Prostatic cancer and radionuclides

Evidence implicates zinc-65

EDITOR,—In their paper on prostatic cancer in employees of the United Kingdom Atomic Energy Authority, Cleone Rooney and colleagues raise the possibility of localisation of zinc-65 in the prostate being an aetiological factor but state that "there are no reliable data on ^{65}Zn uptake by the human prostate."[1] Prout *et al* showed in 1959 that ^{65}Zn localises avidly in the prostate in human males, and especially in benign adenomas.[2] In 1956 Daniel *et al* showed that the ratio of the ^{65}Zn concentration in normal prostates to that in blood was over 2·5:1; one patient had a ratio of 27:1.[3] The consensus of both groups was that neoplastic prostates concentrated less zinc. The uptake of zinc by the human prostate is so high that it is technically possible to image the prostate with ^{69m}Zn.[4,5] (Unfortunately, there are no isotopes of zinc suitable for routine imaging, so this approach has not found a place in routine nuclear medicine.)

This avid uptake of zinc by the prostate must increase the probability of ^{65}Zn being a relevant factor in carcinogenesis in this population.

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1 Rooney C, Beral V, Maconochie N, Fraser P, Davies G. Case-control study of prostatic cancer in employees of the United Kingdom Atomic Energy Authority. *BMJ* 1993;307:1391-7. (27 November.)
2 Prout GR Jr, Sierp M, Whitmore WF. Radioactive zinc in the prostate. Some factors influencing concentrations in dogs and men. *JAMA* 1959;169:1703-10.
3 Daniel O, Hadda F, Prout G, Whitmore WF. Some observation on the distribution of radioactive zinc in prostatic and other human tissues. *Br J Urol* 1956;28:271-8.
4 First human prostate scans reported. *JAMA* 1967;200:19-20.
5 Gold FM, Lorber SA. Radioisotope ^{69m}Zn chloride prostate gland scan I: ^{69m}Zn organ distribution studies and gamma-camera scan in canine subjects. *Invest Urol* 1970;8:231-8.

Excess of other cancers in Wales

EDITOR,—As Cleone Rooney and colleagues have shown an increased risk of prostatic cancer in men exposed to certain internally incorporated nuclides, including strontium-90, caesium-137, and caesium-134,[1] increased incidence of the disease might be expected in those countries that experienced fallout of fission products from atmospheric testing. One place where such a comparison can be made is Wales: contamination related to rainfall in Wales was more than twice that in England in 1958-65.[2]

The figure compares standardised registration ratios for prostatic cancer obtained from the Office of Population Censuses and Surveys and Welsh cancer registries based on the combined rates for 1979. There is a clear increase in the differential and total incidence of the disease in line with the differences in contamination 20 years earlier.[3]

Rooney and colleagues' study may be pivotal in highlighting the fact that certain internally decaying nuclides may enhance the risk. The increase in prostatic cancer in Wales is only one aspect of a general and unexplained increase in cancer in Wales between 1975 and 1987 (the last year for which data are available).

One illuminating example is the incidence of

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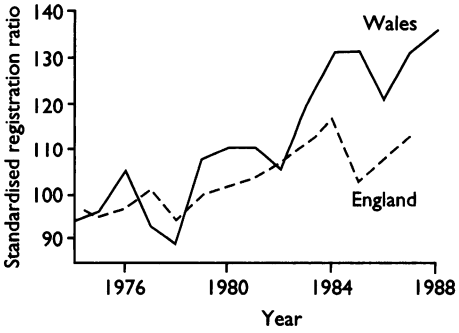

Standardised registration ratios for prostatic cancer (ICD9 code 185) based on combined rates for England and Wales for 1979

bone cancer (*International Classification of Diseases* (ninth revision) code 170). This remained the same in the two countries between 1962 and 1975, when it began to increase in Wales. In 1984 the incidence in Wales peaked at 350% of that in England, which remained constant at about 1/100 000.[3] Though the American Committee on the Biological Effects of Ionizing Radiations does not accept that the prostate is radiosensitive and might have difficulty in accommodating the findings of Rooney and colleagues, it accepts a causal link between ^{90}Sr and bone cancer, though not at the low doses involved reported by Rooney and colleagues.[4] With the help of the British National Radiological Protection Board, and using published data on intake of ^{90}Sr,[2] Green Audit (Wales) has calculated that the 10 year dose to the bone surfaces of people in Wales during 1958-65 was 0·75 mSv.

On the basis of the currently accepted risk factors for radiogenic bone cancer.[4] the predicted number of fatal cancers resulting from this dose in the population of Wales (three million) is less than 1·5 for all time. If it is assumed that the excess incidence is equal to the incidence in Wales minus that in England for each year, then that yields some 425 excess bone cancers in Wales for the period 1979-87. If these cancers were caused by ^{90}Sr then there must be an error in the perception of this hazard of some 500 times.[5] A similar enhancement of effect is needed to explain Rooney and colleagues' findings.

Algorithms of risk derive mainly from data on short term external irradiation.[4] In the Hiroshima series, irradiated and control groups were both exposed to equal internal contamination and hazards from this source would have been missed.

Comparison of rates of cancer in Wales and England since the 1960s raises important questions about the radiation from internal isotopes, and such questions must surely also follow Rooney and colleagues' work.

I thank John Harrison of the National Radiological Protection Board for help with calculations of doses and risks.

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1 Rooney C, Heral V, Maconochie N, Fraser P, Davies C. Case-control study of prostatic cancer in employees of the United Kingdom Atomic Energy Authority. *BMJ* 1993;307:1391-7. (27 November.)
2 Letcombe Radiation Laboratory, Agricultural Research Council. *Annual reports.* London: HMSO, 1958-72.
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5 Busby C. *Radiation and cancer in Wales.* Aberystwyth: Green Audit (Wales), 1994.

Cancer risk has no effect on mortality

EDITOR,—Cleone Rooney and colleagues have shown a raised risk of prostatic cancer in a particular subset of employees of AEA Technology (the trading name of the United Kingdom Atomic Energy Authority).[1] We accept their conclusions but believe that two additional points are important in interpreting the study.

Firsty, although the risks of prostatic cancer are high in workers exposed to the radionuclides tritium, chromium-51, iron-59, cobalt-60, and zinc-65, particularly in those working with heavy water reactors, the general mortality of these workers is good. The table presents standardised mortality ratios for subgroups of the workforce of

Standardised mortality ratios (observed/expected deaths) for AEA Technology's workforce†

	Cause of death (ICD codes (9th revision)		
	All causes (000-999)	Malignant neoplasms (140-209)	Prostatic cancer (185)
All employees‡	78** (6881/8861·0)	79**(1897/2387·8)	90 (104/115·8)
Radiation workers:			
All	76** (3786/4951·8)	75** (1001/1326·0)	89 (64/72·0)
Monitored for tritium	66** (203/309·4)	70* (62/88·9)	253* (11/4·3)
Monitored for other intakes§	77* (963/1257·3)	80** (282/351·3)	141 (26/18·5)
Working with heavy water reactor‖	65** (246/379·4)	63* (67/105·6)	141 (8/5·7)
At Winfrith	70** (460/656·7)	78* (143/184·0)	201* (19/9·4)
Who had worked with steam generating heavy water reactor at Winfrith	63** (53/84·4)	90 (22/24·6)	405* (5/1·2)

†Mortality is to the end of 1990, the last full year for which data are available. The underlying cause mortality stratified by age, sex, and calendar year is compared with that in the population of England and Wales: significance of difference from 100: *P < 0·05, **P < 0·001.
‡This category of employees is the cohort defined in Fraser *et al*'s study,[2] the other categories being subgroups of that cohort.
§Radiation workers monitored for nuclides other than tritium and plutonium.
‖Radiation workers identified from dose records as ever having worked with the heavy water reactors at Harwell or the steam generating heavy water reactor at Winfrith.