testosterone and urinary hydroxysteroid and ketosteroid concentrations are normal during minoxidil treatment, thereby excluding androgenic stimulation.^{12 13}

Microscopical examination of hair grown during systemic treatment with minoxidil shows an intermediate type of hair with pigmentation and intermittent medullation and a normal shaft.⁴ Some of the hairs grown during treatment with topical minoxidil were classified as intermediate in type, being longer than vellus hair but too fine and thin to be terminal hair (table III). Some patients' regrowth never progressed beyond this intermediate phase and was not cosmetically acceptable, while others went on to develop terminal hair.

Although we have little doubt that topical minoxidil can induce new hair growth in patients suffering from alopecia areata, those with more severe and extensive disease have a worse response and those with alopecia universalis and alopecia totalis are less likely to respond. It is not possible at this stage to say whether treatment with minoxidil will affect eventual prognosis. The few post-treatment biopsies that we have performed suggest that the disease is still active despite regrowth of hair. Only time will tell whether this treatment will find an established place in the management of patients with alopecia areata or whether hair that has regrown will be retained when treatment is discontinued. Topical minoxidil, however, appears to have at least two virtues: firstly, it now appears clear that it can induce some hair regrowth and may be a useful stopgap measure in patients suffering from alopecia areata, to see them through until spontaneous resolution occurs; and, secondly, it appears to be relatively safe, with no topical or systemic side effects having been encountered during this study.

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References

- ¹ Fenton DA, Wilkinson JD. Alopecia areata treated with topical minoxidil. *J R Soc Med* 1982;**75**:963-5.
- ² Rook A, Dawber R. *Diseases of the hair and scalp*. Oxford: Blackwell Scientific, 1982:362.
- ³ Dargie JH, Dollery CT, Daniel J. Minoxidil in resistant hypertension. *Lancet* 1977;ii:515-8.
- ⁴ Burton JL, Marshall A. Hypertrichosis due to minoxidil. *Br J Dermatol* 1979;**101**:593-5.
- ⁵ Zappacosta AR. Reversal of baldness in patient receiving minoxidil for hypertension. *N Engl J Med* 1980;**303**:1480-1.
- ⁶ Weiss VC, West DP, Mueller CE. Topical minoxidil in alopecia areata. *J Am Acad Dermatol* 1981;**5**:224-6.
- ⁷ Lomas SM. Minoxidil ointment and liquid. *Pharmaceutical Journal* 1982;**229**:6190:193.
- ⁸ Burton JL, Schutt WH, Caldwell IW. Hypertrichosis due to diazoxide. *Br J Dermatol* 1975;**93**:707-11.
- ⁹ Chidley CA, Gottlieb TB. The pharmacologic basis of antihypertensive therapy: the role of vasodilator drugs. *Prog Cardiovasc Dis* 1974;**27**:99-113.
- ¹⁰ Lowenthal DT, Affrime MB. Pharmacology and pharmacokinetics of minoxidil. *J Cardiovasc Pharmacol* 1980;**2**:suppl 2:93-106.
- ¹¹ Humphrey SJ, Wilson E, Zins GR. Whole body tissue blood flow in conscious dogs treated with minoxidil. [Abstract.] *Fed Proc* 1974;**33**:583.
- ¹² Earhart RN, Ball J, Nuss DD, et al. Minoxidil induced hypertrichosis: treatment with calcium thioglycolate depilatory. *South Med J* 1977;**70**:442-5.
- ¹³ Ryan JR, Jain AK, McMahon FG. Minoxidil treatment of severe hypertension. *Current Therapeutic Research* 1975;**17**:55-6.

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Mortality among British veterinary surgeons

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Abstract

A total of 3440 veterinary surgeons resident in Britain were followed up from 1949-53 until 1975. A roughly twofold increase in mortality from suicide was observed and also a decreased mortality from respiratory diseases. There was no excess of deaths from leukaemia or other cancers as recently reported from the United States and as implied by the hypothesis that veterinary surgeons are unusually exposed to oncogenic viruses.

Introduction

Veterinary surgeons are likely to be more than usually exposed to the viruses that cause Marek's disease, feline lymphomas, bovine lymphosarcoma, and other animal tumours. If any such animal viruses caused cancer in man an increased mortality from cancer might occur among veterinary surgeons. I therefore carried out a prospective study of mortality among British veterinary surgeons.

Methods

With the cooperation of the Royal College of Veterinary Surgeons information was abstracted from its records for 1949 and 1950 of all registered veterinary surgeons resident in Britain. Because of the possibility that young veterinary surgeons might be at increased risk of leukaemia the study group was extended to include recently qualified graduates who registered in the years 1951-3. The details abstracted included name, date of birth (when available), university of graduation, and date of registration. Date of birth was available for only a small proportion of individuals and had usually to be sought from the relevant university.

Details of deaths that had occurred among the study population before the end of 1975 were obtained from the obituary lists of the Royal College of Veterinary Surgeons, which are published regularly, and copies of the death certificates were obtained. In the case of veterinary surgeons who were no longer registered but who had not been notified to the Royal College of Veterinary Surgeons as having died, their status up to the end of 1975 was determined with the help of local colleagues and also the Office of Population Censuses and Surveys through the National Health Service Register. Again, any relevant death certificates were traced. Details of emigration among the study group were noted as indicated in the records of the Royal College of Veterinary Surgeons, which show the current address of all registered members. In addition, the National Health Service Register was able to give the date of emigration of certain former members of the college.

The number of person years at risk was calculated for each sex by five year age group and calendar year up to the end of 1975, periods spent abroad being excluded. Expected numbers of deaths from different causes were calculated by multiplying the person years in each category of sex, age, and calendar period by the corresponding

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mortality for England and Wales, both for all men and for men in social class I. Mortality among men in social class I is available only for the years around the decennial censuses and for ages below 75. The mortalities recorded in social class I by the Registrar General in the period 1949-53 were applied to the man years before 1956, the mortalities for 1959-61 to those in the period 1956-66, and the mortalities for 1970-2 to those in the period 1967-75.

Results

The study group consisted of 3440 male veterinary surgeons, the number of women being judged too few to warrant detailed study. These men were followed up until the end of 1975, by which time 1236 had died in the United Kingdom, 35 had emigrated, 25 were untraced, and 2144 were still living, in all contributing 70 670 man years for analysis. Table I shows the numbers of individuals at entry to the study together with the man years at risk over the study period, according to age group.

Table II shows the observed and expected numbers of deaths from major causes among men. A deficiency of deaths from all causes was apparent, the ratio of observed to expected numbers of deaths being 0.92. This was mainly due to a low mortality from cancer and respiratory diseases. When expected numbers were calculated using mortalities in social class I (table III), however, only the deficiency of respiratory diseases persisted ($p < 0.05$). Among the major causes of death examined only accidents and violence showed an excess mortality over both national figures (69 observed, 49.8 expected) and figures for social class I. This was due to an increased mortality from suicide (27 observed against 13.1 expected from social class I mortality,

TABLE I—Numbers of male veterinary surgeons at entry to study and man years (1949-75) by age group

Age group	No	No of man years
20-24	442	852
25-34	1144	10 003
35-44	640	18 320
45-54	427	18 946
55-64	328	12 043
65-74	268	6711
75-84	166	3205
85 +	25	590
Total	3440	70 670

TABLE II—Observed and expected numbers of deaths from major causes among male veterinary surgeons

Causes of death*	Observed No	Expected No	Ratio of observed to expected
Circulatory and cerebrovascular diseases (400-468)	534	535.23	1.00
Cancer (140-239)	228	271.43	0.84
Respiratory diseases (470-527)	93	193.59	0.48
Accidents and violence (E800-999)	69	49.77	1.39
Gastrointestinal diseases (530-587)	40	37.95	1.05
Other causes	272	262.52	1.04
All causes	1236	1350.49	0.92

* Codes in *International Classification of Diseases* (7th revision) given in parentheses.

TABLE III—Numbers of deaths from major causes among veterinary surgeons aged under 75, and expected numbers calculated from mortality in social class I

Causes of death*	Observed No	Expected No	Ratio of observed to expected
Circulatory and cerebrovascular diseases (400-468 and 330-334)	378	378.95	1.00
Cancer (140-239)	162	167.91	0.97
Respiratory diseases (470-527)	34	48.24	0.75
Accidents and violence (E800-999)	53	36.95	1.43
Gastrointestinal diseases (530-587)	21	20.61	1.02
Other causes	51	61.81	0.83
All causes	699	714.47	0.98

* Codes in *International Classification of Diseases* (7th revision) given in parentheses.

of which five deaths were from gunshot wounds compared to 1.5 expected). No death was attributed to injuries caused by an animal in the course of work, though two deaths were caused by riding accidents.

Table IV shows the observed and expected numbers of deaths from different cancers. Mortality from lung cancer was lower (61 observed, 93.8 expected) and mortality from cancer of the prostate higher than expected (29 observed, 18.7 expected). When the analysis was repeated using social class I mortalities, however, these differences disappeared (table V). There was no excess of deaths from leukaemia or lymphoma.

Because of interest in a possible link between dogs and multiple sclerosis mortality from this disease was also examined, but no excess of deaths was apparent (two observed *v* 1.9 expected). (In two other cases multiple sclerosis was mentioned on the second part of the death certificate.) No death was attributed to brucellosis, though this was mentioned on the second part of the certificate in two cases.

TABLE IV—Observed and expected numbers of deaths from cancer among male veterinary surgeons

Site or type of cancer*	Observed No	Expected No	Ratio of observed to expected
Lung (162,163)	61	93.78	0.65
Oesophagus (150)	4	7.66	0.52
Stomach (151)	26	37.91	0.69
Colon (153)	21	20.43	1.03
Rectum (154)	14	16.18	0.87
Bladder (181)	8	11.22	0.71
Prostate (177)	29	18.67	1.55
Leukaemia (204)	4	5.70	0.70
Lymphomas (200-202)	11	13.30	0.83
Skin (190, 191)	2	2.48	0.81
Other cancers	48	44.10	1.09
All cancers (140-239)	228	271.43	0.84

* Codes in *International Classification of Diseases* (7th revision) given in parentheses.

TABLE V—Numbers of deaths from cancer among veterinary surgeons aged under 75, and expected numbers calculated from mortality in social class I

Site or type of cancer*	Observed No	Expected No	Ratio of observed to expected
Lung (162,163)	56	51.68	1.08
Oesophagus (150)	3	4.95	0.61
Stomach (151)	16	15.94	1.00
Bladder (181)	4	6.98	0.57
Prostate (177)	8	10.25	0.78
Leukaemia (204)	4	5.22	0.77
Lymphomas (200-202)	3	6.13	0.49
Other cancers	68	66.76	1.02
All cancers (140-239)	162	167.91	0.97

* Codes in *International Classification of Diseases* (7th revision) given in parentheses.

Discussion

Veterinary surgeons are sometimes exposed to animals with malignant disease caused by viruses, such as Marek's disease and feline lymphoma. Thus they might be at increased risk of developing cancer if any such animal viruses caused cancer in man. At the outset of this study I noted that an excess of deaths from leukaemia had been recorded by the Registrar General during 1959-63 in the occupational category that included veterinary surgeons.¹ Although based on small numbers (nine observed deaths against five expected), this might have pointed to a larger risk among veterinary surgeons, who form only a small proportion of the group in question ("other professional workers"). More recently an increased mortality from leukaemia (45 observed deaths compared with 34.7 expected) has been reported in a proportionate analysis of deaths among veterinary surgeons in the United States in the period 1947-77.² It was suggested that this excess was due to inadequate protective procedures in diagnostic radiology in veterinary practice. The present study, however, found no evidence that British veterinary surgeons have an increased risk of death from leukaemia or indeed from any form of cancer.

By contrast, the American study found an excess mortality

not only for leukaemia but for several other cancers, including cancer of the brain and nervous system, skin, and prostate and lymphomas. (Three regional American studies of mortality among veterinary surgeons from California,³ Missouri,⁴ and Illinois⁵ were too small for detailed analysis of different cancers.) The reason for the difference in findings between the American and British studies is not clear. It may be relevant, however, that the American study did not ascertain all deaths in a defined population, as this study did, but consisted of a proportionate analysis of deaths noted in the obituary columns of the *Journal of the American Veterinary Medical Association*. As the authors pointed out, the proportionate mortality from certain causes can be inflated if other diseases have a reduced mortality, a frequent observation among professional groups. Another possible bias is differential reporting of deaths from cancer to the American Veterinary Medical Association compared with deaths from other causes.

Mortality from respiratory diseases among British veterinary surgeons is low, whether compared with the national mortality (ratio of observed to expected deaths 0.46) or with the mortality in social class I (ratio 0.75). Mortality from lung cancer was slightly higher than that in social class I, and although this was not statistically significant, it does not encourage the view that the deficiency of deaths from respiratory diseases is attributable simply to not smoking. Many veterinary surgeons live in rural districts with no atmospheric pollution, and this may play a part.

Cook and Dowling suggested that dogs may play a part in the aetiology of multiple sclerosis.⁶ In view of the greater than average contact by veterinary surgeons with dogs it is relevant that no excess mortality from multiple sclerosis was observed in this study (two observed deaths, 1.9 expected), a finding that is in keeping with more recent work.⁷ An increased risk of zoonotic infections and of injuries while handling animals is well known⁸

but was not reflected in the underlying causes of death in this study, although brucellosis was mentioned incidentally on two death certificates and two deaths were due to riding accidents. No support was found for the hypothesis that veterinary surgeons may be at increased risk of death from cancer because of exposure to oncogenic viruses in the course of their work.

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References

- ¹ Registrar General. *Occupational mortality. Decennial supplement. England and Wales 1961*. London: HMSO, 1971.
- ² Blair A, Hayes HM Jr. Mortality patterns among US veterinarians, 1947-1977: an expanded study. *Int J Epidemiol* 1982;**4**:391-7.
- ³ Fasal E, Jackson EW, Klauber MR. Mortality in California veterinarians. *J Chron Dis* 1966;**19**:293-306.
- ⁴ Botts RP, Edlavitch S, Payne G. Mortality of Missouri veterinarians. *Journal of the American Veterinary Medical Association* 1966;**149**:499-504.
- ⁵ Schnurrenberger PR, Martin RJ, Walker JF. Mortality in Illinois veterinarians. *Journal of the American Veterinary Medical Association* 1977;**170**:1071-5.
- ⁶ Cook SD, Dowling PC. A possible association between house pets and multiple sclerosis. *Lancet* 1977;**ii**:980-2.
- ⁷ Read D, Nassim D, Smith P, Patterson C, Worlow C. Multiple sclerosis and dog ownership: a case control investigation. *J Neurol Sci* 1982;**55**:359-67.
- ⁸ Constable PJ, Harrington JM. Risks of zoonoses in a veterinary service. *Br Med J* 1982;**284**:246-8.

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Precancerous lesions of the cervix uteri in infertile women

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Abstract

A study of 318 patients with tubal infertility and a control group of 200 unselected infertile women yielded 14 (4.4%) and 1 (0.5%), respectively, with precancerous lesions of the cervix uteri. The one patient in the control group with severe dysplasia was later shown to have tubal infertility. The overall incidence of premalignant lesions of the cervix uteri as reported to the National Cancer Registry of Norway was 0.1% for the age group and period studied.

Women with tubal infertility represent a small but comparatively high risk group for the development of precancerous lesions of the cervix uteri.

Introduction

In Norway cervical neoplasia is the most common cancer of the female reproductive tract. Each year about 400 new cases of invasive cervical cancer and 800 to 900 cases of severe dysplasia and carcinoma in situ of the cervix uteri are reported to the National Cancer Registry.¹ Some 70% of these are in women aged 20-39 years. Cervical neoplasia is of special interest because it may be detected early by cytological screening. Hence defining populations at high risk of developing cervical cancer would help in reducing the incidence of the disease.

Several aetiological factors have been postulated in cervical carcinogenesis. There is much evidence suggesting that a sexually transmitted virus—for example, herpes simplex virus—may be implicated.²⁻⁴ The virus of condyloma accuminatum is also reportedly associated with cervical neoplasia.⁵ Other sexually transmitted diseases that have been postulated as a factor include syphilis, gonorrhoea, and trichomoniasis and genital infections with mycoplasma, chlamydia, and cytomegalovirus.³⁻⁸ Also associated with an increased risk of the disease are early age at first intercourse and early age at first marriage, multiple sexual partners and multiple marriages, great coital frequency, multiparity, and low social class.³⁻⁶ A circumcised male partner is reportedly associated with a low risk of cervical cancer.³⁻⁶ An increased risk from oral contraceptives has not been proved.¹⁰

In women with tubal infertility many of these risk factors

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