State of California

Memorandum

To : Henry J. Voss
Director

Date : May 22, 1990

Place : Sacramento

Phone: 2-2395

From : Department of Food and Agriculture

Lyndon S. Hawkins, Chairperson
Subcommittee of the Pesticide Registration
and Evaluation Committee

Subject: Bentazon

Attached are the Findings and Recommendations regarding bentazon. These are made pursuant to the requirements of the Pesticide Contamination Prevention Act, and are submitted on behalf of the Subcommittee of the Pesticide Registration and Evaluation Committee.

Attachment

SURNAME

STATE OF CALIFORNIA GEORGE DEUKMEJIAN, Governor

PARTMENT OF FOOD AND AGRICULTURE

SUBCOMMITTEE OF THE
PESTICIDE REGISTRATION AND EVALUATION COMMITTEE

IMPLEMENTATION OF THE PESTICIDE CONTAMINATION PREVENTION ACT
BENTAZON: FINDINGS AND RECOMMENDATIONS.

May 22, 1990

Bentazon has been found in ground water in several counties in the Sacramento and San Joaquin Valleys. Results from sampling and research reported to the subcommittee indicate that bentazon can leach to ground water. Detection of bentazon in the ground water has been attributed to legal agricultural use.

Pursuant to California Department of Food and Agriculture, Notice of Bentazon Finds in California Ground Water and Registrants' Opportunity to Request Hearing dated April 26, 1989, and the Notice of Hearing Pertaining to Bentazon (November 27, 1989), the subcommittee held hearings to review registrant reports, public comment, and other appropriate information regarding the presence of bentazon and breakdown products in ground water and soil in California. After review of this information, the subcommittee offers the following findings and recommendations to the Director. These findings were unanimously agreed upon by representatives of the Department of Health Services, State Water Resources Control Board, and Department of Food and Agriculture.

Donald C. Mengle
Department of Health Services

H. Paul Lillebo
State Water Resources Control Board

Lyndon S. Hawkins
Department of Food and Agriculture, and
Chair, Subcommittee of the Pesticide
Registration Evaluation Committee

Attachment

SUBCOMMITTEE OF THE
PESTICIDE REGISTRATION AND EVALUATION COMMITTEE

IMPLEMENTATION OF THE PESTICIDE CONTAMINATION PREVENTION ACT
BENTAZON: FINDINGS AND RECOMMENDATIONS

May 22, 1990

I. Introduction

The subcommittee, established pursuant to Section 13150 of the Food and Agricultural Code (FAC), has completed its deliberations on the pesticide bentazon. This report contains the findings of the subcommittee as determined by vote of the subcommittee on April 19, 1990.

In arriving at its findings, the subcommittee has carefully considered whether it could make any of the findings specified in subdivision (c) of Section 13150 (FAC).

II. Findings

The subcommittee makes a finding as specified in subdivision C, 2 of Section 13150 of the Food and Agriculture Code.

The subcommittee finds that:

A). Bentazon has polluted the ground waters of the State.

B). Providing that use on rice is not allowed, the use of bentazon can be modified so that there is a high probability that bentazon would not pollute or threaten to pollute the ground waters of the State. Those modifications include:

1). Use on corn permitted with certain limitations.
2). Use on sorghum permitted with certain limitations.
3). Use on peas permitted with certain limitations.
4). Use on dry beans permitted with certain limitations.
5). Not permitted for home use.
6). Restricted material status for bentazon.

Use on dry beans, peas, sorghum, and corn should be restricted to significant pest levels of velvet leaf and nightshade, as determined by a licensed pest control adviser. At this time, use should be limited to dry beans, peas, corn, and sorghum that are sprinkler irrigated or dry-land farmed.

Justification For Finding

Summary:

The detection in wells of bentazon is associated with its use on rice in the Sacramento Valley. No detections of bentazon in ground water have been associated with use of the product on beans, peas, sorghum, or corn, particularly in coastal and southern San Joaquin Valley counties of California. The study by BASF on breakdown of bentazon in soil, although flawed, indicates risk of contamination of ground water to be low in crops that are sprinkler irrigated.

In areas where bentazon will be used, a monitoring program should be established by the registrant, growers, and CDFA. The likelihood of contamination of ground water increases with heavy irrigation or high rainfall within a few days of application.

During the testimony, it was clear that a study which evaluates the behavior of bentazon in furrow-irrigated crops is needed. A cooperative research program needs to be established among the principals including the registrant (BASF), University of California, and CDFA.

In most other cases where pesticides have been found in ground water, the PREC subcommittee has determined that modification of use can substantially reduce the risk of contaminating ground water. Those modifications should be consistent with sound Integrated Pest Management (IPM) strategies and good agricultural practices coupled with a strong monitoring program and comprehensive educational program for growers, pest control advisers and pesticide applicators.

Background:

The detection of bentazon has occurred in wells in ten counties with concentrations ranging from 0.1 to 13.7 parts per billion. Of 190 wells which were analyzed for bentazon between December, 1988 and April, 1989, 63 wells or 33% were confirmed positive. Of all of the monitoring performed by CDFA, no concentrations exceeded the maximum contaminant level for drinking water of 18 parts per billion set by the Department of Health Services. However, BASF discovered levels higher than 18 ppb in one well previously sampled by CDFA.

The toxicological database on bentazon is relatively extensive. Sufficient information was considered available for the Department of Health Services to establish a health-based Proposed Maximum Contaminant Level (PMCL) of 18 ppb for bentazon in drinking water.

The acute toxicity of bentazon is low (rat, oral LD50 is 1100 mg/kg). The compound was not found to be carcinogenic in adequately conducted long-term feeding studies with two rodent species, mice and rats. In teratology studies with rats, no fetal malformations were evident at dose-levels below those which produced maternal toxicity. An acceptable two-generation rat reproduction study revealed no adverse effects on reproductive performance. A battery of standard mutagenicity tests uncovered no adverse effects.

It was reported that "degradation" of bentazon proceeds more quickly than any downward movement through soil to ground water, but no information was provided on the nature or toxicity of the transformation products. (See Attachment 1 for information on toxicology.)

In California, most bentazon is used to control weeds in rice fields. Approximately 60% of the rice fields were treated annually with bentazon before use was suspended as the result of detection of the chemical in wells in the Sacramento Valley.

The registrant suggested that much of the ground water contamination by bentazon under rice fields occurred as a result of leaching of bentazon through exposed sand or gravel strata, and further proposed to prohibit the use of bentazon on fields where such soils occur. The subcomittee concurs that porous soils have contributed to ground water contamination by bentazon. However, locating all such soils, and basing use regulation on their occurrence, would be exceedingly difficult. Additionally, because of the long persistence of

bentazon in anaerobic conditions, there is a high likelihood of movement of bentazon through non-gravelly soils under flooded rice growing practices. Moreover, because of the pervasive ground water contamination by bentazon already evident in rice growing areas, no monitoring program can be envisioned which would ensure that continued use of bentazon in these areas, even at a reduced level, would not contribute further to ground water contamination. Therefore, the subcommittee does not support any use on rice under current cultural practices.

The registrant conducted several studies which evaluated the fate and behavior of bentazon on crops other than rice. Even though there were procedural flaws, the results of these studies indicate that bentazon presents little risk of contaminating ground water for crops that are sprinkler irrigated. Additionally, there is a need to conduct other studies, particularly on furrow irrigated crops.

Aside from chemical properties that are indicative of pesticides that are likely to leach, several factors increase the chances for bentazon to reach ground water (Table 1). These factors include extremely long anaerobic half-life, vulnerability of certain soil types, wells not properly cased or sealed, and presence of shallow water table.

Table 1. Pesticides found in ground water in California as the result of legal agricultural use and various parameters important to potential to pollute ground water.

Pesticides Detected	Water Solubility (ppm)	Koc	Hydrolysis Half-Life (Days)
Bentazon[1]	2,500,000[2]	31	>30
Aldicarb	6000	79	670
Atrazine	33	180	160
Bromacil	820	60	110
Diuron	42	460	110
Prometon	720	79	NA
Simazine	4.9	220	110

[1]Anaerobic metabolism >365 days.

[2]This value is for the sodium salt form of bentazon.

The high water solubility, low Koc, and long anaerobic half-life values for bentazon indicate a high potential to leach into ground water. For further understanding about water solubility, Koc, and hydrolysis half-life and how these are related to leachability, see Johnson, 1989.

III. Acknowledgements

The subcommittee thanks those who provided information about bentazon, including facts about its toxicity, use, and potential relationships to ground water pollution. Additionally, we thank the staffs of the County Agricultural Commissioners, Cooperative Extension Service of the University of California, and representatives of the agricultural community who took time to discuss with

us the agricultural practices in areas where bentazon is used and/or has been found in ground water. We also thank representatives of the Department of Food and Agriculture who presented testimony at the hearing on the fate and behavior of bentazon in soil and ground water.

IV. References

Johnson, Bruce. 1989. Setting Revised Specific Numerical Values. Department of Food and Agriculture, Sacramento, CA. EH89-13

Sitts, John. 1989. Survey for Bentazon in Well Water of 15 California Counties, December 1988 - May 1989. Department of Food and Agriculture, Sacramento, CA. EH89-10

Note: Considerable information was presented by BASF Corporation, its representatives, and the Environmental Hazards Assessment Program, Department of Food and Agriculture. This information is part of the hearing record and on file at the Department of Agriculture, Pesticide Registration Branch.

ATTACHMENT I

CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE
MEDICAL TOXICOLOGY BRANCH

SUMMARY OF TOXICOLOGY DATA

BENTAZON

SB 950-220, Tolerance #355

Original Summary dated July 21, 1986
Rev. 3/26/87

I. DATA GAP STATUS

Combined (chronic + onco) rat: No data gap, no adverse effect.

Chronic dog: data gap, no study.

Onco rat: (see combined rat, above).

Onco mouse: No data gap, possible adverse effect.

Repro rat: data gap, inadequate study, no adverse effect indicated.

Terato rat: No data gap, possible adverse effect.

Terato rabbit: No data gap, possible adverse effect.

Gene mutation: No data gap, no adverse effect.

Chromosome: No data gap, no adverse effect.

DNA damage: No data gap, no adverse effect.

Neurotox: Not required at this time.

Note, Toxicology one-liners are attached.

** indicates acceptable study
Bold face indicates possible adverse effect

Charles N Aldous
3/26/87 J Parker 3/27/87

II. TOXICOLOGY SUMMARY

RAT CHRONIC AND ONCOGENICITY STUDIES

**043-046 43273-43275, 42993, 42995, and 43259, Combined study, rat, Nippon Institute for Biological Science, Original Japanese version dated March 21, 1984. Portions of report dated as late as 22Jan86 (Rec. #43273). Title: "Studies on the 24-month oral chronic toxicity and potential carcinogenicity of Bentazon in rats". Bentazon, tech. (ZNT No. 81/273, 93.3% purity) 0, 200, 800, and 4000 ppm in diets of Fischer 344/Du crj rats. NOEL - 200 ppm (Reduced platelet counts in 800 ppm males at 6 months, and increased partial thromboplastin time in 800 and 4000 ppm males and females at 12 months. Thyroid weight increases in males at 800 and 4000 ppm. Complete and acceptable. Original review by C. Aldous, Filename - BENTRTK1.220, 6/24/86. Update of this one-liner reflects additional data received in 3/5/87 submission by registrant (Vol. 053, p. 3 ff., reviewed by C. Aldous on 3/24/87, Filename 220RTK1.BEN).

029 970023 Invalid Cannon Labs study. No useful data.

MOUSE ONCOGENICITY

An acceptable mouse oncogenicity study has been reviewed (Record #s 43271, 43272, 42992, 42994, and 43260). Additional data has been received, (059:055398, below), which provide sufficient information for hazard evaluation. Other chronic effects observed at 400 ppm and above do not, by themselves, indicate serious adverse effects. See one-liner below.

**041/042 43271, 43272, 42992, 42994, and 43260 (Document #s 355-041 to -042), [Additional data in 059:055398 contains blind re-reading of liver and lung slides] Oncogenicity, Mouse, Nippon Institute for Biological Science. Title: "Studies on the 24-month chronic toxicity of Bentazon in mice". Completion dates - March 21, 1984 (refers to original Japanese version, Rec. #s 43271-2), April 9-12, 1985 (refers to Rec. #42994), and Dec. 23, 1985 (refers to Rec. #43260). Bentazon, technical (93.9%). 0, 100, 400, and 2000 ppm, in diet. Chronic effects NOEL - 100 ppm, based primarily on testicular calcification and pancreatic islet cell hyperplasia in males at 400 ppm and above. "Limited evidence of oncogenicity", according to EPA classification system for evaluation of oncogenicity studies (based on dose-related increase in hepatocellular adenomas (or adenomas + carcinomas) in males. No evidence of increased hepatocellular carcinomas alone). Limited evidence of tumor development in one sex of one species, primarily in benign tumors. without human epidemiology data, does not indicate that bentazon is a candidate for oncogenic risk assessment. Complete and acceptable. [Original review by C. Aldous, 6/18/86. Reviews of additional data on and 3/17/87 and 3/24/87. See also memo, J. Carlisle to L. Nelson, (3/17/87). Original review Filename - Bentmool.220. Review of additional data by C. Aldous, 3/25/87, in File 220MOO1.BEN.

059:055398 Mouse Oncogenicity (832) "Review of hepatic and pulmonary tissues of 24-month chronic oral toxicity study of bentazone Reg. No. 51 925 (ZNT No. 81/273) in mice". [Follow-up of final report of mouse study 041/042: Record #043272, etc.]. Additional data: "blind" re-examination of mouse liver and lung slides by three pathologists. Results: No increase in

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incidence of male hepatocellular carcinomas; possible increase in hepatocellular adenomas in 2000 ppm males (apparent positive dose trend); confirmation of increased female hepatocellular nodular hyperplasia in (at least) 2000 ppm group; no further concern about possible increase in female bronchoalveolar tumors (re-reading confirms not significant increase). C. Aldous, 3/17/87 (This data has been combined with concurrently submitted supplementary information in file 220MOO1.BEN, 3/25/87).

053 55186 (Review of N.I.B.S. eye and brain histology data by W. H. Butler. This record is identical to 043:042995, except that the present record includes a title page to orient the reader).

030 970027 Invalid Cannon Labs study. No useful data.

CHRONIC, NON-RODENT

No non-rodent chronic studies have been received. A dog chronic study has been undertaken and will be received approximately Dec. 1988 (see 355-053, p. 8).

REPRODUCTION, RAT

Rat reproduction study (026:970025) has been evaluated and found inadequate. Dosage levels were much lower than those successfully employed in other rat studies. No evidence of untoward effects was seen. Registrant indicates that a replacement study will be submitted in Dec., 1988 (see Rebuttal comments submitted with 3/5/87 letter from BASF).

026 970025 [Tab: "Report C5"] Laboratorium fuer Pharmakologie und Toxikologie, 4/12/76. Title: "Chronic oral toxicity of Bentazon in a reproduction study covering three generations of Sprague-Dawley rats". Bentazon, tech. 0, 20, 60, and 180 ppm in diet. NOEL - 180 ppm (HDT, no toxicity). Not acceptable nor upgradable. Dosages too low. Original review by A. Apostolou, 6/18/85. Not on disk.

TERATOGENICITY, RAT

The acceptable study below, 054:055187, confirms conclusions from earlier studies that developmental toxicity is observed at levels at which significant evidence of maternal toxicity is not seen. The NOEL for developmental toxicity is relatively high.

**054 055187 "Embryotoxicity (including Teratogenicity) Study with Bentazon Technical in the Rat, Project 064530". RCC, 1-21-87. Bentazon Technical (Lot N 187, 97.8%) administered by gavage to groups of 25 mated rats at dose levels of 0, 40, 100 or 250 mg/kg on days 6 - 15 of gestation. Maternal toxicity NOEL > 250 mg/kg/day. Developmental toxicity NOEL - 100 mg/kg/day (increased incidence of resorptions, decreased fetal weight, increased incidence of delayed skeletal ossification at 250 mg/kg/day). Acceptable, possible adverse effect since the developmental NOEL is less than the maternal NOEL. J. Parker, 3-24-87 (FILE 1B:220RTT1.JAP)

055 055188 "Dose-finding Embryotoxicity (including Teratogenicity) Study with Bentazon Technical in the Rat, Project 069772, First Study". Research

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and Consulting Company (RCC), Switzerland, 6-30-86. Bentazon Technical (Lot N. 187, 97.8%) was administered by gavage to groups of 5 mated rats at 0, 400, 600 or 800 mg/kg on days 6 - 15 of gestation. Death was noted in 2/5 females at 800 mg/kg and total resorption of all implantations was noted in all Bentazon treated groups. Decreased body weight gain was noted in all Bentazon treated groups. JAP 3-23-87 (1-liner from background section of review of study, 054:055187, above).

055 055189 "Dose-finding Embryotoxicity (including Teratogenicity) Study with Bentazon Technical in the Rat, Project 071897, Second Study". RCC, 8-5-86. Bentazon Technical (Lot N. 187, 97.8%) was administered by gavage to groups of 5 mated rats at 0, 100, 200 or 300 mg/kg on days 6 - 15 of gestation. Slightly reduced body weight gain was noted at 200 and 300 mg/kg/day. There was no other sign of maternal toxicity. Resorptions were increased and live litter size and weight were reduced at 300 mg/kg/day. There was a slight reduction in fetal weight at 200 mg/kg/day. Based on this range finding study, doses of 40, 100 and 250 mg/kg/day were selected for the full study. This appears to be a reasonable dose selection. JAP 3-23-87 (1-liner from background section of review of study, 054:055187, above).

040 43002 Nippon Institute for Biological Science, May, 1982. Title: "Teratogenicity study of Bentazon, Reg. No. 51 929 (ZNT No. 81/273), in rats by dietary administration". Bentazon, tech. 0, 2000, 4000, and 8000 ppm in diet over full gestation period. Maternal toxicity NOEL - developmental toxicity NOEL - 4000 ppm (8000 ppm dams with reduced body weight gain, hematuria, signs of depression, etc. Fetuses of 8000 ppm dams frequently runted, slight delayed ossification, and occasional liver hemorrhages and subcutaneous edema may be treatment related). Not complete as written. Upgradable. More information requested, including additional individual data. C. Aldous June 25,1986 Filename - Bentrtt1.220

NOTE: As of BASF letter dated 3/5/87, registrant does not plan to upgrade this study, as another rat teratogenicity study (054:055187) has been submitted in acceptable conformance with current EPA guidelines.

026 970028, Medicinal-Biological Research Lab, 10/8/71. Title: "Study on possible teratogenic effect of 3-isopropyl-1H-2,1,3-benzothiadiazin-4(3H)-one-2,2-dioxide on the rat following oral administration". Bentazon, tech. 0, 22, 67, and 200 mg/kg/day. No reported maternal toxicity. Developmental toxicity NOEL - 67 mg/kg/day: Substantial resorptions in 200 mg/kg/day group (66% of implantations, primarily late resorptions), frequent runting, anasarca, and misshapen bones in extremities, including radius and ulna, also tibia and fibula (possible adverse effect). Not acceptable, not upgradable: Numerous cases of spina bifida in vehicle controls, dosage levels not justified, unacceptable numbers of late fetal deaths reduced numbers of fetuses too much for teratogenicity to be properly evaluated. A. Apostolou, 6/18/85. Not on disk.

TERATOGENICITY, RABBIT

** 056 055191 "Embryotoxicity (including Teratogenicity) Study with Bentazon Technical in the Rabbit, RCC Project 064528" , Research and Consulting Company (RCC), Switzerland, 1-26-87. Groups of 16 mated Chinchilla rabbits were treated by gavage on days 6 - 18 of gestation at dose levels of 0, 75, 150 or 375 mg/kg/day. Maternal toxicity NOEL > 375

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mg/kg/day (HDT). Developmental toxicity NOEL - 375 mg/kg/day (increased resorption rate noted at 450 mg/kg/day in pilot study in the absence of maternal toxicity). Acceptable with pilot study 057 055192, possible adverse effect. Parker, 3-25-87.

057 055192 "Dose-finding Embryotoxicity (including Teratogenicity) Study with Bentazon Technical in the Rabbit, RCC Project 064517", 10-16-86. Groups of 3 mated Chinchilla rabbits were treated by gavage on days 6 - 18 of gestation at dose levels of 0, 150, 300 or 450 mg/kg/day. Maternal toxicity NOEL > 450 mg/kg/day. Developmental toxicity NOEL - 150 - 300 mg/kg/day (increased resorption rate at 450 and possibly 300 mg/kg/day). This study was used by the laboratory to justify dose selection for the full scale teratology study, 056 055191. Parker, 3-25-87.

055 055190 "Study to determine the prenatal toxicity of 3-(1-methylethyl)- 1 H - 2,1,3 - benzothiadiazin-4 (3H) - on - 2,2-dioxide in rabbits", BASF Department Toxicology, 3-6-78. Groups of 15 inseminated Himalayan rabbits were treated by gavage on days 6 - 18 of gestation with 0, 0, 50, 100 or 150 mg/kg/day. Dose level selection was too low and no toxicity was observed in any parameter measured. Unacceptable, not upgradeable, no adverse effect indicated. This study has been replaced, 056 055191. Parker, 3-26-87.

MUTAGENICITY STUDIES

MUTA 842 GNMU

**039:43261 Salmonella (1983, BASF Toxicology), Bentazon, 96.7%; 5 strains - TA1535, TA1537, TA1538, TA98 and TA100; ±Sprague-Dawley rat liver S9 activation at 0, 20, 100, 500, 2500 or 5000 ug/plate; two trials, 4/conc. in trial 1, 2 in trial 2; Negative for increased reversion rate. Acceptable J. Gee, 6/9/86.

**039:43262 Salmonella (1983, BASF Toxicology) Bentazon, 92.6%; TA1535, TA1537, TA1538, TA98 and TA100; ±B6C3F1 male mouse liver activation at 0, 20, 100, 500, 2500 or 5000 ug/plate; also, E. coli WP2uvrA; Repeat trials; no increased reversion rate; some cytotoxicity at 5000 ug/plate. Complete, acceptable J. Gee, 6/9/86.

039:43268 Salmonella (1985, BASF) Title: "Report on the study of Bentazon-Na (pure active ingredient) and Bentazon-Na (technical grade) in the Ames test" (RZ Report No. 85/081). Bentazon "pure active" (99.5% pure Bentazon-Na) and "technical" grade (more correctly termed the MUP, 47.7% Bentazon-Na equivalent). ±rat liver activation at 0, 500, 1000, 2500, 5000, 7500 or 10000 ug/plate, TA1535, TA1537, TA1538, TA98, and TA100; repeat trials; Acceptable Supplementary Information (valid study, however technical grade of active ingredient was not used). No increase in reversion rates. J. Gee, 6/11/86, no file on disk. (1-liner updated 3/23/87 by C. Aldous, based on 3/5/87 rebuttal information).

039:43269 *Salmonella* (1976, Institute of Environ. Toxicol.) Title: "Mutagenicity testing on Bentazon in microbial systems". Bentazon, 94%; TA1535, TA1537, TA1538, TA98, TA100 and E. coli WP2 hcr; ±rat liver activation at 0, 10, 50, 100, 500 or 1000 ug/plate, 1 trial; NO increase in

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reversion rate reported - also did host-mediated in male mice. Unacceptable (no repeat, other deficiencies) J.Gee, 6/11/86, review not on disk.

039 43263 CHO/HGPRT (1985, BASF) Title: "Report on a point mutation test carried out on CHO cells (HGPRT locus) with the test substance Bentazon", RZ Report No 85/396. Bentazon, 93.9%; ±mouse (B6C3F1) and rat (Sprague-Dawley) liver activation at 0, 0.1, 0.464, 1.0 or 4.64 mg/ml for 4 hours, 9-day expression; Increase in "uncorrected" mutation rate with mouse activation in 2 trials; negative with rat or -S9; Incomplete, unacceptable. No cytotoxicity data for final plating, mutation rate reported only on "uncorrected" basis. See discussion following report of study 039:43264. J. Gee, 6/9/86, review not on disk.

**039 43264 CHO/HGPRT (1985, Litton Bionetics). Title: "Mutagenicity evaluation of Bentazon technical. 84/140 in the CHO HGPRT forward mutation assay". Bentazon, 93.9%; ±rat and mouse liver activation at 0, 1.25, 2.5, 5, 7.5, 10, 12.5 or 15 mg/ml in repeat trials; no adverse effect identified; Complete, acceptable J. Gee, 6/9/86, Review not on disk.

Study 039:43264 used the same range of concentrations as 039:43263, and provides sufficient data to determine that the occasional statistically significant values are not of biological significance, but are due to scatter of some values for cloning efficiency and mutant colony counts. The calculated (mutation frequency)/10^6 survivors reflects these. No dose-related response is noted and a number of high mutation frequency values occur at extreme cytotoxicity where other factors become important. Report 039:43264 mentions that a precipitate formed at $\geq$ 0.156 mg/ml, which was dissolved upon neutralization with NaOH, while the other one does not mention it up to 4.64 mg/ml. Since report 039:43263 is deficient in details, it is unknown whether they found the same problems. Without a complete report for 039:43263, the best judgment is that bentazon is not significantly mutagenic in CHO.

Comparison of the two tests:

	BASF	Litton
Cells	CHO-K1	CHO-K1-BH4
Test article	yellowish white	light brown
Purity	93.9%	93.9%
Lot	N169	84/140 technical
Treatment	4 hrs -FBS	4 hrs +FBS
Expression time	9 days	7 days
Medium	F12	F10
Select	6-TG, 10 uM (1.67 ug/ml)	6-TG, 10 ug/ml
Cell number	3 x 10^5/80 Cm^2	2 x 10^5/78 Cm^2
Number of plates	5	12

MUTA 843 CHRO

**039 43267 Mouse micronucleus (1985, BASF) JG, 6/10/86. Bentazon 95.6%; 5/sex/group were exposed by oral gavage to 0, 200, 400, or 800 mg/kg, single dose, sacrificed at 16, 24 or 48 hours; No evidence of

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micronuclei formation; Acceptable : (Unacceptable in original review. Upgraded on basis of additional data in Doc. #355-053, pp. 16-17, and 057:55193. See Suppl. Info. review by J. Gee, 3/25/87 (not on disk)).

026 970030 (Tab Report C8) Title: "To assess the effect of oral administration of Bentazon on the fertility of male Sprague-Dawley rats with particular reference to dominant lethal factors". Rat dominant lethal (1971, Prof. F. Leuschner). Technical bentazon administered in diet to males at 0, 20, 60, and 180 ppm for a minimum of 13 weeks prior to mating with untreated females. No evidence of dominant lethal effects. Study not acceptable or upgradeable: doses far below an acceptable MTD for a dominant lethal study. A. Apostolou, 6/18/85, review not on disk.

026 970031 Mouse dominant lethal (BASF, 6/13/73) Title: "Report on the testing of 3-isopropyl-1H-2,1,3-benzothiadiazin-4(3H)-one-2,2-dioxide for mutagenicity after intraperitoneal administration to the male mouse". Technical bentazon (no purity stated) administered once ip to males at 195 mg/kg (20% of LD50). No evidence of dominant lethal effect over 8 weeks of mating with untreated females. Study not acceptable or upgradable: dose was well below the maximum which could have been given, hence inadequate sensitivity. A. Apostolou, 6/18/85, review not on disk.

MUTA 844 DNA

**039 43265 Mouse hepatocyte UDS in vitro (Feb., 1985, Litton Bionetics). Title: "Report on the evaluation of Bentazon in the *in vitro* mouse primary hepatocyte unscheduled DNA synthesis assay". Bentazon (free acid) purity = 92.6%, batch N 169). Male mice hepatocytes exposed for 18 hours to 0, 2.5, 5.0, 10.0, 25.1, 50.2, 100, 251, 502 ug/ml; No evidence of UDS up to 60% survival; Acceptable, complete. J. Gee, 6/10/86, Review not on disk. Update of this one-liner reflects additional data received in 3/5/87 submission by registrant. See review by C. Aldous, 3/23/87, file 220844A.BEN.

**039 43266 In vivo mouse UDS. (1985, Litton Bionetics). Bentazon, (free acid) purity = 92.6%, batch N 169). 2 males/grp were given 0, ~41, ~90, ~180 or ~360 mg/kg i.p.; hepatocytes harvested 6 hours posttreatment; incorporation of ^{3}H-tdR for 18-19 hours; No evidence of UDS; Acceptable (Original review by J. (Remsen) Gee, 6/10/86. Upgraded from unacceptable status on receipt of additional information in Document #355-053, p. 21 and data in 057:55195. See Suppl. Info. form by J. Gee, 3/25/87.)

039 43270 *B. subtilis* rec assay (1976, Institute of Environ. Toxicol.) Title: "Mutagenicity testing on Bentazon in microbial systems (Rec-assay - *Bacillus subtilis*"). Bentazon, 94%; H17 & M45; 0, 20, 100, 200, 500, 1000 or 2000 ug/10mm disk; No difference in growth; no activation. Unacceptable, 1 value/treatment only. J. Gee, 6/11/86, review not on disk.

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