Report of the Working Party on the Laboratory Use of Dangerous Pathogens.

DEPARTMENT OF HEALTH AND SOCIAL SECURITY

Report of the Working Party on the Laboratory use of Dangerous Pathogens

Chairman: Sir George Godber

Presented to Parliament by the Secretary of State for Social Services
by Command of Her Majesty
May 1975

LONDON
HER MAJESTY'S STATIONERY OFFICE
55p net
Cmnd. 6054

ISBN 0 10 160540 4

LIST OF MEMBERS

Sir George Godber GCB, DM, FRCP, DPH (*Chairman*)
Dr A J Beale MD, Dip. Bact., FRCPath., FI Biol.
Mr A G Beynon CB, MRCVS, DVSM
Dr A B Christie MA, MD, FRCP, FFCM, DPH, DCH
Mr C H Collins MBE, MI Biol., FIMLT
Mr G Davies BVSc, MRCVS, Dip. Bact.
Professor J P Duguid MD, BSc, FRCPath
Mr J R Foster FIMLT
Professor K B Fraser MC, MD, DSc
Dr D A Haig BVSc, DVSc, MRCVS
Dr J M Harrington BSc, MSc, MB, MRCP
Professor R J C Harris PhD, FRCPath
Dr M S Pereira MD
Dr C J Revington BSc, MB, BCh, DPH, FFCM
Dr D A J Tyrrell MD, FRS, FRCP, FRCPath
Dr J F Warin OBE, MA, MD, MRCP, FFCM, DPH
Mr J F Williams
Professor R E O Williams MD, FRCP, FRCPath

Mr J G Handby
Department of Health and Social Security

Mr J G Watson MRCVS, DVSM
Ministry of Agriculture, Fisheries and Food

Joint Secretaries

CONTENTS

CHAPTER 1

INTRODUCTION

1. This Working Party was set up in November 1973 by the Secretary of State for Social Services in conjunction with the Secretaries of State for Scotland, Wales, Northern Ireland and Education and Science and the Minister of Agriculture, Fisheries and Food, with the following terms of reference:—

> "To consider whether there are organisms capable of causing communicable diseases that require measures to be taken in laboratories or elsewhere additional to those now recommended, in order to prevent infection in man or in animals and to make recommendations as to the measures required".

2. It was decided that consideration should be given to this question following the escape of smallpox virus in Spring 1973 from a laboratory in the London School of Hygiene and Tropical Medicine as a result of infection of a laboratory worker who in turn transmitted the infection to two outside contacts, both of whom died. This incident has since been the subject of a public enquiry(1).

3. We held a total of seven meetings to consider various aspects of the problem and set up a sub-group to examine the particular need for a code of practice to guide laboratories. We considered that urgent action was required to control the handling of the group of pathogenic micro-organisms which, in our judgement, presented the highest degree of risk and so we submitted an interim report to Ministers in May 1974. This report advocated the establishment of a voluntary system of control over the conditions for handling such pathogens and the appointment of an informal advisory group to assist Ministers in its application. We were subsequently invited to consider the detailed arrangements for the operation of this voluntary system and advised on these in October 1974.

4. In order to assess the extent to which pathogens are held we arranged for a questionnaire to be sent to all laboratories in the United Kingdom asking them about their use of certain dangerous pathogens.

5. During our discussions we had the benefit of the advice of a number of observers from the Department of Health and Social Security; in particular we would like to acknowledge the help of Dr H M Archibald, Dr N J B Evans, Dr P Abela-Hyzler, Dr M A Buttolph, and Mr R T P Pronger (who sadly died in August 1974). In addition to our joint secretaries we were also served by and would like to express our thanks to Mrs E V Lancaster and M R Moodie.

6. In looking at this question we have become aware of the great number and considerable variety of laboratories handling dangerous pathogens and of their different purposes in doing so. It became apparent to us that measures to control these situations were required but also that no single system of control would be applicable to all pathogens. In making our recommendations we have therefore attempted to match the measures to be applied to the degree of risk involved in handling any particular pathogen.

CHAPTER 2

NATURE AND EXTENT OF THE PROBLEM

7. Pathogenic micro-organisms are now handled extensively for research, teaching, diagnostic and production purposes in a wide variety of institutions. These include Government research laboratories, universities, hospitals, technical colleges and commercial laboratories.

8. Exotic and dangerous pathogens may also be present in specimens sent to diagnostic laboratories not normally expecting to receive them. Such dangers are implicit in any diagnostic work. Fortunately situations of this kind occur extremely rarely but the ordinary routine of the laboratory should recognise the possibility. The remarks in this report are directed primarily at laboratories which purposely hold pathogens in order to carry out their work, but they will be of use to any laboratory which might receive specimens containing pathogens. Special arrangements may be necessary in these laboratories in some urgent situations (such as diagnostic work on cases of suspected smallpox) and on such occasions the appropriate recommendations of this report would apply.

NATURE OF THE DANGER

9. The pathogens held do not present equal dangers. Some, if they escape from a laboratory can cause serious disease among the general public. Some such diseases are highly infectious and for others neither immunisation nor effective treatment is available. Other pathogens present a high degree of danger to the much smaller number of people who have contact with them but present minimal risks to the public at large because they cannot spread from man to man. Those at risk from this second group are therefore the laboratory workers who handle them, their families and contacts and others who may inadvertently have contact with the pathogen, for example, cleaners, those responsible for the disposal of laboratory waste, and postal workers should a package containing pathogenic material be broken and the contents spilled.

10. Some pathogens are found relatively commonly in this country and their use by laboratories presents few additional risks. Standard laboratory procedures, properly applied, should be sufficient to contain them. On the other hand, others are normally found only in other countries and work on them presents much greater dangers for which special precautions are recommended.

11. The major hazard represented by infection of the animal community is that of economic loss, not only to the animal owner but also to the nation. It is Government policy to prevent the establishment of exotic animal diseases of major importance by stamping out outbreaks if and when they occur. This can be expensive: for example, during the last major outbreak of Foot and Mouth Disease in this country in 1967/68 over £26m was paid in compensation

from public funds to owners of animals slaughtered. That outbreak was not attributable to the escape of Foot and Mouth Disease virus from a laboratory, but serves to illustrate the scale of epidemic which might be caused. Laboratory escapes have been known to occur. Less easily quantified losses also occur during an outbreak of exotic disease as a consequence of restriction of movement of livestock, disruption of agricultural activities in general and curtailment of exports of pedigree stock. The availability of supplies of home-grown meat, milk and eggs is threatened in the event of extensive outbreaks. An important export trade could also be threatened if guarantees that the animals are disease-free cannot be given. Disease in the animal community causes pain and suffering to the animals affected and it is clearly of benefit to them as well as to the human population, to minimise the risk of such disease by whatever means are available. It is essential that where a certain animal disease is subject to control measures, the causal agent of that disease should be similarly subject, and that when a country is free from disease every effort should be made to maintain that freedom.

12. We are aware that concern has been expressed about the adequacy of measures taken to ensure the safety of the public and of the laboratory staff. Various advisory reports have been issued with the object of improving the situation in specific types of laboratory. The effects have been variable. Some laboratories already adopt carefully devised safety precautions so that the risks are minimised but others have failed to take adequate steps to meet the dangers involved. In some laboratories clear responsibility for safety precautions rests with a safety officer but in others there is no clear responsibility and proper safety measures have been neglected as a result. Other factors which contribute to the variability of safety precautions are the structure, arrangement and equipment of the laboratory.

13. The number of incidents where accidental release of a pathogen from a laboratory has caused death or serious illness among the public or animals in this country is small. The smallpox outbreak of 1973 was quickly controlled but public concern that such an escape can occur is understandable and the circumstances suggested that there is need for further control. Accidental infections of laboratory workers occur more commonly but are largely preventable.

SIZE OF THE PROBLEM

14. No complete list of pathogens held by laboratories in this country existed and only general estimates were available of the extent to which dangerous pathogens were being used. We therefore arranged to collect such information to provide a sound basis from which to draw conclusions. It was decided to send a questionnaire to all laboratories in the country asking which, if any, of 66 pathogens listed were held. We eventually identified over 70 pathogens which we felt should be handled only with special precautions and for good reason. These are listed at Appendix I. The list of pathogens contained in the questionnaire was expanded as a result of representations made subsequent to its distribution.

15. One of the problems was that no comprehensive list of laboratories was available to us and one had to be compiled from various sources. Inevitably there was some duplication in the list and we are grateful to the laboratories approached for their forbearance and co-operation. The list of all laboratories now compiled should be of value in the future. The only laboratories not approached directly were those in schools as we felt they were unlikely to be handling the pathogens we had identified as being particularly dangerous. We did however send a copy of the questionnaire to all education authorities seeking their co-operation in satisfying themselves that this supposition was correct in the schools for which they were responsible.

16. The results of the survey are set out in detail in Appendix II. Replies are still being received but results to date indicate that 595 laboratories hold one or more of the pathogens listed. The most widely held organism is *Salmonelli typha* (322 laboratories) followed by *Mycobacterium tuberculosis* (289), *Vibrio cholerae* (194) and *Brucella* (179). Among those we would regard as the most dangerous pathogens we note that four laboratories are holding Herpes B virus, one is holding Lassa fever virus and Marburg virus, 13 are holding Rabies virus, 19 smallpox virus and 29 one or more members of the equine encephalomyelites group of viruses. When the appropriate safety precautions are considered it is worth noting that 564 laboratories are holding pathogens which are either a hazard primarily to man or are agents of animal diseases transmissible to man. One hundred and twenty-seven laboratories are holding pathogens which are a hazard to animals only. We were surprised at the large number of laboratories which this survey has shown to be in possession of pathogens. The number greatly exceeded our expectations and reinforced our belief that steps should be taken to ensure that adequate safety precautions are in force. In addition, WE RECOMMEND that the total number of laboratories holding pathogens in categories A and B should be reduced by ceasing the practice in any laboratory which cannot show good reason for continuing. In particular the use of *Salmonella typhi* to test disinfectant should be superseded by the use of another suitable organism such as *E. coli* and the relevant British Standard should be amended to permit this practice. *Mycobacterium tuberculosis*, except when the strain is known not to be virulent should not be used for teaching.

HISTORICAL BACKGROUND TO CONTROL

17. In the past rather more direct control has been exercised by the agricultural departments over the handling of certain dangerous animal pathogens in research laboratories and elsewhere than has been exercised by the health departments. This control is part of, and an extension to, the functions of the agricultural departments directed towards prevention, eradication and physical control of certain epidemic diseases of economic importance in animals. The agricultural departments have achieved this by means of a mixture of statutory powers and voluntary controls. In the main, voluntary controls have been employed to cover gaps in the legislation particularly in relation to the import of possibly dangerous biological material which lies outside the definitions of animal tissues etc covered by the legislation. A number of important gaps still exist in the present controls. A description of the various statutory powers available is given in chapter 5.

18. The health departments have adopted a somewhat different role in that responsibility for instituting appropriate safety measures has traditionally rested with the hospitals and medical schools where research is undertaken. We are aware that in many cases this responsibility has been taken seriously and codes of practice drawn up and appropriate safeguards adopted. Nevertheless in some cases this has not happened and this clearly suggested that some system of ensuring a sufficient level of safety precautions was required.

GENETIC ENGINEERING

19. During our deliberations we became aware of the concern, which has since been publicly expressed, about certain experiments in the field of genetic engineering. To assist us in considering this problem Professor H L Kornberg of the Department of Biochemistry at the University of Leicester kindly attended one of our meetings. He advised us that it was now possible to produce in large quantities recombinant, self-replicating strains of plasmids or viruses with artificially modified DNA, by the use of techniques within the scope of many laboratories. Such new strains, we were informed, might involve hazards to the health of the community and anxieties were being expressed by scientists both in the USA and in this country lest experiments should take place without proper precautions. Of particular concern was the fact that experiments involving attempts to modify commonly occurring bacteria such as *Escherichia coli* to give them oncogenic or antibiotic resistant properties might be made.

20. We felt that the responsible Departments should be advised of the information we had received and of the issues involved and we felt also that discussions should be encouraged among scientists in this country. Our Chairman therefore wrote to the Chief Medical Officer of the Department of Health and Social Security and the Chief Veterinary Officer of the Ministry of Agriculture, Fisheries and Food. Shortly after this the National Academy of Sciences in the United States called for a moratorium on experiments involving the manipulation of DNA of organisms with oncogenic or antibiotic resistant properties. This statement was published in *Nature* (volume 250, 19 July 1974) and commanded some support in the UK. A Working Party was established by the Advisory Board for the Research Councils under the chairmanship of Lord Ashby of Brandon to consider the potential benefits and the potential hazards of genetic engineering in micro-organisms. We welcomed this development.

21. We have seen the report of the Ashby Working Party and note that it points to the need for expert guidance on measures for containment of special risks in some of the work which may take place. The most dangerous work may need to be done in laboratories able to provide the special protection needed for handling highly dangerous pathogens. We interpret this as meaning that similar criteria might need to be adopted in considering the suitability of a laboratory for this work to those recommended for safe work on the very highly dangerous pathogens which form part of our category A. WE RECOMMEND therefore that the Dangerous Pathogens Advisory Group described in chapter 4 below should be so constituted as to meet the need for advice on control measures required in connection with work of the type considered by the Ashby Working Party.

CHAPTER 3

GENERAL CONSIDERATIONS

22. In considering the use of dangerous pathogens in laboratories we had in mind the need to balance the requirements of education, diagnosis and production on the one hand with the need to protect the human and animal communities on the other. It is clear that some degree of risk must be accepted but only if the benefits, actual or potential, to the public justify it. We would not wish to see scientific advancement retarded and we recognise that for example in some diagnostic laboratories, it is essential to maintain reference preparations so that accurate diagnosis can be made quickly in the event of an outbreak. However, the risks must be kept to a minimum. The circumstances under which the pathogens are held should be known and made as safe as possible. WE RECOMMEND that where any element of special risk to the public is involved the admissibility of the proposed work should be subject to a decision taken outside the laboratory. Whenever it is necessary to work with such pathogens they should be handled in conditions of maximum safety.

ASPECTS OF LABORATORY SAFETY

23. There are three basic aspects of laboratory safety which must be considered:—

- — construction of the laboratory, equipment, facilities provided and their condition,
- — systematic application by the staff of recognised safety precautions,
- — staff supervision and training.

24. Laboratories and the facilities available in them vary widely. Hazards are most easily contained in laboratories which are purpose-built, properly equipped and remotely located from accommodation used for other purposes. Some laboratories correspond to this ideal, but others, especially when the volume of work is comparatively small, are housed in multi-purpose buildings with shared facilities where it is much more difficult to confine a hazard to the laboratory itself. The methods and materials used in construction also have an effect on the readiness with which effective safety measures can be introduced and modifications may be expensive. Equipment provided for experiments should be adequate for the purpose and serviced regularly.

25. Specific training of all laboratory staff in safety precautions is essential but available evidence suggests that it is often not considered of great importance and that in some laboratories it does not take place in a regular or organised way. The responsibility for ensuring that training of staff takes place lies with those in charge of the laboratories. The training should include instruction in the safe use of equipment, procedures to be adopted in undertaking experiments and the responsible conduct expected of those working in the laboratory. New staff should be informed and all staff reminded regularly of the particular measures adopted in the laboratory and any local conditions which affect them.

26. Dangerous pathogens should be handled in laboratories only under the supervision of suitably qualified staff, and responsibility for the supervision of junior staff should be clearly assigned. An essential feature of this supervision must be to ascertain that the nature of the work being carried out is understood and that approved procedures are being used. The entry into, and work in that laboratory by " occasional " staff (such as window cleaners, electricians, etc.) should be carefully limited and supervised.

27. However, the implementation of safety precautions can be effective only if those precautions are understood and accepted by the laboratory workers. The individual who ignores them has failed to appreciate the danger to himself and to others which may result from his actions. The chance that an accident will occur is fortunately small and some laboratory workers are tempted to take short cuts. We therefore welcome the recent increase in the number of safety officer appointments. The head of the laboratory of course remains ultimately responsible for ensuring that precautions are adequate but a safety officer can advise on improvements in the standard of safety applied in the laboratory and increase the staff's awareness of the safety implications of their work and is a necessary form of assistance in all but the smallest laboratories. In our view such appointments should be made in all laboratories where the pathogens listed in Appendix I are handled.

EXISTING CODES OF PRACTICE

28. A number of codes of practice already in circulation and in use in many laboratories have helped to improve standards of safety in laboratories. We noted the variation in detail and in completeness of these codes of practice and that their adoption is voluntary. Consequently no mechanism exists to ensure their enforcement. In particular we were advised that the code issued in 1972 by the Department of Health and Social Security and entitled " Safety in Pathology Laboratories " ([2]) had not always been brought to the attention of laboratory staff by health authorities as had been recommended. The code's provisions were not always being observed. Consequently, we recommended that the Department of Health and Social Security remind health authorities of its importance and this was subsequently brought to the attention of Regional Medical Officers.

29. Oversight of laboratories is maintained in a number of different ways and only in the field of animal health have there been statutory controls. Conflicting advice could therefore be given to laboratories from different sources. We consider it vital that there should be efficient communication and co-ordination among the different interests involved and WE RECOMMEND that general guidance on safety in laboratories should be drawn up and applied.

OCCUPATIONAL HEALTH

30. Occupational health measures can contribute significantly to decreasing the risk of infection both to the individual laboratory worker and to those with whom he may come into contact. A health review prior to employment in a laboratory, a regular programme of vaccination and immunisation appropriate

to the pathogens likely to be encountered, obligatory reporting of illness and health checks at specified intervals are all desirable measures. Absences due to illness should always be checked in case they could have resulted from infection acquired in the laboratory. Satisfactory liaison arrangements with the general practitioners of staff are necessary, within the limits set by professional confidence. This is discussed in Appendix III. We are aware of the implications of this for individual laboratory workers for although contributing an obvious benefit to themselves in helping to ensure their good health, such measures might affect adversely their earnings capacity. For example someone thought capable of transmitting infection might be excluded from the work on which he was currently engaged. Usually it will be possible for him to be employed on other work within the same laboratory but should this prove impossible his earning capacity may suffer as a result. In these circumstances we consider that adequate compensation arrangements should be agreed. In this connection we note that an application has been made to the Industrial Injuries Advisory Council which may result in viral hepatitis being classified as an industrial disease. During our deliberations we had the opportunity to consider the preliminary conclusions reached by Dr Harrington in his survey of the health of laboratory staff ([3]). These showed that some safety precautions were not being universally applied and we understand that the results of this work are being studied by the health departments.

INTERNATIONAL CONSIDERATIONS

31. We are aware of the interest currently being shown in a number of countries in the problems presented by the laboratory handling of dangerous pathogens and we specifically considered the " Classification of Etiologic Agents on the Basis of Hazard " prepared by the Center for Disease Control of the US Department of Health, Education and Welfare. The circumstances and considerations differ from country to country depending upon whether the particular disease caused is endemic to that country and the extent to which conditions exist which might assist or deter the spread of infection. Nevertheless the principles adopted in approaching this problem should we think be uniform irrespective of the country involved. We note that the Twenty-Sixth World Health Assembly accepted the report of the Committee on International Surveillance of Communicable Diseases of the World Health Organisation. The report included the recommendation—

> " that health administrations undertake, as a matter of urgency, to identify all laboratories in their countries that had strains of organisms of diseases subject to the Regulations and other highly dangerous or exotic organisms and vectors, and to determine the capacities of these laboratories to contain such organisms and vectors ";

and the request—

> " that the organisation, with appropriate consultation, develop guidelines for containment of these and other organisms and vectors in the laboratory and for their packaging and shipment ".

Particular emphasis was placed on the need to control smallpox virus in view of the imminent eradication of the disease. WE WELCOME these recommendations and feel that as similar considerations apply to animal health the Food and Agriculture Organisation should also assist in developing such guidelines.

CHAPTER 4

PROPOSED CONTROL MEASURES

32. We identified over 70 pathogenic microbes which we considered should be subject to special restriction in the UK. These are listed at Appendix I. Some degree of risk attends the handling of any pathogen and WE RECOMMEND that no pathogen (whether included in Appendix I or not) should be handled in laboratories except under the control of suitably qualified staff. The pathogens at Appendix I are divided into two groups. The first group (category A) consists of those which we regard as the most highly dangerous and for which the most stringent precautions are required. They are organisms so dangerous as to present great risks to the health either of laboratory workers or of the human or animal communities. The organisms in the second group (category B), while not presenting the same degree of danger, still require careful handling because there are special risks to laboratory workers and/or animals. However, they are either already present in the human or animal communities in this country or are unlikely to cause epidemics if introduced into this country.

33. We do not consider these groupings to be definitive; WE RECOMMEND that they should be kept under review and they may well be amended in the light of future discussion and experience. A system to enable this to be achieved is proposed below (paragraph 39). We feel that the control measures suggested for use in a laboratory handling pathogens should be related to the degree of hazard presented by those pathogens. Consequently we propose different precautions for each category of pathogen. We recognise also that different degrees of hazard are presented by individual pathogens within the same category and we would expect these differences to be reflected in a flexible approach to the appropriate measures.

Category B pathogens

34. Pathogens included in this group should be handled in laboratories only under the control of suitable qualified staff and while observing the precautions set out in an appropriate code of practice. WE RECOMMEND that a code of practice should be drawn up centrally to be used as a basis for standing orders suitable for the individual laboratory. It is important that staff working in the laboratory should be well aware of the precautions to be adopted and copies of the code should be available to them. Supervisors should ensure that their juniors are conversant with its contents. Until such a code is drawn up useful guidance may be found in "Safety in Pathology Laboratories" and "The Prevention of Laboratory Acquired Infection"([4]). Laboratories handling pathogens of danger to animals would be expected to observe any additional requirements contained in codes of practice which recognise the special hazard to farm livestock presented by such activities.

35. To ensure that the importance of safety precautions is given proper recognition in laboraties WE RECOMMEND that, in each laboratory, either a safety officer should be appointed or a senior person in the laboratory should be

designated for that duty and allowed the necessary time to discharge the function satisfactorily. He should ensure that the necessary facilities are provided for educating staff in safety procedures. WE RECOMMEND that courses of training for safety officers should be established to enable them to carry out these vital duties effectively.

Category A pathogens

36. Pathogens included in this group are those we regard as the most highly dangerous and we considered that urgent action was required to introduce measures to control their import into, transit within and holding or handling in this country. It is not sufficient for such measures to be applied as seen fit by individual laboratories. In view of the degree of hazard presented to the human and animal communities by work being undertaken on pathogens in laboratories it is essential that control of their possession and of their use should be exercised by some central body.

37. In May 1974 therefore we submitted to the Secretary of State for Social Services an Interim Report in which WE RECOMMENDED that a system of control for work with pathogens in this category should be set up as soon as possible. Such a system of control could only be voluntary in the first instance and we considered that in due course it would need to be reinforced by appropriate statutory powers. It involved the establishment of a confidential system whereby any laboratory holding or handling (or intending to hold or handle) pathogenic micro-organisms included in category A would apply to the appropriate Department (see paragraph 44). The Department would then seek the advice of a Dangerous Pathogens Advisory Group on the desirability of that laboratory's continuing with or undertaking the work proposed and on the conditions under which the work should be done. The Dangerous Pathogens Advisory Group would be a small independent body of experts consisting of individuals whose experience would command the confidence of those working in laboratories.

38. The interim Report was accepted by the Secretary of State and we were subsequently invited to consider the detailed arrangements for the operation of the system. We advised on these in October 1974.

The Role of the Dangerous Pathogens Advisory Group

39. We advised that the function of the Advisory Group should be:

1. To determine by enquiry the physical conditions and organisation in any laboratory working or proposing to work with category A pathogens. Special attention should be paid to the experience and competence of the workers concerned.

2. To advise the appropriate Department(s) after suitable interchange with the laboratory, whether the safeguards in use in that laboratory met the standards the Advisory Group considered necessary. To advise on any additional safeguards needed to meet these standards. In some circumstances the Advisory Group might advise that a laboratory be given approval for a part only of the work it proposed to undertake. To comment, as appropriate, on the value of the work in relation to the hazards presented.

3. To review and revise as necessary the list of category A pathogens.

4. On request, to advise laboratories handling category B pathogens on suitable safety precautions.

40. Visits would have to be made to laboratories handling category A pathogens to discover how live preparations of the pathogens were being stored and handled. Appropriate advice could then be formulated. The total number of laboratories, though not large, is larger than expected. (Questionnaire returns have so far identified 115). Inevitably the work falling upon members of the Dangerous Pathogens Advisory Group would be heavy and WE RECOMMEND that the Department(s) concerned should obtain quickly the services of specialists who could assist by visiting laboratories and reporting to the Advisory Group. Unless this were done we feared considerable delays would occur.

41. We considered it essential that those who visit laboratories should command the confidence of the staff in those laboratories. They should therefore be of high professional standing, have experience in handling dangerous pathogens and be in close touch with current techniques and developments. Such persons are to be found in various Government laboratories and we thought that Departments would look to those organisations and to the universities and Research Councils for help.

42. We also felt it was important that a high level of confidentiality should be maintained. It should be made clear that information given by laboratories in reply to the questionnaire or in the course of visits would remain confidential to those directly interested.

The Public Interest

43. In our Interim Report we stated that preparations containing viable category A pathogens should not—

> " be held or transferred within or imported into this country without prior permission from an appropriate authority, and that such permission should be granted only after ensuring that the necessary conditions for the safe handling and packaging of the organisms were met and that the purpose for which they are held or imported is of overriding importance ".

Apart from the question of safety we believe a decision is required on whether the purpose for which pathogens are held is of " overriding importance " when the value of the work is considered in relation to the risks involved.

44. The development of a technique, the educative value of carrying out a process, the desirability of keeping specimens for reference, general scientific merit or even the probability of a specific contribution to knowledge would not of themselves justify automatic acquiescence with a request to use category A pathogens. The risk to the public presented by the pathogens must be balanced against the possible benefits to the public to be derived from work on them. An expert assessment is required in each case for each pathogen and WE CONSIDER that the final decision should rest with those who represent the

public, suitably advised. As the ultimate question is one of danger to human or animal health the responsibility is that of the Secretary of State for Social Services or the Minister of Agriculture, Fisheries and Food or their counterparts in Scotland, Wales or Northern Ireland. The Minister would consult other Government Departments and could seek advice from the Dangerous Pathogens Advisory Group, and any other expert body, such as the appropriate Research Council and would no doubt take into account such factors as the purpose of the proposed work and whether similar work was already in progress elsewhere.

Form of approval

45. Once the Dangerous Pathogens Advisory Group has ascertained what were the precautions in operation in a laboratory it would advise the appropriate Department on whether those precautions were adequate. The Department would notify the laboratory that it approved specific work on specific pathogens. General approval to work on all category A pathogens would not be given. A further application would be required if a laboratory wished to extend the range of pathogens or enlarge the scope of its work.

46. Laboratories holding category A pathogens should not send material containing viable organisms to any laboratory in this country without first seeking the agreement of the Dangerous Pathogens Advisory Group unless the recipient laboratory was already working on that pathogen and already had the approval of the appropriate Department for that work. The method of transfer within this country or to laboratories overseas should be subject to Advisory Group approval.

Code of Practice

47. Any laboratory holding category A pathogens should observe the precautions recommended for laboratories holding category B pathogens. However, in view of the particularly hazardous nature of work with category A pathogens we consider that some more stringent precautions must be taken and some additional facilities provided when they are handled. We set up a sub-group to consider this and the code of practice which it compiled is at Appendix III. It includes recommendations on the design of laboratories and animal houses and the facilities that should be provided; procedures for handling specimens and laboratory discipline; security; the responsibilities of safety officers; arrangements for training and supervision of laboratory staff and arrangements to safeguard the health of staff and to alert the responsible officers to any health hazard for the community.

48. The code we have drawn up is intended as appropriate to work on very dangerous pathogens presenting a hazard to humans, for example on Lassa Fever or Marburg viruses. It is intended that it should be suitably amended to take account of the different properties of other category A pathogens. The Dangerous Pathogens Advisory Group should have unquestioned authority to advise the reinforcement or relaxation of the code as appropriate to the pathogens held and to the work proposed in any individual laboratory. In the introduction to the Code of Practice we have defined the different types of work in which pathogens may be encountered and suggest the considerations that should apply to each.

Publicity

49. Replies to our questionnaire have enabled us to compile a list of laboratories at present handling category A pathogens. When the Dangerous Pathogens Advisory Group has been set up, directors of these laboratories should be informed that the voluntary system of control has been established and invited to participate in it. We are confident that our list is as complete and accurate as possible but in addition the institution of the voluntary system should be brought to the attention of all laboratories. Some may be holding pathogens which have not been reported and others will wish to acquire pathogens in the future and it is important that no laboratory should be ignorant of the action required.

50. Hitherto we have considered the subject of safety within the laboratory but there are factors external to the laboratory which have implications for the health of the human or animal communities. WE RECOMMEND that any laboratory undertaking work on the category A pathogens which present a hazard to man should be known to the Local Authority in whose area the laboratory is situated, and specifically to the medical officer with responsibility for notifiable diseases. In England and Wales this is usually the Medical Officer for Environmental Health (MOEH). The local officer of the Health and Safety Executive should similarly be informed. We suggest that these officers should be consulted at the time visits are made and that they should subsequently be notified of the terms of the approval given to the laboratory. Once contact has been established between the laboratory and the Local Authority they would have to agree satisfactory procedures for the protection of the public health, for example concerning the disposal of laboratory waste, immunisation programmes and health care arrangements for laboratory staff in the event of illness. It would be for the MOEH to ensure that the family doctors of laboratory staff are aware of the risks of their patients' work and to co-ordinate arrangements with the laboratory's safety officer.

51. For the future the onus will be on any laboratory wishing to work with a category A pathogen to seek the advice of the Dangerous Pathogens Advisory Group. It should be clearly understood that such pathogens are not to be acquired nor such work begun before any advice has been applied. From time to time appropriate publicity should remind directors of any laboratories where such work might be undertaken of this requirement.

Form of Control procedures

52. To summarise, the main events in the voluntary system of control would be as follows—

1. A laboratory working on, or wishing to work on, category A pathogens would apply to the appropriate Government Department for reference to the Dangerous Pathogens Advisory Group.

2. The Advisory Group would arrange a visit to the laboratory to enquire into the circumstances in which the work would be done and the purpose of that work.

3. The Advisory Group would advise the appropriate Department(s) whether the precautions in operation in the laboratory would be adequate for the work proposed. It would advise on additional precautions necessary to ensure safety. The Advisory Group could comment on the value of the work proposed in relation to the hazards involved if it so wished.

4. The Department(s) would consider the Advisory Group's report and other factors and decide whether approval to do the work should be given. Any other Department with an interest in the laboratory's work would be consulted before a final decision was taken.

5. If approval were refused, or if approval were given for only part of the work proposed, reasons would be given and the laboratory could make representations to the Department.

Special position in Northern Ireland

53. In the field of animal health special considerations apply in Northern Ireland as some animal diseases endemic in Great Britain are not normally found there. Legislation to maintain this position and specific to Northern Ireland already exists. A different constitutional position also obtains in that powers are vested in the Departments of Health and Agriculture in Northern Ireland. We accept that a special position obtains in Northern Ireland and WE RECOMMEND that the control measures should permit this special position to be maintained.

54. The system for control outlined above would be equally applicable to Northern Ireland given some modifications, viz:

- supplementary lists of pathogens (lists A and B) subject to control only in Northern Ireland could be drawn up;
- such a list could be compiled either by the Dangerous Pathogens Advisory Group (which would then have to include specific representatives of Health and Agriculture in the Province) or by a separate advisory group for Northern Ireland;
- the " appropriate Department " to whom reference reports would be made would be the Department of Health or of Agriculture in Northern Ireland.

The position of Northern Ireland is discussed in more detail in Appendix IV.

Report of the Committee of Inquiry into the Smallpox Outbreak

55. The report of this Committee of Inquiry was presented to Parliament in June 1974 and we therefore had the opportunity to consider it before reaching our own conclusions about the precautions required in handling dangerous pathogens. The Committee's recommendations were specifically related to the handling of smallpox virus and not necessarily appropriate to the handling of other pathogens. Moreover they were only intended as an interim set of measures to be adopted pending further consideration of the general question of laboratory work on pathogens by a " permanent committee of experts ". Their call for such a body was anticipated by the setting up of our Working Party and we recommend that this function now be continued by the Dangerous Pathogens Advisory Group.

56. The Committee of Inquiry recommended that the " permanent committee of experts " should:

1. designate a list of pathogens including smallpox virus, laboratory work with which constitutes a major threat to public health;

2. maintain for public inspection a register of establishments and departments within them where any work with designated pathogens is being undertaken;

3. formulate and regularly review a code of practice necessary for the safe conduct of all procedures in the appropriate laboratories of such registered premises, and

4. have the requisite powers to ensure that no potentially hazardous work is undertaken in those laboratories unless the code is followed.

57. The first of these tasks has been completed by the compilation of the list of category A pathogens. The replies to our questionnaire have enabled a record to be set up of those laboratories holding category A pathogens, as recommended at 2., but we do not consider this need be available for public inspection. In our view the co-operation of laboratories is likely to be easier to obtain if they are assured that information supplied by them will be treated in the strictest confidence. Moreover we do not see what particular benefits there would be in making such information available to the general public, provided that implementation of the precautions we have suggested is ensured by the Dangerous Pathogens Advisory Group. On 3. we have recommended the implementation of a particular code of practice to which we have added a list of supplementary precautions to be observed in handling certain pathogens. We have differed from the Committee of Inquiry in some of the particular precautions recommended where we feel more stringent safeguards are required, and also where pathogens other than smallpox demand precautions of a rather different nature. We have recommended initially the establishment of the system of control on a voluntary basis but we recognise, as 4. suggests, that in due course statutory powers will be required. The suggested form these powers should take is set out in the next chapter.

CHAPTER 5

THE NEED FOR STATUTORY POWERS

58. In the previous chapter we suggested control measures and codes of practice to be observed when handling dangerous pathogens. The implementation of our recommendations can be expected to lead to an improvement in safety precautions in operation in laboratories and the publication of this report to a generally increased awareness of the risks involved in handling dangerous pathogens. To the laboratory worker there is a significant risk in handling these pathogens, as a number of tragic incidents bear witness. Danger to the public from escape of an organism is less likely but the consequences in terms of morbidity or mortality should this occur could be very serious. Infection of the animal community represents severe economic loss as well as great suffering to the animals.

We proposed a voluntary system of control because we saw a need to take urgent action to minimise the risks. However, as these risks are considerable we feel it is necessary to back the voluntary control measures with statutory powers. We are confident that the scientific community in general will adopt a responsible attitude towards the problem and will improve safety conditions where this is shown to be desirable. We hope and expect that improvements will be introduced as a result of close co-operation and constructive discussion between laboratories and the Advisory Group. Nevertheless we consider that the public has a right to expect powers of enforcement to exist.

59. A number of pieces of legislation already control particular aspects of the problem and others could be used to provide wider control, viz:

Factories Act 1961 (Applies in England, Wales and Scotland)

The provisions of the Factories Act 1961 are considered to apply to laboratories used for manufacturing processes (eg the production of vaccine) and those engaged as a matter of routine in connection with the manufacturing process (eg for sampling, quality testing etc). The Act contains no specific provisions relating to pathogenic organisms but if dangerous practices or conditions existed then it would be possible to proceed by way of a court order to prohibit the use of the factory or plant until the necessary steps had been taken to enable the process or work to be carried on with due regard to the safety, health and welfare of those employed. The Factories Act does not apply to laboratories used for research or teaching or to hospital laboratories which are among the most frequent users or holders of pathogenic material, as these are not considered to come within the definition of a factory. Its provisions will in due course be replaced by regulations made under the Health and Safety at Work Act.

Diseases of Animals Act 1950 (England, Wales and Scotland)

A combination of controls are exercised by the Agricultural Departments under this Act.

— Part II of the Act provides for the regulation of veterinary therapeutic substances. The Therapeutic Substances Order 1952 (as amended) made under these powers provides for the control, by licence, of the manufacture, import and handling of sera antitoxins, antigens and vaccines to be used for veterinary purposes. Licences may not be granted where such substances are liable to spread disease. The Medicines Act provides for the repeal of this part of the Act. In addition the administration of sera and glandular products to ruminants and swine is prohibited by the Foot and Mouth Disease (Sera and Glandular Products) Order 1939 made under earlier diseases of animals legislation, unless authorised by the Agricultural Departments.

— Part I of the Act provides powers, among other things, to prohibit or regulate the import of "animals, carcasses, fodder, litter, or other things". The Importation of Carcasses and Animal Products Order 1972 made under these powers provides for the conditional licensing of the import of carcasses and animal products but for the purposes of the Order "animal" relates primarily to farm animals and does not provide for control, for example over carcasses and tissues of exotic animals. Because of this limitation consideration is being given to the extension of the definitions of "animals" and "animal products" in the Order to widen the range of species and substances to which the controls can be applied.

— Control is exercised over laboratories working on certain organisms which would cause diseases which are notifiable under diseases of animals legislation. Licences are issued to exempt laboratories from the normal conditions of the disease Order which require any animal or poultry suffering from the disease to be notified to the Ministry of Agriculture and in some cases for such animals to be slaughtered. The licences giving this exemption set out conditions relating to the security of the premises and procedures for handling the pathogen, to the nomination of a suitable person to be responsible for the safe keeping of the pathogen and for compliance with conditions, and to the movement of such pathogens from the licensed premises.

— Under the Diseases of Animals Bill at present before Parliament the importation control provisions of existing diseases of animals legislation are being replaced by a modernised and consolidated code. The powers given to the Minister of Agriculture, Fisheries and Food and the Secretary of State for Scotland to control the import of animals and animal material will be available when the Bill becomes law to enable controls to be applied to the import of animal pathogens. The relevant provisions will, we understand, enable the Agriculture Ministers either to prohibit the importation of a pathogen or to make its importation subject to whatever conditions they consider necessary for the purpose of preventing the introduction and spread of disease.

The Medicines Act 1968 (All UK, including Northern Ireland)

This Act which applies to the UK, provides for a comprehensive system of control by licence of the manufacture, import, marketing and distribution, sale, supply and description of medicinal products for human or veterinary use. Section 105 of the Act includes powers to make orders applying these provisions subject to such exceptions and modifications as may be specified, to a substance which is not a medicinal product where it appears to the Health and Agriculture Ministers that, if used without proper safeguards, that substance is capable of causing danger to the health of the community, to the health of animals generally or to one or more species of animals. We understand that pathogenic organisms could probably be brought within the scope of the Act and hence of the licensing system with a Section 105 order, though this section has not hitherto been used to control the use of micro-organisms.

Rabies Act 1974 (England, Wales and Scotland)

The purpose of this Act, is to extend the powers under the Diseases of Animals Act 1950 to deal with an outbreak of rabies outside quarantine; to provide supplementary powers to control the importation of animals which may carry rabies; and the importation, keeping and use of rabies virus. The Act enables orders to be made for prohibiting or regulating the keeping and importation of rabies virus in any form and the deliberate introduction of the virus into animals.

Health and Safety at Work Act (England, Wales and Scotland)

The provisions of Part I of this Act relate to:

— securing the health, safety and welfare of persons at work;
— protecting persons other than persons at work against risks to health or safety arising out of or in connection with the activities of persons a work;
— providing safeguards in connection with the keeping or use of explosive or highly inflammable or otherwise dangerous substances, and generally preventing the unlawful acquisition, possession or use of such substances.

The Act (with certain exceptions) applies to all areas of employment including Crown premises, although special provisions are made relating to agricultural activities.

The Act provides general powers for imposing more detailed requirements by statutory instrument. These may include notification of the handling of substances, registration of premises, licensing of the manufacture, supply, keeping or use of dangerous substances, certification of persons to supervise certain operations, and prior permission to undertake high hazard activities. The Health and Safety Commission has powers to approve non-statutory codes of practice after consultation with the appropriate Government department and to initiate, when it considers it to be necessary, enquiries into any hazardous situation. Inspectors appointed by the Health and Safety Executive have powers of entry, and where there is failure to comply with the requirements of the Act or of approved codes of practice, to issue Improvement and Prohibition notices without going through the courts, although not on Crown premises.

Northern Ireland

Similar measures are enacted in Northern Ireland and these are described in Appendix IV.

60. Whatever means of implementing a statutory system of control is adopted we consider it important that the system should fulfil the following criteria:

- Control should be exercised over the importation, possession, use and disposal of category A pathogens. The control measures should be enforceable, with appropriate sanctions to ensure this.
- All pathogens, whether of danger to humans, to animals or to both should be subject to a broadly similar system of control, based on similar underlying principles.
- It is highly undesirable that a single laboratory should be liable to inspection by a number of different bodies for similar purposes. If more than one Act applies we would expect joint inspection to take place and co-ordinated advice to be given to the laboratory.
- Inspection of laboratories should be carried out by experienced specialists of high standing in their profession.
- When approval to do work is refused, or is given for only part of the work specified in the application, reasons for the refusal should be given and a system of appeal laid down.
- The Dangerous Pathogens Advisory Group should be maintained.

61. It is our conclusion that the several powers listed in paragraph 59 could be used at once but do not provide a convenient and quickly responsive system for the control of hazards which are unlikely, but could be capable of causing extensive harm. WE RECOMMEND therefore that these powers be consolidated so that the Departments of Health and Agriculture can act with full authority, without delay and with uniform principles. New legislation should confer on the responsible Minister the power—

(1) to register laboratories which alone may hold and use preparations known to contain living organisms of specified strains;

(2) to designate the strains to be controlled;

(3) to limit import of such preparations to authorised occasions.

(4) to prohibit transfer of such preparations within the country save on specific authority as to destination and conditions in transit.

SUMMARY OF RECOMMENDATIONS

1. The total number of laboratories holding pathogens in categories A and B should be reduced by ceasing the practice in any laboratory which cannot show good reason for continuing (paragraph 16).

2. When work involves any special risk to the public a decision on whether that work should proceed should be made outside the laboratory (paragraph 22).

3. General guidance on safety in laboratories should be drawn up and applied (paragraph 29).

4. International standards for the control of dangerous pathogens should be drawn up (paragraph 31).

5. No pathogen should be handled in a laboratory except under the supervision of suitably qualified staff (paragraph 32).

6. The categorisation of dangerous pathogens included in this report should be kept under review and modified as necessary in the light of future discussions and experiences (paragraph 33).

7. A safety officer should be appointed in any laboratory holding dangerous pathogens (paragraph 35).

8. Courses of training for safety officers should be established (paragraph 35).

9. Arrangements for control measures should permit the special position of Northern Ireland to be maintained (paragraph 53).

Category A pathogens

10. A voluntary system of control of pathogens in category A should be established as soon as possible (paragraph 37).

11. A statutory system of control should be established in due course (paragraphs 37 and 61).

12. An expert Dangerous Pathogens Advisory Group should be set up to examine the safety precautions in force in laboratories proposing to hold category A pathogens (paragraph 27).

13. The Dangerous Pathogens Advisory Group should be so constituted as to be able to advise on control measures required in genetic experiments (paragraph 21).

14. The services of specialists should be obtained to assist in visiting laboratories (paragraph 40).

15. The final decision on whether proposed work is in the public interest should rest with the appropriate Government Minister (paragraph 44).

16. Approval to a laboratory should be for specified work on specified pathogens and not for category A pathogens as a whole (paragraph 45).

17. Pathogens should not be sent outside the laboratory without the prior approval of the Dangerous Pathogens Advisory Group (paragraph 46).

18. The Code of Practice at Appendix III should form the basis for the decision on the adequacy of safety precautions (paragraph 47).

19. The Medical Officer for Environment Health and local Health and Safety Officer (or corresponding officers) should be notified of the presence of a laboratory handling category A pathogens in their area and of the terms under which such work is approved (paragraph 59).

20. Suitable publicity should ensure that all laboratories are aware of the voluntary system of control and of the organisms to which it applies (paragraph 49).

Category B pathogens

21. A Code of Practice should be drawn up centrally which could be used as a basis for standing orders in category B laboratories (paragraph 34).

References

(1). Report of the Committee of Inquiry into the Smallpox Outbreak in London in March and April 1973; Cmnd 5626; HMSO 1974.
(2). Safety in Pathology Laboratories; Department of Health and Social Security and Welsh Office, 1972. (Circulated with HM(72)34 and SHM 48/1972).
(3). The Health of Medical Laboratory Workers; Dr J M Harrington; Unpublished research.
(4). The Prevention of Laboratory Acquired Infection; C H Collins, E G Hartley and R Pilsworth; PHLS monograph 6; HMSO 1974.

APPENDIX I

CLASSIFICATION OF PATHOGENS

CATEGORY A PATHOGENS

Organisms so dangerous as to present great risks to the health either of laboratory workers or of the human or animal communities such that material containing live organisms should not be accepted knowingly or held at all in this country without authorisation.

(i) Pathogens presenting hazards primarily or significantly to the human community.

VIRUSES	Herpes B virus of monkeys
	Lassa Fever virus
	Marburg virus
	Rabies virus
	Smallpox virus

(ii) Pathogens presenting hazards primarily to animals.

VIRUSES	African Horsesickness virus
	African Swine Fever virus
	Bluetongue virus
	Equine Encephalomyelites group of viruses
	Foot and Mouth Disease virus
	Fowl Plague viruses
	Infectious Pancreatic Necrosis virus
	Infectious Haematopoietic Necrosis virus
	Japanese B virus
	Lumpyskin Disease virus
	Newcastle Disease virus
	Rift Valley Fever virus
	Rinderpest virus
	Saint Louis virus
	Sheep Pox virus
	Spring Viraemia virus
	Swine Fever virus
	Swine Vesicular Disease virus
	Teschen Disease virus
	Vesicular Exanthema virus
	Vesicular Stomatitis virus
	Viral Haemorrhagic Septicaemia virus
	Wesselsbron virus
BACTERIA	*Aeromonas salmonicida* (Furunculosis)
	Flexibacter columnaris (*Chondrococcus columnaris*)
	Francisella tularensis
FUNGUS	*Histoplasma farciminosum*
PROTOZOA	*Myxosoma* (*Lentospora*) *cerebralis* (Whirling disease)
PIROPLASMA	*Theileria*, all species
FLAGELLATES	*Trypanosoma cruzi* (Chagas' disease)
	Trypanosoma equiperdum
	Trypanosoma vivax
NOT YET CLASSIFIED	Agent of Ulcerative Dermal Necrosis
	Agent of Erythrodermatitis

CATEGORY B PATHOGENS

Organisms which present considerable dangers to laboratory workers and/or animals but are either present in the human or animal communities or are not likely to cause epidemics. They should only be held in a laboratory under the supervision of suitable qualified staff.

VIRUSES	Arboviruses, all species not in Category A
	Aujesky's Disease virus
	Bat rhabdovirus
	Contagious Pustular Dermatitis virus
	Duck Plague virus
	Equine Infectious Anaemia virus
	Equine Viral Arteritis virus
	Infectious Bovine Rhinotracheitis virus
	Kyanasur Forest Disease virus
	Lymphocytic Choriomeningitis virus
	Monkey Pox virus
	Murine rhabdovirus
	Serum Hepatitis (HBAg)
	Transmissible gastroenteritis virus (of pigs)
	Unattenuated Yellow Fever virus
BACTERIA	*Bacillus anthracis*
	Brucella, all species
	Clostridium botulinum
	Leptospira, all species
	Mycobacterium leprae
	Mycobacterium tuberculosis, all strains
	Pseudomonas mallei (*Loefflerella mallei*)
	Pseudomonas pseudomallei
	Salmonella typhi
	Vibrio cholerae
	Yersinia pestis (*Pasteurella pestis*)
RICKETTSIAE	*Rickettsiae*, all species
	Coxiella burnettii (Q fever)
CHLAMYDIA	*Chlamydia psittaci*
PIROPLASMA	*Babesia*, all species
PLASMODIA	*Plasmodium*, all species
MYCOPLASMATA	*Mycoplasma mycoides var mycoides*
	Mycoplasma mycoides subsp. capri
	Mycoplasma agalactiae subsp. agalactiae
FUNGUS	*Coccidioides immitis*
NOT YET CLASSIFIED	Enzootic Bovine Leucosis agent

APPENDIX II

SURVEY RESULTS

1. The Questionnaire

Dear Sir

LABORATORY USE OF DANGEROUS PATHOGENS

1. Following the outbreak in early 1973 of smallpox from a laboratory source, the Secretary of State for Social Services in conjunction with the Secretaries of State for Scotland, Wales, Northern Ireland, and Education and Science, and the Minister of Agriculture, Fisheries and Food, set up a Working Party under the Chairmanship of Sir George Godber to examine the risks of human and animal health presented by the handling of dangerous pathogens and to make recommendations as to the measures required to prevent the spread of infection in man and animals. A list of Working Party members and their terms of reference is printed overleaf.

2. There is at present no complete list of pathogens held in this country and the Working Party consider that information on the type of pathogens held in laboratories and the purpose for which they are held is fundamental to their task. They therefore seek your co-operation in ensuring that the attached questionnaire is completed and returned by 10 *July* 1974 *to:*

Mrs S Johnson
Room 1214
Department of Health and Social Security
Hannibal House
Elephant and Castle, London SE1 6TE

When an organisation or authority is responsible for several separate laboratories that might be handling pathogenic material they are asked to complete a questionnaire for each laboratory; further copies of the questionnaire are obtainable from the above address. All information provided will be treated in strict confidence by the Working Party.

3. A check list is included but you are only asked to record the organisms of which you hold live preparations in any group of pathogens in the questionnaire. You are not asked to say what organisms you expect to meet in your diagnostic work, regularly or occasionally.

4. It is well understood that laboratories have no control over the nature of infective agents which may be present in material sent to them although some selection will result from the known special interests of some of them doing diagnostic work. Our primary concern is with cultures or known infected material which may be held for research, teaching or comparative purposes.

Yours faithfully

J G HANDBY
Joint Secretary

OFFICE USE ONLY

Serial No.

LABORATORY USE OF DANGEROUS PATHOGENS-ORGANISMS

Name of Laboratory .....

.....

Address of Laboratory .....

.....

Responsible Authority/Organisation .....

.....

Name of Supervising Officer
(of Laboratory or Microbiology Section) .....

Position Held .....

Laboratory Function (Please place a circle around the appropriate code to indicate the *main* function of the laboratory from list below)

EDUCATIONAL:	Medical/Veterinary/Agricultural School	01
	University Science Department	02
	Technical College/Polytechnic Etc	03
	School	04
RESEARCH:	Medical/Veterinary/Agricultural	05
	Other Service	06
	Commercial/Industrial	07
PRODUCTION:	Production of Bulk Microbes	08
	Testing of Products with Microbes	09
DIAGNOSTIC:	Public Health Laboratory Service	10
	Veterinary Diagnostic Laboratory	11
	Hospital	12
	Private	13

PATHOGENS HELD

Please indicate whether a pathogen is normally held by your laboratory by placing a circle around either YES or NO as appropriate, after each pathogen. Each line should be completed.

HUMAN PATHOGENS (including animal pathogens transmissible to man)

1.	VIRUSES:	Bat rhabdovirus	YES/NO
2.		Contagious Postular Dermatitis virus ...	YES/NO
3.		Foot and Mouth Disease virus	YES/NO
4.		Herpes B virus of monkeys	YES/NO
5.		Japanese B virus	YES/NO
6.		Kyanasur Forest Disease virus	YES/NO
7.		Lassa Fever virus	YES/NO
8.		Marburg agent	YES/NO
9.		Rabies virus	YES/NO
10.		Saint Louis virus	YES/NO
11.		Smallpox virus	YES/NO
12.		Unattenuated Yellow Fever virus ...	YES/NO
13.		Vesicular Stomatitis virus	YES/NO
14.		Wesselsbron virus	YES/NO
15.		Arboviruses, any other species*	YES/NO
16.		Serum Hepatitis virus (Australia Antigen)	YES/NO
17.	BACTERIA:	*Bacillus anthracis*	YES/NO
18.		*Brucella*, all species*	YES/NO
19.		*Clostridium botulinum*	YES/NO
20.		*Francisella tularensis* (*Pasteurella tularensis*)	YES/NO
21.		*Leptospira*, all species*	YES/NO
22.		*Loefflerella mallei*	YES/NO
23.		*Mycobacterium leprae*	YES/NO
24.		*Mycobacterium tuberculosis*, all strains* ...	YES/NO
25.		*Pseudomonas pseudomallei*	YES/NO
26.		*Salmonella typhi*	YES/NO
27.		*Vibrio Cholerae*	YES/NO
28.		*Yersinia pestis* (*Pasteurella pestis*)	YES/NO
29.	RIKETTSIAE:	All *rickettsiae*	YES/NO
30.		*Coxiella burnettii* (Q Fever)	YES/NO
31.	CHLAMYDIA:	*Chlamydia psittaci*	YES/NO
32.	PIROPLASMS	*Theileria*, all species	YES/NO
33.	FLAGELLATES:	*Trypanosoma cruzi* (Chagas disease) ...	YES/NO
34.	PLASMODIA	All plasmodia	YES/NO
35.	FUNGUS	*Coccidioides immitis*	YES/NO

ANIMAL PATHOGENS ONLY

36.	VIRUSES:	African Horsesickness virus	YES/NO
37.		African Swine fever virus	YES/NO
38.		Arboviruses, any species*	YES/NO
39.		Aujesky's disease virus	YES/NO
40.		Bluetongue virus	YES/NO
41.		Duck Plague virus	YES/NO
42.		Encephalomyelitis group of viruses ...	YES/NO
43.		Equine Infectious Anaemia virus	YES/NO

*Please list species held at the end of the questionnaire.

44.		Equine Viral Arteritis viruses	YES/NO
45.		Fowl Plague virus	YES/NO
46.		Infectious Bovine Rhinotracheitis virus ...	YES/NO
47.		Lumpyskin Disease virus	YES/NO
48.		Murine rhabdovirus	YES/NO
49.		Newcastle Disease virus	YES/NO
50.		Rift Valley Fever virus	YES/NO
51.		Rinderpest virus	YES/NO
52.		Sheep Pox virus	YES/NO
53.		Swine Fever virus	YES/NO
54.		Teschen disease virus	YES/NO
55.		Transmissible gastroenteritis virus ...	YES/NO
56.		Vesicular Disease of Swine virus	YES/NO
57.		Vesicular Exanthema virus	YES/NO
58.	PIROPLASMS:	*Theileria*, all species*	YES/NO
59.		*Babesia*, all species*	YES/NO
60.	MYCOPLASMATA:	*Mycoplasma mycoides var mycoides* ...	YES/NO
61.		*Mycoplasma mycoides subsp. capri* ...	YES/NO
62.		*Mycoplasma agalactiae subsp. agalactiae* ...	YES/NO
63.	FLAGELLATES:	*Trypanosoma equiperdum*	YES/NO
64.		*Trypanosoma vivax*	YES/NO
65.	FUNGUS:	*Histoplasma farcinimosum*	YES/NO
66.	NOT YET CLASSIFIED:	Enzootic bovine leucosis agent	YES/NO

*Please list species held at the end of the questionnaire

Signed .....

Date .....

Lists: 1. *Arboviruses* 2. *Brucella*

3. *Leptospira* 4. *Mycobacterium tuberculosis*

5. *Theileria* 6. *Babesia*

2. Results

1. RESPONSE RATE

A large number of questionnaires were issued on 10 June. As a result of the discrepancies and duplication described above many were amalgamated into a single reply. These have been counted as one questionnaire and one reply in the following tables.

Number of laboratories holding pathogens	595
Number of laboratories with no pathogens	1,269
Number of laboratories not replying	2,152
Total number of questionnaires sent	4,016

The response rate is therefore 46·5 per cent. However, the figure for non-respondents is almost certainly over-estimated as these laboratories are subject to the same duplication as the responding laboratories, but the extent of that duplication cannot be calculated.

2. ANALYSIS

In the following tables:

1. all figures refers to the total number of establishments.

2. when establishments are analysed by laboratory function there is some double counting as some laboratories identified more than one main function. Categories 1 (Medical/Veterinary/Agricultural School) 5 (Medical/Veterinary/Agricultural Research) and 12 (Hospital) are particularly subject to duplication.

3. "Human pathogens" means pathogens causing disease in human or pathogens causing diseases of animals which are transmissible to humans.

"Animal pathogens" means pathogens causing disease only or predominantly in animals.

TABLE 1. TOTAL NUMBER OF ESTABLISHMENTS HOLDING PATHOGENS

Category A			*Category B*			*All pathogens*		
Human	Animal	Total	Human	Animal	Total	Human	Animal	Total
49	87	115	564	101	581	567	127	595
(2·6)	(4·7)	(6·1)	(30·6)	(5·5)	(31·4)	(30·6)	(6·8)	(32·0)

Figures in parentheses are percentages of all laboratories replying

TABLE 2. TOTAL NUMBER OF ESTABLISHMENTS HOLDING INDIVIDUAL PATHOGENS

Category A Pathogens	*No of establishments*
Herpes B virus	4
Lassa Fever virus	1
Marburg virus	1
Rabies virus	13
Smallpox virus	19
African Horsesickness virus	1
African Swine Fever virus...	3
Bluetongue virus	1
Equine Encephalomyelites group	29
Foot & Mouth Disease virus	2
Fowl Plague viruses ...	24
Japanese B virus	4
Lumpyskin Disease virus ...	1
Newcastle Disease virus ...	63
Rift Valley Fever virus ...	6
Rinderpest virus	2
Saint Louis virus	2
Sheep Pox virus	5
Swine Fever virus	2
Teschen Disease virus ...	6
SVD virus	1
Vesicular Exanthema virus	1
Vesicular Stomatitis virus ...	14
Wesselsbron virus	2
Francisella tularensis ...	3
Histoplasma farciminosum...	0
Theileria, all species ...	8
Trypanosoma cruzi	16
Trypanosoma equiperdum ...	6
Trypanosoma vivax ...	12

Category B Pathogens	*No of establishments*
Arboviruses (human) ...	45
Arboviruses (animal) ...	35
Aujesky's Disease virus ...	21
Bat rhabdovirus	6
Pustular Dermatitis virus ...	24
Duck Plague virus	7
Equine Anaemia virus ...	2
Equine Arteritis virus ...	1
Bovine Rhinotracheitis virus	24
Kyanasur Forest Disease virus	3
Murine rhabdovirus ...	1
Serum Hepatitis virus ...	98
Gastroenteritis virus (pigs)	11
Yellow Fever virus ...	3
Bacillus anthracis	110
Brucella, all species ...	179
Clostridium botulinum ...	52
Leptospira, all species ...	41
Loefflerella mallei	17
Mycobacterium leprae ...	5
M. tuberculosis	289
Pseudomonas pseudomallei...	29
Salmonella typhi	322
Vibrio cholerae	194
Yersinia pestis	29
Rickettsia, all species ...	3
Coxiella burnettii	23
Chlamydia psittaci	28
Babesia, all species ...	17
Plasmodium, all species ...	16
M. mycoides var mycoides ...	19
M. mycoides subsp. capri ...	16
M. agalactiae subsp. agalactiae	17
Coccidioides immitis ...	2
Enzootic Bovine Leucosis agent	0

TABLE 3A

Number of establishments holding category A pathogens by laboratory function

	HUMAN														ANIMAL														
	Herpes B virus	Lassa Fever virus	Marburg virus	Rabies virus	Smallpox virus	Foot & Mouth Disease virus	Japanese B virus	Saint Louis virus	Vesicular Stomatitis virus	Wesselsbron virus	*Francisella tularensis*	*Trypanosoma cruzi*	African Horsesickness virus	African Swine Fever virus	Bluetongue virus	Equine Encephalomyelitis virus	Fowl Plague viruses	Lumpyskin Disease virus	Newcastle Disease virus	Rift Valley Fever virus	Rinderpest virus	Sheep Pox virus	Swine Fever virus	Teschen Disease virus	SVD virus	Vesicular Exanthema virus	*Histoplasma farciminosum*	*Theileria*, all spp	*Trypanosoma equiperdum*	*Trypanosoma vivax*	Total no of establishments holding category A pathogens
Med/Vet/Agr School	2			1	4		2		2			3				2	7		16			1	1	2			3		2	26
University Science Dept				1	1				1			6				1	3		6									2	3	12
Tech College/Poly					1																									1
School																														0
Med/Vet/Agr Research	3			8	6	1	3	1	11	1	1	12	1	2	1	11	16	1	28	4	2	4	1	5	1	1	5	4	7	53
Other Service	1	1	1	1	1		1		1	1	1	1				1	2		1	1		1								2
Commercial/Industrial				2	4							2		2		6	2		7	1		1					2	2	3	11
Production bulk microbes				4	1	1					1	1		1		5	2		6	1	1	1	1	1			1	1	1	9
Testing with microbes				3	1				1			1		1		3	2		5	1	1	1	1	1			1	1	1	6
PHLS				2	7			1	1		1					3	2		3	1							1			13
Vet diagnostic				2	1				1			1		1		6	4		17	1	1	1	1	3			1	1	1	19
Hospital	1			3	4		1		3							2	6		12											19
Private					1		1									2			3											3
Other or unclassified																														0

TABLE 3B

Number of establishments holding category B pathogens by laboratory function

	HUMAN																						ANIMAL											
	Arboviruses all spp not in A	Bat rhabdovirus	Pustular Dermatitis virus	Kyanasur Forest virus	Serum Hepatitis virus	Yellow Fever virus	*Bacillus anthracis*	*Brucella*, all species	*Clostridium botulinum*	*Leptospira*, all species	*Mycobacterium leprae*	*M. tuberculosis*	*Pseudomonas mallei*	*Pseudomonas pseudomallei*	*Salmonella typhi*	*Vibrio cholerae*	*Yersinia pestis*	*Rickettsia*, all species	*Coxiella burnettii*	*Chlamydia psittaci*	*Plasmodium*, all species	*Coccidioides immitis*	Arboviruses all spp not in A	Aujesky's Disease virus	Duck Plague virus	Equine Anaemia virus	Equine Arteritis virus	Bovine Rhinotracheitis virus	Murine rhabdovirus	Gastroenteritis virus (pigs)	*Babesia*, all species	*M. mycoides var mycoides*	*M. mycoides subsp. capri*	*M. agalactiae subsp. agalactiae*	Enzootic Bovine Leucosis agent	Total no of establishments holding category B pathogens
Med/Vet/Agr School	14	2	8		19	1	30	31	17	16	1	47	8	11	36	31	14	1	5	5	2	1	11	7				6		1	3	6	4	3		74
Univ Science Dept	5	1			1		10	7	4	1		8	1	3	15	7	1			1	6		6	4				1			6	4	4	3		47
Tech College/Poly								6	2	1	1	5		5	24	4	2				1		2					1					1	2		30
School																																				0
Med/Vet/Agr Research	31	5	9	1	22		28	32	17	15	4	48	4	7	40	29	9	2	6	9	8	1	23	9	5	2	1	13	1	6	10	11	5	9		125
Other Service ...	2			1	1	1	4	4	2			2		3	5	3	2						1													8
Commercial/Industr	4		1		3		6	8	6	1		11		1	28	6				1	2		2	1	1	1		5		2	3	1	1	1		47
Production bulk microbes	2		2		3		4	8	4	3		4	2	1	5	5	1		2	3	1			1	2	2		3		2	2	1	1	2		13
Testing with microbes	3		2		4		3	11	2	3		8	1	1	25	8			2	3	2			1	2	2		3		2	2	2	1	2		34
PHLS ...	5		5		37	1	26	43	7	5		35	2	8	64	63	4	1	9	10			2	2	1			2		1		1	1	1		80
Vet diagnostic ...	3		6		1		9	35	8	11		19	2	1	3	2	1		6	6	1		1	3	4	2		9		5	3	6	2	6		44
Hospital	10	1	4		62	1	46	71	12	13	1	181	8	15	168	113	13	1	11	8	1	1	6	2				2		1		1	1	1		260
Private		1			1		1		1	1		1	1		4	1		1					1													5
Other or unclassified	1							3						1	4	2	1				1		1								2	2	3		7

APPENDIX III

CODE OF PRACTICE FOR USE IN LABORATORIES HOLDING CATEGORY A PATHOGENS

The sub-group held one meeting to discuss the code of practice. The members from the Working Party were Professor Harris (Chairman), Mr Collins and Dr Tyrrell. Mr W Bruce of the Animal Virus Research Institute, Pirbright, Mr M Burdin, deputy director of the Central Veterinary Laboratory, Weybridge and Professor K Dumbell, Professor of Virology at St Mary's Hospital Medical School were co-opted as members and we would like to express our gratitude for their valuable assistance.

INTRODUCTION

1. This code of practice is for use in laboratories holding category A pathogens and should be regarded, for the time being as supplementary to the basic safety procedures commended in the PHLS monograph "The Prevention of Laboratory Acquired Infection," and in due course to the code of practice we propose should be drawn up for the handling of category B pathogens.

2. As Category A pathogens are not a homogeneous group, but display widely differing properties it is not expected that whole code would be applied in all circumstances (see paragraph 48 of our report).

3. The Dangerous Pathogens Advisory would be able to exercise discretion in advising Departments:

either if it were satisfied that the ends which the Code sought to achieve were fully met by other means

or if it decided that the hazards presented by a certain type of work on a specific pathogen in a particular laboratory required either reinforcement or relaxation of the measures laid down in the code.

4. Thus, the Dangerous Pathogens Advisory Group would advise on the precise precautions necessary to be taken in each laboratory individually. As this involves a consideration of the particular pathogen(s) held and of the type of work proposed it follows that any authority to proceed would be given for specified work on specified pathogens. Any extension of the pathogens held or the scope of the work performed would need a separate application to the appropriate Department.

5. The practice appropriate to a particular laboratory depends upon the nature of the work being carried out, and this is determined to some extent by the purpose that is being served. In terms of objectives, laboratory work with pathogens can be divided into the following categories. One laboratory may be carrying out work of several different types at the same time.

Service diagnostic laboratories
Reference diagnostic laboratories
Culture reference collections
Research
Teaching
Work associated with manufacturing procedures

6. *Service diagnostic laboratories* receive large numbers of specimens containing unidentified micro-organisms. For example, NHS laboratories in England received over 10 million requests for work in general microbiology in 1972. Pathogens in category A are encountered rarely in this country, although the possibility exists that such a pathogen may be present in a specimen sent to a service diagnostic laboratory. All laboratories handling pathogens should observe a suitable code of practice.

However, it is not practicable for service diagnostic laboratories to handle all the large numbers of specimens received as though they contained category A pathogens. Obviously, extreme care must be exercised in dealing with a specimen if there is any reason to believe that it may contain one of the pathogens in category A. Such belief might be based on clinical symptoms, or may arise in the course of laboratory examination. In such cases, it will be appropriate to observe certain of the precautions detailed herein, for example, those relating to protective clothing, and the handling and packaging of specimens.

Material suspected of containing a pathogen in category A should be removed at the earliest opportunity from a service diagnostic laboratory to a properly-equipped reference diagnostic laboratory. Appropriate precautions should be taken when the material is moved, and it may be necessary to carry out disinfection procedures at the service laboratory.

7. *Reference diagnostic laboratories* receive specimens suspected of containing category A pathogens (particularly smallpox) so that the identification can be confirmed or disproved. They should be constructed and equipped in such a way that this work can be carried out without hazard to the staff and to the general public: their structure, equipment and methods of working should be subject to approval by the appropriate Department.

8. *Culture reference collections* which hold pathogens in category A carry out a minimal amount of manipulation in order to maintain the cultures. The appropriate parts of the code of practice given herein should be observed when this is done, and the cultures should be held under proper security.

9. *Research, teaching and work associated with manufacturing procedures* include a variety of activities. When pathogens in category A are used, this Code of Practice should be applied, subject to any modifications advised by the Dangerous Pathogens Advisory Group. Teaching practices, in particular, should be reviewed critically to ensure that category A pathogens are only used when there is no suitable alternative.

NOTE: Throughout this code the term " laboratory " is used to mean any room or rooms in which category A pathogens are handled, and, as appropriate, linking corridors.

A. THE TOXIC LABORATORY—SITING AND STRUCTURE

1. Whereas the toxic laboratory need not be physically separated from other laboratories it should not be sited next to a known fire hazard (eg the solvent store) or be in danger of flooding (eg under a room where water is, or may be, flowing unattended).

2. The laboratory should be isolated from the corridor (or another room) by an air lock. Air locks and rooms must be ventilated by a plenum and exhaust (filtered) air system. The air pressure within the laboratory must be maintained at least 0.3″ water gauge below that in the corridor and must be displayed on a manometer which can be read without entering the laboratory.

3. The laboratory must be sealable so as to permit fumigation.

4. If work is carried out on category A pathogens which can be transmitted by animal or insect vectors, the laboratory must be proof against entry or exit of such animals or insects.

5. Liquid effluent should not be flushed directly from the laboratory to the public sewer.

B. LABORATORY FACILITIES

1. Work on Category A pathogens must not be carried out in normal safety (exhaust protective) cabinets in an otherwise standard laboratory.

2. Each toxic laboratory must have direct access to an autoclave with double doors in which all discarded material should be sterilized prior to cleaning or disposal. There should be no possibility of removing the load on the " clean " side without the autoclave cycle having been completed.

3. Each member of staff working in the laboratory should have adequate air space.

4. Pathogens must be stored in suitable containers (depending on the mode of storage, frozen or freeze-dried) in a locked cabinet reserved for category A pathogens. A key should be available on demand only to nominated individual(s).

C. PROTECTIVE CLOTHING

1. *Laboratory Gowns* should wrap over the chest and fit tightly at the wrists. Ordinary white laboratory coats are *unsuitable*. Staff should have a clean gown for each uninterrupted period spent in the laboratory.

2. Gowns must be autoclaved before they are removed from the toxic laboratory.

3. *Gloves* Surgical gloves must be worn in the toxic laboratory.

4. *Face-shields*, caps respirators and plastic or otherwise impervious clothing must be available and used in appropriate circumstances, eg when there are hazards from splashes or aerosols.

D. SAFETY OFFICER

1. A Safety Officer must be appointed.

2. The Safety Officer should have appropriate qualifications *and* laboratory experience in working with Category A pathogens.

3. The Safety Officer will act as adviser to the Director of the establishment in all matters which may affect the safety of the staff and the containment of the organisms.

4. He will take control, render first aid in, and investigate, all accidents in toxic laboratories and take what other action he considers necessary.

5. Where his responsibilities are not sufficient to warrant his full-time employment as safety officer then, provided that he is readily accessible to the laboratory during normal hours, he may hold another appointment.

6. He will be responsible for the safe storage of pathogens and the maintenance of the inventory.

7. He will be responsible for organising the admission to the laboratory of cleaners and maintenance men and for the disinfection of any apparatus, etc which is to be removed.

8. He will be responsible for advising staff on all aspects of the application of this Code of Practice.

9. He will liaise with the Medical Officer for Environmental Health and the family doctors of staff with health cards (see Section K below).

10. He will organise the initial training in the safe handling of pathogens of staff required to begin work in a toxic laboratory.

E. TRAINING IN HANDLING PATHOGENS

1. The Safety Officer should be responsible for the initial training of all junior, or inexperienced, staff joining the laboratory.

2. Training will cover, eg the correct use of safety-hoods; pipettes; syringes/needles; hot/cold rooms; centrifuges; blenders; freeze-drying; shaking machines; ultra-sonic disintegrators; glassware and the disposal of contaminated protective clothing and laboratory materials.

3. Since it is imperative that laboratory discipline should not be relaxed junior staff, while being encouraged to be safety conscious, should not *train* others in safe handling.

4. A senior laboratory staff member should *continuously* supervise the work of the more junior.

5. Staff should only work with category A pathogens if they have some previous experience in microbiology *and* have had a course of training supervised by the Safety Officer *and* are at least 18 years of age.

F. SUPERVISION

1. Work in the toxic laboratory should, at all times, be supervised by a senior, trained and experienced member of the staff in person.

2. Laboratory staff should never work alone.

3. The supervisor will be personally responsible to the Safety Officer for the safety of the work actually in progress at any time, although he may not be responsible for the overall project.

4. Suitable restrictions should be imposed on contact between handlers of pathogens and patients and/or livestock.

G. LABORATORY DISCIPLINE

1. Each toxic laboratory should be identified clearly with a large sign.

2. When not in use the laboratory must be locked. The key(s) should be kept in a central position, under the supervision of the Safety Officer, and released only to authorised personnel.

3. In normal hours the supervisor will be responsible to the Safety Officer for ensuring that no unauthorised individual enters it.

4. The Safety Officer will hold a list of all those authorised to enter the toxic laboratory.

5. No unlisted personnel (eg visitor, observer, cleaner or maintenance/repair man) will enter the laboratory unless he has received a signed statement from the Safety Officer that it is safe for him to do so.

6. The Safety Officer will be responsible for *confirming* that a laboratory and its apparatus have been disinfected.

7. On entering, laboratory personnel must go through the airlock to a " clean " side changing area (locker room) separated from the " dirty " side by a shower. Normal clothing, rings, watches etc are removed into a locker. Clean sterile protective clothing (see Section D) is put on. Where appropriate, protective overgarments including respirator and hood should be worn. Rubber boots should be put on just prior to entering the toxic area. The " clean " and " dirty " areas should be clearly distinguished physically.

8. On the way out boots and gloves should be washed in a suitable disinfectant (eg 5 per cent chloros). Overgarments should be placed in a bin on the " dirty " side of the showers and all remaining clothing also removed to a bin. Gloves should be the last to go. The individual then showers, transfers to the " clean " side and dresses.

9. This procedure must be adhered to whenever, and for whatever purpose, the room is vacated.

10. Eating, drinking or smoking will not be permitted in any toxic laboratory or animal room at any time.

11. *All* accidents, or spillages, in the toxic laboratory must be reported *immediately* to the Safety Officer. Every such incident must be regarded as a full *medical or animal disease* hazard.

12. The day-to-day cleanliness of a toxic laboratory is the responsibility of those working in it. Only when the Safety Officer has confirmed that it has been successfully disinfected can other cleaning/maintenance work be carried out.

13. At the end of a working day benches and working surfaces should be disinfected.

14. Periodically, and certainly at the end of any particular experimental procedure, the rooms and everything in them must be fumigated with gaseous formaldehyde.

H. HANDLING INCOMING SPECIMENS

1. Clerical staff should not be permitted to open incoming specimens, or packages purporting to contain pathogens.

2. Packets should be opened by someone trained to take appropriate action if the contents are found to be damaged or leaking.

3. It is undesirable for laboratories to transfer category A pathogens by any form of public carrier but, if it is unavoidable then the specimen should be *sealed* in a *leak-proof* container and the intended recipient warned of its despatch. (See Section I below).

4. Particular care is necessary when material is to be transferred from the toxic to other laboratories. Pathogens may remain viable after being prepared for electron microscopy. The Safety Officer must be consulted before *all* transfers.

I. PACKAGING

1. An externally-identified liquid sample should be sealed in a tin can filled with sufficient absorbent material wholly to mop up a spill. The can may if necessary be cooled in solid carbon dioxide or liquid nitrogen.

2. Solid samples should be so wrapped that, in the event of the container being ruptured, it will be apparent whether or not material could have escaped.

3. A specimen for diagnostic purposes should be treated as described by Collins *et al.* (The Prevention of Laboratory Acquired Infection, pp 11–14).

J. SECURITY

1. It is imperative that the laboratory and animal rooms should be secure against the entry of intruders or vandals.

2. Security patrols, etc. should not enter toxic laboratories, or animal rooms. If it appears that an adjacent fire or water hazard threatens the room then the Safety Officer should be informed immediately.

3. A key to the laboratory should be held centrally (see Section G above) for emergency access but should only be released on the instruction of the Safety Officer (eg if he knows that the room has been disinfected then he can do this by telephone).

4. The Safety Officer should have a list of pathogens (categories A and B) held in all toxic laboratories in his charge and know where they are deposited (see Section D above).

5. Any pathogens removed should be signed for, and none should be added without the Safety Officer's knowledge.

K. HEALTH OF STAFF

1. The conventional health declaration form may not be adequate to eliminate those who ought not to work with category A pathogens and it may be necessary to supplement this with a medical examination and, if necessary to insist on this, and on vaccination where appropriate, as a condition of employment.

2. Each employee in a toxic laboratory should carry a card which tells his family doctor that, if he is ill, he *may* have contracted a serious infectious disease requiring his isolation, and requesting the doctor to contact the Safety Officer.

3. The name of the doctor, to whose list an employee is attached, should be recorded by the Safety Officer.

4. It is desirable that, on appointment of an employee to work in the toxic laboratories, his GP should be informed of the nature of this work.

5. The card should be carried by everyone who could have contact at work with the toxic laboratory/animal room.

6. Each such employee should be vaccinated against the organisms with which the laboratory is working so far as this is possible.

7. The immune status of vaccinees should be maintained at an optimum level, and where possible and desirable measured periodically.

8. Records of the health and vaccination status of staff in toxic laboratories must be maintained at a central point and be accessible in an emergency.

9. Vaccination should also be offered to the immediate families of the staff.

10. Staff members should be responsible for reporting absences, due to ill-health, to the Safety Officer. He will enquire, where appropriate, of the patients' own doctor.

11. Where a member of staff fails to attend, without notifying the Safety Officer, his supervisor should immediately institute enquiries.

L. ANIMAL ROOM

NOTE: All relevant regulations in this Code of Practice apply to any room in which animals are under treatment with a category A pathogen. There are, in addition, hazards arising from the natural diseases of animals which may be transmissible to man. These include rabies, leptospirosis, ornithosis, Monkey B, etc. Diseases can be contracted following bites, scratches, droplet infection or the bites of insect vectors. There are particular hazards associated with the generation of aerosols in animal rooms.

In addition to the staff utilizing the animals others may be engaged to clean and feed them and the code applies also to them.

1. *Dust*: accumulations of dust in the ventilation system must be cleared.

2. *Drains*: (see Section A above).

3. *Dead animals*: after post-mortem examination carcasses must be incinerated on site or autoclaved before they leave the site. Where incineration would create a radio-biological hazard, carcasses must be suitably sealed.

4. *Bedding, dung etc*: these materials must also be rendered innocuous.

5. *Cages*: all cages must be autoclaved before being cleaned and returned to store.

6. *Escapes*: animal rooms should have double doors. In no circumstances, should there be a direct exit to the outside. However, animals can be " mislaid " and when this happens the Safety Officer must be informed.

7. *Vermin*: suspected, or obvious, infestation with insects, or wild rodents, must be reported at once to the Safety Officer.

8. *Monkeys*: the principle hazard in monkey handling not common to the handling of other animals is the risk of infection with Monkey B virus, which can produce a fatal paralytic encephalitis in man. In monkeys, the disease consists of herpetic lesions of lips and mouth, and, whilst it can be transmitted to primates from other parts of the globe, is generally confined to eastern species. The following basic rules for handling must be observed:—

(i) Monkeys from different intake batches must not be accommodated in the same room.

(ii) Cages and droppings must be handled as if the animals were known to be infected.

(iii) Whenever monkeys are handled two or more persons must be present, one of whom must be an experienced handler.

(iv) Nets or cages traps must be provided for the capture of escaped monkeys, and windows fitted with bars. Doors must be kept shut during handling. All other openings in walls, floors or ceilings must be suitably secured.

(v) Unless experimental conditions absolutely contra-indicate it monkeys must always be anaesthetised before handling. Care must be taken to ensure the animals really are " out " before removal from the cage.

(vi) Whenever monkeys are anaesthetised the opportunity should be taken to examine the lips, tongue and gums for herpetic lesions. This should be done with the aid of blunt forceps. Any monkey suspected of being infected must be destroyed IMMEDIATELY.

(vii) Protective clothing will consist of gown, gloves, gum-boots, face shield, surgical mask and cap. A change of undergarments and a shower are required afterwards.

(viii) Care should be taken to ensure that adequate quantities of freshly made up disinfectant solution are available in dunk troughs and hand basins.

(ix) Skin punctures and abrasions resulting from handling monkeys or potentially monkey contaminated material must be treated IMMEDIATELY with disinfectant and reported to the Safety Officer forthwith.

(x) Injured personnel must be kept under daily observation for a minimum of 3 weeks, and any indisposition, particularly fever or muscular weakness, must be reported IMMEDIATELY at onset.

9. *Responsibility*: general animal house staff should not service toxic rooms. This staff should be specially trained and the Safety Officer should be responsible for them.

APPENDIX IV

NORTHERN IRELAND

1. Legislation

Factories Act (Northern Ireland) 1965

This is comparable to the GB legislation described in chapter 5.

Diseases of Animals Act (Northern Ireland) 1958

Part I provides powers to expend money for the eradication of animal and poultry diseases; requirements as to notification of scheduled diseases; powers to treat or slaughter; compensation; regulation of movement of animals and poultry; import restrictions; prevention of sheep scab; and powers for the control of dogs.

Part II regulates the manufacture, sale etc of veterinary therapeutic substances. Schedule 4 details the therapeutic substances to which Part II relates.

Part III details the functions of the Department of Agriculture in Northern Ireland.

Various items of subordinate legislation specify certain diseases as notifiable diseases.

The Diseases of Animals (Therapeutic Substances) Order (Northern Ireland) 1953 and subsequent amendments prohibit except under authority of a licence issued by the Department of Agriculture the manufacture for sale or landing in Northern Ireland from any country other than Great Britain of any therapeutic substance defined in the order. The following substances used solely for veterinary purposes are covered: sera, toxins, antigens, anaerobic vaccines, killed bacterial vaccines, living bacterial vaccines, viral vaccines.

A licence is required for certain vaccines imported from Great Britain as specified in the 1963 Amendment Order.

The landing of Carcasses and Animal Products Order (Northern Ireland) 1970 controls the import into Northern Ireland of certain substances of animal origin to control the risk of introducing animal diseases.

An amendment to the Diseases of Animals Legislation which would extend control to pathogens is being considered.

Rabies Act

Health and Safety at Work Act

Neither of these Acts extends to Northern Ireland but comparable legislation is being considered.

2. Special position on animal health

A high status in animal health has been attained through the controls effected under the Diseases of Animals legislation which provides powers similar to but also additional to those available under Great Britain legislation. A number of diseases present in Great Britain are unknown in Northern Ireland and their introduction could result in the devastation of an important section of the Northern Irish economy.

In order to extend to Northern Ireland the principle expounded in paragraph 11 that the causal agents of notifiable diseases should be subject to control and that freedom from disease should be maintained, the lists of pathogens at Appendix A should be enlarged, for Northern Ireland only, to include:—

Category A

VIRUSES	Duck Hepatitis virus
	Duck Plague virus (in category B of GB list)
	Goose Hepatitis virus
	Infectious Equine Anaemia virus (in category B of GB list)
	Viruses of the Jaagsiekte complex
	Viruses of the Visna-Maedi complex
BACTERIUM	*Moraxella anatipestifer* (*Pasteurella anatipestifer*)
MYCOPLASMATA	*M. mycoides subsp. capri* (in category B of GB list)
	M. mycoides var mycoides (in category B of GB list)

All these organisms are the agents of notifiable diseases in Northern Ireland and none of the diseases is present in Northern Ireland.

Category B

VIRUSES	Fowl Pox virus
	Infectious Bursal Disease (Gumboro) virus
	Influenza A infection virus
BACTERIA	Bacteria of the Arizona group
	Mycobacterium Johnei
	Salmonella sp.
MYCOPLASMATA	*M gallisepticum*
	M meleagripis
	M synoviae
NEMATODE	*Trichinella Spiralis*

Fowlpox, Arizona disease, Trichinosis and Influenza A infection are not present in Northern Ireland.

Printed in England for Her Majesty's Stationery Office by Oyez Press Limited
Dd 294707 K40 5/75