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TO: Vinyl Institute Executive Board
Vinyl Institute Manufacturing Practices Committee

FROM: Dr. Roy T. Gottesman

SUBJECT: Vinyl Chloride and TSCA

I attach a copy of a paper entitled, "Vinyl Chloride and TSCA" presented by John T. Barr of Air Products and Chemicals, Inc. at the CMA Seminar on Risk Management of Existing Chemicals on December 9 which I think you will find of interest.

Roy T. Gottesman
Roy T. Gottesman

RTG:jmd
Attachment

VEV-200515

A Division of

THE SOCIETY OF THE PLASTICS INDUSTRY, INC.

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VINYL CHLORIDE AND TSCA

J. T. Barr
Air Products and Chemicals, Inc.*

The well known regulatory history of vinyl chloride and its role as a bellwether of current regulatory philosophy makes it a useful paradigm for examining the relationship of existing laws and TSCA for control of chronic hazards.

To this end, we will first review some of the highlights of its regulatory history, and then engage in some speculation as to the response these events might elicit today under TSCA.

Vinyl chloride became of industrial importance about fifty years ago, about a hundred years after its discovery, when Semons discovered that its polymer could be converted into useful articles by plastization with phthalate esters. Commercial development began first in Europe and then in this country in the late thirties, largely using existing rubber processing equipment, for it was rubber which it initially replaced in the market. For the same reason, the use of PVC was sequestered by the government during the war years, and it was not until the early fifties that widespread consumer applications developed. PVC is now a mature product, and its growth rate falls in step with the Gross National Product. Presently, about six billion pounds are used annually in this country, and about four times that in the world.

Some of the broader toxicological attributes of VC were recognized in the thirties. It was known to be an anesthetic, but problems with cardiac arrhythmia prevented its use in that application(1). As pathological techniques improved, industry scientists recommended in the early sixties that exposure be limited to 50 ppm, because of temporary liver enlargement in animals at that level(2), but the American Conference of Government and Industrial Hygienists considered this overly conservative and accepted instead the 500 ppm recommendation of Harvard scientists(3). This was the value adopted by OSHA in its formative days.

Also in the early sixties, the European industry recognized among its workers a disease termed acroosteolysis, AOL, which is a degenerative disease of the bone tufts, particularly in the fingers, that is accompanied by Reynaud's phenomenon(4). An extensive epidemiological survey here and in Europe found about a hundred possible cases which were associated closely with manual cleaning of reactor walls between polymerization batches, but neither the precise etiological agent nor the disease mechanism was identified(5,6).

An attempt was made to reproduce this disease in rats by the medical department of one of the European producers. An exact duplication of the human disease was not seen, but many of the rats developed tumors at numerous sites. The reporting of this finding by Viola(7) in 1970 evoked little interest in the regulatory community, possibly because of the very high doses used, several thousand ppm, which were frankly toxic to the animals, and the fact that the tumors largely were metastatic from the Zymbal gland, an organ not present in humans.

* • Air Products and Chemicals, Inc., 1983

Nevertheless, both the European and domestic producers formed consortia to perform bioassays at lower concentrations and also began epidemiological surveys of their employees.

Preliminary results of the European bioassay became available first in early 1973, and showed tumor development at much lower concentrations in organs which do have human counterparts. This result was transmitted to regulatory officials that summer, and industry screening of employee records was intensified(8). This resulted in the recognition that winter by an industry medical director of a cluster of 3 rare liver tumors termed angiosarcoma, or ASL, in the employees of one facility(9). Reporting of this fact to government officials led to the current regulatory status of vinyl chloride.

It also led to a virtual explosion of research on the chronic toxicity of VC. The body of scientific literature on the oncogenicity of vinyl chloride is as large as that for any other substance. It is recognized that VC is a classical procarcinogen. Metabolism by the mixed function oxidase in the liver converts it to the ultimate carcinogen, an epoxide. Detoxification of this intermediate by the sulfhydryl group of glutathione or other proteins removes the toxic potential(10). Both of those mechanisms are saturable(11). An overload of the metabolic step assures that the vinyl chloride will pass through the liver and some will be metabolized in other organs. An overload of the detoxification step allows escape of the toxicant into the sinusoidal passages of the liver where interaction with the chromosomal protein causes ASL to develop. An overload of both mechanisms can lead to tumor development outside of the liver, as is seen in mice and rats at very high doses. Despite the large data base, however, information on the precise mechanism of these various steps still is lacking. We do not even understand why some persons respond with AOL and some with ASL, but none with both diseases.

OSHA proceeded promptly in early 1974 to set an emergency temporary limit of 50 ppm for worker exposure, and later that year reduced the limit to 1 ppm, the current figure. Industry was given a grace period during which respirators could be used to meet this requirement, but now that level must be met by engineering practices(12).

The EPA promulgated a combined engineering and works practice standard in 1976 which has resulted in ambient concentrations in the fractional ppb range near producing or using facilities(13).

In the meanwhile, FDA and CPSC established prohibitions on the use of VC in aerosol or other consumer applications, a practice which had been discontinued in 1973. The BATF had already banned the use of PVC liquor bottles in 1973 because of concern for taste effects from migration of residual VC into the contents. In 1975 the FDA proposed revocation of the GRAS status of rigid PVC packaging under the Delaney clause, also because of migration concerns, but that proposal never has been promulgated, and the FDA has stated that it is considering withdrawal of the proposal and recommending to BATF the reauthorization of plastic liquor bottles in light of the current very low residual monomer levels in fabricated PVC articles.

Other regulations have followed as new statutes and rules have come into play. The DOT and the Coast Guard regulate the transportation of VC, of course, and VC is listed as a priority pollutant and hazardous waste under various water and solid waste rules, and has a reportable quantity of one pound under Superfund.

Did the existing laws operate satisfactorily at the time of discovery of the chronic hazards of VC? It appears that they did. A leading medical authority who was deeply involved in the worker health evaluation in 1974 has termed VC a "success story". Reevaluation of the risk to employees under the 1 ppm standard by a conservative nonthreshold extrapolation method(14) yields a lifetime estimate of less than 10^{-6} , a risk level which is not thought to be of concern. The comparable risk estimate for the general populace is several orders of magnitude lower. EPA has stated on several occasions that it believes that vinyl chloride is regulated adequately.

Risk assessment has been a popular avocation among those interested in VC, and more than a dozen have been performed(15). These can be divided generally into two classes: those which rely solely on animal data; and those which attempt to incorporate the human experience.

Those in the first class yield similar results, and show the normal spread of estimates from the various mathematical models in common use. These range from 1500 to 10^{-8} ppb for a lifetime risk of 10^{-6} , or 8 orders of magnitude. It is necessary to eliminate the high dose data points, that is, those over 2,500 ppm from the Maltoni data(16) in order to get reasonable fits to most models, because these doses show broad systemic toxicity. The lower doses, 500 ppm and below, as a group fall into a general pattern on a log-probit plot, but individual 2 or 3 dose experiments show tremendous differences in slope when plotted separately. The popular multihit model predicts a life time risk of 10^{-6} at fractional ppb levels.

The human factor was accounted for in two ways. The EPA used some preliminary employee epidemiological data to confirm its animal-based extrapolation(17). Unfortunately, the human data were selected from those locations known to have ASL cases, while other facility data were omitted. They also were in error on the past exposures by more than an order of magnitude. This resulted in an estimate of 20 cases per year from the estimated 1974 ambient concentrations for the population within 5 miles of production and processing facilities.

The EPA seldom bothers to check its estimates against available data, so it sometimes comes up with results such as that made for arsenic a few years ago that would have predicted 18 million cases of skin cancer a year in this country if it had been applied to Agency data on the average arsenic concentrations in drinking water. Similarly, a survey of all known ASL cases in this country for the 10 years before 1974 showed no cases associated with residency near such plants(18), rather than the 200 predicted cases. It is reasonable to assume that if any cases had developed since that time the publicity associated with it would have brought them to light. Thus we have 110 million-person years of negative history for near-by residents. This places an upper limit on risk of less than 10^{-7} per ppm-yr.

Two studies applied pharmacokinetics in an attempt to obtain relevant human data. Gehrig and coworkers estimated a lifetime risk of 10^{-8} at 1 ppm from the probit model, based on a biotransformation of rat data. The unconstrained linear model predicted no risk at less than 99 ppm(14).

Anderson, Hoel and Kaplan carried this procedure one step further, and applied it to bound metabolic products, rather than to the total amount metabolized. Their results gave a lifetime risk of 10^{-7} at less than 1 ppm, with the probit model, or at less than 2 ppm with the linearized multistep model(19).

Thus we see that risk is in the eye of the estimator, but it is clear that estimates incorporating human data reflect the human experience for VC far better than do the direct application of animal data.

There was understandable uncertainty on the part of both the regulators and industry in 1974. This was the first commodity chemical to be regulated under the relatively new statutory situation as the result of new information. Nevertheless both the regulatory agencies and industry acted promptly to reduce exposures and emissions to an acceptable level.

The current count of occupational ASL cases is about 100 worldwide, with 30 of these in this country(20). All of these cases had their first exposure in 1964 or earlier, and there appears to be room for optimism that the steps taken in the mid-sixties because of the AOL information will have prevented any significant number of cases developing from exposures commencing after that date. Certainly it is reasonable to expect that there have been no new cases initiated after the early seventies.

Had TSCA been in place in the mid-sixties, would it have made any difference in the course of events? It appears unlikely that it would. Certainly the AOL discovery would have resulted in a series of 8(e) notices to TSCA. The probable outcome of that would have been either a recommendation from ITC for more tests, or a Sec. 4 testing requirement. It is possible that, because of its commercial importance, VC could have been placed on the ITC list before the AOL data became available. Additional data could have been called for under secs. 8(a) and (d). The result of all this most likely would have been a negotiated testing rule, under which industry would have initiated a series of studies which would have culminated in a bioassay, and the carcinogenicity of VC would have been discovered in due time. Yet, this is precisely what did happen in the absence of TSCA, except that the preliminaries were omitted, and the bioassay was performed concurrently with the screening tests. Thus it is possible that the final critical data were obtained earlier than would have occurred under present conditions.

Bear in mind that most of today's powerful testing methods were not available twenty years ago. That fact would not have been changed by legislative fiat, and any decision made at that time had to be made in light of the available knowledge.

If the data of Viola suddenly became available today instead, would there be any significant difference in the outcome, or the timing of that outcome? Probably so, but only because of the vastly more powerful scientific tools which we have available to us now. Neither the speed of agency motion nor the

rate at which industrial facilities can be built or modified has increased. If anything, the latter has slowed, given the multiplicity of permits and approvals now required. Overall, it is possible that if today we knew nothing more about VC than was known in 1970, we would arrive at a regulated state a few months earlier than was achieved in 1974, but scientific progress, and not legislative or regulatory advancement, should get the credit.

What if VC were to become a new product today? Would it run the same course in which it would be 40 years before there was full recognition of its chronic potential? Certainly not. Again, however, the reason is due more largely to scientific progress rather than statutory development.

One change might be apparent. If VC were the subject of a PMN today, rather than being the model to which all other aliphatic olefins are compared for structure-activity analysis, it would be judged by the others in its family. This comparison would be less dogmatic than the reverse now is. Ethylene and vinylidene chloride are not animal carcinogens; the relevance to humans of the carcinogenicity of high doses of TCE is equivocal and controversial; and vinyl acetate has only a preliminary "non-negative" report. Thus this class of substances would have lost its leader for structure activity comparison, and a decision as to the need for further testing from that analysis would not be clear-cut, based on analogous compounds.

Neither would a full MPD set be of great assistance. VC responds poorly to the classical in-vitro tests, and only recently has it become possible to obtain reproducible positive results in many of these. If the position were taken that any positive result triggers further testing, then we would be left exactly where we were in the late sixties, recognizing the need for a bioassay.

One other point should be considered before the requirements of Sec. 9 of TSCA to give primacy to existing statutes is ignored. Section 2 of TSCA requires the consideration of economic factors in actions taken under TSCA, while the OSH Act and the Clean Air Act Section 112 do not. In fact, at the time that VC was being regulated, these two statutes were being interpreted as forbidding economic consideration. Had TSCA been the regulatory vehicle of 1974, it is unlikely that the final regulations could have been as strict as they actually became, because of this factor.

It is difficult to separate cleanly the compliance costs for the OSHA and EPA rules on VC because of the overlapping time periods. The best estimate for OSHA costs made by the industry in a presentation to the Presidential Task Force on Regulatory Relief was something over \$200 million of capital, with over \$25 million per year of annual costs. The EPA has reported to Congress(21) that compliance with its rule has cost about \$100 million per year since 1978. Thus, about \$900 million has been expended thus far. Various published costs per life saved have ranged from \$4 to 200 million for the OSHA standard, depending on which exposure starting point was used. The more costly EPA standard appears not to have prevented any cases of ASL, based on epidemiology, and thus has an infinite cost(15). This suggests that the proponents of strong TSCA activity for existing chemicals should reconsider their position on Sec. 9 if their long term goal is more stringent regulations.

There seems to be no sure method of preventing some surprises in toxicology. Improved surveillance and diagnostic methods assure that we will know more about chronic effects in the future than we do now. New substances simply cannot be subjected to full-scale testing before they show strong commercial promise. If there were no other reasons for this, the limitation on test facilities dictates that we direct our immediate effort toward substances of major import, and this is being done at capacity. It is proper that we concentrate our efforts on present exposures. Fortunately, recent medical advances help us to recognize these surprises earlier, and to minimize their impact.

Existing statutes, that is, non-TSCA derived regulations, appear to be able to regulate existing substances adequately. The history of vinyl chloride bears this out. The principal value of the TSCA derived activities seems to be in the gathering of surveillance data on these substances to assure that the relevant data are made available to the proper agencies, and in future oversight of new substances as they develop into commercial items.

The reexamination of the hazards of all existing chemicals is an overwhelming task for which EPA has no special expertise(22). Just the establishment of priorities for such a reexamination is beyond the present capacity of the Agency(23). The Agency has recognized some of the problems which it faces, and the recent "TSCA Priorities and Progress, 1983" report discusses a much more sharply delineated existing chemicals program. Even here, however, the division between TSCA and existing statutes is not defined clearly. Further, the Agency appears to be entering the realm of risk management through its Advisory and Chips series. One unfortunate result of this is the generation of another tainted list of substances which becomes an invitation for pressure to regulate. The temptation to prepare these "little lists" for the executioners apparently is too great to be resisted(24), as Lester Lave pointed out recently.

We believe that EPA can best obey its statutory mandate by developing a more efficient system for establishing priorities, and by implementing more effectively its Section 9 procedures.

Prepared for presentation at the Chemical Manufacturers Association
Seminar on Risk Management of Existing Chemicals, 9 December 1983,
Washington, D.C.

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The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Chloroethylene, chloroethene, ethylene monochloride, monochloroethene, monochloroethylene; CAS 75-01-4.

Trade Names: VC, VCM, Trovidur, and others.

Uses: In the manufacture of plastics, as a refrigerant, and in organic synthesis.

PHYSICAL INFORMATION

Appearance: Colorless gas; may be liquified by refrigeration or pressurization.

Odor: Faint, sweet, ether-like.

Minimum Detectable by Odor: 4000 ppm.

Behavior in Water: Slightly soluble.

Evaporation: Rapid.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 1 ppm.

NIOSH Recommended Limit: None detectable by recommended methods.

ACGIH Recommended Limit: Average 8 hour exposure -- 5 ppm.

Short Term Exposure:

Inhalation: Exposure at 8,000 ppm for 5 minutes can cause dizziness, intoxication, tiredness, drowsiness, abdominal pain, numbness in fingers and toes, pains in joints, coughing, sneezing, loss of appetite and weight.

Skin: Contact with liquid may cause frostbite; contact with vapor may cause irritation and rash. Absorption is possible through the skin.

Eyes: Can cause severe and immediate irritation.

Ingestion: None found.

Long Term Exposure:

May cause club-like swelling and shortening of fingers; joints may become thickened and stiff with coarse, whitish deposits. Joints of arms and legs may suffer damage. Liver and kidney damage may occur. Not all symptoms disappear after exposure stops.

Vinyl chloride has caused liver cancer in occupational exposure.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health.
(For an explanation of the terms and abbreviations used, see "What is Toxic" available from the New York State Department of Health.)

VEV-200524

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move victim to fresh air. Give artificial respiration or oxygen as required. Seek medical attention.

Skin: Remove soaked clothing. Wash affected area with soap and water for at least 5 minutes. Seek medical attention if necessary.

Eyes: Wash with running water for at least 15 minutes. Seek medical attention.

Ingestion: Seek immediate medical attention.

FIRE AND EXPLOSION INFORMATION

General: Flammable. Fumes may travel long distances and flash back. Ignites at -106°F (-78°C).

Explosive Limits: Upper -- 33%, Lower -- 3%.

Extinguisher: Stop flow of gas. Use water to keep fire exposed containers cool.

REACTIVITY

Conditions to Avoid: High temperatures may cause breakdown to phosgene and hydrochloric acid. Avoid sources of ignition.

Materials to Avoid: Long contact with air may result in formation of unstable peroxides which are explosive. Corrosive to iron at high temperatures in the presence of water.

PROTECTIVE MEASURES

Storage and Handling: Protect against physical damage. Outside or detached storage is preferred. Store in a cool, dry, well ventilated area away from sources of ignition.

Engineering Controls: Provide ventilation or process enclosures. Sinks, showers should be readily available.

Protective Clothing (Should not be substituted for proper handling and storage) and impervious clothing should be worn if contact with vinyl chloride is possible.

Protective Equipment: For levels up to 10 ppm use a combination Type C respirator with auxiliary self-contained air supply and half facepiece, or a pressure demand type, with half facepiece, or a chemical cartridge respirator providing a service life of at least 1 hour at 10 ppm. For levels up to 25 ppm, use a purifying respirator with hood, helmet, full or half facepiece, and a service life at 25 ppm, or a gas mask with chest or back mounted canister. For levels up to 100 ppm, use a Type C supplied-air respirator with full facepiece, or open-circuit self-contained breathing apparatus with full facepiece. For levels up to 1,000 ppm, use a combination Type C supplied-air respirator in continuous flow mode, with full facepiece and auxiliary self-contained air supply, or Type C supplied-air respirator with half facepiece, helmet or hood in continuous flow mode. For levels up to 5,000 ppm, use a Type C supplied-air respirator, demand type, with full or half facepiece and auxiliary self-contained air supply. At unknown levels or above 5,000 ppm use an open circuit, self-contained breathing apparatus, pressure demand type, with full facepiece.

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of the spill area. Put on respirator and other protective clothing to keep levels below explosive limit. Remove possible sources of ignition. Move to safe place in open air. For final disposal contact your regional office of the Department of Environmental Conservation.

For more information:

Contact the Industrial Hygienist or Safety Officer at your workplace or the New York State Department of Health, Bureau of Toxic Substance Assessment, Empire State Plaza, Room 3010, Albany, New York 12237.

VEV-200525



Vinyl Chloride Monomer Safety Notice



Shell Chemical Company
A Division of Shell Oil Company Houston Texas

**For 24 hour emergency assistance only, call
SHELL 713-473-9461 or CHEMTREC 800-424-9300**

VEV-200526

Safety Notice - Vinyl Chloride Monomer

DANGER: VINYL CHLORIDE MONOMER IS A TOXIC, EXTREMELY FLAMMABLE liquefied compressed gas. Skin contact with the liquid can cause frostbite. Exposure to very high concentrations of the gas may cause asphyxiation, persistent irregular heartbeat, narcosis, nausea or dizziness. Long-term exposure may cause permanent liver injury and cancer.

DANGER: VINYL CHLORIDE MONOMER IS A CANCER CAUSING AGENT (ACGIH). Long-term exposure to vinyl chloride vapor has caused cancer, including a rare form of liver cancer in animals. Some production workers exposed for many years to much higher concentrations of vinyl chloride monomer vapor than encountered in plants operating today have developed the same type of liver cancer. In addition, there are reports that vinyl chloride monomer may cause cancer at other sites as well. Degeneration of the ends of the fingerbones has also been observed in some workers after prolonged exposure to high concentrations of vinyl chloride monomer.

Access to areas in which vinyl chloride monomer is manufactured, stored, handled or used must be restricted to authorized personnel.

Vinyl chloride monomer is flammable and highly reactive. It can be explosive under certain conditions.

The following guidelines must be observed when working with vinyl chloride monomer:



Poison

Do not breathe vapor. Avoid liquid contact.

YOU MUST HAVE GOOD VENTILATION WHEN WORKING WITH VINYL CHLORIDE MONOMER. Exposure to very high concentrations of vinyl chloride monomer gas may cause asphyxiation, persistent irregular heartbeat, narcosis, nausea or dizziness. Long-term exposure may cause permanent liver injury and cancer.

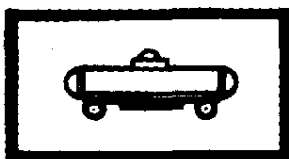
The Occupational Safety and Health Administration (OSHA) regulations (21 CFR 1910.1017) do not permit employee exposure to concentrations exceeding 1 part per million (1 ppm) averaged over an 8-hour work-shift or exposure to concentrations exceeding 5 ppm averaged over a fifteen minute period. These low concentrations are not detectable by smell. Workplace air monitoring is therefore required to ensure that concentrations are below the permissible level. If concentration exceeds the Action Level (See personal hygiene section), immediate steps must be taken to reduce concentration and avoid exposure. Leave the area immediately. Notify your supervisor at once.

NIOSH approved respiratory equipment must be available for immediate use when it is necessary to work in areas where the vinyl chloride monomer concentration may exceed the permissible exposure limit.

The Occupational Safety and Health Administration (OSHA) regulations (21 CFR 1910.1017) do not permit any employee to be exposed to direct contact with liquid vinyl chloride monomer.

Do not smoke, eat, drink or store food or beverages in the immediate area where vinyl chloride monomer is handled, processed or stored.

VEV-200527



Containers

Hazardous when emptied

Air should never be allowed to enter a vinyl chloride monomer container. Always leave at least 10 psig of vinyl chloride monomer vapor pressure in an empty container.

Empty containers which contain residual vinyl chloride monomer vapor are dangerous. All safety precautions given for full containers must be observed for empty containers.

Containers for vinyl chloride monomer are dedicated. They should not be used for any other service unless they have been decontaminated under conditions approved by a safety engineer or other qualified person familiar with the hazards involved.



Practice good personal hygiene

Do not eat or smoke in the immediate area where vinyl chloride monomer is handled, processed or stored. Wash your hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

REMEMBER

Exposure to very high concentrations of vinyl chloride monomer may cause unconsciousness or death. Long-term exposure may cause permanent liver injury and cancer.

Notify your supervisor and get medical attention at once if you have been exposed to vapor concentrations exceeding the OSHA limit (See PEL below) or if skin contact has occurred. *PEL (OSHA)* 1 ppm (8 hour period); 5 ppm (15 minute period). *Action level (OSHA)* 0.5 ppm (8 hour period). When monitoring indicates employee exposure in excess of the action level, a program of individual employee monitoring in accordance with 29 CFR 1910.1017 must be initiated.

If you have any questions about vinyl chloride monomer, ask your supervisor before transporting or working with it.

In case of accident or exposure, notify your supervisor immediately



In Case of Fire

Evacuate the area.

All unauthorized personnel should be kept at a distance of at least 2000 feet from fire area, due to the danger of exploding vessels (BLEVE'S). In addition, downwind areas should be evacuated if there is danger of exposure to toxic combustion gases or vinyl chloride monomer above the action level. (See personal hygiene section.)

Allow only authorized and properly protected personnel into the area. Personnel must be trained for fire fighting and wear full protective clothing and self-contained breathing apparatus when entering the fire area. The combustion products are irritating, harmful and potentially lethal at high concentrations.

Use water spray or fog, foam, CO₂ or dry chemical extinguishing media on small fires. No entirely satisfactory extinguishing media is known for large fires. If possible, and without personal risk, shut off source of supply. If source is not closed off, do not attempt to extinguish a large fire, as vinyl chloride monomer vapor can be reignited by hot metal. Cool nearby storage containers with water spray or fog to keep fire from spreading if this can be done without danger to personnel, and let fire burn itself out.



In Case of Spills or Leaks

Evacuate the area.

Eliminate all sources of ignition (heat, sparks and flames of any sort). No smoking.

Only authorized personnel with full protective clothing and self-contained breathing apparatus should be allowed in the area. If possible, and without danger to personnel, shut off the source of supply. When vinyl chloride monomer vapor concentrations reach the flammable limits, entry into the area should be made only for purposes of rescue. Downwind areas may have to be evacuated if concentrations exceed the action level. (See personal hygiene section.)

Dike and contain the spill. Allow to evaporate. Notify fire department. Disperse vapor cloud with high sustained flow of water spray or fog.

Vinyl chloride monomer vapors are heavier than air and can travel long distances along the ground to an ignition source. They may also concentrate in low areas unless dispersed. Be prepared for fire.

Keep out of sewers due to danger of explosion. Keep out of water systems. Notify authorities if this happens or is threatened. EPA and Coast Guard number for spill notification is 800-424-8802.

**For 24 hour emergency assistance only, call
SHELL 713-473-9461 or CHEMTREC 800-424-9300**

VEV-200529



In Case of Exposure

Get medical attention at once.

If someone is overcome, remove to fresh air at once. If not breathing, administer artificial respiration. If respiration is difficult, administer oxygen.

In case of liquid contact, remove contaminated clothing and shoes immediately. If vinyl chloride monomer gets on skin, wash immediately with soap and water; thaw frosted parts of the body with water at body temperature or slightly above; flush eyes with clean, low pressure water for at least fifteen minutes.



Flammable

Eliminate all sources of ignition.

Keep away from heat, sparks, and flames of any sort. No smoking.

Vinyl chloride monomer has a flash point of -108°F (TOC). It forms flammable mixtures with air at concentrations between 3.6 and 33 volume percent. Vapors are heavier than air and may travel long distances along the ground to an ignition source. They may also concentrate in low areas unless dispersed by wind or water spray.

When transferring vinyl chloride monomer, the entire transfer system must be electrically grounded.

On burning, highly irritating and toxic hydrogen chloride is formed. If combustion is incomplete, highly toxic carbon monoxide and phosgene may also form.



Reactive

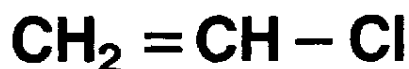
Prevent contamination and contact with polymerization initiators

VEV-200530

Hazardous, exothermic polymerization of vinyl chloride monomer may occur on exposure to heat, oxidizing agents, oxygen, air, sunlight, and other polymerization catalysts. Contact with aluminum, copper, metal alkyls and alkali metals, such as sodium, potassium, and their alloys, must be avoided.

On exposure to air, shock sensitive peroxides can form. On decomposition, these may initiate explosive polymerization of the bulk vinyl chloride monomer.

Vinyl Chloride Monomer



Typical properties

Flash point (Tag Open Cup)	- 108° F	
Flammable limits in air, %V		
Lower	3.6	
Upper	33	
Vapor pressure	2580	mm Hg @ 68° F
Specific gravity	0.91	20/20° C
Vapor density	2.15	(Air = 1)
Solubility in water, %W	0.25	@ 20° C



Shell Chemical Company

If you have any questions on the use of vinyl chloride monomer and would like further information, call us at the sales offices listed below. Do not use emergency number except for emergencies.

Chemical Sales Offices

VEV-200531

Anaheim, California 92803
511 N. Brookhurst
P.O. Box 4848
Phone (714) 991-9200
(213) 589-6661

St. Ann, Missouri 63074
500 Northwest Plaza
Phone (314) 291-5700

Atlanta, Georgia 30339
320 Interstate North Parkway
(404) 955-4600

San Ramon, California 94583
2401 Crow Canyon Rd.
P.O. Box 241
Phone (415) 820-7004

Cleveland, Ohio 44130
7123 Pearl Rd.
Phone (216) 842-4000

Stamford, Connecticut 06904
600 Summer Street
Phone (203) 327-3600

Houston, Texas 77019
2001 Kirby Drive
Phone (713) 526-4631

West Orange, New Jersey 07052
100 Executive Drive
P.O. Box 600
Phone (201) 325-5200

Oak Brook, Illinois 60521
1415 West 22nd St.
Phone (312) 887-5500



Vinyl Chloride Monomer Safety Notice



Shell Chemical Company
A Division of Shell Oil Company Houston Texas

VEV-200532

**For 24 hour emergency assistance only, call
SHELL 713-473-9461 or CHEMTREC 800-424-9300**

Safety Notice - Vinyl Chloride Monomer

DANGER: VINYL CHLORIDE MONOMER IS A TOXIC, EXTREMELY FLAMMABLE liquefied compressed gas. Skin contact with the liquid can cause frostbite. Exposure to very high concentrations of the gas may cause asphyxiation, persistent irregular heartbeat, narcosis, nausea or dizziness. Long-term exposure may cause permanent liver injury and cancer.

DANGER: VINYL CHLORIDE MONOMER IS A CANCER CAUSING AGENT (ACGIH). Long-term exposure to vinyl chloride vapor has caused cancer, including a rare form of liver cancer in animals. Some production workers exposed for many years to much higher concentrations of vinyl chloride monomer vapor than encountered in plants operating today have developed the same type of liver cancer. In addition, there are reports that vinyl chloride monomer may cause cancer at other sites as well. Degeneration of the ends of the fingerbones has also been observed in some workers after prolonged exposure to high concentrations of vinyl chloride monomer.

Access to areas in which vinyl chloride monomer is manufactured, stored, handled or used must be restricted to authorized personnel.

Vinyl chloride monomer is flammable and highly reactive. It can be explosive under certain conditions.

The following guidelines must be observed when working with vinyl chloride monomer:



Poison

Do not breathe vapor. Avoid liquid contact.

YOU MUST HAVE GOOD VENTILATION WHEN WORKING WITH VINYL CHLORIDE MONOMER. Exposure to very high concentrations of vinyl chloride monomer gas may cause asphyxiation, persistent irregular heartbeat, narcosis, nausea or dizziness. Long-term exposure may cause permanent liver injury and cancer.

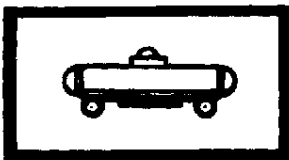
The Occupational Safety and Health Administration (OSHA) regulations (21 CFR 1910.1017) do not permit employee exposure to concentrations exceeding 1 part per million (1 ppm) averaged over an 8-hour work-shift or exposure to concentrations exceeding 5 ppm averaged over a fifteen minute period. These low concentrations are not detectable by smell. Workplace air monitoring is therefore required to ensure that concentrations are below the permissible level. If concentration exceeds the Action Level (See personal hygiene section), immediate steps must be taken to reduce concentration and avoid exposure. Leave the area immediately. Notify your supervisor at once.

NIOSH approved respiratory equipment must be available for immediate use when it is necessary to work in areas where the vinyl chloride monomer concentration may exceed the permissible exposure limit.

The Occupational Safety and Health Administration (OSHA) regulations (21 CFR 1910.1017) do not permit any employee to be exposed to direct contact with liquid vinyl chloride monomer.

Do not smoke, eat, drink or store food or beverages in the immediate area where vinyl chloride monomer is handled, processed or stored.

VEV-200533



Containers

Hazardous when emptied

Air should never be allowed to enter a vinyl chloride monomer container. Always leave at least 10 psig of vinyl chloride monomer vapor pressure in an empty container.

Empty containers which contain residual vinyl chloride monomer vapor are dangerous. All safety precautions given for full containers must be observed for empty containers.

Containers for vinyl chloride monomer are dedicated. They should not be used for any other service unless they have been decontaminated under conditions approved by a safety engineer or other qualified person familiar with the hazards involved.



Practice good personal hygiene

Do not eat or smoke in the immediate area where vinyl chloride monomer is handled, processed or stored. Wash your hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

REMEMBER

Exposure to very high concentrations of vinyl chloride monomer may cause unconsciousness or death. Long-term exposure may cause permanent liver injury and cancer.

Notify your supervisor and get medical attention at once if you have been exposed to vapor concentrations exceeding the OSHA limit (See PEL below) or if skin contact has occurred. *PEL (OSHA)* 1 ppm (8 hour period); 5 ppm (15 minute period). *Action level (OSHA)* 0.5 ppm (8 hour period). When monitoring indicates employee exposure in excess of the action level, a program of individual employee monitoring in accordance with 29 CFR 1910.1017 must be initiated.

If you have any questions about vinyl chloride monomer, ask your supervisor before transporting or working with it.

In case of accident or exposure, notify your supervisor immediately



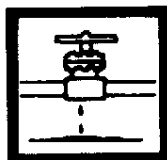
In Case of Fire

Evacuate the area.

All unauthorized personnel should be kept at a distance of at least 2000 feet from fire area, due to the danger of exploding vessels (BLEVE'S). In addition, downwind areas should be evacuated if there is danger of exposure to toxic combustion gases or vinyl chloride monomer above the action level. (See personal hygiene section.)

Allow only authorized and properly protected personnel into the area. Personnel must be trained for fire fighting and wear full protective clothing and self-contained breathing apparatus when entering the fire area. The combustion products are irritating, harmful and potentially lethal at high concentrations.

Use water spray or fog, foam, CO₂ or dry chemical extinguishing media on small fires. No entirely satisfactory extinguishing media is known for large fires. If possible, and without personal risk, shut off source of supply. If source is not closed off, do not attempt to extinguish a large fire, as vinyl chloride monomer vapor can be reignited by hot metal. Cool nearby storage containers with water spray or fog to keep fire from spreading if this can be done without danger to personnel, and let fire burn itself out.



In Case of Spills or Leaks

Evacuate the area.

Eliminate all sources of ignition (heat, sparks and flames of any sort). No smoking.

Only authorized personnel with full protective clothing and self-contained breathing apparatus should be allowed in the area. If possible, and without danger to personnel, shut off the source of supply. When vinyl chloride monomer vapor concentrations reach the flammable limits, entry into the area should be made only for purposes of rescue. Downwind areas may have to be evacuated if concentrations exceed the action level. (See personal hygiene section.)

Dike and contain the spill. Allow to evaporate. Notify fire department. Disperse vapor cloud with high sustained flow of water spray or fog.

Vinyl chloride monomer vapors are heavier than air and can travel long distances along the ground to an ignition source. They may also concentrate in low areas unless dispersed. Be prepared for fire.

Keep out of sewers due to danger of explosion. Keep out of water systems. Notify authorities if this happens or is threatened. EPA and Coast Guard number for spill notification is 800-424-8802.

VEV-200535

**For 24 hour emergency assistance only, call
SHELL 713-473-9461 or CHEMTREC 800-424-9300**



In Case of Exposure

Get medical attention at once.

If someone is overcome, remove to fresh air at once. If not breathing, administer artificial respiration. If respiration is difficult, administer oxygen.

In case of liquid contact, remove contaminated clothing and shoes immediately. If vinyl chloride monomer gets on skin, wash immediately with soap and water; thaw frosted parts of the body with water at body temperature or slightly above; flush eyes with clean, low pressure water for at least fifteen minutes.



Flammable

Eliminate all sources of ignition.

Keep away from heat, sparks, and flames of any sort. No smoking.

Vinyl chloride monomer has a flash point of -108°F (TOC). It forms flammable mixtures with air at concentrations between 3.6 and 33 volume percent. Vapors are heavier than air and may travel long distances along the ground to an ignition source. They may also concentrate in low areas unless dispersed by wind or water spray.

When transferring vinyl chloride monomer, the entire transfer system must be electrically grounded.

On burning, highly irritating and toxic hydrogen chloride is formed. If combustion is incomplete, highly toxic carbon monoxide and phosgene may also form.



Reactive

Prevent contamination and contact with polymerization initiators

Hazardous, exothermic polymerization of vinyl chloride monomer may occur on exposure to heat, oxidizing agents, oxygen, air, sunlight, and other polymerization catalysts. Contact with aluminum, copper, metal alkyls and alkali metals, such as sodium, potassium, and their alloys, must be avoided.

On exposure to air, shock sensitive peroxides can form. On decomposition, these may initiate explosive polymerization of the bulk vinyl chloride monomer.

Vinyl Chloride Monomer



Typical properties

Flash point (Tag Open Cup)	- 108° F	
Flammable limits in air, %V		
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Upper	33	
Vapor pressure	2580	mm Hg @ 68° F
Specific gravity	0.91	20/20° C
Vapor density	2.15	(Air = 1)
Solubility in water, %W	0.25	@ 20° C



Shell Chemical Company

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Anaheim, California 92803
511 N. Brookhurst
P.O. Box 4848
Phone (714) 991-9200
(213) 589-6661

St. Ann, Missouri 63074
500 Northwest Plaza
Phone (314) 291-5700

Atlanta, Georgia 30339
320 Interstate North Parkway
(404) 955-4600

San Ramon, California 94583
2401 Crow Canyon Rd.
P.O. Box 241
Phone (415) 820-7004

Cleveland, Ohio 44130
7123 Pearl Rd.
Phone (216) 842-4000

Stamford, Connecticut 06904
600 Summer Street
Phone (203) 327-3600

Houston, Texas 77019
2001 Kirby Drive
Phone (713) 526-4631

West Orange, New Jersey 07052
100 Executive Drive
P.O. Box 800
Phone (201) 325-5200

Oak Brook, Illinois 60521
1415 West 22nd St.
Phone (312) 887-5500

VEV-200537

VEV-200538

Smead.

File-626

CONFIDENTIAL

World Register
of Cases of

ANGIOSARCOMA OF THE
LIVER (ASL)
due to VCM

REVIEW DATE
1st JANUARY 1990

Collated by:

Dr Brian Bennett

Occupational Health

ICI Chemicals and Polymers Ltd

Hillhouse Site

PO Box 4

Thornton-Cleveleys

Blackpool FY3 4GD

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(Telephone 0253 861632)

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VEV-200540

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GenCorp, Fairlawn, Ohio, USA
Dow Chemical Europe, Horgen, Switzerland
Imperial Oil, Sarnia, Ontario, Canada
Dynamit Nobel, Troisdorf, Germany
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ICI Runcorn, UK
University of Bonn, West Germany
CDF Chimie, AZF, Bully-les-Mines, France
Guy's Hospital, London, UK
Chemical Industries Association, London, UK
Dupont, Wilmington, Delaware, USA
EniChem, Milan, Italy
Occidental Chemical, Pottstown, Pennsylvania,
USA
Atochem, Port de Bouc, France
Institute di Oncologia, Bologna, Italy
Montedison, Milan, Italy
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Hydro Polymers Ltd, Newton Aycliffe, UK
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IARC, Lyon, France
ICI Duperial, Buenos Aires, Argentina
Rio Rodano, Madrid, Spain
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 Huls AG, Marl, Germany
 Air Products, Allentown, Pennsylvania, USA
 Huls AG, Marl, Germany
 McGill University, Montreal, Canada
 Norsk Hydro, Porsgrunn, Norway
 Cancer Treatment & Research Foundation,
 Halifax, NS, Canada
 IARC, Lyon, France
 Society of the Plastics Industry,
 Washington DC, USA
 AECI, Sasolburg, South Africa
 BF Goodrich, Cleveland, Ohio, USA
 Norsk Hydro, Stenungsund, Sweden
 BP Chemicals International, Barry, UK
 Harvard University, Cambridge, Massachusetts,
 USA
 EVC, Brussels, Belgium
 BASF, Ludwigshafen, Germany

From: Dr B Bennett, Occupational Health, ICI Chemicals & Polymers,
 Hillhouse Site, PO Box 4, Thornton-Cleveleys, Blackpool, FY5 4QD
 England

4

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 1990

P R E F A C E : A C K N O W L E D G E M E N T S , S I G N I F I C A N T C H A N G E S , C O M M E N T S A N D R E Q U E S T S

- 1 The 14 new cases in this Register are: France 26, 27, 28; Germany 33, 34, 35, 36, 37, 38, 39; Spain 01; UK17, US 42,43. The Spanish case is the first notified from that country.
- 2 The following 2 cases have been deleted from the Register: Germany 26 (Alcoholic Cirrhosis), US24 (Cholangiosarcoma).
- 3 There are amendments from the previous Register against cases: France 22, 23, 24; Germany 31, 32; US33, 34.
- 4 I thank the following for information about new cases: Drs Lagast, Contassot, Friedel, Tenkhoff, Lee, Hamill and Mr Roy N Johnson. For information about other cases I thank Drs Dietz, Fendel, Smith and Williams.
- 5 So far as I know the following are still alive: France 15 and 28; US33 and 36. I am grateful for information on this subject in the past year, and urgently need to be kept up-to-date, please.
- 6 In Table 3 I have now treated a 'cluster' as 3 cases instead of 2, due to the passage of time and the increased number of cases in the world.
- 7 Tables 4E to 4H have been amended, as the number of cases per factory has altered.
- 8 A new Table 16 has been introduced showing the number of PVC factories in the world so far as known to me. Please keep me informed of any alterations in ownership, openings, re-openings or closures (see Tables 8 to 15).
- 9 The initials of case UK05 have been amended to RK (not JK). It will be seen that certain cases have no initials against them. Can anyone please help with this? Some of the countries concerned are Belgium, Czechoslovakia, France, Sweden, the US and Yugoslavia. VEV-200544
- 10 CHOLANGIOSARCOMA As stated above I have deleted US24 which was a Cholangiosarcoma, not an Angiosarcoma. I have heard of another case of Cholangiosarcoma but the significance of these cases is not apparent in connection with VCM. I should be grateful if anyone who knows of any other case where the patient does develop Cholangiosarcoma with VCM exposure, would inform me about it.
- 11 RESEARCH Please keep me informed of all relevant research and if possible send me copies of Reports. Would recipients of the Register please pass on this request.
- 12 Please also notify me of all changes relevant to the Register and especially new cases, for which a blank sheet is provided at the back of the Register.

FROM: Dr Brian Bennett, Occupational Health, ICI Chemicals and Polymers Limited, Hillhouse Site, PO Box 4, Thornton-Cleveleys, Blackpool, FY5 4QB, England

LIVER ANGIOSARCOMA CASES (REVIEW DATE - JANUARY 1990)

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LIVER ADENOCARCINOMA Case - (Review Sept. 1, January 1981)

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 YR 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 CANCAZ HIGHLIGHTS	OTHER COMMENTS
01		12.01.13	Solvay	Jeanpette	00.07.58	00.05.76	63	18	17	29.06.76	Yes	High	Autocleaner 14 yrs 1958-1968 exposed to 200 ppm 15 yrs 1968-1975 for 8 hrs per day and certainly under 500 ppm in 6 to 8 hrs per day in 7m ³ autoclaves 1968-1972 exposed to 50-200 ppm 8 hrs per day in 7m ³ autoclaves 1972-1974 exposed to 50-200 ppm in auto- clave room 1974-100 ppm 1975- 50 ppm RETIRED 1 Feb 1975	Driller in a foundry (2 yrs) Farmer (15 yrs) Work in glass ind. & chem- ical industry Complete Clinical and cancer details are given in a paper by Hublet et al in Arch. Belg. Med. Soc., Hyg. Med. Trav. Med. Leg. 1977 pages 601-622	Hepatic tests in Oct 1974 were normal. Retired Feb 1975 Hospitalized May 1976
02	SR	20.09.40	Solvay	Jeanpette	20.06.62	00.10.79	39	17	9	23.10.83	Yes	MR 62-03. 63 01.67 5 yrs 5 mths 10.71 operator 200 ppm 3 yrs Smiths. 8h/day 104.63-12. 66 < 200 ppm	Autocleaner 5 yrs 5 mths operator 3 yrs Smiths. 3 yrs Smiths. Positive isotography 11.79. Hepa- rectomy 02.80. Chemotherapy Information Given in letter 12 Nov 1984 from Dr de Sluiter	Ret sign July 79; Theractic pain 07.79. Hepatic tests altered 10.79. Positive isotography 11.79. Hepa- rectomy 02.80. Chemotherapy Information Given in letter 12 Nov 1984 from Dr de Sluiter	

VEU-200546

VEU-200546

KEY - MONTH - YEAR
All dates use UK system

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 WC EXPOSURE	DATE OF DIAGNOSIS	AGE AT DIAGNOSIS	YEARS OF EXPOSURE TO DIAGNOSIS	YEARS OF EXPOSURE	DATE OF DEATH	DATE OF HISTOLOGICAL CONFIRMATION	ESTIMATED 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		06.03.14	1943	1957	43	14	14	21.12.57	Yes				Maintenance, millwright, pipefitter	Operator overline	Worked overline Smoker
03		26.08.19	1941	1962	42	21	20	23.03.62	Yes				Operator, foreman	Worked overline	Non-smoker
04		05.04.19	1945	1967	46	22	22	21.01.68	Yes				Reactor cleaner	Operator, foreman, water cooling unit	Worked overline Smoker
05		07.05.11	1944	1968	57	24	05	05.07.68	Yes				Reactor cleaner	Water cooling unit	Worked overline Smoker
06		15.12.19	1947	1971	51	24	23	10.04.71	Yes				Reactor cleaner	Maintenance, millwright overline	Worked overline Smoker
07		09.11.19	1946	1972	53	26	25	24.12.72	Yes				Reactor cleaner	Machine shop overline	Worked overline 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 up, pipefitter maintenance	Worked overline	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.

CANADA

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

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
<u>CANADA</u>															
10		16.05.15		Shawinigan	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, BPG
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, BPG
												Low	1955-65 VC Manufacture		
												Medium	1965-72 Autoclave Operator, PVC Resins		
13	SS	10.06.26	BPG	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 Dietz, BPG, 1988
												1970-80 Low	Supervisor		

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[illegible]

NEW-200549

FRANCE

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Sheet 1

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
01	M	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	SDR	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" 5 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	VOM production 16 yrs. Italian POM. Shepherd, Sewyer, Mason	Ref. Rety et al Arch. Mal. Prof. 1 37 n 6 June 77 p 551-555
04	MDR	27.01.27	PCUK	Brignoud	19.10.49	16.01.76	49	26	26	04.01.76	Yes	High	Monomer production worker 8 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)Thoreotomy 9th Feb 1976 contal angiosarcoma 2)Scintigraphy 1976 found ASL 3)Haemorrhage from ASL 4)Right Hepatectomy	Ref. P Coudane et al "Semaine des hopitaux 10 Septembre 1976 Previously had bone angiosarcoma" Also Pilichowski et al "La Nouvelle Presse Medicale" 21th July 1979 Page 2485.

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FRANCE

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

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
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) 2 yrs filtration 10-11 yrs polyworker and works lab?		This man had AOL prior to AS. Ann. de Med. 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 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 clerk 14 yrs autoclave worker		Had been (tunnel) worker previously
09	RFX	08.10.14	BP	St Fons	10.01.48	26.04.76	63	28	28	25.12.77	Yes	Very High 1948-1966 Leaser Exposure 1966-1976	Polymer- isation operator, 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 Bety et al in Archives de Maladies Professionals Vol 40 No 6 1979 pages 741-1.

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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
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 (HCl & Acetylene) Foreman (agent de maîtrise). 1972 retired		
12		16.08.14	PCUR	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	Solvey	Taveux	23.09.63	26.06.79	40	16	13	22.08.79	Yes		Autocleaner 2 yrs, Auto- operator 9 yrs, Copolymers 4 yrs	2 yrs as cycle mechanic. 10 yrs as operator in sanitary ware manufacture	Cigarette smoker until 1974. Ill all of 1977 due to Oesophageal varices. Surgical intervention 25.05.79 (right hepatectomy)
14	RJ	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 and jobs on intermittent only manufacture in VCM poly process	1975-1979 maintenance work in VCM poly process	

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

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
15	DEP	03.01.37	Chloe Chimie (Formerly RP)	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		Left Hepatectomy 1983. J C Contaminot Letters of 5 10 83 and 29 7 88.
16	GDM	13.07.22	Chloe Chimie (Formerly RP)	St Fons	17.10.41	05.01.83	61	41	38	03.04.83	Yes	High-33 yrs Moderate- Low - 5 yrs	Polymerist- ion Process Man Maintenance Worker Health & Safety Agent		Retired Jan 1979. J C Contaminot Letters of 5 10 1983 and 25 7 84.
17	HAR	22.02.23	Chloe Chimie (Formerly RP)	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 Contaminot Letter of 5 10 1983
18	R	14.07.42	Solvay	TAVANUX	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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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> 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 5.4.86
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	SEP 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 Auban	01.09.58	05.11.87	59	29	26	08.09.88	Yes	High 1958-70 Low 1970-84	12 years Autoclave worker. 14 years in Control Room		Letters from Dr Contassot, Atochem 2.12.87, 29 / 88, 24.01.89
23	DO	07.02.27	Atochem	St Fons	1944	1988	63	44	28	21.09.89	Yes	High	Autoclave Cleaner & all PVC production jobs		Partial Hepatectomy, Apr 88, Chemotherapy Information from Dr J C Contassot, Atochem, 1988/89

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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
24	RA	08.12.26	Atochem	Brignoud	1943	1988	62	45	35	01.12.88	Yes	High	PVC Production - 2 years MCV Detection - 3 years PVC Production maintenance - 30 years		Liver transplant May 1988. Information from Dr J C Contassot, Atochem, 1988/89
25	BB	02.03.30	Solvay	Tavaux	1962	1988	58	26	23	07.05.88	Yes	11 years) High) - 5 years Polyfloor - 6 years 12 years Low) - 12 years	Polycleaner - 5 years Polyfloor - 6 years Control Room - 12 years		Primary Liver Tumour Metastases lung, brain, bone, spleen, kidney. Information from Dr H Lagart, Solvay, November 1988
26	MG	29.11.40	Solvay	Tavaux	16.04.63	25.10.88	48	25	15	02.11.88	Yes	High 12 years Low 3 years	Autoclave Cleaner for 15 years		Died by haemorrhagic rupture of the tumour. No surgery. Letter from Dr H Lagart, Solvay, 28.4.89.
27	RC	1929	Atochem	St Fons	1954	1988	59	34	30	00.01.89	Yes	1954-74 High 1974-84 Low	Autoclave Cleaner and all PVC production jobs		Notified by Dr Contassot, Atochem, December 1989
28	JG	1926	Atochem	St Fons	1942	1989	63	47	20	Alive	Yes	20 years High	10 years monomer analysis (labs) 10 years production PVC		Notified by Dr Contassot, Atochem, December 1989

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Sheet 1

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

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 31.3.77. This of course is strictly correct. However I wonder whether this man had high exposure to VCN 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	Clinical details in paper by Gobel et al Virchow Arch A Path 1976 372 p 195-203

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Sheet 2

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

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															Confirmed
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)		RG Chemie says "chemistry laboratorian in the Techno- logical Research Department" (NIOSH says assistant factory chemist which may be wrong translation)		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 plant.
06 (NIOSH gives as Case 05)		00.00.32	7	7	16.12.62	00.00.75	43	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	?	Polypworker	?	

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Sheet 3

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

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 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 yr av 35 ppm
10 (NIOSH gives 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 17% auto- clave cleaning		Average exposure first 9 yrs 150 ppm, occ 1000 ppm. Last yr av 75 ppm. CHH letter of 21.04.78
11 (NIOSH gives as Case 10)		00.00.29	8	8	10.10.55	28.06.77	47	21	22	28.06.77	Yes	High	3 yrs auto- clave cleaner 19 yrs filter operator		
12 VEV-200558		00.00.38	4	4	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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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
13		00.00.14	7	7	00.00.60	08.04.78	63	18	14	19.05.78	Yes				P 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 Speiseröhre" (a carcinoma of the oesophagus) not attribut- able to VCM & not recognized as an indust- rial disease				P 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 09/79. Some detail of this & also cases 9, 13, 15, 16 & 17 given in NIH Report for 1978

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COUNTRY AND REFERENCE NO.	NAME OR INITIALS	DATE OF BIRTH	COMPANY	FACILITY	FIRST VC EXPOSURE	AGE AT DIAGNOSIS	YEARS IN EXPOSURE TO DIAGNOSIS	YEARS OF DEATH	HISTOLOGICAL CONFIRMATION	LEVEL ESTIMATED	OCCUPATION	OTHER CAREER RIGHTS	(OTHER SUBJECTS)
1		2	3	4	5	6	7	8	9	10	11	12	13
16		01.00.23	4	4	07.08.78	55	23	20	Yes ASL and Hepaticellular carcinoma	High	Auctioneer worker (1) 1964. Master and master since March 1973 given to Rep for 1978. Different details given in NYC Associated disease by Leibach and Marseller (1981) p71.		
17	(MOSH gives as Case 15)	00.00.37	4	4	01.11.61	41	16	11	Yes	High	Worker Auctioneer	No	
18		00.00.13	5	5	00.00.55	66	24	21	Yes		Auctioneer Worker		
19		00.00.26	4	4	18.10.54	54	25	18	Yes No ASL No ASL	High	Auctioneer Worker		In Reactive Letter of 13-04-82 to Dr. F. A. Adams

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Sheet 6

LIVER Angiosarcoma Cases (Review Date: 1 Jan 1990)

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
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 Fireman	Dr Besche letter of 11-04-82 to Dr W G F Adams
23		00.00.27	8	0	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	1969	11.10.82	54	13	12	28.05.83	Yes	High (>300 ppm)	Autoclave Cleaner		Prof Eder (Munich) letter 22.08.83. 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 Selimir (Munich) letter 22.08.83. Friedel letter 19.04.85
(26)											Deleted on advice of Dr Tenckhoff December 1989: Alcoholic Cirrhosis, not VCN associated.				
27		00.00.28	4	4	1955	18.01.83	55	28	18	02.03.84	Yes	High	Autoclave Cleaner (till 1972)		Leibach. Friedel letter 19.04.85

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Sheet 1

LIVER Angiosarcoma Cases (Review Date: 1 Jan 1990)

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
28		21.11.23	7	7	01.10.60	11.08.85	61	25	25	25.08.85	Yes	High	Process worker 1974-84 01.10.60 - 31.03.84 PVC production, agitator area		Annual WCM screening 24.04.85: no complaint, no abnormality detected. 1970 two-thirds gastrectomy 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	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	30.06.85	61	32	20	31.01.86	Yes	High	Autoclave cleaner		Haemangiosarcoma. Friedel letters 23.12.86, 15.11.89 & Fendel 16.2.89.
32		00.00.30	8	8	1955	00.04.85	55	30	21	15.07.86	Yes	High	Polyworker Autoclave cleaner		Haemangiosarcoma. Also Developed Cholangiosarcoma. Friedel letters 23.12.86, 15.11.89 and Fendel 16.2.89.
33		00.00.17	8	8	1953	19.08.83	67	30	21	25.03.85	Yes	High	Autoclave Cleaner, Chemistry Worker		Letter from Dr Friedel 15.11.89
34		00.00.34	4	4	1956	13.05.85	51	29	16	17.09.85	Yes	High	Shift leader		Letter from Dr Friedel 15.11.89
35		00.00.24	4	4	1968	18.2.73	49	5	4	16.10.84	Yes	High	Autoclave Cleaner		1975 disease of liver parenchyma; at last 80%. Letter from Dr Friedel 15.11.89

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LIVER Angiosarcoma Cases (Review Date: 1 Jan 1990)

Sheet 8

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
36		00.00.18	4	4	1953	19.01.76	57	23	23	14.02.86	Yes	High	Autoclave Worker		Letter from Dr Friedel 15.11.89 and information from Dr Tenkhoff Dec 89
37		00.00.25	4	4	1969	09.08.85	59	16	6	05.09.86	Yes		Laboratory Assistant		Letter from Dr Friedel 15.11.89
38		00.00.22	4	4	1954	16.05.88	66	34	19	16.09.86	Yes	High	Shift leader at the autoclaves; later on at the lumber		Letter from Dr Friedel 15.11.89
39		00.00.42	4	4	1968	00.10.86	44	18	5	03.11.86	Yes	High	Autoclave Cleaner		Pension from 19/4-64 80% later on 100%. Letter from Dr Friedel 15.11.89 and information from Dr Tenkhoff Dec 89

VEU-200563

ITALY

Sheet 1

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

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
01 (On NIOSH supple- mentary list)	LG	15.06.34	PAMSAC	Mira Venice	00.00.65	19.04.71	36	06	03	16.04.71	Yes		PVC Bag extruder		Primary tumour may have been pericardium. 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		Polymarker		* **
03	VG	14.03.20	Solvay	Ferrara	00.01.53	10.07.75	55	22	21	10.07.75	Yes	High	Autocleaner 8 yrs (1953- 61) Autoclave operator 12 yrs (1961- 72)	1972-5 did a variety of jobs including PVC packing.	**
04 VEU-200564	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	1 yr - Monomer operator 20 yrs - Autoclave operator & other duties in suspension polymer- isation. 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 AOL.
05	G Danesi	19.03.37	PAMSAC	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		S Pagliarone telex of 2 Aug 1983

* 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 Rondinella in Acta Oncologica Vol 1 1980 pages 45 - 49.

ITALY
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
06	GZ	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 Chiozzini, Venice, 22.09.87 and 11.01.88
07	AP	09.02.25	Mopifan	Terni	1958	21.01.86	60	28	22	05.04.86	Yes	1958-74 High 1974-80 Medium	Maintained VC Machinery (not operating or 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.

YEV-2009

NEW-200565

JAPAN

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

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
01	Tomoji Mori	01.08.22	Mitsui Toatsu	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 letters of 31.03.78 & 30.11.87
02	SC	02.08.39	Kanegafuchi Chemical	Osaka	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 letters of 31.03.78 & 30.11.87
03	YS	01.09.30	Mitsui Toatsu	Nagoya	00.07.65	26.06.85	54	20	5	14.09.85	Yes	High	5 years Autoclave cleaner		Letter from Dr Nakamura, Japanese PVC Association 30.11.87

VEU-200566

NORRIS

[illegible]

VEV-200567

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 CANCER HIGHLIGHTS	OTHER COMMENTS
01	MOS	26.03.40	Hispanic	Torreblanca	01.02.64	10.11.89	49	25	13	09.11.89	Yes	High 12 years Medium 1 year	Autoclave Operator 12 years. Latex 1 year	From 1.1.78 production of hydrogen peroxide	Cause of death: multiple carabral hemorrhages. No metastasis. Letter from Dr Lapart, Solway, 04.01.90.

SWEDEN

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

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 CANCER HIGHLIGHTS	OTHER COMMENTS
01	MU	23.06.27	Kemnord	Sundsvall	14.08.51	20.10.70	43	19	18	20.10.70	Yes		Polyworker		
02	BL	27.11.11	Kemnord	Sundsvall	00.01.45	00.08.72*	61	27	27	16.08.72	Yes	High	VOM production		Mr Sjoelin's letter of 28 March 1978 confirms BL was a smoker worker who was heavily exposed, probably even more so than a normal reactor cleaner
03	ME	10.06.10	Kemnord	Sundsvall	00.05.47	18.03.76	65	29	21	19.03.76	Yes	High	Polyworker		
04	AL	16.11.14	Kemnord	Sundsvall	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 D Byren letter 18.8.77 to CEFIC
05		12.03.19	Kemnord	Sundsvall	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 2nd Nov 1981 from Dr David Byren

* In his letter of 1st April 1982, Dr Montesano of IARC says 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.

VEV-200569

UK

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

Sheet 1

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 COMPLICATION	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 VOM 1947-8 Drier 1948-61 Autoclave operator 1961-66 Drier		Lee and Harry Lancet 29-06-74 pages 1316-8
(02)															Dubious fabrication case
03	BW	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	1954-5 Bagging Plant 1955-6 Drier Plant 1956-8 Autoclave worker 1958-61 Chargehand Drier Plant 1961-72 Foreman c 2/3 Plant	Pre-war fish packer 1939-45 army vehicle maintenance 1945-54 fish packer	

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Page 1		UK - Sheet 2		LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)											
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 WC 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
05	RK	30.03.14	BP	Barry	08.01.51	00.10.79	65	28	21	19.11.79	Yes		1951-52 Polycleaner 1952-55 Latex 1955-60 Polyfloor 1960-64 Poly Chargehand 1964-70 Charging operator 1970-72 Drier operator		Further information 1989 from Dr P M Smith and Dr D N J Williams
06	GP	1931	BP	Barry	1962	09.01.80	48/9	18	12	09.01.80	Yes		7 yrs Poly Floor Operator 5 yrs Greaser on Poly Floor		Further information 1989 from Dr P M Smith and Dr D N J Williams
07	RGB	26.04.20	BP	Barry	1963	00.00.80	60	17	8.2	13.06.80	Yes		Polycleaner 1963-5 Recovery 1965-1971		Further infor- mation 1989 from Dr P M Smith & Dr D N J Williams
08	WTN	08.05.24	BP	Barry	19.09.50	27.11.81	57	31	24	25.12.81	Yes	1950-1958 500 ppm 1968-1974 200 ppm	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	1938-1948 Motor Mechanic 1948-1950 Operator on Acetylene Production Plant	Further information 1989 from Dr P M Smith and Dr D N J Williams

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LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

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
09	EIGP	07.05.25	BP	Barry	15.02.50	02.03.83	58	33	29	24.02.83	Yes	Medium	Polymworker	2 years on Acrylonitrile Resin Plant. Also prior to 1950. 4 years RAF maintenance. 3 years motor car paintshop. 2 years in Graving 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)	Polyclean- 1966-67. Spray-drier bagger 1967- 68. Blow-down stripper operator 1968-70.	Heavy goods vehicle driver until final illness. 18.06.84 from 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 68-69. Poly Operator 69-79. Leading Hand 79-82.		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 P I Lee

VEU-200572

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
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	GS	15.06.4	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 worker at times between 1968-1982		Letters from Dr DMD Evans, Pathologist, Penarth, Wales and Dr DJJ Williams, BP, Barry
15	BCP	23.08.2	BP	Barry	1956	1988	66	32	16	01.05.88	Yes	9 years High 5 years Medium 2 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	25.05.2	ICI	Hillhouse	1963	1988	66	25	12	12.11.88	Yes	1 year) Low) 9 years) High) 2 years) Low)	Packer 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.
17	RM	14.01.31	ICI	Hillhouse	08.04.63	1989	58	26	25	17.09.89	Yes	1963-63 Low 1963-74) High) (11 years) 1974-88) Low) (14 years))	Packer 2 months Autoclave Operator 25 years (14 years))		Information from Dr B Bennett ICI, and Dr F I Lee, Blackpool Victoria Hospital, 1989.

USA

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

UK system of dates

DAY - MONTH - YEAR

Sheet 1

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
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 Jamm 19/4) p 53	History given in Annals NY ACAD SCIENCES Vol 329 (1979) page 190 in Paper by B R Cottine of USNA	Rolling Stone Art Ref 1 NY Acad of Sc Symp 1974 Also Block Jamm 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 Dimwiddle	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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LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

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
09	Raymond Gettle- 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 Beckman	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. Bagger Dryer op. Stripping op. 3 yrs prior service in tyre plant	Ref 1 - letter of 26 April 1978 from Russell & Park to J T Seesell of NCA
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 Selig.
(15)															Accountant; ASL - No evi- dence of VON exposure.

VEU-200575

USA - Sheet 3

LIVER Angiosarcoma Cases - (Review Date: 1 Jan 1990)

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
16	Jenna Howard	04.11.27	BPG	Louis- ville	08.05.50	00.00.69	41	19	04	27.03.69	Yes		1951-4 VCN polymer- isation	From 1954 onwards in Army and other service. 46-50 Army	Table 4 in Magowan Testimony to US Senate Confirmed in M H Johnson ltr 07.08.78
17	Peerenboom	06.05.31	BPG	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 & years after diagnosis
18	Charles Arthur	22.04.28	BPG	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 Charle- 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				WOLSH letter of 25.10.79
21	Chester Hinkle	02.09.09	UCC	S Charle- 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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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
22		02.10.23	BPG	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 W Johnson confirm this is the case described by Dannaber Tosbarro & Van 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)			Deleted 1990 by B Bennett: Not angiosarcoma, but confirmed Cholangiosarcoma												
(25)			Removal from register confirmed in R Kaminski letter of 5 November 1980												R M Wheeler letter of 20/2/79 and Rose Kaminski letters of 26/2/79 and 5/11/80

USA - Sheet 5

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
26	John Berry	07.07.23	BPG	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. 111 August 1965. Terminated employment Jan 1966		R Kaminaki 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 is bulk and dispersion PVC manufacture	R M Wheeler ltr of 4 Jan 1979 and Charleston Daily Mail 30.11.78 and R Kaminaki 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 Kaminaki letter of 6/4/79
29		12.10.07	UCC	S Charle- ston	00.05.42	00.03.80	72	38	16	01.03.80	Yes				R Kaminaki Letters of 19th June 1980 6 5th Nov 1980
30	WVN	22.07.22	Tenneco Chemicals	Flemington	11.06.64	30.12.80	58	17	15	30.12.80	Yes	6 - Unknown 9 - Minimal	Maintenance Mechanic 6 yrs Elsewhere 14 yrs Boiler house Operator 9 yrs		

VEU-200578

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
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 to that time	Chemical Operator in charge reactor	From 1959 to 1976 Aliphatic Chemicals operator and [from July 1976 [to date [Foreman [Aliphatic [Chemical [Operation	Dr Ducey letter 16.10.81 and R M Wheeler letter of 9.11.81. Also Dr Ducey letter of 07.03.83 re date of death.
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 "bottle operator" in "chemicals industry".	1940-1951 Various jobs in polymer manufacture BUTVAR LUSTREX 1951-1964 Various jobs in and around PVC autoclaves 1964-1971 Various clerical jobs in PVC polymerisation facility/ Retired 01-03-71.		Information given in letter of 24 February 1982 from Dr Walter C Baron 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	1954-74 High 1975-82 Low	Multiple jobs including Poly Operator + Polycleaner.		Prof Tamburro letter of 12 Aug 1982 + Dr W M Johnson letter of 28 Feb 1981.

VEV-200579

LIVER Angiosarcoma Cases - (Review Date: 1 January 1990)

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 CONFIRMATION	ESTIMATED EXPOSURE LEVEL	OCCUPATION	OTHER CAREER HIGHLIGHTS	OTHER COMMENTS
34	Mr Byrum	29-01-34	BPG	Louisville	1955	03-11-82	48	27	10	04.08.83	Yes	1955-74 High 1975-82 Low	Poly Operator + Autoclave Cleaner 1955-65	1965 left BPG to become a Clergyman.	Dr H H Johnson letter of 3 Nov 1982, 28 Feb 1983 and 9 August 1984.
35		09-03-12	UCC	S Charleston	23-07-44	18-07-83	71	39	14	18-07-83	Yes	High from 1944 to 1955. Med from 1955-1958			Dr Dacey letter of 5 September 1983.
36		27-08-32	The General Tire and Rubber Co	Ashland	11-06-56	21-08-83	50	27	27	Alive	Yes	Moderate	1956-56 labourer 1956-57 prod helper 1957-70 operator 1970-75 electrician 1975-present operator		R W Landrie letter of 12 Sept 1983: spotted at medical May 1983. Testing commenced May 1983
37	J Payton	29.08.29	BPG	Louisville	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 H Johnson
38	JMB	28.08.22	Air Products	Calvert City	00.02.63	19.01.84	61	20	20	28.10.83	Yes	High 1963-1982	Normal progression from helper to senior operator, cleaned reactors, stripping & recovery areas as well as charging operator.		Thrombo cytopenia and leucopenia 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.

VEV-200580

LIVER Angiosarcoma Cases - (Review Date: 1 January 1990)

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
39	J Menice	27.06.18	Pantamote	Pasnaic	1960	March 1984	65	24	23	29.06.84	Yes	Low	29.09.60 - May 66 Vinyl Fabrication Plant May 66 - Aug 70 Utility Resin Operator (inc Jul 66 - Sep 67 Reactor Operator) Low Sep 70-82 Monomer Operator Low 1982-83 Mill Operator, Calendar Shop, until retirement	Worked before 1960 with US Air Force, United Wool Dyers and Oranite Operator (Operator) 1942-45 Foreman 1945-76	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 Ertel of Pantamote with letter of 24.02.86 from Dr Auerbach, Pathologist.
40	P P Gillmer	26.10.14	BPG	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, BPG, 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	1949-65 Chemical Op/ Shift Sup/ Foreman, PVC Resin Production 1965-77 NF Plant area for 6 months in 1965]	Retired 1977 (Age 62)	Letters from Prof Tamburro University of Louisville, 1987 and Dr C A Johnson, Goodyear, 1988

VEU-200581

Communication

Division

1971

July 28, 1980

Enclosed is a draft of what I thought I might send at our
meeting of the neighborhood association in
August 14.

I welcome any comments you may have, but I'd specifically like
to hear on the following:

- 1. Is this too much detail or not enough? "Short & simple" (5/13/80) page 221
- 2. Does it address the question of mutagenicity/teratogenicity?
- 3. Is it as soon as possible, but I need your input at least by

Division:

Norm Lehmkuhl
Norm Frost
Al Amsden
John Friend
Bill Broddle