Health Consultation

WEST LEESBURG SITE
(a/k/a FUZZELL WHOLESALE NURSERY INCORPORATED)

LEESBURG, LAKE COUNTY, FLORIDA

OCTOBER 31, 2001

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

HEALTH CONSULTATION

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LEESBURG, LAKE COUNTY, FLORIDA

Prepared by:

Florida Department of Health
Bureau of Environmental Epidemiology
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Background and Statement of Issues

ATSDR Request

In October 1999, the federal Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR) received a petition to assess the public health threat at the former Fuzzell Wholesale Nursery (2). The former Fuzzell Wholesale Nursery site is near the corner of Flatwoods and Casteen Roads in west Leesburg, Florida. ATSDR asked the Florida Department of Health (DOH) to review the February 2000 Florida Department of Environmental Protection (DEP) test results (3). Florida DOH, through a cooperative agreement with the ATSDR, evaluates the public health significance of hazardous waste sites in Florida. This health consultation is limited to a review of those February 2000 Florida DEP test results.

History of the Former Fuzzell Wholesale Nursery

The owner of the former Fuzzell Wholesale Nursery began growing woody ornamentals in 1986. In 1987, he started using the fungicide Benlate 50 dry flowable (DF). [1] Benlate 50 DF is composed of 50% Benomyl, the "active" ingredient, and 50% "inert" ingredients. "Inert" ingredients can include solvents, surfactants, buffers, encapsulators, wetting agents, off-specification materials, and clean-out from previous lots or runs of pesticide manufacture (6, 7). Following industry standards, the off-specification and clean-out material may include unspecified contaminants, if those contaminants do not exceed prescribed trace contaminant acceptable levels in the finished product (6).

The owner of the former Fuzzell Wholesale Nursery used the fungicide Benlate 50 DF in potting media. Fungicide applied to the nursery plants may have drained onto the ground through holes in the pots (10). The owner noticed plant health problems in 1987, but made no associations with the use of Benlate 50 DF (11). By 1989, however, commercial growers throughout much of the nation were reporting damage to plants treated with Benlate 50 DF. Concurrently, DuPont, the maker of Benlate 50 DF, reviewed their production records. DuPont found that certain lots of the Benlate 50 DF had detectable levels of atrazine (a herbicide). From August to October 1989 DuPont ordered a limited recall of the affected Benlate 50 DF lots (Appendix A).

Subsequent to the 1989 limited recall, growers in 40 states and other countries continued to report damage to crops treated with Benlate 50 DF. On March 22, 1991, DuPont recalled all lots of Benlate 50 DF. Following this second recall, DuPont compensated growers for crop damages,

[1] Benlate 50 DF is the 50% dry flowable formulation containing the fungicide Benomyl (8). Benomyl is the trade name for methyl 1-(butylcarbamoyl)benzimidazol-2-ylcarbamate (9). DuPont patented Benomyl in 1968. DuPont first sold Benomyl as a wettable powder in the United States in 1969 as a systemic fungicide (Appendix A). Benlate 50 DF was first used on the site in 1987 (11).

including the owner of the former Fuzzell Wholesale Nursery. In November 1992, DuPont halted compensation for crop damage (Appendix A).

Demographics

In 1990, an estimated 8,238 people lived within two miles of the site. About 25 percent were 19 years old or younger. Approximately 76.9 percent were white , 21.9 percent were black, 3.8 percent were Hispanic, 0.25 percent were America Indians, and 0.25 percent were Asians or Pacific Islanders. The average per capita income was $11,360 and 17.6 percent (1,454 people) were below the poverty level (16).

Reported Health Symptoms

People who have either worked at or visited the former Fuzzell wholesale nursery or live near the site have reported a variety of symptoms that include the following:

> watering eyes, burning and swollen cheeks and tightness in the chest, nose bleeds, white spots on the tongue, throat rash, recurrent skin rashes, fungal infections on the nails, loss of nails, chronic fatigue, kidney problems, back pain, muscle and joint aches, sensitivity to light, memory loss, diarrhea, nightmares (1, 2, 12).

Florida DEP February 2000 Environmental Tests

In February 2000, Florida DEP and their consultants collected the following environmental samples from on and around this site (Figures 1&2) (4, 5):

- Twelve surface soil samples
- Five subsurface soil samples
- Fifteen groundwater samples from private drinking-water wells and one groundwater sample from an irrigation well
- Eight groundwater samples from shallow monitor wells
- One surface water sample from a pond
- One sediment sample from a pond
- Nine air samples.

Tables 1, 2, and 3 list the chemicals Florida DEP analyzed these samples for.

Discussion

Florida DOH finds that except for arsenic, the February 2000 levels of the contaminants tested for were all below health-based screening values and therefore unlikely to cause illness. Florida DEP found 11.9 milligrams per kilogram of arsenic in one background surface soil sample (from a nearby resident's yard). Florida DOH finds that although this level is above its health-based

screening value, it is unlikely to cause any non-cancer illness. Arsenic is known to cause cancer. Florida DOH finds that there is no apparent increased cancer risk, however, from this level of arsenic in soil.

The February 2000 Florida DEP laboratory analytical data provided to Florida DOH for this health consultation have the following limitations. First, chemicals that had previously been found on the site were not analyzed during the February 2000 investigation (Table 4). Second, possible contaminants and breakdown products in Benlate 50 DF were not analyzed during the February 2000 investigation (Tables 5a - 5e and Appendix B). Third, some chemicals analyzed lacked valid primary/secondary source standards or had other laboratory quality assurance/quality control irregularities (Tables 6 and 7).

The use of expired standards and the lack of secondary standards for calibration are not generally accepted laboratory procedures. Without valid calibration standards it is not possible to insure the quality of the laboratory instruments and procedures. Without secondary calibration standards from a second vendor, it is not possible to insure the quality of the primary calibration standard from the first vendor. Because the laboratory could not retrieve 2-amino benzimidazole (2-AB) from spikes of actual soil, it is unlikely this method would have detected this chemical in the soil samples taken for this investigation (Table 6). The laboratory had five analytical sets (two soil and three water) fail matrix and/or laboratory spike percent recovery for certain chemicals (Table 7).

Of the chemicals in Tables 4-7, only nine have sufficient toxicological information on which to judge the public health threat. These nine chemicals are chlorothalonil, metalaxyl, carbaryl, chlorsulfuron, diuron, linuron, pendimethalin, propazine, and trifluralin. These nine, however, are not persistent enough to be detectable in the environment now, ten years after Benlate 50 DF was last applied. Therefore, additional testing for these chemicals is not warranted.

ATSDR's Child Health Initiative

ATSDR and DOH, through ATSDR's Child Health Initiative, recognize that in communities faced with the contamination of their environment, the unique vulnerabilities of infants and children demand special attention. Children are at a greater risk than are adults for certain kinds of exposure to hazardous substances emitted from waste sites. Because they play outdoors and because they often carry food into contaminated areas, children are more likely to be exposed to contaminants in the environment. Children are shorter than adults, which means they breathe dust, soil, and heavy vapors close to the ground. They are also smaller, resulting in higher doses of chemical exposure per body weight. If toxic exposures occur during critical growth stages, the developing body systems of children can sustain permanent damage. Probably most important, however, is that children depend on adults for risk identification and risk management, housing, and access to medical care. Thus, adults should be aware of public health risks in their community, so they can accordingly guide their children (13).

In recognition of these concerns, ATSDR has developed screening values for many chemicals, calculated specifically for children's exposures. These would have been used if any concentrations of chemicals had been determined at the petitioned site.

Conclusions

Florida DOH finds that except for arsenic, the levels of contaminants found by Florida DEP in February 2000 were all below health-based screening values and therefore unlikely to cause illness. Florida DOH finds that although the level of arsenic in one soil sample was above the health-based screening value, it is unlikely to cause any non-cancer illness. Arsenic is known to cause cancer. Florida DOH finds there is no apparent increased cancer risk, however, from this level of arsenic.

The February 2000 Florida DEP laboratory analytical data provided to Florida DOH have the following limitations. First, chemicals that had previously been found on the site were not analyzed during the February 2000 investigation. Second, possible contaminants and breakdown products in Benlate 50 DF were not analyzed during the February 2000 investigation. Third, some chemicals analyzed lacked valid primary/secondary source standards or had other laboratory quality assurance/quality control irregularities.

Of the chemicals in Tables 4-7, only nine have sufficient toxicological information on which to judge the public health threat. These nine, however, are not persistent enough to remain in the environment at detectable levels after ten years. Therefore, additional testing for these chemicals is not warranted.

Based on the reasons listed above, the Florida DOH categorizes this site as an indeterminate public health hazard.

Recommendations

If future investigations identify site-related chemicals that pose a potential public health threat, efforts should be made to identify an exposure pathway and point of contact that would allow a plausible hypotheses for linking reported symptoms with this (these) chemical(s).

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Table 1. Chemicals Analyzed in Soil Samples

Chemical(s)	Method
Carbendazim, STB, 2-aminobenzimidazole	Florida DEP SOP: LC-002-2 and LC/MS
Benomyl as Carbendizem	Florida DEP SOP: LC-002-2 and LC/MS
n,n'-di butyl urea, Flusilizole, DuPont H7169, DuPont F7321	Florida DEP-S-FLUZ
mercury	EPA 245.5
primary metals	EPA 6010 mod.
organochlorine pesticides and polychlorinated biphenyls	EPA method 8080 mod.
organonitrogen and phosphorous pesticides	EPA method 8141A mod.
volatile organic compounds	EPA method 8260

Table 2. Chemicals Analyzed in Groundwater and Surface Water Samples

Chemical(s)	Method
carbendazim, STB, 2-aminobenzimidazole	Florida DEP SOP: LC-002-2 and LC/MS
Benomyl as Carbendizem	EPA 631 mod. And LC/MS
n,n'-di butyl urea, Flusilizole, DuPont H7169, DuPont F7321	Florida DEP-W-FLUZ
mercury (not surface water)	EPA 245.5
primary metals (not surface water)	EPA 200.7 mod.
organochlorine pesticides and polychlorinated biphenyls	EPA method 608 mod
organonitrogen and phosphorous pesticides	EPA method614 mod.
volatile organic compounds	EPA method 624/8260 mod

Table 3. Chemical Analyzed in Air Samples

Chemical(s)	Method
methyl and butyl isocyanates	TO-14A modified

Table 4. Chemicals Previously Detected On-Site but Not Analyzed in February 2000.

Chemicals Not Analyzed in February 2000	Laboratory Method Previously Used	Previously Found On-Site (Date, Media, Amount)
2,4-dichlorobenzoic acid (2,4-DCBA)	0.2 methanol solution of m-trifluoromethylphenol trimethylammmonium hydroxide for trans-esterification of triglycerides to methyl esters	10/27/91, soil, 0.5 - 1 ppm (15)
Heptadecone	Library Search 8270	4/16/91, irrigation water, 13 ug/L, (14)
KA131 or 359 mH+ and 331 mH+	LC/MS - F.A.B.	5/13/91, soil,* (15) 6/10/91, potable well water & ditch water, * (15)
metalaxyl (Ridomyl, Subdue	method unknown	5/13/91, soil, * (15)
2,2'-Methylenebisphenol	Library Search 8270	4/16/91, drinking water well #2, 12 ug/L, (14) 4/16/91, pond #3, 13 ug/L, (14)
4,4'-Methylenebisphenol	Library Search 8270	4/16/91, drinking water well #2, 11 ug/L, (14) 4/16/91, pond #3, 11 ug/L, (14)
3-(1-Methyl-2-pyrrolidinyl) pyridine (nicotine)	Library Search 8270	4/16/91, irrigation water, 4 ug/L, (14)

* No amounts given

Tables 5a - 5e. Possible Benlate 50 DF Contaminants Not Analyzed in February 2000.

5a - Fungicides:	
Cymoxanil (17)	6-Methoxyoquinoline, 1-oxide (14, 17)
2,3-Dimethylquinoxaline (14)	
Isocyanatocyclohexane (17)	Thiabendazol (mertec, 2-thiazol-4-yl-benzimidazole) (17)

5b - Pesticides:
Carbaryl (17)

5c - Herbicides:	
Bensulfuron (17)	Pendimethalin (17)
Cyanazine (17)	Propazine (17)
Chlorsulfuron (17)	Sulfometuron (17)
Diuron (17)	Tribenuron (17)
1H-Indol-5-01 (17)	Trifluralin (17)
Linuron (17)	Thifensulfuron (17)
Nicosulfuron (17)	

5d - Anti-microbial chemicals:	
2-Methoxy-4-(2-propenyl) phenol (14, 17)	Sulfonamide Acid (17)

5e - Solvents, Chemical Intermediates, and Others:	
Butyl amine (20)	1,3-Dioxolan-2-one (17)
N-Butyl Acetamide (14, 17)	1-Ethenyl-2-Pyrrolidinone (14)
N-Butyl Formamide (14, 17)	2-Ethylnaphthalene (14)
4-Cyclohexylbenzenamine (14)	1-(4-Hydroxy-3-methoxyphenyl)-2-propanone (14)
1,4-Dihydro-1-methyl-4-oxo-3-pyridine carbonitrile and 1,6-Dihydro-1-methyl-6-oxo-3-pyridine carbonitrile (14, 17)	3,1-Methyl -2-pyrrolidinyl pyridine (14)
4-(1,5-Dimethyl-3-oxohexyl)-1-cyclohexene-1-carboxylic acid, methyl ester,(14)	1-Methylpiperidine (17)
	1-Phenyl Naphtho [2,1-6] Thiophene (17)

Compiled from McDowell (17) and Enviropact (14).

Table 6. Analytical Laboratory Irregularities

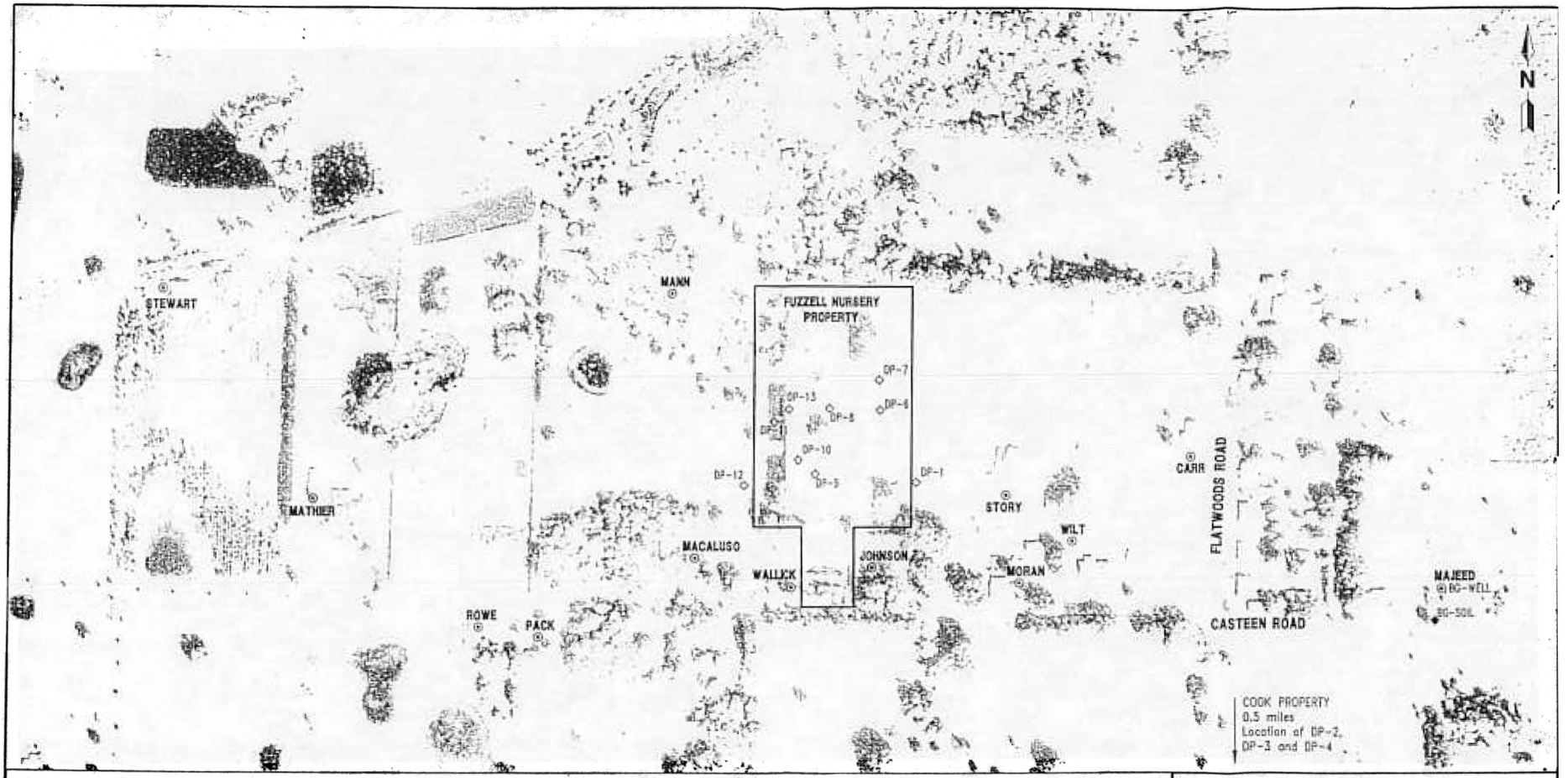
Chemicals Analyzed in February 2000	Laboratory Quality Assurance/Quality Control Irregularities	Previously Found On Site (Date, Media, Amount)
2-Aminobenzimidazole (2-AB)	Florida DEP recovered 2-AB spikes from Ottawa Sand (a solid) but not soil (18).	5/31/91, soil, ** (15)
Butyl Isocyanate	No valid secondary source standards(18). Causes tearing eyes and breathing difficulties at 10-20 ppb (19). The detection limit, however, was 100 ppb	Not previously found
Chlorothalonil	Failed quality control standards because of spike recovery problems	4/16/91, well #2, 17 ug/L, (14) 4/16/91, 9 ug/L, pond #3, (14) and in plants soil (15)
n,n'-Dibutylurea (DBU or DuPont W3792-00)	Failed quality control standards because of spike recovery problems	7/15/91, soil,1.9 ppm (15)
Flusilizole and its degradation products: DuPont F7321 DuPont H7169	No valid secondary source standards(18).* Because Flusilizole is not a registered product, its breakdown products and analytical procedures are unknown.	6/4/91, potable well water , amount unknown (15)
3-Butyl- 2,4-dioxo-s-triazine[1,2a] benzimidazole (STB or DuPontW1167)	Primary analytical standards expired (18). Since no chemical was detected, no data qualifiers were used. No other certified standards were available.*	6/21/91, pond water, unknown (15) 5/31/91, soil, 0.6 ppm (15) 6/10/91, well, 2.5 ppb (15) 6/10/91, ditch water, trace (15)
Methyl Isocyanate	No valid secondary source standards.	Not previously found

* Primary Standards are used for calibration, secondary standards are used to verify the primary standards.

Table 7. Summary of Laboratory Fortified Blank and Matrix Spike Recovery Failures

Method	Sample Numbers	Quality Control Failed	Chemical(s)
S-FLUZ (soil)	TLH-2000-02-04-06 - soil samples: DP-1 1', DP-2 1', DP-3 1', DP-4 1'	Matrix Spike Recovery: 53.3%	N,N'-dibutylurea
S-FLUZ (soil)	TLH-2000-02-07-02 - soil samples: DP-5 1', DP-6 1', DP-6 8', DP-7 1', DP-7 8', DP-8 1', DP-8 7', DP-9 1'	Matrix Spike Recovery: 53.2%	N,N'-dibutylurea
W-FLUZ (water)	TLH-2000-02-04-15:for private well water samples*** and water samples DP-1 20', DP-3 20'	Lab Fortified Blank (41%), Lab Fortified Blank % Recovery (50.5%), Matrix Spike (49.6%), and Matrix Spike % Recovery (50.35%)	DuPont F7321, DuPont 7169, and N,N'-dibutylurea
W-FLUZ (water)	TLH-2000-02-07-08: water samples, Story Dup., Pack Well, Cook Well #2, BG-1, DP-6 15', DP-7 15', DP-11, DP-8 11', DP-13 20', DP-9 20', DP-12 8'	Lab Fortified Blank(62.1%), Lab Fortified Blank % Recovery (64.3%), Matrix Spike Recovery: 60.9%	DuPont F7321
		Matrix Spike (133%) Matrix Spike % Recovery (141%)	Flusilizole
		Matrix Spike (59%)	N,N'-dibutylurea
W-Pest-CL	TLH-2000-02-09-18, water samples Fuzzell well	Matrix Spike (150%)	Methoxychlor

***Private Wells for Story, Wilt, Macaluso, Wallick, Johnson, Carr, Cook, Mann, Mather, Rowe, Stewart, Mann, Fuzzell, Pack, Cook.



LEGEND

- DP-1 — Direct-push sample location and designation
- BG — Background sample location and designation
- SOIL — Soil boring location and designation
- ROWE — Residential well location

0 150 300

SCALE: 1 INCH = 300 FEET

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SITE MAP WITH SAMPLE LOCATIONS

HARDING LAWSON ASSOCIATES	**STORY PROPERTY SITE INVESTIGATION REPORT LEESBURG, LAKE COUNTY, FLORIDA**	
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION SITE INVESTIGATION SECTIONS	**DATE:** 3/00	**FIGURE:** 1

Florida Department of Health

Bureau of Environmental Epidemiology

0 0.2 0.4 Miles

Figure 2. 1995 Aerial Photograph

West Leesburg Site Investigation

N W E S

Disclaimer:
This product is for reference purposes only and is not to be construed as a legal document. Any reliance on the information contained herein is at the user's own risk. The Florida Department of Health and its agents assume no responsibility for any use of the information contained herein or any loss resulting therefrom.

Certification

This Health Consultation was prepared by the Florida Department of Health, Bureau of Environmental Epidemiology, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

Debra Gable
Technical Project Officer
SPS, SSAB, DHAC
ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation, and concurs with its findings.

for Richard Gillig
Branch Chief,
SSAB, DHAC
ATSDR

Appendix A

Benlate Chronological Events
From Benlate files at the Florida Department Environmental Protection
Prepared by Florida Department of Agriculture and Consumer Services staff

BENLATE CHRONOLOGICAL EVENTS

1947 — Modern pesticide regulation began when Congress passed the Federal Insecticide Fungicide and Rodenticide Act (FIFRA), primarily concerned with immediate health problems and effectiveness.

1969 — Benlate WP (wettable powder) is registered with the federal government by DuPont. The product is a powdered version of Benlate.

1970 — EPA is formed replacing the USDA as pesticide regulating agency.

1970's — During 1970's EPA said benomyl contained a possible carcinogen, but DuPont successfully rebutted charge as study used mice susceptible to liver tumors.

1972 — Congress broadened the scope of FIFRA requiring the EPA to re-register all pesticides, weighing their safety against possible benefits to farmers. Pesticide manufacturers were required to replace outdated studies on product safety and provide new studies not formerly required. The task overwhelmed the agency.

1972 — Australian researcher, K.G.M. Skene described growth regulating responses by benomyl either speeding, retarding or otherwise altering plant growth, "...results support...remarks about the need to carefully assess benomyl's side effects in the field."

1973 — Study by A. Stringer and M.A. Wright (Journal "Pesticide Science) reports Benlate application "virtually eliminated" earthworm populations in apple orchards.

1974 — Study by A. Stringer and C.H. Lyons said earthworm populations in one case had not returned to normal levels even two years after last application of Benlate.

1974 — Winard K. Hock, a researcher with the U.S. Dept. of Agriculture in Ohio, used benomyl to treat two young trees seedlings in experiments he hoped would lead to a cure to Dutch elm disease. The plants would not grow. They were stunted.

1978 — A position document by the EPA notes two studies demonstrating mutagenic effects in plants treated with either benomyl or one of benomyl's breakdown products. The EPA's emphasis was on the assessment of human health hazards, not hazards to plants. The Agency did no follow up.

1979 EPA suggested Benlate carry warning label citing birth defects and reduced sperm production in laboratory animals, as well as a warning against exposing pregnant women to the product.

1982 Health concerns about the fungicide led to EPA to conduct a special review of Benlate.

1982 EPA deemed the warning unnecessary as long as workers wore cloth masks to prevent inhalation of the product in addition to long-sleeve shirts and protective clothing.

1986 A report by the General Accounting Office found that EPA had not completed its review of any of the 600 main pesticide ingredients on the market which were used in all of the 50,000 pesticides products then on the market. The GAO indicated it extend into the 21st century.

1987 The EPA stopped requiring manufacturers to submit studies showing the effectiveness of pesticides in the field. It EPA's Grable said, "It was thought that if a product didn't work right or caused damage, farmers wouldn't buy it anyway."

1987 DuPont introduces Benlate DF (dry flowable), which is composed of tiny granules. The product is easier to use than the powered Benlate and replaces it in the marketplace.

1988 DuPont hires hired Terra chemicals International, inc. to formulate Benlate at Terra's Blytheville, Ark., facility. In depo. taken in lawsuit by Kawamanta Farms, Inc. in Hawaii, former Terra employees and plant manager said low-level contamination (20 parts per million) of Benlate approved by DuPont. (DuPont aware that Terra previously produced atrazine on same machinery.) Overcontaminated Benlate was reintroduced into Benlate during subsequent production. Terra could not test directly for presence of atrazine (DuPont aware).

05/--/89 "In May of 1989 we made a decision that there would be nothing gained or nothing served by trying to recall the product," DuPont spokesman Bailey testified in a depo. taken during July 1992 in a Central Florida nursery case.

05/02/89 DuPont received three damages complaints from Midwestern nurseries between May 2 and May 10, 1989 (from court papers).

05/12/89 DuPont discovered that Benlate DF was contaminated with a plant-damaging herbicide, yet failed to either tell the U.S. EPA or warn farmers using the product (from court

papers).

05/16/89 DuPont executive met in Wilmington to discuss the unfolding problem. A handwritten DuPont note (author not listed), "do the right thing to protect our business & prevent a recurrence." Notes do not detail any plan for public recall.

05/16/89 A. Jay Julis, DuPont scientist, writes interoffice memo, regarding to biological testing on petunias and cucumbers, "If there is a 'legal' reason that this test should be thrown out--please let me know ASAP."

05/24/89 DuPont urges 2 of its subcontractors who either formulated or packaged Benlate for the company to adopt DuPont's own position against a recall. Handwritten note by DuPont executive with manager at Platte Chemical Co. (Fremont Neb. based contractor that formulated Benlate for DuPont) outlines conversation. Bailey and Ted Kirchner participated at the Platte meeting. Notes, "you are a party, want to make sure you agree. We propose to do nothing. We will not do that without your agreement. ...We think prudent risk to do nothing..."

05/25/89 Another note, "reasonable to not recall because most has been used...could be MM$ claim if golf course damage."

08/02/89 John Peters, inspector for Wisconsin Dept. of Agri., inspects plants dying or dead at Greiling Farms just sprayed with Benlate DF.

08/03/89 Greiling production manager Gary W. Schussman calls DuPont and is informed that the product was contaminated with Atrazine. Schussman, "I was shocked that they knew."

Peters later contacted the EPA and exposed DuPont, "DuPont had told Mr. Greiling that if he told anyone that it was the Benlate that killed his plants that DuPont would sue Mr. Greiling for damages."

08/07/89 U.S. EPA investigator visited Platte's Nebraska plat.

08/10/89 DuPont tells the EPA that Benlate DF is contaminated with a herbicide called Atrazine. This is the beginning of a national recall. Eventually, 300 farmers report damage.

08/11/89 DuPont notified distributors of contamination, but only recalled the most-severely contaminated batches of the products; told customers it had discovered "low level" of atrazine in Benlate (actual level was 4,900 parts per million considered quite dangerous by EPA)

08/12/89 Wisconsin bans the sale of Benlate.

09/01/89 EPA demands that all Benlate be recalled as DuPont tries to convince them to recall only the most severely contaminated batches.

09/01/89 Letter from EPA to DuPont Chairman Edgar S. Woodard asked to identify Benlate customers on retail level to assure the recall as much as possible. (DuPont did not do it.)

09/13/89 Florida Dept. of Agriculture and Consumer Services authorizes all agricultrual products specialists, Bureau of Feed, Seed & Fertilizer Inspection and Bureau of Pesticides to issue stop-sale orders.

09/28/89 DuPont, facing EPA pressure, agrees to a national recall of all lots of the product.

12/27/89 Carl Grooms, Plant City strawberry grower, received first notice from DuPont; preparing to spray crops again same day received letter.

01/--/90 Lindsey, Plant City strawberry grower, received first notice from DuPont.

1990 EPA began another special review.

09/25/90 Florida Dept. of Agriculture became aware of potential problem with Benlate as early as 9/25/90, when an inspector with the Division of Plaint Industry visited Frank Fuzzell. Report, "...Same symptoms as Benlate contamination."

10/11/90 Everett Lewis of Rocky Point, NC, wrote a letter to DuPont about damage.

Late 1990 Frank Fuzzell, ornamental nursery owner, warns DuPont, Univ. of Florida and Florida Dept. of Agriculture about Benlate damages.

Late 1990 DuPont dismissed at least 3 warnings that Benlate was still damaging plants even though all the fungicide tainted by the herbicide was off the market.

01/--/91 Letter from Lee Goode of A&L Agricultural Laboratories, told DuPont that Fuzzell "knows he is not the only grower with the problem and that they just aren't aware of it yet."

02/--/91 Chuck Bethke, representative of Michigan Peat Co., telephoned DuPont twice regarding damages of his customers (including Fuzzell's).

03/22/91 Benlate DF is again recalled. Nearly 1,900 reports of crop damage soon flood DuPont. The company begins payment of losses, which eventually total nearly $500 million. State officials suspect product level flawed. Benlate WP is reintroduced to farmers.

04/15/91 Letter from DuPont to Growers states "...recalled product poses no threat to human health or food safety...we believe there is no potential for detectable atrazine residues on food crops."

09/10/91 DuPont chemist Michael Duffy writes a memo indicating DuPont knew that Benlate DF could damage plants even if used at label rates. Company says "theories" in document were later disproved.

09/11/91 DuPont announces a Benlate label change deleting all ornamental uses and all dip, drench, container and greenhouse uses.

05/--/92 A University of Hawaii study shows that BIC remains at easily detectable levels days after application (was thought to disappear almost immediately in the presence of water). (BIC= n-Butyl Isocyanate which is a compound produced by Benlate after sprayed on crops and is a highly toxic compound that can irritate eyes, nose, and respiratory passages--was not considered much of a threat by the EPA.)

05/07/92 DuPont announces its research has disproven that Benlate can cause lingering soil contamination. State scientists say they remain unconvinced as unexplained crop damage persists.

09/03/92 Florida Department of HRS concluded a survey of 75 people exposed to Benlate DF fungicide indicating a wide variety of farmer health ills:

42	Headaches
33	Stiff or Achy Joints
26	Shortness of Breath
22	Fatigue
20	Rashes
18	Swollen Joints
18	Sore and Irritated Throats
17	Nausea
15	Dizziness
13	Numbness and Tingling in Extremities
13	Short-term Memory Loss
13	Nosebleeds
5	Did not report or recall health ailments

Other symptoms reported to the state: cancer, watery and

red eyes, sinus problems, intestinal disorders, diarrhea and vomiting.

09/30/92 R.H. Biggs of the University of Florida Institute of Food and Agricultural Sciences assesses the present possibilities for crop damages:

1. Benlate DF is breaking to give off toxic products;
2. There is something basically wrong with the DF formulation. With usage there is evidence in nurseries of a malady manifested to a critical degree, particularly those under intensive cultural management including enclosed structures; and
3. Benlate DF in interacting with other agents resulting in phytotoxicity.

11/05/92 DuPont announces that is research shows Benlate never damaged crops and that the product is completely safe. Florida Agriculture Commissioner Bob Crawford calls its position "ludicrous."

1995 EPA expecting to complete health studies to further assess benomyl's safety.

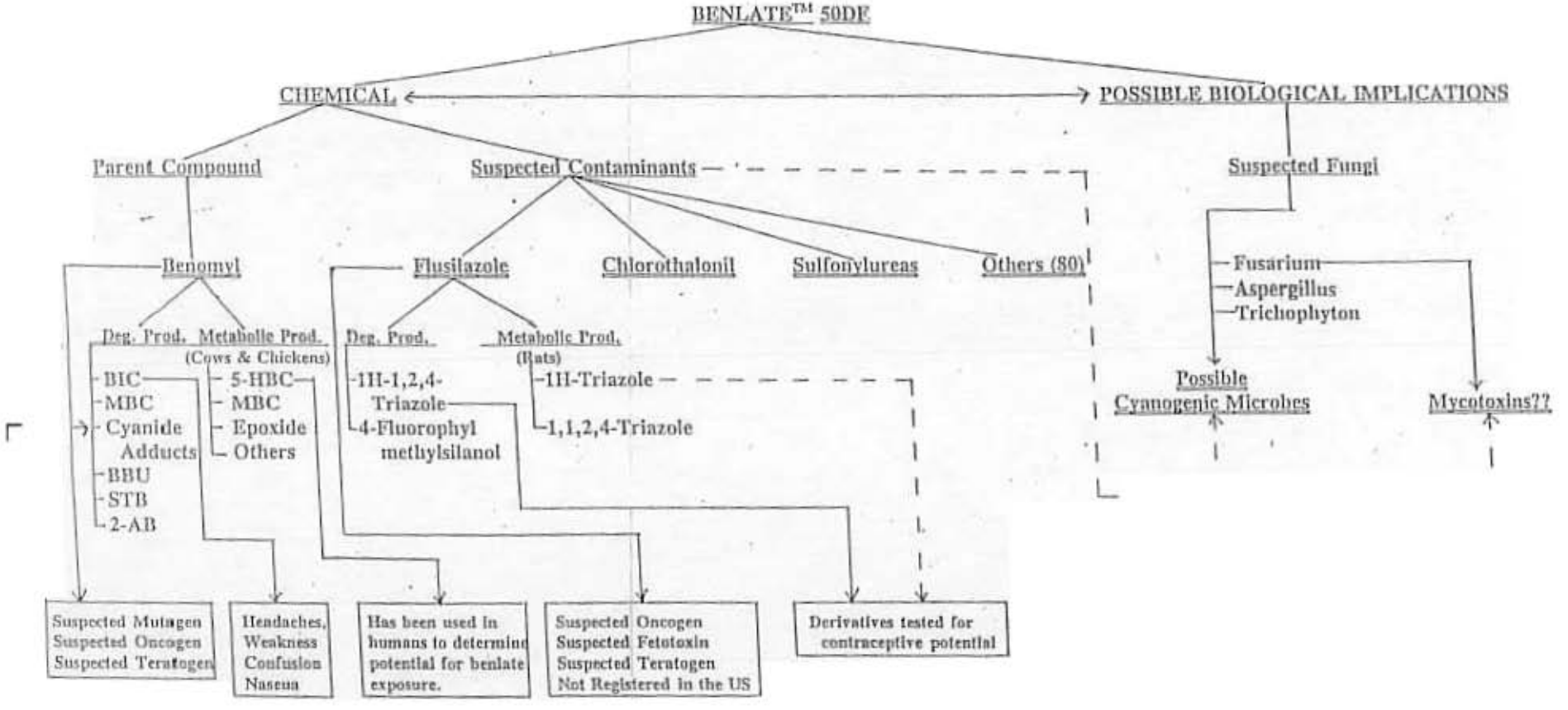
** To date, Benlate DF and benomyl are incomplete in its re-registration review by the EPA. EPA expects to receive final studies on benomyl by 1994 and re-register the pesticide the following year. The agency already has 20,000 studies on benomyl, although many are two decades old.

** The only ingredient between Benlate WP and Benlate DF is a so-called inert ingredient which EPA does not disclose to the public because it is considered a trade secret.

** Carl Grable, head of the EPA's fungicide divide, said the agency required far less demanding health and safety data on Benlate DF since it was a reformation of an existing product.

Appendix B

Benlate Breakdown Pathways


BENLATE™ 50DF
CHEMICAL
POSSIBLE BIOLOGICAL IMPLICATIONS
Parent Compound
Suspected Contaminants
Suspected Fungi
Benomyl
Flusilazole
Chlorothalonil
Sulfonylureas
Others (80)
Fusarium
Aspergillus
Trichophyton
Deg. Prod.
Metabolic Prod. (Cows & Chickens)
Deg. Prod.
Metabolic Prod. (Rats)
BIC
MBC
Cyanide Adducts
BBU
STB
2-AB
5-HBC
MBC
Epoxide
Others
1H-1,2,4-Triazole
4-Fluorophyl methylsilanol
1H-Triazole
1,1,2,4-Triazole
Possible Cyanogenic Microbes
Mycotoxins??
Suspected Mutagen
Suspected Oncogen
Suspected Teratogen
Headaches, Weakness Confusion Nausea
Has been used in humans to determine potential for benlate exposure.
Suspected Oncogen
Suspected Fetotoxin
Suspected Teratogen
Not Registered in the US
Derivatives tested for contraceptive potential