invaluable advice on questionnaire design. Those who carried out the original analysis and collection of the data hold no responsibility for the further analysis and interpretation of them. Material from the omnibus survey, made available through the Office of Population Censuses and Surveys, has been used with the permission of the comptroller of HMSO. The dataset is held on the data archive of the Economic and Social Research Council at the University of Essex.

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Control of hydatid disease in Wales

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Abstract

Objectives—To evaluate the success of the south Powys hydatid control programme by analysis of trends in cystic disease in humans and sheep and dog infestation.

Design—A review of hospital admissions for human hydatid disease in 1984-90, abattoir prevalence surveys of hydatid cysts in adult sheep, arecoline acetarsol and coproantigen surveys of prevalence of *Echinococcus* infestation in dogs.

Setting—All hospitals in England and Wales, three abattoirs, and dog populations in mid and south east Wales.

Subjects—Residents of England and Wales admitted to hospital between 1984 and 1990 with a new diagnosis of human hydatid disease (*International Classification of Diseases* (ICD), ninth revision, code 122) acquired in the United Kingdom.

Results—The average annual incidence of human hydatid disease in Powys, mid-Wales, fell from 3.9×10^{-5} in 1974-83 to 2.3×10^{-5} in 1984-90. Age specific incidence rates in Wales declined over this period only in children, and no cases occurred in children (<15 years) in Powys. Two Welsh children who lived in Gwent and mid-Glamorgan were infected. Prevalence of hydatid cysts in old sheep from south Wales declined during the control period, but in 1993 prevalence of cysts was 13%. Prevalence of *E granulosus* infestation was zero in the control area in 1993, but it was 2.4% in Powys dogs outside the control area in 1989 and 9.2% in dogs in Gwent in 1991.

Conclusions—Human hydatid disease has been successfully controlled in south Powys but cystic echinococcosis is still endemic in sheep in mid-Wales, and there is a focus of infection in humans, sheep, and dogs in the bordering areas of Gwent and mid-Glamorgan. There is considerable potential for an upsurge in human cases if control measures are relaxed.

Introduction

The south Powys control scheme^{1,2} was set up in 1983 to eliminate the main endemic focus of human

echinococcosis in the United Kingdom^{3,4} and was based on supervised dosing of dogs at six weekly intervals with praziquantel (Droncit; Bayer). The programme was replaced in 1989 by a health promotion campaign. We have evaluated the success of the control programme by following World Health Organisation guidelines.⁵

Subjects and methods

Data on hospital admissions for England and Wales for 1984-90 (*International Classification of Diseases* (ICD), ninth revision, code 122) were collected and reviewed as in our earlier study.⁴ Clinical details of 407 (84%) of 483 possible cases were obtained. We also reviewed serology records from Cardiff Public Health Laboratory, histopathology records from the Welsh and English borders, and hospital radiology records in a hydatid reference centre. We assessed trends in incidence in adults and children by using Poisson regression analysis in GLIM.^{6,7}

The prevalence of cysts in lungs and liver of slaughtered adult sheep was measured in the only local abattoir known to receive sheep from the control area between 1984 and 1989.

The coproantigen test^{8,9} was applied to faecal samples collected from dogs who had not received anthelmintic treatment in the previous two months from all farms in Llangenny, Powys (outside the control area) in May 1989; the Vales of Ewyas, Gwent in November 1991; and five valleys in the south Powys control area in May 1993.

Results

TRENDS IN HUMAN INFECTION

A total of 49 Welsh and 40 English residents were identified as new confirmed cases acquired in the United Kingdom. In addition, 14 other cases were found from serology records at Cardiff Public Health Laboratory (n=6), histopathology records from the Welsh and English borders (n=1), and records from the hydatid reference centre (n=7). In total, 62 Welsh and 41 English residents were identified as cases.

In Wales, excluding Powys, the average annual

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Table 1—Average annual age specific incidence per 10⁵ population (total cases in period/population in census years 1961, 1981, and 1991)

Year	Age group (years)						All ages
	0-4	5-14	15-29	30-40	45-64	≥ 65	
1953-62							
Wales (excluding Powys)	0.05 (1/196 897)	0.20 (8/394 448)	0.38 (18/476 862)	0.43 (22/506 931)	1.19 (77/649 025)	1.36 (41/301 894)	0.68 (171*/2 526 206)
Powys	1.16 (1/8 647)	2.22 (4/18 006)	5.09 (11/21 592)	3.46 (8/23 107)	5.23 (16/30 598)	2.52 (4/15 867)	3.73 (44/117 817)
1974-83							
Wales (excluding Powys)	0 (0/165 800)	0.20 (8/391 800)	0.15 (9/591 780)	0.14 (7/514 390)	0.45 (28/617 820)	0.45 (19/421 250)	0.27 (72†/2 702 840)
Powys	4.67 (3/6 430)	4.50 (7/15 570)	4.87 (11/22 610)	2.83 (6/21 190)	4.68 (12/25 630)	2.08 (4/19 230)	3.89 (43/110 660)
1984-90							
Wales (excluding Powys)	0.05 (1/185 460)	0.03 (1/350 530)	0.14 (8/588 010)	0.14 (8/562 990)	0.20 (12/612 630)	0.27 (13/474 250)	0.22 (43/2 772 870)
Powys	0 (0/7 200)	0 (0/14 480)	1.93 (3/22 140)	2.94 (5/24 270)	3.57 (7/27 960)	2.53 (4/22 550)	2.28 (19/118 590)

*In four cases age not known.

†In one case age not known.

incidence declined in almost all age groups between 1953-62 and 1984-90 (table 1). In Powys between 1953-62 and 1974-83 rates increased in children and declined slightly in adults, but from 1974-83 to 1984-90 there was a sharp decrease in children with little change in adults. The regression analysis showed that the fall in Powys between 1974-83 and 1984 was just significant ($\chi^2=3.84$; $P=0.05$). There were no cases in children under 15 years of age in Powys between 1984-90 but there were in north Gwent and the Gwent/mid-Glamorgan border.

ABATTOIR SURVEYS

The prevalence of cysts in lungs and liver in slaughtered adult sheep fell from 23.5% (265/1129) in 1984-6 to 15.5% (108/698) in 1986-7, 11.9% (92/776) in 1987-8, and 10.5% (71/679) in 1988-9 (χ^2 for trend = 67.9; $P<0.0001$). In sheep from the English borders the prevalence was 14.2% (146/1026) in 1984-6, falling to 10.0% (4/40) in 1988-9, although the change was not significant. At another abattoir in Powys in 1991-2 the prevalence was 17.8% (76/426). In a Gwent abattoir in 1993 13.2% (17/129) of Powys sheep and 12.8% (75/586) of Gwent sheep had cysts.

PREVALENCE OF TAPEWORM INFESTATION IN DOGS

The coproantigen test showed that 2.4% (2/84) of dogs in Llangenny, 9.2% (7/76) in the Vales of Ewyas, and 0% (0/107) in south Powys (95% confidence intervals 0% to 3.4%) were positive for coproantigen. The Llangenny dogs were purged with arecoline acetarsol, and one coproantigen positive dog shed 1000 echinococcus worms. Three of seven dogs from the Vales of Ewyas who were positive for coproantigen also shed *E granulosus* after purgation.

Discussion

Despite an overall fall in incidence in Wales between 1953-62¹⁰ and 1974-84⁴ the incidence of human hydatid disease diagnosed in hospital in children in Powys increased. Since the south Powys control programme,

however, age specific incidence rates have fallen significantly in children and young adults in Powys but have changed little in other age groups. During the control scheme the prevalence of hydatid cysts in slaughtered sheep in south Powys fell significantly from 23.5% to 10.5%. A similar but not significant trend was seen in sheep from neighbouring areas, possibly because farmers there were influenced by campaign publicity. In 1975 a quarter of farm dogs in Powys were shown to be harbouring *E granulosus*, and almost 60% of farms had at least one infected dog.¹¹ Using a new and more sensitive test^{9,12} we found zero prevalence in dogs in south Powys in 1993, despite significant prevalence of cysts in older sheep, indicating that the follow up health education campaign has also been successful.

Although the control programme in Powys has been successful, hydatid disease is still endemic in mid- and south Wales and the English borders and relaxation of control measures could lead to a resurgence. The new cases in children and the results of the survey in dogs suggest that transmission within Gwent is a considerable problem. Surveys of dogs to target intervention and evaluation control measures are now much more practicable with the development of the highly specific coproantigen test and can be used with either frozen or formalin fixed stool specimens.^{12,13}

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Key messages

- Human and animal cystic echinococcosis is endemic in parts of mid-Wales
- Humans are infected by ingesting eggs of the dog tapeworm, which the dog acquires by eating sheep offal containing hydatid cysts
- Regular dosing of dogs with praziquantel has eliminated infestation of dogs in the control area and reduced prevalence in sheep
- No cases in children occurred in Powys, but there were cases outside of the control area in Gwent and mid-Glamorgan
- Prevalence of hydatid cysts in old sheep in Powys and Gwent is still high and control measures must be continued and the control area extended