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Incidence and nature of human tuberculosis due to bovine tubercle bacilli in South-East England: 1977–1987

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SUMMARY

A total of 201 new cases of tuberculosis due to bovine tubercle bacilli was confirmed in South-East England between 1977 and 1987 inclusive. This represents about 1% of all cases of tuberculosis in this region. Most cases occurred amongst older individuals of indigenous white British origin, although some younger patients of Southern European and Indian subcontinent ethnic origin were also diagnosed. The lung was the most frequent site of disease, followed by the genito-urinary tract. In view of the known risk of transmission of disease from man to cattle via the respiratory and urinary tracts, continued surveillance of this relatively uncommon form of tuberculosis is still indicated.

INTRODUCTION

In 1966 Magnus remarked that 'even if cattle tuberculosis is eradicated in the country one has to reckon that the human population will bear traces of bovine tuberculosis infection for several decades'. In Great Britain the cattle tuberculosis eradication programme was completed in 1960, at which time only 0·06% of cattle reacted to tuberculin, in sharp contrast to the 40% or so that reacted before the programme commenced in 1935 (Myers & Steele, 1969). Following the completion of the programme, the reported incidence of disease in man due to bovine tubercle bacilli (*Mycobacterium bovis*) dropped to a very low level. It is likely, however, that the incidence since 1960 has been greatly underestimated owing to a failure or unwillingness of diagnostic laboratories to distinguish between human and bovine tubercle bacilli, or to notify the type of bacillus responsible for disease. Between 1977 and 1981 only 125 (22·5%) of 566 bovine strains identified by the reference centres of the Public Health Laboratory Service (PHLS) had been reported to the Communicable Diseases Surveillance Centre (CDSC) by the isolating laboratories (Collins & Grange, 1983).

The purpose of this survey is to report the incidence, nature and epidemiological trends of human tuberculosis due to bovine strains in South-East England, a

Table 1. *Characteristics of tubercle bacilli*

Type of tubercle bacillus	Oxygen preference	Nitrase	Susceptibility to TCH	Susceptibility to pyrazinamide
Classical human (*M. tuberculosis*)	A	Pos.	R	S
Asian human (*M. tuberculosis*)	A	Pos.	S	S
African I (*M. africanum*)	M	Neg.	S	S
African II (*M. africanum*)	M	Pos.	S	S
Bovine (*M. bovis*)	M	Neg.	S	R

A, aerobic; M, microaerophilic; R, resistant; S, sensitive.

region where the chance of contracting the disease from cattle is now exceedingly remote. The survey is based on strains of tubercle bacilli referred to the PHLS South-East Regional Centre for Tuberculosis Bacteriology, a laboratory that receives about 95% of all mycobacteria isolated from clinical specimens in this region, during the 11-year period 1977–87.

MATERIALS AND METHODS

Since 1977, all tubercle bacilli referred to the PHLS South-East Regional Centre for Tuberculosis Bacteriology have been divided into five types for epidemiological purposes by means of four simple tests: susceptibility to thiophen-2-carboxylic acid hydrazide and to pyrazinamide, oxygen preference (aerobic or microaerophilic) and nitratase activity (Collins, Yates & Grange, 1981, 1982; Yates Grange & Collins, 1986). The five types are summarized in Table 1 which shows the properties used to identify bovine strains in this study.

Information on the age and sex of the patient, and the anatomical site from which the tubercle bacillus was isolated, was supplied by the referring hospital or clinic. On the basis of names, the patients were divided into those of apparent British (and Irish), Southern European, Indian Subcontinent (ISC) and African ethnic origin.

RESULTS

A total of 201 patients with tuberculosis due to bovine tubercle bacilli were registered during the 11-year period 1977–87. Of these, 167 (83%) had British names, 12 (6%) had Southern European names, 18 (9%) had ISC names and 4 (2%) had African names.

The total number of patients with all forms of tuberculosis, the division of the causative organism into human, African and bovine tubercle bacilli and the percentage of patients with disease due to the latter, are shown in Table 2. There was a tendency for the annual numbers of new cases of tuberculosis to decline (time series analysis: $Z = 2{\cdot}19$, $P < 0{\cdot}05$). The decline of bovine infections, though not statistically significant, tended to reflect that of the total number of cases.

The sex of 199 of the 201 patients was known and males predominated over females (103:96). This male predominance was seen in those with British names (85:82), Southern European names (8:4) and ISC names (10:7). The sex of three of the four patients with African names was known and all three were females.

Table 2. *Annual numbers of new cases of tuberculosis due to human, African and bovine tubercle bacilli in South-East England*

Year	Human	African	Bovine	Total	% of total due to bovine
1977	1597	15	20	1632	1·22
1978	1777	33	27	1837	1·47
1979	1647	27	22	1696	1·30
1980	1788	15	23	1826	1·26
1981	1683	20	20	1723	1·16
1982	1483	18	18	1519	1·18
1983	1522	16	19	1557	1·22
1984	1298	24	15	1337	1·12
1985	1308	17	10	1335	0·75
1986	1185	17	13	1215	1·07
1987	1164	7	14	1185	1·18
Total	16452	209	201	16862	1·20

Table 3. *Anatomical site of disease in the four groups of patients*

	British		Southern European		ISC		African
Site	No.	%	No.	%	No.	%	No.
Lung	67	40	5	42	9	50	1
Lymph node	23	14	1	8	6	33	2
Bone and joint	18	11	2	17	2	11	—
Genito-urinary	43	26	2	17	—	—	—
Abdominal	6	3·5	—	—	1	6	1
CNS	6	3·5	2	17	—	—	—
Other	4*	2	—	—	—	—	—
Total	167		12		18		4

* Includes one case of lupus vulgaris.

Patients with British names were aged from 20 to 90 years (mean 62, S.D. 17). Those with Southern European names were aged 16–60 years (mean 34, S.D. 13) and those with ISC names were aged 16–54 years (mean 29, S.D. 11). Patients in the latter two groups were significantly younger than those with British names ($P < 0{\cdot}001$; Mann Whitney test). Only two patients with British names were born after 1960, the year of completion of the cattle tuberculosis eradication programme. These were a man aged 24 with pulmonary lesions and a woman aged 23 with a tuberculous knee. Both presented in 1986.

The anatomical sites from which bovine tubercle bacilli were isolated are shown in Table 3. In the three main groups (British, Southern European and ISC names) the lung was the most frequent site of disease. Genito-urinary disease was the most frequent form of non-pulmonary disease amongst those with British names but there were no such cases amongst those with ISC names, in whom lymphadenitis predominated. There were no significant differences in the age distributions of patients with disease in the various anatomical sites within each ethnic group.

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DISCUSSION

Almost 30 years after the completion of the cattle tuberculosis eradication programme in Great Britain, bovine tubercle bacilli continue to cause about 1% of bacteriologically proven tuberculosis in South-East England. Most cases occur in the indigenous population who were born at the time when infection from bovine sources could still occur.

Nine per cent of cases occurred in individuals of ISC ethnic origin but, as 35% of cases of tuberculosis in South-East England occur in this group (Yates, Grange & Collins, 1986), the bovine tubercle bacillus is a relatively less frequent cause of disease in this ethnic group than amongst the indigenous population. Patients of ISC ethnic origin are much younger than those with British names; the age distributions in these groups closely resemble those of patients with disease due to human tubercle bacilli (Yates, Collins & Grange, 1982).

In the days when bovine tuberculosis was rife in Great Britain, most human disease due to bovine strains was non-pulmonary: cervical lymphadenopathy, lupus vulgaris and orthopaedic lesions being particularly prevalent (Griffith, 1937). Genito-urinary involvement was uncommon and occurred in older patients. Pulmonary disease was likewise rare and although bovine strains accounted for about a third of the cases of non-pulmonary tuberculosis, it only caused 0·4–0·6% of cases of pulmonary tuberculosis in South England. Interestingly, this is still the proportion of pulmonary tuberculosis caused by bovine strains in South-East England at the present time.

The lung is now the most frequent organ involved, followed by the genito-urinary tract in patients of European origin and cervical lymphadenitis in those of ISC ethnic origin. Again, it is of interest that the anatomical distribution of non-pulmonary lesions due to bovine strains closely mirrors that of lesions due to human strains in the two ethnic groups (Grange, Yates & Collins, 1985). This suggests that the pattern of disease is determined by factors other than intrinsic differences in the infecting organism. Likewise, no differences in the type and site of human disease caused by classical guinea-pig-virulent strains of *M. tuberculosis* and the guinea-pig-attenuated Asian variant (Table 1) are apparent (Yates, Collins & Grange, 1982).

The occurrence of man-to-man transmission of bovine tubercle bacilli is a controversial issue although several very probable cases have been published (see Collins & Grange, 1987). This study offers no evidence either for or against this possibility. The younger patients of Southern European and ISC origin may well have been infected abroad.

Man-to-cow transmission is well documented and may occur via the respiratory tract and also by farm workers with genito-urinary disease urinating in the cow sheds. Huitema (1969) reviewed 50 instances of man-to-cow transmission and noted that in 24 of these the source case had genito-urinary tuberculosis.

Similarly, in Germany, 114 cattle in 16 herds were infected from 12 source cases, 9 of whom had genito-urinary tuberculosis: 1 of these infected 48 cattle in 4 different herds (Schliesser, 1974). Thus the relatively high incidence, found in this study, of bovine infection involving the genito-urinary tract (45 of 201 cases,

23%) is a cause for concern, particularly as the symptoms of this disease may be of a rather vague 'orthopaedic' nature (Huitema, 1969).

In conclusion, human disease due to the bovine tubercle bacillus still occurs in England and, owing to the risk to cattle as well as, possibly, to fellow human beings, continued vigilance and surveillance is required.

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