

Cancer Among Fire No Smoke



Starting point

For the first time in the CSST's history, in 2003 it received an application for compensation for a fire fighter's kidney cancer. The agency then commissioned the IRSST (the Institute) to conduct a critical review of the scientific literature. The Institute compiled and analyzed all studies that measured the risk of various types of cancer – some 15 in total – among fire fighters.

Person in charge

Douglas McGregor¹, Toxicity Evaluation Consultant



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Results

A total of seven reports were written on the basis of the critical literature review: three during a first phase (in 2005) and four during a second phase (in 2007). In the second phase, only data on non-Hodgkin lymphoma (NHL) were found to be "relatively compatible with the existence of an increased risk of NHL or the absence of effect on its incidence" in fire fighters. In the case of the three other reports (concerning colorectal cancer, leukemia and eight other cancers (one of which was cancer of the respiratory tract), the conclusions reached were negative.

Users

The occupational health and safety professionals.

IN 2003, THE CSST'S MONTREAL

office received an application for compensation for kidney cancer involving a fire fighter. This event represented a first in the Commission's history. While some Canadian provinces, such as Nova Scotia, Alberta and Manitoba, already had legislation in this regard, the CSST had not yet ruled on this issue. It therefore mandated the IRSST to conduct a critical review of the scientific literature on this topic, i.e. an critical analysis of all studies worldwide that had sought to assess the risk of developing different cancers faced by fire fighters as a result of their occupation.

Three reports published in 2005 concerned the following cancers: brain, kidney and bladder. "These first reports mention analyses that have made it possible to officially recognize the existence of evidence-based links between the occupation of fire fighter and two types of cancer – kidney and bladder – in fire fighters with 20 or more years of experience," specified Marc Baril, who coordinated the peer-review process for the project.

According to the conclusions of the four reports published in 2007, which comprised the second and final phase of the project entitled *Critical literature*

review: *Cancer and fire fighters*, only one of the cancers – non-Hodgkin lymphoma (NHL) – pointed to a possible link between it and the occupation of fire fighter. In the three other cases, although increased risks for certain types of cancer were noted, these risks were low, if not insignificant.

LARGE-SCALE LITERATURE REVIEW

When Douglas McGregor began the project, he reviewed 22 studies that analyzed the links between firefighting and cancer among fire fighters. Two of these studies were Canadian (one carried out in Calgary and Edmonton in 1993, and the other in Toronto in 1994). The oldest study dated from 1978 and the most recent from 2001. Only one study involved a group of female fire fighters, but the sample was too small for gender to be taken into account.

"The types of cancer Dr. McGregor investigate were those that appeared to be the most frequent in the studies



Photo: Mario Bélisle

fighters Without Fire?

analyzed,” explained Mr. Baril. To determine the substances that fire fighters are likely to inhale in the course of their duties, the author referred to a study conducted in 2001 by Austin et al. on the subject of fires in municipal buildings. “These researchers,” he wrote, “observed that only 14 different compounds accounted for about 75% of the total volatile organic materials measured.” The study indicated that “the spectra of volatile organic compounds... [were] dominated by benzene along with toluene and naphthalene. [The researchers] also found that propylene and 1,3-butadiene were present in all of the fires.”

MEASURING EXPOSURE DIFFICULT

All the authors of the studies that attempted to establish a link between one or more cancers and the occupation of fire fighter faced the challenge of measuring the subjects’ real exposure to different substances. First, “unlike industrial workers, the exposure of firemen is not repeated 8 h per day, 5 days per week,” noted Dr. McGregor. Furthermore, “although self-contained breathing apparatuses (SCBAs) are available, these are seldom worn from the time the firemen arrive at the scene until the time that they leave.” Lastly, very few studies took the specific task into account; in other words, many of the fire fighters involved were likely to be assigned to administrative tasks and might never actually have been called upon to fight fires.

NON-HODGKIN LYMPHOMA (NHL)

Of the 22 studies reviewed, 10 alone concerned non-Hodgkin lymphoma (NHL). The following must be said about this cancer, which the World Health Organization classifies among the malignant hemopathies: international agencies recognize as potentially carcinogenic the four substances involved in its onset, independently of the type of work performed. These are PAHs, benzene, 1,3-butadiene and diesel engine exhaust.

Dr. McGregor points out that in the majority of the 10 studies, there was some indication of an increased risk of developing an NHL, but that this risk appeared significant in only four of the studies. Two of the studies showed a standardized mortality ratio (SMR) of between 3.27 and 5.60, but these two studies had significant weaknesses.

The most important study of all those reviewed was the one conducted by Baris et al. (2001). Its importance stemmed from the fact that it observed an historic cohort (1925 to 1986) of

7,789 firemen in Philadelphia, representing the largest number of person-years of all the studies reviewed, specifically, 204,821. It was also valuable because, unlike nearly all the other studies, it considered fine parameters pertaining to firemen’s actual exposure (including duration of employment, cumulative number of fire runs, age at death, etc.). It found that the overall risk of mortality from NHL was increased among firemen, and that mortality from NHL was significantly increased among firemen with 20 or more years of service (based on nine cases).

ALL THE AUTHORS THAT ATTEMPTED TO ESTABLISH A LINK BETWEEN ONE OR MORE CANCERS AND THE OCCUPATION OF FIRE FIGHTER FACED THE CHALLENGE OF MEASURING THE SUBJECTS’ REAL EXPOSURE TO DIFFERENT SUBSTANCES.

Dr. McGregor believes that “most of the studies lacked sufficient statistical power to detect a possible moderate association (e.g., a 2-fold increase in risk). Nevertheless, most of the studies showed a tendency for an increased risk, which, if not due to chance, could

Standardized mortality ratio (SMR)

The standardized mortality ratio, or SMR, is the ratio of the number of observed deaths (e.g. from lung cancer) in a given study population or group, the number of expected deaths based on the age-specific mortality rates for the standard population (e.g. national mortality statistic for lung cancer). It is usually expressed as a percentage.

The standardized incidence ratio, or SIR, is the ratio of the number of new deaths observed in the study population or group, to the number of deaths expected based on the age-specific rates for the standard population. It is expressed as a percentage.

The mortality odds ratio (MOR) is the ratio comparing mortality in a non-exposed group to that in an exposed group.



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be indicative of a real underlying association between employment as a fireman and risk of NHL.”

CANCERS OF THE COLON AND RECTUM (COLORECTAL CANCER)

Looking at the critical literature review on colorectal cancer, the evidence provides far fewer data reflecting an increased risk among fire fighters. Dr. McGregor recognizes that, unlike NHL, “there is very little indication that either benzene or 1,3-butadiene exposures are associated with colorectal cancers.”

The most important study of all those reviewed was again that conducted by Baris et al. (2001), which showed that the overall risk of mortality from cancer of the colon was increased among firemen (with an SMR of 1.51, based on 64 deaths), but that this was not the case for cancer of the rectum (with an SMR of 0.99, based on 14 deaths). However, the generally small numbers of cases did not allow the researchers to examine the dose-response relationship, although attempts were sometimes made, but with no consistency in their results.

The fact that none of the studies took the nutritional factor into account, a factor that is very specific to colorectal cancer, must be mentioned. In fact, Dr. McGregor writes as follows: “Diet has long been regarded as the most important environmental influence on colorectal cancer” (World Cancer Research Fund, 1997). Given that none of the studies included a control for diet and that they had numerous other limitations, the author concluded that the available epidemiological data did not provide sufficient evidence for establishing a compelling link.

He made the same observation regarding leukaemia. “The (...) data (...) in general are not supportive of a



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conclusion that occupation as a fireman is an unequivocal risk factor for leukaemia.”

SKIN CANCER AND CANCER OF THE RESPIRATORY TRACT

Thorough analysis of the studies did not point to any particular factor in relation to skin cancer and cancer of the respiratory tract.

Evidence-based associations have now been shown between two types of cancer – kidney and bladder – and the occupation of fire fighter. Since this finding

has come to light, the CSST has begun compensating some Quebec fire fighters. **PT**

LUC DUPONT

For more information



McGregor, Douglas. *Risk of Cancer of the Colon and Rectum in Firemen*, Report R-516, 32 pages.

Download free of charge:
www.irsst.qc.ca/files/documents/pubIRSSST/R-516.pdf

Risk of Leukaemia in Firemen, Report R-518, 30 pages.

www.irsst.qc.ca/files/documents/pubIRSSST/R-518.pdf

Risk of Non-Hodgkin Lymphoma in Firemen, Report R-520, 30 pages.

www.irsst.qc.ca/files/documents/pubIRSSST/R-520.pdf

Risk of Multiple Myeloma and Cancers of the Respiratory System, Oesophagus, Stomach, Pancreas, Prostate, Testes and Skin in Firemen, Report R-522, 44 pages.

www.irsst.qc.ca/files/documents/pubIRSSST/R-522.pdf

All these publications are also available in French.

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