Chapter 22
Ensuring recognition of the link between cancer and multiple exposures to carcinogens at work

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On 9 April 2014, the Lyon Social Security Affairs Tribunal (TASS) acknowledged that multiple exposures were instrumental in the death from two cancers (pharynx and floor of mouth) of a worker who had worked his entire life as a glassblower. On 5 December 2014, the role of multiple exposures was also recognized in the case of a docker who likewise died of two cancers (kidney and thyroid). Both received posthumous recognition as victims of occupational diseases. On what data and arguments were these rulings based?

1. General scientific principles of how cancers develop

Cancer does not follow the conventional "single cause-single effect" biological model. It is a long process, often spanning several decades of an individual's life. It develops as serial, simultaneous exposures to carcinogens interact with and are written into the biological development of an individual's cells. Our current knowledge of carcinogenesis tells us that the mutagenic and carcinogenic damage caused by exposure to multiple carcinogens combine and increase the cancer outcome risk.

Also, a carcinogen does not just attack one single target organ. It is now known that asbestos can be involved in the occurrence of pleural, peritoneal and pericardial mesotheliomas, lung cancer, cancer of the larynx or pharynx, ovarian cancer, stomach cancer, colorectal cancer and more. According to the latest *International Agency for Research on Cancer* monograph (2012), colorectal cancer, for example, is one of the anatomical sites where - when studies were conducted - a statistically significant relationship was found with asbestos exposure.

Finally, cancer has no "signature" from which to "select" some and exclude other causative factors of an individual's cancer. A cancer sufferer's history of exposure to carcinogens can be reconstructed using his own experience and knowledge of his employer company's production process. Rather than establishing a causal link with a specific toxicant, this allows identification of all contaminants that may have caused the individual bodily harm and contributed to the onset of cancer. In a cancer sufferer's cellular history, each of the different carcinogens to which they have been exposed most likely plays a role - in synergy with the others - in the process that gave rise to and accelerated the development of the particular cancer. The complexity of this process means that an expert cannot claim with absolute certainty that one or more contaminants are to blame rather than any other(s).

2. The state of knowledge of the cancer-work relation

Epidemiology normally concerns itself only with one type of cancer and one substance at a time. One of the few epidemiological studies to consider multiple exposure to carcinogens is that on the incidence of cancer cases among rescue and recovery workers on the World Trade Center site (Ground Zero) after the 9/11 attacks. A 7-year follow-up study of more than 20,000 rescue and recovery workers found a high incidence of cancers involving numerous cancer sites (Solan *et al.* 2013). The epidemiologists link this raised early incidence of cancer cases with multiple exposure to the toxicants in the dust clouds in which these workers operated.

This study aside, epidemiological research on occupational cancers is on the wane. Canada's Toronto-based Occupational Cancer Research Centre has recently highlighted a radical decline in epidemiological studies on the cancer-work relation between 1991 and 2009 (Raj *et al.* 2014). Most of the studies reviewed are single carcinogen studies, focusing only on known carcinogens, even though in this 20-year period, the forms of organization of work and production have changed not only towards greater versatility of workers (including through job flexibility), but also an ever more intensive use of physical and chemical carcinogens.

3. The extent of multiple exposure

The findings of a 12-year survey done by the researchers of the French *scientific interest group on occupational cancers* (Thébaud-Mony 2008) show a widening mismatch between the reality of multiple exposure to carcinogens and the knowledge developed on the relationships between work and cancer.

Multiple exposure can occur within a single occupational activity when a worker is exposed to several carcinogens at once or in very close succession. It is even greater when the whole working life is looked at. Casualization of employment plays a big role here: agency and other contingent workers have a higher likelihood of successive exposure to multiple carcinogens than those in steady employment. Also to be considered are jobs that involve performing a variety of tasks. This is an important factor in multiple exposure of building workers, industrial cleaning and maintenance, agriculture, etc.

Data from the 2010 SUMER survey in France provides some evidence of multiple exposures as part of a single work activity. The percentages relate only to multiple exposure to chemical carcinogens and do not measure combined exposures to a chemical agent and other agents (night work, ionizing radiation, electromagnetic fields, UV, etc.). Based on this data, 1.2% of employees are exposed to at least three carcinogens. The incidence is highest among skilled manual workers (3.6%) and unskilled manual workers (2%), and particularly high in the construction industry (4.8%). Where occupations are concerned, maintenance seems to carry the highest risk of multiple exposure (8.3%). The correlation with company size is also significant: 1.8% in firms with between 1 and 9 employees versus 0.5% in companies with 500 or more employees.

4. Recognition of occupational diseases

In terms of gaining recognition of cancers as occupational diseases, the foregoing argues for very specific treatment in order to identify the "direct and fundamental" link required by the French legislation between multiple, long-term occupational exposures to carcinogens, and cancer. The focus needs to be put not on what are usually inadequate epidemiological data but rather the proven toxicity – and especially the carcinogenicity – of the products to which the person has been exposed in his work.

The lack of a monocausal relationship between a specific exposure and a cancer outcome should under no circumstances be a reason for refusing to recognize cancers as occupational diseases. After all, multicausality is well established for very many occupational diseases (all musculoskeletal disorders, many respiratory diseases). An analysis of health inequalities by occupational groups points to the critical role played by working conditions in these medical conditions.

In both the cases mentioned in the introduction, recognition was not obtained from the regional occupational disease recognition committees (CRRMP[1]) following medical and legal assessments, but gained in the courts through legal proceedings. Finding in favour of the Cervantes family in proceedings brought in the TASS, the Lyon court held on 9 April 2014 that: "Mr Cervantes' simultaneous and/or successive exposure over a period of more than thirty years to multiple toxicants, three of which are major carcinogens (asbestos, PAHs, solvents), interacting with one another increased the risk of developing cancer of the head and neck, and thus may have caused the successively diagnosed and ultimately fatal 'floor of mouth cancer' as well as the 'cancer of the pharynx'."

The court was also at pains to "point out that the ratio decidendi of the Committees' (CRRMP) decisions was too cursory to account for the elements of the case that persuaded them to rule out any causal role of work [...] They had before them several scientific opinions, the general gist of which argued in favour of recognition of a causal link, and which deserved to be addressed or at least commented on by them."

In the case of a docker, Mr Chagnolleau, heard on 5 December 2014, the Nantes TASS found that it had "sufficient evidence to find that Mr Chagnolleau's multiple exposure to toxicants and carcinogens during his work played a direct and fundamental causal role in the onset of his disease". That evidence consisted in health and safety committee minutes, the sickness insurance fund's preventive engineers' service reports, and a multidisciplinary study on dockers' occupational exposure to carcinogens highlighting the extent of multiple exposures (Chaumette *et al.* 2014). The TASS also found that "the ratio decidendi of the adjudicating regional committees' decisions is too cursory to account for the elements of the case that persuaded them to rule out any causal role of work".

1. France, like most European countries, has a twin-track system for the recognition of occupational diseases: either they are included on a list – or schedule – which confers a presumption of causality; or they are recognized on a case-by-case basis, forcing victims to prove the causal relationship between their working conditions and their disease. CRRMPs are responsible for the second aspect.

Presented with arguments based on the reality of the facts (with which medical experts were unfamiliar) and the state of scientific knowledge, the court thus ruled that these facts should be considered, while questioning the type of expert opinions sought by the CRRMP. Could these two judgments - which may be followed by those in other pending cases – bring about a change in the regulations to include multiple exposure to carcinogens in a list of occupational diseases? Doing so would help ensure recognition of victims' occupational cancer at first instance while still living rather than after a protracted and costly court case conducted not by the victims themselves but more often by the next-of-kin of deceased victims. As it is, victims are deprived of the recognition of the role of work in the development of their cancer, which has not only a financial but also a symbolic impact (see chapter 21).

References

Chaumette P. *et al.* (2014) Enjeux de santé au travail et cancers : les expositions à supprimer dans les métiers portuaires. Une recherche-action sur le Grand Port Maritime de Nantes/Saint-Nazaire, Programme Escales, Rapport scientifique. http://www.msh.univ-nantes.fr/34368189/0/fiche___article/&RH=1342621160125

IARC (2012) Arsenic, metals, fibres and dusts, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans 100(C), Lyon, International Agency for Research on Cancer.

Raj P. *et al.* (2014) Recent trends in published occupational cancer epidemiology research: results from a comprehensive review of literature, American Journal of Industrial Medicine, 57 (3), 259-264.

Solan S. *et al.* (2013) Cancer incidence in World Trade Center rescue and recovery workers, 2001-2008, Environmental Health Perspectives, 121 (6), 2013, 699-704.

Thébaud-Mony A. (2008) Construire la visibilité des cancers professionnels : une enquête permanente en Seine-Saint-Denis, Revue française des affaires sociales, 2008/2, 237-254.