*J Clin Pathol* 1989;**42**:677–681

# Infections in British clinical laboratories, 1986–87

N R GRIST, J A N EMSLIE

*From the University of Glasgow and the Communicable Diseases (Scotland) Unit, Ruchill Hospital, Glasgow*

SUMMARY During 1986–87 this continuing survey showed 15 specific infections in the staff of 235 laboratories, representing 28 524 person years of exposure. The community was the probable source of four of the five cases of tuberculosis and one of the five cases of salmonellosis. Occupational exposure was the probable cause of four infections by *Shigella flexneri*, three by *Salmonella typhimurium*, and one by *S typhi*, all affecting medical laboratory scientific officers (MLSOs) in microbiology. Occupational exposure was also the probable cause of one case of tuberculosis in a mortuary technician and one of probable non-A, non-B hepatitis in a medical laboratory scientific officer haematology worker. The overall incidence of reported infections was 52·6/100 000 person years (35/100 000 for infections of probable occupational origin). The highest rates of laboratory acquired infections related to MLSO microbiology workers and mortuary technicians. No additional infections were seen as a result of extending the survey to forensic laboratories.

## Material and methods

This ongoing survey of infections in the staff of clinical laboratories in Britain was continued by the same methods as before[1] but supplemented by distributing questionnaires to those members of the British Association in Forensic Medicine (BAFM) who were not listed as members of the Association of Clinical Pathologists (ACP). The data were also compiled using a commercial software program dBase-III Plus (Ashton-Tate), which allows for creation of an extensive database and quick retrieval of data.

## Results

Questionnaires were received from 235 centres. Most of these (186) were in England, 28 in Scotland, 12 in Wales and nine in Northern Ireland. Of the forms sent out, 200 were returned from the ACP members, 27 from the supplementary list compiled with the assistance of the Institute of Medical Laboratory Sciences (IMLS), and eight from BAFM members. Blood Transfusion Centres provided four returns.

### INCIDENCE OF INFECTIONS

Table 1 summarises the total data. It includes all reported infections, irrespective of whether they were considered to have an occupational origin, but excluding one report of "viral fever" after an "insect bite" in a medical biochemist. Only one case of viral hepatitis was reported. The commonest infections reported were bacterial bowel infections (salmonellosis, including typhoid and shigellosis) and tuberculosis.

*Hepatitis*

In 1986 a 29 year old female MLSO working in haematology was reported as a case of non-A, non-B hepatitis, having been unwell from April 1985. Liver function tests were found to be abnormal in August 1985 and a liver biopsy specimen in April 1986 showed chronic progressive hepatitis. The test for hepatitis B surface antigen was negative, but other viruses were not tested for. There was no history of a laboratory accident except for an intercurrent finger cut in December 1985 on an anti-A grouping serum ampoule; this was presumably irrelevant.

*Tuberculosis* (table 2)

Three of the five infections were recrudescences of previous infections, one of which (case 2) was acquired in India either in the community or during hospital work there. One (case 3) was reported only on histological evidence. Case 4, however, involved a mortuary technician who had worked on tuberculous necropsies. This was the only case which had probably originated from occupational exposure in this country, giving an incidence of 172/100 000 person years in mortuary technicians (rate 3·5/100 000 in the total 28 524·3 person years of the total survey).

Accepted for publication 2 March 1989

Table 1 *Cases and incidence of infections reported in laboratory staff 1986–87**

| Grade and discipline | Population at risk (person years) | Reported infections (No/100 000 person years) | | | |
|---|---|---|---|---|---|
| | | Hepatitis | Tuberculosis | Salmonellosis | Shigellosis |
| *Medical:* | | | | | |
| Morbid anatomy | 1047·5 | 0 | 0 | 0 | 0 |
| Haematology | 632·7 | 0 | 0 | 0 | 0 |
| Biochemistry | 280·6 | 0 | 0 | 0 | 0 |
| Microbiology | 622·1 | 0 | 0 | 0 | 0 |
| Immunology | 41·5 | 0 | 0 | 0 | 0 |
| Unspecified | 135·5 | 0 | 0 | 0 | 0 |
| Subtotal | 2759·9 | 0 | 0 | 0 | 0 |
| *Science:*† | | | | | |
| Morbid anatomy | 144·0 | 0 | 0 | 0 | 0 |
| Haematology | 40·0 | 0 | 0 | 0 | 0 |
| Biochemistry | 832·5 | 0 | 0 | 0 | 0 |
| Microbiology | 248·5 | 0 | 0 | 0 | 0 |
| Immunology | 71·0 | 0 | 0 | 0 | 0 |
| Others | 85·0 | 0 | 0 | 0 | 0 |
| Subtotal | 1421·0 | 0 | 0 | 0 | 0 |
| *MLSO:*† | | | | | |
| Morbid anatomy | 2568·7 | 0 | 0 | 0 | 0 |
| Haematology | 4269·0 | 1 (23) | 0 | 1 (23) | 0 |
| Biochemistry | 3786·1 | 0 | 0 | 0 | 0 |
| Microbiology | 4779·9 | 0 | 2 (42) | 4 (84) | 4 (84) |
| Immunology | 246·0 | 0 | 0 | 0 | 0 |
| Others | 820·0 | 0 | 0 | 0 | 0 |
| Subtotal | 16469·7 | 1 (6) | 2 (12) | 5 (30) | 4 (24) |
| *Others:* | | | | | |
| Post mortem mortuary technicians | 582·0 | 0 | 1 (172) | 0 | 0 |
| Post mortem mortuary attendants | 63·5 | 0 | 0 | 0 | 0 |
| Nurses, phlebotomists, donor attendants | 1775·8 | 0 | 0 | 0 | 0 |
| Laboratory assistants, cytology screeners, photographers | 778·2 | 0 | 2 (257) | 0 | 0 |
| Porters | 571·5 | 0 | 0 | 0 | 0 |
| Domestics | 681·8 | 0 | 0 | 0 | 0 |
| Office administrators | 3117·8 | 0 | 0 | 0 | 0 |
| Others | 303·0 | 0 | 0 | 0 | 0 |
| Subtotal | 7873·6 | 0 | 3 (38) | 0 | 0 |
| Total (all groups) | 28524·3 | 1 (3·5) | 5 (17·5) | 5 (17·5) | 4 (14·0) |

*Excludes one "viral fever" in biochemist.
†Science = graduate PTA staff; MLSO = PTB staff.

Table 2 *Cases of tuberculous infection*

| Case No | Year | Occupation | Age | Sex | Comments |
|---|---|---|---|---|---|
| 1 | 1986 | MLSO, microbiology | 36 | M | Recrudescence of pulmonary tuberculosis after 16 years; cavitations and film positive |
| 2 | 1986 | MLSO, microbiology | 25 | F | Recrudescence: from India, where had worked in hospital and had fever and lymphadenopathy in December 1985. Joined laboratory staff January 1986; recrudescence of fever and lymphadenopathy May 1986—*M tuberculosis* isolated from bronchoscopy specimen |
| 3 | 1986 | Porter and lab assistant | 40 | M | Acid fast bacilli detected histologically in oral neoplasm |
| 4 | 1986 | Mortuary technician | 47 | M | New pulmonary infection, x-ray picture positive, *M tuberculosis* cultured. Necropsy work included tuberculosis cases |
| 5 | 1987 | Laboratory aide, biochemistry | 34 | M | Recrudescence of pulmonary tuberculosis after 3–4 years. Positive x-ray, film and *M tuberculosis* sputum culture |

Table 3 *Cases of salmonella infection*

| *Case No* | *Year* | *Occupation* | *Age* | *Sex* | *Comments* |
|---|---|---|---|---|---|
| 6 | 1986 | MLSO, microbiology | 20 | M | *S typhi* infection. Routine work on isolation (blood culture) and identification. No cause identified by Health and Safety Executive investigation |
| 7 | 1987 | MLSO, microbiology | 25 | M | *S typhimurium* infection. Routine stool culture work; several cases at same time with same phage-type; also had Chinese take-away meal |
| 8 | 1987 | MLSO, microbiology | 62 | M | *S typhimurium* infection. Routine culture work, Same phage-type isolated from a patient's abscess |
| 9 | 1987 | MLSO, microbiology | 25 | F | *S typhimurium* infection. Routine diagnostic work in cramped conditions; no "accident" identified |
| 10 | 1987 | MLSO, haematology | 26 | F | *S typhimurium* infection. Attributed to local restaurant |

*Salmonellosis* (table 3)
These comprise four cases of *S typhimurium* infection and one of typhoid (case 6). Three, probably four, seem to have been acquired during routine bench work with specimens or derived cultures; all involved microbiology MLSOs. A local restaurant was the suspected source of *S typhimurium* infection of an MLSO haematology worker (case 10). The incidence of salmonella infections of probable occupational origin was therefore 84/100 000 person years in microbiology MLSOs (14/100 000 in the total population).

*Shigellosis* (table 4)
All four infections were probably acquired during routine work by microbiology MLSOs working with specimens or derived cultures, giving an incidence of 84/100 000 in this group (14/100 000 for the total population).

*Multiple infections*
Four laboratories reported more than one infection: (a) tuberculosis (case 5) and hepatitis; (b) tuberculosis (case 1) and salmonellosis (case 7); (c) typhoid (case 6) and shigellosis (case 12); (d) salmonellosis (case 9) and two cases of shigellosis (cases 13 and 14). A heavy workload in cramped conditions was mentioned in the report from this last laboratory.

## Discussion

Because of the relatively high incidence of tuberculosis in mortuary and morbid anatomy workers found in previous surveys, the ongoing enquiry was extended to include the laboratories of members of the British Association in Forensic Medicine. This added only 262·5 person years of exposure (0·92% of the total 28 524·3 in the whole survey), compared with 4070·5 person years (14·27%) provided by the supplementary IMLS list. The composition of the groups was very similar except for the expected increase in proportions of medical morbid anatomists, morbid anatomy MLSOs, mortuary technicians and attendants in the BAFM group (table 5). The composition of the whole study population was not significantly changed and comparison with those of previous surveys remains valid.

No additional cases of tuberculosis were shown by the BAFM intake, but the single case of tuberculosis probably acquired occupationally in Britain affected a mortuary technician. Since 1982 tuberculosis of suspected occupational origin has not been reported to us other than in association with morbid anatomy and post mortem room work, but the past importance and continuing threat of tuberculosis in laboratory workers is documented by Collins.[2] Müller recently criticised the use of class II biosafety cabinets in tuber-

Table 4 *Cases of shigellosis*

| *Case No* | *Year* | *Occupation* | *Age* | *Sex* | *Comments* |
|---|---|---|---|---|---|
| 11 | 1986 | MLSO, microbiology | 30 | M | *S flexneri* 2a infection. Routine tests with broth culture from patient from abroad. No "accident" but new method requiring bigger volumes (now discontinued) |
| 12 | 1987 | MLSO, microbiology | 24 | F | *S flexneri* 3a infection. Routine diagnostic stool work. No "accident" identified. No cause found by Health and Safety Executive investigation |
| 13 | 1987 | MLSO, microbiology | 27 | F | *S flexneri* infection. Routine diagnostic stool work. No "accident" identified; cramped conditions of work |
| 14 | 1987 | MLSO, microbiology | 30 | M | *S flexneri* 2 infection. Routine diagnostic stool work. No "accident" identified; cramped conditions of work |

Table 5 *Comparison of study populations (No of person years (%))*

| Grade and discipline | Total (ACP + BAFM + IMLS components) | | BAFM responses (n = 8) | | IMLS responses (n = 27) | |
|---|---|---|---|---|---|---|
| *Medical:* | | | | | | |
| Morbid anatomy | 1047·5 | (3·7) | 25 | (9·3) | 124·5 | (3·1) |
| Haematology | 632·7 | (2·2) | 10 | (3·7) | 115 | (2·8) |
| Biochemistry | 280·6 | (1·0) | 1 | (0·4) | 31·5 | (0·8) |
| Microbiology | 622·1 | (2·1) | 2 | (0·7) | 62·5 | (1·5) |
| Immunology | 41·5 | (0·2) | 1 | (0·4) | 11 | (0·3) |
| Unspecified | 135·5 | (0·5) | 17 | (6·4) | 50·5 | (1·2) |
| Subtotal | 2759·9 | (9·7) | 56 | (21·0) | 395 | (9·7) |
| *Science:* | | | | | | |
| Morbid anatomy | 144·0 | (0·5) | 0 | | 93 | (2·3) |
| Haematology | 40·0 | (0·1) | 0 | | 6 | (0·2) |
| Biochemistry | 832·5 | (2·9) | 6 | (2·2) | 144·5 | (3·6) |
| Microbiology | 248·5 | (0·9) | 0 | | 30 | (0·7) |
| Immunology | 71·0 | (0·3) | 0 | | 12 | (0·3) |
| Others | 85·0 | (0·3) | 0 | | 0 | |
| Subtotal | 1421·0 | (5·0) | 6 | (2·2) | 285·5 | (7·0) |
| *MLSO:* | | | | | | |
| Morbid anatomy | 2568·7 | (9·0) | 33 | (12·3) | 342·5 | (8·4) |
| Haematology | 4269·0 | (15·0) | 9 | (3·4) | 768 | (18·9) |
| Biochemistry | 3786·2 | (13·3) | 6 | (2·2) | 499 | (12·3) |
| Microbiology | 4779·0 | (16·8) | 7 | (2·6) | 494·5 | (12·2) |
| Immunology | 246·0 | (0·9) | 6 | (2·2) | 43 | (1·1) |
| Others | 820·0 | (2·9) | 16·5 | (6·2) | 163 | (4·0) |
| Subtotal | 16468·8 | (57·7) | 77·5 | (29·5) | 2310 | (56·9) |
| *Others:* | | | | | | |
| Post mortem mortuary technicians | 582·0 | (2·0) | 31·0 | (11·6) | 70 | (1·7) |
| Post mortem mortuary attendants | 63·5 | (0·2) | 14·0 | (5·2) | 8 | (0·2) |
| Nurses etc | 1775·8 | (6·2) | 6·5 | (2·4) | 331 | (8·1) |
| Laboratory assistants etc | 778·2 | (2·7) | 13·0 | (4·9) | 61 | (1·5) |
| Porters | 571·5 | (2·0) | 9 | (3·4) | 78 | (1·9) |
| Domestics | 681·9 | (2·4) | 17·0 | (6·4) | 81 | (2·0) |
| Office/Admin | 3117·8 | (10·9) | 19·5 | (7·3) | 430·5 | (10·6) |
| Others | 303·0 | (1·1) | 18·0 | (6·7) | 8 | (0·2) |
| Subtotal | 7873·7 | (27·6) | 128·0 | (47·9) | 1067·5 | (26·3) |
| Total | 28523·4 | (100) | 267·5 | (100) | 4058·0 | (100) |

culosis laboratories[3] but others have emphasised that when correctly designed, constructed, installed, operated and maintained, these safety cabinets are capable of providing good protection against airborne infection.[2 4-6]

We received one delayed report of a case of tuberculosis in a medical morbid anatomist, diagnosed in 1984. Diabetes mellitus was also present, indicating increased susceptibility. The infection seems likely to have been acquired in the post mortem room.

As in previous surveys bacterial bowel infections affected predominantly microbiology MLSOs engaged in routine diagnostic procedures with stools or derived cultures. Typhoid infection has been reported only once before in these surveys,[7] also associated with routine diagnostic work. It is interesting to note that whereas infections by *S sonnei* in the United Kingdom outnumbered those by *S flexneri* by over 5 : 1, laboratory infections by *S flexneri* outnumbered those by *S sonnei* by 4 : 3 during the nine years in which they have been reported to us (table 6). For ease of comparison laboratory infections are expressed in the table as rates per 100 000 reported infections by

Table 6 *Reported shigella infections in United Kingdom and laboratory infections by same types in same period, 1979–87*

| | *S sonnei* | *S flexneri* | *S boydii* | *S dysenteriae* |
|---|---|---|---|---|
| England, Wales, and Northern Ireland* | 35 815 | 7066 | 601 | 413 |
| Scotland† | 5 365 | 451 | 69 | 27 |
| Total United Kingdom infections | 41 180 | 7515 | 670 | 440 |
| Reported laboratory infections | 9 | 12 | 2 | 0 |
| Laboratory infection rate per 100 000 infections | 21·9 | 159·6 | 298·5 | (0) |

*Data from PHLS Communicable Diseases Surveillance Centre.
†Data from Communicable Diseases (Scotland) Unit.

each of the four shigellae involved. *S flexneri* is more than seven times as likely to give rise to infection in the laboratory as the more common *S sonnei*. Larger numbers are required to evaluate the even higher calculated rate associated with *S boydii*.

Viral hepatitis was encouragingly rare, represented by only a single case of probable non-A, non-B infection, which might or might not have had an occupational origin. This contrasts with the previous survey[7] when 11 cases of viral hepatitis were reported, six of them hepatitis B of probable occupational origin. Perhaps techniques and working conditions are improving, prompt recognition and management of incidents of exposure may be better, and more general prophylactic immunisation against hepatitis B may be showing its benefit. Evidence from the next survey (1988–89) may confirm or refute this possible trend. Parovirus B19 infection has not yet been reported to us, though cases have recently been reported in laboratory workers.[8] Likewise, human immundeficiency virus (HIV) has not yet figured in these surveys, although the possibility of laboratory acquired infection has been recognised.[9 10]

Since our last report, the incidence of both infections and injuries acquired has been described for 6492 workers in the state of Minnesota, USA, during one year, 1986.[11] The rates of infection were 140/100 000 for public health laboratory staff and 350/100 000 for hospital laboratory staff, contrasting with 52·6/100 000 in our present survey.

This survey was conducted with the support of the Association of Clinical Pathologists and the cooperation of the Institute of Medical Laboratory Scientists and the British Association in Forensic Medicine. We thank those who provided information for the survey. We are grateful to Mrs Ann Carey and Miss M Theresa Paixao, who kindly processed the data, and to Miss Fiona Johnston who prepared the typescripts.

**References**

1 Grist NR, Emslie JAN. Infections in British clinical laboratories, 1982–283. *J Clin Pathol* 1985;**38**:721–5.
2 Collins CH. *Laboratory-acquired infections*. 2nd edition. London: Butterworths, 1988.
3 Müller HE. Laboratory-acquired mycobacterial infection. *Lancet* 1988;**ii**:331.
4 Clark RP. Microbiological safety cabinets and laboratory infection. *Lancet* 1988;**ii**:844–5.
5 Rueda-Pedraza ME, Teel LD. Microbiology safety cabinets and laboratory-acquired infection. *Lancet* 1988;**ii**:845.
6 Salkin IF, Mahoney W. Microbiology safety cabinets and laboratory-acquired infection. *Lancet* 1988;**ii**:845.
7 Grist NR, Emslie JAN. Infections in British clinical laboratories, 1984–85. *J Clin Pathol* 1987;**40**:826–9.
8 Cohen BJ, Couroucé AM, Schwarz TF, Okochi K, Kurtzman GJ. Laboratory infection with parvovirus B19. *J Clin Pathol* 1988;**41**:1027–8.
9 McEvoy M, Porter K, Mortimer P, Simmons N, Shanson D. Prospective study of clinical laboratory and ancillary staff with accidental exposures to blood and body fluids from patients infected with HIV. *Br Med J* 1987;**294**:1595–7.
10 Expert Advisory Group on AIDS. *AIDS : HIV-infected health care workers*. London: HMSO, 1988.
11 Vesley D, Hartmann HM. Laboratory-acquired infections and injuries in clinical laboratories: a 1986 survey. *Am J Publ Hlth* 1988;**78**:1213–5.

Requests for reprints to: Professor N R Grist, Communicable Diseases (Scotland) Unit, Ruchill Hospital, Glasgow G20 9NB, Scotland.