Training for carers and users of genetically modified animals:

A survey of staff training needs and training provision in the UK

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Acknowledgements

This survey was only possible because of the willingness of establishments and individuals to discuss their training and we are extremely grateful to all those who gave up their time to be interviewed. We would also like to thank Penny Hawkins for her useful input on the initial approach and organisation of the report.

The RSPCA and training

The RSPCA as a matter of policy is opposed to all experiments or procedures that cause pain, suffering or distress to animals. However, as in all other areas of its work, the society adopts a constructive, practical approach to the laboratory animals issue, and supports initiatives that lead to a greater application of the 3Rs of reduction, refinement and replacement of animal experiments. The Society's Research Animals Department sees good training as key to implementing the 3Rs and this document is produced as part of our work in this area.

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Summary

A survey was undertaken to evaluate how training for users and carers of genetically modified (GM) animals is approached in UK scientific establishments designated under the Animals (Scientific Procedures) Act 1986. A total of 16 establishments were visited between August 2003 and March 2004, and 96 people participated, including animal care staff, animal unit managers and scientists. In addition, a number of stakeholder organisations were approached for their opinions.

Establishments did not generally provide any separate specific training for carers or users of GM animals, but some GM animal specific topics (for example taking tissue biopsies and training in IVC management and use) were generally included as part of the standard training provided for animal technicians. Also, some GM animal specific information was provided as part of the GM animal unit induction for scientists. This information included the importance of maintaining the specified pathogen free (SPF) barrier and background information on GM animals.

The majority of staff stated that their role with respect to GM animals led them to have additional training needs. Although most staff were generally satisfied with the training that they had received, many had not received all the relevant training that they thought would be valuable to them in their role, for example in nomenclature and ethical aspects of GM animal use. Many staff suggested improvements to the current training regime, either at their establishment, or on a wider scale, including that all staff receive at least a basic level of GM animal specific training.

All stakeholder organisations consulted stated that staff involved in GM animal care and/or use would require at least some additional training, but opinion varied regarding what this should comprise and who should be responsible for defining its content and delivery.

1. Introduction

It is widely recognised that good training for staff who care for and use laboratory animals is essential in order for the three Rs of replacement, reduction and refinement to be fully implemented. Such training should cover husbandry, care and procedures and requires to be relevant to the needs of individual trainees.

Over the past 10 to 15 years there has been an exponential rise in the number of genetically modified (GM) animals, generally mice, used in experiments in the UK (Home Office Statistics 1990-2003) and their use is continuing to rise throughout the scientifically developed world. GM mice, and many of the inbred strains used in their

production, often have distinct characteristics which require specific housing and husbandry. Several of the standard techniques used in production and maintenance of these animals (for example, superovulation and tissue biopsy for genotyping) are not commonly used in other areas of research. Many people working within GM animal research therefore believe that training in these specific aspects is required by all staff involved. Thus, many establishments and some organisations have included GM animal specific training in their staff training programmes. The form, content and availability of such training is, however, inconsistent (personal communications).

This paper presents the results of a survey which was designed to explore the extent and content of specific training for those caring for and/or using GM animals, and to obtain the views of staff members themselves about their own requirements in this respect. The overall aim was to help identify what training is required, and for whom, in order to minimise animal use and suffering and improve animal welfare in the area of GM animal based research.

2 Objectives

The objectives of the survey were to determine with respect to GM animal use:

- whether specific training is currently provided within UK establishments and if so what this comprises;
- what staff feel their specific training needs are;
- whether there are any gaps between perceived training needs and training provision;
- what good practice is considered to be and what good ideas are currently being progressed;
- the opinion of a number of stakeholder organisations on these issues.

This report summarises the information obtained, highlights the perceived training needs of different categories of staff, and compares these with what is actually provided. It is hoped that it will assist all those responsible for, or with an interest in, training to evaluate current training provision and develop this further.

3 Method

The survey was conducted by visiting 16 designated establishments in the UK and discussing issues relating to training in GM animal care and use with a number of interviewees. Six organisations with an interest in the issue were also consulted for their opinions.

All interviews were based on a standard questionnaire (included as Appendix A) and the respondents had not seen the questions beforehand, although they were generally aware of the purpose of the project. Most participants were interviewed on their own, although on three occasions two people were interviewed together. Questions were asked in the same way for all respondents, but some qualification or explanation was provided if necessary for the individual. The survey included questions about the individual's perceived training needs relevant to GM animals, any training received or available, and any comments or suggestions about training more generally. Staff carrying out, or responsible for, embryo manipulations were also asked how success

rates were monitored and recorded for training purposes. Additional background questions about the establishment and standard training provision were asked of the most appropriate respondent; usually the GM animal unit manager or Named Animal Care and Welfare Officer (NACWO).

The completed questionnaires were analysed by compiling all responses into appropriate sections to provide common themes and individual comments (comments in italics are quoted *ad verbatim*). As each establishment had its own individual culture and employed different training policies and protocols, people explained their training provisions and requirements in a variety of ways and frequently included other issues, opinions and thoughts. Therefore, although numerical results are included in the report wherever possible, many of the results presented are descriptive. However, there were many common practices and themes and these are set out below. The report necessarily refers to UK legislation throughout and uses UK terminology, but the issues it raises are relevant wherever GM animals are used.

All participants were given the opportunity to comment on the manuscript before publication.

3.1 Participating establishments

The project was critically dependant on the co-operation of the participating establishments, which included universities, research council funded establishments and pharmaceutical companies. It was not possible to select a random sample of establishments as there is no publicly available central list, so the survey was conducted among those where the RSPCA Research Animals Department (RAD) already had contacts, or where a further contact was provided from a participating establishment. Nevertheless, a representative range in size and type of participating establishments were involved.

Background information about the participating establishments is provided in Table 1. The number of mice housed and the number of GM lines varied hugely between establishments, but all animal units were ‘barrier’ units. The management of the animal unit with respect to who had access also varied, as many establishments limited access in order to minimise the chance of barrier breakdown. Hence, in some cases, scientists did not access the animal unit, or were discouraged from entering for any purposes that were not essential for the research.

Table 1. Background information about the GM animal units of participating establishments

		Number of establishments
Holding capacity of GM and normal mice	Range - from 300 to 80,000 (but note establishment with 300 could hold thousands)	
	<5,000	- 4
	5,000 - 12,000	- 3
	12,000 - 50,000	- 6
	>50,000	- 3
Number of breeding lines (GM and inbred)	Range - from 6 to 300	
	<50	- 4
	50 – 100	- 5
	>100	- 7
Containment systems used	IVCs	- 7
	IVCs & open cages	- 7
	Other (e.g. Scantainers)	- 2
Why enclosed systems (those that restrict airflow) were used	to protect animals	- 4
	to protect humans and animals	-12
Did researchers/scientists have access to the animal unit?	Yes	-13
	No	- 3

3.2 Staff participants

The aim was to interview six people at each establishment: one GM animal unit manager and/or the person responsible for training, two animal technicians (one junior and one senior or a NACWO), two scientists (one junior and one senior, preferably a project licence holder [PPL]), and the named veterinary surgeon (NVS). Information about the actual number and position of participants is provided in Table 2.

Although there was an average of 6 participants per establishment, some establishments provided more interviewees than others. Also, not all staff groups were interviewed at every establishment (for example there were few NVS participants). This is taken into account where appropriate in the report; for example responses per establishment rather than per individual are sometimes given. However, each individual staff member can be viewed as an independent contributor in terms of their opinions regarding their own training needs, so respondents are evaluated individually for issues regarding perceived training needs. Individual evaluation is also presented for training received, as staff working at the same establishment, with similar job roles, had not necessarily received the same training.

Some respondents did not answer all the questions and as a result the ‘number of respondents’ or ‘number of establishments’ varies slightly throughout the report. The actual number of respondents, or establishments, that answered a particular question is clearly stated in the text wherever numerical information is given.

Table 2. Participants of the survey, classed according to broad job role

Participant category	Category explanation	Number of respondents
Managers and deputy managers	Managers or deputy managers of independent GM animal units	22
Technicians and senior technicians	Animal technicians and senior animal technicians working with GM animals	35
Technical scientists	Staff with a scientific role relating to production and use of GM animals who generally provide a service to other scientists	9
Scientists	Scientists of all levels working with GM animals	24
Named Veterinary Surgeons	Establishment Named Veterinary Surgeons	3 (plus 3 in other categories)
Other	Other staff, e.g. training managers	3
		Total = 96

4 Results

During the course of the survey participants provided information about:

- the background of the establishment and how each establishment or individual animal unit approached training for its staff;
- the opinions of participating staff on their training needs and the training they had received;
- the opinions of some relevant stakeholder organisations.

The information presented is primarily focused on the training provided to establishment staff that is directly relevant to their needs. Inevitably, there were additional highly related topics covered within the survey questions, and/or raised by respondents themselves, that gave further background information and helped to provide a basis for the results. For example, comprehensive training may be considered to include informal ongoing training, such as everyday communication and 'on the job' training given by colleagues, as well as more formal courses and literature based learning. Communication is therefore highly relevant, and the way communication was established and maintained within the establishment is examined within the report.

4.1 Establishment background

There are many aspects of the way an establishment is organised that impinge upon the nature of the training provided, including: how it is presented, how it is received, how it is taken up, and how it is put into practice. Four key points emerged as being particularly important in this respect.

(i) The roles and responsibilities of different staff groups with respect to GM animal related activities have a direct bearing on the type of training that is required and by whom.

(ii) The way refinements are identified and implemented within participating establishments, given the fast-moving nature of the field of genetic modification, necessitates the frequent updating of techniques, processes and procedures, with consequent implications for staff training.

(iii) The way the efficiency of genetic modification is monitored provides an opportunity to measure training outcomes.

(iv) The establishment and maintenance of good communication is generally very important, but is particularly so for GM animal use because the concepts and purposes of the research are often complicated, and require that all involved know what they are doing and why they are doing it.

4.1.1 Roles and responsibilities

Staff training requirements will clearly differ depending on the nature of the work carried out, how this is organised, and individual roles and activities. Information regarding which staff groups were responsible for some common procedures and processes associated with the creation and maintenance of GM lines is summarised in Table 3.

Scientists usually prepare the DNA constructs and carry out gene targeting. Scientists also often carry out the embryo manipulations in establishments where there is no dedicated microinjection technician. Animal unit staff usually carry out scientific procedures on animals and take responsibility for the all animal husbandry. Despite these trends there was no universal standard system regarding which staff groups undertake which tasks.

No animal technicians were involved in analysing tissue biopsies at the time of the survey, but at least one animal unit was investigating the possibility of technicians taking over the genotyping of the animals. Also, during the survey there appeared to be some movement toward animal technicians becoming more involved in the research aspect of GM animal use. If this proves to be the case, it will have wider implications both for animal technician training and for their primary role as animal carers.

There were also differences in the activities carried out by different establishments. The majority generated new GM lines on-site (generally around 25/year but up to around 100/year); a couple only imported lines from other establishments or contracted out the work to a commercial company. The majority of breeding programmes were under the control of laboratory based scientists, but the breeding programme was often designed by animal unit and scientific staff working in conjunction. One reason given for this was that breeding can get out of hand very quickly, and so it is essential for a well-designed system to be place, and for this to be well monitored. Such differences in activities and approaches between establishments have implications for local training.

Table 3. Roles of different staff groups in carrying out common tasks with respect to GM animal creation and use (NB each task could be carried out by more than one staff group within the establishment/animal unit)

	Number of establishments/independent GM animal units					
Task	Scientist	Technician	NACWO	NVS	Minj tech*	NA/other
Prepares DNA constructs	15					1
Targets and cultures ES cells	13	1			2	3 (no ES cell manipulation done)
Carries out surgical procedures (e.g. vasectomy)	5	10	5	1	7	2
Carries out superovulation	2	14	3	1	3	1
Carries out euthanasia	6	15	7	3	4	
Carries out embryo manipulations	7	3			9	2 (no embryo manipulation done)
Carries out tissue biopsy for genotyping	4	15	5	1	3	
Analyses tissue biopsy	15				1	
Carries out welfare assessment of new lines	2	10	2	1		4 (phenotyping staff)
Directs breeding programme	11	5	6		2	
Carries out weaning and sets up matings	2	14	6		1	

*Minj tech = microinjection technician.

4.1.2 Identifying and implementing refinements

There was a general awareness at all establishments that training and development does not stop at training staff to be proficient in their current activities. They need to be able to learn about, and implement, refinements as these are developed. This was seen to be particularly important in GM animal work due to the rapidly developing nature of the field.

Two important consequences of this are first, that training has to adapt to keep up with new developments in terms of both research and the 3Rs, and second, that a particular staff member, or group of staff members, will have to take responsibility for identifying and implementing possible refinements and other new developments. This may have additional training implications for them personally.

Table 4 provides a summary of animal unit managers' responses regarding the way new refinements and best practices were identified, and who was responsible for their

implementation. The managers, in general, saw it as primarily their own responsibility to identify new refinements, though would commonly listen to other staff members' suggestions. Animal unit staff, in general, seemed particularly keen to identify and try out new refinements and best practices, and saw it as an essential part of their role.

Attending conferences was a popular way to help learn of new refinements. One particular comment was that attending conferences was important not just for the talks, but also to stimulate people to think and provide networking opportunities, all of which were seen to contribute to keeping up to date and providing more comprehensive training. However, the expense of conferences was highlighted as a significant factor which limited who could attend.

In the majority of animal units there was a system in place for discussing and implementing potential refinements, for example, through the animal welfare group or NACWO. However, in some animal units the ethos was *'just go ahead and try it'*. The consensus overall was that it is important for the animal unit manager to know what was being tried, and that a formal system for implementing and monitoring refinements is therefore beneficial.

Table 4. Responses from GM animal unit managers regarding how refinements were identified and implemented within their establishments

Questions on refinements	Responses (from 15 GM animal unit managers)	
How are refinements identified?	At meetings and conferences	- 8 unit managers
	Speaking to other staff (on-site)	- 8 unit managers
	E-mail discussion groups	- 6 unit managers
	External networking	- 5 unit managers
	From the scientific literature	- 5 unit managers
	Other sources included the IAT, LASA, RSPCA and MRC,CBPAR, or by attending managers or NACWO meetings	
How do refinements get implemented?	Via the unit manager	- 7 unit managers
	Via the ERP	- 5 unit managers
	Other approaches were via the animal welfare group, NACWO or 'just go ahead and try it'	

4.1.3 Monitoring the success of genetic manipulation for training purposes

Embryo manipulations are an integral part of the genetic modification process and are generally agreed to be technically highly demanding. The skill level of the microinjectionist can dramatically influence the number of embryos required per successful GM line produced. Appropriate and thorough training in embryo manipulation is therefore essential for all staff who carry out this role.

Initial training in these aspects is most often one to one, at the microscope, but a great deal of practice is necessary to reach a high level of skill. It has previously been suggested that benchmark figures[1] and other records could be used to monitor success

[1] Benchmark figures are numbers showing expected success rates, performance targets and/or intervention rates and are used as a guide for a particular technique or procedure.

rates and to determine whether staff are improving and/or meeting expectations over time (Robinson *et al*., 2003). Staff involved in or responsible for embryo manipulations were therefore asked how training in this was monitored at their establishment. The results are summarised in Table 5.

The results show that benchmark figures were often used and that records were kept at nearly all establishments with the intention of highlighting any problem areas in the genetic modification process. A number of participants commented that benchmark figures can provide a source of satisfaction when good results are achieved. However, caution was needed in interpreting the figures, since there are a large number of experimental variables that can affect the results - it is not just dependant on the skills of the microinjectionist.

In some cases the figures were used to form part of the local ethical review process (ERP) review of project licences, or were used as part of an end of year analysis, as well as for training purposes.

Table 5. Responses for staff members regarding how success rates of genetic manipulations are recorded and monitored

Questions regarding genetic manipulations	Responses (from staff carrying out manipulations or their managers)	
Are benchmark figures used to monitor success of embryo manipulations?	Yes No	- 9/14 respondents - 5/14 respondents
Are records kept of success rates?	Yes No Records included: • Batch numbers of solutions • Number of eggs obtained per female • Number of eggs injected • Number of embryos transferred • Mouse strains and ages • Pregnancy rates • Number of offspring • % GM success rate	- 14/15 respondents - 1/15 respondents
Are records audited?	Yes No	- 7/11 respondents - 4/11 respondents

4.1.4 Staff communication

'Communication' was raised with respondents as part of the survey because it is an important issue when evaluating training as a whole. Good communication between staff allows them to train each other by providing information, explanations and expertise. Indeed, a great deal of training within all establishments visited was described as informal, received from other members of staff.

Respondents volunteered comments relating to communication throughout the questionnaire. It was noted that good communication when working with GM animals was particularly important because:

- it is important for all staff involved in the generation of a line to be aware of any expected phenotypes, and also for the occurrence of unexpected phenotypes to be rapidly disseminated and dealt with to minimise animal suffering and maximise scientific output;
- the breeding system can get quickly out of control without good and frequent communication between the laboratory and animal unit, leading to over-breeding or incorrect mice being mated.

It was considered important both to *establish* good communication between individuals and different staff groups, and to *maintain* this. Establishing and maintaining good communication between the GM animal unit staff and scientists was noted to be particularly significant when trying to ensure the smooth running of the animal unit and avoid common problems, such as over-breeding.

Establishing communication systems

It was considered to be important to establish good communication between members of staff in order that they:

- get to know each other;
- appreciate each others roles (and to help prevent the development of an 'us and them' attitude between laboratory and animal unit based staff);
- appreciate each others practical and ethical standpoints.

The ways in which different staff groups communicated with each other were not the same at all participating establishments. For instance scientists communicated with animal technicians either by:

- formal direct contact – 6/16 establishments (usually via the animal unit induction);
- phone or e-mail only;
- using the animal unit manager, NACWO or animal unit liaison officer as an intermediary.

It was commonly noted that the easiest way to establish good communication was for staff to meet each other face to face, as opposed to communicating via telephone, email, or through third parties. Providing training that mixed groups with different roles, or from different areas of the establishment, was noted to provide a useful opportunity for people to meet, 'network' and establishing good working relationships. There was at least some mixed group training (e.g. the accredited Home Office modular training courses) in 14 out of 16 establishments.

At some establishments managers said that the way communication was established could be improved and/or that this was currently being addressed. In some others there was direct contradiction between the managers' perception of the situation and that of their staff. For example, at one establishment the animal unit manager reported that *'direct contact is set up'* between animal unit staff and scientists, but two

technical staff commented that *'some scientists visit and some don't'* and a scientist commented that *'those [scientists] that do visit have a better rapport [with animal unit staff]'*.

Maintaining communication

Many respondents noted that an ongoing good relationship between the different staff members involved with a GM line was useful not only for good animal welfare and good science, but also as part of ongoing training, and in terms of job satisfaction. For example, several scientists reported that having a good working relationship with animal unit staff helped them understand how to breed and maintain their lines. They said that the animal technicians were invaluable in observing phenotypes of new GM lines and spotting breeding or welfare problems that had important implications for the research. In addition, many technicians particularly highlighted that face to face discussion of the research and feedback of the results was quite motivating and beneficial. However, only 2 out of 16 establishments mentioned the existence of an official system for feedback of scientific results to technical staff when directly asked about this.

Ways in which some establishments have approached the issue of enabling and promoting continuance of good quality information exchange between staff groups included:

- arranging visits of scientists to the animal unit;
- arranging visits of the animal technicians to the laboratories;
- setting up e-mail discussion groups;
- sending out regular 'update sheets' covering the results of all GM lines;
- ensuring information was provided to the animal unit manager who filtered it down to the relevant personnel;
- setting up seminars where scientists showed experimental results and there was opportunity for discussion.

However, it should be noted that many of the above were inconsistently implemented across the animal unit or establishment.

Comments from respondents on the issue of communication indicated that, although they appreciated the efforts made by establishments to set up seminars and other opportunities for staff to meet and exchange information, there was no real need for formal feedback mechanisms if there was a positive open working relationship in place. This apparent contradiction seemed to result from the fact that official systems of communication may be necessary to establish a positive working relationship initially, but once that relationship was in place staff were comfortable to interact informally with each other as and when necessary.

Staff also mentioned that there were sometimes barriers to the setting up and maintenance of a positive working relationship, including that:

- scientists were sometimes discouraged from entering the animal barrier unit, to help prevent the introduction of infection – this led to a substantial decrease in ease of communication with animal unit staff;

- there was sometimes insufficient time to provide feedback to animal unit staff and one scientist noted that the high staff turnover rate in the animal unit made trying to keep technicians up to date difficult;
- positive feedback to all those who had been involved in generating and caring for the GM line was often overlooked - this sometimes led to animal technicians feeling isolated from the research, for example, when a long time has been spent carefully breeding up a poor-breeding GM line and the project licence holder gives instructions to cull it without giving an explanation why;
- although staff from many establishments spoke of the existence of feedback seminars, many interviewees said that they actually occurred rarely, or that the seminars had not happened for a long time.

4.2 Establishment training provision

Each establishment or individual animal unit had its own approach to training in terms of what was provided, when and where it was given, how it was presented and who received it. There was often no training provided that was specific to GM animal use. Where specific training was provided it was generally given as part of general animal care and use training. However, as the majority of animal units visited were focused specifically on GM animals, any training provided in-house (e.g. the animal technicians' training programme) was generally reasonably focussed on GM animals in order to meet animal unit requirements. Therefore, general and specific training are both covered within this section of the report.

One establishment did provide additional specific training by holding an annual GM animal training course aimed at research scientists. The course duration was one week and there were 10-15 attendees. The course covered a wide range of topics, including information about selection of DNA, transfer of DNA, timed matings and embryo manipulations. Attendees also observed procedures, including superovulation injections and vasectomies. Another establishment had recently introduced specific training for scientific staff on 'the impact [of experiments] to animals'. One respondent there commented that it had made a definite impact on the number of GM animals used, because people now felt their responsibilities more, and felt more emotionally involved. A summary of more general findings regarding establishment training provision is provided in Table 6.

Table 6. Summary of some aspects of establishment training provision and contents

Training issue	Summary of responses
Specific GM animal training provided?	Generally no formal course aimed at GM animal use
Do all staff receive some specific training?	No- some scientists and temporary staff could receive no training
The general training program commonly includes:	<u>Animal Technicians/GM animal unit based staff</u> • a comprehensive training programme which covers general and GM animal specific aspects according to their role. • college courses and other courses, e.g. IAT • attending HO modular courses (if work requires PIL) • seminars

	Scientific staff • attending animal unit induction • attending HO modules • seminars
Who attended the HO modular courses:	• varied between establishments - some laboratory heads sent all their staff, others only sent those staff who require a PIL • animal technicians often attended the modules to gain a PIL to carry out procedures (such as tissue biopsies for genotyping) • some animal technicians were discouraged from obtaining a PIL in case they became too involved in the research, as this might detract from their primary role of animal carer
Contents of the HO modular courses:	• varied between establishments • some establishments that held modular training in-house had developed it to fit their specific research requirements with respect to GM animals
Examples of GM animal relevant seminars (for all staff) included:	• the use of IVCs • speed congenics • management of animal barrier units • the use of reporter strains • assessment of adverse effects • issues that have arisen in the GM animal unit
GM animal related topics commonly included in the animal technician training programme:	• taking tissue biopsies • other procedures (e.g. embryo transfer – if relevant to their role) • IVC training • observing skills – looking for negative effects of genetic modification • specific aspects of record keeping
GM animal related topics commonly included in the animal unit induction (for scientists): Also occasionally included:	• maintaining the specified pathogen free (SPF) barrier • animal unit policies and guidelines • occupational health aspects (e.g. animal allergens) • background information on GM animals • breeding guidelines • humane endpoints • checking for and dealing with adverse phenotypes.

Information was also provided by establishments and individuals about training delivery, including the way that the training is given and when (summarised in Table 7). It is interesting to note that two-way feedback (of trainee to trainer and vice-versa) occurred at all establishments.

Very few establishments undertook compulsory refresher training, although several were considering bringing it in, or having it more widely available. The ongoing

development of a computer-based training record system, which would highlight when refresher training was due for each member of staff, was also mentioned by one establishment. Reasons given as to why refresher training was not provided included that '*blanket retraining is a waste of resources'* and '*training is ongoing and therefore refresher training is not necessary'*.

Table 7. Summary of some aspects of training set-up within participating establishments

Training set-up	Response
Is training external or internal?	Mostly internal - 10/17 independent units had only internal training
Internal training comprises:	• Animal technician training programme • Unit induction for other staff
External training often comprises:	• HO modular courses • College courses (for animal technicians) • IAT courses • Seminars, conferences etc
Is training given before or after work starts?	• Animal technicians received some (general) training before starting work in 3/15 establishments • College courses (for technicians) began annually • Unit inductions were given before staff were allowed access to the unit • HO modular training was always given prior to work commencing (legal requirement)
What training aids were used (how was training given)?	Most training was one to one (in 9/17 units) Other methods included talks (often with PowerPoint presentations), discussions and providing on-line information.
Is there a syllabus for training?	In 8/17 units
Is feedback given to trainees?	Always
Do trainees give feedback on the training?	Always
Any records of training kept?	In 14/17 units
Is refresher training provided?	Automatic in 4/16 establishments, on request in 6/16 establishments

4.3 Staff opinion on training needs and training provision

A major objective of the training survey was to ascertain what individuals in different positions and with different responsibilities feel are their training needs, and to determine whether these needs are met. Individual respondents were therefore asked questions about the specific activities they carry out with respect to GM animals, and whether they feel that these activities lead them to have any additional training needs. As part of this process, a list of training areas that are highly relevant or specific to GM animals was drawn up, and respondents were asked to comment on whether training in those subjects would be valuable, and whether they had in fact received training in any or all of them (see Figures 2a-d).

The activities, and consequently training needs, were different for different groups of staff in line with the roles and responsibilities examined in section 4.1.1. Responses have therefore been grouped below into those from animal unit managers (or deputy managers), animal technicians, technical scientists, scientists and NVSs.

The majority of respondents believed that their role in caring for or using GM animals did lead them to have additional training needs and that these needs were met, with the possible exception of veterinary staff (see Figure 1). Most staff took all available training opportunities at their establishment, but if they did need any additional training or information, then their requests were always adequately dealt with. Where training needs had not been met or available training had not been taken up, the reason given was generally a lack of time.

One very interesting point to note is that no interviewee said that any of the training they had received was not useful – everybody felt that all the training they had received had been useful and valuable.

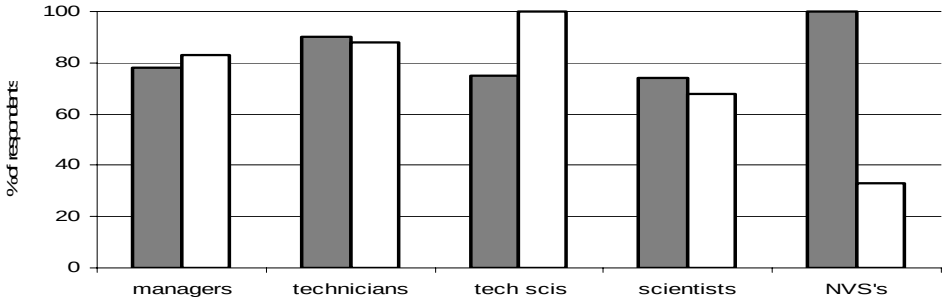


Figure 1. Percentage of respondents who felt that their role with respect to care and/or use of GM animals led them to have additional training needs (filled bars) and the percentage of respondents who felt that all their training needs with respect to GM animals were met (open bars). Respondents comprised of 18 managers and deputy managers, 31 animal technicians, 8 technical scientists, 23 scientists and 3 NVSs

4.3.1 Animal unit managers

Specific activities relating to GM animals that were commonly reported by animal unit managers (or deputy managers) included:

- general management of the animal unit;
- monitoring the health and welfare of GM animals;
- carrying out or monitoring tissue biopsies;
- training staff;
- keeping up to date with and developing best practice.

Most animal unit managers thought that their role in managing GM animal units led them to have additional training needs. The managers obtained their initial training from a wide variety of different sources, including external meetings, discussion with internal and external contacts, specific GM animal courses and the IAT and LASA. They also commonly noted that their knowledge was obtained from actual experience of working with GM animals. Some animal unit managers also approached other

managers, scientists and other contacts, or searched the scientific literature and used on-line discussion lists to top-up their knowledge.

Despite the large range of information channels open to them, some managers stated they would like to gain a more in depth, knowledge of genetics. Some managers would also like more information and guidance on what training to provide to their staff with respect to GM animal care and use. One respondent noted that *'There are many different ways of working in many different places and the information given on what should be done is not really clear'*.

Figure 2a shows managers' opinions on whether training in a list of suggested subjects was valuable for their staff and whether training in that subject was provided at their establishment (as opposed to showing what training they personally needed and received). The responses show that managers believed training in all the topics mentioned was valuable for their staff with the exception of nomenclature (mainly because it was not the responsibility of animal unit staff to name GM lines). Several managers also commented that the housing and husbandry of GM animals was the same as for normal animals and so additional training was not required. There were several additional comments on the importance of training in breeding protocols and good record keeping, both of which were seen as key roles for animal unit staff. The training that the managers stated would be provided to their staff fits quite closely to the training that animal technicians reported receiving (see section 4.3.2). This helps confirm the situation actually in practice in UK establishments.

Overall it appeared that managers wanted their staff to be trained in any aspect of GM animal care and use that was relevant and/or interesting to them, and that they were willing to consider staff requests for training and accommodate them where possible. Table 8a shows common routes by which training was provided to animal unit staff in practice. It shows that most training in the suggested topics was provided 'on the job' as part of in-house staff development. This is in agreement with the results in section 4.2, regarding establishment training provision.

Table 8a. Common responses from animal unit managers regarding how their staff receive training on a number of topics relevant to GM animal use

	Common training routes			
Training topic	On the job	Course e.g. IAT	HO modules	Seminars
Basic genetics	✓	✓		
Why GM animals are used	✓			
Ethics of GM animal use			✓	✓
Inbred lines	✓			
Nomenclature				
Welfare assessment of GM animals	✓			
Breeding strategies of GM animals	✓			
Record keeping	✓			

GM animal housing and husbandry	✓			
Practical (e.g. handling, phenotyping)	✓			

4.3.2 Animal technicians

Specific GM animal related activities that most animal technicians reported to carry out in their role were aspects of husbandry, breeding the GM lines, and taking tissue biopsies.

A wide variety of other activities were also mentioned, including phenotypic analyses, general health monitoring, carrying out regulated procedures, post mortems, embryo manipulations, completing records and Home Office returns, and helping with the ERP review of projects. Only one animal technician reported that their role in caring for GM animals did not involve any GM animal specific tasks.

In order to carry out the above tasks many animal technicians volunteered that they required extra training in a range of topics. Frequently mentioned were:

- GM animal welfare;
- GM animal behaviour;
- basic genetics;
- record keeping;
- the effects of genetic modification on animals.

Other topics mentioned included specific Home Office licensing issues, additional animal handling skills, GM animal husbandry and breeding skills, maintaining disease free status, specific procedures (e.g. tissue biopsy), reasons for GM animal use and pain control.

Figure 2b shows animal technicians' opinions regarding whether training in a specific list of suggested topics was valuable to them and whether training in that subject was received. The majority believed that training in all the topics mentioned would be valuable and most received training accordingly. However, training in ethical aspects of GM use and nomenclature was not widely provided. Many technicians reported that training in nomenclature was not necessary because it was not their responsibility to name lines. Other reasons given for including certain topics in their training included that:

- training in why GM animals are used helps technicians understand why the work is being done;
- it is valuable for training to be focused on improving GM animal welfare by picking up on any welfare problems by developing excellent observational skills;
- welfare assessment is an integral part of an animal technicians job and experience is very important when it comes to ability to assess GM animal welfare;
- training or discussion of ethical aspects is useful particularly when considering the large numbers of animals involved and the culling of healthy animals;

- training in GM line phenotyping and breeding helps to promote more interest in the work and for technicians to appreciate their work in a wider context.

Common routes by which technicians received training in particular topics are given in Table 8b. Training in most topics was given on the job, as part of a structured in-house training scheme and many respondents commented that such one-to-one practical training was most important for animal technicians. College and NACWO courses also provided useful sources of information and half had also undertaken some IAT or accredited Home Office modular training. Only three respondents had participated in a separate, specific, GM animal course (in-house), but several GM animal related topics had been included in their general in-house training; such as tail biopsy, breeding protocols and how GM animals are created. Several technicians made very positive comments about the training that they had received and about the skills and approachability of their in-house trainers.

Animal technicians usually approached their line manager if they needed further training or information, but more senior staff, such as NACWOs, also used a wider range of information channels, including contacts within the field, on-site scientists and various meetings and conferences.

Several respondents made direct comments about IAT training, and the Institute's provision for technicians involved in GM animal care in particular. Several reported that IAT training needed to be updated in this area, that more GM animal specific information should be provided in the IAT handbook, and that more courses should be available. There were several comments that the IAT course on genetic modification (last run in 2001) was very good, and it was hoped that it would be provided again.

Table 8b. Common responses from technicians regarding how they receive training on a number of topics relevant to GM animal use

	Common training routes					
Training topic	Workplace	Discussion	In-house training	Seminars	Courses college/IAT	HO modules
Basic genetics	✓	✓	✓		✓	
Why GM animals are used	✓	✓		✓		
Ethics of GM animal use	✓	✓				✓
Inbred lines	✓	✓				
Nomenclature						
Welfare assessment of GM animals	✓		✓		✓	
Breeding strategies of GM animals	✓				✓	
Record keeping	✓				✓	

GM animal housing and husbandry	✓		✓			
Practical (e.g. handling, phenotyping)	✓		✓		✓	

4.3.3 Technical science staff

The group of participants described as technical scientific staff includes microinjection technicians and some laboratory staff, such as those with overall responsibility for maintenance of GM lines for their group. In line with these roles, commonly reported activities included:

- making DNA constructs;
- carrying out embryo manipulations;
- genotyping;
- managing the colonies;
- phenotyping;
- cryopreservation.

Most respondents believed that they had additional training needs as a result of their role, including training in various specific experimental procedures and in embryo manipulations.

Figure 2c shows technical scientists' opinions on whether training in a list of subjects was valuable and whether training in that subject was provided to them. The majority of respondents believed that training in all the suggested topics would be valuable to them and most had received training accordingly. Training in the characteristics of inbred lines, breeding protocols and record keeping was often noted as being very important for this type of role. Specific ethical aspects and nomenclature had often not been covered in the training they had received, but naming lines was not often their responsibility.

Common routes for training are provided in Table 8c, which shows that most of this is received on the job. Each staff member seemed to have been specifically trained for his or her role, although a substantial amount of their skills may have been self-taught or acquired by on the job practice. Several participants had also attended specialist courses, or visited other establishments to learn techniques. Common comments centred around the opinion that it is very important to know why you are doing things (including the reasoning behind the various protocols and procedures) in order to be effective in this role. If they needed any additional training, technical scientists would generally approach their line manager, the manager of the animal unit or other members of staff.

Table 8c. Common responses from technical scientists regarding how they receive training on a number of topics relevant to GM animal use

	Common training routes		
Training topic	On the job	HO modules	Seminars/discussion
Basic genetics	✓		
Why GM animals are used			
Ethics of GM animal use		✓	✓
Inbred lines	✓		
Nomenclature			
Welfare assessment of GM animals	✓	✓	
Breeding strategies of GM animals	✓		
Record keeping	✓		
GM animal housing and husbandry	✓	✓	
Practical (e.g. handling, phenotyping)	✓		

4.3.4 Scientists

Activities commonly reported by scientists to be associated with their use of GM animals included: directing breeding and general management of GM colonies; designing and making DNA constructs; carrying out genotyping assays; and phenotyping the GM lines. There were however many other activities reported, including carrying out the microinjections, carrying out tissue biopsies and bringing new GM lines into the establishment.

Most scientists agreed that these activities led them to have additional training requirements, including in:

- breeding protocols;
- characteristics of inbred strains;
- specific experimental design;
- effects of genetic modification.

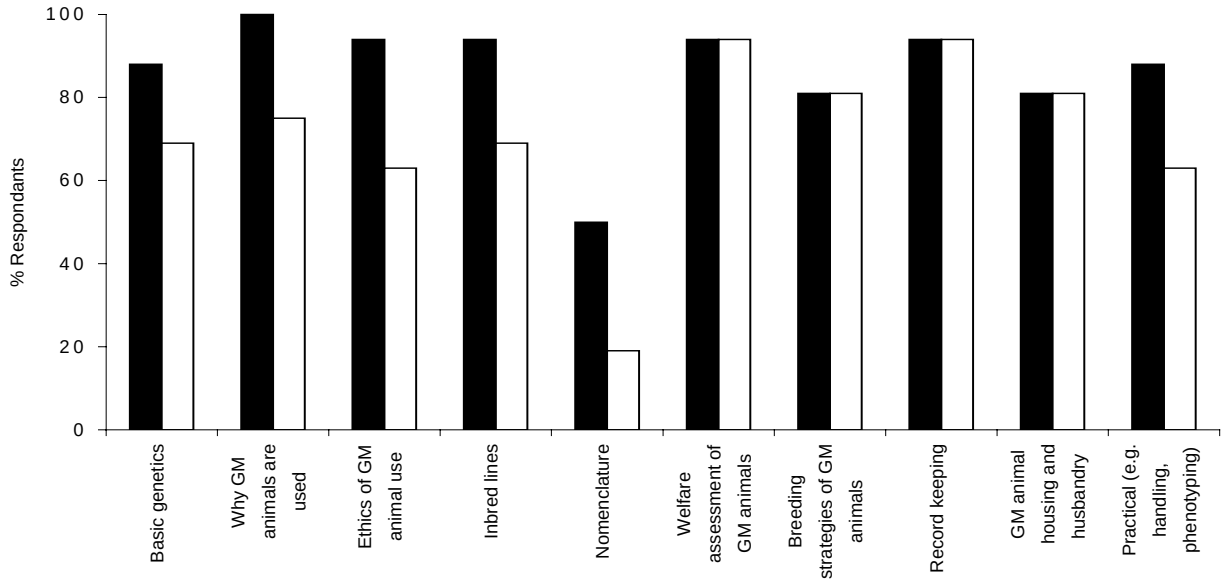
Figure 2d shows whether scientists considered training in a list of suggested topics of value to them and whether they received training in those topics. Responses indicate that scientists would value training in all of the topics listed, with the possible exception of why GM animals are used (almost half the respondents said that they already knew this). However, training in several of these topics, notably in characteristics of inbred strains, nomenclature and breeding strategies had not often been received.

Figures 2a-d. Opinion of respondents regarding whether training is valuable and provided/received in suggested topics.

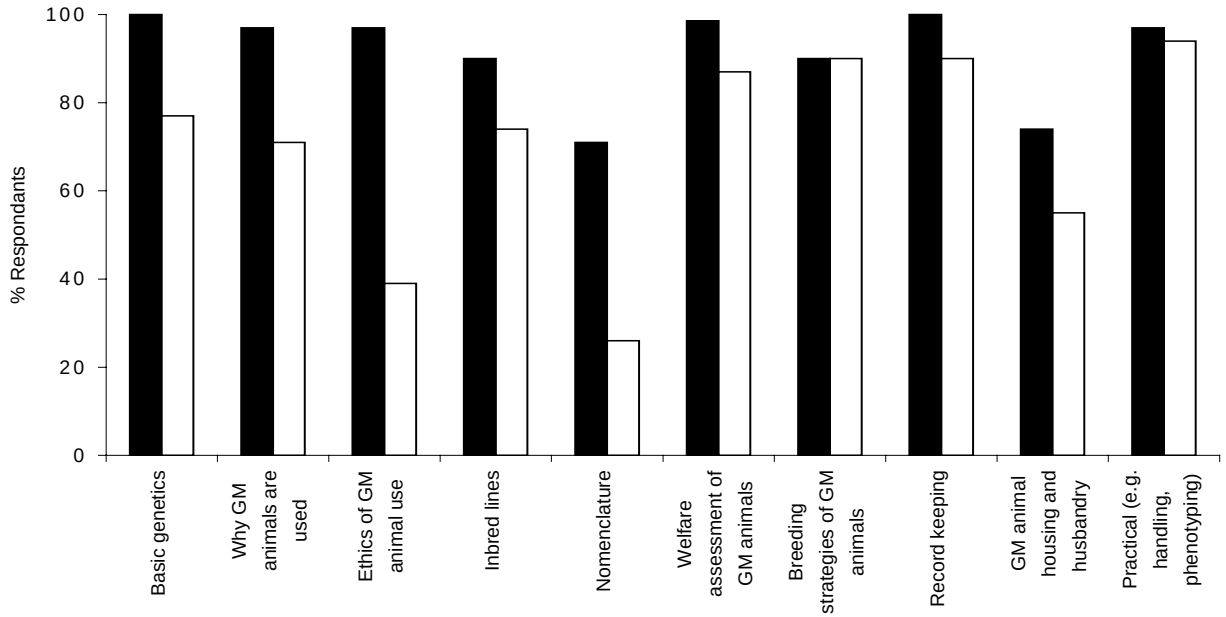
Graphs show the percentage of respondents who would find training in the suggested topics valuable for their staff (managers and deputy managers) or for themselves (animal technicians, technical scientists and scientists) and the percentage of respondents who provide (managers) or received (animal technicians, technical scientists and scientsists) training in those subjects. Several scientist respondents stated they had received training in some topics previously elsewhere. Respondents comprised of 16 managers, 31 animal technicians, 8 technical scientists and 23 scientists.

■ Feel valuable □ Received ■ Received previously

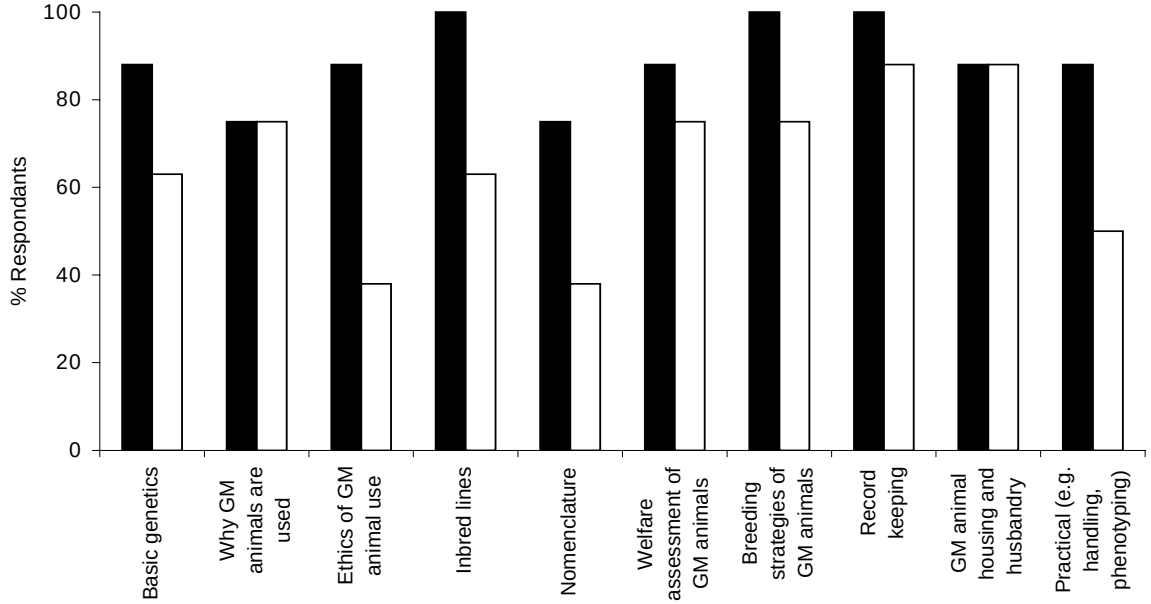
a) Managers



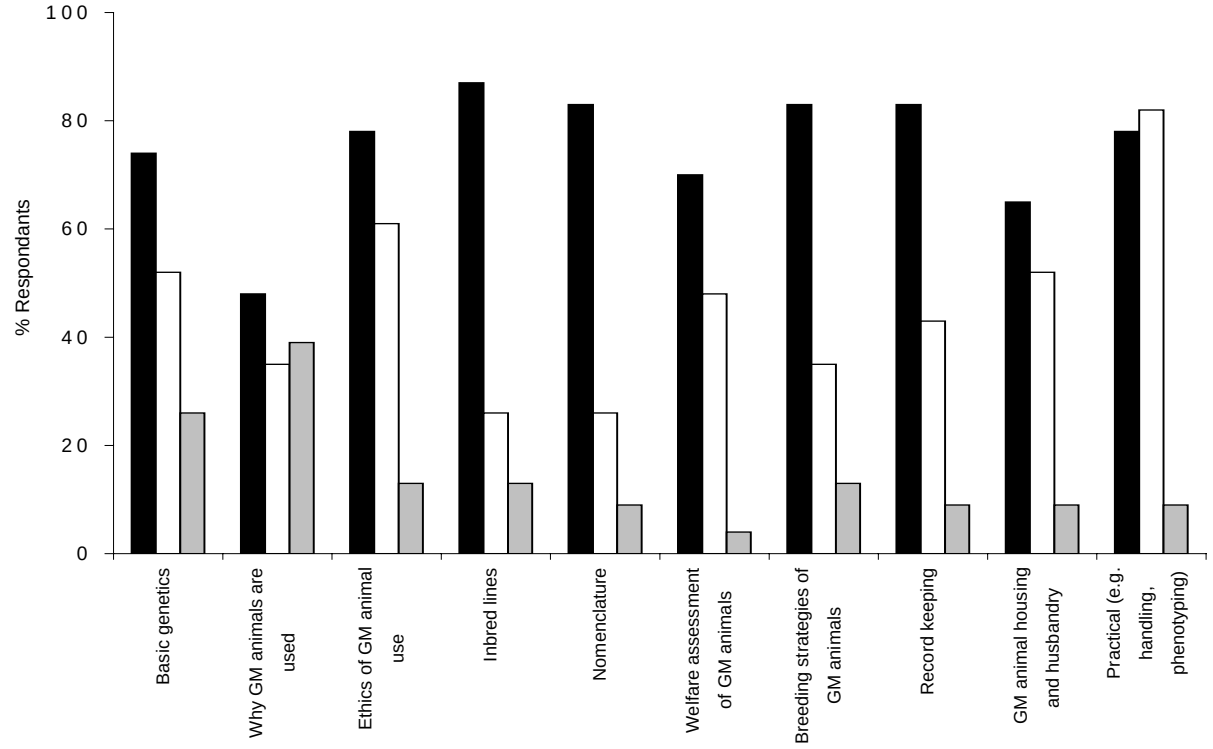
b) Animal technicians



c) Technical scientists



d) Scientists



Common routes by which scientists received their training are provided in Table 8d. Most scientists had completed some of the accredited Home Office modules (generally modules 1-3) and several of the more senior respondents had also attended module 5. However, there were frequent comments that the modular courses did not cover all the specific issues that they needed to learn and so further task specific training was commonly received on the job. Other approaches included searching the web, or consulting the Home Office guidance or modular training course notes. They also commonly approached the manager of the GM animal unit, other animal unit staff, their group leader, the NVS and their colleagues if they needed additional training or information.

Scientists did not commonly report attending any specific GM animal training courses or seminars. Several stated training in breeding protocols and record keeping was essential and it was also commonly accepted that discussion of ethics was useful, especially at the start of projects. Most respondents agreed that all involved in a line should be aware of its characteristics and that scientists should be in touch with the welfare of the animals they use. However, some scientists considered that it was not their responsibility to know anything other than what they needed to know for research. Their view was that it was the technicians' and NACWOs' responsibility to pick up on any problems and ensure the animals did not suffer unnecessarily.

Table 8d. Common responses from scientists regarding how they receive training on a number of topics relevant to GM animal use

	Common training routes					
Training topic	On the job	Discussion/internal contacts	Course e.g. degree	Previous experience	HO modules	Literature
Basic genetics	✓		✓	✓		
Why GM animals are used				✓		
Ethics of GM animal use					✓	
Inbred lines	✓	✓				✓
Nomenclature						✓
Welfare assessment of GM animals				✓	✓	
Breeding strategies of GM animals	✓			✓		
Record keeping		✓				
GM animal housing and husbandry	✓				✓	
Practical (e.g. handling, phenotyping)		✓			✓	

4.3.5 Named Veterinary Surgeons

Due to the small number of NVS participants in the survey, numerical analysis of their responses is inappropriate. However, there were several pertinent comments from the respondents.

Generally, the responsibilities of the NVS with respect to GM animals were considered to be similar to those for any other animals, including: health screening of the GM lines, discussion of endpoints, and general consultation.

All three NVS respondents stated that they did require additional training to perform their duties in GM animal units, so that they could develop an understanding of the techniques use to make GM animals and the effects of genetic modification on the GM animals themselves.

Training in these issues is received in the workplace, as part of in-house lectures, or via the Laboratory Animal Veterinary Association (LAVA) (see Section 4.5.3). If more information or training was needed then NVS respondents approached the manager of the GM animal unit, licensees, or members of the NVS community (again often via LAVA). The NVS participants agreed that training in basic genetics and why GM animals are used would be valuable, but there was no consensus on whether training in any of the other topics suggested to the staff groups above would also be valuable.

4.4 Staff opinion regarding current best practice for training

A major objective of the survey was to identify current best training practice for users and carers of GM animals and report any positive ideas and developments. The information presented above regarding the training currently provided by establishments, goes some way to identify what establishments are currently doing to ensure their staff are appropriately trained in GM animal care and use. However, staff opinion was also sought regarding what aspects are currently highly valued and what could be improved.

4.4.1 Suggested improvements to training provision

Although the vast majority of respondents appeared to be happy with the training they had received, many did provide suggestions of improvements that could be made to the current training regime at their establishment, or in a more general sense. Some suggestions were very specific to one particular establishment, department, or role, but most were generally applicable. Those which were mentioned most commonly are listed below.

<u>Suggestions regarding general establishment training</u>

It was felt that more time and resources should be dedicated to training. Many respondents (particularly animal technicians) wanted regular training sessions and many managers wanted more time to be available for them to train their staff and others.

It was also considered that trainees knowledge should be more thoroughly tested. Many respondents (again particularly animal technicians) commented that their knowledge level and ability to carry out their roles is not really tested following training. Some respondents would like more formal testing, which would then provide a valuable record of achievement (e.g. a pass certificate) for the future.

GM animal specific training

Several respondents stated that all staff should receive some level of GM animal specific training - including those who only use animal tissues. Some even suggested that all staff on site should receive at least a basic level of training to understand what they are doing and its impact to the GM animals themselves.

It was also noted that there needs to be more structure to GM animal specific training, as training is currently a bit ad-hoc. It was commented that there needs to be a more formal and structured training programme to ensure that all staff understand the issues and do not take things for granted. Several respondents suggested that there would be value in there being a specific (internal or external) GM animal course or even a specific accredited Home Office module for GM animals. However, it was also noted that not everything one needs to know can be learnt on a course and many respondents felt that GM animal specific training needs to be reviewed in individual establishments, to identify priorities regarding who needs training and what their training requirements are.

4.4.2 Staff comments on highlights of training provision by individual establishments

Respondents were asked to identify any particularly good aspects of the training regime at their establishments. A large number of very positive comments were provided; animal technicians in particular were very positive about the training they had received. Most respondents referred to their general training and not to ‘specific training in the care or use of GM animals’. This is because GM animal specific training is usually provided as part of general training.

Establishment training availability

Staff frequently commented that ease of access to training and training resources was extremely important and they appreciated establishments that actively encouraged staff training and ensured it was backed up by a large training budget. The initiatives that were most frequently reported as making a positive contribution to implementing the Three Rs and improving staff morale are summarised below.

- Ensuring that all staff involved in GM animal care and use receive some specific training.
- Providing ‘user friendly’, well-written information and standard operating procedures (SOPs) on the establishment intranet.
- Having a GM line database, containing information about welfare, as a useful training and everyday resource.
- Holding a ‘GM animals training day’ that is open to all staff.

- Making an on-site statistician available to help people ensure that experiments involving GM animals will be statistically sound and to help with data analysis.
- The availability of a range of people on site with different expertise that staff could 'tap into', because GM work often involves specialist knowledge and technical skills.
- Setting up discussion or working groups - particularly NACWO forums and welfare groups - for informal training by information sharing and working through problems as a group.
- Holding establishment seminars and lunchtime talks aimed at all staff. Talks from external speakers on ethics and animal use was highlighted by one respondent as being particularly useful for raising broader issues, and for being more challenging than internal talks.

Some people also commented positively on information obtained from external sources. For example, comments were frequently made about the benefits of subscribing to the 'transgenic list' at transgenic-list@imperial.ac.uk. This is a world-wide e-mail discussion forum dedicated to problem solving and discussion of all aspects GM animal use and care (it was noted however that the information obtained from list members cannot be guaranteed to be correct).

Highlights of the establishment training programme

Staff generally appreciated the existence of well structured and delivered training programmes and made a number of comments about the general training structure within their establishments. Respondents particularly valued:

- dedicated time being put aside for completion of the training programme;
- training that begins quickly after the employee starts work;
- discussion between manager and trainee about training needs and the consequent tailoring of training to fit individual requirements;
- having good trainers and a dedicated knowledgeable training manager;
- one to one training as the best way to learn quickly, learn the most relevant skills and be able to immediately identify and address any problems. One to one training was particularly valued for embryo manipulation techniques, preferably with a camera attached to the microinjection microscope so that trainees could see exactly what the trainer was doing;
- being trained in small groups with colleagues who they know and feel comfortable with. This facilitates a relaxed open atmosphere where people feel confident about asking questions;
- the availability of additional training outside the standard programme for those who need it;
- training being in depth and viewed as an ongoing process;
- training courses that are comprehensive and suitably challenging so that passing them is a recognisable achievement;
- training provided in several different units (rotational training) - where experience can be gained of different roles;
- provision of comprehensive training records, for example in a training folder.

4.4.3 Staff comments on the accredited Home Office modules

Many staff undertake the Home Office modules as part of their training in animal care or use, and this is quite frequently the only formally structured training that many staff receive. Therefore, although the basic modules are not specific to GM animal use, respondents often commented during the survey about the contents and effectiveness of these.

The majority of respondents who mentioned the modular training were satisfied that the basics of animal use were adequately covered within the syllabus and that the content was well presented. However, some felt that the modules they had attended were not adequate training for them because they did not fulfil all their individual training requirements. Many respondents felt the need for additional, more specific, training in aspects of GM animal use to be included in the current modules, or for a specific GM animal module to be developed.

4.5 Opinions of other organisations

A number of organisations with particular interests regarding the care and use of GM animals were asked for their views on training issues and to identify any issues which they believed needed to be progressed. Their comments are summarised below.

4.5.1 The Institute of Animal Technology

The IAT, as the professional body of animal technicians, has considerable interest in training for carers of GM animals. The IAT does not currently hold a regular training course focused on GM animals. However, a one day course entitled Genetic Modification for Animal Technicians has been held by the IAT on two occasions (the latest in 2001). The Institute hopes to run a very similar course again in late 2004, although it is apparently not viable to run it every year.

The course provided an introduction to GM animals and included talks on:

- what genetic modification is and how GM animals are produced;
- specific aspects of record keeping and legislation;
- GM animal welfare;
- GM rats;
- possible future trends in the field.

Presentations were followed by a discussion workshop. The course was introductory in nature, designed for junior technicians and did not aim to meet the training needs of more senior staff.

The IAT hopes that any relevant GM animal training required by animal technicians is covered within college courses and establishment in-house training programmes. However, the organisation is working itself, and with other organisations, to investigate whether there is a ‘training gap’ and, if so, on the training options that would best bridge that gap. For example, they are considering including a GM animal specialist topic as part of the certificate level IAT qualification. Such specialist training could be provided as part of in-house training or on-line, in order to keep the

time that staff are away from their day to day tasks to a minimum, and to enable country-wide access to the information.

4.5.2 The Laboratory Animal Science Association

LASA has a wide membership, including research scientists, animal welfare scientists, senior animal technicians, NACWOs and animal unit managers. The organisation consequently has a fairly broad view of training provision and staff training needs.

LASA is of the opinion that specific training for both animal technicians and scientists who are involved in GM animal care and/or use is valuable, but that the training needs of these two groups are different. It believes that training for scientists should be focused on creating and using lines with the least wastage of animals, whereas training for animal technicians should be focused on monitoring the GM lines, communication (for example of phenotypes and breeding status), and responding to any welfare problems that arise as a result of the genetic modification. LASA focuses on scientists' and named persons' training, and takes the view that it is the IAT's role to train animal technicians. LASA would, however, support the IAT and other organisations, such as the MRC, in the provision of training.

Topics that LASA believes their members should have knowledge of include: basic genetics, why GM animals are used, ethical aspects of GM animal use, inbred strain characteristics, welfare assessment of GM lines, breeding strategies, specific aspects of record keeping and, specific aspects of housing and husbandry. Tips on where to get help and useful sources of additional information should also be provided to staff. However, it was also noted that the actual training needs of an individual depends upon their existing knowledge and role within the establishment.

LASA holds two annual 'GM section' meetings in order to allow developing good practises in the field to be presented and discussed. In addition the association is considering the future provision of Continuous Professional Development (CPD) training and it is envisaged that GM animal use would be included in this.

4.5.3 The Laboratory Animal Veterinary Association

LAVA has an interest in training for users and carers of GM animals because many members will be responsible for GM animal care and thus are in a good position to help reduce suffering and improve animal welfare.

LAVA commented that specific training requirements for NVSs include breeding and genotyping practices. The Association has not provided any specific training in this area in the past, but it was recently decided that it is important to address new technologies at LAVA meetings and GM animals were included amongst the priority. As a result, GM animal (transgenic) technologies were discussed at a LAVA meeting in 2004. The following topics were included:

- basic genetics (DNA structure and function);
- the basics of transgenics and mutagenesis, e.g. knockouts and, genotyping and backcrossing of mice;
- some clinical applications of the technology, e.g. mouse models;

- the ‘GM mouse passport’ as a method for improving welfare;
- benefits of transgenic research;
- practical aspects of GM animal welfare.

The course was well attended and reported to be very useful by participants.

4.5.4 The Medical Research Council’s Centre for Best Practice for Animals in Research[2]

The Medical Research Council (MRC) has an interest in training issues for both carers and users of GM animals because it funds projects involving GM animals and employs staff at all levels who are involved in carrying out such work. The MRC is currently carrying out a survey of the training requirements with respect to GM animals of animal technicians undertaking MRC funded work and this should highlight specific training needs.

A representative of the MRC Centre for Best Practice for Animals in Research (CBPAR) provided the Centre’s views on training for users and carers of GM animals. This was that LASA should take the leading role in training for scientific staff and that the IAT should also be involved. The lack of a proper defined training course in the area of GM animals is a problem for all groups, although scientists and technicians have different needs. For example, training in the ethical aspects of GM animal use, characteristics of inbred strains, nomenclature, breeding strategies and record keeping would be useful for both groups. However, training in basic genetics and why GM animals are used, is only likely to be useful for animal technicians, as scientists involved in the field should already be fully versed in these topics. Housing and husbandry and welfare assessment of GM animals should also be approached differently for the different groups. Animal technicians need to understand the practical aspects of these areas, whereas scientists need to understand their importance and the basic concepts, for example, with regard to the way housing can be adapted to improve the welfare of some GM lines.

4.5.5 The Institute of Biology

The Institute of Biology (IOB) is one of the three accrediting bodies (together with the Universities' Accreditation Scheme and Scottish Accreditation Board) responsible for ensuring that the courses that they accredit conform to the requirements of the Home Office. The IOB is not a policy making body in this regard and has no set opinion on what ought to be included in training for those involved in the care and/or use of laboratory animals (GM or otherwise). However, the IOB does stress that people should not regard passing the compulsory course exams as the end of training. They should recognise the need to continue to learn on the job any aspects relevant to their role.

The IOB commented that although GM animal use is the fastest growing area of biomedical research, there is currently no specific requirement for training to be given in GM animal use in the syllabus of the accredited Home Office modules. However, the existence of variability (in phenotype) between different strains of rats and mice is generally stressed on courses which the IOB accredits, and attendees need to be aware

[2] Subsequent to the survey MRC CBPAR formed the core of the National Centre for the 3Rs

that different strains have different patterns of 'normal' behaviour. The IOB also supports course organisers who do include GM animal specific training where it is relevant to the attendees.

The IOB considers itself to be in a position to respond quickly to any changes or developments in the area of GM animal use and would immediately inform the courses for which they are responsible of any Home Office or Ministerial request for a change to the compulsory training.

5 Conclusions and recommendations

Respondents to the survey participated enthusiastically and with considerable interest. This emphasises the importance of training in general, and how comprehensive, effective training is appreciated by staff working under the ASPA.

The majority of staff were pleased with the training they had received, and most establishments visited were striving to provide the comprehensive and relevant training that staff want. However, it is important to note that the establishments visited were those that were already sufficiently interested in the issue to participate in the survey, and although it is hoped that this reflects the situation throughout the UK, this should not be assumed.

With regard to future developments, many participants suggested that a specific GM animal course should be introduced, either within establishments, or even at a formal national level, in addition to the current Home Office Modular courses. However, none of the organisations consulted seemed to be in a position to immediately provide such a course. In any case this may not be the best way to make progress; the various staff groups have different roles and consequently different training needs, and it might be difficult to provide a standard course that would suit everyone. Providing separate courses for animal technicians, scientists and specialists (such as microinjectionists) might be a solution, provided that each course was regularly reviewed to ensure that it was up to date with regard to the technology, refinements in its application, animals behaviour, welfare and care and new training resources and methodologies.

It was also commonly stated that individual establishments need to evaluate the training requirements of their staff in relation to their current training provision. If many establishments conclude that additional formal training specific to GM animals is necessary, then this would lend weight to the development of regional or national courses. This is an issue that the authors believe all those currently involved with training issues (including IAT, LASA, LAVA, accrediting bodies, the trainers, the APC and the Home Office) should consider.

Attending courses means time away from normal work, and it was noted by respondents that time is already an important limiting factor with respect to the current level of training provision. A potential solution that is already being considered by some organisations (e.g. LASA and the IAT) is to provide on-line resources that would enable staff to learn as individuals, or could be used by training managers as part of in-house group training. Such resources would allow staff to learn at their own pace, when time allowed, and would negate the need for each manager to

start from first principles when introducing specific training to their animal unit or establishment. However, this is not sufficient on its own, since it does not satisfy the need for the type of guidance, development of ideas, motivation and discussion which can be provided by traditional training methods.

5.1 Recommendations

The following recommendations have been drawn from the report in order to help develop training for those working with GM animals. They are aimed primarily at individual establishments, however, other stakeholder organisations may wish to consider some or all of them as part of a wider review of training.

Training issues

5.1.1 All participating staff groups and organisations agree that *there is a need* for specific training for GM animal carers and, in addition, staff *want* training in this area. GM specific training should therefore be provided to all those involved with GM creation, care and use.

5.1.2 Such training would provide basic background information suitable to the trainee's general role. For example; 'the impact of genetic modification on the animals' for scientific staff and 'identifying adverse effects of genetic modification' and 'welfare assessments of GM lines' for animal technicians. Additional topics (e.g. tissue biopsy) should be taught specific to the individual's role.

5.1.3 Training provision should be compatible with the establishment type and the nature of the research that is carried out. It needs to be related to other establishment factors such as opportunities for interpersonal communication and strategies for identifying and implementing refinements. Feedback from trainees is very important, as is regular review of course content and delivery.

5.1.4 There should be a mechanism for: a) ensuring that staff know what training is available to them and; b) consulting them about the additional training needs they feel they have and ensuring these are provided. This comes within the remit of the local ERP.

5.1.5 Where appropriate, the outcomes of training should be tested and evaluated, for example with a post-training exam/questionnaire and by auditing figures of the efficiency of the genetic modification process. Benchmarks for embryo manipulations could be set and success rates recorded. Training records should be kept as part of the process of CPD.

5.1.6 Those involved in developing, delivering and monitoring training (e.g trainers, accrediting bodies, LASA, IAT, LAVA, Home Office, APC) should seriously consider the need for a 'GM animal' course, group of courses, or the revision of the current Home Office modules to include GM animal topics. This requires discussion and decisions on:

- the target audience/s;
- the course/s content and expected learning outcomes;
- the time constraints on additional training and how these can be overcome;
- the potential for on-line resources to be provided and the advantages and disadvantages of training using these.

Associated but more general issues

5.1.7. It is important to ensure that there is a mechanism in place in-house for identifying, evaluating and implementing refinements and that all relevant staff are aware of this and motivated to use it.

5.1.8. Improving communication in-house, especially between different staff groups is critically important. Scientists should be encouraged to feed back to animal technicians about progress with the research and what is being done with the animals they care for. This could be done through seminars, update fact-sheets, GM seminars or discussion days or just by including the technician in the loop as part of the full research team.

5.1.9. Good communication with outside discussion groups and professional bodies is also helpful so staff should be actively encouraged to go to relevant meetings held by IAT, LASA, LAVA and provide appropriate resources. If a training need is identified which is difficult to satisfy in-house, consider asking IAT/LASA/LAVA to hold a training/information day. (However, note that IAT and LASA meetings have become extremely expensive limiting opportunity for staff attendance. Both organisations could consider providing more affordable meetings)

References

Home Office '**Statistics of Scientific Procedures on Living Animals: Great Britain' years 1990 to 2003'** The Stationery Office, Norwich

Home Office (2000) '**Guidance on the Operation of the Animals (Scientific Procedures) Act 1986'** The Stationery Office, London

Robinson V, Morton DB, Anderson D, Carver JFA, Francis RJ, Hubrecht R, Jenkins E, Mathers KE, Raymond R, Rosewell I, Wallace J, Wells DJ (2003) '**Refinement and reduction in production of genetically modified mice: Sixth report of the BVA(AWF)/FRAME/RSPCA/UFAW Joint Working Group on Refinement**' *Laboratory Animals* **37** (Supplement 1)

Appendix A Questionnaire used to carry out the survey

General questions to ask facility manager/training manager only

1. Roughly what is your holding capacity (including normal animals used in the creation and maintenance of genetically modified (GM) lines)?
   How many GM breeding lines do you have?
   Do you generate GM lines on site?
   If so, how many?

2. Describe the set-up of the facility with reference to who carries out the following:

	Laboratory based Scientist	Animal Technician	NACWO	NVS	M'inj Tech. *
Prepares DNA constructs for embryonic stem (ES) cell or microinjection					
Targets and cultures ES cells prior to blastocyst injection					
Carries out surgical procedures (e.g. vasectomy and embryo transfer (ET))					
Carries out superovulation?					
Carries out euthanasia/Schedule 1 killing					
Carries out blastocyst or fertilised oocyte injections					
Carries out tissue biopsies for genotyping					
Analyses tissue biopsies					
Directs the breeding programme					
Carries out weaning and sets up matings					

* M'inj Tech. = microinjection technician

3. Are specific welfare assessments carried out over and above the regulatory requirements (on GM lines)? If so, who carries these out?

4. Do lab based researchers access (go into) to the animal/barrier/transgenic unit?

   What for?

5. What containment systems are used in the facility and why - e.g. to protect humans and/or to protect animals?

6. Are records kept of phenotypes and GM animal welfare assessments? If so who completes and updates these?
   Who has access to them and how (e.g. intranet)?

7. Apart from the groups I am visiting, who else gets training?
   What does it comprise of?

8. Do all those involved with GM animals receive dedicated training, e.g. how are PhD students and other temporary staff trained and do they carry out all their own work as outlined in the practices above?

9. Is there a syllabus for the training provided?
Does it indicate times in terms of when the course is delivered and how long it should take?
Is learning self-directed or is it lectures/tutorials, one to one, interactive programmes on CD?

10. Are outcomes of training and records of training undertaken recorded?
How?

11. Where is the training done (internal/external)?

12. How would people be aware of new technologies/refinements changes in best practice?
How do they get identified and implemented e.g. is there a refinement group?

To ask all participants

1. What specific activities do you carry out with respect to GM animals?

2. Do you feel that these activities lead you to have additional training needs from research using non-GM animals? If so what?

3. What general training have you received (at this establishment)? How long was the training for the areas/topics mentioned?

4. About the subjects of training specific to transgenic animals
Have you received training in the following?
Do you think it would be/is valuable for your role?
As part of what training was this aspect covered (e.g. Home Office module 1)?
Any other comment.

    a) Basic genetics and how GM animals are produced (including reasons for inefficiency)
    b) Why GM animals are used
    c) The ethics of using GM animals
    d) Information about commonly used inbred lines and why they are used
    e) Nomenclature and how to name new lines and their intercrosses
    f) Carrying out welfare assessments
    g) Breeding strategies
    h) Record keeping (specific aspects)
    i) Housing and husbandry of GM animals (specific aspects)
    j) Practical training, e.g. handling, phenotype scoring
    k) Other, if so what

5. About the training system

   a) What training aids were used during the training and how would you rate them (good, bad)?
   b) Did you receive feedback on how you performed?
   and / or was your understanding assessed?
   c) Have you assessed the training programme or given feedback?
   d) How frequent are courses held? Is refresher training provided?
   e) When was the training given; after the work started or before?

6. Is there additional training available at this establishment that you have not taken up? If so, was it inaccessible (e.g. timing) or not appropriate for you?

7. Do you feel that the training you have undertaken has addressed your training needs specific to the care and use of GM animals?
   If not then what needs have not been dealt with and how could this be addressed?

8. What improvements (if any) could you suggest to the current training regimen?

9. Is there anything particularly good/positive about the training programme that you would like to highlight?

10. Is training of laboratory and animal facility based staff combined or separate?

11. How is communication between staff based in the laboratory and animal facility established?
    Is there an opportunity for all staff to meet for feedback and to exchange ideas, views, update on results etc?

12. If you need training and/or information who do you approach?
    Is this successful?

13. Any other comments?

Specific questions for those carrying out embryo manipulations (or managers of staff carrying out embryo manipulation)

1. How are success rates for embryo manipulations monitored, e.g. are benchmark figures used? Do you think benchmark figures are useful?

2. Are records kept of success rates? For example in relation to; person carrying out the manipulations, mouse strain, age, etc.

3. If the answer to 2 is ‘yes’, then what happens to those records?
   Are they audited (if so, when and by whom)?
   If the answer to 2 is ‘no’ then are there constraints on doing it (e.g. time)?