HYPOSENSITISATION

Hypersensitisation, which requires multiple injections, has been widely used for many years but its effectiveness is still controversial. Some benefit may be obtained against grass pollen allergy, but no convincing evidence is available that it is effective against house-dust mite or food allergies. The use of multi-allergen "cocktails" cannot be recommended. Until more basic knowledge of the immunological processes involved in hyposensitisation is available and properly designed clinical trials have proved its effectiveness this method of treatment cannot be recommended.

PHYSIOTHERAPY

Instruction and practice in the correct methods of breathing and relaxation during an acute attack are necessary for children who are incompletely controlled. Undue emphasis, however, must not be placed on this aspect of symptomatic treatment. All too often asthmatic children attend local physiotherapy departments with an inevitable loss of schooling and have yet been denied basic aetiological assessment. Over-zealous "slapping and tipping" during an acute attack must be avoided.

RESIDENTIAL SCHOOLING

The need for placing asthmatic children into residential schools has decreased as a result of a better understanding of the disease and the recent advances in treatment. The child with intractable asthma will often improve after such a placement. The reasons for this will vary but may include removal from domestic allergens or psychosomatic causes, regular supervised medication, and the general improvement in the social environment.

The management of the wheezing child requires careful investigation and the proper use of available therapeutic measures. Generalised observations about treatment are useful but their application must be tempered by the individual's response. There are no "short cuts," but there are few other chronic conditions of childhood which will appropriately reward the doctor's enthusiasm.

Reference

- 1 Williams, H, and McNicol, K N, *British Medical Journal*, 1969, 4, 321.

Hospital Topics

Incidence of tuberculosis, hepatitis, brucellosis, and shigellosis in British medical laboratory workers

J M HARRINGTON, H S SHANNON

British Medical Journal, 1976, 1, 759-762

Summary

A retrospective postal survey of 21 000 medical laboratory workers in England and Wales showed 18 new cases of pulmonary tuberculosis in 1971, a five-times increased risk of acquiring the disease compared with the general population. Technicians were at greatest risk, especially if they worked in morbid anatomy departments. Of the 35 cases of hepatitis, the technicians were again the occupational group most likely to acquire the disease. Microbiology staff were twice as likely to report shigellosis as those in other pathology divisions but only one case of brucellosis was reported in the whole laboratory population. A similar survey carried out in 1973 of 3000 Scottish medical laboratory workers corroborates the results from England and Wales. Medical laboratory workers continue to experience a considerable risk of

developing an occupationally acquired infection. Improvements in staff safety and health care seem to be necessary.

Introduction

Medical laboratory work has always been a source of occupational hazards.¹⁻⁴ Fires, explosions, gassings, and physical injury^{5, 6} may occur in all types of laboratories, but medical establishments carry the additional risk of occupationally acquired infections. Despite the large volume of pathogenic material handled by routine diagnostic laboratories, the risk may be greatest in research laboratories, as the dangerous nature of the substances or processes may be unknown. Laboratory workers not infrequently become the first unwitting human case of such an infection. Examples include Herpes B virus,⁷ American Q fever,⁸ Louping ill, and Newcastle disease.⁹ Marburg disease was first described in laboratory workers¹⁰ and parenteral spread of hepatitis virus was probably first noted after an accidental inoculation with jaundiced serum in 1929.¹¹

Few surveys of laboratory-acquired infection have been undertaken; most reports are of small outbreaks in specific laboratories. Sulkin and Pike's study of 5000 American laboratories¹ suggested that brucellosis, tuberculosis, hepatitis, and enteric diseases are among the commonest laboratory-acquired infections, and these findings have been supported by other reports.⁴ In 1957 Reid¹² noted that British medical laboratory workers had a risk two to nine times that of the general population of

TUC Centenary Institute of Occupational Health, London School of Hygiene and Tropical Medicine, London WC1E 7HT

J M HARRINGTON, MB, MRCP, lecturer in occupational medicine (present address: medical epidemiologist, Environmental Hazards Activity, Cancer and Birth Defects Division, Bureau of Epidemiology, Center for Disease Control, Atlanta, Georgia 30333 USA)

H S SHANNON, MSc, FSS, statistician

acquiring tuberculosis, and this work was instrumental in establishing a code of practice for safe working with tuberculous material.¹³

The present investigation was the culmination of sporadic reports of further cases of tuberculosis in medical laboratories and resulted in a three-year research project concerned with various aspects of health and safety in British medical laboratories.

Materials and methods

The first phase of the study was a retrospective postal survey of all staff working in medical laboratories of the National Health Service (NHS), National Blood Transfusion Service (NBTS), and the Public Health Laboratory Service (PHLS) in England and Wales (1971) and Scotland (1973). Questions were asked about many aspects of laboratory work and personal health. The present paper is an analysis of the answers to one group of questions: "During 1971 (1973 in Scotland) did you develop any of the following infections: tuberculosis, hepatitis, shigellosis, or brucellosis?" Related questions furnished data on the type of infection, time off work, age, sex, occupation, and laboratory duties.

With the aid of the Department of Health and Social Security, batches of questionnaires were sent to 334 group secretaries or house governors for distribution to NHS laboratories. The 68 PHLS directors and 14 NBTS directors were also sent questionnaires for their staff. As 48 hospital authorities did not have pathology laboratories replies were requested from 368 laboratory groups employing an estimated 24 000 workers. Batches of questionnaires were returned from 352 laboratories (95.7%) and in no laboratory was the individual response estimated to be below 90%. The 20 950 completed questionnaires from individual workers, therefore, probably represented an overall response rate above 85%. In the Scottish study all laboratories responded, returning 3061 questionnaires.

Other phases of the research included a mortality study of pathologists and technicians¹⁴ and a prospective study of sickness, absence, and accidents in a 10% sample of the laboratories included in the present study.⁶ Environmental safety and health will be the subject of a further communication.

The "expected" number of cases of tuberculosis in the laboratory population was calculated by multiplying the contemporary age-sex specific attack rates prevailing in England and Wales by the population of laboratory workers by age and sex.

Results

TUBERCULOSIS

England and Wales

Twenty-three people stated that they had developed tuberculosis during 1971. Corroborative evidence of tuberculosis was obtained in half the cases either by contact with the laboratory or from additional information provided by the respondent. Analysis of sickness absence records for 1971 obtained from the hospital authority showed at least one period of prolonged absence in all individuals, which could be construed as relevant to a diagnosis of overt tuberculosis. Four cases, however, were not pulmonary and two cases were doubtful. One of these was excluded for lack of real evidence of infection, but the other was included as the Heaf test result had converted from negative to

highly positive during the time of supposed infection. Both these doubtful cases were treated with antituberculous drugs. The remaining 18 cases are included in the analysis and all occurred in white Caucasians.

The overall incidence rate was 110 cases per 100 000 person-years of exposure (table I). The national notification rate for England and Wales in 1971 for men and women aged 15-64 for pulmonary tuberculosis was 20.4 per 100 000 person-years. Laboratory workers therefore showed a 5.4 times increased risk of acquiring tuberculosis compared with the general population. The sex specific rates were 168 per 100 000 man-years and 71.1 per 100 000 woman-years. Comparison with the national rates for men and women show that the risk ratio was 5.8 for men and 5.4 for women (see fig). These both represent significantly more cases among the laboratory population (table II).

Risk ratio for pulmonary tuberculosis in British medical laboratory workers and Post Office staff compared with national notification rates.

There was also an excess risk of acquiring tuberculosis among the technical staff as opposed to the medical and scientific staff (see fig). Analysis of the data according to pathology division (table I) showed the highest incidence among necropsy staff.

National notification rates tend to underestimate the true incidence of tuberculosis owing to under-reporting, but another potential error is that occupational groups tend to be healthier than the whole population as they are a "survivor" population containing fewer sick, disabled, or dying individuals than the country as a whole. This latter point is supported by the fact that the incidence of pulmonary tuberculosis in the General Post Office for 1971 was 20% lower than the national figures (see fig). The net effect is probably to underestimate the relative risk in laboratory workers. The data also illustrate the apparent excess risk of acquiring tuberculosis in the laboratory population by laboratory grade.

Scotland

The three cases of pulmonary tuberculosis noted in Scotland in the 1973 survey occurred in men—one doctor and two technicians. The overall incidence rate was 109 cases per 100 000 person-years. The

TABLE I—Incidence of pulmonary tuberculosis in medical laboratories by laboratory grade and division. Numbers of cases in England and Wales, 1971 (Scotland 1973 in parentheses)

Laboratory division	Medical staff	Scientific staff	Technical staff			Domestic and clerical staff and aides	Total	Rate per 100 000 person-years
			Qualified	Junior/student	Necropsy			
General pathology	1 (1)	1	1	1	2	1	6 (1)	86.4
Clinical chemistry				1			1	38.2
Microbiology			2 (1)	1		1	4 (1)	97.2
Haematology			(1)	1			1	39.6
Morbid anatomy				2	4		6 (1)	401.8
Blood transfusion								
Total	1 (1)	1	3 (2)	5	6	2	18 (3)	110.0 (109.0)
Rate per 100 000 person-years ..	94.7			148.2		41.54	110.0	

TABLE II—Pulmonary tuberculosis in laboratory population by age (in years) and sex compared with incidence expected from national notification rates in England and Wales, 1971

	Total	Men				Women			
		15-34	35-54	≥55	All men	15-34	35-54	≥55	All women
Observed	18*	1	8*	2†	11*	6*	1	0.07	7*
Expected	3.3	0.8	0.6	0.33	1.9	1.1	0.4		1.3
Ratio	5.45	1.25	13.3	6.1	5.8	5.45	2.5		5.4

*P<0.001. †P<0.05.

TABLE III—Cases of hepatitis in medical laboratory workers by grade and division: England and Wales, 1971 (Scotland 1973 in parentheses)

Laboratory division	Medical staff	Scientific staff	Technical staff		Domestic and clerical staff and aides	Total	Rate per 100 000 person-years
			Qualified	Junior students			
General pathology	(1)	1	3	4		8 (1)	95.0
Clinical chemistry			2	2		5	261.0
Microbiology			4	3	1	8	269.5
Haematology			3	2 (1)		5 (1)	274.0
Morbid anatomy	1		1	2		4	391.0
Blood transfusion	1			1 (1)	3	5 (1)	237.0
Total	2 (1)	1	13	14 (2)	5	35 (3)	170.0
Rate per 100 000 person-years ..	118.5		230.5		82.5	170.0	

	No	Rate/100 000 person-years
Men	17	215.9
Women	18	141.5

1972 notification rate (all ages) was 26 per 100 000, giving a risk ratio of 4.2.

HEPATITIS

England and Wales

We identified 35 cases of hepatitis and since in a survey of this kind it is impossible to be certain of the exact type of hepatitis no sub-division was attempted. The incidence rates were calculated as number of cases per 100 000 person-years and compared with figures obtained by Grist^{15,16} (table III). The overall incidence rate was 170 per 100 000 person-years. Technicians seemed to experience the highest rates, whereas in Grist's survey biochemistry workers were at greatest risk. Our findings suggested that the rate was highest in morbid anatomy departments. Haematology, biochemistry, and microbiology departments experience a similar but lower incidence.

Comparison with the national notifications for infectious jaundice are not strictly valid as these rates do not include serum hepatitis and will certainly underestimate the true incidence of infectious jaundice.

Scotland

Three cases were reported, one in a morbid anatomist and the other two in junior technicians in haematology. Further analysis of the data was not feasible with such small numbers.

SHIGELLOSIS

England and Wales

We identified 37 cases with an overall incidence rate of 226 per 100 000 person-years (table IV). The highest rates occurred among technical and scientific staff, with 11 of the 37 cases occurring in microbiology departments. Microbiology had the highest incidence rate (444 per 100 000 person-years).

Scotland

Microbiology accounted for seven of the eight cases and only one patient was not a technician (table IV).

BRUCELLOSIS

Only one case, a senior English technician, was reported.

Discussion

The major methodological problem of postal surveys is obtaining a satisfactory response rate. In the present inquiry 95.7% of laboratory authorities responded and lists of people who failed to return a questionnaire were included with each batch of replies. On average 90% of those eligible for inclusion

TABLE IV—Cases of shigellosis in medical laboratory workers by grade and laboratory division: England and Wales, 1971 (Scotland 1973 in parentheses)

Laboratory division	Medical staff	Scientific staff	Technical staff	Domestic and clerical staff and aides	Total	Rate per 100 000 person-years
General pathology		1	12	3	16	230.4
Clinical chemistry			3		3	191.5
Microbiology	1	2 (1)	8 (6)		11 (7)	444.0 (1072.2)
Haematology			3	1	4	264.1
Morbid anatomy			3		3	334.6
Blood transfusion						
Total	1	3 (1)	29 (7)*	4	37 (8)*	226.0 (290.9)
Rate per 100 000 person-years	80.6	344.3 (356.4)	307.4 (444.9)	83.1	226.0 (290.9)	

*One technician—division not stated.

	No	Rate/100 000 person-years
England and Wales { Men	15	230.0
{ Women	22	233.4
Scotland { Men	5	357.3
{ Women	3	222.1

in the study replied in each participating laboratory, which gave an individual response rate of about 86%. Little information was available on the laboratories or workers who failed to reply. All PHLS laboratories, however, responded, and, of the 15 NHS establishments who did not reply, eight were London undergraduate or postgraduate teaching hospitals, five were hospitals in the South-east of England, one was in the Midlands, and one was in the North. For individual non-responders, doctors were the largest group and technicians the smallest.

Retrospective studies further suffer from the errors of recalling past events. Although the infections studied are unlikely to be easily forgotten, evidence from hospital and trade union sources suggests that some people deliberately withheld information on tuberculosis. This suggests that the number of cases recorded was an underestimate. Problems also arise in attempting to verify the responses given in the questionnaires. Positive replies to tuberculosis were checked indirectly through laboratory and hospital tracings but other diseases were not readily verifiable and the results should be viewed cautiously.

Thus the relatively high response rate probably gives a fair estimate of the laboratory experience in 1971 in England and Wales and 1973 in Scotland notwithstanding the potential errors cited. A further bias would seem to be in extrapolating the results to London teaching hospitals, which were seriously underrepresented in the responders.

The tuberculosis incidence rate in laboratory populations has fallen considerably in the past 15 years, but comparison with the national notification rates shows that the risk among British medical laboratory workers has remained 2 to 7.5 times that in the general population.¹² Analysis of the cases by laboratory grade suggests a correlation between risk and bench contact with pathogens—technicians having the highest incidence and ancillary workers the lowest. Nevertheless, the rate for ancillary workers is twice the national rates. The highest rate by laboratory division occurs in morbid anatomy as one-third of the total number of cases occurred in necropsy technicians. Until recently this occupational group have lacked adequate professional status and training, and with the fall in overt tuberculosis in Western Europe proportionately more cases are being diagnosed at necropsy.^{17, 18} Improvements in the surveillance and training of necropsy staff are clearly needed. Comparisons with Reid's study¹² are unavoidable and as his results led directly to a code of practice for handling tuberculous material it could be suggested that stricter enforcement of this code is required.

There are considerable differences between our results on hepatitis and those of the Association of Clinical Pathologists' (ACP) survey carried out by Grist, which reported biochemistry technicians as being at greatest risk.¹⁵ Possibly the ACP study reflects a truer picture of the risk of acquiring hepatitis as the study was done for and by pathologists. Nevertheless, in both studies technicians seem to be at greatest risk compared with other laboratory grades and this is probably due to increased contact with infected material. Furthermore, no verification of the diagnosis of hepatitis was attempted in this survey, whereas Grist obtained some corroborative clinical and serological evidence of infection. The data in table III should therefore be viewed cautiously and firm conclusions cannot be drawn from analysis of these figures.

For shigellosis no comparisons are possible with other published information and laboratory staff who contracted diarrhoea are also more likely to attempt to establish a specific cause for their illness than the general population. This may also explain the higher rates for shigellosis in microbiological laboratories, which accounted for 18 of the 45 cases reported in the two surveys. The alternative explanation is that their contact with enteric organisms is greater. The relatively high rates for scientifically qualified staff may be spurious in view of the few cases and relatively small population compared with other grades of staff.

From the data available we cannot assess whether these incidence rates are high compared with non-occupationally exposed groups. It may be so, however; a study of sickness

absence in a 12% sample of laboratories carried out by us in 1973-4 showed that the chief cause of absence in laboratory workers was the category "infective and parasitic diseases." There was two to three times more absence from these causes in the study group compared with a control group of workers and these results will be the subject of a further communication.

Brucellosis did not seem to be a disease of note in the laboratory population studied, though diagnostic difficulties could mask chronic or subacute forms of the disease. Serological evidence would be necessary to establish an accurate picture.

Conclusions

Tuberculosis and possibly hepatitis remain occupational hazards of British medical laboratory workers. Shigellosis may also be more prevalent in this population than in the community at large but comparable community data are lacking. The present survey also furnished evidence (to be published) that in some laboratories safety and health care are inadequate. It may be necessary, therefore, to institute a reappraisal of codes of practice for safe working in laboratories. This task will probably be undertaken by a subgroup of the Working Party on the Laboratory Use of Dangerous Pathogens, which recently reported its findings.¹⁹

We are indebted to all the laboratory personnel who completed the survey questionnaires and especially to the laboratory directors, hospital authorities, and the Association of Scientific Technical and Managerial Staffs who ensured a high response rate. The DHSS and the Scottish Home and Health Departments financed the study and we are grateful for their help in establishing the study population. We are especially grateful to Sir James Howie, Professor D D Reid, and Professor N R Grist who assisted in planning the investigation and to Dr P J Taylor for providing Post Office data on tuberculosis incidence. Throughout the study we were provided with invaluable guidance from Professor R S F Schilling and Dr M L Newhouse.

This investigation forms part of an MD thesis by one of us (JMH) submitted to the University of London.

Requests for reprints should be addressed to HSS.

References

- Sulkin, S E, and Pike, R M, *American Journal of Public Health*, 1951, **41**, 1 and 769.
- Kisskalt, K, *Archiv für Hygiene und Bakteriologie*, 1929, **101**, 137.
- Reitman, M, and Wedum, A G, *Public Health Reports*, 1956, **71**, 659.
- Phillips, G B, *Technical Study No 35*. Fort Detrich, US Army Biological Laboratory, 1961.
- Skinhöf, P, *Scandinavian Journal of Clinical Laboratory Investigation*, 1974, **32**, 27.
- Harrington, J M, *Proceedings of the Royal Society of Medicine*, 1975, **68**, 94.
- Sabin, A B, and Wright, A M, *Journal of Experimental Medicine*, 1934, **59**, 115.
- Dyer, R E, *Public Health Reports*, 1938, **53**, 2277.
- Sulkin, S E, *Bacteriological Reviews*, 1961, **25**, 203.
- Martini, G A, et al, *Deutsche medizinische Wochenschrift*, 1968, **93**, 559.
- Findlay, G M, et al, *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 1931, **25**, 7.
- Reid, D D, *British Medical Journal*, 1957, **2**, 1.
- Department of Health and Social Security, *Precautions against Tuberculosis Infection in the Diagnostic Laboratory*, HM (70)60. London, DHSS, 1970.
- Harrington, J M, and Shannon, H S, *British Medical Journal*, 1975, **4**, 329.
- Grist, N R, *Proceedings of the Royal Society of Medicine*, 1973, **66**, 795.
- Grist, N R, personal communication, 1974.
- Linell, F, and Ostberg, G, *Scandinavian Journal of Respiratory Diseases*, 1966, **47**, 200.
- Laker, M F, *Lancet*, 1973, **2**, 198.
- Department of Health and Social Security, *Report of Working Party on the Laboratory Use of Dangerous Pathogens*, Cmnd 6054. London, HMSO, 1975.

Is ultraviolet ray treatment (for producing a tan and preventing mild acne) safe in pregnancy?

There is no evidence that ultraviolet rays will adversely affect pregnancy, provided that the treatment is used judiciously.