

Interferon beta 1b has to be self administered subcutaneously every other day. Patients run the risk of feeling that they have chronic flu³ or of becoming depressed,³ and 38% of them will have neutralised the drug by the development of antibodies after three years.³

Interferon beta 1b has no significant effect on the development of disability in multiple sclerosis.³ Quite why it has been licensed is a mystery to many of us. Why is Schering allowed to advertise it in the *BMJ*?

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- 1 IFNB Multiple Sclerosis Study Group. Interferon-beta 1b is effective in relapsing-remitting multiple sclerosis. Clinical results of a multicentre, randomised, double-blind placebo-controlled trial. *Neurology* 1993;43:655-61.
- 2 Patey DW, Li DKB, UBC MS/MRI Study Group, IFNB Multiple Sclerosis Study Group. Interferon-beta 1b is effective in relapsing-remitting multiple sclerosis. MRI analysis results of a multicentre, randomised, double-blind, placebo-controlled trial. *Neurology* 1993;43:662-7.
- 3 IFNB Multiple Sclerosis Study Group and UBC MS/MRI Analysis Group. Interferon-beta 1b and the treatment of multiple sclerosis: final outcome of a randomised controlled trial. *Neurology* 1995;45:1277-85.

Non-Hodgkin's lymphoma and solar ultraviolet radiation

Data are inconsistent

EDITOR.—Graham Bentham confirms known geographical patterns when he reports a positive association between the incidence of non-Hodgkin's lymphoma and ambient solar ultraviolet radiation in England and Wales.^{1 2} His results conflict with those from the United States, where a negative association was reported,³ further fuelling the debate over whether exposure to solar ultraviolet radiation increases the risk of non-Hodgkin's lymphoma. If there is a positive association then those people working in outdoor occupations might be expected to be at increased risk of this malignancy.

We examined the risk of non-Hodgkin's lymphoma among people judged to spend most of their working day outdoors, using one of the largest population based cancer registration datasets in the world. The data and methodology have been fully described elsewhere.⁴ Briefly, occupational information was available on 252 663 men and 119 227 women registered as having cancer in England between 1981 and 1987. Ten job groups were defined as outdoor occupations (see table 1); they accounted for a total of 17 636 registrations in men and 960 in women. Proportional registration ratios were used to estimate the relative risk of specific cancers in outdoor workers compared with workers in all occupations combined, with adjustment for age (five year age groups), social class (six classes), and cancer registry of origin (13 registries). All registrations for which the occupation was adequately described formed the standard for comparison.

Table 1 shows the risks for all cancer sites in outdoor workers by sex. In men there was a significant 19% excess of non-melanocytic skin cancer, suggesting high exposure to solar ultraviolet radiation⁵ but no excess of non-Hodgkin's lymphoma. In women the reverse was found, with a significant 56% excess of non-Hodgkin's lymphoma but no excess of non-melanocytic skin cancers. It is notable that 25 of the 27 women diagnosed as having non-Hodgkin's lymphoma were farmers and that similar observations among agricultural employees have been attributed by others to exposure to pesticides.⁶

We also examined the relation between the occupation specific risks for non-melanocytic skin cancers and non-Hodgkin's lymphoma

Table 1—Adjusted proportional registration ratios (95% confidence intervals) for outdoor workers* aged 20-74, England, 1981-7

Cancer (ICD code, 9th revision)	Men		Women	
	No Observed	Adjusted proportional registration ratio	No Observed	Adjusted proportional registration ratio
Oral cavity (141, 143-145)	130	96 (81 to 115)	6	160 (59 to 349)
Salivary (142)	22	91 (57 to 138)	0	—
Pharynx (146-148)	79	78 (62 to 98)	2	70 (9 to 255)
Oesophagus (150)	452	103 (94 to 113)	14	111 (61 to 187)
Stomach (151)	1180	96 (91 to 102)	26	89 (59 to 131)
Small intestine (152)	37	124 (88 to 172)	2	161 (20 to 584)
Colon (153)	927	95 (90 to 102)	49	103 (77 to 137)
Rectum (154)	848	103 (97 to 111)	31	117 (80 to 167)
Liver (155)	116	99 (82 to 119)	1	29 (1 to 167)
Gall bladder (156)	66	74 (58 to 95)	8	152 (66 to 300)
Pancreas (157)	591	104 (96 to 113)	21	101 (63 to 155)
Retropertoneum (158.0)	10	78 (38 to 145)	0	—
Peritoneum (158.8-158.9)	10	80 (38 to 147)	1	234 (6 to 1307)
Nose and nasal sinuses (160)	40	111 (80 to 152)	1	70 (2 to 394)
Larynx (161)	233	95 (84 to 109)	0	—
Lung (162)	5354	98 (95 to 101)	115	101 (84 to 122)
Pleura (163)	67	69 (54 to 89)	1	61 (2 to 342)
Thymus and mediastinum (164)	22	138 (87 to 209)	2	309 (38 to 1117)
Bone (170)	32	103 (71 to 146)	2	123 (15 to 448)
Soft tissue (171)	65	93 (72 to 119)	7	207 (84 to 428)
Melanoma (172)	125	94 (79 to 113)	9	67 (31 to 128)
Non-melanocytic skin (173)	1564	119 (114 to 126)	49	88 (65 to 117)
Female breast (174)	NA	—	190	96 (84 to 112)
Male breast (175)	28	98 (65 to 142)	NA	—
Uterus (179, 181, 182)	NA	—	30	99 (67 to 143)
Cervix (180)	NA	—	37	88 (63 to 123)
In situ cervix (233.1)	NA	—	105	93 (76 to 113)
Ovary (183)	NA	—	44	99 (72 to 133)
Prostate (185)	1126	108 (102 to 115)	NA	—
Testis (186)	190	100 (86 to 115)	NA	—
Other male genital organs (187)	57	110 (84 to 144)	NA	—
Bladder (188, 189.1-189.9)	925	89 (84 to 95)	15	84 (48 to 140)
Kidney (except pelvis) (189.0)	268	88 (79 to 100)	8	98 (43 to 195)
Eye (190)	19	82 (49 to 128)	1	85 (2 to 479)
Brain and meninges (191, 192, 225, 237.5-9, 239.6)	489	104 (95 to 114)	24	113 (73 to 169)
Malignant brain (191)	373	107 (97 to 119)	11	87 (44 to 156)
Thyroid (193)	39	97 (69 to 133)	8	131 (57 to 259)
Suprarenal and other endocrine organs (194)	8	59 (26 to 118)	0	—
Ill defined and secondary (195-199)	894	94 (89 to 101)	50	112 (84 to 149)
Non-Hodgkin's lymphoma (200, 202)	401	95 (86 to 105)	27	156 (103 to 228)
Hodgkin's disease (201)	120	88 (73 to 105)	3	63 (13 to 187)
Myeloma (203)	211	112 (98 to 128)	3	42 (9 to 126)
Leukaemia (204-208)	395	105 (96 to 117)	12	85 (44 to 149)

ICD = *International Classification of Diseases*. NA = Not applicable.

*Outdoor workers were defined by using the Southampton occupational classification and included the following job groups (number of registrations given in parentheses): farmers (men, 8245; women, 838); foresters (men, 194; women, 6); fishing and related workers (men, 292; women, 3); scaffolders (men, 298; women, 4); bricklayers and tilers (men, 2957; women, 0); roofers and glaziers (men, 556; women, 16); builders etc (men, 3760; women, 79); rail track workers (men, 358; women, 2); road construction workers and paviours (men, 662; women, 9); mains and service layers (men, 314; women, 3).

because it is well known that exposure to solar ultraviolet radiation increases the risk of skin cancer.⁵ No linear association was observed, for either men (correlation coefficient 0.07) or women (correlation coefficient -0.02).

The aetiology of non-Hodgkin's lymphoma is poorly understood, and many factors are likely to be important. Given the inconsistencies in the data presented here and elsewhere, more detailed research is clearly required before a causal role is ascribed to solar ultraviolet radiation.

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- 1 Bentham G. Association between incidence of non-Hodgkin's lymphoma and solar ultraviolet radiation in England and Wales. *BMJ* 1996;312:1128-31. (4 May.)
- 2 Swerdlow A, dos Santos Silva I. *Atlas of cancer incidence in England and Wales 1968-85*. Oxford: Oxford University Press, 1993.
- 3 Hartge P, Devessa SS, Graumen D, Fears TR, Fraumeni JF. Non-Hodgkin's lymphoma and sunlight. *JNCI* 1996;88:298-300.
- 4 Roman E, Carpenter LM. Cancer incidence in England 1981-87. In: Registrar General. *Occupational health. Decennial supplement for England and Wales 1995*. London: HMSO, 1996:77-102.
- 5 World Health Organisation. Solar and ultraviolet radiation. *IARC Monogr Eval Carcinog Risks Hum* 1992;No 55.
- 6 Linet MS, McLaughlin JK, Walker HS, Chow WH, Weiner JA, Stone BJ, et al. Occupation and hematopoietic and lymphoproliferative malignancies among women: a linked registry study. *J Occup Med* 1994;36:1187-98.

Basal cell carcinoma may be linked to haematological malignancy

EDITOR.—Graham Bentham shows that the incidence of non-Hodgkin's lymphoma is positively associated with exposure to solar ultraviolet radiation,¹ giving insights into the previous