

Please do no dispatch

## Guinea Pigs Go to Court: Epidemiology and Class Actions in Taiwan

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This chapter describes the first two major cases of industrial diseases brought to justice in Taiwan, with the support of an original citizen mobilization and a network of lawyers. The first case is located in the north of the island near Taipei. The 450 plaintiffs had been exposed to a wide range of organic solvents like trichloroethylene and other toxics when they were working for the US manufacturer of television sets RCA. More than a thousand people identified with this case have developed all sorts of cancer. The second case occurs near Tainan, in the south of the island, where tremendous concentrations of dioxin—for some sorts the largest in the world—have been left by a former chemical plant. In both cases, the plaintiffs complained that they are used as guinea pigs for the sake of science. Although the hearings have just begun (2009), the controversy and the speeches of the actors suggest that the scientific uncertainty can not but generate various forms of *compromises*, between “perhaps” and “probable”, epidemiology and toxicology, humans and animals, and thus, all sorts of possibilities for a legal *decision* or a policy.

In the US, many critics of “epidemiology as usual” as regards industrial diseases have emerged, both from within the discipline and from the outside. Inside the discipline, Carl Shy (1997) reproduced with some sense of humor the procedure of a justice court to charge epidemiology with the “failure to serve as the basic science of public health”, but he did not

give the decision of this imaginary court, as if it was only to alert his colleagues of a growing popular discontent. Outside the discipline, as soon as the mid-1980s and with much more consistency, the sociologist Phil Brown (1987) has provided a major work to bring the public back into public health, through his conceptualization of “popular epidemiology,” as distinct from “classical epidemiology” reticent to cooperate with lay people in the search for the scientific truth and cause-effects on toxic issues. Brown would later identified “critical epidemiologists” as scientists not only eager to cooperate with lay people but also as ready to challenge the methodological blind angles of their discipline (Brown 1997). Finally he synthesized the various forms and levels of cooperation between lay people and scientists (Brown 2007: 14-39). Incidentally, Brown’s seminal fieldwork on popular epidemiology was the case of Woburn, Massachusetts—this story was also made famous by a bestseller (Harr 1995) then a movie starring John Travolta—that dealt also with trichloroethylene, the major contaminant at stake in the RCA case in Taiwan. But in contrast with Woburn where the victims were residents’ children affected by leukemia, the RCA case concerns mainly former workers of the plant—mostly female—affected by all sorts of cancers and mutagenic or reproductive disorders (CMR). Moreover, the two cases that we present here highlight the tensions between classical epidemiologists who do share some of the insights of popular epidemiology and their hardcore peers. Many of them were trained in the world’s top of the top universities, like the Harvard School of public health, which put them on the rails to accumulate impressive lists of publications in the best scientific journals of their respective field. However classical these epidemiologists may be, they have been playing a decisive role in the construction of the scientific truth to determine the impact for residents and former workers of the chemical toxics used or generated by the industrial process. But the translation of this epidemiological truth into a juridical decision—heartedly expected by the victims of the contaminations at stake—is yet to come and does not depend only on the will of these epidemiologists.

### ***Organic solvents between “possible” and “probable”***

The Radio Corporation of America (RCA) was founded in 1919 in Camden, New Jersey, with the backing of General Electric (GE). The history of RCA has been described as a “70-year quest for cheap labor.” (Cowie 1999) In 1939, after the company succeeded in developing US’s first all-electronic television system, it opened a new plant in Bloomington, Indiana, a more rural area with less unionized labor, then in Memphis in 1965, where African-Americans made up the core of the labor pool. As US environmental regulation was becoming more stringent, RCA was among the first big American corporations to move abroad, first to Ciudad Juarez, Mexico, in 1964. In 1970, RCA founded two factories in Taiwan for the production of television sets, both in the south of Taipei—the capital city—one in Taoyuan and the other one in Chupei. A third factory would later be built in Ilan county, northeast of Taipei. But Taoyuan would remain the biggest plant and the future center of mobilization concerning the hazards issue. The company easily recruited thousands of workers, mostly young women who had just finished junior high school. The prestige of the company and the fascination for its output (brand-new models of TV sets) made it very attractive for the rural populace. RCA was a nice “family”, providing workers with social activities, dormitories, etc. The pliable workforces in Taiwan and Mexico would eventually be used as blackmail to prevent American workers from striking. In 1986, RCA was acquired by General Electric, which two years later, sold its consumer-electronics branch to the French corporation Thomson. But in 1992, after examination of the groundwater and soil, Thomson sold the Taiwanese plants to local companies, then moved its production to China and Singapore.

### **Fifteen years of investigation to measure RCA’s hazards legacy**

Before it became an emblematic case of occupational hazards, the RCA issue started as a matter of *ex post facto* environmental concern around the vicinity of the former factory. In June 1994, a legislator and former director

of the Environmental Protection Administration (EPA) pushed forward a survey that concluded with the presence of extremely high concentrations of several organic solvents like trichloroethylene (TCE) in the soil and groundwater. After another survey, in June 1998, the EPA announced that the RCA site in Taoyuan was a “permanently contaminated area” (Wu 2009: 206-207). Meanwhile, it happened that many former workers were suffering from various sorts of cancer. In 1998, they launched the RCA Self-Help Association (RCA-SHA), which soon received the support of the Taiwan Association of Victims of Occupational Injuries (TAVOI) founded in 1992 by intellectuals and labor activists with Christian or leftist sensibility. Together, TAVOI and the SHA started to lobby the government to get compensation. In April 2001, the two associations conducted an investigation with the help of the government’s Council of Labor Affairs (CLA). They found 1395 former workers with cancer (226 had died already) and 100 with various tumors. In 2002, members of TAVOI and RCA-SHA went to the United States for a two-week campaign that sought the support of the U.S. Labor Department, members of the Congress, the GE Labor Union, etc. for their cause (Ku 2006).

Under pressure from the media coverage and a critical report of the Control Yuan (an ombudsman institution), the government launched an inter-ministry task force to set up epidemiological and risk-assessment surveys among former workers and neighbors of the site, and to identify the contamination source by hydrological checks. One study was conducted by the Institute of Occupational Safety and Health (IOSH), which is affiliated with the government’s Council of Labor Affairs. The other survey was sponsored by the government’s Environmental Protection Agency (EPA) and conducted by the College of Public Health of National Taiwan University (NTU), under the leadership of Prof. Wang Jung-Der, a prominent figure in Taiwan for occupational and environmental medicine.

The IOSH team produced three reports in Chinese between 1999 and 2001,<sup>1</sup> then three articles in English in international scientific journals—the last one in 2005—while the team of NTU wrote two reports in Chinese in 1999 and 2000, then submitted six articles to international scientific

journals—the last one in 2009. The final results of the IOSH team (Y.-M. Chang 2005) concluded that there was no significantly elevated cancer incidence nor any “standardized incidence ratio” (SIR) for any type of cancer in exposed workers, including breast cancer, arguing that the numerous short durations of employment might bias the cancer risk toward false positive. The authors presume that the cancers could only appear after long period of exposure, neglecting the possible increase of toxicity by the combination of the various carcinogens at stake and their massive use. On the basis of IOSH’s reports, which did not support a significant causal link, and at the same time TAVOI was campaigning in the US in May 2002, GE made a statement to the press that the company could not be held liable since the Taiwanese government itself had confirmed that the cancers were not related to RCA (Ku 2006).

The results of NTU team draw a much different picture. The results of their collaboration with toxicologists for experimentation on mice showed that the mixture of organic solvents (including trichloroethylene) present in the underground water near the factory was a potential carcinogen to male and female mice (Wang 2002). Other NTU articles were epidemiological surveys. The first results could only suggest evidence for liver cancer among male residents (J.-H. Lee 2002; 2003). In their last series of articles (Sung 2007; 2008; 2009), it is patent that the authors had investigated all possible means to find evidence but that they have been limited by the methodological constraints of classical epidemiology. The first one concerned the consequences for the workers themselves. It was based on a cohort of 63,982 female workers covering the period 1973–1997 (Sung 2007). Despite a total of 1572 cancer cases for the period 1979-2001, and despite an extensive review suggesting an association of TCE exposure with kidney cancer, liver cancer, and non-Hodgkin’s lymphoma as well as for cervical cancer, Hodgkin’s disease, and multiple myeloma, no increase of SIR could be found although all above cancers were analyzed. The authors could only conclude that the workers with exposure to trichloroethylene and/or mixture of solvents, first employed prior to 1974, “may have an excess risk of breast cancer.” (Sung 2007) To account for such limitations,

the authors stressed that the analysis was “limited by the lack of detailed exposure information”—a reference to the fact that RCA, GE and Thomson not only refused to disclose job histories and other archives, but eventually tried to hide or destroy every possible proof. As the authors remind, “the factory had been inspected eight times by the Taiwanese government’s inspection agency, with multiple violations of the regulations having been recorded.” (Sung 2007) The last two articles focused on the possible consequences for the workers’ offspring. It looks as if the authors were finally forced to conclude much less than what they would intuitively felt, as in both papers they insist on the lack of data and the multiple violations of solvent regulation by the company. At least they could report an increased incidence of leukemia for the children of female workers (Sung 2008), and a relative increase of infant mortality due to congenital malformation, especially for cardiac defects, for the children of male workers (Sung 2009).

Besides these surveys, two literature reviews have been carried out, one for a public report in Chinese conducted by Wang Jung-Der (2003), the other one in English by Otto Wong (2004). The former found short-term high exposure in female workers during the early 1970s. The latter is presented as an exhaustive thirty-page analysis including most of the articles related to the RCA issue in Taiwan available at that time, yet his conclusion seems to take into account only those supporting an absence of risk. Historians Gerald Markowitz and David Rosner have ranged its author, Otto Wong, among the “damn liars,” more inclined to serve the interests of industry rather than the public health, as he was instrumental for both the vinyl chloride industry and the chemical polluters of the “Cancer Alley” in Southern Louisiana. (Markowitz and Rosner 2002: 229-230, 258-259)

### **Challenges to the *pax epidemiologica***

None of the Taiwanese medical experts has been labeled under such an infamous category. However, for the last decade, as the former workers of RCA faced various sorts of cancer but received no compensation, this issue has generated growing criticism of the conservative conclusions of the

Taiwanese *pax epidemiologica*—to borrow from what Christopher Sellers (1997) defined as the *pax toxicologica* for the US of the 1930s. Indeed, in this case, the Taiwanese bureaucrats have only considered scientific data, overestimating epidemiology in particular and completely disregarding the testimonies of the workers.

Inspired both by the gender studies and the popular epidemiology of Phil Brown, Lin Yi-Ping stressed that the surveys of both teams (IOSH and NTU-CPH) were also distorted by a male-dominated methodology ignoring or minimizing the specificities of the majority of former workers, i.e. women. As she was a doctor candidate at NTU at that time, she joined the team of Wang Jung-Der for their next survey (Sung 2007) and was instrumental in correcting those weaknesses. Nevertheless, the authors could show causal links only for breast cancer. Also inspired by Phil Brown and other alternatives to dominant epidemiology, Wu Yi-Ling (2009) performed a critique of the IOSH surveys on RCA from a sociological perspective. She found a number of methodological weaknesses and stressed that the routine comparison of data through a “one cause, one effect” approach leads to conclusions of false negatives and is characteristic of what she names a “politics of scientifically inconclusive results”. Indeed, the often negative conclusions of epidemiological surveys can be seen as the absence of prevention upstream, and a reluctance to pay compensation downstream of the hazards. But all the scholars should not be put on the same rack.

The researchers of government-controlled IOSH might be incited to minimize the problems for the government to limit, especially as the polluter had left the country. But for NTU scholars, insofar as they publish in renowned international journals, they are assured to get research credits, even from state-related institutions like the National Science Council, EPA or Labor Department, no matter what their findings. And as new clusters or significant issues may benefit of “publication bias” or rather good quotation scores, their authors are more easily inclined to feel sympathetic to the victims. Because they lacked company data, NTU researchers tried animal experimentation to find and demonstrate a causal link, but RCA’s former workers just perceived their conclusion as another useless attempt to

accumulate significant evidence: “How many of us shall die until we shall be recognized as statistically significant?”<sup>2</sup> The slogan “We’re not guinea pigs!” that appeared on a placard during a protest action around the same period in 2002 (See photo 1) expressed also such a misunderstanding of what the scientists from NTU were trying to do, because the other team was so blatantly denying one after the other any possible cause-effects relation. Logically, the IOSH team logically did not pursue its investigation after the last publication in 2005, while the NTU team did continue a systematic quest for more evidence. Despite their limitations, the epidemiological and toxicological results of the latter are now considered as precious arguments by the lawyers of the plaintiffs whose challenge will consist in translating these “*inconclusive* results” into a judicial *decision*.



Photo 1. A protest picket in 2001, in front of the government’s office, by RCA-SHA and TAVOI. At left with the microphone is Ku Ku Yuling, general secretary of TAVOI at that time. One placard says: “We are not guinea pigs”. ©TAVOI

### **Five years after it started... the lawsuit is just beginning**

On January 2001, the inter-ministry investigation task force was dissolved. Accompanied by TAVOI, the RCA-SHA launched a protest action before the government; they also petitioned the Legislative Yuan (Parliament) and the Ministry of Foreign Affairs, and met with some lawyers who formed a voluntary group to help in the legal battle to come. One year later, the lawyers used secret documents that they obtained from the CLA to urge the court to seize the assets left by RCA in Taiwan. It would later appear in the financial documents of the company that in 1998, RCA had already moved



abroad a bank deposit of 2.8 billion New Taiwan Dollars.<sup>3</sup> In April 2004 finally, after hesitating to start a lawsuit in the US, finally, around 200 members of RCA-SHA decided to launch a lawsuit at Taipei District Court. One year later, as it had been rejected for procedural reasons, the association had to appeal. Then once again, in August 2005, the case was rejected again, for the same reason, by the High Court of Taiwan. The association brought the case to the Supreme Court, which, in December, declared the original judgment unsuitable and ordered the High Court to re-examine the case. In March 2006, the High Court rejected the previous decision of the Taipei district court, which was ordered to re-examine the case.<sup>4</sup> So the plaintiffs had to start all over again! Meanwhile, 47 of them had died. Justice takes time, but industrial hazards kill fast.

During the year 2007, the association received the support of the Legal Aid Foundation (*Fafu* in Chinese), an ombudsmen organization that was launched in 2004, thanks to a social movement and the democratization of the country. *Fafu* established a support group of around fifty lawyers with a core group of ten devoted to the RCA issue. After investigating other evidence, these “cause lawyers” (Sarat and Scheingold 2006) also considered suing General Electric and Thomson, with a demand for a total compensation of NT\$ (New Taiwan Dollars) 2.4 billion,<sup>5</sup> with a total number of 438 plaintiffs registered under three distinct groups. The ten lawyers clearly established that in 1987, one year after the sale of the plant to GE, RCA and GE had jointly conducted an environmental survey but failed to disclose the results. In 1994, following the sale of the plant to Thomson and then to local owners, Taiwan’s EPA insisted that RCA, Thomson and GE jointly act to clean up the pollution, but the companies demanded that the Taiwanese government agree not to pursue them for liabilities. The government had consented in order to speed up the clean up process. Under the active leadership of the lawyer Lin Yong-Song, the Taipei branch of *Fafu* has held regular brain-storming discussion meetings, with the RCA-SHA and TAVOI, inviting experts to join when necessary. The first audience at the court occurred in March 2009, and the most serious part started in November.

## **Animal and human experimentation**

A document submitted to the court by the defendants (GE, Thomson) on March 2009 argues that “plaintiffs must present expert testimony demonstrating that exposure to (a particular chemical) more than doubled the risk of their alleged injuries.”<sup>6</sup> As they argue, “a possible cause only becomes ‘probable’ when ... it becomes more likely than not that the injury was the result of the action.” Their document is mainly based on American verdicts except its quotation of the three IOSH reports to reject causality for the various cancers in the specific case of Taiwan RCA former workers. And by the way, the document also stipulates that “epidemiology is the best evidence of causation in the mass torts context”, as if toxicology and animal experimentation were not appropriate sources of evidence. Against this simplistic reasoning and caricature of “classical epidemiology”, the plaintiffs’ lawyers deploy in their response the complexity of carcinogenesis, insisting on the absence in the literature of any threshold of exposure, and the possible combined effects of the large cocktails of toxicants the RCA workers had been exposed to.<sup>7</sup> As a mean to valorize toxicology and animal experimentation as legitimized complements to human epidemiology, they remind that the system of classification and labeling of chemicals established by the United Nations Economic Commission for Europe (UNECE) assumes that animal experimentation is sufficient to determine human carcinogenicity unless proven otherwise. Therefore products, which have been proven to be toxic or carcinogenic through animal experimentation, do not necessarily need to be “tested” by epidemiology so as to prove their toxicity/carcinogenicity for humans.

The lawyers then present that the surveys realized by the NTU team of Prof. Wang J.-D., both in their epidemiological and toxicological dimensions, provide a sufficient body of evidence, congruent with the standards of such organizations as the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) of the US Department of Health, and the US National Institute for Occupational Safety

and Health (NIOSH).

Concretely speaking, because most of the workers had to clean PC boards with organic solvents, they have been exposed in massive quantities to trichloroethylene, tetrachloroethylene and chloroform which are all recognized as occupational carcinogens by NIOSH and are classified as “reasonable” carcinogens by the NTP, and “probable” or “possible” by IARC. Besides, they were exposed to naphtha, that contains benzene which is a certified carcinogen for IARC and NTP. Furthermore, the water that they were given for drinking or washing themselves contained not only the solvents already mentioned but also vinyl chloride, a certified carcinogen for IARC, as well as 1,2-dichloroethane and methylene chloride, classified as “reasonably” carcinogenic by NTP and “possibly” carcinogenic by IARC. Besides those recognized carcinogens, workers have also been exposed to other strong toxins like xylene, toluene, isopropyl alcohol, acetone and ethyl acetate. Such complex combinations of toxins should therefore invalidate any attempt at a “one cause, one effect” approach.

Therefore, the surveys made by the NTU team tend to show that solvents and chemicals used at RCA are proven to be carcinogenic both through animal experimentation and human epidemiology. Those surveys may yield a “not statistically significant” result, but it does not mean that the relation between exposure and disease is insignificant or nonexistent. A lack of data presenting complete job histories of the plaintiffs (to prove the exact location of exposure) might be the harder to overcome. Moreover the judges have a large span for interpreting the *probabilities* that founded the current classification of the toxicants at stake.

**Figure 1: Carcinogens at stake in the RCA issue**

Categories of carcinogens	NIOSH	NTP	IARC
1: Certified as “occupational carcinogens” (NIOSH), or “known to be human carcinogens” (NTP) or “carcinogenic to human” (IARC)	TCE Tetrachloroethylene Chloroform	Benzene Vinyl chloride	Benzene Vinyl chloride
2: “reasonably anticipated to be a human carcinogen” (NTP)		TCE Tetrachloroethylene Chloroform	

		1,2-dichloroethane Methylene chloride	
2A: “probably carcinogenic to humans” (IARC)			TCE Tetrachloroethylene
2B: “possibly carcinogenic to humans” (IARC)			Chloroform 1,2-dichloroethane Methylene chloride
3: “not classifiable as to its carcinogenicity to humans” (IARC)			Xylene, toluene Isopropyl alcohol
4: “probably not carcinogenic to humans” (IARC)			?

### Between possible and probable

Concerning the list set by NIOSH, there is no graduation of probability; all the toxicants listed are *occupational* carcinogens. But the meta-categories set by IARC and NTP aim at a different purpose: to provide an accurate synthesis of the available international literature. As the defense may argue, the major toxicants at stake in the RCA case—trichloroethylene (TCE) and tetrachloroethylene—are *only* class 2 in the NTP (“reasonably anticipated to be human carcinogen”), and class 2A in the IARC (“*probably* carcinogenic to humans”). The class 2A is based on sufficient animal experiments but with limited or insufficient human epidemiological evidence that is required to set the toxicant into class 1 of substances that are definitely proved to be “carcinogenic to humans”. The category 2B further designates substances that are “*possibly* carcinogenic to humans”.

So it looks as if the big boundary between class 1 and 2A was a frontier between humans and animals, and class 2A was a waiting room for the class 1. But until someone has the opportunity to make an ethnography of these organizations and their decision process, no one really knows how the toxicants shift from one category to the other. So the difference between 2A and 1 might be as thin as the one between 2A and 2B, or between “probably” and “possibly”. As the criteria for decision are unclear, the decision process results perhaps less from the smart probability reasoning inherited from Pascal and Bayes’s than from all sorts of *compromises* between one hypothesis and another, or perhaps between science and economic priorities. Like Shapiro (1991) who has described the “probable

cause” as both a cornerstone and a “talismanic formula” of the American judicial system, IARC’s categories from 2A downward (to the class 3 “not classifiable” and 4 “probably not”) look also as talismanic formulas to soothe our anxious *ignorance*<sup>8</sup> of incomplete moderns as pointed by Latour (1993).

Similarly, such uncertainty leaves plenty of room for the judges to make their own mind. As identified by Jasanoff (1995: 114-137) in her analytical framework of toxic torts, they may incline for the arguments of the “radical reformists,” who favor hard epidemiological data, or they may be more sensitive to those of the “incrementalists,” who borrow to a larger repertory of proofs, from clinical evidence to limited—though not insignificant—statistic significance in toxicology or epidemiology. Moreover the concrete testimony of the plaintiffs or their physicians may gain more attention from the judge, rather than the strictly abstract figures favored by the “radical reformists”; and that would be counted as the “human factor” of their decision. In other words, so as to decide between these different regimes of truth, the judges also have to make some sort of intellectual compromises. In the next part, we will see further aspects of these compromises.

### ***Dioxin as a body resource***

The Anshun area is located in the rural suburbs of Tainan city, in the south of Taiwan. It is a beautiful, quiet area, between seashores and hectares of former salt ponds converted into oyster and fish farms. Just a few hundred meters from the “dioxin hot spot” is one of Taiwan’s oldest and most magnificent Mazu temple, visited by pilgrims from all over the island. The industrial hazards that struck this lovely place can be seen as a legacy of its colonial and post-colonial modern past. In 1938, when Taiwan was still part of the Japanese empire and the Japanese army was expanding its control over China, the chemical company Kanegafuchi Sôda, a subsidiary of the firm Kanebô, received land--confiscated from local salt farmers--to open a plant in Anshun. After inauguration by Shinto priests and military officers in

1942, the factory began the production of caustic soda, hydrochloric acid, liquid chlorine and toxic gas to be used in the war effort. Caustic soda was made through electrolysis of the chloralkali process using large quantities of mercury (Chang J.-W. 2008). This marked the first phase of occupational and environmental hazards in this area. After Japan's defeat in 1945, another era of colonialism started for the Taiwanese people, when the island was taken over by the troops of General Chiang Kai-Chek. In Anshun, the company was renamed the Taiwan Alkali Industry, and despite its partial destruction, the Anshun factory re-launched production of its three core products. In 1965, the factory began producing pentachlorophenol (PCP), which has been used extensively as an herbicide and wood preservative. By the 1970s, Taiwan Alkali had become the largest PCP maker in East Asia. However, its production was halted in 1978, and four years later, the entire factory was closed down. PCP has been documented *per se* as a hazardous occupational and environmental toxin, and it would later appear that the production of PCP might also incidentally generate dioxin. The hazards left are therefore a complex cocktail of mercury, PCP and dioxin.

To add institutional complexity, as it is often the case with industrial pollution, control of the company passed from hand to hand following the war. In 1966, by order of the Ministry of the Economy, Taiwan Alkali was put under the umbrella of China Petroleum, a public company. In 1983, after the closure of the plant, it became part of its subsidiary, the China Petroleum Development Company, which was re-privatized in 1994. This ping-pong game between public and private sector has created many pitfalls for the victims of this industrial pollution.

Some twenty years after the plant's closing, a confluence of scientific concern and grassroots mobilization transformed the dormant cocktail of hazards into a local and national issue. A doctoral thesis submitted at the National Tsing Hua University, followed by a journal article in 1997 examined the Anshun case (Soong 1997). The survey established an exhaustive list of the various sorts of dioxins found around the plant, with one sample showing a concentration hundred times higher than the sediments from the Er-Jen river, a known dioxin-polluted river in the south

of Tainan. However, it was not until 2002-2003 that it would become a wider matter of concern. Then, in 1993, 1995, and 2004, the main author of this survey, Prof. Soong Der-kau, conducted or participated in a series of systematic surveys commissioned by the EPA. However, despite thousands of pages of results accumulated, Prof. Soong is not the most visible representative scientist in this affair.

### **The complementary narratives of two “local kings”**

Two key players really emerged out of this issue, each representing a different group in Tainan city. One is Lee Ching-Chang, professor of environmental sciences at National Cheng-Kung University (NCKU); the other is Hwang Hwan-Jang, who also teaches environmental sciences, but in more humble institutions: the Chung Hwa College of Medical Technology and the Tainan Community College. Cheng-Kung University, which ranks as the second best university in the country, is located on a wide and beautiful campus in the center of the city, with thousands of elite students and researchers, and a lot of money in research funding. In contrast, the Tainan Community College occupies a much smaller building and provides night classes for all sorts of citizens, but which, under Hwang’s leadership, has helped launch and sustain the grassroots mobilization in Anshun.

When high levels of dioxin were discovered around 2002, the local population of Anshun area was reluctant to accept the facts, so Hwang and his comrades had to convince both the residents and the local media of the potentially dramatic impact on the environment and on their health. As Hwang discovered that there had also been significant emissions of mercury into soils and fishponds, he contacted Prof. Harada Masazumi, a world-known specialist on Minamata disease. As he frequently did all over the globe, Harada came to Anshun to take some measurements and try to gauge its potential similarities with the contamination of the food chain that occurred in Minamata. This sudden visit helped Hwang and his colleagues to attract more media attention to the issue. Hwang and friends also went to Japan to attend a conference and learn more about Minamata’s long and

tragic story.<sup>9</sup> As word spread, with the help of Harada, other Japanese environmental specialists would come to Anshun. So far, however, the main focus of the Anshun issue remains principally dioxin. Borrowing to Latour, we could say that Hwang and his young colleagues of the community college *translate* the scientific discoveries of Lee et al. into words that spur action at the grassroots level. And sometimes they must bear the various “translation costs” of this role, like public or state’s anger. Without Hwang’s aggressive explanations, the ordinary people of Anshun would not be able to understand the complex scientific conclusions of Lee’s research (which, moreover, is mostly in English). Hwang also displays a talent for attracting and communicating with the media. So Hwang plays the role of the local ombudsman, while Lee stands as a sort of “imperial scholar” or “scientific autocrat.” The latter is not, however, a state or industry’s “at-your-service expert” (*yuyong zhuanjia*). Perhaps Hwang is doing more than mere *translation*. Although they are not published in English in international journals, but in Chinese and in activist publications, Hwang’s narratives on the Anshun issue are more than a simple vulgarization of Lee’s surveys. They provide different insights. Through mappings and interviews of the local people, along with comparisons of various international standards on the control or treatment of dioxin, biochemical hypotheses etc., Hwang’s narratives develop a comprehensive understanding of the complex trajectories of the toxins and their impact on fish, oysters, vegetation, and people. Unlike expert-activists described by Barbara Allen (2003) in the case of Louisiana’s “Cancer Alley,” Hwang has not yet trained any local activist in Anshun to develop a popular epidemiology, strictly speaking. But he has played a valuable role in acting as whistle-blower, attracting attention at local, national and even international levels, something that international journal articles alone will not produce.

Turning to the international literature on the Anshun issue, the name of Lee Ching-Chang is indeed unavoidable. With his research team from NCKU’s Department of Environmental and Occupational Health (DEOH), he has designed and directed most of the surveys on that matter. Along with reports in Chinese to Tainan city office, one of the main sponsors of those



surveys, he has led five important articles in well-known international journals (J.-W. Chen 2006; C.-C. Lee 2006a; 2006b; 2006c; J.-W. Chang 2008). From time to time, he has collaborated with researchers from the National Health Research Institutes (NHRI) which is attached to the Ministry of Health. Wang Shu-Li, a young researcher at NHRI, has been charged with a three-year survey. Other teams competed to bid the research funding from Tainan City or the EPA, but Lee et al. succeeded in getting most of it, thus securing his access to the cohort population. Despite such a hegemonic position on the Anshun issue, and compared to the NHRI's rather inconclusive first report, Lee's reports more firmly establish the causal links between the former plant and a large set of diseases among the population of Anshun. They also make concrete recommendations both for medical follow-up and for quick treatment of the dioxin in the soil. After his education in public health and environmental engineering at National Taiwan University (1978-1992), Lee worked at the EPA (1986-1988). This prior connection may explain why, in 1999, the EPA asked him to conduct a survey to determine serum levels of polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDD/Fs) in the general population living around nineteen incinerators. They discovered incidentally that the population of two villages, Hsien-Gong and Lu-Erh, in the immediate vicinity of the former Taiwan Alkali plant had much higher levels. Further investigation on larger human cohorts along with analysis of fish and soil sediments would confirm that the Anshun area was a "hot spot" for dioxin, "the first one reported in Taiwan" (C.-C. Lee 2006a; 2006b; 2006c).

### **The compromise: necessary for some, impossible for others**

Lee's articles were in English, however, and the people of Anshun were not really informed of what was at stake. Hwang was therefore urging the Tainan city office to disclose the epidemiological surveys in Chinese. In 2008, Lin Ji-Jin, a resident of Hsien-gong who had initiated the Self-help Association [of the victims] of Dioxin from Taiwan Alkali Anshun sued the city office to get those reports disclosed. He was helped by Wang Yu-

Cheng, an assistant professor of environmental law at Cheng-Kung University. Within a few months, the city office chose to make those reports public to prevent further protest from the people of Anshun, who were usually rather obedient. Lee C.-C., the main author of those surveys, expressed his discontent to Wang concerning this judicial offensive: why make so much fuss?<sup>10</sup>

Meanwhile, in 2005, as dioxin also became a controversial issue concerning milk and duck eggs in Taiwan (K.-T. Chou 2008), Chang Kuo-Lung, director of the EPA, pushed the government to launch a program to provide medical and economic assistance to the victims, and pave the way for the clean-up/removal of the dioxin.<sup>11</sup> The Tainan city office was also under pressure from growing discontent among the population of Anshun; no doubt anxious that it would lose support at the next county elections, it then established a healthcare unit for the residents. A total sum of 1.3 billion New Taiwan Dollars (around 28 million euros) was allocated for five years (2005-2010), the major part of it for the “relief” of the population (i.e. not *compensation*). Residents of the three villages that have been most exposed could apply for a low sum monthly allowance if they have a blood rate of 64 picograms (pg,  $10^{-12}$  g) of dioxins, and the equivalent of a monthly minimum wage if they have serious diseases.<sup>12</sup> The criteria of 64 pg was presented as based on the result of the epidemiological surveys, but some residents in Anshun were not convinced by this arbitrary decision. When Lin Ji-Jin, the representative of the Anshun’ Self-Help association, requested that this scale be lowered down to 32 pg, which is the safety criteria recommended by WHO, the city mayor proposed a compromise of 48 pg, but it was rejected by the expert committee. As the mayor confessed frankly: “Some of them wanted 32, others wanted 64. Well, then, I proposed a compromise. Of course, a compromise this is not science, but everyone had good reasons, haven’t they?”<sup>13</sup> The selected value of 64 was proposed by Lee C.-C.: “the mayor finally admitted that it was not a political matter, but a problem that was strictly scientific.”<sup>14</sup>

## Bringing the “hot spot” to court

Even more problematic was the fear that the “relief plan” would end in June 2010, no matter how much the elderly population was stricken by dramatic levels of diabetes and various sorts of cancers, and what the consequences were for their children. By 2007, Hwang Hwan-Jang therefore convinced the local chapter of the Legal Aid Foundation (*Fafu*) to make a public call to the residents to initiate a lawsuit. It was difficult for the three young female lawyers, headed by Lin Hsuan-Chi, to convince the rather old population of Anshun, but by July 2008, they had established a group of 85 plaintiffs, who matched the financial criteria to receive legal aid. In addition, a group of ten attorneys would progressively set up another group of 115 out-of-pocket plaintiffs. The plaintiffs accuse the China Petroleum Development Company of tortuous conduct, while the Ministry of Economic Affairs, the Tainan city office and its Bureau of Environmental Protection are being sued on the basis of negligent violation of official duty. In a secondary claim, the Ministry of Economic Affairs is also being targeted as a joint tort-feasor. They request compensation for medical care and moral suffering, and consolation payments for the relatives of those who have already died.

The litigation focuses on three issues: *liability* (who is responsible and who is not); *causation* (whether dioxin does cause physical damage); and *validity* (if the plaint is made within two years after damage is known by the plaintiff, or ten years after the pollution is known to have happened). According to Fafu, the serum level of mercury is not particularly high on average among the residents, and hard to prove in court; the dioxin level is comparatively higher, and easier to establish exposure-disease causation. As compared also to organic solvents as in the RCA case, general causation has been more strongly established for dioxin by the international literature, notably for diabetes and cancer. However, the plaintiffs’ attorneys must not only prove that CPC’s former PCP plant is the source of the dioxin in their bodies, but that the dioxin does increase their morbidity.

The first court hearing was held in February 2009, where both parties expressed their positions. The judge tried to convince the defendants to settle

with the plaintiffs by offering a settlement, arguing that the state has already given NT\$1.4 billion, and the plaintiffs claim only a few million (100-200 million), and it was clear that there was pollution, and it would be better to avoid spending so many social resources and the fees of six attorneys. But the CPC said they had nothing to do with the health of the plaintiffs, because among the 17 dioxins involved, the company only generated OCDD but not the TCDD that was found in the victims. They even argued that OCDD was not as fatal as TCDD. According to Lee C. C., there is no basis for such argumentation and he's ready to declare it at the court.<sup>15</sup> In August and October 2010, on the invitation of the plaintiffs' attorneys, Soong Der-Kau, the author of the first report on the issue, attended two court hearings as an expert. Despite all the evidence that he was able to provide, he seemed sort of afraid to declare frankly that the PCP could not but have been originated from the plant. While some people in Anshun react strongly when they are asked blood serum for the epidemiological surveys ("We are guinea pigs!"<sup>16</sup>), others expect perhaps too much from the figure of Science incarnated by Lee C.-C.:

We have little chance of winning this suit against the state, and *the only resource we have is the toxin in our bodies*. ... The government will just delay and delay until all the plaintiffs die! Just within one year, ten people have died already. ... Lee Ching-Chang is the one who can determine our life and death, but he doesn't... I don't say this to attack him, but I mean he's the one who can make the State give us compensation or not.<sup>17</sup>



Photo 2. Blood examination at the Mazu temple, Anshun, 27 December 2008.

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***Conclusion: To be or not to be a guinea pig***

Our purpose in this article was to clarify the role played by epidemiology and toxicology in the specific case of industrial hazards. As shown by Desrosières (1998), the birth of probabilities in the seventeenth century had a lot in common with gambling (among other things); it later played a decisive role in the development of modern statistics and the Public Health Movement of nineteenth-century England. This can be considered as the positive side of what the author called the “politics of large numbers.” But there is also a very dark side if we look at the sort of “sinister lotto” that many industries have been playing (Thébaud-Mony 2007: 190-194). As is palpable in the argumentation of RCA lawyers, many industries bet that not all workers exposed to toxins would be hurt, and for those who will get hurt, the long latency will help to dilute the evidence. If some epidemiologists express sympathy for the victims, like Wang Jung-Der on a discrete mode or Lee though in more ambivalent terms, others minimize the cost of compensation for the sake of the state’s finances (the researchers of NIOSH or NHRI), and others (like Otto Wong) directly serve the interest of the polluting company. Therefore epidemiology presents of course a “plurality” of faces. But all those epidemiologists agree on the principle of a truth that would be indivisible, one and unique. The idea of compromise as inherent to the very practice of science would sound like a blaspheme to all of them. The political executives would be less resistant to it, even though they would not confess it as frankly as the mayor of Tainan. And this is where the polluters can take a chance.

We saw that in their quest for compensation, the people of Anshun perceive the toxin in their body as their sole “resource.” As a human cohort, they also feel that they are treated as a resource for the sake of scientific knowledge, while it does not lead them to fair compensation and medical care nor to a safe solution for the future of their land. In the case of RCA, just after the disclosure of toxicological results through animal experimentation, the former workers protested: “We are not guinea pigs!” While in Anshun, although there was no animal experimentation, people

protest: “We are guinea pigs!” Of course, in both cases, the meaning is the same: they feel that they are treated *as if they were* guinea pigs. And in both cases, it has motivated them to go to court. As Hwang mentioned, as a local resident was furious about the blood serum test organized by Tainan City (see photo ?.2), “nature also serves as a guinea pig!” This reminds us that “ecology is not about a naturalization of politics--as if one wanted to ‘treat humans like plants and animals’; it’s about the immense complexity involved for any entity—human or non human—to have a voice.”(Latour and Weibel 2005: 458) Yet, we think it important to highlight that in this hybrid parliament of *Res Publica* (Latour and Weibel 2005: 14-41), some humans may be forced to reduce their right to speak through the *thing* (*Res*) that invaded their body, and which is measured in *invisible* quantities as small as picograms. Not only do toxins become their sole resource with which to negotiate and build their future, but their final recourse is to go to court to *publicly* voice the intimate details of their bodies’ sufferings. Hearings have just started in the case of RCA and Anshun, but we know from other occupational and environmental lawsuits that plaintiffs will have to divulge their complete job and family history, and give details of their physical problems, from relatively minor diseases (like skin disorders or headaches, etc.) to extremely delicate issues related to gender identity, such as breast or uterine cancer, as well as to ill or stillborn children. We also know that the court allows only very limited free expression, so that, even if they should win the case with severe sanctions for the polluters, the plaintiffs may still be left with feelings of great frustration.<sup>18</sup> There is much that is wrong with this state of affairs, between human experimentation by epidemiology and frustrating condemnation at court. In the process, however, all the actors can contribute to rebuilding that thing called “Public Health.” In the two cases that we presented here, many former workers of RCA, and to a lesser extent the residents of Anshun, are clearly engaged in this process. Despite all their frustrations, the efforts of these victims, and their lawyers, to make use of the various scientific studies for *their* cause may result in legal breakthroughs, which might change the way these “guinea pigs” are treated in the future.

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1 . For the complete references in Chinese, see our article in the special feature on the RCA issue in the *Taiwanese Journal for Studies of Science, Technology and Medicine*, January 2011.

2 . Ku Yuling (former general secretary of TAVOI), The RCA case and other occupational hazards in Taiwan, oral presentation at the Centre de Recherches sur les Enjeux Contemporains en Santé Publique (CRESP), University of Paris 13, September 2003. See also TAVOI, "Questions and answers about RCA" (in Chinese), four-page leaflet printed by TAVOI, 2001.

3 . By today's rates, approximately \$84 million (US).

4 . Our interview with Ling Yong-Song in Taipei, 23 November 2009.

5 . Around \$72 million (US).

6 . Taiwan RCA former workers vs RCA/GE/Thomson, Preparatory document of the defense N°9, 26 March 2009, 22 pages.

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7 . Taiwan RCA former workers vs RCA/GE/Thomson, Preparatory document of the plaintiffs N°22, 26 March 2009, 35 pages.

8 . Here we take *ignorance* at large. Brian Wynne has identified more precisely several levels: *risk*, when we know the probabilities of possible harmful events and their associated kinds of damage; *uncertainty*, when we know the types and scales of possible harms, but not their probabilities; *ambiguity*, when the meaning of the different issues are themselves unclear; full *ignorance*, where we don't know what we don't know (the "unknown unknowns"); and *indeterminacy*, when what we know is conditioned by our preference (Felt et al. 2007: 36).

9 . Interview with Harada in Kumamoto, 7 July 2008, and with Hwang in Tainan, 28 July 2008. Concerning Harada and Minamata, see Jobin (2005; 2006).

10 . Our interview with Wang Y.C., Tainan, 30 October 2009.

11 . A physicist of international reputation, Chang had been also a pioneer of the anti-nuke movement in Taiwan, much concerned by all sorts of industrial hazards (our interview in Taipei, February 2002).

12 . All the residents can apply for a monthly allowance of NT\$1.814 (approximately US\$60); NT\$ 3000 (US\$100) if they have a blood rate of 64 picograms, and the equivalent of a monthly minimum wage (NT\$ 15.840, US\$ 500) if they have serious diseases.

13 . Our interview with the mayor at Tainan City office, 13 April 2010.

14 . Our interview with Lee at Cheng-Kung University, 26 November 2009.

15 . Ibid.

16 . Our fieldwork in Anshun, 26 November 2008, and our observation of the medical check offered by the Tainan city office on 27 December 2008. For further interviews and analysis, see Jobin (2010).

17 . Our interview in Anshun, 30 October 2009.

18 . See Jobin (2006: ch.4-5).