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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

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AUG 16 1988

OFFICE OF  
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

**SUBJECT:** EPA Id. No.: 069001. Pyrethrins: Submission of rat and rabbit teratology range finding studies in response to a prior request from Toxicology Branch. Assignment of the Core Classification for the rat teratology study.

TOX CHEM No.: 715  
TOX PROJECT No.: 8-0852  
Record No.: 221240

**FROM:** John Doherty *J. Doherty 2/3/89*  
Toxicology Branch  
Hazard Evaluation Division (TS-769)

**TO:** Geraldine Werdig  
DATA-CALL-IN Section  
Registration Division (TS-767)

**THROUGH:** Edwin Budd  
Section Head  
Toxicology Branch  
Hazard Evaluation Division (TS-769)

*Budd  
8/10/88*

Rat and rabbit teratology studies assessing for potential developmental toxicity of pyrethrins were previously submitted to the Agency by the Pyrethrin Joint Venture/Chemical Specialties Manufacturers Association (PJV/CSMA) and reviewed (refer to J. Doherty review dated October 10, 1987, attached). In the original reviews of these studies it was noted that the range finding studies were not included in the final reports and Toxicology Branch requested that these studies be provided. The range finding study for the rat teratology study was especially important because the high dose level selected for the main study did not result in toxicity to the dams, a condition that is desirable for the study to be deemed acceptable. The PJV/CSMA has submitted the range finding studies for the rat and rabbit teratology studies as requested. This information was reviewed and the following comments apply.

Toxicology Branch Comments

1. The rat and rabbit dose range finding studies were reviewed and classified as CORE SUPPLEMENTARY.
2. The information presented in the rabbit range finding study was determined by TB to justify the selection of the dose levels used in the definitive teratology study. Therefore the classification of this study as CORE GUIDELINES is supported.
2. The information presented in the rat range finding study was determined by TB to indicate that the selection of the dose level of 75 mg/kg/day as the highest test dose level for the definitive rat teratology study was at best marginally acceptable. The toxicity noted at this level in the range finding study (two rats showing signs of tremors on one day each) is not considered to be sufficient to meet the criteria that the dams shows signs of maternal toxicity. When this dose level was used in the definitive study, no signs of maternal toxicity resulted. Selection of a higher dose level (for example 125 mg/kg/day) would more likely have resulted in definite signs of toxicity in the dams.

In spite of the fact that no signs of maternal toxicity resulted in the definitive study, TB does not consider any scientific or regulatory purpose would be served by requiring that a second rat teratology study be conducted.

Thus, the CORE classification of the rat teratology study (IRDC #556-002, July 30, 1987, refer to review by J. Doherty dated October 10, 1987) is assigned as GUIDELINES and meets the testing requirement for a rat teratology study.

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Reviewed by: J.D. Doherty *J. Doherty 8/3/88*  
Section II, Tox. Branch (TS-769C)  
Secondary reviewer: E.R. Budd  
Section II, Tox. Branch (TS-769C)

*8/10/88*

DATA EVALUATION REPORT

STUDY TYPE: 83-3. Teratology -rats                      TOX. CHEM. NO.: 715  
(Range finding study)

ACCESSION NO.: 406037-01                                      MRID NO.: Not provided

TEST MATERIAL: Pyrethrum Extract, Task Force Blend #FEK-99,  
08/05/86

SYNONYMS:

STUDY NUMBER(S): IRDC #556-001

SPONSOR:        Pyrethrin Joint Venture/Chemical Specialty  
                  Manufacturers Association

TESTING FACILITY: IRDC

TITLE OF REPORT: Range Finding Teratology Study in Rats with  
                         Pyrethrum Extract

AUTHOR(S): James L. Schardein

REPORT ISSUED: August 26, 1987

CONCLUSIONS:

Maternal Toxicity:  
NOEL = 37.5 mg/kg/day  
LEL = 75 mg/kg/day (tremors)  
At 150 mg/kg/day deaths.

Classification: CORE-SUPPLEMENTARY

Special Review Criteria (40 CFR 154.7): N/A

Quality Assurance Statement:

A statement signed by Margery J. Wirth attesting that the study has been reviewed by the IRDC Quality Assurance Department was provided.

## REVIEW

[Note: The definitive teratology study for which this dose range finding study was run was reviewed previously by TB and classification was RESERVED. The highest dose level used in the definitive study did not result in toxicity to the dams a condition that is desirable for classifying a teratology study as CORE MINIMUM or higher. TB requested the registrant to provide the study report for the dose range finding study in order to ascertain that the highest dose level tested was reasonably close to a dose level which results in maternal toxicity. This review of the dose range finding study will emphasize maternal toxicity.]

In this study, five groups of five female rats (assumed pregnant) were dosed with either 0, 37.5, 75, 150, 300 or 600 mg/kg/day of pyrethrins (as active ingredient) on days 6 through 15 of gestation at a volume of 3 mL/kg dissolved in 0.5% methylcellulose. The rats used were Sprague-Dawley derived Charles-River COBS CD obtained from the Charles River Breeding Laboratories, Inc. Portage, Michigan. The rats were mated by pairing with a male of the same strain and source. The surviving females were sacrificed on day 20 of gestation

### Results

#### 1. Survival, Appearance and Behavior.

Deaths resulted in the rats dosed with 150 (2), 300 (3) and 600 (2) mg/kg/day. Due to excessive toxicity in the groups dosed with 300 and 600 mg/kg/day, the remaining rats were sacrificed on gestation day "5" or 6. TB notes that there is an apparent discrepancy here because the first day of dosing was reported as day 6. There should not have been any pyrethrin related toxicity on day 5. The symptoms in the rats which preceded death included convulsions and tremors.

No treatment related effects were reported in the dams dosed with 37.5 mg/kg/day. Some signs of tremors and/or convulsions were reported in two dams dosed with 75 mg/kg/day on one day (day 6 or day 7) for each dam. Four of the five rats dosed with 150 mg/kg/day were reported as displaying tremors and/or convulsions.

#### 2. Body Weight.

No treatment related effects on body weight were reported for the groups dosed with either 37.5, 75 or 150 mg/kg/day. The rats in the groups dosed with either 300 or 600 mg/kg/day were not assessed for body weight changes.

### 3. Uterine Examinations

No effects of pyrethrin treatment at 37.5, 75, or 150 mg/kg/day on the mean number of viable fetuses, mean postimplantation loss and the mean number of implantations or corpora lutea were evident. These parameters were not assessed in the rats dosed with 300 or 600 mg/kg/day of pyrethrin.

### CONCLUSION and DISCUSSION

Based on these data, the testing laboratory determined that dose levels of 0, 5, 25 and 75 mg/kg/day would be appropriate for the definitive teratology study. The testing laboratory's selection of 75 mg/kg/day as the high dose level for the definitive teratology study is considered by TE unwarranted based on the range finding study. For example, the only signs of toxicity were that two rats showed tremors on only one day. This is not considered a significant toxicity response in the range finding study. The selection of a higher dose level (for example a dose level of 100 to 125 mg/kg/day) would more likely have resulted in more definite signs of maternal toxicity.

This study is SUPPLEMENTARY and supports the following one liner.

NOEL = 37.5 mg/kg/day for maternal toxicity

LEL = 75 mg/kg/day, transient tremors in 2 of 5 rats.

At 150 mg/kg/day, deaths result.

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Reviewed by: J.D. Doherty  
Section II, Tox. Branch (TS-769C)  
Secondary reviewer: E.R. Budd  
Section II, Tox. Branch (TS-769C)

8/11/87  
Budd  
10/10/87

DATA EVALUATION REPORT

STUDY TYPE: 83-3. Teratology - Rabbit      TOX CHEM. NO.: 715  
(Range finding study)

ACCESSION NO.: 406037-02      MRID NO.: Not provided

TEST MATERIAL: Pyrethrum Extract (#FEK-99), Task Force Blend  
08/05/86

SYNOPSIS:

STUDY NUMBER(S): IRDC # 556-003

SPONSOR: Pyrethrin Joint Venture/Chemical Specialties  
Manufacturers Association

TESTING FACILITY: IRDC

TITLE OF REPORT: Range-Finding Teratology Study in Rabbits with  
with Pyrethrum Extract

AUTHOR(S): James L. Schardein

REPORT ISSUED: August 11, 1987

CONCLUSIONS:

Maternal toxicity NOEL = 150 mg/kg/day.  
LEL = 300 mg/kg/day (tremors, weight loss)  
At 600 mg/kg/day deaths.

Classification: CORE-SUPPLEMENTARY

Special Review Criteria (40 CFR 154.7): N/A

Quality Assurance Statement:

A statement signed by Margery J. Wirth attesting that the study has been reviewed by the ~~IRDC~~ Quality Assurance Department at the IRDC was provided.

## REVIEW

[Note: The definitive rabbit teratology study for which this dose range finding study was run has already been reviewed by TB and classified as CORE GUIDELINE (refer to the review by J. Doherty dated October 1987). Thus this review of the dose range finding study will emphasize maternal toxicity of pyrethrins to justify selection of the dose levels selected for the definitive study.]

In this study, five groups of five pregnant rabbits (New Zealand White, SPF rabbits, received from the Hazleton Research Animals, Denver, Pa.) were dosed by gavage on days 7 through 19 of gestation with either 0, 37.5, 75, 150, 300 or 600 mg/kg/day of pyrethrins (as 57.57% pyrethrin extract but the dose level is mg/kg of pyrethrin). The rabbits were previously made pregnant by artificial insemination. On gestation day 29, the rabbits were sacrificed by injection of sodium pentobarbital via the marginal ear vein. Following sacrifice, the uterus and ovaries were exposed and the contents examined. The fetuses were not further evaluated for developmental toxicity.

### Results

#### 1. Survival, Appearance and Behavior

Two rabbits in the group dosed with 600 mg/kg/day died apparently as a result of pyrethrin intoxication. All rabbits in this group developed tremors and/or convulsions (in some cases). Only one female in the group dosed with 300 mg/kg/day developed tremors. No treatment related behavioral reactions were reported in the groups dosed with 37.5, 75, or 150 mg/kg/day.

One rabbit dosed with 37.5 mg/kg/day died but its death was not determined to be related to pyrethrin treatment. One rabbit each in the groups dosed with 37.5 and 300 mg/kg/day aborted on days 22 and 25 respectively but the cause of these abortions were not described as being related to pyrethrin treatment.

No compound related differences in necropsy were reported in any of the dosed rabbits.

#### 2. Body Weights.

During the treatment period (days 7-19 of gestation), the does in the groups dosed with 300 or 600 mg/kg/day showed weight loss (about 11 and 19% respectively). No effects on body weight were evident in the groups dosed with 37.5, 75, or 150 mg/kg/day.

#### 3. Uterine Examination.

The rabbits dosed with 600 mg/kg/day had an increase in the mean postimplantation loss (44.4% vs 2.9% for the controls). The

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groups dosed with 150 mg/kg/day (16.7%) and 300 mg/kg/day (12.5%) also had apparent increases in postimplantation loss. There was only doe with viable fetuses in the high dose group. The increase in postimplantation loss noted in the groups dosed with 150 and 300 mg/kg/day was not considered by the testing laboratory to be biologically significant.

CONCLUSION.

This study is SUPPLEMENTARY. The selection of the dose levels of 0, 25, 100 and 250 mg/kg/day for the definitive teratology study was justified. At 300 mg/kg/day and above there is body weight loss and tremors. At 600 mg/kg/day there is significant toxicity to result in death to the does.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

*reviewer*

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OFFICE OF  
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: EPA File No. 069001 - Pyrethrin: Review of Rat  
and Rabbit Teratology Studies.

TOX Chem No.: 715  
TOX Project No.: 7-0898  
Record No.: 201356

FROM: John Doherty *J. Doherty 9/11/87*  
Toxicology Branch  
Hazard Evaluation Division (TS-769C)

TO: Geraldine W. Werdig  
Data Call-In Program  
Registration Division (TS-767C)

THRU: Edwin R. Budd, Section Head  
Toxicology Branch  
Hazard Evaluation Division (TS-769C)

*Budd  
10/21/87*

The Pyrethrin Joint Venture/Chemical Specialties  
Manufacturers Association (CSMA) has responded to the Data  
Call-In Notice by providing rat and rabbit teratology studies.  
Toxicology Branch (TB) has reviewed these studies and is  
providing the following comments.

1. CORE classification of the rat teratology study is RESERVED. The study did not demonstrate any pharmacological effects of treatment in the dams. Such criteria are desirable for studies to be determined to be CORE MINIMUM or higher. TB, however, does not consider it necessary to request a second rat teratology study at this time because there were no indications of potential teratogenicity or developmental toxicity in this study or in the study with rabbits.

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TB requests that the registrant submit the results in detail for the range-finding study with rats.  
The submission should include all reactions at all dose levels together with an indication of the degree of severity where appropriate. On receipt and review of this information, TB will consider upgrading the study to CORE MINIMUM or higher.

2. The rabbit teratology study was determined to be CORE GUIDELINES.

TB requests, however, that the results of the range-finding study with rabbits also be submitted to the Agency.

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Studies Reviewed

<u>Study</u>	<u>Results</u>	<u>Core Classification</u>
Rat Teratology IRDC 556-002 July 30, 1987	NOEL > 75 mg/kg/day <sup>(HDT)</sup> for maternal toxicity, teratogenicity, and fetotoxicity	[RESERVED]
Rabbit Teratology IRDC 556-004 July 22, 1987	Maternal Toxicity NOEL = 25 mg/kg/day Maternal LEL = 100 mg/kg/day (body weight decreases during dosing, one rabbit showed excessive salivation and head arched backward) Teratogenicity and fetotoxicity NOEL > 250 mg/kg/day (HDT).	GUIDELINES
Discussion of rat and rabbit teratology studies as pre- pared by Gerald P. Schoenig, Ph.D. (CSMA) (dated July 31, 1987).	[Document not reviewed in DER] Dr. Schoenig summarizes the results of both the rat and rabbit teratology studies.	N/A

Reviewed By: J.D. Doherty *J. Doherty 7/11/87*  
Section II, Toxicology Branch (TS-769C)  
Secondary Reviewer: E.R. Budd  
Section II, Toxicology Branch (TS-769C) *Budd 7/12/87*

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DATA EVALUATION REPORT

Study Type: Teratology - Rat

TOX Chem No.: 715  
MRID No.: N/A

Accession No.: 402882-02

Test Material: Pyrethrum <sup>Extract</sup> (57.574%) \* FEK-99 (Task Force Blend)

Synonyms:

Study No.: IRDC 556-002

Sponsor: Pyrethrin Joint Venture/CSMA

Testing Facility: International Research and Development Corporation (IRDC)

Title of Report: Evaluation of Pyrethrum Extract in a Definitive Rat Teratology Study

Author(s): J.L. Schardein

Report Issued: July 30, 1987

Conclusions:

NOEL > 75 mg/kg/day (HDT) for maternal toxicity, teratogenicity, and fetotoxicity.

Classification: RESERVED

Special Review Criteria (40 CFR 154.7): N/A

Review:

Part I - Range-Finding Study

Only a brief description of the dose range-finding study was provided. In this study, rats were dosed with 37.5, 75, 150, 300, and 600 mg/kg/day. No information was provided as to the number of rats per group, condition as to pregnancy, and number of times they were dosed. It was reported that maternal toxicity in the form of tremors and/or convulsions and mortality were observed at 150, 300, and 600 mg/kg/day and that tremors were also noted at the 75 mg/kg/day dose level. Based on the results of

the range-finding study, dosage levels of 5, 25, and 75 mg/kg/day were selected for the definitive study.

#### Part II - Definitive Study

Male and female Charles River COBS CD strain rats were mated (one male with one female) and the day of copulation (gestation day 0) noted by the presence of a vaginal plug. Mated females were assigned to one of four groups. The test article was administered by gavage following suspension in 0.5% methylcellulose on days 6 through 15 of gestation. [It was noted that ~~the~~ rats receiving the low dose of 5 mg/kg/day were not dosed on gestation day 6; apparently they were accidentally omitted.]

The rats were sacrificed on gestation day 20 and the dams and pups necropsied; the pups were prepared for teratogenic and developmental toxicity evaluation.

1. Maternal Toxicity - None of the rats in the study died. A single female in the high-dose group delivered its litter on day 19, one day prior to scheduled delivery. There were no effects of pyrethrin administration with respect to body weight gain or behavioral reactions.

There were no appearances of test chemical effects with respect to number of viable fetuses, postimplantation loss, total implantations, corpora lutea, mean fetal body weight, gravid uterine weight, or the sex ratio of the pups. There were 22, 21, 25, and 24 litters available for the control, low-, mid-, and high-dose test groups. There were also 334, 333, 357, and 341 pups available for the control, low-, mid-, and high-dose test groups.

The NOEL for this study is > 75 mg/kg/day. This is not in agreement with the range-finding study which was reported to have demonstrated behavioral reactions at the dose level of 75 mg/kg/day.

2. Fetal Development - All of the available pups were reported to have been examined externally. Approximately one-half of the pups from each dose group were prepared for visceral examination and the remaining half were prepared for skeletal examination.

There was no evidence of a test chemical related effect of pyrethrin on either external, visceral, or skeletal development presented. The anomalies that were reported were present in all dose groups except minor incidences of some variations, which were not present in some of the groups. One example is that "14th rudimentary ribs" were present in litters from dosed dams only. There were 5, 7, and 10 incidences in the low-, mid-, and

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high-dose groups. The frequency of this type of lesion, however, did not exceed the historical control frequency.

The NOELs for both teratogenicity and fetotoxicity are > 75 mg/kg/day (HDT).

No positive control was included in this study but extensive historical control data were appended. The historical control data consisted of 25 control groups for a total of 572 dams and 3384 male and 3282 female pups from studies during the period from June, 1977 to August, 1984. The frequency of observations noted in this study were within the ranges noted for the historical controls.

[Note: Analysis of the test material as prepared for dosing was found to be 94 to 103% of the target dose levels. The dose levels are expressed as mg/kg/day of pyrethrin which was 57.574% of the weight of the test material.]

Conclusion:

CORE classification of this study is RESERVED. TB recognizes that there were no signs of maternal toxicity evident in this study as would be desirable for a CORE MINIMUM or higher study. TB, however, notes that the range-finding study reported that there were behavioral reactions in the dams at the dose level of 75 mg/kg/day, which was selected for the high-dose level in the definitive study. Since there were no indications of potential teratogenicity/developmental toxicity in this study or in the rabbit teratology study, TB does not consider it necessary at this time to request a second teratology study in rats.

The registrant is, however, requested to submit the results of the range-finding study which clearly demonstrates all the responses to the pyrethrin mixture at each of the dose levels in the range-finding study. Upon receipt and review of the data from the range finding study, TB will consider upgrading the study to CORE MINIMUM or higher.

Reviewed By: J.D. Doherty *J. Doherty 9/11/87*  
Section II, Toxicology Branch (TS-769C)  
Secondary Reviewer: E.R. Budd *Budd 10/2/87*  
Section II, Toxicology Branch (TS-769C)

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DATA EVALUATION REPORT

Study Type: Teratology - Rabbit

TOX Chem No.: 715  
MRID No.: N/A

Accession No.: 402882-03

Test Material: Pyrethrum *Extract (Task Force)* Blend, #FEK-99) 57.574% Pyrethrins

Synonyms:

Study Number: IRDC 556-004

Sponsor: Pyrethrin Joint Venture/CSMA

Testing Facility: International Research and Development Corporation (IRDC)

Title of Report: Evaluation of Pyrethrum Extract in a Definitive Rabbit Teratology Study

Author: J.L. Shardein

Report Issued: July 22, 1987

Conclusions:

Maternal NOEL = 25 mg/kg/day  
Maternal LEL = 100 mg/kg/day, body weight gain decreased during dosing, one rabbit showed excessive salivation and head arched backward.

Teratogenicity and fetotoxicity NOEL > 250 mg/kg/day (HDT).

Levels tested 0, 25, 100, and 250 mg/kg/day.

Classification: Core-Guidelines

Special Review Criteria (40 CFR 154.7): N/A

Review:

Part I - Range-Finding Study

Only a brief description of the dose range-finding study was provided. In this study, groups of rabbits were dosed with the

pyrethrin test material at dose levels of 37.5, 75, 150, 300, and 600 mg/kg/day. Neither the number of rabbits in each group, their condition as to pregnancy, nor the number of times they were dosed was provided. It was stated that maternal toxicity, "including tremors/convulsions, death, and fetal toxicity in the form of high postimplantation loss, were observed at 600 mg/kg/day. At 300 mg/kg/day, tremors and weight loss were observed in the does during the treatment period. No obvious signs of fetal or maternal toxicity were observed at the lower levels." No data tables were provided. On this basis, the dose levels of 0, 25, 100, and 250 mg/kg/day were selected for the main definitive study. [Note: The dose is expressed in terms of pyrethrins and not total sample.]

#### Part II - Definitive Study

Four groups of sixteen female New Zealand White SPF (obtained from Hazleton Research Animals, Denver, Pennsylvania) rabbits were artificially inseminated with sperm obtained from bucks of the same strain. The sperm was obtained from eight bucks and pooled and diluted prior to insemination, such that the semen from one male was used to inseminate an equal number of females in each group. Immediately after insemination, ovulation was induced by an injection of 100 U.S.P units of human chorionic gonadotropin into the marginal ear vein.

The test material was administered to each doe on days 7 through 19 of gestation. Prior to administration, the test material was dispersed in 0.5% methylcellulose. The control group received the vehicle alone.

On gestation day 29, the surviving females were sacrificed with sodium pentobarbital and their pups delivered.

#### Results:

1. Maternal Toxicity - None of the dams died. There were some signs of reaction to the test material in the high-dose group and in a single rabbit in the mid-dose group. These signs consisted of excessive salivation, head arched backward, and labored breathing. It should be noted that only two to three rabbits in the high-dose group and a single rabbit in the mid dose group exhibited these symptoms.

Body weight gain was affected in the high- and mid-dose level groups during the dosing period. For example, the rabbits gained 201, 211, 129, and 38 grams for the control, low-, mid-, and high-dose test groups, respectively. Overall, for the 0 to 29 days of gestation, there was no marked effect on body weight gain.

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Other indices of maternal toxicity, including viable fetuses, postimplantation loss, total implantations, or corpora lutea, did not show evidence of test chemical effects.

One doe in the high-dose group aborted near term, but there was no convincing evidence presented that this abortion was due to the test material. Another doe in the high-dose group had a totally resorbed litter, but again there was no evidence that this was due to the test material.

A NOEL for maternal toxicity is assigned as 25 mg/kg/day.

2. Fetal morphological observations (structural anomalies that alter general body conformity, disrupt or interfere with body function or are generally thought to be incompatible with life) and developmental variations (alterations in anatomic structure that are considered to have no significant biological effect on animal health or body conformity, representing slight deviations from normal).

There were 122, 103, 97, and 101 live fetuses available in the control, low-, mid-, and high-dose level test groups, respectively, which were examined externally, viscerally, and skeletally.

There were no patterns of test chemical-related increases in either morphological or developmental anomalies evident. There was no test chemical effect noted on either the sex ratio or the body weights of the fetuses.

The NOEL for both teratogenicity and fetotoxicity is assigned as > 250 mg/kg/day.

No positive control was included in this study but extensive historical control data were appended. The historical control data consisted of 17 control groups for a total of 290 dams and 950 male and 893 female pups from studies during the period May, 1985 to October, 1986. The frequency of observations noted in this study were within the ranges noted for the historical controls.

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Conclusion:

This study is CORE GUIDELINES. The following one-liner pertains:

Maternal Toxicity NOEL = 25 mg/kg/day  
Maternal Toxicity LEL = 100 mg/kg/day; body weight gain during treatment decreased, one rabbit showed signs of excessive salivation and head arched backward.  
Teratogenicity and Fetotoxicity NOEL > 250 mg/kg/day (HDT).

Note: The test material was analyzed for stability and for homogeneity in 0.5% methylcellulose. Data were presented to show that the pyrethrins were stable for 24 hours and that samples from the top, middle, and bottom were within  $\pm 5\%$  of the mean values. The test article concentrations were also reported to be 90 to 104% of the claimed concentrations of 25, 100, and 250 mg/kg/day.

The dose levels are expressed in terms of pyrethrins, which make up 57.574% of the actual sample.