Carcinogen Policy:
Policy for the use of known or suspected chemical carcinogens, mutagens and substances toxic to reproduction

Contents

1. Introduction

This document describes the control measures appropriate for meeting legal requirements and promoting best practice for work involving the use of carcinogens, mutagens, and substances toxic to reproduction [STR]. It aims to provide Heads of Schools/ Departments and others responsible for the use of known or suspected carcinogens, mutagens & STR with information on the steps they need to take to ensure compliance with current legislation. These guidelines should, where appropriate, be incorporated into School/ departmental policies and specific experimental procedures.

2. Scope

The Safety, Health and Welfare at Work (Chemical Agents) Regulations and the Safety, Health and Welfare at Work (Carcinogens) Regulations require that employers must assess any work activity likely to involve a risk of exposure to chemicals, carcinogens or mutagens.

Mutagens [agents that cause heritable genetic changes] and substances toxic to reproduction [agents that impair fertility or cause harm to a developing foetus], are not subject to the same specific legislative requirements as carcinogens. In addition, some cytotoxic and antimitotic drugs have similar properties. Therefore, even though not specifically prescribed for, because of the serious nature of their hazardous properties, they should be treated in the same manner as carcinogens. For the purpose of this Policy and associate guidelines no further distinction is drawn between these categories and the procedural requirements must be applied to all. The term 'carcinogen' has been used throughout the document as a generic term to cover all categories.

3. Responsibilities

The following responsibilities are in addition to the general responsibility for safety as laid down in the RCSI Health and Safety Statement and related safety policies.

3.1 Heads of Schools or Departments must ensure that arrangements are in place to:

- Identify those procedures carried out within the School that involve the use of substances which fall into the category of carcinogen, mutagen, STR or cytotoxic agent [see Section 4 for definitions and classification]

- Ensure safe storage, labelling and transport of any such agents
- Ensure risk assessments are undertaken and records of use are kept [see Section 7 & 8.2.3]
- Ensure that employees/students/visitors who may work with these agents are suitably trained in the standards required and ensure these are conformed to.
- In order to assist him/her in discharging these responsibilities the Head of School may nominate a suitably qualified and competent individual to act on their behalf and to give advice on the safe use of these agents.

3.2 Principal Investigators / Supervisors

In addition to the requirement for ensuring suitable risk assessments are undertaken, the PI and Supervisors must also ensure that:

- workers within their group are informed of the nature of the hazard,
- workers are suitably trained in the control measures to be applied to remove or reduce risks to a minimum and are competent to carry out the work,
- training records must be kept,
- an appropriate level of supervision is maintained at all times

3.3 Lab staff / technicians / students have a duty to protect themselves and others from any hazards arising out of their work and therefore must comply with the requirements of this policy.

4. Definitions

4.1 Carcinogens are agents that cause cancer and fall into three categories. Appendix 1 shows the definitions of the categories, the hazard statements and symbol that will be assigned if obtained from a supplier and one or two examples of each category. More detailed information is available in the applicable legislation.

4.2 Mutagens are substances that cause heritable genetic changes (mutations). Most mutations are harmful and most mutagens are carcinogens and vice versa. See Appendix 1.

4.3 Substances toxic to reproduction (STR) are substances known or suspected to impair fertility or to cause developmental toxicity in humans. This definition covers a broader range of health effects than the earlier "teratogenic" which applied only to substances that adversely affected the developing foetus. Mutagens and STRs are classified similarly to carcinogens in Categories 1 to 3. See Appendix 1.

5. Sources of Information on categorisation of carcinogens

The primary source of information on categorisation is to be sought from the relevant Safety Data Sheet.

In addition an authoritative source of information is the International Agency for Cancer Research [IARC]. Over the years it has published a series of Monographs on a variety of

chemicals and classes of substance and has classified them according to severity of carcinogenic hazard. The IARC lists may be referred to when determining the properties of a particular compound. The Monographs also provide useful information on deactivation and disposal regimes. This information can be found at: http://monographs.iarc.fr/ENG/Classification/index.php

Limited information on categorisation of carcinogens can also be found in Appendix 1 below.

6. Risk assessment

As with any other chemical, a risk assessment must be carried out for the procedure involving the use of a carcinogen. The assessment should take account of the following:

- identification of the substance to be used and justification for its use
- the nature and severity of the hazard i.e. is it a carcinogen?
- whether substitution by a less hazardous substance is reasonably practicable.
- evaluation of the risk of exposure. Are there any workers who may be at particular risk including possible risks to pregnant women?
- identify the control measures by which exposure can be prevented or if not reasonably practicable controlled. [See Table 1]
- precautions under non-routine conditions e.g. emergencies
- use of personal protective equipment
- waste disposal and deactivation protocol
- monitoring procedures, where necessary [e.g. testing for contamination]
- health surveillance procedures
- information/training and supervisory requirements

The assessment must be reviewed:

- if there is any indication that control measures may not be working such as following an accident or incident or if indicated by monitoring activities
- if there is any change to the process
- in the event of neither of the above, at least annually.

7. Control of Exposure

7.1 Physical and procedure controls

The Regulations set out strict statutory and legal obligations in relation to the control of exposure to carcinogens to prevent exposure. Table 1 specifies the principles and hierarchy of measures that are legally required and must be adhered to and offers some practical advice on how these can be implemented.

Table 1: Physical and procedure controls

Prevent exposure *If prevention is not possible, control exposure to as low as reasonably practicable by the use of:*	Principal Investigators / Supervisors must consider: • whether suitable, safer alternatives are available • modifying the process to avoid using the carcinogen, • avoiding the formation of carcinogenic by-products or intermediates.
Total Enclosure of the process or parts of the process that could result in exposure (*unless not reasonably practicable)*	• Use a glove box or isolator
Use of plant, processes and systems of work which minimise the generation of, or suppress and contain spills leaks, fumes and vapours	• Use a fume cupboard or powder weighing cabinet specifically designed for use with carcinogens/highly toxic compounds. Make sure it is working and be aware of air turbulence as this can spread fine powders within the fume cupboard. • Handling must be confined to dedicated areas that are clearly identified with appropriate hazard signs. • Obtain agents in pre-weighed vials or 'isovac' containers to remove need for dispensing [even if this is more expensive]. • Purchase carcinogens in the smallest amounts available for practical use. • Minimise frequency of use. If the compound is stable in solution then weigh out enough for several experiments and divide into suitable aliquots for future use. • Make sure that safe storage, handling, labelling and disposal methods are available. • Work over a tray. • Ensure effective spillage procedures are in place. • Minimise the number of people exposed. Exclude non-essential personnel. • Follow good occupational hygiene, wash hands after handling compound. No eating drinking /smoking/application of cosmetics.
Training & Supervision	• Ensure those carrying out the dispensing process are skilled, experienced and fully trained in the safe use of these compounds. PIs are asked to nominate one or two people in the group who are authorised to do this on behalf of less experience workers. • Ensure that persons working with classified substances are trained on this procedure.

Personal protective equipment may be used as secondary protection but must never be the primary means of controlling exposure.	• Lab coat where possible should be double fronted, side fastening with cuffs. • Gloves should be of the correct type depending on the nature of the compound and any associated solvent that may be involved. Check glove manufacturers' charts or seek advice. • Respiratory protection [RPE] such as face masks may only be worn as a secondary means of protection in addition to working in a fume cupboard or in the event of a spill outside primary containment. RPE must be of the correct type and, depending on type, may require face fit testing. The wearer must have received suitable training in the correct use of the RPE. • Protective clothing must not be worn outside the area designated for work with carcinogens.

7.1.1 Storage

Heads of School, PI's and Supervisors must ensure that known or suspected chemical carcinogens, mutagens and substances toxic to reproduction are kept in secure, locked storage locations except when in use. Access to the store must be restricted to named and authorised staff who are trained and competent in using such substances.

Storage of carcinogenic substances must be kept to a minimum. Containers and storage areas must be clearly labelled with appropriate hazard signs.

7.1.2 Decontamination & Disposal

The procedure for safe disposal of carcinogens and materials contaminated by them, must be determined as part of the risk assessment process, before the agent is put into use.

Many carcinogens can be rendered harmless by the addition of an appropriate chemical solution – often strong acid or alkali. If the compound cannot be deactivated it will be subject to the requirements of Hazardous Waste Regulations and will require disposal by specialist contractor. Seek advice from the RCSI Chemical Waste Co-ordinator about disposal.

It should be noted that the disposal of toxic waste is a costly exercise and appropriate budgetary arrangements must be made during the planning stages of any procedure.

7.1.3 Emergency procedures

Safety data sheets [SDS] will give details of first aid and spill procedures for specific compounds. These should be referred to before commencing the work as part of the risk assessment process. Specific first aid and spill information should be included in the assessment and incorporated into the safe operating procedure.

7.1.4 Transport

Work must be organised in such a way as to avoid the transport of carcinogens outside the room where they are stored / lab within which they will be used. Where transport to another lab or area within RCSI is unavoidable, secondary containers must be used to reduce the risk of any spillage.

7.2 Administrative Controls

7.2.1 Approval for work

All new procedures involving the use of known/suspected carcinogens must be covered by a suitable and sufficient risk assessment which has been approved and validated in

accordance with RCSI policy and procedures. The PI approving the assessment must be satisfied that:

- the use is essential,
- the proposed scale of the work is justified
- that adequate facilities exist to allow its safe use, storage and disposal
- the investigator undertaking the work is trained and competent

The PI approving the work must sign to that effect on the process risk assessment and SOP.

7.2.2 Work procedures

All work involving known or suspected carcinogens, mutagens and STRs must be carried out in accordance with specific written standard safe operating procedures [SOP]. These must be drawn up in light of the risk assessment findings and in accordance with the principles outlined in Table 1 above.

7.2.3 Records of exposure

There is little value in recording every time a powdered carcinogen is dispensed; however Departments must ensure that there is a recording system in place that enables individuals who have been involved in such work to be identified. This can best be achieved by ensuring that a list of authorised users is appended to the risk assessment for the procedure in which the carcinogen is used. The procedural risk assessment must include the following information:

- Title of project/ procedure,
- The full chemical name of the carcinogen along with any trade name or short name by which it is commonly referred to,
- Quantity normally used in the procedure,
- The form [liquid, gas, powder],
- Name of responsible scientist /PI,
- A list of authorised users involved in the work including the date they started on the project and the date they finished.

These records must be kept for 40 years.

Any accidental exposure to a carcinogen such as might occur as result of spillage must be recorded – see 8.2 below.

8. Monitoring

8.1 Proactive monitoring of the workplace

Because exposure to carcinogens can result in serious health effects, consideration must be given to appropriate monitoring procedures in the form of regular checks at pre-determined intervals that engineering controls are operating effectively and that

procedures are being followed. Fume cupboards (FC) are subject to annual maintenance and checks organised by Estates. However it is important that before each use, the FC control panel is checked for safe operation and there is some additional check made to ensure the fans are operating.

8.2 Reactive monitoring - Accident/incident recording

Where an incident occurs, that results in the potential or actual exposure of any individual to a carcinogen, even if there is no apparent health effect, it must be recorded on the RCSI Accident/Incident reporting system. The Health and Safety Manager must be immediately informed as such an occurrence may be reportable to the Health and Safety Authority (HSA).
The individual will be referred to Occupational Health who will ensure an appropriate entry is made on the individual's health record. The above records must be kept for 40 years and be available for inspection.

9. Training and Supervision

Individuals required to work with carcinogens must be fully trained in how to handle carcinogens safely and be assessed as fully competent by their supervisor before handling the carcinogen. This training and attainment of competence must be recorded, with both trainer and trainee signing to that effect.

A very high level of supervision should also be maintained to ensure that workplace standards and working practices are maintained.

10. Use of Carcinogens for teaching

The use of powdered or highly concentrated solution of carcinogens, particularly those regulated by law, for teaching is prohibited. Use of aqueous solutions which contain carcinogens in low concentration for teaching is permitted subject to risk assessment and authorisation by Health and Safety Manager and the relevant Head of School/Department with the ongoing need and conditions of use reviewed annually.

11. New & Expectant Mothers

When a female employee becomes pregnant she must immediately inform her PI / Department Head / supervisor / Health and Safety Manager so that an additional risk assessment can be undertaken before carrying out any further work with these substances.

Female workers who work with carcinogens and who are contemplating becoming pregnant can seek advice from their GP or from Occupational Health.

For additional assistance or information contact safety@rcsi.ie or collettepower@rcsi.ie

Appendix 1 Categorisation of carcinogens

Carcinogen is defined as a substance or a mixture of substances which induce cancer or increase its incidence. Substances which have induced benign and malignant tumours in well performed experimental studies on animals are also considered to be presumed or suspected human carcinogens unless there is strong evidence that the mechanism of tumour formation is not relevant for humans.

Carcinogenic substances are classified in three categories according to the following criteria:

Category 1: Category 1A and Category 1B	
Known or presumed human carcinogens A substance is classified in Category 1 for carcinogenicity on the basis of epidemiological and/or animal data. A substance may also be included in category 1A if it is known that it is a human carcinogen, based on the existence of human testing, or category 1B if it is supposed to be a human carcinogen, based on the existence of animal testing. The classification in Category 1A and 1B is based on the strength of evidence and others. This evidence may come from: i. human studies that establish a causal relationship between human exposure to a substance and the development of cancer (known human carcinogen); or ii. ii. animal experiments for which there is sufficient evidence to demonstrate animal carcinogenicity (presumed human carcinogen). In addition, on a case-by-case basis, scientific judgment may warrant a decision of presumed human carcinogenicity derived from studies showing limited evidence of carcinogenicity in humans together with limited evidence of carcinogenicity in experimental animals.	 *Danger* H350 May cause cancer (indicate exposure route if it is conclusively proven that the danger is not caused by any other route)

Category 2	
Suspected human carcinogens. The placing of a substance in Category 2 is done on the basis of evidence obtained from human and/or animal studies, but which is not sufficiently convincing to place the substance in Category 1A or 1B, based on strength of evidence together with additional considerations. Such evidence may be derived either from limited evidence of carcinogenicity in human studies or from limited evidence of carcinogenicity in animal studies.	 *Warning* H351 Suspected of causing cancer (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)

Categorisation of mutagens

Mutation is a permanent change in the amount or structure of the genetic material in a cell. The term 'mutation' applies both to heritable genetic changes that may be manifested at the phenotypic level and to the underlying DNA modifications when known (including specific base pair changes and chromosomal translocations). The term 'mutagenic' and 'mutagen' will be used for agents giving rise to an increased occurrence of mutations in populations of cells and/or organisms.

For the purpose of classification for germ cell mutagenicity, substances are allocated to one of two categories:

Category 1: Category 1A and Category 1B

Substances known to induce heritable mutations or to be regarded as if they induce heritable mutations in the germ cells of humans.

Substances known to induce heritable mutations in the germ cells of humans.

The classification in Category 1A is based on positive evidence from human epidemiological studies.

Substances to be regarded as if they induce heritable mutations in the germ cells of humans.

The classification in Category 1B is based on:

i. Positive result(s) from in vivo heritable germ cell mutagenicity tests in mammals; or
ii. Positive result(s) from in vivo somatic cell mutagenicity tests in mammals, in combination with some evidence that the substance has potential to cause mutations to germ cells. It is possible to derive this supporting evidence from mutagenicity/genotoxicity tests in germ cells in vivo, or by demonstrating the ability of the substance or its metabolite(s) to interact with the genetic material of germ cells; or
iii. Positive results from tests showing mutagenic effects in the germ cells of humans, without demonstration of transmission to progeny; for example, an increase in the frequency of aneuploidy in sperm cells of exposed people.

Danger

H340 May cause genetic defects(state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)

Category 2

Substances which cause concern for humans owing to the possibility that they may induce heritable mutations in the germ cells of humans

The classification in Category 2 is based on:

Positive evidence obtained from experiments in mammals and/or in some cases from in vitro experiments, obtained from:

i. Somatic cell mutagenicity tests in vivo, in mammals; or
ii. Other in vivo somatic cell genotoxicity tests which are supported by positive results from in vitro mutagenicity assays.

Note: Substances which are positive in invitro mammalian mutagenicity assays, and which also show chemical structure activity relationship to known germ cell mutagens, shall be considered for classification as Category 2 mutagens.

Warning

H341 Suspected of causing genetic defects (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)

Categorisation of substances toxic to reproduction

CATEGORY 1 Category 1A and Category 1B

CATEGORY 1

Known or presumed human reproductive toxicant.

Substances are classified in Category 1 for reproductive toxicity when they are known to have produced an adverse effect on sexual function and fertility, or on development in humans or when there is evidence from animal studies, possibly supplemented with other information, to provide a strong presumption that the substance has the capacity to interfere with reproduction in humans. The classification of a substance is further distinguished on the basis of whether the evidence for classification is primarily from human data (Category 1A) or from animal data (Category 1B).

Category 1A

Known human reproductive toxicant.

The classification of a substance in Category 1A is largely based on evidence from humans.

Category 1B

Presumed human reproductive toxicant.

The classification of a substance in Category 1B is largely based on data from animal studies. Such data shall provide clear evidence of an adverse effect on sexual function and fertility or on development in the absence of other toxic effects, or if occurring together with other toxic effects the adverse effect on reproduction is considered not to be a secondary non-specific consequence of other toxic effects. However, when there is mechanistic information that raises doubt about the relevance of the effect for humans, classification in Category 2 may be more appropriate.

Danger

H360: May damage fertility or the unborn child (state specific effect if known)(state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)

CATEGORY 2

Suspected human reproductive toxicant

Substances are classified in Category 2 for reproductive toxicity when there is some evidence from humans or experimental animals, possibly supplemented with other information, of an adverse effect on sexual function and fertility, or on development, and where the evidence is not sufficiently convincing to place the substance in Category 1. If deficiencies in the study make the quality of evidence less convincing, Category 2 could be the more appropriate classification.

Such effects shall have been observed in the absence of other toxic effects, or if occurring together with other toxic effects the adverse effect on reproduction is considered not to be a secondary non-specific consequence of the other toxic effects.

Warning

H361: Suspected of damaging fertility or the unborn child (state specific effect if known) (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)

Appendix 2 Warning sign

Information to be displayed at lab entrance / exit doors when using known or suspected chemical carcinogens, mutagens and substances toxic to reproduction

CAUTION

Danger

Known or suspected chemical carcinogen, mutagen or substance toxic to reproduction in use.

Ensure compliance with Carcinogen Policy.