



PART VII

**Safety organization
and training**

19. The biosafety officer and biosafety committee

It is essential that each laboratory organization has a comprehensive safety policy, a safety manual, and supporting programmes for their implementation. The responsibility for this normally rests with the director or head of the institute or laboratory, who may delegate certain duties to a biosafety officer or other appropriate personnel.

Laboratory safety is also the responsibility of all supervisors and laboratory employees, and individual workers are responsible for their own safety and that of their colleagues. Employees are expected to perform their work safely and should report any unsafe acts, conditions or incidents to their supervisor. Periodic safety audits by internal or external personnel are desirable.

Biosafety officer

Wherever possible a biosafety officer should be appointed to ensure that biosafety policies and programmes are followed consistently throughout the laboratory. The biosafety officer executes these duties on behalf of the head of the institute or laboratory. In small units, the biosafety officer may be a microbiologist or a member of the technical staff, who may perform these duties on a defined part-time basis. Whatever the degree of involvement in biosafety, the person designated should possess the professional competence necessary to suggest, review and approve specific activities that follow appropriate biocontainment and biosafety procedures. The biosafety officer should apply relevant national and international rules, regulations and guidelines, as well as assist the laboratory in developing standard operating procedures. The person appointed must have a technical background in microbiology, biochemistry and basic physical and biological sciences. Knowledge of laboratory and clinical practices and safety, including containment equipment, and engineering principles relevant to the design, operation and maintenance of facilities is highly desirable. The biosafety officer should also be able to communicate effectively with administrative, technical and support personnel.

The activities of the biosafety officer should include the following:

1. Biosafety, biosecurity and technical compliance consultations.
2. Periodic internal biosafety audits on technical methods, procedures and protocols, biological agents, materials and equipment.

3. Discussions of violation of biosafety protocols or procedures with the appropriate persons.
4. Verification that all staff have received appropriate biosafety training.
5. Provision of continuing education in biosafety.
6. Investigation of incidents involving the possible escape of potentially infectious or toxic material, and reporting of findings and recommendations to the laboratory director and biosafety committee.
7. Coordination with medical staff regarding possible laboratory-acquired infections.
8. Ensuring appropriate decontamination following spills or other incidents involving infectious material(s).
9. Ensuring proper waste management.
10. Ensuring appropriate decontamination of any apparatus prior to repair or servicing.
11. Maintaining awareness of community attitudes regarding health and environmental considerations.
12. Establishment of appropriate procedures for import/export of pathogenic material to/from the laboratory, according to national regulations.
13. Reviewing the biosafety aspects of all plans, protocols and operating procedures for research work involving infectious agents prior to the implementation of these activities.
14. Institution of a system to deal with emergencies.

Biosafety committee

A biosafety committee should be constituted to develop institutional biosafety policies and codes of practice. The biosafety committee should also review research protocols for work involving infectious agents, animal use, recombinant DNA and genetically modified materials. Other functions of the committee may include risk assessments, formulation of new safety policies and arbitration in disputes over safety matters.

The membership of the biosafety committee should reflect the diverse occupational areas of the organization as well as its scientific expertise. The composition of a basic biosafety committee may include:

1. Biosafety officer(s)
2. Scientists
3. Medical personnel
4. Veterinarian(s) (if work with animals is conducted)
5. Representatives of technical staff
6. Representatives of laboratory management.

The biosafety committee should seek advice from different departmental and specialist safety officers (e.g. with expertise in radiation protection, industrial safety, fire prevention, etc.) and may at times require assistance from independent experts in various associated fields, local authorities and national regulatory bodies. Community members may also be helpful if there is a particularly contentious or sensitive protocol under discussion.

20. Safety for support staff

The safe and optimum operation of a laboratory is dependent to a great extent on the support staff, and it is essential that such personnel are given appropriate safety training.

Engineering and building maintenance services

Skilled engineers and craftsmen who maintain and repair the structure, facilities and equipment, should have some knowledge of the nature of the work of the laboratory, and of safety regulations and procedures.

Testing of equipment after servicing, e.g. testing the efficiency of biological safety cabinets after new filters have been fitted, may be carried out by or under supervision of the biosafety officer.

Laboratories or institutions that do not have internal engineering and maintenance services should establish good relationships with local service providers to familiarize them with the equipment and work of the laboratory.

Engineering and maintenance staff should only enter Biosafety Level 3 or Biosafety Level 4 laboratories with clearance and supervision by the biosafety officer and/or the laboratory supervisor.

Cleaning (domestic) services

Biosafety Level 3 and Biosafety Level 4 laboratories should be cleaned by the laboratory staff. Cleaning personnel should only enter Biosafety Level 3 or Biosafety Level 4 laboratories with clearance and supervision by the biosafety officer and/or the laboratory supervisor.

21. Training programmes

A continuous, on-the-job safety training programme is essential to maintain safety awareness among laboratory and support staff. Laboratory supervisors, with the assistance of the biosafety officer and other resource persons, play the key role in staff training. The effectiveness of biosafety training, indeed all safety and health training, depends on management commitment, motivational factors, adequate initial job training, good communications, and ultimately the organization's goals and objectives. The following are critical elements for an effective biosafety training programme.

1. **Needs assessment.** This process includes defining the tasks involved, the order of importance (in terms of frequency, criticality, complexity) and details of the steps necessary to accomplish them.
2. **Establishing training objectives.** These are observable behaviours that the trainee is expected to demonstrate, on the job, after the training. Objectives may acknowledge the conditions under which certain activities or behaviours are performed and the required level of proficiency.
3. **Specifying training content and media.** Content is the knowledge or skill that the trainee must master to be able to meet the behavioural objectives. Those individuals who know the job and its demands best usually define the content of the biosafety training programme. Other approaches used may focus on the products of problem-solving exercises or the design of learning measures to correct mistakes people have made in using a skill. It is not clear that one teaching method (lectures, televised instruction, computer-aided instruction, interactive video, etc.) is superior to another. Much depends on specific training needs, the make-up of the trainee group, etc.
4. **Accounting for individual learning differences.** Effective training must take into account the characteristics or attributes of the trainees. Individuals and groups may differ in aptitude, literacy, culture, spoken language and pre-training skill levels. How the training programme is viewed by trainees in terms of improving their job performance or personal safety may dictate the approach used. Some individuals are more visual or "hands-on" learners; others learn well from written materials. Any special needs of employees must also be addressed, such as course adaptation for those with hearing impairments. In addition to taking account of these elements, it is recommended that the developers of any safety training programme become acquainted with the principles of adult learning.

5. **Specifying learning conditions.** The instructional event (e.g. training course, videotape, written materials, etc.) should not conflict with, inhibit or be unrelated to mastery of the skill or topic being taught. For example, if the intent of the instruction is to develop capabilities in problem-solving techniques, the instructional approach should stress thinking/reasoning approaches rather than rote memorization. The instruction provided should require productive behaviour and/or appropriate feedback (positive/accurate/credible). In addition, instructional events that provide opportunities for practice under conditions similar to that of the job will enhance the transfer of the skill to the actual job.
6. **Training evaluation.** This provides information that helps to determine whether the instruction has had the intended effect. Training evaluations generally take four forms:
- measuring the trainees' reaction to the instruction provided
 - measuring the trainees' recollection and/or performance
 - assessing behavioural change on the job
 - measuring tangible results in terms of the organization's objectives or goals.
- The most complete evaluation of a training effort involves assessments for each of the four areas. The least efficient method of evaluation is to consider only the trainees' reactions to the instruction as this may bear little relationship to the extent of actual learning. It should not be used as the sole measurement of training effectiveness.
7. **Training revision.** Training evaluations rarely indicate that a training programme is a complete success or failure because multiple criteria are used to measure results. Usually the data indicate a better understanding, retention or application of some parts of the course material as compared with others. Variation or gaps in knowledge or the desired competencies resulting from the training effort may reflect the need to consider more training time, alternative instructional techniques or more capable instructors.

WHO provides various tools for microbiological safety training.