen · Eggs cracked/pen · Eggs set/pen · Viable embryos/pen · Live 3-week embryos/pen · Normal hatchlings/pen · 14-day-old survivors/pen · 14-day-old survivors/pen · Weights of 14-day-old survivors (mean per pen) · Egg shell thickness
Egg collection and subsequent development: (no. of eggs laid, no. of eggs cracked, shell thickness, no. of eggs set, no. of viable embryos, no. of live 3 week embryos, no. hatched, no. of 14-day survivors, average weight of 14-day-old survivors, mortality, gross hatchling body weight)	<ul style="list-style-type: none"> - eggs laid - eggs cracked/damaged - eggshell thickness - eggs set - viable embryos - live 3-week embryos - number of normal hatchlings - hatchling body weight 	
Indicate if the test material was regurgitated	No indications of dietary regurgitation was reported.	
Observation intervals (for various parameters)	Parental and hatchling mortality and signs of toxicity were recorded once daily. Parental body weights were recorded at Weeks -2, 0, 2, 4, 6, 8, and 22 (test termination). Parental food consumption was determined twice weekly. All adult birds were subject to a gross pathological examination.	<i>Body weights and food consumption must be measured at least biweekly.</i>
Were raw data included?	Yes, sufficient.	

I. RESULTS AND DISCUSSION:

A. MORTALITY:

No treatment-related mortality was observed during the study; however, eight incidental deaths occurred, one in the 40 ppm group, two in the 160 ppm group, and five in the 640 ppm group (p. 22 and Appendix 4, p. 48).

One female from the 40 ppm group was sacrificed *in extremis* on Day 82 (Week 12). No clinical effects were reportedly observed prior to death (Appendix 3, pp. 46-47); however, necropsy revealed reduced feathering on head, cuts on the head and right foot, and reduced muscle and subcutaneous fat (Appendix 7a, p. 61). Necropsy of the pen-mate was unremarkable.

One male from the 160 ppm group was found hanging dead from the wire mesh cage on Day 49 (Week 7). Necropsy of this animal and its pen-mate were unremarkable. Another male from the 160 ppm group was found dead on Day 126 (Week 18); this animal exhibited cuts on both feet from Days 100-125. Necropsy revealed thinness, cut and swollen feet (both), and the liver coated in a clear gelatinous substance. Necropsy of the pen-mate showed reduced feathering on the head, but was otherwise unremarkable.

One male from the 640 ppm group was sacrificed *in extremis* on Day 10 (Week 2); this animal exhibited a cut on the top of the head, thinness, weakness, and inability to stand from Days 1-10. Necropsy revealed a small cut on the head, reduced muscle and subcutaneous fat, an enlarged gall bladder, and green discoloration of the liver. On Day 138 (Week 20), one male was found dead without having exhibited prior clinical effects. Necropsy of this bird revealed reduced feather on the neck, rump, and vent, and a pecked right leg. Also on Day 138, a female was sacrificed *in extremis*; this animal exhibited a cut on the top of the head from Days 43-111. Necropsy revealed a large swelling on the left side of the head, and a small cut on the head. Another female was sacrificed *in extremis* on Day 141 (Week 21) without having exhibited prior clinical effects. Necropsy revealed a swollen right wing elbow joint. The last death that occurred in the 640 ppm group was a female found dead on Day 155 (Week 23); a cut on the top of the head was observed in this animal from Days 67-70 and 107-156. Necropsy revealed reduced feathering on the head, a cut on the head, and reduced muscle and subcutaneous fat. For all mortalities that occurred in the 640 ppm group, necropsies of the pen-mates were unremarkable.

No other mortalities were observed during the study, and due to the nature of lesions observed at necropsy, these deaths were considered not to be related to treatment. Although the incidence of mortality was greater in the highest dose group, the study author reported that the deaths were related to long-term housing in cages, and not to treatment.

Table 4: Effect of Chlorothalonil on Mortality of *Colinus virginianus*.

Observation Period

	Week 7		Week 14		Week 23	
	No. Dead Male Female	No. Dead Male Female	No. Dead Male Female	No. Dead Male Female	No. Dead Male Female	No. Dead Male Female
Control	0	0	0	0	0	0
41 (40)	0	0	0	1	0	1
153 (160)	1	0	1	0	2	0
624 (640)	1	0	1	0	2	3

B. REPRODUCTIVE AND OTHER ENDPOINTS:

Abnormal Effects/Behavior: No overt signs of toxicity were observed at any test level. Incidental clinical observations normally associated with long-term housing in cages and/or cage mate aggression were observed and included cuts of the head and feet (Appendix 3, pp. 46-47). One bird from the 40 ppm group became weak and was noted to be thin from Days 141-156 (study termination); however, this observation was considered to be incidental and not related to treatment (p. 22).

Food Consumption: No treatment-related effects on food consumption were observed, and there was no evidence that the palatability of the diet was affected by the test material (p. 22 and Table 2, p. 27). Overall feed consumption averaged 18-19 g/bird/day for all test groups.

Body Weight: No treatment-related effects on body weight were observed (p. 22 and Table 1, p. 26).

Necropsy: All necropsy findings were considered incidental to treatment and primarily related to long-term housing in cages (p. 22 and Appendix 7b, pp. 62-63).

Reproductive Effects: No treatment-related effects were observed on egg quality, fertility, embryonic development, hatchability, or survival of hatchlings (Tables 3-8, pp. 28-33). Although not statistically-significant, a treatment-related reduction in the number of eggs laid/hen and thus in the number of 14-day old survivors/hen were observed at the 640 ppm level (p. 23). These findings were of biological significance.

All chicks appeared to be in good clinical health throughout the study (Appendix 14, pp. 112-257). A single chick produced during Week 21 from the 160 ppm group was unable to walk after hatching due to a twisted leg (p. 24); however, this effect was not considered to be related to treatment. No treatment-related abnormalities were observed in any chick

examined post-mortem.

Table 5: Reproductive and other parameters (nominal concentrations; study author-reported).

Parameter	Control	40 ppm	160 ppm	640 ppm	NOEC/ LOEC
Eggs laid	1488	1437	1555	1140	N/A
Eggs laid/hen	62.0	62.4	68.9	51.0 ¹	160 ppm 640 ppm
Eggs cracked (damaged)	55	23	58	36	N/A
Eggs cracked/eggs laid (%)	3.7	1.6	3.7	3.2	640 ppm >640 ppm
Shell thickness (mm)	0.20	0.21	0.21	0.20	640 ppm >640 ppm
Eggs set	1304	1288	1364	985	N/A
Viable embryos	1132	1226	1254	881	N/A
Viable embryos/eggs set (%)	87	95	92	89	640 ppm >640 ppm
Live 3-week embryos	1079	1209	1197	841	N/A
Live 3-week embryos/viable embryos (%)	95	99	95	95	640 ppm >640 ppm
No. of normal hatchlings	956	1070	1059	739	N/A
No. of dead in shell - pipped	51	53	58	44	N/A
No. of dead in shell - not pipped	72	86	77	51	N/A
No. of normal hatchlings/viable embryos (%)	84	87	84	84	640 ppm >640 ppm
No. of normal hatchlings/live 3-week embryos (%)	89	89	88	88	640 ppm >640 ppm
Hatchling weight (g)	6.8	7.0	6.7	6.8	640 ppm >640 ppm

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Parameter	Control	40 ppm	160 ppm	640 ppm	NOEC/ LOEC
No. of 14-day old survivors	888	987	950	684	N/A
No. of 14-day old survivors/hen	37.2	42.8	42.2	30.4 ¹	160 ppm 640 ppm
No. of 14-day old survivors/No. of normal hatchlings (%)	93	92	90	93	640 ppm >640 ppm
No. of 14-day old survivors/eggs laid (%)	60	69	61	60	640 ppm >640 ppm
14-day old survivors weight (g)	24	25	24	25	640 ppm >640 ppm
Mean adult food consumption (g/pn/day)	18	19	18	18	640 ppm >640 ppm
Weight of adult males, g at start of treatment: at Week 8: at Week 22 (study termination):	195 203 213	200 206 219	193 199 207	191 203 211	640 ppm >640 ppm
Weight of adult females, g at start of treatment: at Week 8: at Week 22 (study termination):	193 221 226	196 228 231	191 221 230	192 219 221	640 ppm >640 ppm
Gross pathology (incidence of animals exhibiting pathological findings at study termination)	8/48	6/46	8/44	11/38	640 ppm >640 ppm

N/A = Not statistically-analyzed.

¹ Not statistically-significant, but considered to be of biological importance.

C. REPORTED STATISTICS:

The following variables were statistically analyzed: adult body weight, adult feed consumption, eggs laid per female, eggs cracked of eggs laid, viable embryos of eggs set, live 3-week embryos of viable embryos, normal hatchlings of viable embryos, normal hatchlings of live 3-week embryos, 14-day old survivors per hen, 14-day old survivors of eggs laid, 14-day old survivors of normal hatchlings, egg shell thickness, and offspring's body weight (Appendix 16, pp. 267-279).

Proportional data were transformed (angular transformation for the proportion of damaged eggs and a modified angular transformation for all remaining proportional data) prior to analysis. An analysis of variance (ANOVA) was performed to determine statistically-significant differences between groups. Williams test was then used to compare the treatment means with the control group mean. Nominal concentrations were used for all estimations.

D. VERIFICATION OF STATISTICAL RESULTS:

Statistical Method: Analysis was conducted using "chicks.sas" (Ver. 3; March 2002), a SAS program provided by EFED/OPP/USEPA. Data for all endpoints were examined graphically using box plots to determine if they exhibited a dose-dependent response, which was ultimately used to select the multiple comparison test to detect LOAEC and NOAEC. Data for each endpoint were tested to determine if their distributions were normal and if their variances were homogeneous using Shapiro-Wilk's and Levene's tests, respectively. Data that satisfied these assumptions were subjected to Dunnett's and William's tests and data that did not satisfy these assumptions were subjected to the non-parametric MannWhitney-U (with a Bonferroni adjustment) and Jonckheere's tests. Data for dead birds were excluded from the analyses. See Appendix I for output of reviewer's statistical verification and graphs for affected endpoints to support any reviewer-generated conclusions that may differ from those reported in the study.

Table 6. Reproductive and other parameters (mean-measured concentrations; reviewer-report ed).

Parameter	Control	41 ppm	153 ppm	624 ppm	NOEC/ LOEC
Eggs laid/pen	62.00	62.39	68.27	50.00	640 ppm >640 ppm
Eggs cracked/pen	2.29	1.00	2.55	1.74	640 ppm >640 ppm
Eggs not cracked/eggs laid (%)	96.14	98.40	95.76	94.23	640 ppm

Parameter	Control	41 ppm	153 ppm	624 ppm	NOEC/ LOEC
					>640 ppm
Eggs set/pen	54.33	55.91	59.86	42.89	640 ppm >640 ppm
Shell thickness	0.25	0.21	0.21	0.20	640 ppm >640 ppm
Eggs set/eggs laid (%)	87.40	88.88	86.37	81.57	640 ppm >640 ppm
Viable embryo/pen	47.17	53.00	56.45	39.42	640 ppm >640 ppm
Viable embryos/eggs set (%)	87.65	94.90	92.44	90.94	640 ppm >640 ppm
Live embryos/pen	44.96	52.48	53.86	37.68	640 ppm >640 ppm
Live embryo/viable embryo (%)	95.18	98.98	94.76	94.13	640 ppm >640 ppm
No. of hatchlings/pen	39.83	46.43	47.64	33.32	640 ppm >640 ppm
No. of hatchlings/eggs laid (%)	64.89	73.53	68.58	63.44	640 ppm >640 ppm
No. of hatchlings/eggs set (%)	73.81	82.58	77.83	76.62	640 ppm >640 ppm
No. of hatchlings/live embryos (%)	87.75	87.84	87.19	88.01	640 ppm >640 ppm
Hatchling survival/pen	37.00	42.83	42.73	30.68	640 ppm >640 ppm
Hatchling survival/eggs set (%)	68.28	76.58	70.00	69.99	640 ppm >640 ppm
Hatchling survival/no. of hatchlings (%)	92.22	92.44	88.75	90.00	640 ppm >640 ppm

Parameter	Control	41 ppm	153 ppm	624 ppm	NOEC/ LOEC
Hatchling weight (g)	6.89	7.09	6.76	6.74	640 ppm >640 ppm
Survivor weight (g)	24.38	25.64	25.50	24.33	640 ppm >640 ppm
Mean food consumption (g/bird/day)	17.54	18.83	17.82	19.16	640 ppm >640 ppm
Male weight gain (g)	18.21	18.13	14.14	18.37	640 ppm >640 ppm
Female weight gain (g)	31.29	33.87	40.23	29.68	640 ppm >640 ppm

E. STUDY DEFICIENCIES:

There were no significant deficiencies from §71-4a that affected the validity or acceptability of this study.

F. REVIEWER'S COMMENTS:

Results of the reviewer's statistical analyses were similar to those of the study author, in that no statistically significant differences from control were detected. The reviewer agrees with the study author's comments that biologically significant differences occurred for egg production, so these conclusions are reported in the Conclusions and Executive Summary sections.

At study initiation (Week 0), the body weight of male number 163 was reported as 132 g (p. 55 of Appendix 5). This was obviously a typographical error, as the body weight of this bird was 187 g at the start of acclimation (Week -2), and 184 g at Week 2.

G. CONCLUSIONS:

This study is scientifically sound, fulfills U.S. EPA guideline §71-4a, and is classified as CORE.

NOEC: 153 ppm a.i.

LOEC: 624 ppm a.i.

Endpoint(s) Affected: Egg production.

III. REFERENCES:

A reference list was not provided.

APPENDIX I. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION:

Bobwhite repro, Chorthalonil, MRID 45710218

PRINTOUT OF RAW DATA

Obs	TRT	EL	EC	ENC_EL	ES	ES_EL	VE	VE_ES	LE	LE_VE	NH	NH_EL	NH_ES
1	Ctrl	56	12	78.57	37	66.07	34	91.89	31	91.18	24	42.86	64.86
2	Ctrl	54	0	100.00	48	88.89	48	100.00	47	97.92	40	74.07	83.33
3	Ctrl	70	2	97.14	62	88.57	61	98.39	61	100.00	55	78.57	88.71
4	Ctrl	38	4	89.47	30	78.95	26	86.67	24	92.31	17	44.74	56.67
5	Ctrl	79	4	94.94	69	87.34	67	97.10	56	83.58	35	44.30	50.72
6	Ctrl	70	8	88.57	56	80.00	9	16.07	9	100.00	7	10.00	12.50
7	Ctrl	78	1	98.72	71	91.03	71	100.00	66	92.96	62	79.49	87.32
8	Ctrl	70	3	95.71	61	87.14	60	98.36	59	98.33	52	74.29	85.25
9	Ctrl	72	0	100.00	66	91.67	66	100.00	66	100.00	63	87.50	95.45
10	Ctrl	54	0	100.00	48	88.89	45	93.75	44	97.78	41	75.93	85.42
11	Ctrl	81	0	100.00	75	92.59	9	12.00	8	88.89	8	9.88	10.67
12	Ctrl	74	0	100.00	68	91.89	64	94.12	59	92.19	50	67.57	73.53
13	Ctrl	46	0	100.00	42	91.30	42	100.00	42	100.00	40	86.96	95.24
14	Ctrl	58	3	94.83	49	84.48	40	81.63	33	82.50	28	48.28	57.14
15	Ctrl	55	2	96.36	47	85.45	47	100.00	43	91.49	40	72.73	85.11
16	Ctrl	57	0	100.00	52	91.23	48	92.31	46	95.83	44	77.19	84.62
17	Ctrl	56	1	98.21	49	87.50	49	100.00	49	100.00	49	87.50	100.00
18	Ctrl	60	1	98.33	53	88.33	44	83.02	40	90.91	25	41.67	47.17
19	Ctrl	72	1	98.61	65	90.28	65	100.00	63	96.92	60	83.33	92.31
20	Ctrl	72	1	98.61	65	90.28	65	100.00	64	98.46	59	81.94	90.77
21	Ctrl	63	1	98.41	57	90.48	53	92.98	53	100.00	52	82.54	91.23
22	Ctrl	56	6	89.29	47	83.93	41	87.23	39	95.12	35	62.50	74.47
23	Ctrl	60	5	91.67	52	86.67	48	92.31	47	97.92	44	73.33	84.62
24	Ctrl	37	0	100.00	35	94.59	30	85.71	30	100.00	26	70.27	74.29
25	Dose1	81	4	95.06	71	87.65	71	100.00	67	94.37	51	62.96	71.83
26	Dose1	81	2	97.53	73	90.12	71	97.26	69	97.18	69	85.19	94.52
27	Dose1	73	0	100.00	67	91.78	61	91.04	64	104.92	61	83.56	91.04
28	Dose1	.	.	.	.	.	.	.	.	.	.	.	.
29	Dose1	58	0	100.00	52	89.66	48	92.31	48	100.00	40	68.97	76.92
30	Dose1	79	1	98.73	72	91.14	72	100.00	72	100.00	68	86.08	94.44
31	Dose1	72	0	100.00	66	91.67	66	100.00	66	100.00	61	84.72	92.42
32	Dose1	17	1	94.12	14	82.35	14	100.00	14	100.00	14	82.35	100.00
33	Dose1	77	3	96.10	68	88.31	64	94.12	62	96.88	54	70.13	79.41
34	Dose1	0	0	0	0	0	0	0	0	0	0	0	0
35	Dose1	76	0	100.00	70	92.11	68	97.14	68	100.00	65	85.53	92.86
36	Dose1	77	0	100.00	71	92.21	67	94.37	67	100.00	64	83.12	90.14
37	Dose1	76	3	96.05	67	88.16	64	95.52	62	96.88	37	48.68	55.22
38	Dose1	72	1	98.61	65	90.28	63	96.92	62	98.41	45	62.50	69.23

39	Dose1	3	0	100.00	3	100.00	3	100.00	3	100.00	2	66.67	66.67
40	Dose1	29	0	100.00	16	55.17	14	87.50	14	100.00	11	37.93	68.75
41	Dose1	70	2	97.14	62	88.57	60	96.77	60	100.00	60	85.71	96.77
42	Dose1	62	1	98.39	55	88.71	55	100.00	55	100.00	52	83.87	94.55
43	Dose1	80	1	98.75	73	91.25	67	91.78	67	100.00	65	81.25	89.04
44	Dose1	70	0	100.00	64	91.43	34	53.13	31	91.18	29	41.43	45.31
45	Dose1	75	0	100.00	69	92.00	69	100.00	69	100.00	65	86.67	94.20
46	Dose1	47	1	97.87	43	91.49	43	100.00	42	97.67	42	89.36	97.67
47	Dose1	78	0	100.00	72	92.31	72	100.00	72	100.00	51	65.38	70.83
48	Dose1	82	3	96.34	73	89.02	73	100.00	73	100.00	62	75.61	84.93
49	Dose2	81	1	98.77	74	91.36	74	100.00	73	98.65	69	85.19	93.24
50	Dose2												
51	Dose2	71	1	98.59	64	90.14	64	100.00	64	100.00	61	85.92	95.31
52	Dose2	71	1	98.59	64	90.14	63	98.44	62	98.41	56	78.87	87.50
53	Dose2	70	1	98.57	63	90.00	62	98.41	62	100.00	36	51.43	57.14
54	Dose2	76	0	100.00	70	92.11	69	98.57	68	98.55	61	80.26	87.14
55	Dose2	77	5	93.51	67	87.01	66	98.51	59	89.39	49	63.64	73.13
56	Dose2	67	0	100.00	61	91.04	43	70.49	42	97.67	37	55.22	60.66
57	Dose2	83	4	95.18	73	87.95	73	100.00	71	97.26	67	80.72	91.78
58	Dose2	69	2	97.10	61	88.41	57	93.44	48	84.21	37	53.62	60.66
59	Dose2	80	0	100.00	74	92.50	70	94.59	69	98.57	67	83.75	90.54
60	Dose2	76	3	96.05	65	85.53	49	75.38	38	77.55	26	34.21	40.00
61	Dose2	74	0	100.00	68	91.89	68	100.00	66	97.06	63	85.14	92.65
62	Dose2	31	3	90.32	18	58.06	7	38.89	7	100.00	6	19.35	33.33
63	Dose2												
64	Dose2	61	0	100.00	55	90.16	55	100.00	54	98.18	54	88.52	98.18
65	Dose2	42	3	92.86	35	83.33	35	100.00	33	94.29	33	78.57	94.29
66	Dose2	72	0	100.00	67	93.06	65	97.01	63	96.92	59	81.94	88.06
67	Dose2	74	5	93.24	65	87.84	62	95.38	61	98.39	55	74.32	84.62
68	Dose2	83	1	98.80	76	91.57	76	100.00	76	100.00	57	68.67	75.00
69	Dose2	71	22	69.01	42	59.15	35	83.33	22	62.86	10	14.08	23.81
70	Dose2	74	0	100.00	68	91.89	62	91.18	60	96.77	58	78.38	85.29
71	Dose2	24	3	87.50	18	75.00	18	100.00	18	100.00	18	75.00	100.00
72	Dose2	75	1	98.67	69	92.00	69	100.00	69	100.00	69	92.00	100.00
73	Dose3												
74	Dose3	72	1	98.61	65	90.28	55	84.62	55	100.00	46	63.89	70.77
75	Dose3	68	1	98.53	62	91.18	61	98.39	61	100.00	56	82.35	90.32
76	Dose3	50	16	68.00	14	28.00	13	92.86	10	76.92	7	14.00	50.00
77	Dose3	22	0	100.00	19	86.36	16	84.21	16	100.00	16	72.73	84.21
78	Dose3	2	1	50.00	0	0.00	0	0	0	0.00			
79	Dose3	36	2	94.44	30	83.33	27	90.00	26	96.30	24	66.67	80.00
80	Dose3	81	0	100.00	75	92.59	55	73.33	54	98.18	40	49.38	53.33

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81	Dose3	62	0	100.00	56	90.32	55	98.21	53	96.36	45	72.58	80.36
82	Dose3	78	5	93.59	67	85.90	63	94.03	62	98.41	59	75.64	88.06
83	Dose3	29	1	96.55	25	86.21	23	92.00	22	95.65	22	75.86	88.00
84	Dose3	57	1	98.25	50	87.72	50	100.00	50	100.00	49	85.96	98.00
85	Dose3	61	0	100.00	56	91.80	54	96.43	51	94.44	49	80.33	87.50
86	Dose3	.	.	.	.	.	.	.	.	.	.	.	.
87	Dose3	.	.	.	.	.	.	.	.	.	.	.	.
88	Dose3	76	0	100.00	70	92.11	70	100.00	70	100.00	69	90.79	98.57
89	Dose3	1	0	100.00	1	100.00	1	100.00	1	100.00	1	100.00	100.00
90	Dose3	65	1	98.46	59	90.77	53	89.83	41	77.36	29	44.62	49.15
91	Dose3	.	.	.	.	.	.	.	.	.	.	.	.
92	Dose3	47	0	100.00	44	93.62	44	100.00	43	97.73	37	78.72	84.09
93	Dose3	57	2	96.49	50	87.72	41	82.00	34	82.93	29	50.88	58.00
94	Dose3	9	0	100.00	8	88.89	5	62.50	4	80.00	3	33.33	37.50
95	Dose3	.	.	.	.	.	.	.	.	.	.	.	.
96	Dose3	77	2	97.40	64	83.12	63	98.44	63	100.00	52	67.53	81.25

Bobwhite repro, Chorthalonil, MRID 45710218

PRINTOUT OF RAW DATA (continued)

Obs TRT NH_LE HS HS_ES HS_NH THICK HATWT SURVWT FOOD WTGAINM
WTGAINF

1	Ctrl	77.42	18	48.65	75.00	1.51	7	22	18	56	38		
2	Ctrl	85.11	37	77.08	92.50	0.19	6	23	14	12	24		
3	Ctrl	90.16	51	82.26	92.73	0.22	6	23	14	22	42		
4	Ctrl	70.83	15	50.00	88.24	0.18	7	25	17	10	45		
5	Ctrl	62.50	30	43.48	85.71	0.21	7	26	18	10	45		
6	Ctrl	77.78	6	10.71	85.71	0.20	7	25	19	7	38		
7	Ctrl	93.94	62	87.32	100.00	0.23	7	25	17	39	56		
8	Ctrl	88.14	47	77.05	90.38	0.20	7	26	17	17	46		
9	Ctrl	95.45	59	89.39	93.65	0.20	7	26	17	17	49		
10	Ctrl	93.18	38	79.17	92.68	0.21	7	24	17	-20	41		
11	Ctrl	100.00	8	10.67	100.00	0.22	7	25	18	14	52		
12	Ctrl	84.75	44	64.71	88.00	0.19	7	24	23	-4	31		
13	Ctrl	95.24	36	85.71	90.00	0.23	7	23	16	19	26		
14	Ctrl	84.85	26	53.06	92.86	0.18	7	23	20	34	35		
15	Ctrl	93.02	36	76.60	90.00	0.18	6	22	20	36	-65		
16	Ctrl	95.65	42	80.77	95.45	0.22	7	27	19	-8	28		
17	Ctrl	100.00	45	91.84	91.84	0.20	7	25	15	10	49		
18	Ctrl	62.50	24	45.28	96.00	0.18	7	22	15	30	29		
19	Ctrl	95.24	54	83.08	90.00	0.20	7	23	16	21	28		
20	Ctrl	92.19	58	89.23	98.31	0.21	8	25	21	5	33		
21	Ctrl	98.11	52	91.23	100.00	0.19	7	25	21	7	35		
22	Ctrl	89.74	33	70.21	94.29	0.19	7	27	17	28	34		

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23	Ctrl	93.62	43	82.69	97.73	0.20	8	25	16	55	-17
24	Ctrl	86.67	24	68.57	92.31	0.20	7	24	16	20	29
25	Dose1	76.12	49	69.01	96.08	0.19	7	27	17	31	56
26	Dose1	100.00	68	93.15	98.55	0.23	8	27	17	20	54
27	Dose1	95.31	56	83.58	91.80	0.20	7	26	17	22	26
28	Dose1	.	.	.	.	.	.	.	.	.	.
29	Dose1	83.33	40	76.92	100.00	0.21	6	24	21	33	17
30	Dose1	94.44	62	86.11	91.18	0.19	7	23	18	24	30
31	Dose1	92.42	58	87.88	95.08	0.22	7	25	20	20	55
32	Dose1	100.00	13	92.86	92.86	0.20	7	25	15	21	-17
33	Dose1	87.10	48	70.59	88.89	0.22	7	26	21	12	40
34	Dose1	0	.	.	.	.	19	35	48	.	.
35	Dose1	95.59	60	85.71	92.31	0.21	7	26	19	7	45
36	Dose1	95.52	61	85.92	95.31	0.21	7	26	18	13	51
37	Dose1	59.68	28	41.79	75.68	0.21	8	22	23	20	63
38	Dose1	72.58	39	60.00	86.67	0.21	7	23	16	12	40
39	Dose1	66.67	2	66.67	100.00	.	8	28	17	10	-25
40	Dose1	78.57	11	68.75	100.00	0.19	8	24	17	15	31
41	Dose1	100.00	60	96.77	100.00	0.20	7	25	17	11	41
42	Dose1	94.55	47	85.45	90.38	0.19	7	27	20	30	35
43	Dose1	97.01	61	83.56	93.85	0.20	7	30	20	39	55
44	Dose1	93.55	26	40.63	89.66	0.21	8	27	21	21	37
45	Dose1	94.20	59	85.51	90.77	0.22	7	26	20	-10	38
46	Dose1	100.00	37	86.05	88.10	0.19	7	25	18	0	-24
47	Dose1	70.83	44	61.11	86.27	0.21	8	27	23	22	38
48	Dose1	84.93	56	76.71	90.32	0.21	7	25	19	9	45
49	Dose2	94.52	68	91.89	98.55	0.23	7	25	16	47	58
50	Dose2	.	.	.	.	.	.	.	.	.	.
51	Dose2	95.31	53	82.81	86.89	0.20	7	25	19	26	54
52	Dose2	90.32	53	82.81	94.64	0.20	7	26	17	10	46
53	Dose2	58.06	33	52.38	91.67	0.21	7	23	16	9	54
54	Dose2	89.71	57	81.43	93.44	0.23	6	25	17	39	48
55	Dose2	83.05	48	71.64	97.96	0.20	6	25	19	-6	10
56	Dose2	88.10	28	45.90	75.68	0.22	7	27	18	16	45
57	Dose2	94.37	63	86.30	94.03	0.21	7	26	20	31	56
58	Dose2	77.08	24	39.34	64.86	0.20	6	20	14	10	46
59	Dose2	97.10	63	85.14	94.03	0.20	7	24	18	17	44
60	Dose2	68.42	20	30.77	76.92	0.20	7	22	17	12	37
61	Dose2	95.45	61	89.71	96.83	0.22	7	26	16	10	46
62	Dose2	85.71	5	27.78	83.33	0.19	6	25	16	9	48
63	Dose2
64	Dose2	100.00	44	80.00	81.48	0.20	7	24	17	5	32

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65	Dose2	100.00	33	94.29	100.00	0.21	7	24	18	7	20
66	Dose2	93.65	55	82.09	93.22	0.22	7	25	15	8	48
67	Dose2	90.16	53	81.54	96.36	0.21	7	27	17	18	31
68	Dose2	75.00	35	46.05	61.40	0.20	7	23	22	6	31
69	Dose2	45.45	9	21.43	90.00	0.20	6	21	19	5	48
70	Dose2	96.67	57	83.82	98.28	0.20	7	25	17	37	39
71	Dose2	100.00	17	94.44	94.44	0.17	7	26	19	-15	-5
72	Dose2	100.00	61	88.41	88.41	0.23	7	25	25	10	49
73	Dose3										
74	Dose3	83.64	43	66.15	93.48	0.19	8	23	22	0	36
75	Dose3	91.80	53	85.48	94.64	0.19	8	27	23	24	73
76	Dose3	70.00	5	35.71	71.43	0.21	6	21	18	-26	45
77	Dose3	100.00	15	78.95	93.75	0.20	7	28	19	23	2
78	Dose3	0					15	18	40		
79	Dose3	92.31	21	70.00	87.50	0.20	6	24	17	7	36
80	Dose3	74.07	31	41.33	77.50	0.20	8	28	27	13	54
81	Dose3	84.91	43	76.79	95.56	0.20	7	26	20	13	40
82	Dose3	95.16	59	88.06	100.00	0.22	6	24	19	74	43
83	Dose3	100.00	19	76.00	86.36	0.19	7	23	18	31	1
84	Dose3	98.00	46	92.00	93.88	0.18	6	25	22	15	34
85	Dose3	96.08	40	71.43	81.63	0.20	7	28	20	18	40
86	Dose3										
87	Dose3										
88	Dose3	98.57	62	88.57	89.86	0.23	6	25	20	31	29
89	Dose3	100.00	1	100.00	100.00		6	22	16	33	54
90	Dose3	70.73	28	47.46	96.55	0.21	7	21	17	4	39
91	Dose3										
92	Dose3	86.05	35	79.55	94.59	0.21	6	24	17	12	-13
93	Dose3	85.29	28	56.00	96.55	0.22	6	23	16	24	22
94	Dose3	75.00	2	25.00	66.67	0.20	6	19	20	12	-42
95	Dose3										
96	Dose3	82.54	52	81.25	100.00	0.20	7	27	18	23	31

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE EL (Eggs Laid)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.874	<.001	4.859	0.004	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	62.00	12.04	2.46	19.42	56.92, 67.08
Dose1	23	62.39	25.34	5.28	40.62	51.43, 73.35
Dose2	22	68.27	15.75	3.36	23.06	61.29, 75.25
Dose3	19	50.00	26.21	6.01	52.41	37.37, 62.63

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	60.00	37.00	81.00		
Dose1	73.00	0.00	82.00	100.63	-0.63
Dose2	73.00	24.00	83.00	110.12	-10.12
Dose3	57.00	1.00	81.00	80.65	19.35

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	9.70	0.021

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	60.00		
Dose1	73.00	1.000	0.959
Dose2	73.00	1.000	0.981
Dose3	57.00	0.448	0.407

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SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE NEG_EC (Eggs Cracked)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.616	<.001	1.490	0.223	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	2.29	3.00	0.61	130.90	1.03, 3.56
Dose1	23	1.00	1.24	0.26	124.32	0.46, 1.54
Dose2	22	2.55	4.65	0.99	182.55	0.49, 4.61
Dose3	19	1.74	3.66	0.84	210.97	0.00, 3.50

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	1.00	0.00	12.00		
Dose1	1.00	0.00	4.00	43.64	56.36
Dose2	1.00	0.00	22.00	111.07	-11.07
Dose3	1.00	0.00	16.00	75.79	24.21

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	3.34	0.343

MannWhit(Bon) - testing each trt median signif. greater than control

Jonckheere - test assumes dose-response relationship, testing positive trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	1.00		
Dose1	1.00	1.000	0.929
Dose2	1.00	1.000	0.537
Dose3	1.00	1.000	0.729

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE ENC_EL ((EL-EC)/EL (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.602	<.001	3.577	0.017	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	96.14	5.25	1.07	5.46	93.93, 98.36
Dose1	22	98.40	1.86	0.40	1.89	97.57, 99.22
Dose2	22	95.76	6.94	1.48	7.25	92.68, 98.84
Dose3	19	94.23	12.92	2.96	13.71	88.00, 100.00

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	98.37	78.57	100.00		
Dose1	98.74	94.12	100.00	102.34	-2.34
Dose2	98.59	69.01	100.00	99.60	0.40
Dose3	98.53	50.00	100.00	98.01	1.99

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	2.15	0.543

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	98.37		
Dose1	98.74	1.000	0.911
Dose2	98.59	1.000	0.560
Dose3	98.53	1.000	0.588

Data Evaluation Report on the Reproductive Effects of Chlorothalonil on *Colinus virginianus*

PMRA Submission Number

EPA MRID Number 45710218

SUMMARY

NOEC

LOEC

MannWhit (Bonf adjust) Dose3 >highest dose

Jonckheere Dose3 >highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE ES (Eggs Set)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.885	<.001	4.824	0.004	USE NON-PARAMETRIC TESTS

**

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	54.33	11.90	2.43	21.91	49.31, 59.36
Dose1	23	55.91	23.70	4.94	42.38	45.66, 66.16
Dose2	22	59.86	16.65	3.55	27.81	52.48, 67.24
Dose3	19	42.89	24.78	5.69	57.78	30.95, 54.84

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	52.50	30.00	75.00		
Dose1	67.00	0.00	73.00	102.91	-2.91
Dose2	65.00	18.00	76.00	110.18	-10.18
Dose3	50.00	0.00	75.00	78.95	21.05

**

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	9.89	0.020

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	52.50		
Dose1	67.00	1.000	0.968
Dose2	65.00	1.000	0.974
Dose3	50.00	0.432	0.341

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE ES_EL (EggsSet/EggsLaid (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.575	<.001	4.125	0.009	USE NON-PARAMETRIC TESTS

**

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	87.40	5.89	1.20	6.74	84.91, 89.89
Dose1	22	88.88	8.14	1.74	9.16	85.27, 92.49
Dose2	22	86.37	9.83	2.10	11.38	82.01, 90.73
Dose3	19	81.57	24.58	5.64	30.13	69.73, 93.42

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	88.73	66.07	94.59		
Dose1	90.71	55.17	100.00	101.70	-1.70
Dose2	90.14	58.06	93.06	98.82	1.18
Dose3	88.89	0.00	100.00	93.34	6.66

**

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	2.80	0.423

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	88.73		
Dose1	90.71	1.000	0.961
Dose2	90.14	1.000	0.810
Dose3	88.89	1.000	0.590

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE VE (Viable Embryo(d14))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.886	<.001	2.052	0.113	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	47.17	16.93	3.46	35.89	40.02, 54.32
Dose1	23	53.00	23.46	4.89	44.26	42.86, 63.14
Dose2	22	56.45	18.30	3.90	32.42	48.34, 64.57
Dose3	19	39.42	23.16	5.31	58.76	28.26, 50.59

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	48.00	9.00	71.00		
Dose1	64.00	0.00	73.00	112.37	-12.37
Dose2	62.50	7.00	76.00	119.69	-19.69
Dose3	50.00	0.00	70.00	83.58	16.42

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	11.43	0.010

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	48.00		
Dose1	64.00	1.000	0.972
Dose2	62.50	1.000	0.985
Dose3	50.00	1.000	0.377

Data Evaluation Report on the Reproductive Effects of Chlorothalonil on *Colinus virginianus*

PMRA Submission Number

EPA MRID Number 45710218

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE VE_ES (ViableEmbryo/EggsSet (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.614	<.001	1.631	0.188	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	87.65	23.42	4.78	26.72	77.76, 97.54
Dose1	22	94.90	10.03	2.14	10.56	90.46, 99.35
Dose2	22	92.44	14.51	3.09	15.70	86.01, 98.87
Dose3	18	90.94	10.36	2.44	11.39	85.79, 96.09

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	93.93	12.00	100.00		
Dose1	97.20	53.13	100.00	108.28	-8.28
Dose2	98.47	38.89	100.00	105.47	-5.47
Dose3	93.44	62.50	100.00	103.75	-3.75

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	4.22	0.238

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	93.93		
Dose1	97.20	1.000	0.915
Dose2	98.47	1.000	0.881
Dose3	93.44	0.969	0.395

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE LE (Live Embryo(d21))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.898	<.001	1.836	0.147	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	44.96	16.38	3.34	36.43	38.04, 51.87
Dose1	23	52.48	23.36	4.87	44.52	42.38, 62.58
Dose2	22	53.86	19.21	4.10	35.66	45.35, 62.38
Dose3	19	37.68	23.00	5.28	61.03	26.60, 48.77

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	46.50	8.00	66.00	.	.
Dose1	62.00	0.00	73.00	116.73	-16.73
Dose2	61.50	7.00	76.00	119.81	-19.81
Dose3	43.00	0.00	70.00	83.82	16.18

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups
 Degrees of Freedom TestStat P-value
 3 11.50 0.009

MannWhit(Bon) - testing each trt median signif. less than control
 Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	46.50	.	.
Dose1	62.00	1.000	0.991
Dose2	61.50	1.000	0.985
Dose3	43.00	0.626	0.413

Data Evaluation Report on the Reproductive Effects of Chlorothalonil on *Colinus virginianus*

PMRA Submission Number

EPA MRID Number 45710218

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE LE_VE (LiveEmbryo/ViableEmbryo (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.762	<.001	4.733	0.004	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	95.18	5.16	1.05	5.43	93.00, 97.36
Dose1	22	98.98	2.64	0.56	2.67	97.81, 100.00
Dose2	22	94.76	9.08	1.94	9.58	90.74, 98.79
Dose3	18	94.13	8.41	1.98	8.94	89.94, 98.31

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	97.35	82.50	100.00		
Dose1	100.00	91.18	104.92	103.99	-3.99
Dose2	98.28	62.86	100.00	99.56	0.44
Dose3	97.95	76.92	100.00	98.90	1.10

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups
 Degrees of Freedom TestStat P-value
 3 9.32 0.025

MannWhit(Bon) - testing each trt median signif. less than control
 Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	97.35		
Dose1	100.00	1.000	0.998
Dose2	98.28	1.000	0.739
Dose3	97.95	1.000	0.462

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE NH (Number Hatched)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.934	<.001	1.004	0.395	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	39.83	16.17	3.30	40.59	33.01, 46.66
Dose1	23	46.43	21.52	4.49	46.35	37.13, 55.74
Dose2	22	47.64	19.30	4.11	40.51	39.08, 56.19
Dose3	19	33.32	21.03	4.83	63.13	23.18, 43.45

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	40.50	7.00	63.00	.	.
Dose1	52.00	0.00	69.00	116.57	-16.57
Dose2	55.50	6.00	69.00	119.59	-19.59
Dose3	37.00	0.00	69.00	83.64	16.36

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups
 Degrees of Freedom TestStat P-value
 3 8.52 0.036

MannWhit(Bon) - testing each trt median signif. less than control
 Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	40.50	.	.
Dose1	52.00	1.000	0.966
Dose2	55.50	1.000	0.965
Dose3	37.00	0.473	0.354

Data Evaluation Report on the Reproductive Effects of Chlorothalonil on *Collnus virginianus*

PMRA Submission Number

EPA MRID Number 45710218

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE NH_EL (NumberHatched/EggsLaid (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.873	<.001	1.254	0.295	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	64.89	22.50	4.59	34.67	55.39, 74.39
Dose1	22	73.53	15.23	3.25	20.71	66.78, 80.28
Dose2	22	68.58	22.00	4.69	32.07	58.83, 78.34
Dose3	19	63.44	25.88	5.94	40.79	50.96, 75.91

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	73.70	9.88	87.50		
Dose1	81.80	37.93	89.36	113.31	-13.31
Dose2	78.47	14.08	92.00	105.69	-5.69
Dose3	72.58	0.00	100.00	97.75	2.25

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups
 Degrees of Freedom TestStat P-value
 3 2.94 0.401

MannWhit(Bon) - testing each trt median signif. less than control
 Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	73.70		
Dose1	81.80	1.000	0.905
Dose2	78.47	1.000	0.785
Dose3	72.58	1.000	0.423

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE NH_ES (NumberHatched/EggsSet (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Shapiro-Wilks Levenes Levenes Conclusion

Test Stat	P-value	Test Stat	P-value	
0.871	<.001	1.046	0.377	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	73.81	24.06	4.91	32.59	63.65, 83.97
Dose1	22	82.58	15.01	3.20	18.17	75.93, 89.23
Dose2	22	77.83	22.41	4.78	28.80	67.90, 87.77
Dose3	18	76.62	18.99	4.48	24.78	67.18, 86.06

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	84.62	10.67	100.00		
Dose1	89.59	45.31	100.00	111.89	-11.89
Dose2	87.32	23.81	100.00	105.45	-5.45
Dose3	82.67	37.50	100.00	103.81	-3.81

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	2.38	0.498

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	84.62		
Dose1	89.59	1.000	0.908
Dose2	87.32	1.000	0.836
Dose3	82.67	1.000	0.564

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE NH_LE (NumberHatched/LiveEmbryo (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.876	<.001	0.601	0.616	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	87.75	10.62	2.17	12.10	83.27, 92.24
Dose1	22	87.84	12.05	2.57	13.72	82.49, 93.18
Dose2	22	87.19	14.42	3.07	16.53	80.80, 93.58
Dose3	18	88.01	10.43	2.46	11.85	82.82, 93.19

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	91.18	62.50	100.00		
Dose1	93.88	59.68	100.00	100.10	-0.10
Dose2	91.99	45.45	100.00	99.36	0.64
Dose3	88.92	70.00	100.00	100.29	-0.29

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	0.28	0.963

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	91.18		
Dose1	93.88	1.000	0.698
Dose2	91.99	1.000	0.694
Dose3	88.92	1.000	0.605

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE HS (Hatching Survival(d14))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.950	0.002	0.877	0.457	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	37.00	15.75	3.22	42.58	30.35, 43.65
Dose1	23	42.83	20.38	4.25	47.59	34.01, 51.64
Dose2	22	42.73	19.01	4.05	44.49	34.30, 51.16
Dose3	19	30.68	19.96	4.58	65.06	21.06, 40.31

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	37.50	6.00	62.00	.	.
Dose1	48.00	0.00	68.00	115.75	-15.75
Dose2	50.50	5.00	68.00	115.48	-15.48
Dose3	31.00	0.00	62.00	82.93	17.07

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	6.46	0.091

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	37.50	.	.
Dose1	48.00	1.000	0.941
Dose2	50.50	1.000	0.919
Dose3	31.00	0.474	0.299

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE HS_ES (HatchingSurvival/EggsSet (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.888	<.001	2.011	0.119	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	68.28	23.31	4.76	34.14	58.44, 78.12
Dose1	22	76.58	15.36	3.27	20.05	69.77, 83.39
Dose2	22	70.00	23.91	5.10	34.16	59.40, 80.60
Dose3	18	69.99	20.89	4.92	29.85	59.60, 80.37

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	77.07	10.67	91.84		
Dose1	83.57	40.63	96.77	112.15	-12.15
Dose2	81.81	21.43	94.44	102.51	-2.51
Dose3	76.39	25.00	100.00	102.49	-2.49

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	1.72	0.633

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	77.07		
Dose1	83.57	1.000	0.871
Dose2	81.81	1.000	0.730
Dose3	76.39	1.000	0.483

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE HS_NH (HatchingSurvival/NumberHatched (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01

Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05

Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Shapiro-Wilks Levenes Levenes Conclusion

Test Stat P-value Test Stat P-value

0.892 <.001 4.236 0.008 USE NON-PARAMETRIC TESTS

**

BASIC SUMMARY STATISTICS

Level N Mean StdDev StdErr Coef of Var 95% Conf.Interval

Ctrl	24	92.22	5.57	1.14	6.04	89.87, 94.58
Dose1	22	92.44	5.78	1.23	6.25	89.88, 95.01
Dose2	22	88.75	10.72	2.28	12.07	84.00, 93.50
Dose3	18	90.00	9.81	2.31	10.90	85.12, 94.88

Level Median Min Max %of Control(means) %Reduction(means)

Ctrl	92.59	75.00	100.00		
Dose1	92.06	75.68	100.00	100.24	-0.24
Dose2	93.33	61.40	100.00	96.23	3.77
Dose3	93.81	66.67	100.00	97.59	2.41

**

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom TestStat P-value

3 0.44 0.932

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level Median MannWhit(Bon adjust)p-value Jonckheere p-value

Ctrl	92.59		
Dose1	92.06	1.000	0.548
Dose2	93.33	1.000	0.320
Dose3	93.81	1.000	0.408

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE THICK (Eggshell thickness)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.215	<.001	2.994	0.036	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	0.25	0.27	0.05	104.73	0.14, 0.37
Dose1	21	0.21	0.01	0.00	5.19	0.20, 0.21
Dose2	22	0.21	0.01	0.00	6.94	0.20, 0.21
Dose3	17	0.20	0.01	0.00	5.43	0.20, 0.21

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	0.20	0.18	1.51		
Dose1	0.21	0.19	0.23	80.76	19.24
Dose2	0.20	0.17	0.23	80.87	19.13
Dose3	0.20	0.18	0.23	79.41	20.59

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	2.33	0.507

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	0.20		
Dose1	0.21	1.000	0.868
Dose2	0.20	1.000	0.889
Dose3	0.20	1.000	0.659

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE HATWT (Hatchling Weight)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.988	0.590	3.272	0.025	USE NON-PARAMETRIC TESTS

**

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	6.89	0.49	0.10	7.10	6.68, 7.09
Dose1	22	7.09	0.45	0.10	6.31	6.89, 7.29
Dose2	22	6.76	0.38	0.08	5.56	6.60, 6.93
Dose3	18	6.74	0.66	0.16	9.85	6.41, 7.07

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	7.00	5.70	7.80		
Dose1	7.00	6.40	7.90	102.95	-2.95
Dose2	6.75	6.00	7.40	98.20	1.80
Dose3	6.50	6.00	8.20	97.92	2.08

**

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	6.35	0.096

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	7.00		
Dose1	7.00	1.000	0.863
Dose2	6.75	0.488	0.156
Dose3	6.50	0.403	0.036

SUMMARY NOEC LOEC
 MannWhit (Bonf adjust) Dose3 >highest dose
 Jonckheere Dose2 Dose3

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE SURVWT (Survivor Wt (d14))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
 Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.
 Shapiro-Wilks Shapiro-Wilks Levenes Levenes Conclusion
 Test Stat P-value Test Stat P-value
 0.982 0.290 2.537 0.062 USE PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS
 Level N Mean StdDev StdErr Coef of Var 95% Conf.Interval
 Ctrl 24 24.38 1.50 0.31 6.15 23.74, 25.01
 Dose1 22 25.64 1.81 0.39 7.08 24.83, 26.44
 Dose2 22 24.50 1.79 0.38 7.32 23.71, 25.29
 Dose3 18 24.33 2.66 0.63 10.92 23.01, 25.65

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	25.00	22.00	27.00		
Dose1	26.00	22.00	30.00	105.17	-5.17
Dose2	25.00	20.00	27.00	100.51	-0.51
Dose3	24.00	19.00	28.00	99.83	0.17

 **

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
 Analysis of Variance (ANOVA) - overall F-test
 Numerator df Denominator df F-stat P-value
 3 82 2.22 0.091

Dunnnett - testing each trt mean signif. less than control
 Williams - test assumes dose-response relationship, testing negative trend
 Tukey - two-sided tests, all possible comparisons, not used for NOEC or LOEC

Level Mean Dunnnett Isotonic Williams Tukey p-values

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	p-value	mean	p-value	Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	24.38	24.98	0.131	0.996	1.000			
Dose1	25.64	0.999	24.98	0.915	0.218	0.157		
Dose2	24.50	0.832	24.50	0.709		0.993		
Dose3	24.33	0.735	24.33	0.606				

SUMMARY

Dunnett

Williams

NOEC

Dose3

Dose3

LOEC

>highest dose

>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE FOOD (Food Consumption)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
 Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.
 Shapiro-Wilks Shapiro-Wilks Levenes Levenes Conclusion
 Test Stat P-value Test Stat P-value
 0.953 0.003 0.427 0.734 USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	17.54	2.28	0.47	13.02	16.58, 18.51
Dose1	23	18.83	2.12	0.44	11.29	17.91, 19.74
Dose2	22	17.82	2.38	0.51	13.38	16.76, 18.87
Dose3	19	19.16	2.89	0.66	15.09	17.76, 20.55

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	17.00	14.00	23.00		
Dose1	19.00	15.00	23.00	107.32	-7.32
Dose2	17.00	14.00	25.00	101.58	-1.58
Dose3	19.00	15.00	27.00	109.21	-9.21

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
 Kruskal-Wallis test - equality among treatment groups
 Degrees of Freedom TestStat P-value
 3 6.95 0.073

MannWhit(Bon) - testing each trt median signif. less than control
 Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	17.00		
Dose1	19.00	1.000	0.977
Dose2	17.00	1.000	0.631
Dose3	19.00	1.000	0.906

Data Evaluation Report on the Reproductive Effects of Chlorothalonil on *Colinus virginianus*

PMRA Submission Number

EPA MRID Number 45710218

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE WTGAINM (Male wt gain)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.957	0.005	0.728	0.538	USE NON-PARAMETRIC TESTS

**

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	18.21	17.90	3.65	98.30	10.65, 25.77
Dose1	23	18.13	11.47	2.39	63.27	13.17, 23.09
Dose2	22	14.14	14.43	3.08	102.10	7.74, 20.54
Dose3	19	18.37	19.04	4.37	103.66	9.19, 27.55

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	17.00	-20.00	56.00		
Dose1	20.00	-10.00	39.00	99.57	0.43
Dose2	10.00	-15.00	47.00	77.64	22.36
Dose3	18.00	-26.00	74.00	100.88	-0.88

**

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	2.95	0.400

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	17.00		
Dose1	20.00	1.000	0.649
Dose2	10.00	0.407	0.120
Dose3	18.00	1.000	0.353

Data Evaluation Report on the Reproductive Effects of Chlorothalonil on *Colinus virginianus*

PMRA Submission Number

EPA MRID Number 45710218

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, Chorthalonil, MRID 45710218
 ANALYSIS RESULTS FOR VARIABLE WTGAINF (Female wt gain)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS

Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
 Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
 Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks	Shapiro-Wilks	Levenes	Levenes	Conclusion
Test Stat	P-value	Test Stat	P-value	
0.815	<.001	0.799	0.498	USE NON-PARAMETRIC TESTS

 **

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	24	31.29	24.95	5.09	79.72	20.76, 41.83
Dose1	23	33.87	24.61	5.13	72.65	23.23, 44.51
Dose2	22	40.23	15.46	3.30	38.43	33.37, 47.08
Dose3	19	29.68	26.44	6.07	89.08	16.94, 42.43

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	35.00	-65.00	56.00		
Dose1	40.00	-25.00	63.00	108.24	-8.24
Dose2	46.00	-5.00	58.00	128.56	-28.56
Dose3	36.00	-42.00	73.00	94.86	5.14

 **

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	4.57	0.206

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	35.00		
Dose1	40.00	1.000	0.817
Dose2	46.00	1.000	0.964
Dose3	36.00	1.000	0.663

SUMMARY	NOEC	LOEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose