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Sir Richard Doll: Death, Dioxin and PVC

As a doctor and a man of science, naturally you see this affair of the polluted water-supply as a perfectly clear-cut isolated issue. I don't suppose it's occurred to you that a great many other things are involved.

Henrik Ibsen, An Enemy of the People

Introduction

Sir Richard Doll is considered to be one of the world's greatest public health epidemiologists. In Britain, his stature in the contemporary world rises far above those historical characters who, it is said, shaped the scientific approach to public health in the nineteenth and early twentieth century. An English gentleman, who exposed the link between cigarettes and cancer, with a long association with Oxford University, Sir Richard's ethics are accepted as beyond criticism and consequently the results of his research frequently epitomise the inevitable 'rightness' of science as a tool for testing public health risk.

Accolades and awards fall to Sir Richard, at the age of 86, seemingly as naturally and inevitably as fruit falls from trees. In July 2002, he and his long-time colleague, Sir Richard Peto, were awarded the King Olav V's prize of 1 million NOK, for outstanding cancer research. In September 2002 Sir Richard was given the honorary freedom of the City of Oxford. Also in Oxford, work began in January 2003 on a new multimillion pound Richard Doll epidemiology and trials centre.

Wheeled out as a totem of the scientific conscience on popular programmes like *Desert Island Discs*,¹ Sir Richard makes a good avuncular subject appearing to personify the altruistic and curiosity-driven scientist. Hardly ever is anything written, inside or outside the academic press, which is critical of Sir Richard's work.² This is not necessarily because people do not have criticisms, but more obviously because

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¹ A radio programme through which anyone who is anyone in Britain has to pass. The subject is asked what ten records they would want with them if they were stranded on a desert island and which one book, apart from the Bible and Shakespeare.

² There are a number of exceptions to this rule, Geoffrey Tweedale broaches Doll's unreliable research on asbestos in *Magic Mineral to Killer Dust* and Barry Castelman asks important questions about the same subject in his standard work on asbestos. In a more recent book about the late epidemiologist Alice Stewart, a contemporary of Doll's, Gayle Green makes a critical comparison between the two physician scientists. Samuel Epstein, the most acute US critic of the cancer establishment, makes barbed comments about Doll, Peto and their US counterparts in his seminal work *The Politics of Cancer*.

they do not have the power to make their criticisms public and, anyway, English critics are kept in constant thrall by the English disease of libel.³

In a recent interview with James Wilkinson for *intouch*, Sir Richard is introduced as being ‘amongst the first to identify the dangers of smoking, asbestos, and low levels of radiation; the risk of birth control pills; and the role of diet in cancer and other diseases’.⁴ If this summary description of his record as a public health epidemiologist were even superficially correct, why would anyone wish to be critical of Sir Richard’s work?

Sir Richard Doll is principally known for his finding, in the 1960s, that lung cancer can be related to cigarette smoking.⁵ ⁶It is mainly on the basis of this work, that Sir Richard’s reputation as a scientist defending the public interest advanced. However, Sir Richard is not ‘a man of the people’; he has rarely, if ever, taken up any public issues or challenged vested interests and has never been involved in any campaigns where communities considered that their health was under threat from powerful parties.⁷ In fact the opposite is the case, for the greater part of his

³ When I wrote a critical piece for the *Ecologist* about the work of Sir Richard, I was immediately visited by a solicitors letter which pointed out the errors of my way. Some years later I was the subject of a short article, in a well known public health journal, by Sir Richard, headed *A defamatory article by Martin J Walker*. The piece which I wrote for the *Ecologist* was later included by Professor Samuel Epstein in his *The Politics of Cancer*.

⁴ As always, the devil is in the detail, in most these mentioned areas there are serious criticisms of Sir Richard’s work and in relation to low level radiation the statement appears to be definitely incorrect. Sir Richard has always been of the opinion that man made low level radiation has no adverse effects on health.

⁵ Although Sir Richard’s survey of Doctors provided some of the first proof, the view that smoking tobacco and cancer were linked, had been expressed by doctors, researchers and writers since the nineteenth century for example, here are a couple of citations: Frederick Hoffman, *Third and Fourth Quarterly Report of the San Francisco Cancer Survey* (Prudential Press, 1925) and the 1928 summary thereof by Drs. Herbert L. Lombard and Carl B. Doering, in ‘Cancer Studies: Habits, Characteristics and Environment of Individuals with and without Cancer,’ *New England Journal of Medicine* 198 (10): 481-487 (April 26, 1928). The tobacco-cancer link was already sufficiently known in America to be the subject of commentary by a lay author in 1885, under the pseudonym of Meta Lander. She wrote *The Tobacco Problem*, 6th ed. (Boston: Lee and Shepard Pub. 1885), discussing tobacco and cancer. (Leroy J. Pletten, Ph.D. The Crime Prevention Group. Priorities ASCH Magazine, Volume 12, 1 2000)

⁶ In *The Woman Who knew Too Much*, Alice Stewart tells the author how Doll came to work on the smoking study in 1947: “Stewart does feel that Doll was exceptionally lucky to be in the right place at the right time ... ‘Dr Percy Stocks had been studying the rising rate of lung cancer and had called a meeting at the Medical Research Council; he had a hunch that the cause was smoking. We went round the table at the meeting and all these experts gave their reasons why they didn’t think that smoking was the problem. Nobody wanted to do this survey, and everyone was saying that it wasn’t necessary ... It came to Bradford Hill as a sort of last resort, who said, ‘Right, well it looks like we’ve got to do something. I’ve got a young man in my office’, and he gave the study to Doll”.

⁷ An interesting comparison is drawn between Sir Richard Doll and the late Professor Alice Stewart, by Gayle Greene in her book *The Woman Who Knew Too Much* (University of Michigan Press 1999). Alice Stewart undoubtedly one of the most important epidemiologists of her generation, was at Oxford during the same period as Doll. She supported the campaigns of families against low-level radiation on behalf of their children who had contracted leukemia, she also supported Friends of the Earth and other environmental campaigns. Gayle

working life, Sir Richard has worked almost entirely for industrial corporations, in defence of their products and processes. Some of his cancer research work was funded by corporations at whom other scientists have pointed the finger as polluters, and much of his work for the British cancer charities has involved organising drug trials, paid for by pharmaceutical companies.⁸

Without actually carrying out extensive studies, Sir Richard has dismissed a number of contentious pollutants, such as pesticides and exhaust particulates, as co-factors in the cause of cancer and he has stated his case quite forcefully in favour of industry and against environmentalists.⁹ He has never made any secret of the fact that he has been funded by industry for specific research projects. His position on industry funding appears to have been that it was not possible for the source of funding to affect his research.¹⁰

Sir Richard's epidemiological reviews and his personal views have lead to published opinions that there is little or no connection between nuclear power and childhood leukaemia; little or no connection between vinyl chloride and any other form of cancer apart from liver angiosarcoma; little or no connection between power lines and cancer; little or no danger from lead in petrol or fluoride in drinking water, little or no connection between asbestos beyond the point of production and asbestosis, and little or no health damage caused by dioxin. In *at least three* of these instances, lead in petrol, asbestos beyond production and dioxin, social policy in some countries has found his conclusions and those of like-minded scientists seriously wanting.

In 1986, Sir Richard gave evidence in Spain that poor quality polluted olive oil was entirely responsible for an outbreak of ill health and deaths. Spanish epidemiologists, who had concluded that pesticides were the most probable cause, 'resigned' their government posts. Like other industry -funded scientists, Sir Richard has personally criticised other researchers whose work has been critical of industrial products.¹¹

says in a comparison between Doll and Stewart, 'Alice doesn't see why she and Doll couldn't have been working together all these years, and it is difficult to see why they weren't, since they had such similar backgrounds and concerns. Both strated out as physicians; both changed subjects after the war, moving into epidemiology before it was called epidemiology; both had left-wing political views that drew them to social medicine. Both made major discoveries in the fifties that helped shape epidemiology so it came to include chronic as well as infectious diseases. They both moved in Oxbridge circles, attended the same metteings, were on the same editorial boards. But one went on to fame and the other to obscurity'.

⁸ In 1995, Doll was the monitor on the ISIS 4 trials, which was funded to the tune of £6 million by a drug company. The trial was called off because of the unaccountable number of deaths caused in the control group.

⁹ Daily Mail. June 3rd 1992, 'Doll ends this article, written at the time of the Rio Summit, warning that we must stop environmentalists whom he describes as the "anti-science mafia", from "hijacking" the Rio summit. [cited in, Walker M J, Sir Richard Doll: A Questionable Pillar of the Cancer Establishment, The Ecologist. Vol 28, 2, 1998]

¹⁰ In 1993, Doll wrote to Cumbrians Opposed to a Radioactive Environment (CORE) after it had criticised the UK Co-ordinating Committee on Cancer Research, (UKCCR) receipt of £6m used in a study headed by Doll, 'To imply that the UK CCR was in some way under the influence of the nuclear industry ... this is certainly untrue'

¹¹ Most notably Lennard Hardell, see later in this article.

In the battle between academic and industry-funded epidemiology, Sir Richard Doll has stood steadfastly in favour of the development of industry funding and against the general idea of investigations being carried out by either lay bodies or public sector institutions. In the eighties he played a part in setting up the research programme of the CIIT and was given an award by the organisation in 1992.¹²

In 1972, Sir Richard became Master of Green College Oxford, a new College of Oxford University, which, despite its confusing name, had the principal objective of bringing together students of epidemiology and industry. In his retirement, Sir Richard became a member of the Advisory Council of the American Council for Science and Health, which, frequently funded by Monsanto and other chemical companies, promotes industry and gives the seal of approval to chemicals which have been linked to ill-health by other scientists.

This essay analyses one particular research intervention made by Sir Richard during the 1980s: a research review of the health effects of vinyl chloride on workers, carried out for the American Chemical Manufacturers Association. I have tried to describe, in some detail, the variables which might affect what has come to be known as ‘conflict interests’ in this case. I argue what I consider to be the most logical case, that the general climate surrounding industry-funded research, especially in the Chemical Industry, and particularly at Monsanto, and especially during the nineteen seventies and eighties, suggests that industry organises its research in such a way that it is mainly uncritical of their products and processes. Further, in certain circumstances, it defends or manipulates evidence of toxic substances, to the detriment of the public, in order to assure profits.

Finding where individual scientists fit into industry machinations, especially in a society, the ethos of which is secretive and defends powerful interests against public knowledge, is difficult. I have relied to a great extent, in my criticisms of Sir Richard’s role in this particular case, on what might be called circumstantial evidence, or less value-laden, ‘similar fact evidence’. I have tried to take this particular work of Sir Richard’s out of the constraints of its academic discipline, and place it in the industrial, PR and propaganda culture, which more realistically describes the public face of contentious industries. I have allowed reflections and information on the chemical industries covert tactics, to extend beyond vinyl chloride and beyond the exact period of Sir Richard’s review. This looseness of method is necessary, I think, in order to show clearly that chemical companies and academics

¹² Industry, especially the chemical industry hoped that CIIT would gradually siphon off epidemiological research from the Universities and bring it under their control. Established in 1976 as the Chemical Industry Institute of Toxicology, in 2001, the organisation changed its name to CIIT, Centers for Health Research. Appearing to operate like one of the National Institutes for Health, it was cited by its President William F. Greenlee as “positioned to become one of the pre-eminent environmental and human health research institutes with a global role in benefiting the public,” CIIT is wholly funded by the Chemical Industry for whom it carries out research. Funded initially by the American Chemistry Council Long Range Research Initiative (LRRRI), backers now include government agencies, and corporate clients while its member companies include: Bayer, BASF, Chevron, Dow, Du Pont, Kodak, Exxon, Novartis and GEC.

have worked to a strategy for decades, a strategy within which Sir Richard Doll, either consciously or unconsciously, has played an important role.

Epidemiology and Industry

There are literally hundreds of disputed chemicals produced in developed countries. Some of them are suspected carcinogens, while others are considered mutagenic, and still others just make you seriously ill. These chemicals overshadow the lives of thousands of workers, consumers and citizens. According to an article in the Journal of the American Medical Association, each year some 60,000 deaths in America could be attributable to toxic agents, with half of these being cancer deaths caused by synthetic chemicals. Worldwide, according to a Cornell University study, environmental pollution and degradation are responsible for 40 percent of deaths.¹³

Increasingly in the post-industrial period, everything and everybody has its price, its purpose and its market. A terrible utilitarianism has infected European social and intellectual life. A whole series of agencies and organisations have grown up, apparently to mediate the discourse between academia and industry, between consumers and the risks they take, in reality these agencies only propose and pursue industry's agenda. The advent of these organisations has obscured the singular and major difference, which exists and has been recognised, between industry and academia over the last century; industries collapse if they fail to be consistently profitable.

At the centre of this conflict between industry, its workers and the consumers of its produce is the Epidemiologist. Epidemiology is the science of cause, especially in relation to illness. By investigating the social, personal and biological context of illnesses, epidemiologists hope to uncover how they develop or are passed between people. In theory, armed with this information the public health policy maker regulates to curtail the illness or public health threat. Over the last half century (and more in certain industries), however, and especially since the return to privatised production, some of the most renowned European and American epidemiologists have been employed by industry to *refute*, rather than deduce, the chemical and environmental causes of illness.

These epidemiologists are, at the heart of democracy, defining and re-defining what risk to the population's health, society and particularly industry, can live with. Strategic decisions about the production of power, transport, the direction of production in strategic industries and the acceptable death rate of workers are often decided, not by the people or even their political representatives, but by epidemiologists funded by industry.

In the main, the early epidemiologists were either independent scientists or scientists working for public institutions. However, as the lines of demarcation between industry and citizen began to harden in the sixties, it became

¹³ October 1998 Bioscience, David Pimentel et al. Cornell University

evident that research into the public health effects of such things as pesticides, for example, would bring independent scientists into head-on collision with industry.

In the nineteen-sixties, industry began to take the tiller and Epidemiologists were invited by company medical officers to study the health conditions of illness in factories. In 1953, not long after publishing his first paper with Bradford Hill¹⁴ on smoking and lung cancer¹⁵, Doll accepted an invitation from the Medical Officer for Turner and Newall, the asbestos producers, to measure the dangers of asbestos fibres inside their principal factory. After beginning work for Turner and Newall, Doll was invited by the Medical Officer of ICI to work for them on the records of angiosarcoma of the liver, a rare disease affecting men who worked with vinyl chloride.

Vinyl Chloride

Vinyl chloride monomer (VCM), a soft plastic, was first invented in France in 1835. In 1929, researchers at Goodrich found uses for the plastic, particularly in the car industry. The production of vinyl chloride had a considerable impact on the US economy, reducing dependence on rubber. By 1945, US and European production had reached 50,000 tons. This increased massively over the next fifty years, from 220 thousand tons per year in 1950 to 26 million in 2000. PVC is now the second most used plastic in the world. Sixty per cent of the 30 billion pounds produced worldwide is used in the construction industry.

Fourteen out of fifteen plants in North America manufacturing VCM are in Louisiana and Texas.¹⁶ These plants release approximately 8 million pounds of pollution annually.¹⁷ They operate among more than 130 oil refineries, petrochemical plants, and other industries clustered along an 85-mile stretch of the Mississippi River between New Orleans and Baton Rouge, infamously known as “Cancer Alley”.

1959 – 1975 An Industry in Denial¹⁸

As early as 1958, the Dow Chemical Company was discreetly testing vinyl chloride on animals to find out whether it was a health threat to workers. The company recorded adverse liver effects. In a 1959 letter, one Dow scientist, writing to B.F. Goodrich’s hygiene director, concluded that vinyl chloride could produce ‘rather appreciable injury’ among workers routinely exposed to the then voluntary standard

¹⁴ This study had been begun by the Medical Research Council in 1947.

¹⁵ Bradford Hill A, Doll R. 1950 Smoking and carcinoma of the lung. *BMJ* 1950; ii, 1271.

¹⁶ Thornton, Joe, *Dioxin: From Cradle to Grave*, Greenpeace USA, 1997, p. 49.

Georgia Gulf Annual Report (SEC Form 10-K)

¹⁷ Analysis of Financial Condition and Results of Operations, Mar. 29, 2000.

U.S. Environmental Protection Agency. Toxic Release Inventory, 1997.

¹⁸ This part of the article is based upon articles put together on the internet, by the Chemical Industry Archive. Jim Morrison’s brilliant and lengthy reporting in the *Houston Chronicle* and Bill Myers television programme *Trade Secrets*. In turn all these sources have drawn from the documents revealed in the *Ross v. Conoco* case.

of 500 ppm. This opinion, the scientist said, 'is not ready for dissemination yet and I would appreciate it if you would hold it in confidence ...'.

In November 1959, a Union Carbide memo suggested that levels as low as 100 ppm 'produced organ weight changes and gross pathology'. Dow researchers published their animal data in 1961, recommending a vinyl chloride exposure limit of 50 ppm, which they alone adopted.

Around 1964, a hand disability (acro-osteolysis) was recognised among VCM workers who cleaned huge, blender-like reactors, and Goodrich sought research help from Cincinnati University's Kettering Laboratory. By 1966, it was clear that acro-osteolysis was endemic to the industry. A 1967 article authored by four Goodrich medical officials in JAMA, suggested, however, that the disease was not serious or common, and was probably due to 'personal idiosyncrasy'.¹⁹

In 1965, Robert Kehoe of the Kettering Laboratory wrote to Monsanto Chemical Company, then one of the biggest producers of vinyl chloride: 'It is difficult not to conclude, on the face of the evidence, poor as it is, that acro-osteolysis is an occupation disease'. Companies began worrying about the effect reports of the illness would have on the industry. In a January 1966, a memo from J.V. Waggoner of Monsanto, recounts a conversation with a Goodrich executive about the pending European publication of a paper on the disease. Goodrich European representatives had tried to get the authors to change the wording, 'to ensure that it didn't condemn PVC in general'.

Throughout the 1960s, the Chemical Manufacturers Association (CMA)²⁰ attempted to restrict information about acro-osteolysis and block recommendations that VCM levels inside mixer tanks be set at 50ppm. A January 1966 a memo from Monsanto recounts a conversation with a Goodrich Corporate Vice President reporting acro-osteolysis occurring in workers not involved in cleaning the reactors.

In 1968, Goodrich was still guarding information on scores of cases of the disease, labelling them 'confidential' and 'not to be disseminated'. In November 1969, the MCA Plastics Committee agreed no further proposals for research into the causes of acro-osteolysis would be accepted.

In May 1970, Dr. Pier Luigi Viola, an industrial physician for the Belgian chemical firm Solvay, attempted to reproduce acro-osteolysis in animals and reported instead cases of cancer. The results of Viola's work sent shock waves through the industry: 'Publishing of Doctor Viola's work in the US could lead to serious problems ... the present political climate in the US is such that a campaign by Mr. R. Nader and others could force an industrial upheaval'.

Dr. Cesare Maltoni, an Italian scientist, finally ended speculation about cancer and VCM. In 1972, after only a year's work, funded partly by the chemical companies, Maltoni showed that vinyl chloride produced a rare liver cancer, angiosarcoma, in rats at levels as low as 250 ppm. Maltoni's results travelled quickly

¹⁹ This is the same argument that the chemical industry have used against Multiple Chemical Sensitivity, ME and Chronic Fatigue Syndrome over the last thirty years. [See Dirty Medicine: Science, big business and the assault on natural Health care. Martin J Walker, 1993. Slingshot Publications]

²⁰ First called the Manufacturing Chemists Association (MCA) and now called the American Chemistry Council (ACC)

across the Atlantic. It was two years, however, before the chemical companies were willing to make inevitable regulatory changes. Even this might not have happened had there not been three fatal cases of angiosarcoma recorded among Goodrich workers in Louisville in 1974. In 1973 the Chemical Manufacturers Association was still advising its members to make no public ‘reference . . . to the question of carcinogenesis’.

Testifying before the U.S. Senate in August 1974, Dr. Marcus Key the Director of the National Institute for Occupational Safety and Health, (NIOSH), said that they had been kept in the dark about Maltoni’s results. In October 1974, Viola produced more evidence that vinyl chloride was ‘strongly carcinogenic’ in animals. Even at this late stage, the industry tried to censor Viola’s results. MCA representatives crossed the Atlantic to successfully pressure Dr. Viola into changing his report to downplay the seriousness of his findings.

In the light of Goodrich cancer revelation, OSHA quickly adopted an emergency temporary standard of 50 ppm and proposed a permanent standard of 1 ppm. Products which the industry had been defending were restricted.²¹ The plastics industry argued that the instigation of a 1ppm minimum safety standard would eliminate at least 1.6 million jobs and lead to losses of \$65 billion. Some companies claimed that the proposed standard was ‘unnecessary’ and the regulators were risking ‘an industry shutdown’. In 1975 the industry lost a challenge to the 1ppm regulation in a federal court.

The Aftershock of Maltoni

The regulatory assault on the VC industry, precipitated by Maltoni, left the industry fearful of being shut down. Their main fear was that there would be new data about cancer produced by VCM at other body sites.

In September 1982, a letter sent to executives of various chemical companies described the setting up of a Vinyl Institute. ‘In the recent past, the viciousness and frequency of these attacks (on the industry) have escalated to the point where they are seriously threatening important markets . . . The Industry is trying to organise itself to counter these attacks by forming an organisation the Vinyl Institute, whose primary purpose will be to defend and promote vinyl products’.

The success of the chemical industry’s continuing attempts to separate vinyl chloride and cancer can be seen in an incident in 1994. The American Cancer Society’s authoritative *Cancer Facts & Figures* listed vinyl chloride among possible risk factors for lymphoma, in this way: ‘Other possible risk factors include exposures to herbicides, industrial solvents and vinyl chloride’. Hasmukh C. Shah, head of the vinyl chloride panel for the Chemical Manufacturers Association at the time, complained that the publication was misleading, suggesting the following: ‘Other possible risk factors include exposure to herbicides, industrial solvents, and vinyl

²¹ The chemical industry heavily promoted vinyl chloride as a propellant in aerosol cans throughout the late 1950s and 1960s. Yet as early as 1964, *Aerosol Age*, a trade magazine, reported that vinyl chloride in the air could reach very high levels in beauty parlours where hair spray was used- levels that would later be judged by vinyl chloride makers themselves to exceed the dose found to cause cancer in chemical plant workers.

chloride, *although the evidence supporting an association with vinyl chloride exposure is limited*'. In the event, the 1995 revised version of *Cancer Facts & Figures* eliminated all reference to vinyl chloride in the section on lymphoma.

Doll's Review of Cancer and Vinyl Chloride²²

Doll was approached by Brian Bennett, the Medical Advisor to ICI UK, in the early eighties and began to work with him on the Angiosarcoma Register (ASL), a register of vinyl chloride workers who had died of angiosarcoma. The ASL was begun by Dr. John Stafford, Bennett's predecessor. Bennett's paper with Doll and his colleague Forman was published in 1985 in the *British Journal of Industrial Medicine*.²³

In 1984, Bennett discussed with Doll the idea of reviewing the evidence relating to vinyl chloride and cancers other than angiosarcoma. In November, Bennett wrote from the Medical Department of ICI to Dr Carol Stack of the Chemical Manufacturers Association (CMA) in Washington, informing him that he 'had written to Sir Richard Doll, asking about the possibility of he himself reviewing all the epidemiological data base, in order to perform a critical review of the industry'.²⁴

As the Medical adviser at ICI, Bennett was in an important position within the UK plastics industry. Although it might have looked as if he were taking a leap of faith in proposing the apparently independent Doll for the review, Bennett was in fact an experienced defender of the industry position. In 1984, at the same time as he approached Doll, Bennett explained to his American counterparts, how Ecetoc²⁵ was dealing with a team of Dutch researchers proposing much reduced ppm safety thresholds. Bennett wrote that Ecetoc had set up 'a working group to *combat* this project'.

By the end of 1984, Bennett had apparently persuaded the CMA, the VC Program Panel and medical advisers at Dow Chemicals and Union Carbide that Doll's

²² This section is based principally on the letters and documents acquired by the plaintiffs during the Ross case and researched by the author on the internet at Chemical Industries Archive.

²³ Forman D, Bennett B, Stafford J, Doll R. Exposure to vinyl chloride and angiosarcoma of the liver: a report of the register of cases. *Br J Ind Med* 42:750-753 (1985).

²⁴ Although this process appears to be straightforward, readers will see in later parts of this paper, that since the early seventies, Doll already had an ongoing contractual relationship with the Monsanto Chemical Company, which was one of the largest producers of Vinyl Chloride and one of the leading companies in the CMA.

²⁵ ECETOC (European Centre for Ecotoxicology and Toxicology of Chemicals) was established in 1978 as a scientific, non-profit making, non-commercial association, financed by fifty leading chemical companies. It was established 'to provide a scientific forum through which the extensive specialist expertise in the European chemical industry could be harnessed to research, on the ecotoxicology and toxicology of chemicals'. The Association's main objective, they say, is to identify, evaluate and help industry minimise, adverse effects on health and the environment that may arise from the manufacture and use of chemicals.

review would be good for the industry. At this point the projected cost of the review was put at around \$5,000.

In April 1985, Bennett wrote to Doll at the Imperial Cancer Research Fund (ICRF) based in the Radcliffe Infirmary, telling him that he had the ‘necessary confirmation’ from the industry to undertake the epidemiological review, a review which Bennett said would be beneficial not just to the industry, but ‘to the world’.

In the same year as he began discussing the review with Bennett, Doll organised a seminar on asbestos, health and litigation for Turner and Newall Directors at Green College, the Oxford College of which he was the first Warden.²⁶ Doll had been working with Turner and Newall, asbestos producers for almost thirty years, reviewing their data on asbestosis and cancer, and he was now helping in their defence against litigation.

It was initially agreed to start the review in the spring of 1985, but new work which Doll had taken on got in the way and it was not begun until June 1985. In May 1985, Bennett went to Oxford to meet Doll and finalise the Review. Doll thought then that the Review would take a year. Bennett informed the Americans that it could take this long, because Doll was ‘greatly in demand’ and was then in the middle of reviewing the data on Spanish Toxic Oil.²⁷

At their meeting in Oxford, Doll suggested to Bennett that on its completion his work should be peer reviewed by Peto, his colleague who was also employed by the ICRF, and by Geoffrey Paddle and Ted Torkelson, medical advisers to chemical companies. The cost of the review was settled at £15,000 plus expenses.

In March 1986, Doll wrote to William Gaffey, at Monsanto, ‘Dear Bill ... I have been asked ...to review the evidence relating to vinyl chloride to the development of cancers in organs other than the liver’. Doll asked for Gaffey’s advice and added that he had recently returned from the annual meeting of CITT at Research Triangle Park, where he had met George Rousch. In November 1986, Gaffey wrote to Doll, reporting on a paper recently commissioned by the CMA from Environmental Health Associates of Berkeley California, on benzene and vinyl chloride. The principal investigator was Otto Wong, who had done much of the work on the Vinyl Chloride, Equitable Environmental Health Study, an ongoing study begun by Gaffey and Tabershaw in 1974.²⁸

²⁶ The College was founded in 1979 following the benefaction of Dr. Cecil Green whose company, Geophysical Services Ltd., later became Texas Instruments. It was created to encourage medical students to be involved in academic programmes in industry.

²⁷ Bob Woffinden Cover-up *The Guardian* Saturday August 25, 2001.

²⁸ There was to be a similar but bigger row in 1991 when Wong published the updated version of the CMA ongoing study without first showing it to the CMA. In this study Wong reported a statistically significantly elevated level of brain cancer. The unauthorized publication provoked members of the CMA’s vinyl chloride panel and touched off a months-long effort to persuade Wong to recant.

²⁸ Waxweiler RJ, Stringer W, Wagoner JK, Jones J, Falk H, Carter C, Neoplastic risk among workers exposed to vinyl chloride. *Ann NY Acad Sci* 271 (1976) 40-48.

Wong's relationship with the industry over VCM became rocky when he began to worry about brain cancer in VCM workers. In his letter, Gaffey told Doll not to pay too much attention to Wong's results. He said that positive lung and brain cancer results had been perceived in earlier papers produced by Dow staff. *These results were, however, felt to be 'based on too few observations to be trustworthy'*. Gaffey referred to a paper by Waxweiler,²⁹ joking about Waxweiler's honesty; Doll, he said, 'should keep his hands on his wallet' while reading the results.

Doll had finished his review, *Effects of Exposure to Vinyl Chloride: an assessment of the evidence*, by May 1987 and it was being read by others chemical industry researchers. Gaffey appears to have had problems with studies quoted by Doll which had hinted at an incidences of angiosarcoma in men living in the vicinity of plants. In October 1987, the report had been sent around to its various sponsors. On Bennett's suggestion, in February 1988, Doll sent the review to the editor of the Scandinavian Journal of Work, Environment and Health, which accepted it for publication.

Monsanto Through Rose-Tinted Glasses

Apart from his relationship with Turner and Newall, which must be considered central to his early work, the other most consistent relationship which Sir Richard has had with industry has been with the chemical company Monsanto. Unlike the relationship with Turner and Newall, however, his relationship with Monsanto was, until the year 2000, when information about it was revealed in the Ross case, almost completely obscured, by both Doll and the chemical industry.

Doll's relationship with Monsanto and inevitably with the plastics industry, began in the early seventies, when he became an adviser consultant to the company.³⁰ Apparently long before he worked with Bennett at ICI, Doll was already working with Monsanto. In 1973, perhaps as a consequence of his relationship with Monsanto (or perhaps in establishing it), Doll was asked to attend the presentation in Bologna of research which appeared to prove in animal studies that vinyl chloride caused liver damage.

In working for Monsanto, Doll was working for one of the most maligned and criticised industrial companies in the world. In the past, like an iconoclastic company in a Batman story, they had seemed to do everything expected of a chemical company, *writ large*. During the 1970s and 1980s, while Doll worked

³⁰ In 2002 Sir Richard Doll deposited a number of boxes of papers at the Wellcome Institute. The further facts of Dolls long term consultative contract, overseen by William Gaffey, was found by the author in these papers. Although these papers were well-weeded, Doll left in them a letter from William Gaffey renewing his contract to act as a consultant for the company at the billable rate of £1,000 a day. Wellcome has a policy document which has to be signed by readers which states that nothing should be written which might damage the reputation of anyone drawing on material viewed in their library.

as a consultant under contract for them, the company was involved in some of the dirtiest covert campaigns in industrial history.

Founded in 1901 in St Louis by Edgar Queeny, and named after his wife, Olga Mendez Monsanto, the company first produced saccharin. After the First World War, Monsanto began producing chemicals. In the twenties they became a major producer of aspirin, and later began producing detergents, plastics, fibre products and silicon wafers.

In the mid nineteen eighties, Monsanto's then president, Richard Mahoney, decided to turn the company into a Life Sciences company, focusing on three areas: food ingredients, medicine, and, most importantly, agricultural products.^{31,32} In the year 2000, after constant regulatory difficulties and reports of dirty tricks and covert dealings, what was left of the Monsanto Chemical company merged with Pharmacia & Upjohn and changed its name to the Pharmacia Corporation.

The company has had a traditional revolving door relationship with government. This mutual exchange between the company and the US government began as early as the Second World War, when the company conducted research for the Manhattan Project. Today, President Bush's Agriculture Secretary, Ann Veneman, was previously on the board of a Monsanto-owned biotechnology company. Most recently the Monsanto biotech company has been employed by the US Government, spraying thousands of gallons of Roundup in the war against drugs in Columbia.³³

³¹ In 1993 the new President, Bob Shapiro started buying into seed stocks, he paid \$4 bn for two companies involved in creating new varieties, De Kalb Genetics and Delta Pine Land, then added another \$1.4 bn for the international operations of leading producer Cargill. In 1994 Shapiro engineered a \$33 bn merger with American Home Products, a drugs company that numbers slimming drugs and contraceptive devices among its products. Finally Monsanto spent another £320 m to take over UK based Plant Breeding International from Unilever

³² In 1999 after international criticism, Monsanto agrees not to commercialise their "Terminator" seeds these seeds are genetically engineered so as not to germinate a second generation. This means that the farmer has to buy new seeds every year and is unable to build up independent stocks of seeds.

³³ In December 2000, Dutch journalist Marjon Van Royen investigated the health reports on the ground in Colombia, and found that "because the chemical is sprayed in Colombia from planes on inhabited areas, there have been consistent health complaints [in humans]. Burning eyes, dizziness and respiratory problems being most frequently reported." Although Roundup is billed as "safe" for mammals including humans by the U.S. State Department (but not to some insects or aquatic life), there have been too many persistent reports of skin and other problems after fumigation incidents involving farmers and their animals to ignore. Digging further, Van Royen found something alarming: another additive called Cosmo-Flux 411 F was being added to increase Roundup's toxicity. The Roundup/Cosmo-Flux mixture has never been scientifically evaluated nor has the public, either in the U.S., or in Colombia, been informed of this practice. [Toxic Drift: Monsanto and the Drug War in Colombia. Jeremy Bigwood. Special to CorpWatch. June 21, 2001]

An Environmentally disastrous company

Monsanto's list of difficulties with the EPA and other US regulation agencies as well as other companies is a sordid corporate tale. Monsanto has been identified by the Environmental Protection Agency (EPA) as 'potentially responsible' for no fewer than ninety-three contaminated U.S. sites under Superfund law.³⁴

In 1986, Monsanto was found guilty of negligently exposing a worker to benzene at its Chocolate Bayou Plant in Texas. It was forced to pay \$100 million to the family of Wilbur Jack Skeen, a worker who died of leukaemia after repeated exposures.

In 1991, Monsanto was fined \$1.2 million for trying to conceal discharge of contaminated waste water into the Mystic River in Connecticut. In 1993, the Food and Drug Administration approved Posilac, bovine somatotropin (BST), despite constant alarms that it is a carcinogen. In 1995, Monsanto was sued after allegedly supplying radioactive material for a controversial study which involved feeding radioactive iron to 829 pregnant women. Also in 1995, the company was ordered to pay \$41.1 million to a waste management company in Texas after criticism over hazardous waste dumping.

In 1997, *The Seattle Times* reported that Monsanto sold 6,000 tons of contaminated waste, containing cadmium, believed to cause cancer, kidney disease, neurological dysfunction and birth defects, to Idaho fertiliser companies. In 1969, Monsanto began producing the Lasso herbicide, known as Agent Orange, and in 1987 it was one of the companies named in a \$180 million settlement for Vietnam War veterans exposed to the herbicide. Monsanto produced Cycle-Safe, the world's first plastic soft-drink bottle. The bottle, suspected of posing a cancer risk, was banned the following year by the Food and Drug Administration.

Monsanto's closeness to government and its lavish outlay on politics and campaigning have helped the company maintain a constant battle against regulation.³⁵ In 1986 it spent \$50,000 to combat California's anti-toxics initiative, Proposition 65. The initiative was to prohibit the discharge of chemicals known to cause cancer or birth defects into drinking water supplies.

In 1990, Monsanto spent more than \$405,000 to defeat California's pesticide regulation Proposition 128, known as the Big Green initiative. The initiative was aimed at phasing out the use of pesticides, including Monsanto's product alachlor, linked to cancer and global warming.

PCBs

³⁴ Greenpeace, April 1997 1436 U St. NW, Washington DC 20009

³⁵ Monsanto donated \$12,000 directly to Bush's presidential campaign as well as contributed to industry PACs. During the 2000 elections Monsanto gave \$74,000 to mainly Republican congressional campaigns.

In 1929, the Swann Chemical Company, later purchased by Monsanto, developed PCBs, oily liquids that conduct heat but not electricity. PCBs became widely used in the electrical equipment industry as non-flammable coolants in transformers. Shortly after it began production, the company learned, according to a company memo, that PCBs, ‘cannot be considered non-toxic.’

However, for nearly 40 years, Monsanto produced PCBs, and sold them for use in paints, newsprint, carbon paper, deep-fat fryers, adhesives, even bread wrappers. In Anniston, an industrial city in the South, Monsanto routinely discharged toxic waste into a creek and dumped millions of pounds of PCBs into open-pit landfills.³⁶

By 1965, US researchers began to find significant concentrations of PCBs in the blood, hair, and fatty tissue of wildlife. In 1966, Monsanto managers discovered that fish submerged in an Anniston creek turned belly-up within 10 seconds, spurting blood and shedding skin; they told no one. In 1969, they found that another creek had 7,500 times the legal PCB levels.

An article in *New Scientist* in 1969 explained that PCBs ‘bioaccumulate[d] along the food chain.’ Monsanto continued to mass produce PCBs until 1968, when 1300 residents of Kyushu, Japan, fell ill after eating contaminated rice. By the 1970s, research had determined that PCBs were indeed potent carcinogens and their manufacture was banned in the United States and Canada in 1976.

The toxic effects of PCBs, however, continue to affect the environment. In East St. Louis, Illinois, where one Monsanto PCB manufacturing plant was located, there are higher foetal death rates, more premature births, the third highest rate of infant death, and one of the highest childhood asthma rates in the United States.

In Anniston in 1996, state officials and plaintiffs' attorneys were finding astronomical PCB levels in the area: as high as 940 times the federal level of concern in yard soils, 200 times that level in dust inside people's homes, 2,000 times that level in Monsanto's drainage ditches.

The Kemner Case³⁷

In the late 1970s, a rail accident in Sturgeon, Missouri, spilled thousands of gallons of wood preservative. Despite the ensuing health problems of residents, Monsanto

³⁶ Monsanto Hid Decades Of Pollution : PCBs Drenched Ala. Town, But No One Was Ever Told. By Michael Grunwald Washington Post Staff Writer. Tuesday, January 1, 2002; 2002 The Washington Post Company

³⁷ Much of the information in this section is taken from the work of Eric Francis, a New York based award winning investigative journalist who has been writing about Monsanto, Dioxin and PCBs for the last decade. The Kemner Brief by Eric Francis can be found at <http://www.andconspiracyofsilence.com>, Sierra Magazine, September/October 1994.

denied that dioxin was a constituent of the spill; testing, however, documented high levels. In 1979, a number of people, including a woman named Kemner, sued Monsanto for the alleged injuries they suffered.

In *Kemner and others v. Monsanto*, Kemner's lawyer, Rexford Carr,³⁸ managed to badly damage Monsanto after asking for the disclosure of all Monsanto's dioxin documents, and calling employees and consultants to give evidence to the documents and against the company. Carr presented the court with a number of examples where Monsanto had either evaded proper labelling regulations or not made public its disposal of dioxins.

Evidence was given in *Kemner* that Monsanto had, between 1970 and 1977, knowingly dumped 30-40 pounds of dioxin a day into the Mississippi River. The manufacturers of Lysol, recommended for cleaning babies' toys, had not been told about the dioxin content of Santophen, a Monsanto product added to Lysol. Other companies, which had specifically asked about the presence of dioxin in products, were lied to by Monsanto.

Some herbicides, particularly those which Monsanto's 2,3,7,8 - the most potent dioxin - were not labelled as containing dioxin. One witness, who had worked for Monsanto, gave evidence that the company knowingly sent dioxin-contaminated products to its customers from 1978 to 1983. Even though Monsanto had apparently adopted a recommendation that one part per billion of 2,3,7,8 was 'probably medically acceptable', Monsanto was actually sending out one product containing more than 100 parts per billion.

It was also revealed, most importantly, during this trial that Monsanto had embarked upon a deliberate campaign to convince people that dioxin was harmless. As part of this campaign, Monsanto used allegedly fraudulent research to 'prove' that dioxin was not toxic.

Monsanto and Epidemiology

Monsanto staff disclosed during the *Kemner* trial that studies of the toxicity of dioxin had been rigged by Monsanto. The epidemiologist at Monsanto was William Gaffey. Gaffey was a mathematician, brought in by Monsanto specifically to 'clean up' the public image of dioxin. It was Gaffey to whom Doll had written on first getting the job of reviewing studies of the effect of vinyl chloride on workers and it was Gaffey who actually managed Doll's - at that time secret - consultative contract with Monsanto.

Gaffey retired in 1989 as director of epidemiology for Monsanto and died in 1995 aged 71, still involved in a \$4M law suit funded by Monsanto against *Rachel's Environmental News*³⁹, which, along with others, had reported the

³⁸ Carr later wrote the 'Kemner Brief' cited by Eric Francis

³⁹ All the available information about Gaffey and the *Kemner* case can be found in the internet archive of *Rachel's Environment and Health News*, the best environmental publication, available free by email from the Environmental Research Foundation. The editor

story of his fraudulent dioxin research. Another Monsanto dioxin study, produced in 1984 by Suskind and Hertzberg,⁴⁰ was also to become the centre of accusations about fraudulent epidemiology, as a consequence of evidence given in the Kemner trial.

In 1979, Gaffey and Judith Zack had studied workers at a Monsanto plant in West Virginia who had been exposed to dioxin while manufacturing Agent Orange. In their study, Gaffey and Zack reported finding no evidence of unusual cancers.⁴¹

In his Kemner Brief,⁴² Carr wrote 'Zack and Gaffey, two Monsanto employees, published a mortality study purporting to compare the cancer death rate amongst the Nitro workers who were exposed to dioxin in the 1949⁴³ explosion, with the cancer death rate of unexposed workers. The published study concluded that the death rate of the exposed worker was exactly the same as the unexposed worker. However, Zack and Gaffey deliberately and knowingly omitted 5 deaths from the exposed group and took 4 workers who had been exposed and put these workers in the unexposed group, serving, of course, to decrease the death rate in the exposed group and increase the death rate in the unexposed group.

'The exposed group, in fact, had 18 cancer deaths instead of the reported 9 deaths, with the result that the death rate in the exposed group was 65% higher than expected. Consider what the medical community would believe about dioxin, if these facts were known outside the confines of this case!! The plaintiffs, in cross-examining the medical director of Monsanto, Dr. Roush, clearly established the fraud that took place. The cross-examination not only revealed that the overall death rate from cancer was 65% greater in the exposed population than expected, but that the death rate from lung cancer was 143% higher than expected, the bladder cancer death rate was 809% higher and the lymphatic cancer death rate was 92% higher. Death from heart disease was 37% higher than expected.⁴⁴

of Rachel's Environment and Health News, Peter Montague, a tireless environmental campaigner and writer was personally named in Monsanto's action.

⁴⁰ Suskind and Hertzberg 1984

⁴¹ Judith A. Zack and William R. Gaffey, "A Mortality Study of Workers Employed at the Monsanto Company Plant in Nitro, West Virginia," in Richard E. Tucker, Alvin L. Young, and Allan P. Gray, editors, *Human and environmental risks of chlorinated dioxin and related compounds* (New York: Plenum Press, 1983) pgs. 575-591.)

⁴² Cited in

⁴³ In 1949, there had been a massive explosion at the Monsanto development in Nitro, Virginia.

⁴⁴ A complaint which followed the Kemner case, showed clearly how consolidated the links between regulatory agencies and Monsanto were. In 1990, a worker at the Environmental Protection Agency (EPA) forced an investigation into Monsanto on the bases of the evidence heard in Kemner case. On February 23, 1990, Dr. Cate Jenkins sent a complaint to Raymond Loehr, head of EPA's Science Advisory Board and as a consequence the EPA opened an investigation on August 20, 1990. This investigation was closed two years later on August 7, 1992. Jenkins said that EPA had set dioxin standards relying on flawed Monsanto-sponsored studies of Monsanto workers exposed to dioxin, studies that had showed no cancer increases among heavily exposed workers. Jenkins suggested the need for a scientific investigation of Monsanto's dioxin studies, in August 1990, EPA's Office of Criminal Investigation (OCI) recommended that a "full field criminal investigation be initiated by OCI." The charges against Monsanto included: Monsanto failed to notify and lied to its workers about the

In December 1985, some months after writing to Gaffey about the vinyl chloride research, Doll added his authority to the dirty tricks campaign that Gaffey was running to clean up dioxin. On December 4, he wrote to Justice Phillip Evatt, who had presided over the Australian Royal Commission that had enquired into the effects of Agent Orange and dioxin on Australian personnel during the Vietnam war.

The Australian Royal Commission had been a whitewash, the concluding report echoing, almost word for word, the evidence given by Monsanto. However, even these hearings could not completely expunge from the record the studies of Lennard Hardell and Olaf Axelson, which had shown that railway workers exposed to dioxin impure herbicides had died prematurely from soft tissue sarcomas. This work was to lead later to the Swedish Government's ban on the use or sale of these herbicides. Hardell gave evidence to the Australian Royal Commission.

Doll's letter to Evatt, fawningly complementing him on his Report, went on to perform a complete character assassination of Hardell as a clinical research scientist.

Your Review of Hardell's work, with the additional evidence obtained directly from him at interview [probably a reference to Hardell's examination for the Commission], shows that many of his published statements were exaggerated or not supportable and that there were many opportunities for bias to have been introduced in the collection of his data. His conclusions cannot be sustained and *in my opinion, his work should no longer be cited as scientific evidence*⁴⁵.

What are we to think of this unsolicited letter, from a renowned epidemiologist, who was at the time being paid £1,000 a day for consultative work for Monsanto, who was briefed and commissioned by William Gaffey, a man who had been employed by Monsanto specifically to detoxify dioxin, and produced just a few months after he, Doll, had begun work on the American Chemical Association and Monsanto supported review of vinyl chloride workers?

presence and danger of dioxin in its chlorophenol plant, so that it would not have to bear the expense of changing its manufacturing process or lose customers. A criminal investigation was opened August 20 and was formally closed two years later with Monsanto neither found innocent nor found guilty. OCI said, "The investigation is closed. The submission of allegedly fraudulent studies to the EPA were [sic] determined to be immaterial to the regulatory process. Further, allegations made in the Kemner litigation appear to be beyond the statute of limitations. A insider writing later of this investigation, said that the basis for closing the criminal investigation were fraudulent. Rather than investigating all the allegations regarding Monsanto, he says, the EPA actually spent two years investigating Cate Jenkins. The EPA punished Jenkins for her whistleblowing by giving her no assignments during almost two years; in April 1992 she was finally given work to do, but it was clerical. Jenkins filed a complaint with the Department of Labor. The Labor Department found in her favor, that she was being illegally harassed. But EPA appealed that decision to an administrative law judge, thus continuing the harassment. The judge ruled in Jenkins's favor, but EPA-now with Carol Browner at the helm appealed again, this time to the Secretary of Labor. He eventually found in Jenkins's favor, thus ending the long period of harassment. Jenkins was reinstated and her attorneys fees were paid..

⁴⁵ Letter from Richard Doll, Green College, December 4, 1985 to The Hon. Mr. Justice Phillip Evatt, DSC, LLB [ref: 40-X-016]

Even if Sir Richard were completely naive about the way in which the propaganda war in favour of dioxin was being organised by Gaffey and Monsanto, even if he had no inkling that Monsanto might be involved in rigging epidemiological studies, he could hardly have missed the trial and imprisonment of Dr. Paul Wright, a senior Monsanto staff member, found guilty of massive scientific fraud. The case came to trial in 1983.^{46,47}

A joint FDA and Justice Department investigation into Industrial Bio-Test Laboratories (IBT) began in 1976.⁴⁸ The lab had performed more than 1,500 studies over the decade prior to the trial and was responsible for between 35 and 40 percent of all toxicology tests in the US. The company was eventually implicated in rigging and manipulating an estimated 10,000 chemical company trials used to register around 325 insecticides and herbicides.

Dr. Paul Wright, a Monsanto toxicologist, took a job with IBT in 1971. During his eighteen months there as Chief Toxicologist, Wright supervised and wrote up trials of Monsanto products. Returning to an elevated position of Manager of Toxicology at Monsanto, Wright tendered the trial reports on which he had worked at IBT to the FDA, the EPA and other regulatory bodies.

At IBT, Wright oversaw and fixed trials on PCBs, anti-bacterials and pesticides, some of them suspected carcinogens. When he was testing Monsanto's herbicide Machete, Wright added extra lab mice to skew the results.⁴⁹ In two studies of monosodium cyanurate, an ingredient in a Monsanto swimming-pool chlorinator, Wright replaced raw data with after-the-fact invented records, concealed animal deaths, and reported procedures and observations that never happened.⁵⁰ During Wright's trial with three IBT executives, his legal fees were paid by Monsanto.

⁴⁶ Once the world's most notorious polluter, General Electric discovers the cure for cancer, Planet Waves Special Report By Eric Francis:
Faking It, The Case Against Industrial Bio-Test Laboratories, Keith Schneider, Amicus Journal Spring 1983

⁴⁷ In a more recent case, Craven Laboratories, a top residue testing lab for Monsanto and other chemical companies was found to have faked studies of 20 pesticides. This case was reported by the companies, but with a long time lag. In February 1994, Don Allen Craven was sentenced to five years in prison and his company, Craven Laboratories, fined \$15.4 million for falsifying pesticide residue test results used by the EPA for setting pesticide tolerances in foods and registering pesticides. (Corporate Sovereignty And (Junk) Science Edward S. Herman).

⁴⁸ Faking It, The Case Against Industrial Bio-Test Laboratories, Keith Schneider, Amicus Journal Spring 1983

⁴⁹ U.S. Environmental Protection Agency, cited in Dan Fagin and Marianne Lavelle, Toxic Deception How the chemical industry manipulates science, bends the law, and endangers your health. Carol Publishing Group, Secaucus, N.J

⁵⁰ Dan Fagin and Marianne Lavelle, Toxic Deception How the chemical industry manipulates science, bends the law, and endangers your health. Carol Publishing Group, Secaucus, N.J.)

A post-dated peer review

One morning in January 2000, Sir Richard Doll attended the offices of Covington and Burling, the solicitors in England acting for Dow Chemicals in the Ross case. Doll was to be cross-examined via video on the evidence he had given for Dow.

Doll's 1988 review of the research, intended to find out whether there was any reported carcinogenicity, associated with vinyl chloride other than in the liver⁵¹ had given the seal of approval to the safety of the chemical and its productive process. The paper, based predominantly on an ongoing industry-organised study begun in 1975, concluded that there was no proof that workers contracting any other kinds of cancer, except angiosarcoma, when working with vinyl chloride. The review, like other work in the field, had actually thrown up a slightly higher than average incidence of brain tumours amongst vinyl chloride workers; however, this was, the paper suggested, neither statistically significant nor probably occupationally related.⁵²

The importance of Doll's review to the industry, can be judged by the American Chemistry Council (the old CMA, [ACC]) statement issued in 2001. In support of its argument that the vinyl chloride industry was 'clean' the ACC said:

One [of a number of] scientist, Sir Richard Doll, is the epidemiologist who identified the link between cigarette smoking and lung cancer. These scientists have concluded that a link between brain cancer and vinyl chloride exposure is unlikely. According to Sir Richard Doll, the 'small' excesses of brain cancer that have been identified in the groups studied 'are...not statistically significant, and there is nothing to suggest that they are occupational in origin.'⁵³

In the wake of the Ross decision, the American reporter Bill Moyers produced a television programme *Trade Secrets*. Answering criticisms aired on the programme, the ACC again stated, 'The world's leading researchers have studied vinyl chloride

⁵¹ Doll, R. Effects of Exposure to Vinyl Chloride,' *Scan. J. Work. Environ. Health* 14: 61-78 (1988).

⁵² Sir Richard reached similar conclusions when his study of childhood leukaemia around nuclear power stations found an incidence of leukaemia 21% higher than the national average. The researchers explanation was that this elevation was probably not related to the nuclear power plant or the occupation of parents but perhaps due to a 'leukaemia virus'. Doll and his colleagues tentatively advanced the theory that the homes of nuclear power workers were so clean that their children were more susceptible to this hitherto unknown virus.

⁵³ They quote two scientist, the second being Dr. Aaron Blair, is the director of the Occupational Epidemiology Division of the National Cancer Institute. An old review 1997 he would no longer say the same thing especially on a specific matter like vinyl chloride

and brain cancer and concluded that the evidence does not support a link between brain cancer and exposure to vinyl chloride’.

Doll’s cross-examination by Ross’s lawyers tested to the limit the idea that industry funding does not affect the results of research. Doll’s review was based on three studies deemed to have the right depth of data. The principal of these was the continuing study first carried out by Tabershaw and Gaffey for the CMA. This study had been updated in 1982, the report of which was given to industry in 1986, and published in the American Journal of Industrial Medicine in 1991 by Otto Wong at Environmental Health Associates.

The CMA study covered 10,173 men who had worked in 37 plants owned by 17 companies and who had been employed after 1941. A UK study, which was the second largest in Doll’s four studies, looked at 5,498 men. The third study carried out in Canada was limited to employees in a single plant, opened in 1943 and which stopped producing VCM in ‘the late sixties’. This study compared only 451 men exposed to either VCM or PVC for at least five years (average length of exposure 17 years, with 44% more than 25 years), with 870 men from the same plant considered not exposed, as they had worked at the plant with VCM or PVC for six months or less.

In their cross-examination of Sir Richard, the lawyers tried to elicit information about the way in which the data for the study had been collected and processed. A picture began to emerge of the CMA study as one in which a number of things had been done to manipulate the resultant statistics. Older, highly exposed workers were left out, as were entire plants. Younger workers with little or no exposure were included. Exposures were mis-classified. These defects were recognized and discussed by the CMA and participating companies, but were not corrected nor were they brought to the attention of Wong when he did the first update of the study.⁵⁴

It was revealed during the trial that an epidemiologist with the National Institute for Occupational Safety and Health (NIOSH) had noticed in 1974 that workers with a long latency period had not been included in the study. Unlike the British study, the CMA study appeared to use no scale of exposure, simply lumping together those who were exposed in groups which were not comparable across different factories.

The question of industry data is central to Doll’s review. US lawyers for Ross maintained that in many cases data had been coded before reaching the researchers, so that broader information about their subjects was lost.

Illustrating the kind of error which they had found in the studies, counsel suggests that all the subjects from one plant, a Dow Chemical plant of 57 workers in Michigan, were coded and given to researchers. However, despite the study being only of males, 11 women workers were included. In relation to the Michigan workers in particular, counsel said that personal identifiers were not given in a large number of

⁵⁴ Huston Chronicle

cases in the original Gaffey study, making any follow-up impossible. According to Union Carbide, one group of workers included in the exposed group had never actually been exposed.

Specifically with reference to Doll's review, counsel were concerned about the inevitably selective nature of a review of this kind. Why, they asked, had he left out from serious consideration a 1987 supplement 7 assessment of vinyl chloride, by the International Agency for Research on Cancer in Lyon, France, which suggested that there was sufficient evidence to link VCM with brain and lung cancer, as well as leukaemia and lymphoma. Doll replied that at least in this matter the IARC investigators were incompetent.⁵⁵ Addressing Doll's conclusion that a statistically insignificant elevation of brain tumour incidence was not related to work with vinyl chloride, counsel asked Doll if he could think of another cause of brain tumours; he suggested 'ionising radiation'!

Winding up their cross-examination, the lawyers looked at the issue of acknowledgements and Doll's financial interests in the chemical industry. When Doll had written asking Bennett's advice about acknowledgements, Bennett said that there was no need for him to state funding from the CMA. Doll followed his suggestion and consequently made no mention in the published paper of the CMA or co-operation with ICI, the major UK producer of vinyl chloride.

Payment for the review from the Chemical Manufacturers Association, paid in part by ICI, and partly by Dow, was £15,000. However, at the time he was carrying out the review, Doll was also receiving money for consultative work from Monsanto, one of the biggest producers of VC and an important member of the MCA. In the years 1987 and 1988 Doll received large amounts for consultancy work from Monsanto.

CONCLUSION ONE: The People's Right to Know

In North America, where journalists do their job and muck-rakers really do rake muck, issues of conflict of interest, bias in epidemiology and industry defence of toxic chemicals have created an open wound which will not scab over. In Britain, on the other hand, where many journalists are more practised in forelock tugging than writing and where putative muck-rakers are frightened off by legal actions, there has been next to no serious debate inside or outside science about these matters.

With one in three people in developed society suffering from some form of cancer in their lifetime, and with little or no headway having been made in

⁵⁵ The IARC had for thirty years been one of the only truly independent cancer research organisations in Europe, making them a constant target for industry and its funded scientists. The IARC study into Vinyl Chloride workers was the only one which committed that Vinyl Chloride could create brain tumours in workers. When the campaign against public information on passive smoking began, one of its targets was a major study being conducted by the IARC, everything was done by Phillip Morris and its many acolyte organisations to discredit and change the results of this study.

uncovering either the causes or preventative strategies, every citizen has a right to be worried about cancer and the environment. Those who work in manual occupations and in factories, who live in inner city areas and who are poor have more reason to be worried, because the incidence of cancer shows a definite bias towards the less well-off.

Epidemiologists who claim to assess carcinogenic risk levels in society have a considerable responsibility. Sir Richard's years of research has led him to conclude that, excluding cigarette smoking, in America, only around 4% of cancer cases are caused by chemicals or environmental pollutants.⁵⁶ Other researchers assess levels of chemically caused cases at well over 50%. Clearly these two figures are of a different order of magnitude. Sir Richard's estimate suggests that there is no crisis in environmentally caused cancer and few significant changes have to be made by industry. The second assessment indicates that industry and the way that we regulate production and consumption in developed society need considerable change if we are to reduce cancer.

The papers disclosed in various legal cases, over the last thirty years, illustrated the fact that industry cannot be trusted to truthfully uncover causes of mortality and illness associated with its products and production processes. Attempts by industry to cover up the harmful effects of its products and processes display capitalism at its most cynical and uncaring.

During Sir Richard's cross examination by Ross case lawyers, he put on record many of the payments which he had received from chemical companies. Doll told the Ross case lawyers that he did not know that he was expected to reveal either his source of funding or his longer term consultancy obligation to Monsanto, at the end of his review on vinyl chloride. Had he made reference to his funding, at the time, however, the medical, legal and epidemiological world might have taken a quite different approach to his paper. After all, not only was Monsanto one of the major producers of vinyl chloride, but both Monsanto and The Chemical Manufacturers Association were deeply involved throughout the 1970s in what might be called dirty tricks.⁵⁷

The debate about whether Sir Richard Doll has been a naive passenger in the machinations of industrial science will probably continue long after his death. It can, however, only be considered ironic that almost forty years after he published the results of his research linking smoking to cancer, he should end up giving evidence for Dow Chemicals, briefed by a law firm which have since the nineteen-sixties been deeply involved in running flak for the tobacco companies.⁵⁸

⁵⁶ In *The Woman Who Knew Too Much*, this figure is quoted as 2%

⁵⁷ At this time, Monsanto was one of the biggest chemical companies and a major producer of plastics. The company later split into a number of different parts.

⁵⁸ Covington and Burling were the counsel for the Tobacco Institute and played a decisive role in formulating Operation White Coat, a project initiated by Phillip Morris, which retained European scientists to argue the case against passive smoking. The objective of the project was to 'resist and roll back smoking restrictions' and 'restore market confidence' in the cigarette companies. Underpinning this objective were plans to 'reverse scientific and popular misconceptions that ETS(passive smoking) is harmful' and 'restore social acceptability of smoking'. In order to advance this programme, company scientists were

By the time that Doll gave evidence at the offices of Covington and Burling in the Ross case, the company had moved beyond tobacco, incorporating and representing a series of other industries in their covert PR operations, such as Good Epidemiological Practice and the Sound Science Campaign.⁵⁹

CONCLUSION TWO: The Epidemiological Quandary

How can the public evaluate and critique the work of industry-funded epidemiologists? In trying to understand bias or interest conflict, we find ourselves having to look at much more than the conclusions of researchers. We have to take into account the researchers' subjective and perhaps deeply internalised view of society and its organisation. The discourse around this matter runs along well-worn tracks and entails the old discussion about the virtues of qualitative and quantitative research.

The qualitative argument is that the emotional, intellectual and funding orientation of the researcher is as important as the supposedly 'objective' view.⁶⁰ The quantitative position has always been that the researcher is only an instrument, guided and constrained by the rules of science.

At the heart of this academic dispute, we might well be able to discern the real difference between the outcome of Sir Richard's review and that of *Ross v. Dow*. The legal process is much closer to art than science, the emotional disposition and even the body language of actors is openly displayed. Each side states its case subjectively, as well as scientifically, and historical information can be introduced; vested interests are also declared. Within the law, people cry, beg and atone and are punished or vindicated. The legal process unfolds like a dramatic narrative, its actors each revealing a little more of the plot;⁶¹ while the whole process is public and can usually be reported.

The legal forum would appear far better at getting to the heart of the matter than the closed, secretive and incestuous world of academia, in which the actors do their utmost to disguise their commitment to any cause and the psychological factors which drive them.

Modern Industry has found a powerful ally in quantitative social science, and particularly in epidemiologists. In the nineteenth century, the great British empirical public health researchers, almost all social reformers, went into communities and spoke to their inhabitants. They put epidemiology of a kind,

collected with the purpose of setting up the Scientific Committee of the International Centre for Indoor Air Research. Also involved in Project White Coat were Shook, Hardy and Bacon the company intimately involved in the Good Epidemiological Practice campaign.

⁶⁰ There is a wide range of qualitative work and journalistic investigation into industrial illness and the way it is covered up by companies. For example Paul Brodeur's two important books about asbestosis.

⁶¹ Janet Malcolm. *The Crime of Shiela McGough*. Vintage Books, Random House, New York. 1999

journalism, social science and curiosity to work on behalf of the people in critical juxtaposition to profit-motivated industry and the municipal authorities whose judgement was dulled by vested interests. While a handful of contemporary public health epidemiologists still work in this way, those linked to industry work not for the people, or even to slake their own curiosity, but to defend the profitability of corporations, and to legitimate the authority of the State and its municipalities. Their research is constantly updating not 'what is best for the people' but 'what risk to the people industry can profitably get away with'.

Journalists often talk about the 'smoking gun', which verifies a misdeed; in reporting on academic work, however, it is almost impossible to find a smoking gun. Public Health epidemiologists have been allowed to drift so far beyond normal ethical standards that even the payment of millions of pounds from an interested and highly contentious corporation for a study involving the corporation's product - a sure sign of corruption in any other profession - does not today even count as 'possession of a firearm'.

As in all serious confrontations between those who have power and those who suffer the consequences of that power, it is important that those without power develop tools and instruments to help themselves. At the moment, the public, when they suffer illness, have to suffer a further indignity, by becoming the passive subject of parasitic industry-based research, which does not intend to either help to heal their health or prevent them again becoming ill.⁶² This circumstance argues clearly for community-centred, lay epidemiology.

Amongst professionals, while it might not be possible to do anything about the manner in which industry corrupts science, confounds democracy, buys science and confuses truth with profit, those who still inhabit this area, could, if they so wished, transform their own circumstances. If nationally and internationally, academics, clinicians and researchers were to form associations with severe codes of practice in relation to vested interests, industrially funded research would quickly lose standing.

⁶² The fact that many public health epidemiologists are medically qualified doctors adds another dimension to their work; in that they have sworn, first to do no harm and then to heal the sick.