Vista Chemical Company
15990 N. Barker's Landing Rd.
Post Office Box 19029
Houston, Texas 77224
Phone (713) 531-3200

Notice letters

March 21, 1986

VISTA

Mr. B. I. Raffle
Supervising Counsel
Environmental & Engineering Group
Conoco Legal Department
P.O. Box 2197
Houston, TX 77252

Certified - Return Receipt Requested

Mr. H. J. Neeld
Director, Environmental Programs
Environmental Conservation
Conoco Inc.
P.O. Box 2197
Houston, TX 77252

Certified - Return Receipt Requested

RE: U.S. v. Conoco Case # 83-2518

Gentlemen:

Pursuant to the Asset Purchase Agreement dated as of July 20, 1984, among E.I. Du Pont de Nemours and Company, Conoco Inc., and Vista Chemical Company, and the Consent Decree entered in the above action, we hereby provide notice of recently-discovered information which may lead to the filing of an Environmental Claim.

On February 28, 1986, the Vista LC VCM plant experienced a relief valve discharge from the VCM product Loading Bauxite Dryer. As a result of the incident report sent to the State, the enclosed request for further information has been received. Please contact George Hopkins at the VCM plant if you have any questions regarding this matter.

Sincerely,

Thomas G. Grumbles, C.I.H.
Environmental Quality Manager

ajo/8

cc (w/att):
W. L. McClain
J. C. Ledvina
R. A. Conrad

VVV 000000399

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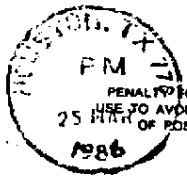

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(Name of Sender)

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(Street or P.O. Box)

Houston, TX 77224
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P.O. Box 2197
Houston, TX 77252

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5. ADDRESS (Complete only if requested)

6. UNABLE TO DELIVER BECAUSE:

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RETURN RECEIPT, REGISTERED, INSURED AND CERTIFIED MAIL

PATRICIA L. NORTON
SECRETARY

OFFICE OF AIR QUALITY AND NUCLEAR ENERGY

GREG J. GASPERECZ
ASSISTANT SECRETARY

March 13, 1986

CC: GEH RTF
PEM JCL
RAC WLM
MGH

ORIG: ENVIR. FILE

CERTIFIED MAIL - RETURN RECEIPT REQUESTED P 669 936 930

Mr. R. A. Conrad
Plant Manager
Vista Chemical Company
P. O. Box 605
Westlake, LA 70669

Dear Mr. Conrad:

The Air Quality Division is in receipt of your 76.18 letter dated March 10, 1986 relating to a VCM release on February 28, 1986.

Our mandate under La. R.S. 1089 I is to make a determination of preventability for each VCM release covered under 76.18. Accordingly we would appreciate a response to this letter 15 days after receipt.

To help us with our determination, please supply the following information:

- A sketch of the entire system involved, to include instrumentation, pumps, valves, vessels, etc. Please make specific reference to the VCM recovery system at the Shiploading Facility since our file information indicates this equipment to be activated carbon absortion beds, and
- if possible tie in the pressuring up of the system with a copy of the PRC or PI chart reading, and
- a copy of your unit supervisor's log book entry relating to this event, and
- the size, material of construction, the manufacturer, and specification for the rupture disk protecting the VCM Product Loading Bauxite Dryer SRV, and
- a copy of your calculations attesting to the quantity of VCM released, and
- a completed copy of your internal investigative report relative to this event.

VVV 000000402

Reprinted from British Journal of Industrial Medicine 1985;42:750–753

Exposure to vinyl chloride and angiosarcoma of the liver: a report of the register of cases

D FORMAN, B BENNETT, J STAFFORD, AND R DOLL

British Medical Association, Tavistock Square, London WC1H 9JR

British Journal of Industrial Medicine 1985;42:750–753

Exposure to vinyl chloride and angiosarcoma of the liver: a report of the register of cases

D FORMAN,[1] B BENNETT,[2] J STAFFORD,[2] AND R DOLL[1]

From the Imperial Cancer Research Fund Epidemiology and Clinical Trials Unit,[1] Radcliffe Infirmary, Oxford OX2 6HE, and Imperial Chemical Industries plc,[2] Thornton Cleveleys, Blackpool FY5 4QD, UK

ABSTRACT The Association of Plastic Manufacturers in Europe maintains a register of all cases of angiosarcoma of the liver (ASL) resulting from exposure to vinyl chloride monomer (VCM). This register has recorded all known VCM related cases of the disease worldwide that have been histologically confirmed. Although likely to be incomplete, it is the most comprehensive tabulation of such cases available and, by the end of 1984, 118 men had been registered. The information from analysis of the cases currently on the register is used to make an approximate projection of the number of cases to be expected in the future. The conclusion from this projection is that the industry is reaching the halfway stage in the appearance of VCM related ASL.

The idea that vinyl chloride might cause cancer was first suggested by Viola in 1970 as a result of experiments in rats.[1] This was subsequently confirmed by Maltoni in 1973 with his comprehensive series of experiments in rats, mice, and hamsters.[2] Among the tumours that developed in these animals was the normally rare angiosarcoma of the liver (ASL). It was not, however, until three cases of ASL were observed in men who had been heavily exposed to vinyl chloride in a polyvinyl chloride (PVC) polymerisation plant in the United States that the reality of the hazard was generally accepted.[3] ASL is normally so rare that only three or four cases occur each year in the whole of Britain (see below) so that the occurrence of three cases in a small group of industrial employees in the United States was, in itself, sufficient to justify the belief that the chemical caused the disease. If, however, any doubt has persisted it was soon dispelled by the steady accretion of new industrial cases and the finding that angiosarcomas and various other tumours could be produced in rats by levels of exposure that were appreciably less than those that had previously occurred in industry.[4] Steps were therefore quickly taken in the mid-1970s to reduce the extent to which individuals could be exposed from levels of the order of several hundred ppm to 5 ppm (13×10^6 ngm/m^3) or less.[5] This reduction followed an earlier lowering of exposure levels in the mid-1960s after concern was expressed about the narcotic effects of vinyl chloride and the risk of it producing acro-osteolysis. Before then exposure to some empic was often in the range of several thousand ppm. rarity of ASL, even under conditions of heavy exposure, has made it difficult to study its epidemiological characteristics[6] and it seemed, therefore, that it might be of value to summarise the data that have been recorded in the register of cases that has been maintained by Imperial Chemical Industries plc on behalf of the Association of Plastics Manufacturers in Europe (APME). This tabulates information about all the cases of ASL known to have occurred in men exposed to vinyl chloride that have been reported by individual manufacturing companies, trade associations, and occupational health organisations in Europe, North America, and Japan. The register is, doubtless, incomplete. It includes,

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Table 1 *Numbers of vinyl chloride related cases of angiosarcoma of the liver by date of death*

Period	*No of deaths*
1955–9	2
1960–4	4
1965–9	9
1970–4	23
1975–9	46
1980–4	31
1955–84	115*

*Three men diagnosed in 1980–4 were still alive at 1 January 1985.

Table 2 *Numbers of vinyl chloride related cases of angiosarcoma of liver by age at diagnosis*

Age (years)	*No of cases*
35–39	11
40–44	24
45–49	17
50–54	18
55–59	20
60–64	17
65–69	8
70–74	3
All ages	118

however, all the cases known to the collaborating organisations and they will probably have been informed, in one way or another, about nearly all cases that have been diagnosed among the relevant groups of employees.

Results

Until the end of 1984, 118 men had been recorded as having vinyl chloride related ASL, of whom three were still alive on 1 January 1985. All the cases had been confirmed histologically: 117 were reported to be hepatoangiosarcomas and one a cholangiosarcoma. No cases were recorded in women, but few women have been employed in manufacturing PVC.

Table 1 shows the breakdown of the cases by date of death. It should be noted that the register was begun in 1974 when vinyl chloride first became firmly established as a risk factor for ASL. Under-reporting is, therefore, less likely to be a problem after this date when special attention began to be paid to the disease. Table 2 gives the age distribution of the 118 men at the time of diagnosis. The mean age at diagnosis is 52. Table 3 gives the number of cases diagnosed and the number of PVC producing factories in each of the 12 countries reporting at least one case of ASL. Some countries have had cases in most of their factories (France, West Germany); others have had cases clustered in a small number of factories (United States, United Kingdom). Indeed, the United States has had 23 of its 33 cases in just two factories. Other countries that produce PVC but have not reported any cases are shown in table 4.

Table 5 shows the numbers of cases by time since first exposure and maximum exposure time possible. It seems that the incidence of ASL reaches a peak 20–29 years after first exposure but substantial numbers of cases may still occur after more than 30 years. The table also gives hypothetical numbers for expected new cases based on the distribution of cases in men who could have experienced the maximum latency period. These calculations show that the occurrence of vinyl chloride related ASL is not yet at the halfway stage and one might reasonably expect another 150 cases or so with an unknown number of further cases occurring 35 years or more after first exposure. Table 6 shows the principal occupations of the 118 affected men. At least 43% of the men (51/118) had been employed as autoclave cleaners, an occupation that has been thought to have necessitated the highest exposure to vinyl chloride monomer.

Discussion

The reassuring feature of these results is that the number of cases on the register is so small, and, in particular, that only 80 new cases have been diagnosed since 1975, despite the large size of the industry.

In the decade 1975–84, 19 cases were registered from the United States and seven from the United Kingdom. In men aged over 15 about 3300 deaths a year are attributed to all types of liver cancer in the United States and about 550 a year in the United Kingdom. Many of these cancers are probably sec-

Table 3 *Distribution of vinyl chloride related cases of angiosarcoma of liver by country. (Number of factories with three or more cases in parentheses)*

Country	*No of cases*	*No of factories reporting cases*	*Total No of factories making PVC*		*Capacity* in 1972*
			Pre-1974	*Pre-1964*	
United States	35	10 (3)	44	28	2090
W Germany	26	6 (3)	9	7	1155
France	18	5 (3)	7	5	627
Canada	10	1 (1)	4	3	88
United Kingdom	9	2 (1)	7	4	502
Sweden	5	1 (1)	2	1	105
Italy	4	4 (—)	11	7	778
Yugoslavia	4	1 (1)	3	2	60
Czechoslovakia	2	1 (—)	1	1	48
Japan	2	1 (—)	31	16	1699
Belgium	2	1 (—)	2	1	195
Norway	1	1 (—)	1	1	65
All countries reporting cases	118	34 (13)	122	76	9462

*Capacity in kilotonnes pvc production a year (Information supplied by ICI and by recipients of the register).

Table 4 *Countries with PVC factories operational before 1974 with no cases reported to register*

Country	Total No of factories	
	Pre-1974	Pre-1964
Western Europe		
Austria	1	1
Finland	1	—
Greece	1	—
Holland	2	1
Portugal	1	1
Spain	4	3
Switzerland	1	1
Eastern Europe		
Bulgaria	1	—
East Germany	2	2
Hungary	1	1
Poland	2	1
Rumania	5	4
USSR	3	1
South America		
Argentina	3	3
Brazil	2	2
Chile	1	—
Colombia	2	—
Mexico	5	2
Peru	1	—

Source: Information supplied by ICI and by recipients of the register.

ondary liver cancers originating in other organs, particularly in men over 60, but if this is ignored it appears that only about 0·06% of liver cancers in adult men in the United States (19/3300 × 10) are attributable to vinyl chloride and about 0·13% in Britain (7/550 × 10).

Two pieces of evidence suggest that an extremely high exposure to vinyl chloride may be needed to induce ASL. Firstly, the fact that so many of the cases were among men working as autoclave cleaners in which the highest exposures are thought to have occurred: it was in these jobs that employees sometimes became faint and unconscious before the 1960s, when the main concern about vinyl chloride was its narcotic effect. Secondly, in some countries there is a remarkable clustering of cases into a small number of factories. This suggests that the working conditions and hygiene standards varied in different factories. Fifteen of the 16 Japanese and 19 of the 28 United States factories operating before 1964 have reported no cases, and it would be helpful if it could be shown that the exposures in these factories was appreciably less—unless, of course, the number of employees in these factories were all very small.

It is the rarity of this tumour that has enabled its rapid identification as an effect of exposure to vinyl chloride. Baxter *et al* have calculated that the background incidence of ASL in the United Kingdom is between two and seven cases a year—that is, cases unattributable to exposure to vinyl chloride or to thorotrast, the other established aetiological agent.[7] That being so then the seven industrial cases in the decade 1975–84 represent an increase in the national figures of between 10% and 35%.

The mean induction period (time from first exposure to initial diagnosis) for the 118 cases is 22·6 years. Most cases have occurred 15 to 29 years after first exposure as is common with occupationally induced cancers. There are also, however, substantial numbers of cases occurring after longer time intervals, 18 having been diagnosed 30 or more years after first exposure. This means that new cases are likely to be diagnosed well into the 1990s even if it is assumed th exposures were significantly reduced in the mid-1960s when the first major improvements in standards of hygiene were made. The mean induction period of the cases currently on the register (22·6 years) must there-

Table 5 *Cases of vinyl chloride related angiosarcoma of liver tabulated by years from first exposure to vinyl chloride to diagnosis and years to 31 December 1984 (maximum possible latent period). (Number of cases expected to occur shown in parentheses*)*

Years from first exposure to 31 December 1984	Years from first exposure to date of diagnosis							
	5–	10–	15–	20–	25–	30–34	Total within 35 years	35 or more
⩾35	—	2	1	10	12	7	32	8
30–34	—	1	4	12	7	3 (+4)	27 (+4)	?
25–29	—	3	10	8	4 (+9)	0 (+10)	25 (+19)	?
20–24	—	4	15	2 (+25)	0 (+29)	0 (+22)	21 (+76)	?
15–19	1	2	2 (+7)	0 (+17)	0 (+18)	0 (+14)	5 (+56)	?
0–14	—	—	—	—	—	—	0 (+?)†	?
Total	1	12	32 (+7)	32 (+42)	23 (+56)	10 (+50)	110 (+155)	8 (+?)‡

*Number of cases expected to occur calculated by comparing proportion of cases in relevant years since first exposure category for previous time periods with proportion in other categories—for example, for 25–29 years since first exposure and 25–29 years maximum latency expected:

$$\frac{(3+10+8)}{(2+1+10+1+4+12)} \times (12+7) = \frac{21}{30} \times 19 = 13.3$$

As four cases have already been diagnosed, another nine may be expected.
†Number of new cases to be expected among workers who had less than 15 years since first exposure at 31 December 1984 will be dependent on whether the hazard of vinyl chloride was eliminated in the late 1960s or in the mid-1970s. In the former instance no cases would be expected, in the latter a number approaching the 61 cases projected for those with 15–19 years since first exposure by the end of 1984.
‡It is virtually impossible to estimate the number of expected new cases 35 or more years after first exposure.

Thank you for your cooperation in this matter. Should there be questions, please call.

Sincerely,

WHD
William H. Davis
Chief, LESHAP Unit

WHD:aa

File: 12.40.5