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

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

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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/m³) 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 acroosteolysis. Before then exposure to some employees was often in the range of several thousand ppm. The rarity of ASL, even under conditions of heavy exposure, has made it difficult to study its epidemiological characteristics⁶ 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,

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.

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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 hepatangiosarcomas 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
<i>Western Europe</i>		
Austria	1	1
Finland	1	—
Greece	1	—
Holland	2	1
Portugal	1	1
Spain	4	3
Switzerland	1	1
<i>Eastern Europe</i>		
Bulgaria	1	—
East Germany	1	2
Hungary	1	1
Poland	2	1
Rumania	5	4
USSR	3	1
<i>South America</i>		
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 ($19/3300 \times 10$) are attributable to vinyl chloride and about 0.13% in Britain ($7/550 \times 10$).

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 some-

times 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 thoro-trast, 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 that 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							Total within 35 years	35 or more
	5–	10–	15–	20–	25–	30–34			
≥ 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 (+7)†	?	
Total	1	12	32 (+7)	32 (+42)	23 (+56)	10 (+50)	110 (+155)	8 (+7)‡	

*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.

Table 6 Recorded occupations among ASL cases on register

	No ^a
Production worker/operator	69
Autoclave cleaner	51
General maintenance/fitter	8
Other jobs	11
Unknown	17
	156

^aAs several employees have more than one job recorded for them, these numbers do not add up to 118.

fore be expected to be materially increased with the passage of time.

Any method to assess the number of expected new cases is likely to be imprecise. Our method simply looks at the proportions of cases with different latent periods and makes projections based on the distribution of cases that have occurred within different periods of maximum possible latency. In the absence of any information about the numbers of exposed employees it is all that can be done. The results suggest that another 155 cases are likely to be diagnosed within 35 years after first exposure. Compared with the 110 cases in this category diagnosed so far, this means that the industry is approaching the halfway stage in the appearance of ASL. The calculation of 155 more cases within 35 years of first exposure assumes that the hazard was essentially eliminated in the late 1960s. If it was not a further 50 or 60 cases (something slightly less than the number expected to have been induced in men who could have been observed for only 15 to 19 years by the end of 1984) must be added to the total.

Further cases must also be expected to occur 35 or more years after first exposure but it is, as yet, virtually impossible to estimate the number to be expected with any precision. It could, however, easily be around 50. We suggest, therefore, that it should be assumed that there will be another 200–250 deaths from vinyl chloride related ASL over the next 30 years. This estimate is in pronounced contrast with that calculated by Nicholson *et al* who suggest that "within a factor of 2 or 3" there will eventually be a total of 350 deaths from vinyl chloride related ASL in the United States and 1200 in Western Europe alone.⁸ Nicholson *et al* used a complex model to deduce these figures based on the assumption that the incidence of

ASL at any point in time increases in proportion to (i) the first power of the product of the population at risk and the degree of exposure and (ii) a higher power (most probably the third) of the time since exposure first occurred.⁸ Knowledge of the distribution of cases recorded by the National Institute of Occupational Health and Hygiene (1982) by year of first exposure and year of occurrence, the amount of vinyl chloride produced, estimated average exposures at work at different periods from before 1950 to 1970–4, and normal national mortality rates allowed them to make approximate estimates of the variables in these equations and hence to calculate the number of cases that might be expected to occur in the future.

Only time will show which of the two methods will give the better estimate of the number of cases that will eventually be observed. We are encouraged, however, to think that the lower estimate may be the nearer as the method of Nicholson *et al* predicted an increase in the annual number of cases after 1979, whereas the number recorded to date has declined from an average of 9.2 in 1975–9 to an average of 6.8 in 1980–4. The latter figures will, however, almost certainly, be revised upwards in the course of the next few years owing to delayed reporting.

References

1. Viola PL. Pathology of vinyl chloride. *Med Lav* 1970;61:174–80.
2. Maltoni C. Occupational carcinogenesis 2nd International Symposium on Cancer Detection and Prevention, Bologna, 1974. In: *Advances in tumour prevention, detection, and characterisation*. Vol 2. Amsterdam: Excerpta Medica, 1977.
3. Creech JL, Johnson MW. Angiosarcoma of the liver in the manufacture of PVC. *J Occup Med* 1974;16:19–26, 150–1.
4. Maltoni C, Lefemine G. Carcinogenicity bioassays of vinyl chloride. *Environ Res* 1974;7:387–405.
5. Barnes AW. Vinyl chloride and the production of PVC. *Proceedings of the Royal Society of Medicine* 1976;69:277–80.
6. Fox AJ, Collier PF. Mortality experience of workers exposed to vinyl chloride monomer in the manufacture of polyvinyl chloride in Great Britain. *Br J Ind Med* 1977;34:1–10.
7. Baxter PJ, Anthony PP, MacSween RNM, Schauer PJ. Angiosarcoma of the liver: incidence and aetiology in Great Britain. *Br J Ind Med* 1980;37:213–21.
8. Nicholson WJ, Henneberger PK, Tarr D. Trends in cancer mortality among workers in the synthetic polymers industry. In: *Industrial hazards of plastics and synthetic elastomers*. New York: Lis, 1984:65–78.

CONFIDENTIAL

**World Register
of Cases of**

**ANGIOSARCOMA OF THE
LIVER (ASL)
due to VCM**

REVIEW DATE

1st JANUARY 1989

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LIVER ANGIOSARCOMA CASES
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FEBRUARY 1989

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WPX/ASL - ASL_ADDRESS,3

AP00055845

C O N F I D E N T I A L

REGISTER OF CASES OF ANGIOSARCOMA OF THE LIVER DUE TO EXPOSURE TO VINYL CHLORIDE - REVIEW DATE 1 JANUARY 1989

P R E F A C E : ACKNOWLEDGMENTS, SIGNIFICANT CHANGES, COMMENTS AND REQUESTS

- 1 The 7 new cases in the Register are the following: Canada 13; France 23, 24 and 25; Italy 07; UK 15 and 16.
- 2 There are amendments from the previous Register against the following cases: Canada 11 and 12, UK 14 and US 41.
- 3 I would like to thank the following for information about new cases: Dr Dietz, Dr Contassot, Dr Lagast, Dr Benetta, Dr Williams, Dr Smith, Dr Lea.
- 4 For additional information about other cases I thank also Dr Delorme, Monsieur Bibeau, Dr C A Johnson, Mr Roy N Johnson and Professor Lelbach.
- 5 So far as I know the following people are still alive: cases France 15, 22, 23 and 24; Germany 31 and 32; US 33 and 36. Is this correct? This is important information for the industry world-wide and I would appreciate news, especially regarding the cases in Germany, please.
- 6 Tables 4G and 4H have been enlarged by the addition of the factories at Tavaux (France) and Hillhouse (UK), as each of these has now had 4 cases.
- 7 I should be glad if all recipients of this Register would continue to keep me fully informed of any new cases, or give the name and address of someone who can send me the necessary details. I have again attached a blank sheet at the back of the Register so that information can be supplied under the appropriate headings, so far as possible. Please also send any other relevant information about earlier cases, or about factory changes.
- 8 RESEARCH: (a) May I again ask that all individuals involved in relevant research keep me informed and if possible send me reports. Perhaps recipients of this Register would pass on my request.

(b) Co-factors - I have recently met Professor Carlo Tamburro at the University of Louisville, USA, to assess the data which many of you kindly sent in response to my questionnaire about possible co-factors with Vinyl Chloride. We found there was no correlation within Europe but among the North American cases there was a suggestion of a co-factor effect on latency. In plants where Di-Ethyl Maleate had been used, the latency period seemed to have been shortened. X
- 9 There was an excellent response to the circular I sent in June 1988 about the Register mailing list. Thank you. Please continue to keep me up to date with news of retirements, movements and changes of address.

FROM: Dr Brian Bennett, Occupational Health, ICI Chemicals & Polymers Limited
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February 1989
BB/BGS

AP000055846

LIVER ANGIOSARCOMA CASES (REVIEW DATE - 1 JANUARY 1989)

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AP00055847

BELGIUM

LIVER Angiosarcoma Cases - (Review Date : 1 January 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
BELGIUM															
01		12.01.13	Solvay	Jeneppe	00.07.58	00.05.76	63	18	17	29.06.76	Yes	High 1958-1968 exposed to 200 ppm for 8 hrs per day and certainly under 500 ppm in 6 to 9m ³ autoclaves 1968-1972 exposed to 50-200 ppm 8 hrs per day in 25m ³ autoclaves 1972-1974 exposed to 50-200 ppm in auto- clave room 1974-1980 ppm 1975- 50 ppm RETINED 1 Feb 1975	Autocleaner 14 yrs Polyworker 3 yrs Work in glass ind. & chemi- cal industry	Driller in a foundry (2 yrs) Farmer (15 yrs) Work in glass ind. & chemi- cal industry	Hepatic tears in Oct 1974 were normal. Retired (Feb 1975) Hospitalised May 1976 Complete clinical and career details are given in a paper by Hublet et al in Arch. Belg. Med. Soc., Hyg. Med., Trav. Med., Leg. (1977) pages 601-622
02	SR	29 09 40	Solvay	Jeneppe	20 08 62	00.10.79	39	17	9	23 10 83	Yes	08.62-03. 63 01.67 -10.71 200 ppm 8h/day 04.63-12. 66 - 200 ppm	Autocleaner 15 yrs 5 mths operator 13 yrs 9 mths.	Fireman since 10 71.	1st sign July 79; Thoracic pain 07.79. Hepatic tests altered 10.79. Positive echography 11.79.opsy testes 07.80. Chemotherapy. Hormonal treat- ment given in March 12 Nov 1986 from 10 to 14 days

AP00055848

CANADA
Sheet 1

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
CANADA			SHAWINIGAN												
01		15.12.13			1944	1955	41	11	11	02.09.55	Yes		Reactor cleaner	Operator (polymerisation)	Smoker
02		04.03.14			1943	1957	43	14	14	21.12.57	Yes		Maintenance, millwright, pipefitter	Operator	Worked overtime Smoker
03		26.08.19			1941	1962	42	21	20	23.03.62	Yes		Operator, foreman		Worked overtime Non-smoker
04		05.04.19			1945	1967	48	22	22	21.01.68	Yes		Reactor cleaner	Operator, foreman, water cooling unit	Worked overtime Smoker
05		07.05.11			1944	1968	57	24	05	05.07.68	Yes		Reactor cleaner	Water cooling unit	Worked overtime Smoker
06		15.12.19			1947	1971	51	24	23	10.04.71	Yes		Reactor cleaner	Maintenance, millwright	Worked overtime Smoker
07		09.11.19			1946	1972	53	26	25	24.12.72	Yes		Reactor cleaner	Machine shop operator and poly unit	Worked overtime Smoker
08		13.05.20			1961	1973	53	12	05	12.06.73	Yes		Reactor cleaner	Maintenance machine shop	In plant 25 yrs Smoker
09		19.07.21			1946	1974	53	28	26	04.09.74	Yes		Furnace op. pipefitter maintenance		Worked overtime Smoker

* Paper by Dr F DELORME in Annales d'Anatomie pathologique Paris, 1978 Vol 23 No 2 pp105-114 claims this case had both a hepatoma and ASL simultaneously.

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CANADA
Sheet 2

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
CANADA															
10		16.05.15			1953	1976	61	23	14	00.04.77	Yes		Reactor cleaner	Furnace op. maintenance, packaging	Ex-smoker
11	LG	13.10.25	Gulf	Shawinigan	1943	Nov 85	60	42	5	05.04.86	Yes	High	1943-47 Operator & Supervisor VC Plant	Retired 1972 (Age 47)	Letters from Dr Fernand Delorme, Pathologist & M Bibeau, BFC
12	BC	14.09.20	Gulf	Shawinigan	1945	Mar 82	61	37	27	31.03.82	Yes	High	1945-55 Autoclave Operator, PVC Resins	Retired 1972 (Age 52)	Letters from Dr Fernand Delorme, Pathologist & M Bibeau, BFC
												Low	1955-65 VC Manufacture		
												Medium	1965-72 Autoclave Operator, PVC Resins		
13	SS	10.06.26	BFO	Niagara Welland	1957	1987	60	30	23	26.1.87	Yes	1957-70 High	Poly Cleaner Operator	Retired 1980 (Age 54)	Information from Dr H W Uetz, BFC, 1988
												1970-80 Low	Supervisor		

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LIVER Angiosarcoma Cases - (Review Date: 1 Jan 89)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
CZECHOSLO- VAKIA															
01		28.06.28	State Co	Novaky	01.07.57	24.12.73	45	16	16	24.12.73	Yes		Autoclave Cleaner	IARC letter of 1-4-82 giving details from Prof A David of Centre Ind Hygiene and Occ diseases.	
02		06.07.27	State Co	Novaky	01.11.50	27.11.64	37	14	15	26.11.64	Yes		Autoclave Cleaner	IARC letter of 1-4-82 gave somewhat altered dates for this case. I have accepted the changes since the dates come from Prof A David of the Centre of Industrial Hygiene and Occupational Diseases. My dates come originally from NIOSH.	

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FRANCE
Sheet 1

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 89)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
<u>FRANCE</u>															
01	M	15.04.24	RP	Roussillon	00.01.46	18.02.67	43	21	19	19.02.67	Yes	High	Autoclave worker and cleaner 19 yrs		Ref. Ravier et al Arch. Mal. Prot. 1 30 n° 13 Nov 75 p 171-177
02	SM	03.06.11	PCUK	Brignoud	06.07.59	15.01.75	63	16	12	24.01.75	Yes (NIOSH no comment)	High	12 yrs on monomer 10 yrs on polymer- isation	Italian origin	Ref. G Bonneton et al "Nouvelle Presse Medicale" 15 Nov 1977 p 735
03	NAY	06.01.20	RP	St Fons	00.00.46	15.01.75	55	29	29	29.06.75	Yes	High	Polyworker 10 yrs as autoclave cleaner Compounding 13 yrs	VCM production 16 yrs Italian POW Shepherd, Sawyer, Manon	Ref. Rety et al Arch. Mal. Prot. 1 37 n° 16 June 77 p 551-555
04	MOR	27.01.27	PCUK	Brignoud	19.10.49	16.01.76	49	26	26	04.01.76	Yes	High	Monomer production worker 18 yrs PVC filtration 18 yrs		
05	B	29.01.38	PCUK	Brignoud	18.01.65	13.05.76	38	11	11	13.05.76	Yes	High	Polyworker 11 yrs	1) Thoracotomy 9th Feb 1976 at "Sewaine Hospital" Angiosarcoma 2) Scintigraphy 1976 found ASL 3) Haemorrhage bone from ASL 4) Right hepatectomy	Ref. P Couderc et al "Sewaine Hospital" 10 September Previously had angiosarcoma Also Pellibowski et al "La Nouvelle Presse Medicale" 27th July 1979 Page 1665

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ICI CHEMICALS & POLYMERS

WPX/ASL - LANGLOISES, I

FRANCE
Sheet 2

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
FRANCE															
06	Pa	14.04.34	PCUK	Brignoud	01.03.58	12.08.76	42	18	13	11.09.76 (NIOSH says 12.09.76)	Yes	Moderate	(1958-1960) 12 yrs filtration 10-11 yrs polyworker sand works lab?		This man had AOL prior to IAS. Ann. de Mal. Prof. July '77 p 645 & 6. AOL was found in 1971 five yrs before ASL
07	GIR	26.04.27	BP	St Auban	01.07.50	After death NIOSH says 00.07.76	49	26	22	02.07.76	Yes (NIOSH no comment)	High	Plant fore- man in polymer- isation	1972-6 admin section in St Auban	Died of septicascia (Small liver lesion found after autopsy)
08	B	01.04.34	Solvay	Tavaux	21.05.57	03.12.75	42	19	19	30.01.77	Yes	Moderate	16 yrs packer 15 autoclave clnr 14 yrs autoclave worker		Had been tunnel worker previously
09	WPX	08.10.14	BP	St Fons	10.01.48	26.04.76	63	28	28	25.12.77	Yes	Very High 1948-1966 Lesser Exposure 1966-1976	Polymer- isation operator, autocleaner, autoclave maintenance	10 yrs in sulphuric acid factory, scorekeeper & general services	Operated 4.76 for removal of tumour from liver and died after second surgical operation for bilio bronchial fistula Paper by Dr Wely et al in Archives de Malades Professionals Vol 50 No 6 1979 pages 741-3.

AP00055853

ICI CHEMICALS & POLYMERS

MPX/ASL - LAMCOCASES.12

FRANCE
Sheet 3

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS	
France																
10	VP	24.05.19	RP	St Fons	00.12.56	10.01.78	58	21	21	10.01.78	Yes	High	Autoclave cleaner	10 yrs in mechanical engineering industry 1946-1956	Died of pulmonary embolism 5 days after surgery	
11	IL	15.02.12	RP	St Fons	00.01.41	12.08.78	66	37	31	13.11.78	Yes	High	1941-1946 polymer- isation general purpose worker 1946-1972 VCM synthesis (MCI & Acetylene) Foreman (agent for maltrise) 1972 retired			
12		16.08.14	PCUK	Brignoud	09.02.49	00.05.79	65	30	27	23.06.79	Yes	High	Monomer production and polymer- isation operator			
13		19.01.31	Solvay	Tavaux	23.09.63	26.06.79	40	16	13	22.08.79	Yes		Autocleaner 12 yrs, Auto- operator 10 yrs as operator 19 yrs, Copolymers 14 yrs	2 yrs as cycle mechanic. 1974. III all jobs in manufacture various. Surgical intervention 25.03.79 (right hepatectomy)	Cigarette smoker until 1974. III all of 1977 due to oesophageal varices. (Surgical intervention 25.03.79 (right hepatectomy)	
14	HM	05-04-24	Chimie Chimie (Formerly RP)	St Fons	1943	00.07.81	57	38	36	29.07.81	Yes	Very High	1943-1975 All types of maintenance work Intermittent manufacture in VCM Poly process	1943-1975 All types of maintenance work Intermittent manufacture in VCM Poly process	1975-1979	

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FRANCE
Sheet 4

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
France															Left Hepatectomy 1983
15	DEP	03.01.37	Chloe Chimie (formerly BP)	St Fons	07.07.55	28.09.82	45	27	27	Alive	Yes	High-20 yr Moderate 7 yrs	Autoclave cleaner 1955-1962 autoclave operator 1962-1982		J C Contassot Letters of 5 10 1983 and 29 7 88.
16	GMH	13.07.22	Chloe Chimie (Formerly BP)	St Fons	17.10.41	05.01.83	61	41	38	03.04.83	Yes	High-33 yrs Moderate- Low - 5 yrs	Polymerizat- ion Process Man Maintenance Worker Health & Safety Agent		Retired Jan 1979. J C Contassot Letters of 5 10 1983 and 25 7 84.
17	HAR	22.02.23	Chloe Chimie (Formerly BP)	St Fons	17.06.48	03.04.83	60	34	28	03.04.83	Yes	High - 23 yrs	Autoclave Cleaner 1948-1971	Other sectors of St Fons Factory 1971- 1978	Retired 01.01.79 J C Contassot Letter of 5 10 1983
18	R	14.07.42	Solvay	Tavaux	09.09.63	21.03.84	42	21	21	27.12.84	21.03.84	High-12 yrs Low - 9 yrs	Autoclave Cleaner		09.03.84 Right Hepatectomy 05.05.84- 24.09.84 chemotherapy for lung- metastasis : partial remission. 08.84 - liver recurrence. 10.84 - lung evolution of the disease

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LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
FRANCE															
19	MAZ	15.12.32	Atochem	Brignoud	07.04.59	26.10.84	52	25	25	06.11.85	Yes	High	Autoclave operator and cleaner		Myocardial infarction (1980. Coronary bypass 1981). Letter from Dr Contassot 15.4.86
20	BR	02.03.23	Atochem	Brignoud	1951	27.12.85	63	34	22	26.12.85	Yes	High	Autoclave operator and cleaner	In other parts of factory since 1946	Portal fibrosis from 26.04.74. The illness was diagnosed as presumably work related on 20.04.74. Letter from Dr Contassot 05.04.86
21	Pa	01.10.40	RP	SEF (Montlucon)	1959	03.06.86	45	27	4	28.06.86	Yes	High	Autocleaner 4 years	Maintenance worker	Hepatic test May 84 normal. Hepatic test May 86 showed abnormalities. Letter from Dr Barret 18.07.86.
22	AL	13.08.28	Atochem	St Auben	01.09.58	05.11.87	59	29	26	Alive	Yes	High 1958-70 Low 1970-84	12 years Autoclave worker. 14 years in Control Room		Letters from Dr Contassot, Atochem 22.12.87 and 29.7.88.
23	MA	07.02.27	Atochem	St Fons	1944	1988	63	44	28	Alive	Yes	High	Autoclave Cleaner & all PVC production jobs		Liver transplant May 1988. [Information from Dr J C Contassot Atochem, 1988]
24	DO	08.12.26	Atochem	Brignoud	1943	1988	62	45	35	Alive	Yes	High	PVC Production - 2 years MCV Detection - 3 years PVC Production maintenance - 30 years		Partial hepatectomy, Apr 88, Chemotherapy [Information from Dr Contassot, Atochem, 1988]
25	BB	02.03.30	Solvay	Tavaux	1962	1988	58	26	23	07.05.88	Yes	High (11 years) High (12 years) Low)	Polycleaner - 5 years Polyfloor - 6 years Control Room - 12 years		Primary Liver tumour Metastases lung, brain, bone, spleen, kidney. [Information from Dr H Engel, Solvay, 1988]

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GERMANY
Sheet 1

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
<u>GERMANY</u>															
01		00.00.30	4	4	01.10.56	19.09.68	38	12	12	25.01.69	Yes (NIOSH)		Polyworker		
02		00.00.31	4	4	14.10.57	25.09.70	39	13	11	14.12.71	Yes (NIOSH)		Polyworker		
03		00.00.30	12	12	09.06.52	00.03.73	43	21	16	10.10.73	Yes (NIOSH)		Filling pesticide aerosol cans with VC		Reported under (non polymer- isation workers in NIOSH list of 11.1.77. (This of course is strictly correct. However I wonder whether this man had high exposure to VCM in his can filling operation?
04		00.00.30	8	8	16.04.57	26.11.74	44	17	17	25.11.74	Yes (NIOSH)	200-500 ppm (but high during 1 yr autocleaner)	Polyworker & temporary autocleaner for 1 yr	1958 was autocleaner for 1 yr	Clinical details in paper by Coker et al Virchows Arch A Path 1976 222 p 195-201

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MPX/ASL - LANCIOSCASES,16

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LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

GERMANY
Sheet 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
GERMANY 05 (NIOSH gives as Case 06)		00.00.36	11	11	02.04.60	10.12.73	38	13	05	16.12.74	Yes (NIOSH)		IG Chemie says "chemistry laboratorian in the Techno- logical Research Department" (NIOSH says "assistant factory chemist (which may be wrong translation)		Confirmed Reported under (non-polymer- isation workers in NIOSH list of 31.3.77 and 31.78. I don't think this is a correct classification by NIOSH. The man may have been involved in VCM polymerisation in pilot plant or in main plant.
06 (NIOSH gives as Case 05)		00.00.32	7	7	16.12.62	00.00.75	63	13	12	09.01.75	Yes		PVC - Manu- facture Shift Leader		
07		00.00.26	8	8	15.04.54	12.11.75	49	21	21 (NIOSH says 12)	13.11.75	Yes		PVC Manu- facture and all work incl auto- cleaning 12 yrs (1954-66) Foreman Tech Dev 8 yrs (1967-1975)		
08		00.00.17	4	4	19.07.54	06.04.75	58	20	20	25.12.75	Yes	7	Polyworker	7	

AP00055858

ICI CHEMICALS & POLYMERS

WPK/ASL - LANCUCASES, 11

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GERMANY
Sheet 3

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
GERMANY															
09		00.00.34	2	2	20.02.61	16.06.76	41	15	13	24.03.78	Yes	High peaks	12 yrs poly- worker incl 172 auto- clave cleaning Control room 11 yr		10/78 Confirmed Average exposure first 19 yrs 150 ppm, 1000 1000 ppm, Next 3 yrs av. 175 ppm, Last 1 yr av 35 ppm
10 (NIOSH given as Case 11)		00.00.36	2	2	01.01.61	00.01.77	40	16	10	07.03.77	Yes	High peaks	10 yrs poly- worker incl 172 auto- clave cleaning		Average exposure first 19 yrs 150 ppm, 1000 1000 ppm, Last yr av 175 ppm, CWH letter of 21.04.78
11 (NIOSH given as Case 10)		00.00.29	8	8	10.10.55	28.06.77	47	21	22	28.06.77	Yes	High	13 yrs auto- clave cleaner 19 yrs filter operator		
12		00.00.38	4	4	00.00.61	00.10.77	39	16	6	07.10.77	Yes	1	PVC Manu- facture Autoclave worker for 16 yrs		

AP00055859

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
GERMANY															
13		00.00.14	7	7	00.00.60	08.04.78	63	18	14	19.05.78	Yes				F W Best letter of 30th June 1980 enclosing data from Mr H P Friedel of BG Chemie
14											Not an Angiosarcoma in his letter of 21.12.81, Mr Friedel said this was a "Plattenepi- thelkarzinom" (Der "Speiserohre" (a carcinoma of the oesophagus) (not attrib- utable to VCN & not recognised as an indust- rial disease				F W Best letter of 30th June 1980 enclosing data from H P Friedel of BG Chemie withdrawing this case
15 (NIOSH gives this as Case 13)		00.00.29	8	8	19.10.53	09.10.78	49	25	25	23.10.78	Yes	?	Autoclave cleaner and worker. Drier operator. Later shift leader		Angiosarcoma (confirmed 10/79. Some detail of this is also given 19, 11, 15, 16 16 17 given in INRW Report for 1978
16		00.00.23	4	4	10.01.55	07.08.78 (Leibach suspected ASL at Feb 1975 laparotomy)	55	23	20	07.08.78	Yes ASL and Hepatocellular Carcinoma	High	Autoclave worker till 1964. Leader and master		Angiosarcoma (confirmed, full details of illness since March 1973 given in INRW Med Insp Rep for 1978. Different details given in "VC Associated Disease" by Leibach and Marscheller (1981) p21.

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GERMANY
Sheet 5

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
GERMANY 17 (NIOSH gives as Case 15)		00.00.37	4	4	01.11.41	14.08.78	41	16	11	28.08.78	Yes	High	Autoclave worker	No	Angiosarcoma confirmed. Annual report of the North Rhine Westphalia Medical Inspectorate for 1978 pages 347-377 gives full details. Vinyl chloride disease diagnosed 02-02-73. Oesophageal varices. Radiologically confirmed macro histology.
18		00.00.13	5	5	00.00.55	25.12.79	66	24	21	25.12.79	Yes		Autoclave worker		
19		00.00.25	4	4	18.10.54	00.08.79	54	25	18	22.02.80	Yes (Metastasing ASL)	High	Autoclave worker		Dr Besche letter of 13-04-82 to Dr W G F Adams
20		00.00.15	4	4	14.02.61	00.04.80	65	19	13	19.10.80	Yes (Haemangio Endothelioma of liver with Metastases)	High	Autoclave worker		Dr Besche letter of 13-04-82 to Dr W G F Adams
21		00.00.13	4	4	01.01.62	00.09.79 (pronounced clinical liver symptoms)	66	18	13	19.06.80	Yes (Haemangio Endothelioma of liver with Metastases)	High	Autoclave worker and worked in drying shop		Dr Besche letter of 13-04-82 to Dr W G F Adams
22		00.00.21	4	4	15.10.61	28.08.80	59	19	11	06.12.81	Yes (Metastasing ASL)	High	Autoclave worker	Chargehand, subsequently Foreman	Dr Besche letter of 13-04-82 to Dr W G F Adams

AP00055861

GERMANY
Sheet 6

LIVER Angiosarcoma Cases (Rev Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTO- LOGICAL CONFIRM- ATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
GERMANY 23		00.00.27	8	8	1955	26.03.79	52	24	21	29.09.81	Yes	High (>300 ppm)	Chemistry Worker		Primary hepatocellular carcinoma; proliferation of the sinusoidal cells with sinusoidal ectasia. Friedel letter 23.12.86.
24		00.00.28	8	8	1959	11.10.82	54	13	12	28.05.83	Yes	High (>300 ppm)	Autoclave Cleaner		Prof Eder (Munich) letter 27.08.83. Friedel letter 19.04.85.
25		00.00.23	8	8	1960	28.09.81	58	21	13	14.01.83	Yes	High	Polyclave Worker and Autoclave Cleaner		Prof Seimert (Munich) letter 27.08.83. Friedel letter 19.04.85
26		00.00.22	2	2	1953	14.06.76	54	22	22	22.11.82	Yes	High	Polyworker		Chronic hepatitis, angiomatosis, sinusoidal ectasia. Friedel letter 23.12.86.
27		00.00.28	4	4	1955	18.01.83	55	28	18	02.03.84	Yes	High	Autoclave Cleaner till 1972		Leibsch. Friedel letter 19.04.85
28		21.11.23	7	7	01.10.60	11.08.85	61	25	25	25.08.85	Yes	High	Process worker 1947 84 (01.10.60) -31.03.84 (PVC product- ion, agitator area).		Annual VCM screening 24.04.85: no complaint, no abnormality detected. 1970 Two-thirds gastric resection for ulcers. 1971 Coronary thrombosis 1983 Femoral implantation 1984 Pulmonary embolism and pleuropneumonia. Landers letters 18.09.85 and 04.02.87.
29		00.00.22	2	2	1962	15.02.83	61	21	19	15.02.84	Yes	High	Chemistry worker		Haemangiosarcoma. Friedel letter 23.12.86.
30		00.00.17	4	4	1951	07.01.80	62	29	25	25.05.83	Yes	High	Polyworker Shift leader		Haemangiosarcoma. Friedel letter 23.12.86.
31		00.00.23	8	8	1953	10.06.85	61	32	20	Alive?		?	Autoclave cleaner		Haemangiosarcoma. Friedel letter 23.12.86.
32		00.00.30	8	8	1955	00.04.85	55	30	21	Alive?		?	Polyworker Autoclave cleaner		Haemangiosarcoma. Friedel letter 23.12.86.

AP00055862

ITALY
Sheet 1

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
ITALY															
01 (On NIOSH supple- mentary list)	LG	15.06.34	PANSAC	Mira Venice	00.00.65	19.04.71	36	06	03	16.04.71	Yes		PVC Bag extruder		Primary tumour may have been pericardial. Not homo- geneous with other cases. **
02	SE	13.11.29	Montedison	Porto Marghera	00.00.57	13.12.72	43	15	06	27.12.72	Yes		Polyworker		* **
03	VG	14.03.20	Solvay	Ferrara	00.01.53	10.07.75	55	22	21	10.07.75	Yes	High	Autocleaner 18 yrs (1953)- 161 Autoclave operator 12 yrs (1961- 72)	1972-5 did a variety of jobs including PVC packing.	**
04	FB	20.07.37	AMIC	Ravenna	00.04.59	00.01.81	43	21	21	30.03.81	Yes	12 yrs - Very High 5 yrs - Medium 4 yrs - Low	11 yr - Monomer operator 20 yrs - Autoclave operator & other duties in suspens- ion polymer- ization. Area Foreman in same Dept since 1975.	Never cleaned autoclaves. See paper by CHIAPPINO et al Med Lavoro Vol 6 (1982) pp 555-563	** Non-smoker. Consumed little alcohol. No AQL.
05	GC Danesi	19.03.37	PANSAC	Mira Venice	00.00.67	07.03.83	46	16	8	06.04.83	Yes	Medium-? High	Bag extruder 1967-1975 Commercial Dept 1976- 1983		5 Pagliarunga notes of 12 Aug 1981

* See Maltoni Med di Lavoro 65 p445, 1974. Further details in letter from Dr Montesano of IARC on April 1st 1982.

** Also see Maltoni and Rondivella in Acta Oncologica Vol 1 1980 pages 35 - 49.

AP00055863

LIVER Angiosarcoms Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
ITALY															
06	CZ	21.06.36	Montedison	Porto (Marghera, Venice)	01.10.60	06.12.85	49	25	25	13.02.86	Yes	High (1960-71 Medium (1971-74 Low (1975-85	PVC (manufacture (11 years as) (Autoclave (cleaner (1960-71. (14 years in (Control (Room (1971-85		Letters from Dr Chiossini, Venice, 22.09.87 and 11.01.88
07	AP	09.02.25	Moplefan	Terni	1958	21.01.86	60	28	22	05.04.86	Yes	1958-74 High 1974-80 Medium	Maintained VC Machinery (not operating for cleaning (autoclaves)) VC levels (reduced from 1973/74		Information from La medicina del lavoro, Italy, Vol 79 No.1 Jan-Feb 88, and Dr Benetta, EniChem.

AP00055864

JAPAN

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
JAPAN															
01	Tomoji Mori	01.08.22	Mitsui Toatsu	Nagoya	00.04.53	24.10.75	53	22	13	24.10.75	Yes	PVC Assoc level not known. 1st Japan Times indicated on 25.10.75 exposures often at 3000 ppm up to 1974	13 yrs auto- clave cleaner (1964 - assigned to different work since had ill health		Japan Times 25.10.75 & Japanese PVC Assoc letters of 31.03.78 & 30.11.87
02	SC	02.08.39	Kasegafuchi Chemical	Osaka	00.11.58	10.08.76	37	17	13	10.08.76	Yes	Not known	In polymer- ization work including autoclave cleaning		Japanese PVC Association letters of 31.03.78 & 30.11.87
03	YS	01.09.30	Mitsui Toatsu	Nagoya	00.07.55	26.06.85	54	20	5	14.09.85	Yes	High	15 years Autoclave cleaner		Letter from Dr Nakamura, Japanese PVC Association 30.11.87

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LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

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SWEDEN

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
SWEDEN															
01	NU	23.06.27	Kemanord	Sundevall	14.08.51	20.10.70	43	19	18	20.10.70	Yes		Polyworker		
02	BL	27.11.11	Kemanord	Sundevall	00.01.45	00.08.72	61	27	27	16.08.72	Yes	High	VCM production		Mr Spoellin's letter of 28 March 1978 confirms BL was a sonner worker who was heavily exposed, probably even more so than a normal reactor cleaner
03	ME	10.06.10	Kemanord	Sundevall	00.05.47	18.03.76	65	29	21	19.03.76	Yes	High	Polyworker		
04	AL	16.11.14	Kemanord	Sundevall	00.00.46	12.05.77	62	31	31	12.05.77	Yes	High	1946-1958 polymer- isation worker (12 yrs) & 1958- 1977 foreman (19 yrs)		In first 12 yrs of employment had been heavily exposed. In 1974, liver abnormality and necrosis diagnosed. Data confirmed in Dr O Byren letter 18.8.77 to CEFIC
05		12.03.19	Kemanord	Sundevall	11.05.64	22.11.80	61	16	16	22.11.80	Yes	High - 6 Years Low - 10 Years	1964-1970 centrifuge operator 1970-1980 drier operator		Letter of 22nd Nov 1981 from Dr David Byren

* In his letter of 1st April 1982, Dr Montesano of IARC says in Sweden's National Board of OS Health gives 20-02-70 as date of diagnosis for Case 01 and 15-05-72 for Case 02.

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UK
Sheet 1

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
UK 01	WJ	20.04.01	ICI	Hillhouse	04.04.44	03.12.72 (Fox & Collier paper says 23.12.72)	71	28	22	03.12.72 (Fox & Collier paper says 23.12.72)	Yes	500 ppm	1944-7 VCM 1947-8 Drier 1948-61 Autoclave operator 1961-66 Drier		Lee and Herry Lancet 29-06-74 pages 1316-8
02															Dubious (fabrication case)
03	BJW	02.06.37	BP	Berry	00.02.66	00.12.74	37	09	3.5	24.12.74	Yes	High	Autoclave cleaner		Exposure limited to 2.66 - 9.69
04	JSR	23.06.20	ICI	Hillhouse	26.04.54	00.06.79	59	25	10	12.10.79	Yes	Medium- high	54-5 Bagging Plant 55-6 Drier Plant 56-58 Autoclave worker 58-61 Chargehand Drier Plant 61-72 Foreman C 2/3 Plant	Pre-war fish packer 1938-45 army vehicle maintenance 1945-54 fish packer	

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UK
Sheet 2

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
UK 05	JK	30.03.14	BP	Barry	08.04.51	00.10.79	65	28	21	19.11.79			1951-52 Polycleaner 1952-55 Latex 1955-60 Polyfloor 1960-64 Poly Chargehand 1964-70 Charging operator 1970-72 Drier operator		
06	CEP	1931	BP	Barry	1962	09.01.80	48/9	18	12	09.01.80			17 yrs Poly Floor Operator 15 yrs Greaser on Poly Floor		
07	RCB	16.04.20	BP	Barry	1963	00.00.80	60	17	8.2	13.06.80			Polycleaner 1963-5 Recovery 1965-1971		
08	WTH	08.05.24	BP	Barry	19.09.50	27.11.81	57	31	24	25.12.81		1950-1958 500 ppm 1968-1974 200 ppm	1950-51 Autoclave operator 1951-1957 Chargehand autoclave building 1957-1974 Shift supervisor autoclave building - Never cleaned autoclaves but supervisor's job entailed entering autoclaves to inspect them	1938-1948 Motor Mechanic 1948-1950 Operator on Acetylene Production Plant	

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UK

Sheet 3

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
UK 09	ETCP	07.05.25	BP	Barry	15.02.50	02.03.83	58	33	29	24.02.83	Yes	Medium	Polymaker	12 years on Acrylonitrile Resin Plant. Also prior to 1950. 4 years RAF maintenance. 13 years motor car paintshop. 12 years in Craving Dock.	
10	GJT	04.04.47	BP	Barry	27.04.66	01.05.84	37	18	4.2	16.05.84	Yes	High - 11 months (500 ppm). Low - 18 months (50 ppm). Medium - 21 months (200 ppm)	Polycleaner (1966-67, Spray-drier bagger 1967- 68. Blow-down stripper operator (1968-70.	Heavy goods vehicle driver (until final illness. Dr D M J Williams	Information given in letter 18.06.84 from Dr D M J Williams
11	GLP	08.05.28	BP	Barry	19.12.65	02.06.85	57	19	16	02.06.85	Yes	High 1965-69 Med 69-79 Low 79-82	Polycleaner (1965-68. Service operator 1968-69. Poly operator 1969-79. Leading Hand 1979-82.	-	Letter of 04.06.85 Dr Paul Smith and letter of 04.06.85 Dr D M J Evans oesophageal haemorrhage due to oesophageal varices due to Angiosarcoma of liver
12	JT	24.01.37	ICI	Hillhouse	16.09.57	03.06.85	48	28	28	06.12.85	Yes	Low 1957-59 High 59-74 Low 74-85	Spare man, bagging floor 1957-59. Autoclave operator 1959-85	-	Letter 26.06.85 Dr F J Lee

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ICI CHEMICALS & POLYMERS

WPX/ASL2 - LAMCLOCASES, M

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UK
Shear A

LIVER Angiosarcoma Cases - (Review Date : 1 January 1989)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTO- LOGICAL CONFIRM- ATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
UK 13	HJ	02.03.48	BP	Barry	1968	Jan 86	37	18	3	02.06.86	Yes	High Low High	Polycleaner (1968-69 Central Depot 1969-70 Polyfloor 1970-1971)	Moved to Acrylonitrile Plant until left BP 1983. Manager of IC & SS Ltd at Cardiff Airport 1983-86	Remained well, working actively, until Jan 1986
14	CS	15.06.42	BP	Barry	07.07.66	27.08.87	45	21	11	01.12.88	Yes	10 months High 10 years constant Medium but on inter- mittent jobs	Polycleaner (1966-67 Polyfloor constant worker at times between 1968-1982		Letters from Dr DMD Evans, Pathologist, Penarth, Malco and Dr DMJ Williams, BP, Barry
15	BCP	23.08.21	BP	Barry	1954	1988	66	32	16	01.05.88	Yes	19 years High 15 years Medium 12 years Low	(Poly cleaner & Operator Blow & Recovery Operator Utility Operator)	Exposure periods intermittent	Information from Dr D M J Williams, BP, and Dr Paul Smith, Pathologist 1988
16	RT	25.05.22	ICI	Hillhouse	1963	1988	66	25	12	12.11.88	Yes	1 year Low 9 years High 12 years Low	Packer (Operator Autoclave Operator)		Hepatic fibrosis 1974 (Oesophageal varices Porta-caval shunt 1975 Information from Dr B Bennett, ICI, and Dr F I Lee, Blackpool Victoria Hospital 1988.

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USA
Sheet 1

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

UK system of dates
DAY - MONTH - YEAR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
USA															
01	Earl Perks	17.10.23	BPC	Louis- ville	09.12.48	03.03.73	49	24	21	03.03.73	Yes		Pot Cleaner (Block Jans 1974) p 53	History given in Annals NY ACAD SCIENCES (Vol 329 (1979) page 190 in (Paper by B R Cottine of OSHA	Rolling Stone Art (Ref 1 NY Acad of Sc Symp (1974 Also Block Jans 1.7.74 p 53
02		19.08.33	BPC	Louis- ville	15.11.55	00.05.70	37	14	13	27.09.71 (NIOSH says 28.09.71)	Yes		Pot Cleaner (Cf Block)		(Ref 1 Also Block JAMA 1.7.74 p 53
03	Edward Dimwiddle	25.05.15	BPC	Louis- ville	28.11.45	19.12.73	58	28	28	19.12.73	Yes		Pot Cleaner (Cf Block)	Louisville Courier Journal 07-09-80	(Ref 1 Also Block
04		15.01.24	BPC	Louis- ville	06.07.52	19.08.67	43	15	15	07.01.68	Yes		Pot Cleaner (Cf Block)		(Ref 1 Also Block
05		25.01.12	BPC	Louis- ville	19.06.44	09.04.64	52	20	20	09.04.64	Yes		Pot Cleaner (Cf Block)		(Ref 1 Also Block
06	Ray Austin Jones	23.11.28	BPC	Louis- ville	17.01.62	00.02.74	45	12	12	24.07.75	Yes		US Air Force (Pot Cleaner (Cf Block)		(Ref 1 Louisville Times 23.7.75 (Retired April 1974 Also Block
07	Charles T Smart	03.05.22	UCC	S Charle- ston	27.08.44	00.08.68	45	24	17	23.03.68	Yes				(Ref 1
08		06.05.20	Goodyear	Niagara	07.10.46	00.08.61	41	15	15	29.08.61	Yes				(Ref 1

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ICI CHEMICALS & POLYMERS

MPK/ASL 2 - LANGCASCES, 1

USA
Sheet 2

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

UK system of dates
DAY - MONTH - YEAR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
USA															
09	Raymond Gittle- Finger?	08.11.31	BFG	Louis- ville	28.05.45	01.03.74	43	29	24	11.03.75	Yes	2000 ppm			Ref 1 has wrong figures re first exposure. [Louisville Times 29.10.74, 12.3.75, 10.3.76
10		16.08.13	Goodyear	Niagara	12.06.51	00.05.68	55	17	17	10.05.68	Yes				Ref 1
11		27.05.09	Goodyear	Niagara	14.10.46	00.03.70	61	23	23	16.03.70	Yes				Ref 1
12	Francis A Bachman	17.11.18	Firestone	Pottstown Pa	13.07.49	02.05.69	50	20	19	02.05.69	Yes	High 10 yrs	10 yrs as reactor op. (not cleaner) (separate crew cleaned autoclaves)	Utility & Service op. Packer Dryer op. Stripping op. 3 yrs prior service in tyre plant	Ref 1 + letter of 26 April 1978 from Russell A Fork to J T Seawell of MCA
13	Richard Edward Clendenin	01.12.21	UCC	S Charle- ston	11.12.42	00.05.74	52	32	26	07.04.74	Yes	2000 ppm			Charleston Daily Mail 21.7.75
14															Never diag- nosed as ang- iosarcoma of liver. Inform- ation given in letter 22 May 1984 from J A Saig.
15															Accountant, [ASL - No evi- dence of VM exposure.

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ICI CHEMICALS & POLYMERS

VPX/ASL_2 - LANCLOCASES_2

USA
Sheet 3

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

UK System of dates
DAY - MONTH - YEAR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
USA															
16	James Howard	04.11.27	APC	Louis- ville	08.05.50	00.00.69	41	19	04	27.03.69	Yes		1951-4 VCH (polymer- isation	From 1954 onwards in Army and other service. 46-50 Army	Table 4 in Wagner Testimony to US Senate Confirmed in M M Johnson ltr 07.08.78
17	Peerenboom	06.05.31	APC	Louis- ville	23.06.55	11.10.74	43	19	19	16.10.80	Yes on 11.10.74 but no post-mortem 16.10.80				Dr M K Johnson letter of 24.2.81 con- firmed death 16 years after diagnosis
18	Charlie Arthur	22.04.28	APC	Avon Lake	15.09.54	00.00.75	46	21	13	02.11.75	Yes	113 yrs autocleaner 18 yrs on Estol plasticiser 16 Carboset operation	Navy Tyre Store		Confirmed in M M Johnson ltr 07.08.78 Also Rolling Stone mag. 15.01.76
19	Virgil Christian	00.00.15	UCC	S Charlie- ston	00.00.43	19.06.75	60	32	32	06.04.76	Yes	2000 ppm			Williamsport Sun Gazette 21 June 1975 Charleston Daily Mail 21.7.75
20		31.08.17	Goodyear	Niagara	00.00.55	30.01.76	58	21	18	30.01.76	Yes				NIOSH letter of 25.10.79
21	Chester Hinkle	02.09.09	UCC	S Charlie- ston	00.12.46	Early 77	67	30	22	02.01.77	Yes				28 yrs with UCC at SC Retired News release 21.2.77

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ICI CHEMICALS & POLYMERS

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WPX/ASL_2 - LAMINACASES_1

ISA
Sheet 4

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

UK system of dates
DAY - MONTH - YEAR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
USA															
22		02.10.23	BFC	Louis- ville	11.07.47	00.01.76	52	29	28	04.12.76	Yes				Louisville Times 26.1.76 said he was the 10th AS victim at Belle Lane 03 whom 8 had died by 26.1.76 In his letter of 16.09.81 Dr H N Johnson confirms this is the case described by Dannaher Tamburro & Yan in Feb 1980 Am J Medicine Vol 70 p280
23		00.00.23	Great American Chemical Company	Fitchburg Mass.	08.09.58	06.04.73	50	15	14	06.04.73	Yes				
24	Charles Edward Moore	17.05.17	UCC	S Charle- ston	1939	27.05.77	60	38	24 (NIOSH says 26)	27.05.77	Cholangio- sarcoma (R Kaminski 26/2/79)	Medium to high for vinyl resin 24 yrs	1941-65 non- solvent vinyl resin labourer and 1939-41 may dispersion (vinyl resins) exposed as unit fitter reactor cleaner helper, then shift utility man	1937-39 was off and on labourer 1939-41 may have been exposed as reactor cleaner 1943 became shift fitter 1946 became shift utility man	NIOSH will retain on register since this neoplasm may be associ- ated with ASL.
(25)															R N Wheeler letter of 12/2/79 and (Rose Kaminski) letter of 12/2/79 and 15/11/80
Removal from register confirmed in R Kaminski letter of 5 November 1980															

AP00055875

USA
Sheet 5

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

UK system of dates
DAY - MONTH - YEAR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
USA															
26	John Berry	07.07.23	SFC	Louisville	03.10.47	00.00.77 (up to 2 years after death)	52 (death)	28 (death)	18	11.02.75	Yes	Exposed in (some degree) to 22 (chemicals (but main exposure was to VCM, probably (high (paste (charging, (111 August (1965. (Terminated (employment (Jan 1966	Various jobs in PVC plants from cold room to paste recovery to PVC charging operator to paste charging, (111 August (1965. (Terminated (employment (Jan 1966	R Kaminaki (letter of (26/2/79 and (Prof. Tamburro (letter of (19/1/79	
27	J L Forrest	11.05.16	UCC	S Charleston	01.07.41	30.11.78	62	37	20 (MOSH (says 27 (and C (Daily Mail (25)	25.11.78	Yes	High	Operator to (10.10.76	Exposure in (bulk and (dispersion PVC (manufacture	R N Wheeler (letter of 4 Jan (1979 and (Charleston (Daily Mail (30.11.78 and (R Kaminaki (26/2/79
28		11.04.17	UCC	S Charleston	00.08.44	03.11.78	61	34	33	03.11.78	Yes				R Kaminaki (letter of (16/4/79
29		12.10.07	UCC	S Charleston	00.05.42	00.03.80	72	38	16	01.03.80	Yes				R Kaminaki (Letter of (19th June 1980 (16 5th Nov 1980
30	WVN	22.07.22	Tenneco Chemicals	Flemington	11.06.64	30.12.80	58	17	15	30.12.80	Yes	16 - Unknown 19 - Minimal	Maintenance Mechanic 16 yrs Elsewhere 11 yrs Boiler house Operator 19 yrs		
31		08.11.23	UCC	S Charleston	12.05.46	01.08.81	57	35	13	02.04.82	Yes	High (but not as high (as reactor (cleaner (would (experience) (Worked as (labourer (from (June 1941 (to May 1946 (and may (have (cleaned (reactors in (the plant	Operator in (charge (reactor (operator (from July 1976 (to date (Foreman (Aliphatic (Chemical (operation	From 1959 to (1976 Aliphatic (Chemicals (operator and (from July 1976 (to date (Foreman (Aliphatic (Chemical (operation	Dr Dacey (letter (16.10.81 and (R N Wheeler (letter of (19.11.81. (Also Dr Dacey (letter of (07.01.81 re (date of death.

AP00055876

USA
Sheet 6

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1989)

UK system of dates
DAY - MONTH - YEAR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTOLOGICAL CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
32	C W Giroux	22-02-08	Monsanto	Springfield Mass	15-10-51	00-07-79	71	28	14 (in PVC autoclave area)	17-05-80	An autopsy was done and immediate cause of death given as "Angiosarcoma"	The death certificate gave (Mr Giroux' usual occupation as "kettle" operator" (in and "chemicals industry". autoclaves (1964-1973) (Various clerical jobs in PVC polymerisation facility/ Retired 01-03-73.	1940-1951 Various jobs (in polymer manufacture BUTVAR LUSTREX 1951-1964 (Various jobs (in and around PVC autoclaves (1964-1973) (Various clerical jobs in PVC polymerisation facility/ Retired 01-03-73.		Information given in letter of 24 February 1982 from Dr Walter C Barnes of Monsanto Springfield to Dr A Mann of Monsanto Europe.
33	S Ferguson Jnr	08-10-27	BFG	Louisville	09-09-54	11-05-82	54	28	28	Alive	Yes		Multiple jobs including Poly Operator + Polycleaner.		(Prof Tamburro letter of 12 Aug 1982 + Dr M N Johnson letter of 12 Feb 1981.
34	Mr Byrum	29-01-34	BFG	Louisville	1955	03-11-82	48	27	10	04.08.83	Yes		Poly Operator + Autoclave Cleaner (1955-65.	1965 ltr BFG to become a Clergyman.	(Dr M N Johnson letter of 13 Nov 1982, 126 Feb 1983 and 9 Aug 1984.
35		09-03-12	UCC	S Charles- ton	23-07-44	18-07-83	71	39	14	18-07-83	Yes	High from 1944 to 1955. Medium from 1955-1958			(Dr Dacey letter of 15 Sept 1981.
36		27-08-32	The General Tire and Rubber Co	Ashtabula	11-06-56	21-08-83	50	27	27	Alive	Yes	Moderate	1956-58 labourer 1956-57 prod helper 1957-70 operator 1970-75 electrician 1975-present operator		(R W Landre letter of 12 Sept 1983; spotted at medical (May 1981). Testing commenced (May 1981)

AP00055877

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTO- LOGICAL CONFIRM- ATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
USA 37	Mr J Payton	29.08.29	BPC	Louis- ville	1953	06.08.84	54	31	22	06.08.84	Yes	High	Worked regularly in PVC area in the early days was a reactor cleaner 1953-75.		Information given in letter 09.08.84 from Dr H M Johnson
38	JWB	28.08.22	Air Products	Calvert City	00.02.63	19.01.84	61	20	20	28.10.83	Yes	High	Normal 1963-1982 (progression) from helper to senior operator, cleaned reactors, stripping and recovery areas as well as charging operator.		Thrombocytopenia and leukopenia since since 1978. Gold treatment for arthritis 1976. Under Dr's care about 6 months before death, had passed standard physical examination 3 months earlier. J Barr letters of 22.10.84 and 23.01.85.
39	J J Hemick	27.06.18	Pantacote	Panascite	1960	March 1984	65	24	23	29.06.84	Yes	Low High Low Low	29.09.60 - May 66 - Vinyl Fabrication Plant May 66 - Aug 70 Utility Resin Operator (Inc Jul 66) Sep 67 Resistor Operator (Sep 70-82) Monomer Operator 1982-83 (Mill) Operator, Calendar Shop, until retirement	Worked before 1960 with US Air Force, United Wool Dyers and Dynamite	Never in hospital for any chronic or acute medical problems. Death certificate states cause of death cardio-pulmonary arrest secondary to angiosarcoma of liver. Letter of 15.07.86 from John E Eitel of Pantacote with letter of 24.02.86 from Dr Auerbach, Pathologist.

AP00055878

USA
Sheet 8

LIVER Angiosarcoma Cases - (Review Date: 1 January 1989)

UK system of dates
DAY - MONTH - YEAR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COUNTRY AND REFERENCE NO	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACTORY	FIRST VC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	HISTO- LOGICAL CONFIRM- ATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
USA 40	P P Gilmer	26.10.14	BFG	Louis- ville	22.05.42	1987	72	45	34	03.01.87	Yes	High 1942-1974; Low 1975-1976	Chemical Worker 1942-45 Foreman 1945-76		Letter from Dr Dietz, BFG, 10.3.87
41	R Buckley	2.02.15	Goodyear	Niagara Falls	1949	1987	72	38	27	20.08.87	Yes	High Medium Left PVC area for 6 months in 1965	1949-65 Chemical Op/ Shift Sup/ Foreman, PVC Resin Production 1965-77 MF Plant	Retired 1977 (Age 62)	Letters from Prof Tamburro (University of Louisville, 1987 and Dr C A Johnson, Goodyear, 1988

AP00055879

LIVEN Angiosarcoma Cases - (Review Date: 1 Jan 1989)

AP00055880

Incidence of ASL Cases Per AnnumBy date of death

1955	.....	1
6	.....	0
7	.....	1
8	.....	0
9	.....	0
1960	.....	0
1	.....	1
2	.....	1
3	.....	0
4	.....	2
5	.....	0
6	.....	0
7	.....	1
8	.....	5
9	.....	3
1970	.....	2
1	.....	3
2	.....	5
3	.....	8
4	.....	5
5	.....	11
6	.....	11
7	.....	9
8	.....	10
9	.....	5
1980	.....	10
1	.....	5
2	.....	3
3	.....	10
4	.....	7
5	.....	6
6	.....	5
7	.....	3
8	.....	4
Total		<u>137</u>

N.B. 1 Does not include Italian 01 but does include German 03.

2 The 1977 total includes US case 24 which is a Cholangiosarcoma.

3 Does not include the following who are still alive, so far as known: Fr15, 22, 23 & 24, 011 & 12, 0511 & 11

Distribution of ASL Cases by Country

USA	38 ***
W Germany	31 ** ***
France	25 ***
UK	15
Canada	13
Sweden	5 ****
Italy	6 *
Yugoslavia	4 *****
Japan	3
Czechoslovakia	2
Belgium	2
Norway	1
	—
Total	145
	—

* Omit It01 - atypical case of PVC bag extruder.

** Includes G03 aerosol can filler.

*** Includes case US 24 which was diagnosed as Cholangiosarcoma; & Fr15, 22, 23 & 24, G31 & 32, US33 & 36, who are still alive, so far as known.

**** Includes one monomer worker.

***** Includes two monomer workers.

i.e	Western Europe	85
	North America	51
	Rest of World	9

Total 145

TABLE 3

Pattern of ASL Cases by Factory(a) W Europe

Of the 85 cases in W Europe, 73 have occurred in clusters at 12 factories. Of the 31 German cases, 28 have occurred in clusters at 4 factories.

	<u>ASL Cases</u>
Dynamit, Troisdorf, Germany	12
RP, Barry, UK	11
Wacker, Burghausen, Germany	9
Atochem (formerly Chloé Chimie, formerly RP), St Fons, France	9
Atochem (formerly PCUK) Brignoud, France	8
Kemanord, Sundsvall, Sweden	5
CWH, Marl, Germany	4
ICI, Hillhouse, UK	4
Solvay, Tavaux, France	4
Lonza, Waldshut, Germany	3
Solvay, Jemeppe, Belgium	2
Atochem, St Auban, France	2
	<u>73</u>

NB: There are 32 pre 1962 PVC plants in W Europe; 19 of these have had ASL cases (Ref Table 8)

(b) N America

Of the 51 cases in N America, 42 have occurred at four factories out of a total of 55 factories. In N America 42 plants have not had ASL cases.

	<u>ASL Cases</u>
BFG, Louisville, US	15
BFG, Shawinigan, Canada	12
UCC, S Charleston, US	10
Goodyear, Niagara Falls, US	5
	<u>42</u>

NB: There are 29 pre 1962 PVC plants in N America; 13 of these have had ASL cases (Ref Tables 9 & 10)

(c) Rest of World

The 9 ASL cases are believed to be in one cluster of 4 and two clusters of 2 cases.

TABLE 4A

Latency Periods (Years from first Exposure to Diagnosis)

	<u>Country</u>	<u>No of Cases</u>	<u>Total Years</u>	<u>Average</u>	
<u>W Europe</u>	Belgium	2	35	17.5	
	France	25	689	27.56 *	
	Germany	31	632	20.38 *	
	Italy	6	127	21.16	
	Norway	1	22	22	
	Sweden	5	122	24.5	
	UK	15	350	23.33 *	
		<u>85</u>	<u>1977</u>	<u>23.25</u>	W Europe Average
<u>N America</u>					
	US	38	993	26.13 *	
	Canada	13	314	24.15 *	
		<u>51</u>	<u>1307</u>	<u>25.62</u>	N America Average
<u>Rest of World</u>					
	Czechoslovakia	2	30	15.0	
	Japan	3	59	19.66	
	Yugoslavia	4	85	21.2	
		<u>9</u>	<u>174</u>	<u>19.33</u>	Rest of World Average
<u>Summary</u>					
	W Europe	85	1977	23.25	
	N America	51	1307	25.62	
	Rest of World	9	174	19.33	
		<u>145</u>	<u>3458</u>	<u>23.84 *</u>	World Average

* Of the countries with > 10 cases, France, USA & Canada have an average latency period above world average; Germany & UK below world average.

(Review Date - 1 Jan 1989)

DISTRIBUTION OF LATENCY PERIODS TABLE 4B

	0-9 yrs	10-14 yrs	15-19 yrs	20-24 yrs	25-29 yrs	30-34 yrs	35+ yrs	Total	Average Latency Period (Table 4A)
Belgium			2					2	17.5
Canada		3		5	2	1	2	13	24.15
Czechoslovakia		1	1					2	15.0
France		1	4	3	9	3	5	25	27.56
Germany		5	9	10*	5	2		31	20.38
Italy			2	2	2			6	21.16
Japan			1	2				3	19.66
Norway				1				1	22
Sweden			2		2	1		5	24.5
UK	1		5	1	5	3		15	23.33
USA		2	7	9	8	5	7	38	26.13
Yugoslavia				4				4	21.2
TOTAL	1	12	33	37	33	15	14	145	23.84

* Includes G 03 aerosol can filler

TABLE 4C
LATENCY PERIOD OF ASL CASES TABULATED BY YEAR OF FIRST EXPOSURE

MAX POSSIBLE LATENCY PERIOD	YEAR OF FIRST EXPOSURE	LATENCY PERIOD (NO OF YEARS)	ARITHMETIC MEAN OF LATENCY PERIODS	
49	1939	38*		
48	1940		$\frac{289}{8} = 36.12$	
47	1	37, 21, 37, 41		
46	2	32, 38, 45		
45	3	38, 14, 32, 42, 45***		
	4	28, 11, 24, 20, 24, 34, 39, 44***	$\frac{886}{31} = 28.58$	
	5	27, 22, 28, 29, 37		
	6	21, 29, 31, 26, 28, 15, 23, 30, 35		
41	7	29, 24, 29, 28		
40	8	28, 24, 34		
	9	30, 26, 20, 38	$\frac{559}{22} = 25.41$	
	1950	26, 22, 31, 19, 23, 14, 33		
	1	19, 28, 17, 28, 34, 29		
36	2	21**, 15		
35	3	25, 22, 23, 22, 20, 31, 22, 32***		
	4	21, 21, 25, 25, 21, 28***, 22	$\frac{849}{37} = 22.94$	
	5	22, 23, 24, 14, 19, 21, 27, 27***, 24, 28, 30***		
	6	21, 12, 27***, 32		
31	7	19, 17, 15, 13, 16, 28, 30		
30	8	18, 18, 15, 17, 20, 29***, 28		
	9	16, 21, 25, 27	$\frac{598}{31} = 19.29$	
	1960	13, 18, 21, 25, 24, 25		
	1	15, 16, 16, 16, 19, 19, 12		
26	2	13, 18, 17, 12, 18, 21, 26		
25	3	16, 17, 20, 21, 25		
	4	16, 17	$\frac{246}{14} = 17.57$	
	5	11, 19, 20		
	6	9, 18, 21		
21	7	16		
20	8	18		
	9	13	$\frac{31}{2} = 15.5$	
	1970			VIOLA
	1			
16	2			
15	3			MALTONI
	4			GOODRICH
	TOTAL	145 CASES	$\frac{3458}{145} = 23.84$	

* Cholangiosarcoma

** Aerosol can filler

*** The following are still alive, so far as known Fr15, 22, 23 & 24, G31 and 32, US33 and 36

WPX/ASL2 - LANGIOCUSES, 14

AP00055886

TABLE 4D

LATENCY PERIODS OF ASL CASES TABULATED BY YEAR OF FIRST EXPOSURE AND GEOGRAPHICAL LOCATION

MAX POSSIBLE LATENCY PERIOD	YEAR OF FIRST EXPOSURE	LATENCY PERIODS IN		
		WESTERN EUROPE	NORTH AMERICA	ROW
49	1939		38*	
48	1940			
47	1	37,41	21,37	
46	2		32,38,45	
45	3	38,45***	14,32,42	
	4	28,44***	11,24,20,24,34,39	
	5	27	22,28,29,37	
	6	21,29,31,33	26,28,15,23,30,35	
41	7	29	24,29,28	
40	8	28,34	24	
	9	30,26	20,38	
	1950	26,22,31	19	23,14
	1	19,28,34,29,	17,28	
36	2	21**	15	
35	3	25,22,22,32***	23,31	22,20
	4	21,21,25,25	21,28***	22
	5	22,23,24,27***24,28	14,19,21,27	
		30***		
	6	21,12,32	27***	
31	7	19,17,15,13,28	30	16
30	8	18,18,29***28	15	17,20
	9	16,21,25,27,		
	1960	13,18,21,25,25	24	
	1	15,16,16,16,19,19	12	
26	2	13,18,17,18,21,26	12	
25	3	16,17,21,25	20	
	4	16	17	
	5	11,19		20
	6	9,18,21		
21	7	16		
20	8	18		
	9	13		
	VIOLA 1970			
	1			
	2			
	MALTONI 3			
	TOTAL CASES	85	51	9

* Cholangiosarcoma

** Aerosol can filler

*** The following are still alive, so far as known Fr15 22, 23 & 24, G31 and 32, US33 and 36

(Review date 1 January 1989)

TABLE 4E

PLANT	START UP DATE	LATENCY PERIODS OF ASL CASES IN SPECIFIC PLANTS (10 OR MORE CASES)	NO OF CASES	AVERAGE LATENCY PERIOD
LOUISVILLE USA	1940?	12,14,15,19,19,20,24,27,28,28,28,29,29 31,45	15	24.53 years
TROISDORF W GERMANY	1954	12,13,16,16,18,19,19,21,23,25,28,29	12	19.91
SHAWINIGAN CANADA	1943 (1941?)	11,12,14,21,22,23,24,24,26,28,42,37	12	23.66
BARRY UK	1948	9,17,18,28,31,33,18,19,18,21,32	11	22.18
S CHARLESTON USA	1939?	24,30,32,32,34,35,37,38,38,39,	10	33.99

(Review date 1 January 1989)

TABLE 4F

LATENCY PERIOD OF ASL CASES TABULATED BY YEAR OF FIRST EXPOSURE
AND SPECIFIC PLANT (10 OR MORE CASES)

YEAR OF FIRST EXPOSURE	LOUISVILLE USA	TROISDORF W GERMANY	SHAWINIGAN CANADA	BARRY UK	S CHARLESTON USA
1939					38
1940					
1			21		37
2					32,38
3			14,42		32
4	20		11,24		24,34,39
5	28,29,27		22,37		
6			26,28		30,35
7	29,28		24		
8	24				
9					
1950	19			31,33	
1		29		28	
2	15				
3	31		23		
4	28	21,25			
5	14,19	23,28			
6		12		32	
7		13			
8					
9					
1960					
1		16,16,19,19,	12		
2	12	18		18	
3				17	
4					
5				19	
6				9,18,21	
7					
8				18	
9					
1970					
1					
2					

WPX/ASL2 - LANGIOCASES,17

AP00055889

(Review date 1 January 1989)

TABLE 4G

PLANT	START-UP DATE	LATENCY PERIOD OF ASL CASES IN SPECIFIC PLANTS(4-9 CASES)	NO OF CASES	AVERAGE PERIOD
BURGHAUSEN W GERMANY	1933	17,21,22,25,24,13,21,32,30	9	22.77 years
ST FONS FRANCE	1939	21,28,29,37,38,27,41,34,44	9	33.22
BRIGNOUD FRANCE	1950	11,16,18,26,30,25,34,45	8	25.62
SUNDSVALL SWEDEN	1945	16,19,27,29,31	5	24.4
NIAGARA FALLS USA	1947	15,17,21,23,38	5	22.8
SPLIT YUGOSLAVIA	1950	20,20,22,23	4	21.25
MARL W GERMANY	1948	15,16,22,21	4	18.5
TAVAUZ FRANCE	1953	19,16,21,26	4	20.5
HILLHOUSE UK	1940	28,25,28,25	4	26.5

WPX/ASL2 - LANGLOCASES,18

AP00055890

TABLE 4H

LATENCY PERIOD OF ASL CASES TABULATED BY YEAR OF FIRST EXPOSURE AND SPECIFIC PLANT
(4-9 CASES)

YEAR OF FIRST EXPOSURE	BURGHAUSEN W GERMANY	ST FONS FRANCE	BRIGNOUD FRANCE	SUNDSVALL SWEDEN	NIAGARA FALLS USA	SPLIT YUGO- SLAVIA	MARL W GERMANY	TAVAU FRANCE	HILLHOUSE UK
1939									
1940									
1		37,41							
2									
3		38	45						
4		44							28
5				27*					
6		29		31	15,23				
7				29					
8		28,34							
9			26,30		38				
1950						23*			
1			34	19	17				
2									
3	25,32					20	22		
4	21					22*			25
5	22,24,30	27			21				
6		21							
7	17							19	28
8			18			20			
9			16,25						
1960	21								
1							15,16		
2							21	26	
3								16,21	25
4				16					
5			11						
6									
7									
8									
9	13								
1970									
1									
2									

*Monomer worker

AP00055891

(Review Date - 1 Jan 1989)

TABLE 5

Annual Incidence of ASL Cases (Date of Death) by Geographical Area

	Western Europe	North America	Rest of World	Annual Total	Cumulative Total	Key Events
1955	1	1	1	1	1	
7	1	1	1	1	2	
1961	1	1	1	1	3	
2	1	1	1	1	4	
4	1	1	1	2	6	
7	1	1	1	1	7	
8	1	5	1	5	12	
9	1	2	1	3	15	
1970	1	1	1	2	17	Viola
1	1	2	1	3	20	
2	4	1	1	5	25	
3	1	4	3	8	33	Maltoni
4	3	2	-	5	38	Goodrich
5	6	4	1	11	49	
6	6	3	2	11	60	
7	6	3	1	9	69	
8	7	2	1	10	79	
9	5	-	-	5	84	
1980	6	4	-	10	94	
1	5	0	-	5	99	
2	1	2	1	3	102	
1983	7	3	1	10	112	
1984	5	2	1	7	119	
1985	5	1	1	6	125	
1986	4	1	1	5	130	
1987	1	3	1	3	133	
1988	4	1	1	4	137	
TOTAL	79**	49**	9	137		

* Includes G03 aerosol can filler but omits It 01 bag extruder

** Does not include the following who are still alive, so far as known: Fr15 22, 23 & 24, G31 & 32, US33 & 36

(Review date 1 January 1989)

TABLE 6

ASL CASE NUMBERS BY YEAR OF DEATH AND GEOGRAPHICAL LOCATIONS (EXCLUDING It.01)

KEY EVENTS		WESTERN EUROPE	NORTH AMERICA	REST OF WORLD
	1955		C1	
	6			
	7		C2	
	8			
	9			
	1960			
	1		US8	
	2		C3	
	3			
	4		US5	Cz2
	5			
	6			
	7	F1		
	8		C4, C5, US4, US7, US10	
	9	G1	US12, US16	
Viola	1970	Sw1	US11	
	1	G2	C6, US2	
	2	N1, Sw2, UK1, It2	C7	
Maltoni	3	G3**	C8, US1, US3, US23	Y1, Y2, Cz1
Goodrich	4	G4, G5, UK3	C9, US13	
	5	F2, F3, G6, G7, G8, It3	US6, US9, US18, US26	Jap1
	6	B1, F4, F5, F6, F7, Sw3	US19, US20, US22,	Jap2, Y3
	7	F8, F9, G10, G11, G12, Sw4	C10, US21, US24*	
	8	F10, F11, G9, G13, G15	US27, US28	Y4
		G16, G17		
	9	F12, F13, UK4, UK5, G18		
	1980	UK6, UK7, G19, Sw5, G20, G21US	US17, US29, US30, US32	
	1	It4, F14, UK8, G22, G23		
	2	G26	US31, C12	
	3	UK09, It5, F17, B2, G24, G25, G30	US35, US34, US38	
	4	UK10, F16, F18, G27, G29	US37, US39	
	5	UK11, UK12, F19, F20, G28		Jap3
	6	F21, UK13, It6, It7	C11	
	7		US40, US41, C13	
	8	F25, UK14, UK15, UK16		
	Total	79***	49***	9

* Cholangiosarcoma

** Aerosol can filler

*** Does not include the following who are still alive, so far as known:

Frl5, 22, 23 & 24, G31 & 32, US33 & 36

(Review date 1 January 1989)

TABLE 7

ASL CASE NUMBERS BY YEAR OF FIRST EXPOSURE AND GEOGRAPHICAL LOCATION
(EXCLUDING It.01)

KEY EVENTS		WESTERN EUROPE	NORTH AMERICA	REST OF WORLD
	1939		US24*	
	40			
	1	Fr11, Fr16	C3, US27	
	2		US13, US29, US40	
	3	Fr14, Fr24***	C2, US19, C11	
	4	UK1, Fr23***	C1, C5, US5, US7, US28, US35	
	5	Sw2	C4, US3, US9, C12	
	6	Fr1, Fr3, Sw4	C7, C9, US8, US11, US21, US31	
	7	Sw3	C6, US22, US26	
	8	Fr9, Fr17	US1	
	9	Fr12, Fr4	US12, US41	
	50	Fr7, N1, UK8, UK9	US16	Y2, Cz2
	1	Sw1, UK5, Fr20, G30	US10, US32	
	2	G3**	US4	
	3	G15, It3, G26, G31***	C10, US37	Jap1, Y1
	4	G7, G8, UK4, G19	US18, US33***	Y3
	5	G11, G16, G18, Fr15***	US2, US17, US20, US34	
		G23, G28, G32***		
	6	FR10, G1, UK15	US36***	
	7	Fr8, G4, It2, G2, UK12	C13	Cz1
	8	Fr6, B1, Fr22***, It7	US23	Jap2, Y4
	9	Fr2, It4, Fr19, Fr21		
	60	G5, G13, G25, G28, It6	US39	
	1	G9, G10, G12, G17, G20, G22	C8	
	2	G6, UK6, G21, B2, G29, Fr25	US6	
	3	Fr13, UK7, Fr18, UK16	US38	
	4	Sw5	US30	
	5	Fr5, UK11		Jap3
	6	UK3, UK10, UK14		
	7	It5		
	8	UK13		
	9	G24		
Viola	70			
	1			
	2			
Maltoni	3			
	Total	85	51	9

* Cholangiosarcoma (US24)

** Aerosol can filler (G3)

*** Fr15, 22, 23 & 24, G31 & 32, US33 & 36 are still alive, so far as known

WPX/ASL2 - LANGIOCASES, 22

AP00055894

TABLE 8
WESTERN EUROPE PVC PRODUCERS - START-UP DATES vs ASL CASES (OMITTING 003 & It.01)

START-UP YEAR	COUNTRY NAME	COMPANY NAME	LOCATION	ASL CASE NUMBER	YEAR OF 1st Exposure
1931	West Germany	BASF	Ludwigshafen		
1933	West Germany	Wacker	Burghausen	04,07,11,15,23,24	57,54,55,53,55,69,60,53
				25,31,32	55
1938	Italy	Montecatini	Acna		
1939	France	Rhone-Poulenc/ Chloe/Atochem	St Fons	03,09,10,11,14	46,48,56,41,43,
				15,16,17,23	55,41,48,44
1940	United Kingdom	ICI/EVC	Runcorn (Closed 1948)		
	United Kingdom	ICI/EVC	Hillhouse	01,04,12,16	44,54,57,63
1945	Sweden	Kemnord/Nobel	Sundsvall(Stockvik)	01,02,03,04,05	51,45,47,46,64
1946	France	Rhone-Poulenc	Roussillon	01	46
1948	United Kingdom	BP Chan/ICI/EVC	Barry	03,05,06,07,08,09	66,51,62,63,50,50
				10,11,13,14,15	66,65,68,66,56
	West Germany	CW/Huls	Marl	09,10,26,29	61,61,53,62
1949	Belgium	Solvay	Jemeppe	01,02	58,62
1950	France	ECUK/Atochem	Brignoud	02,04,05,06,12,19	59,49,65,58,49,59,
				20,24	51,43
	France	Rhone-Poulenc/ Chloe/Atochem	St Auban	07,22	50,58
	Holland	Shell	Pernis, Rotterdam		
	Norway	Norsk	Heroya, Porsgrunn	01	50
1951	Switzerland	Lonza/ICI/EVC	Sins		
1952	Italy	Montedison/ Moplefan	Terni	07	58
	Italy	Montedison/EVC	Porto Marghera	02,06	57,60
1953	Austria	Halvic/Solvay	Hallein		
	France	Solvay	Tavaux	08,13,18,25	57,63,63,62
	Italy	Solvay	Ferrara	03	53
	Spain	Rio Rodano	Hernani		
	United Kingdom	BXL/BIP/NORSK	Aycliffe		
	West Germany	Hoechst	Cendorf	18	55
1954	West Germany	Dynamit	Troisdorf	01,02,08,12,16,17	56,57,54,61,55,61,
				19,20,21,22,27,30	54,61,62,61,55,51
1955	Spain	Monsanto Iberia	Monzon		
1956	Spain	Caigsa	Sabinandgo		
		Hispavic/Solvay	Torrelavega		
1958	West Germany	Solvay	Rheinberg		
1960	Italy	S C Ravenna/EVC	Ravenna	04	59
	West Germany	Lonza/ICI/EVC	Waldshut	06,13,28	62,60,60
1961	Italy	Montedison/EVC	Brindisi		
1962	Portugal	Cires	Oporto		
1965	France	Rhone-Poulenc	Montlucon	21	59
	Italy	Pozzi	Ferrandina		
	Italy	Pensac	Mira, Venice	05	67
	West Germany	Wacker	Cologne		
1966	West Germany	Hoechst	Knapsack(Frankfurt)	05*	60
1967	France	Atochem	Balan		
	Spain	Rio Rodano	Miranda de Ebro		
	Greece	Esso Pappas	Diavata Salonika		
1968	Belgium	Badiphil	Antwerp		
1969	United Kingdom	Vinatex/Norsk	Staveley		
	Italy	Romanica/EVC	Cagliari Sardinia		

Continued

AP00055895

Table 8 - Continued

WESTERN EUROPE PVC PRODUCERS - START UP DATES vs ASL CASES (OMITTING G03 & It.01)

START-UP YEAR	COUNTRY NAME	COMPANY NAME	LOCATION	ASL CASE NUMBER	YEAR OF 1st Exposure
1970	Italy	SIR	Porto Torres Sar		
	United Kingdom	ICI/EVC	Runcorn		
1971	Spain	Hispavic/Solvay	Martorell		
	Sweden	Kemabord/Norsk	Sterungsund		
	United Kingdom	BP Chem	Baglan Bay		
1972	Finland	Pekema	Svartback		
	Holland	DSM	Beek Limburg		
1976	France	Soc Art D'vinyl	Mazingarbe		
		(CDF)			
1977	Spain	Monsanto Iberia	Tarragona		
1982	West Germany	ICI/EVC	Voslapp		
			Wilhelmshaven		

* Laboratory worker in Research Department

(Review date 1 January 1989)

TABLE 9

USA PVC PRODUCERS - START-UP DATES vs ASL CASES

START-UP YEAR	COMPANY NAME	LOCATION	ASL CASE NUMBER	YEAR OF 1st EXPOSURE
1939?	*UCC	S Charleston	07,13,19,21,24, 27,28,29,31,35	44,42,43,46,39, 41,44,42,46,44
	Dow	Midland (made Saran copolymer)		
1940?	*BFG	Louisville	01,02,03,04,05, 06,09,16,17,22, 26,33,34,37,40	48,55,45,52,44, 62,45,50,55,47, 47,54,55,53,42
1946	*UCC/Dow	Texas City (Partially closed 1977)		
1947	Goodyear	Niagara Falls	08,10,11,20,41	46,51,46,55,49
1948	Firestone/ Occidental	Pottstown	12	49
	Uniroyal	Painesville (closed 1975)		
1950	Monsanto	Springfield (Closed 1975)	32	51
1952	Dow	Midland (No PVC since c 1975)		
	BFG	Avon Lake	18	54
1953	Diamond/BFG	Deer Park		
1954	General Tire/ ** DiversiTech	Ashtabula (Closed 1984. Reopened 1986 by Vygen)	36	56
1956	Air Products	Pensacola (Pace)		
	Atlantic Refining	Brooklyn (Closed late 1960s)		
	Borden	Leominster (Closed 1984)		
	Conoco	Hebronville (Closed 1975)		
	BFG	Niagara		
	Great American Plastics	Fitchburg (Closed 1983)	23	58
	Hooker	Hicksville (Closed 1980-81)		
	Pantasote	Passaic (Closed 1984)	39	60
1957	Atlantic Tubing	Cranston (Closed 1967)		
	Tenneco/ Occidental	Flemington NJ (Closed 1985)	30	59
1958	Keysor Century	Saugus, Cal		
	Air Products	Calvert City (Paducah) (Closed March 1982 Re-opened October 1983)	38	63
1960	BFG	Long Beach, Cal (No PVC now. Formerly shown as Watson)		
	Borden	Illioopolis		
1962	Tenneco/Occidental	Burlington NJ		
1963	Conoco/Vista	Aberdeen, Miss		
	Stauffer	Long Beach, Cal (Closed 1982)		
1965	Conoco/Olin	Assonet, Mass (Closed by Olin 1975)		
	Ethyl	Baton Rouge (Closed 1984)		
1966	Diamond/Georgia	Delaware City		
	Gulf			
	Gen Tire/Pantasote	Mt Pleasant W Va (Closed 1982)		
	BFG	Henry, Ill		
	Stauffer/Formosa	Delaware City (Sold to Formosa 1981)		
1967	Allied/Robintech/ Georgia Pacific	Painesville, O. (No PVC made by Robintech. GP converted to polystyrene)		
	Hooker/Occidental	Burlington NJ		
1968	Firestone/Occidental	Perryville (Closed 1982)		

TABLE 9 (Continued)

USA PVC PRODUCERS - START-UP DATES vs ASL CASES

START-UP YEAR	COMPANY NAME	LOCATION	ASL CASE NUMBER	YEAR OF 1st EXPOSURE
1969	BFG	Pedricktown NJ		
	Goodyear/BFG	Plaquemine		
1971	Conoco/Vista	Oklahoma City		
1972	Nat Starch	Meredosia, Ill		
1973	Borden	Springfield		
1974	Atlantic Tubing/ Tallyrand	Cranston RI (Closed 1982)		
	Shintech	Freeport, Tex		
1975	Certain-teed	Lake Charles		
	Georgia Pacific/ Georgia Gulf	Plaquemine, La		
	Tenneco/Occidental	Pasadena, Tex		
1979	Firestone/ Occidental	Addis (formerly shown as Plaquemine)		
1983	Formosa	Point Comfort, Tex		
1985	Vygen	** Ashtabula, Ohio		

* My databank has no information on UCC before 1946 or BFG before 1950

** Refer to same plant at Ashtabula, bought by Vygen from DiversiTech.

NB Some of the plants in this list were closed down, some have changed ownership over the years, some have changed their product.

(Review date 1 January 1989)

TABLE 10CANADIAN PVC PRODUCERS - START-UP DATES vs ASL CASES

START-UP YEAR	COMPANY NAME	LOCATION	ASL CASE NUMBER	YEAR OF 1st EXPOSURE
1943 (1941?)	Goodrich (Formerly Gulf) (Formerly Shawinigan Chemicals) (Formerly Canadian Resins & Chemicals)	Shawinigan	01,02,03,04,05 06,07,08,09,10, 11,12	44,43,41,45,44, 47,46,61,46,53 43,45
1951	Monsanto	La Salle (Closed 1975)		
1957	Goodrich	Welland (Niagara)	13	57
1966	Esso (Imperial Oil)	Sarnia		
1979	Diamond Shamrock Alb/ BF Goodrich	Fort Saskatchewan		

(Review date 1 January 1989)

TABLE 11

EASTERN BLOC PVC FACTORIES - START-UP DATES vs ASL CASES

START-UP YEAR	COUNTRY NAME	COMPANY NAME	LOCATION	ASL CASE NUMBER	YEAR OF 1st Exposure
Pre 1939	East Germany	State Company	Schopau		
1941	Russia	State Comps	Vladimir et al		
1950	Yugoslavia	Jugo Vinil	Split	01,02,03,04	53,50,54,58
1951	Czechoslovakia	State Comps	Novaky	01,02	57,50
1955	East Germany	State Comps	Bitterfeldt		
1956	Rumania	State Comps	Icechim		
1957	Poland	State Comps	Oswiecim (Dwory)		
	Rumania	State Comps	Tirnaveni		
			Turda		
1958	Rumania	State Comps	Risnov		
1959	Hungary	State Comps	Berente Borsod		
1961	Rumania	State Comps	Borzesti		
1963	Yugoslavia	Ohis	Skopje		
1965	Bulgaria	State Comps	Varna		
1967	Poland	State Comps	Tarnow		
1969	Russia	State Comps	Djerjinsk		
1970	Rumania	State Comps	Rimnicu Vilcea		
	Russia	State Comps	Volgograd		
1972	Yugoslavia	Vinilplastika	Zadar		
1975	Czechoslovakia	State Comps	Neratovice		
	Russia	State Comps	Kalush Area		
1976	Yugoslavia	Hip	Pancevo		
1977	Rumania	State Comps	Rimnicu Vilcea		

(Review date 1 January 1989)

TABLE 12

JAPANESE PVC PRODUCERS - START-UP DATES vs ASL CASES

START-UP YEAR	COMPANY NAME	LOCATION	ASL CASE NUMBER	YEAR OF 1st EXPOSURE
1950	Chisso Corp	Minamata		
	Kanegafuchi Kag	Osaka	02	58
	Tekkosha	Sakata		
1951	Mitsui Toatsu	Nagoya	01, 03	53, 65
1952	Mitsubishi Mon	Yokkaichi		
	Sumitomo Kag	Kikumoto		
1951	Denki Kagaku	Shibukawa		
	Nippon Zeon	Kambara		
	Toa Gosei	Tekushima		
1955	Ryo-Nichi	Uozu		
1956	Nippon Zeon	Takoaka		
	Nisshin Kagaku	Takeo		
1957	Kureha Kasei	Nishiki		
	Shinetsu Kag	Naoetsu		
1960	Denki Kagaku	Ohmi		
	Kanegafuchi Kag	Takasago		
1964	Chisso Corp	Chiba		
1966	Tokuyama Seksui	Tokuyama		
1967	San Arrow Kagak	Tokuyama		
	Sumitomo Kag	Chiba		
1968	Ryo-Nichi	Mizushima		
	Shinetsu Kag	Tokuyama		
1970	Chisso Corp	Mizushima		
	Denki Kagaku	Goi (Chiba)		
	Kanegafuchi Kag	Kashima		
	Kawasaki Yuki	Kawasaki		
	Mitsui Toatsu	Sakai		
	Nissan Kagaku	Chiba		
	Shinetsu Kag	Kashima		
1971	Tekkosha	Yokkaichi		
1973	Asahi Glass	Hayatsuki		
1974	Toyo Soda	Sakata		
		Yokkaishi		
1975	Central Kagaku	Kawasaki		
	Toyo Soda	Yokkaichi		
1977	Unknown	Kashima		

(Review date 1 January 1989)

TABLE 13

SOUTH AND CENTRAL AMERICAN PVC PRODUCERS

START-UP YEAR	COMPANY NAME	LOCATION	ASL CASE NUMBER	YEAR OF 1st EXPOSURE
1953	Monsanto Mexica	Lecheria (Mexico)		
1954	Policyd	Mexico City (Mexico)		
1955	Geon Do Brazil	Sao Paulo (Brazil)		
1956	Elchlor/Solvay	Sao Caetano (Brazil)		
1960	Electrochlor	Capitan Bermudez (Argentina)		
	Viplastic	Mendoz (Argentina)		
1961	Indupa	Cinco Saltos (Argentina)		
1965	PET Columbiana	Cartagena (Colombia)		
1966	Carburo De Col	Medellin (Colombia)		
1967	Plasticos Omega	Mexico		
	SOC Paramonga	Paramonga (Peru)		
1968	Primex	Puebla (Mexico)		
1970	Policasa	Managua (Nicaragua)		
	Petro Dow	Conception (Chile)		
1971	Polimeros Mex	St Martin Puebla (Mexico)		
1975	Rico Chemicals	Guyanilla (Puerto Rico)		
1976	Petroplas	EL Tablazo (Venezuela)		
1977	Indust Resistoc	Tlaxcala (Mexico)		
1978	Huls Brasil	Cubato (Brazil)		
	Polychem	El Salvador		
	Policyd	Coatzacoalcos (Mexico)		
1979	PET Camacari	Camacari Bahia (Brazil)		

(Review date 1 January 1989)

TABLE 14
AUSTRALASIAN PVC PRODUCERS
START-UP DATES

START-UP YEAR	COMPANY NAME	LOCATION	ASL CASE NUMBER	YEAR OF 1st EXPOSURE
Mid 1950s	ICI Australia	Botany, Sydney		
1960s	B F Goodrich	Melbourne		
Late 1970s	ICI Australia	Laverton Melbourne		

(Review date 1 January 1989)

TABLE 15
MIDDLE EASTERN PVC PRODUCERS
START-UP DATES

START-UP DATE	COUNTRY NAME	COMPANY NAME	LOCATION
Sept 1986	Saudi Arabia	National Plastic Company (Ibn Hayan)	Arabian Petrochemical Company Madiant Al-Jubail Al-Sinahyah

ICI CHEMICALS & POLYMERS

LIVER Angiogenesis Cases

[illegible]

AP00055905

Tuesday, February 10, 1976

7233 JPB

APR 1 1977

Move to Halt Selling Of Spray Adhesives Prompted Abortions

Birth-Defects Scare Resulted
From U.S. Action; Fears
Later Found Without Basis

By JERRY E. BISHOP

Staff Reporter of THE WALL STREET JOURNAL

NEW YORK — Federal action to stop marketing of a consumer product due to suspicions that it might be linked to birth defects, and the resulting publicity, apparently frightened some pregnant women into obtaining abortions—even though it turned out that the suspicions were unfounded and the government move was quickly rescinded.

The incident involved action by the U.S. Consumer Product Safety Commission concerning spray adhesives used by hobbyists and others. In August 1973, shortly after the commission was created, it announced that it was considering banning spray adhesives. An Oklahoma pediatrician had found a higher incidence of damaged chromosomes in 10 persons who had used the spray adhesives than in 12 persons who hadn't. He also had seen two deformed children born to parents who had been exposed to the sprays during or shortly before the pregnancies.

Concern over the spray adhesives' possible link with birth defects led two major makers of the adhesives—Minnesota Mining & Manufacturing Co. and Borden Co.—to voluntarily stop marketing and distributing the products. The commission said that it wanted other makers to follow suit and that it was considering regulatory action. It wanted to halt marketing as a precaution until further studies could confirm or allay the suspicions.

It turned out that the suspicions couldn't be confirmed by further studies and the commission's ban on the adhesives was lifted six months later. During that time, however, the commission's action received wide publicity.

A survey of public reaction, as gauged by 182 genetic-counseling centers, is published in this week's issue of Science magazine, published by the American Association for the Advancement of Science. The survey was limited to the genetic counselors and didn't include the experience of family physicians, pediatricians, obstetricians or other medical personnel.

The survey found that the centers were aware of at least eight pregnant women who had been exposed to the spray adhesives and elected to have abortions without undergoing tests that would have disclosed whether the fetuses were affected. The centers also reported 11 additional instances where pregnant women underwent tests to determine if the fetuses' chromosomes were damaged. One of the 11 women had an abortion although the genetic counselor told her that he was unable to confirm whether the fetus was damaged. The aborted fetus failed to show any obvious defects although it wasn't checked for chromosome damage.

The 182 centers reported that they received 1,100 inquiries about the adhesives' suspected dangers and estimated that it cost the centers 1,200 days of work. Inquiries were highest where local news media gave the story considerable prominence.

The surveyors said that concern about possible genetic dangers of widely used substances "is a real one, and the report of suspicion of an effect should be taken seriously." They added, however, that the episode with the spray adhesives "illustrates the need to distinguish suspicion of toxicity from evidence of toxicity."

The survey was reported by Ernest B. Hook and Kristine M. Healy of the New York State Department of Health and Albany (N.Y.) Medical College.