

## SHORT REPORT

# Two cases of thyroid cancer in a small workforce

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In 1994, in a large parcel depot in the north of England employing 600 staff and 24 electrical and mechanical engineers, two engineers developed papillary cell carcinoma of the thyroid in the same year. A comprehensive review of the literature revealed that ionizing radiation is the only known direct cause of this disease. There was speculation that air filter changing undertaken by the two men affected, shortly after the Chernobyl accident in 1986, may have exposed them to concentrated radioactive fallout. A radiation survey of the parcel depot was undertaken and revealed no evidence of abnormal radioactivity. A total of 27 past and present engineering staff were screened for thyroid cancer. No cases of thyroid cancer were found. Investigation of clusters of rare disease in the occupational setting is indicated mainly in order to address the concerns of the workforce. Nevertheless, investigation is warranted, especially when the aetiology of a disease is poorly understood. It would be prudent for doctors, in whatever speciality, to take an occupational history from individuals who develop thyroid cancer.

*Key words:* Engineers; parcel workers; radiation; thyroid cancer.

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## INTRODUCTION

A large parcel distribution centre in the north of England, dealing with items posted by the public and business customers, had 24 male engineering staff undertaking varied electrical and mechanical maintenance work. The engineers were peripatetic within the site and apart from their workshop base could find themselves working in potentially any area where electrical or mechanical maintenance was required. Their duties ranged from air filter changing to surface/foul water pump maintenance, work in the boiler room or their base workshop. There was potential for exposure to a wide range of hazards. Chemical hazards included a variety of glues, lubricants, cleaning agents, etc.

In 1994 two engineers were diagnosed as having papillary cell thyroid cancer. One, a man in his late twenties, died the same year from what was an unusually aggressive tumour. A colleague in his late forties, was successfully treated with surgery. The men were not related by family. Both had worked on the same shift for several years and had joined the business as apprentice engineers at 16 years of age. They had undertaken air filter changing work shortly after the Chernobyl nuclear incident in

1986 although there was no precise recollection of the date and records of maintenance work for that time no longer existed.

## REVIEW

Thyroid cancer is rare. It accounts for less than 1% of all cancer deaths. Although papillary cell carcinoma is the most common subtype of thyroid cancer overall it is less common in men where there is a less than 5 per million incidence. Its aetiology is poorly understood. The amount of dietary iodine, the level of thyroid stimulating hormone (TSH), the presence of benign thyroid disease and hormonal factors have all been associated with an increased risk.<sup>1</sup> In the occupational setting solvent exposure has been associated with benign thyroid disease<sup>2</sup> but no drug or toxin has thus far been shown to cause thyroid cancer directly. The only environmental exposure known to cause thyroid cancer is ionizing radiation. Only a few studies have considered occupational causes for thyroid cancer. Textile workers, petroleum workers, day nursery personnel and female teachers are among groups at increased risk<sup>3</sup> according to one study. Studies have shown that nuclear workers have a lower incidence and mortality from cancer due to the healthy worker effect and a non-significant excess of thyroid cancer has been found among radiation workers in the UK.<sup>4,5</sup>

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In 1995 almost 2,000 Estonian clean-up workers who had worked at Chernobyl from shortly after the accident, in 1986, until 1991 were examined by ultrasound to screen for thyroid cancer and nodules.<sup>6</sup> Ten per cent were found to have nodules but there was no association with date, period of duty, type of duty or recorded radiation dose at Chernobyl. Two cases of papillary thyroid cancer were discovered.

It is estimated that the Chernobyl accident on 26 April 1986 will produce a total of 1,000 additional fatal cancers over the next 50 years compared with 30 million 'natural' cancers expected in this period. The accident released a plume of radioactive iodine ( $I^{131}$ ) and radio-caesium. In the most heavily contaminated area (Belarus) there was, by 1993, a hundredfold increase in childhood thyroid cancer,<sup>7</sup> mainly of papillary cell type. A corresponding increase in thyroid cancer in adults was not observed. It could be postulated that dietary uptake of radioactive iodine was higher in children. What is certain is that the thyroid gland in children is extremely sensitive to ionizing radiation while it is relatively insensitive in adults.<sup>8</sup>

In the UK, the plume of radioactivity from Chernobyl covered the country by 3 May 1986. Although the north of England received 10 times more fallout deposited on the ground compared to the south<sup>9</sup> due to rain while the plume of fallout was present, a survey of residents in 1987 revealed no evidence of an increase in body content of radioactivity relative to the rest of the UK.<sup>10</sup>

## INVESTIGATIONS

An ionizing radiation survey of the site was undertaken and personal samplers were worn by the engineers for a 3 month period. Air concentration levels of radioactivity were assessed during air filter changing. Surfaces, including the inside of filter units, were checked for contamination and radon levels were measured in the basement. Alpha, beta and gamma radiation was assessed.

Air concentration showed detectable levels of radiation but these were very low and thought to derive from naturally occurring radon in the atmosphere. No radioactive contamination was measured on the surfaces of areas monitored. Dosimeters showed non-significant amounts of radiation dose. In summary, no significant radiation dose rates existed in the areas monitored.

As it could be postulated that for whatever reason, the engineers could have represented a subset of the population at particular risk of the disease, a thyroid cancer screening programme was undertaken. Those invited for the screening included all current employees and those traced as having transferred to other businesses or retired. The screening comprised blood tests for free thyroxine, TSH, thyroid microsomal antibodies and ultrasound of the gland with access to fine needle aspiration biopsy under ultrasound guidance if necessary. The existence of any personal or family history of thyroid disease (in a first degree relative) was recorded as was any history of radiation exposure (occupationally in

industry or the forces, therapeutic exposure, or diagnostic exposure to the neck area in childhood). The areas where the men had been brought up and lived was established, and whether they had been employed on the work site in 1986.

Twenty-seven men underwent screening. This included all the current engineers except for one recent starter who declined screening. The age range was 25–66 years old with a median age of 39 years old. Out of 27 men who had screening investigations 18 individuals had completely normal results.

In those 18 workers with normal results none had any personal or family history of thyroid disease or radiation exposure. Most had lived in the local region all their lives (15) and been employed on the worksite in 1986 (13).

In the nine workers with positive findings, none had any family history of thyroid disease or history of radiation exposure. One man had been diagnosed with multinodular goitre and hypothyroidism several years earlier. Most had always lived locally (seven) and been employed on the work site in 1986 (seven). There were three cases of multinodular goitre (including the known case who had thyroid microsomal antibodies and abnormal thyroid function tests). In four men small (< 5 millimetre) single thyroid cysts were isolated findings. (In one man the cyst had disappeared 6 months later.) One man tested positive for thyroid microsomal antibody as an isolated finding, and in another there was a borderline low thyroxine level. None of the men required treatment as a result of the screening programme although those with significant abnormalities were advised to attend for periodic follow-up with a specialist or their GP.

## DISCUSSION

The investigations could not categorically exclude the possibility that the engineers afflicted by thyroid cancer were exposed to an enhanced level of radioactive fallout from the Chernobyl incident during air filter maintenance. However, even if this were the case the evidence does not suggest that they would be likely to develop thyroid cancer as a result.

As to whether the engineers were exposed at work to some other, as yet unknown, environmental cause of thyroid cancer is impossible to say from the information available, but engineers have not thus far been highlighted as a group at particular risk for thyroid cancer, and no chemical hazard has yet been shown to cause thyroid cancer.

The cause of thyroid cancer is too poorly understood to allow any complacency when clusters of the disease occur in the occupational setting and thorough investigation was warranted in these circumstances despite the fact that the main indication was, as is usual, to address the concerns of a group of workers<sup>11</sup> rather than in the expectation of shedding light on disease causation. Appropriate further action was to recommend monitoring of future incidence among the screened group, in liaison with the local cancer registry, and to offer this short report to share this experience with colleagues. A

further prudent recommendation would be for doctors from whatever speciality to take an occupational history from those who develop thyroid cancer.

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