

Liver Angiosarcoma Cases

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JS/MM/DSO-16
20 January 1982
PJXS79170920/WPX Wide 11

PREFACE

ACKNOWLEDGEMENTS, SIGNIFICANT CHANGES AND COMMENTS

- 1 During a visit on 14 September 1981, Dr Fukawa and Mr Takine of the Japanese PVC Association gave me information which has resulted in the deletion of the 3 unconfirmed cases alleged in the Japan Times of 27 October 1975. Of the three cases, Mr Sato and Mr Ono were confirmed as not being ASL cases though Mr Sato had portal hypertension attributable to VCM exposure. In the case of Mr Tanaka, it has proved impossible to confirm whether or not he had ASL - Mr Tanaka died in 1969. I am grateful to the Japanese PVC Association for investigating these 3 cases.
- 2 I am grateful to Dr M N Johnson of B F Goodrich for his letter of 16 September 1981 in which he confirmed that US Case 22 is a B F Goodrich man and that the case was described in the Dannaher, Tamburro and Yam paper in AMJ 70 1981 pp279-287. Dr Johnson makes the interesting observation that there are no known US ASL cases in plants South of the 36th parallel. This raises again the conjectures about climate, open/closed plants, time employees spend in open as opposed to inside covered plants as a factor in the incidence of ASL cases.
- 3 Ms Rose Kaminski has moved from NIOSH to CDC and responsibility for the NIOSH ASL register has been taken over by Edward W Dacey to whom I am indebted for his letter of 16 October 1981. This letter gave information about US 31 at UCC. The information was augmented in the letter of 9 November 1981 from Mr R N Wheeler Jr of UCC to whom I am grateful for much important detail.
- 4 In his letter of 2 November 1981, Dr David Byren of Kema Nord was kind enough to give me details of a fifth Swedish case. This has occurred at the Sundsvall plant and though the man died in 1980, his diagnosis was not confirmed until one year later.
- 5 In their letters of 9 and 22 December 1981, Dr J Rety of Chloe Chimie (formerly Rhone Poulenc) and Dr J C Aubrun of PCUK gave me full details of French Case 14. I am further indebted to Dr Rety for sending me a copy of two papers written by himself and his colleagues describing in detail French Cases 9 and 10. [Archives de Maladies Professionnelles Vol 40 No 6 of 1979 pages 741 to 744].
- 6 I am indebted to Mr H P Friedel of BG Chemie, Heidelberg for his letter of 21 December 1981 giving details of 3 interesting new German cases, two confirmed and one as yet unconfirmed. The two confirmed cases died in 1980; quite clearly histological confirmation can take a long time and one must therefore be very careful about drawing conclusions about annual rates of ASL cases. I have asked several times whether the annual incidence was decreasing and I am now satisfied that it is not decreasing.

The 3 new cases reported by Mr Friedel are also fascinating because they were all first diagnosed many years ago. They are all at Dynamit Nobel who now have a cluster of 10 cases. Of the 98 cases reported here, 40 are in 4 factories viz BFG Louisville (11), BFG Shawinigan (10), Dynamit Nobel (10) and UCC S Charleston (9).

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- 7 Dr D M J Williams of BP has provided detailed information on UK 8 which will no doubt be submitted to the UK ASL Panel for confirmation.
- 8 At the suggestion of Sir Richard Doll, Table 4B has been included to show some detail of distribution of latency periods. This has coincided with the reporting by BG Chemie of the three interesting cases G 20, 21 and 22 which were diagnosed in 1974, 1974 and 1972 respectively but died in 1980, 1980 and 1981. Just as in the case of US 17 (Mr Peerenboom) who was diagnosed as ASL in 1974 and died in 1980, I have treated the latency period as the date from first exposure to first diagnosis of ASL (or death if sooner). Normally the interval between diagnosis and death is a few months though there are a few cases of 1-2 years. These cases of 6-9 years survival after first diagnosis are exceptional.

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JS/MM/20 January 1982

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LIVER ANGIOSARCOMA CASES (REVIEW DATA - 17 AUGUST 1981)

Table Sequence

Belgium	1	ASL Case Numbers by year of Death (Table 6)	31
Canada	2-3		
Czechoslovakia	4	ASL Case Numbers by year of first exposure (Table 7)	32
France	5-7	Western Europe PVC Producers - Start-up Dates vs ASL Cases (Table 8)	33
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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	Jemeppe	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 1974-100 ppm 1975- 50 ppm RETIRED 1 Feb 1975	Autocleaner 14 yrs Polyworker 3 yrs	Driller in a foundry (2 yrs) Farmer (15 yrs) Work in glass ind. & chemi- cal industry	Hepatic tests 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

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* All dates use UK system
DAY - MONTH - YEAR
** Date published in Journal of
Occ Med 1978 pages 338-340
*** Many of dates altered to fit NIOSH 31/3/77 list

Canada
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CANADA			SHAWINIGAN												
01		15.12.13			1944	1955	41	11	11	02.09.55	Yes		Reactor cleaner	Operator polymerisation	Smoker
02		06.03.14			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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* All dates use UK system
** Data published in journal of
Occ Med 1978 pages 338-340

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*** Many of dates altered to fit NIOSH 31/3/77 line

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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

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France
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FRANCE															
01	HM	15.04.24	RP	Rouss- illon	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. Prof. 1 30 n° 13 Nov 75 p 171-177
02	SH	03.06.11	PCUK	Brignoud	06.07.59	15.01.75	63	16	12	24.01.75	Yes (NIOSH no comment)	High	2 yrs on monomer 10 yrs on polymer- isation	Italian origin	Ref. G Bonneton et al "Nouvelle presse medicale" 15 Nov 1977 p 735
03	NAV	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 3 yrs	VCM production 16 yrs Italian POW Shepherd, Sawyer, Mason	Ref. Rety et al Arch. Mal. Prof. 1 37 n° 16 June 71 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 19th Feb 1976 costal angiosarcoma 2) Scintigraphy found ASL 3) Haemorrhage from ASL 4) Right Hepatectomy	Ref. P Coudere et al "Semaine des hopitaux" 10 Septembre 1976 Previously had bone angiosarcoma" Also Pillchowski et al "La Nouvelle Presse Medicale" 17th July 1979 Page 2485

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FRANCE															
06	Pa	14.04.34	PCUK	Brignoud	01.03.58	12.08.76	42	18	13	11.09.76 (NIOH says 12.09.76)	Yes	Moderate	(1958-1960) 2 yrs filtration 10-11 yrs polyworker and works lab?		This man had AOL prior to AS. Ann. de Mal. Prof. July '77 p 645 & 6. AOL was found in 1971 five yrs before ASL
07	GIR	26.04.27	HP	St Auban	01.07.50	After death NIOH says 00.07.76	49	26	22	02.07.76	Yes (NIOH no comment)	High	Plant fore- man in polymer- isation	1972-6 admin section in St Auban	Died of septicaemia Small liver lesion found after autopsy
08	B	01.04.34	Solvay	Tavaux	23.05.57	03.12.75	42	19	19	30.01.77	Yes	Moderate	6 yrs packer & autoclave clnr 14 yrs autoclave worker		Had been tunnel worker previously
09	IRFX	08.10.14	RP	St Fons	10.01.48	26.04.76	63	28	28	25.12.77	Yes	Very High	Polymer- isation 1948-1966 Lesser Exposure 1966-1976 autocleaner, autoclave maintenance	10 yrs in sulphuric acid factory, storekeeper & general services	Operated 4.76 for removal of tumour from liver and died after second surgical operation for bilio bronchial fistula Paper by Dr Rety et al in Archives de Malades Professionals Vol 40 No 6 1979 pages 741-3.

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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	UL	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 (HCl & Acetylene) Foreman (agent de maitrise) 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			Autocleaner 12 yrs, Auto- operator 19 yrs, Copolymers 14 yrs	12 yrs as cycle mechanic. 10 yrs as enameller in sanitary ware manufacture	Cigarette smoker until 1974. Ill all of 1977 due to Oesophageal varices. Surgical intervention 25.05.79 (right hepatectomy)
14	HJ	05-04-24	Chloe Chimie (Formerly RP)	St Fons	1943	00.07.81	57	38	36	29.07.81	Yes	Very High	1943-1975 All types of maintenance and jobs on work Intermitt- ently 1975-1979 in VCM Poly Process	1975-1979 maintenance work	

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GERMANY															
01		00.00.30	Dynalit	Troisdorf	01.10.56	19.09.68	38	12	12	25.01.69	Yes (NIOSH)		Polyworker		
02		00.00.31	Dynalit	Troisdorf	14.10.57	25.09.70	39	13	11	14.12.71	Yes (NIOSH)		Polyworker		
03		00.00.30	Dynalit	Rheinfel- den	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 31.3.77. 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	Wacker	Burg- hausen	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 Gokel et al Virchows Arch A Path 1976 372 p 195-203

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GERMANY 05 (NIOSH gives as Case 06)		00.00.36	Hoechst	Frankfurt	02.04.60	10.12.73	38	13	05	16.12.74	Yes (NIOSH)		RG 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 1.78. 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
06 (NIOSH gives as Case 05)		00.00.32	Lonza	Waldshut	16.12.62	00.00.75	43	13	12	09.01.75	Yes		PVC - Manu- facture Shift Leader		
07		00.00.26	Wacker	Burg- hausen	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	Dynamit	Troisdorf	19.07.54	06.04.75	58	21	22	25.12.75	Yes	?	Polyworker	?	

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GERMANY															
09		00.00.34	CWH	Merl	20.02.61	16.06.76	41	15	13	24.03.78	Yes	High peaks	12 yrs poly- worker incl 17% auto- clave cleaning Control room 1 yr		10/78 Confirmed Average exposure first 9 yrs 150 ppm, occ 1000 ppm. Next 3 yrs av. 75 ppm. Last 1 yr av 35 ppm
10 (NIOSH gives as Case 11)		00.00.36	CWH	Merl	01.01.61	00.01.77	40	16	10	07.03.77	Yes	High peaks	10 yrs poly- worker incl 17% auto- clave cleaning		Average exposure first 9 yrs 150 ppm, occ 1000 ppm. Last yr av 75 ppm. CWH letter of 21.04.78
11 (NIOSH gives as Case 10)		00.00.29	Wacker	Burg- hausen	10.10.55	28.06.77	47	22	22	28.06.77	Yes	High	3 yrs auto- clave cleaner 19 yrs filter operator		
12		00.00.38	Dynalit	Troisdorf	00.00.61	00.10.77	39	16	6	07.10.77	Yes	?	PVC Manu- facture Autoclave worker for 6 yrs		

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Germany
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GERMANY															
13		00.00.14	Lonza	Waldshut	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 attribut- able to VCM & 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	Wacker	Burghausen	19.10.53	09.10.78	49	25	25	23.10.78	Yes	7	Autoclave cleaner and worker. Drier operator. Later shift leader		Angiosarcoma confirmed 09/79. Some detail of this & also cases 19, 13, 15, 16 & 17 given in INRW Report for 1978
16		00.00.23	Dynamit	Troisdorf	10.01.55	07.08.78	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.

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LIVER Angiosarcoma Cases - (Review Date: 20 January 1982)

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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 given as Case 15)		00.00.37	Dynamit	Troisdorf	01.11.61	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. probably acro osteolysis.
18		00.00.13	Hoechst	Gendorf	00.00.55	25.12.79	66	24	21	25.12.79	Yes		Autoclave Worker		
19		00.00.25	Dynamit	Troisdorf	18.10.54	00.08.79	48 (Figure given by Mr Friedel presumably early diagnosis in 1974)	19 (Figure given by Mr Friedel presumably early diagnosis in 1974?)	18	22.2.80	Yes		Autoclave Worker		
20		00.00.15	Dynamit	Troisdorf	00.00.61	07.02.74	57 (59?)	12	13	19.10.80	Yes		Autoclave Worker		Details in Mr Friedel's Letter of 21.12.81
21		00.00.13	Dynamit	Troisdorf	01.01.62	00.00.74	61	13	13	19.06.80	Yes		Autoclave Worker		Details in Mr Friedel's Letter of 21.12.81
22		00.00.21	Dynamit	Troisdorf	15.10.61	26.10.72	47 (51?)	11	11	06.12.81	?		Autoclave Worker		Details in Mr Friedel's Letter of 21.12.81

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* Should this case be removed from
the list? NIOSH have it on their
supplementary list relating to

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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)		15.06.34			00.00.65	19.04.71	36	06	03	16.04.71	?Yes		PVC Bag extruder		* (Primary tumour (may have been (pericardium. (Not homo- (genous with (other cases
02		13.11.29	Montedison	Porto Marghera	00.00.57	13.12.72	43	15	06	00.12.72	Yes		Polyworker		
03		14.03.20	Solvay	Ferrara?	00.01.53	10.07.75	55	22	21	10.07.75	Yes	High	Autocleaner 8 yrs Autoclave operator 12 yrs		*FOA at al papers at Dubrovnik suggest Ferrara?
04	BP	20.07.37	SC Ravenna	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 suspen- sion polymer- isation. Area Foreman in same Dept since 1975.		

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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 (no comment by Jap PVC Assoc)	Nagoya	00.04.53	24.10.75	53	22	13	24.10.75	Yes	PVC Assoc says not known. * 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 letter of 31.03.78
02	SO	02.08.39			00.11.58	10.08.76	37	17	13	10.08.76	Yes	Not known	In polymer- isation work including autoclave cleaning		Japanese PVC Association letter of 31.03.78

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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
NORWAY															
01	AH	23.12.15	Norsk Hydro	Herøya	00.03.50	21.12.71	56	22	21	04.01.72	Yes	High	Foreman & Autoclave supervisor		Confirmed by Dr Thilo- Evansson of NH. At AFME Mtg of 19 June 1978 Mr P Rangnes stated that AH had been a member of a start-up team. VCM & PVC were made in same building. The VCM was made from acetylene

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	123.06.27	Kemanord	Sundsvall	14.08.51	20.10.70	43	19	18	20.10.70	Yes		Polymaker		
02	BL	127.11.11	Kemanord	Sundsvall	00.01.43	00.08.72	61	27	27	16.08.72	Yes	High	WCM production		Mr Sjoeelin's letter of 128 March 1978 confirms BL was a monomer worker who was heavily exposed, probably even more so than a normal reactor cleaner
03	NE	110.06.10	Kemanord	Sundsvall	00.03.47	18.03.76	63	29	21	19.03.76	Yes	High	Polymaker		
04	AL	116.11.14	Kemanord	Sundsvall	00.00.46	12.05.77	62	31	31	12.05.77	Yes	High	1946-1958 Polymer- isation worker (12 yrs) & 1958- 1974, liver abnormally (19 yrs) and necrosis diagnosed. Data confirmed in Dr D Byren's letter 18.8.77 to CEPIC		In first 12 yrs of employment had been heavily exposed. In 1974, liver abnormally (19 yrs) and necrosis diagnosed. Data confirmed in Dr D Byren's letter 18.8.77 to CEPIC
05		112.03.19	Kemanord	Sundsvall	11.03.64	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 12nd Nov 1981 from Dr David Byren

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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		
02															Dubious fabrication case
03	BJW	02.06.37	BP	Barry	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	18	12.10.79	Yes	Medium- high	54-5 Bagging Plant 55-6 vehicle Drier Plant 56-58 Autoclave worker 58-61 Chargehand Drier Plant 61-72 Foreman C 2/3 Plant	Pre-war fish packer 1939-45 army vehicle maintenance 1945-54 fish packer	

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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	08.01.51	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			7 yrs Poly Floor Operator 5 yrs Grassier on Poly Floor		
07	IRB	1920	BP	Barry	1963	00.00.80	60	17		13.06.80			Polycleaner 1963-5 Recovery 1965-1971		Death attributable to VCM Angiosarcoma incidental finding
08	WTM	08.05.24	BP	Barry	19.09.50	24.11.81	57	31	24	25.12.81			1950-51 Autoclave operator 1951-1957 Chargeman autoclave building 1957-1974 Shift supervisor autoclave building - Never cleaned autoclaves but supervisor's job entailed entering autoclaves to inspect them		

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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 Parks	17.10.23	BFG	Louis- ville	09.12.48	03.03.73	49	24	21	03.03.73	Yes		Pot Cleaner (Block Jama 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 Jama 1.7.74 p 53
02		19.08.33	BFG	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 Dinwiddie	25.05.15	BFG	Louis- ville	28.11.45	19.12.73	58	28	28	19.12.73	Yes		Pot Cleaner (Cf Block)	Louisville Courier Journal 02-09-80	Ref 1 Also Block
04		15.01.24	BFG	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	BFG	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	BFG	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	00.00.68	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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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 Gettler- 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 for 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 craw cleaned autoclaves)	Utility & Service op. Bagger Dryer op. Stripping op. 3 yrs prior service in tyre plant	Ref 1 + letter of 26 April 1978 from Russell A Park 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															Dubious fabrication case
15															Dubious fabrication case

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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	BFG	Louis- ville	08.05.50	00.00.69	41	19	04	27.03.69	Yes		1951-4 VCM polymer- isation	From 1954 onwards in Army and other service. 46-50 Army	Table 4 in (Wagoner Testimony to US Senate Confirmed in M H Johnson ltr 07.08.78
17	Peerenboom	06.05.31	BFG	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 H Johnson letter of 24.2.81 con- firmed death 6 years after diagnosis
18	Charlie Arthur	22.04.28	BFG	Avon Lake	15.09.54	00.00.75	46	21	13	02.11.75	Yes	13 yrs autocleaner 8 yrs on Estol plasticiser & Carboset operation	Navy Tyre Store		Confirmed in M H 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 23.2.77

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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	BFG	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 (Bella Lane of whom 8 had died by (26.1.76 (In his letter (of 16.09.81 (Dr M N Johnson) (confirms this (is the (case described (by Dannaher (Tamburro & Yant (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 24 yrs	1941-65 non- solvent vinyl resin unit and dispersion vinyl resins unit first as fitter 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	IN M Wheeler letter of 18.8.77 to J Stafford gives details Rose Kaminski letter of 26/2/79 R Kaminski (5 Nov 1980) suggests that NIOSH will retain on register since this neoplasm may be associ- ated with ASL.
(25)															R N Wheeler letter of 20/2/79 and Rose Kaminski letters of 26/2/79 and 5/11/80

Removal from register confirmed in R Kaminski letter of 5 November 1980

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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	BFG	Louis- ville	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	Various jobs in PVC plants from cold room to paste recovery to PVC charging operator to paste charging. Ill August 1965. Terminated employment Jan 1966		R Kaminski letter of 26/2/79 and Prof. Tamburro letter of 9/1/79
27	J L Forrest	11.05.16	UCC	S Charle- ston	01.07.41	30.11.78	62	37	20 (NIOSH 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 ltr of 4 Jan 1979 and Charleston Daily Mail 30.11.78 and R Kaminski 26/2/79
28		11.04.17	UCC	S Charle- ston	00.08.44	03.11.78	61	34	33	03.11.78	Yes				R Kaminski letter of 16/4/79
29		12.10.07	UCC	S Charle- ston	00.05.42	00.03.80	72	38	16	01.03.80	Yes				R Kaminski Letters of 19th June 1980 4 5th Nov 1980
30	WVN	22.07.22	Tenneco Chemicals	Flemington	11.06.64	30.12.80	58	16	15	30.12.80	Yes	16 - Unknown 9 - Minimal	Maintenance Mechanic 16 yrs Elsewhere 11 yrs Boiler house Operator 9 yrs		
31		08.11.23	UCC	S Charle- ston	12.05.46	01.08.81	57	35	13	Alive	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 that time	Operator in charge reactor from July 1976 to date Foreman Aliphatic Chemical Operation	From 1959 to 1976 Aliphatic Chemicals operator and R N Wheeler letter of 16.10.81 and 19.11.81	

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<u>YUGOSLAVIA</u>															
01		05.04.14	Jugo Vinil	Split	00.00.53	08.04.73	59	20	20	08.04.73	Yes				[SARIC et al paper Env Health Perspective Vol 17, ppp 189-192 1976
02		15.11.31	Jugo Vinil	Split	00.00.50	12.07.73	42	23	18	12.07.73	Yes*		VCM Production		[*In his letter of 3 Oct 1978, Dr Spirtas of NIOSH changed the status of Case 02 to VCM production employee. Dr Spirtas also notified a new Case 03 also a VCM production worker
03		21.12.31	Jugo Vinil	Split	04.06.54	11.01.76	45	22	22	11.01.76	Yes*		VCM Production		
04		11.06.30			15.12.58	03.09.78	48	20	18	03.09.78	Yes				[Rose Kaminski Letter of 19th June 1980]

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TABLE 1

Incidence of ASL Cases Per Annum

	<u>By date of death</u>
1955	1
6	0
7	1
8	0
9	0
1960	0
1	1
2	1
3	0
4	1
5	0
6	1
7	1
8	5
9	3
1970	2
1	3
2	5
3	7
4	6
5	11
6	11
7	9
8	10
9	5
1980	9
1	4
Total	<u>97</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 The 1981 total does not include US 31 who is alive.

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TABLE 2

Distribution of ASL Cases by Country

USA	28 ***
W Germany	21 **
France	14
Canada	10
UK	7
Sweden	5 ****
Yugoslavia	4 *****
Italy	3 *
Czechoslovakia	2
Japan	2
Belgium	1
Norway	1
	—
Total	98
	—

* Omit It01 - atypical case of PVC bag extruder.

** Includes GE03 aerosol can filler.

*** Includes case US 24 which was diagnosed as Cholangiosarcoma & US 31 who is ALIVE.

**** Includes one monomer worker.

***** Includes two monomer workers.

i.e Western Europe	52
North America	38
Rest of World	8
	—

Total 98

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Pattern of ASL Cases by Factory(a) W Europe

Of the 52 cases in W Europe, 42 have occurred in clusters at 10 factories. Of the 21 German cases, 18 have occurred in clusters at 4 factories.

	<u>ASL Cases</u>
Kemanord, Sundsvall	5
PCUK, Brignoud	5
Dynamit, Troisdorf	10
Chloe Chimie (Formerly RP), St Fons	5
Wacker, Burghausen	4
CWH, Marl	2
ICI, Hillhouse	2
BP, Barry	5
Solvay, Tavaux	2
Lonza, Waldshut	2
	<u>42</u>

NB: There are 31 pre 1962 PVC plants in W Europe; 18 of these have had ASL cases (Ref Table 8)

(b) N America

Of the 38 cases in N America, 34 have occurred at four factories out of a total of 49 factories - in N America 41 plants have not had ASL cases.

	<u>ASL Cases</u>
BFG, Shawinigan	10
BFG, Louisville	11
UCC, S Charleston	9
Goodyear, Niagara	4
	<u>34</u>

NB: There are 29 pre 1962 PVC plants in N America; 8 of these have had ASL cases (Ref Tables 9 & 10)

(c) Rest of World

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The 8 ASL cases are believed to be in 1 cluster of 4 and 2 clusters of 2 cases.

Latency Periods (Years from first Exposure to Diagnosis)

	<u>W Europe</u>	<u>No of Cases</u>	<u>Total Years</u>	<u>Average</u>
	Belgium	1	18	18
	France	14	336	24 *
	Germany	21	362**	17.2 *
	Italy	3	58	19.3
	Norway	1	22	22
	Sweden	5	122	24.5
	UK	7	156	22.3
		<u>52</u>	<u>1074</u>	<u>20.7</u>
<u>N America</u>				
	US	28	685	24.5 *
	Canada	10	204	20.4 *
		<u>38</u>	<u>889</u>	<u>23.4</u>
<u>Rest of World</u>				
	Czechoslovakia	2	31	15.5
	Japan	2	39	19.5
	Yugoslavia	4	85	21.2
		<u>8</u>	<u>155</u>	<u>19.4</u>
<u>Summary</u>				
	W Europe	52	1074	20.7
	N America	38	889	23.4
	Rest of World	8	155	19.4
		<u>98</u>	<u>2118</u>	<u>21.6</u>

* Of the countries with > 10 cases, France and USA have average latency period above world average and Germany well below.

** The latency periods stated by B G Chemie for German Cases 20, 21 & 22 have been used. Even if one decided the latency period should in these three cases run from the first exposure to death, the average would still be low at 18.2.

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
Belgium			1					1	18
Canada		3		5	2			10	20.4
Czechoslovakia			2					2	15.5
France		1	4	2	4	1	2	14	24
Germany		7**	7	6*	1			21	17.2
Italy			1	2				3	19.3
Japan			1	1				2	19.5
Norway				1				1	22
Sweden			2		2	1		5	24.5
UK	1		2		3	1		7	22.3
USA		2	7	7	4	4	4	28	24.5
Yugoslavia				4				4	21.2
TOTAL	1	13	27	28	16	7	6	98	21.6

* Includes G 03 aerosol can filler

** Cases 20, 21 and 22 have latency periods of 12, 13 and 11 as given by the BG Chemie.
There may be problems of definition here - were these cases actually diagnosed as ASL in 1974, 1974 and 1972 respectively and lived until 1980, 1980 and 1981?

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

	Western Europe	North America	Rest of World	Annual Total
1955		1		1
7		1		1
1961		1		1
2		1		1
4		1		1
6			1	1
7	1			1
8		5		5
9	1	2		3
1970	1	1		2
1	1	2		3
2	4	1		5
3	1	4	2	7
4	3	2	1	6
5	6	4	1	11
6	6	3	2	11
7	6	3		9
8	7	2	1	10
9	5	-	-	5
1980	6	3	-	9
1	4	-**	-	4
Total	52 *	37**	8	97**

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

** Does not include US31 still alive.

TABLE 6

ASL CASE NUMBERS BY YEAR OF DEATH AND GEOGRAPHICAL LOCATIONS (EXCLUDING IT01)

KEY EVENTS		WESTERN EUROPE	NORTH AMERICA	REST OF WORLD
	1955		C1	
	6			
	7		C2	
	8			
	9			
	1960			
	1		US8	
	2		C3	
	3			
	4		US5	
	5			
	6			Cz2
	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
Goodrich	4	G4,G5,UK3	C9,US13	Cz1
	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,G21	US17, US29, US30	
	1	It4,F14,UK8,G22		
	Total	52	37***	8

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* Cholangiosarcoma
** Aerosol Can Filler
*** Does not include US31 still ALIVE

TABLE 7

ASL CASE NUMBERS BY YEAR OF FIRST EXPOSURE AND GEOGRAPHICAL LOCATION
(EXCLUDING IT01)

KEY EVENTS		WESTERN EUROPE	NORTH AMERICA	REST OF WORLD
	1939		US24*	
	40			
	1	Fr11	C3,US27	
	2		US13, US29	
	3	Fr14	C2,US19	
	4	UK1	C1,C5,US5,US7,US28	
	5	Sw2	C4,US3,US9	
	6	Fr1,Fr3,Sw4	C7,C9,US8,US11,US21,US31***	
	7	Sw3	C6,US22,US26	
	8	Fr9	US1	
	9	Fr12,Fr4	US12	
	50	Fr7,N1,UK8	US16	Y2
	1	Sw1,UK5	US10	Cz2
	2	G3**	US4	
	3	G15,It3	C10	Jap1,Y1
	4	G7,G8,UK4,G19	US18	Y3
	5	G11,G16,G18	US2,US17,US20	
	6	FR10,G1		
	7	Fr8,G4,It2,G2		Cz1
	8	Fr6,B1	US23	Jap2,Y4
	9	Fr2,It4		
	60	G5,G13		
	1	G9,G10,G12,G17,G20,G22	C8	
	2	G6,UK6,G21	US6	
	3	Fr13, UK7		
	4	Sw5	US30	
	5	Fr5		
	6	UK3		
	7			
	8			
	9			
Viola	70			
	1			
	2			
Maltoni	3			
	Total	52	38	8

* Cholangiosarcoma
 ** Aerosol Can Filler
 *** US31 is still ALIVE

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TABLE 8

WESTERN EUROPE PVC PRODUCERS - START-UP DATES vs ASL CASES (OMITTING G03)

START-UP YEAR	COUNTRY NAME	COMPANY NAME	LOCATION	ASL CASE NUMBER	YEAR OF 1st Exposure
1940	United Kingdom	ICI	Hillhouse	01,04	44,54
1941	France	Rhone-Poulenc	St Pons	03,09,10,11,14	46,48,56,41,43
1944	West Germany	BASF	Ludwigshafen		
	West Germany	Wacker	Burghausen	04,07,11,15	57,54,55,53
1945	Sweden	Kemanord	Sundsvall(Stockvik)	01,02,03,04,05	51,45,47,46,64
	Switzerland	Lonza	Lalden (Visp)		
1946	France	Rhone-Poulenc	Rousillon	01	46
1947	Italy	Montedison	Porto Marghera	02	57
1948	United Kingdom	BP Chem	Barry	03,05,06,07,08	66,51,62,63,50
	West Germany	Huls	Marl	09,10	61,61
1949	Belgium	Solvic	Jemeppe	01	58
1950	France	Puk	Brignoud	02,04,05,06,12	59,49,65,58,49
	France	Rhone-Poulenc	St Auban	07	50
	Holland	Shell	Pernis		
	Norway	Norsk	Heroya	01	50
1951	Italy	Montedison	Brindisi		
1952	Italy	Montedison	Terni		
1953	Austria	Halvic	Hallein		
	France	Solvic	Tavaux	08,13	57,63
	Italy	Solvic	Ferrara	03	53
	Spain	Rio Rodano	Hernani		
	United Kingdom	BIP	Aycliffe		
	West Germany	Hoechst	Gendorf	18	55
1954	West Germany	Dynamit	Troisdorf	01,02,08,12,16, 17,19,20,21,22	56,57,54,61,55, 61,54,61,62,61
1955	Spain	Monsanto Iberia	Monzon		
1956	Spain	Caiqsa	Sabinanigo		
		Hispavic	Torrelavega		
1958	West Germany	Solvay	Rheinberg		
1960	Italy	S C Ravenna	Ravenna	04	59
1962	Portugal	Cires	Oporto		
	West Germany	Lonza	Waldshut	06,13	62,60
1965	France	Rhone-Poulenc	Montlucon		
	Italy	Pozzi	Ferrandina		
	West Germany	Wacker	Cologne		
1966	West Germany	Hoechst	Knapsack(Frankfurt)	05*	60
1967	France	ATO Chimie	Balan		
	Spain	Rio Rodano	Miranda de Ebro		
	Greece	Esso Pappas	Diavata Salonika		
1968	Belgium	Badiphil	Antwerp		
1969	United Kingdom	Vinatex	Staveley		
	Italy	Rumianca	Cagliari Sardina		
1970	Italy	SIR	Porto Torres Sar		
	United Kingdom	ICI	Runcorn		
1971	Italy	S C Ravenna	Ravenna		
	Spain	Hispavic	Martorell		
	Sweden	Kemanord	Stenungsund		
	United Kingdom	BP Chem	Baglan Bay		
1972	Finland	Pekema	Svartback		
	Holland	DSM	Beek Limburg		
1976	France	Soc Art D'vinyl	Mazingarbe		
1977	Spain	Monsanto Iberia	Tarragona		

* Laboratory worker in Research Department

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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	44,42,43,46 39,41,44,42,46
1940?	*BFG	Louisville	01,02,03,04,05, 06,09,16,17,22, 26	48,55,45,52,44, 62,45,50,55,47, 47
1946?	*UCC	Texas City		
1947	Goodyear	Niagara Falls	08,10,11,20	46,51,46,55
1948	Firestone	Pottstown	12	49
	Uniroyal	Painesville		
1950	Monsanto	Springfield		
1952	Dow	Midland		
	BFG	Avon Lake	18	54
1953	Diamond	Deer Park		
1954	General Tire	Ashtabula		
1956	Air Products	Pensacola		
	Atlantic Refining	Brooklyn		
	Borden	Leominster		
	Conoco	Hebronville		
	BFG	Niagara		
	Great American Plastics	Fritchburg	23	58
	Hooker	Hicksville		
	Pantasote	Passaic		
1957	Atlantic Tubing	Cranston		
	Tenneco	Flemington NJ	30	59
1958	Keysor Century	Saugus, Cal		
1960	BFG	Watson, Cal		
	Air Products	Calvert City		
	Borden	Illioopolis		
1962	Tenneco	Burlington NJ		
1963	Conoco	Aberdeen, Miss		
	Stauffer	Long Beach, Cal		
1965	Conoco	Assonet, Mass		
	Ethyl	Baton Rouge		
1966	Diamond	Delaware City		
	General Tire/Pantas	Mt Pleasant W Va		
	BFG	Henry, Ill		
	Stauffer	Delaware City		
1967	Allied	Painesville, O		
	Hooker	Burlington NJ		
1968	Firestone	Perryville		
1969	BFG	Pedrickton NJ		
	Goodyear	Plaquemine		
	Olin	Assonet, Mass		
	(Formerly Conoco)			
1971	Conoco	Oklahoma City		
1972	Nat Starch	Meredosia, Ill		
1973	Borden	Springfield		
	Robintech	Painesville, O		
	(Formerly Allied?)			
1974	Atlantic Tubing	Cranston RI		
	Shintech	Freeport, Tex		
1975	Certain-teed	Lake Charles		
	Georgia Pacific	Plaquemine, La		
	Tenneco	Pasadena, Tex		
1979	Firestone	Plaquemine		

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

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

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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	Shawinigan	01,02,03,04,05 06,07,08,09,10	44,43,41,45,44, 47,46,61,46,53
1951	Monsanto*	La Salle		
1957	Goodrich	Welland		
1966	Esso	Sarnia		
1979	Diamond Shamrock Alb	Fort Saskatchewan		

* Terminated 1975

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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
1941	Russia	State Comps	Vladimir et al		
1950	Yugoslavia	Jugo Vinil	Split	01,02,03,04	53,50,54,48
1951	Czechoslovakia	State Comps	Novaky	01,02	57,51
1955	East Germany	State Comps	Bitterfeldt Schkopau		
1956	Rumania	State Comps	Icechim		
1957	Poland	State Comps	Osweicim (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		

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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		
	Tekkosha	Sakata		
1951	Mitsui Toatsu	Nagoya	01, 02	53, 58
1952	Mitsubishi Mon	Yokkaichi		
	Sumitomo Kag	Kikumoto		
1951	Denki Kagaku	Shibukawa		
	Nippon Zeon	Kambara		
	Toa Gosei	Tckushima		
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		

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