Mortality from dementia in occupations at risk of exposure to bovine spongiform encephalopathy: analysis of death registrations

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BMJ 1999;318:1044–5

Since the early 1980s close contact with animals or animal products infected with bovine spongiform encephalopathy has posed a putative risk of infection with Creutzfeldt-Jakob disease. Several groups with potentially high exposure have already been identified.[1]

To study whether transmissible spongiform encephalopathy has had any effect on people working in animal husbandry and slaughter, we used national mortality records to examine patterns of mortality from Creutzfeldt-Jakob disease and other dementias during 1979-80 and 1982-96.

Subjects, methods, and results

We studied people who died aged 20-74 years during 1979-1996 in England and Wales and for whom the occupational information recorded at death included butcher and abattoir worker, farmer and farm worker, or veterinarian. Women were selected on the basis of their own occupation, if recorded, or on the occupation of their spouse.

The causes of death selected for study were Creutzfeldt-Jakob disease (ICD-9 046.1) and a wide range of dementias, including those most likely to be misdiagnosed as Creutzfeldt-Jakob disease.[2] It was not possible to separate deaths from new variant disease. There were in any case too few deaths from new variant Creutzfeldt-Jakob disease within the study period (13 deaths during 1994-6[3]) to include them as a separate category.

We calculated the age standardised proportional mortality ratio for each occupational group and each disease category. The 95% confidence intervals were calculated by assuming that the observed number of events followed a Poisson distribution. The data were grouped into four periods (1979-80 and 1982-3, 1984-7, 1988-91, and 1992-6). Sex specific linear trends in the proportional mortality ratio over time were examined by fitting a Poisson regression model[4] to the observed numbers of deaths in each year, with the year and the expected number of deaths as the explanatory variables. The estimated risk ratios for successive calendar years represent the average linear change over time in the proportional mortality ratios.

During the study period, 4 145 898 deaths were registered in people aged 20-74. Of these, 92 365 occurred in farmers, 22 596 in butchers, and 970 in veterinarians. In farmers and farm workers only 12 deaths were attributed to Creutzfeldt-Jakob disease (table). Deaths from dementia (including Creutzfeldt-Jakob disease seemed to fall in men but there were no significant trends. In women the proportional mortality ratios remained relatively constant. No deaths were recorded from Creutzfeldt-Jakob disease in butchers or abattoir workers. In men, the proportional mortality ratio for dementias increased from 62 (95% confidence interval 23 to 134) in 1979-83 to 119 (70 to 188) in 1992-6, but the change was not significant. In women, there was no evidence of a linear trend. No

Numbers of deaths, proportional mortality ratios (PMR), and 95% confidence intervals for Creutzfeldt-Jakob disease (CJD) and dementia among men and women aged 20-74 in selected occupational groups, England and Wales, 1979-96

Occupation and cause of death	Total No of deaths	1979-83*		1984-7		1988-91		1992-6		Annual linear trend in PMR	
		No	PMR (95% CI)	No	PMR (95% CI)	No	PMR (95% CI)	No	PMR (95% CI)	Risk ratio	P value
Farmers and farm workers											
CJD:											
Men	7	2	239 (29 to 862)	1	91 (2 to 506)	0	—	4	254 (69 to 652)	1.05	0.65
Women	5	2	195 (24 to 704)	2	131 (16 to 474)	0	—	1	65 (2 to 364)	0.73	0.32
Dementia including CJD:											
Men	247	41	106 (76 to 143)	88	98 (78 to 119)	63	82 (62 to 103)	55	82 (61 to 104)	1.03	0.77
Women	258	41	98 (70 to 133)	76	87 (67 to 106)	75	89 (69 to 109)	66	105 (80 to 130)	0.82	0.35
Butchers and abattoir workers											
CJD:											
Men	0	0	—	0	—	0	—	0	—	—	—
Women	0	0	—	0	—	0	—	0	—	—	—
Dementia including CJD:											
Men	66	6	62 (23 to 134)	23	98 (62 to 147)	19	101 (61 to 158)	18	119 (70 to 188)	1.03	0.30
Women	67	11	113 (56 to 202)	26	123 (81 to 181)	17	80 (47 to 129)	13	91 (49 to 156)	0.97	0.25
Veterinarians											
CJD:											
Men	0	0	—	0	—	0	—	0	—	—	—
Women	0	0	—	0	—	0	—	0	—	—	—
Dementia including CJD:											
Men	4	0	—	0	—	3	359 (74 to 1049)	1	132 (3 to 735)	1.21	0.23
Women	2	0	—	1	127 (3 to 708)	0	—	1	109 (3 to 608)	1.20	0.33

*Occupational data were not available for 1981 owing to industrial action by registrars of births and deaths in that year.

veterinarians died from Creutzfeldt-Jakob disease during the entire period and only six died from dementia.

Comment

We found no increase in deaths from Creutzfeldt-Jakob disease or other dementias during 1979-96 among these occupational groups. Among farmers and farm workers there were four deaths certified as due to Creutzfeldt-Jakob disease in men and one in a woman during 1992-6, but the proportional mortality ratios are not higher than might be expected by chance. The study, assuming 80% power, would be able to detect at least 1.5 additional deaths in male farmers each year with 95% confidence.

It is difficult to monitor trends in rare diseases such as Creutzfeldt-Jakob disease because of small numbers of deaths and doubts about the precision of diagnosis and certification of death. However, surveillance of deaths in these occupational groups will remain necessary to identify promptly any trends in mortality from Creutzfeldt-Jakob disease or its new variant.

We thank Dr R Will at the National CJD Surveillance Unit in Edinburgh for advice in the planning phase of this study, and the constructive criticism of earlier drafts by Gillian Dollamore at the Office for National Statistics.

Contributors: JB was responsible for the extraction and interpretation of the data. BDeS conducted the statistical analysis and contributed to interpretation and reporting. MPC contributed to the study design, interpretation, and drafting the report. PA took the initiative in this study and contributed to the study design, analysis, interpretation of the results, and drafting the paper. PA is the guarantor.

Funding: Department of Health and Medical Research Council.

Competing interests: None declared.

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Commentary: Uncertainty over length of incubation tempers optimism

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The possible consequences of the exposure of large populations to bovine spongiform encephalopathy (BSE) raise major public health concern. Among the studies which have been conducted since the identification of new variant Creutzfeldt-Jakob disease in 1996, some have contributed to this concern while others provided reassuring results.

To date, only 38 cases of new variant Creutzfeldt-Jakob disease have been reported by the national surveillance unit in Edinburgh and, except one in France, no case has been identified in any other European country. The results of Aylin et al add to the reassuring evidence. They examined mortality from Creutzfeldt-Jakob disease and other dementias among groups with potentially high exposure to bovine spongiform encephalopathy. Analysis did not show any increase in mortality during 1979-96. In particular, mortality from dementia was stable over the study period, suggesting that atypical Creutzfeldt-Jakob disease did not constitute an important proportion of the dementia category.

The absence of any increasing trend in population groups with high exposure to bovine spongiform encephalopathy increases optimism about the size of a putative future epidemic. However, these results must be interpreted with caution because predictions based on currently available data are affected by the length of the incubation period of the disease.

The European Union collaborative study of Creutzfeldt-Jakob disease showed that the peak incidence of classic sporadic disease occurred in the 70-79 year age group and that the disease was extremely rare under the age of 40 years. This distribution of age at disease onset suggests a slow, endogenous or acquired, neurodegenerative process associated with accumulation of the pathological prion protein in the brain. In iatrogenic Creutzfeldt-Jakob disease the exact date or length of exposure to infected materials can be defined, allowing the length of the incubation period to be estimated. Reports indicate that the incubation period may vary from 2 years to more than 30 years. In Kuru, another transmissible spongiform encephalopathy which was mainly acquired by oral route, the incubation period is variable and can exceed 20 years.

The incidence of bovine spongiform encephalopathy in cattle increased rapidly from the early 1980s to 1992-3, then decreased. If the incubation period of new variant Creutzfeldt-Jakob disease is short, then those who have developed the disease since 1995 have been infected when the level of exposure was high. If the incubation is 15 years or more, then these people were infected when the level of exposure was low. The results of Aylin et al support an optimistic scenario about the size of a future epidemic of new variant Creutzfeldt-Jakob disease if the incubation is short, but with a longer incubation less optimistic prospects cannot be excluded. This uncertainty re-emphasises the need to continue epidemiological surveillance of Creutzfeldt-Jakob disease in Europe.

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