The Transport of Hazardous Substances, Materials, Biological Agents and Animals Best Practice Guide

MRC will provide a safe environment and employ best practice to ensure health, safety and welfare within the workplace. This document sets the expected best practice guidance for the transport of hazardous substances, materials, biological agents and animals.

Introduction

The transportation of hazardous substances, materials, biological agents and animals is a frequent occurrence in the establishments of the Medical Research Council (MRC) and MRC External Scientific Staff (ESS) teams embedded in the premises of other employers. The packaging of many materials and substances is now governed by international regulations designed to ensure both the safe transit of the goods in question and the safety of those sending, those handling during transit and those receiving the goods.

The present document gives advice on how materials and substances can be safely transported thus protecting both goods and people.

Definition and scope

This document explains the term “a hazardous substance or material” and details the present legal requirements for the transportation of materials in this category. The guidance section also details the procedures that should be in place to ensure that MRC staff transport materials safely and securely regardless of category, mode of transport or distance.

Action

The Director of a Unit or External Scientific Staff (ESS) Team Leader is ultimately responsible for the implementation of Council policy.

MRC the Transport of Hazardous Substances, Materials, Biological Agents and Animals Best Practice Guide
Corporate Safety, Security and Resilience
Version 3, May 2015
Directors Summary

This best practice document gives guidance on the regulations governing the hazardous substances, materials, biological agents and animals. It explains how a hazardous substance or material is defined by United Kingdom (UK) legislation. UK legislation covering the transport of hazardous substances and materials follows closely the international regulations put into place by the United Nations (UN).

The document explains that the packaging and transportation of materials and substances classified as hazardous by the UK legislation must be carried out by a “competent person or persons.” In some instances the competent person(s) may require a specialised qualification to do this job. In the latter situation it is usual for an outside company to fulfil this requirement for MRC establishments.

The guidance within this document also determines the standards the MRC expects when any biological agent, organism, material or substance is transported regardless of its inherent nature or transportation distance.

Directors and ESS team leaders should ensure that those individuals normally assigned to package materials and substances for transport are aware of this best practice and that they follow the guidance.

The document has four guidance notes plus an appendix.

Guidance Note 1  Transportation using vehicles
Guidance Note 2  Transport of biological materials
Guidance Note 3  Transport of radioactive substances
Guidance Note 4  Transport of chemical substances
Appendix 1  UN classification of hazard

MRC Safety, Security and Resilience Section
Head Office
Guidance Notes

Introduction

General

Most units and ESS teams will receive and dispatch substances and materials as part of their normal working programme. In some but not all instances this will involve using an external carrier such as a courier or the Royal Mail. To safeguard the carrier, the general public and the recipient it has become necessary to classify substances and materials in terms of their hazardous properties. The nature of the hazard may come from the physical, chemical or biological properties of the material or substance being transported.

Nine internationally recognised classes of hazardous substances and materials have been created by the UN (see appendix). Certain of these classes are further sub-divided into divisions and sub-divisions. As an example toxic and infectious substances are in class 6. This class has two divisions, 6.1 deals with toxic substances and 6.2 deals with infectious substances. Radioactive materials are in class 7 whereas class 9 contains miscellaneous substances not covered in the other classes. Some genetically modified organisms come into this latter class particularly those that may pose no threat to man but possibly a threat to the environment on accidental release.

Legislation

When dealing with the transport of substantial amounts of hazardous materials and substances then UK regulations require an employer to use a “Dangerous Goods Safety Adviser” (DGSA) to supervise the dispatch of such materials and substances. In the MRC for the majority of cases it is likely that the courier or shipping agent would act as the DGSA.

In the majority of instances the materials or substances being transported from an MRC establishment will not be classified as a dangerous or hazardous substance as defined by the UN regulations. Nevertheless MRC policy is to adopt best practice for transportation of goods, materials or substances whether or not they come under the regulations.

Relevant legislation

In the UK the major pieces of legislation controlling the transport of dangerous goods are,

- Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 (as amended 2008)
- The Carriage of Dangerous Goods and the use of Transportable Pressure Equipment Regulations 2004 (as amended 2005)
- The Radioactive Material (Road Transport) (Great Britain) Regulations 2002 and,
- The Dangerous Goods Regulations published by the International Air Transport Association (IATA).

The packaging of dangerous goods must follow either the "Approved Requirements and the Test Methods for the Classification and Packaging of Dangerous Goods for Carriage" (L88, HSE Books, 1996) for road or rail transport or the IATA regulations and the Air Security Aviation Act, 1993 for air transport.
The requirements of each set of regulations are similar and the present guidance applies, with respect to the classification, packaging and labelling requirements, to all three modes of transport.

In addition it must be remembered that hazardous waste transported from MRC premises is subject to The Hazardous Waste (England and Wales) Regulations 2005 and The Special Waste Amendment (Scotland) Regulations 2004.

In addition transportation of materials and substances of any kind are also covered by sections of the Health and Safety at Work etc. Act 1974.

**Import licences**

The Department for Environment, Food and Rural Affairs (DEFRA) for England and Wales provides the necessary documentation to accompany an imported biological substance irrespective of whether it contains a recognised pathogen. For Scotland, the Scottish Office provides the necessary documentation. Further details can be obtained from your area corporate safety adviser, or from the DEFRA Website [http://www.defra.gov.uk](http://www.defra.gov.uk) or the Scottish Office Website [http://www.archive.official-documents.co.uk/document/cm41/4157/so.htm](http://www.archive.official-documents.co.uk/document/cm41/4157/so.htm).
Guidance Note 1

Transportation using vehicles

The following section covers the use of MRC and privately owned vehicles for transporting biological organisms and other substances and materials. This section focuses on the transport used and should be read in conjunction with the other sections.

Use of MRC vehicles

Where MRC unit vehicles are used for the transport of potentially hazardous materials ensure that:

- Competent and approved persons drive MRC unit transport, for further information consult the relevant MRC Staff Code section.
- The vehicle is taxed with a current MOT and adequately insured for business purposes.
- The vehicle is capable of carrying the cargo
- The driver has written instructions informing him or her of what is being transported and that he or she knows what to do in the event of an emergency.
- A content list should be clearly visible in the vehicle with emergency contact numbers.
- The vehicle is stationary and in a safe situation when making or receiving mobile telephone calls according to MRC Staff Bulletin 333.

Note:

In certain exceptional circumstances the road transport may not be on a public highway. In this case the MRC vehicle does not need to be taxed. A current MOT and insurance must, however, still be in place.

Privately owned vehicles

Privately owned vehicles must not be used, without written authority from the director or an appointed representative, to transport materials and substances. If written permission is given then all of the above points regarding road transport using an MRC vehicle must be met.

Solid carbon dioxide (Card-ice, dry-ice) and cryogenic liquids

The transportation of samples in carbon dioxide (dry-ice) or cryogenic liquids require special precautions as asphyxiation is a potential hazard if the correct precautions are not observed.

The use of solid carbon dioxide in packaging is a normal occurrence especially with biological specimens. Care should be taken to ensure that the outer packaging allows the carbon dioxide gas to escape freely.
1 kg of solid carbon dioxide releases 18.23 cubic feet of carbon dioxide gas (~ 0.7 cubic metres) on sublimation. Care must be taken when samples are transported in solid carbon dioxide in an enclosed vehicle (van or car) to ensure that a build up of carbon dioxide gas does not occur. A concentration of 1.5% of carbon dioxide gas in the atmosphere is considered to be dangerous to humans. The volume of the car or van must be known and the mathematics in the risk assessment must show that at no time can the concentration of carbon dioxide gas from sublimation of the solid carbon dioxide in the vehicle’s atmosphere ever exceeds 0.15%.

Packages with solid carbon dioxide should always be carried in a separate compartment to the driver, e.g. in the boot of a car. Any unit vehicle used for the transport of substantial numbers of packages with dry ice must be modified to ensure that the packages are in a separate compartment or enclosure.

When solid carbon dioxide is being transported by vehicle it is essential that there is a continuous supply of fresh air directed towards the occupants of the car. The air supply system in the vehicle should be set to fresh air, not re-circulation, with the blower on a high setting.

Guidance on the use of cryogenic liquids can be found in the published MRC policy and guidance entitled “Standards for Liquid Nitrogen Supply: Systems for Life Science Applications”.
Guidance Note 2

Transport of biological materials

Introduction

Biological samples will most probably constitute the bulk of materials that is sent from MRC establishments. The majority of such samples will not be classified as hazardous under the UN regulations. This guidance note looks in more detail at how biological samples can be classified under the regulations and who has the authority to dispatch hazardous biological samples. It also looks at how animals and other biological substances not classified as hazardous under the UN regulations should be transported.

Competence and training requirements

The IATA regulations, for air transport, supported by the Civil Aviation Authority, require shippers to be competent to ensure packaging and labelling are done correctly and that the shipper’s forms are completed correctly. In addition competence under these regulations must be verified through an appropriate written test. These requirements may be extended to road and rail transport in the future. All units that routinely send out hazardous biological material must therefore have access to a competent person to advise on packaging and labelling and to sign the shipment notes. For those staff who may only occasionally wish to send such material it may be preferable to engage the services of a third party.

Advice can be obtained from your area corporate safety adviser.

Classification, labelling and packaging

Classification

The UN classes for the transportation of hazardous substances are:

- Class 1 = Explosives
- Class 2 = Gases
- Class 3 = Flammable liquids
- Class 4 = Flammable solids
- Class 5 = Oxidizing substances and organic peroxides
- Class 6 = Toxic and infectious substances
- Class 7 = Radioactive material
- Class 8 = Corrosives
- Class 9 = Miscellaneous dangerous goods.

These classes are recognised and used globally (see appendix 1 for more detail). Each class in itself may be sub-divided into divisions and sub-divisions.
For example class 6 deals with toxic and infectious substances. This class contains two divisions:

- **Division 6.1** Deals with toxic substances
- **Division 6.2** Deals with infectious substances

**Division 6.1**

This comprises materials liable to cause death or serious injury to human health by swallowing, inhaling or skin contact. These definitions are important in deciding whether a toxic substance is defined as being hazardous and is included in Class 6.1.

Within Division 6.1 there are also three separate packing groups each determined by toxicity levels.

a. **Packing Group I** - Substances and preparations presenting a very severe toxicity risk;

b. **Packing Group II** - Substances and preparations presenting a serious toxicity risk;

c. **Packing Group III** - Substances and preparations presenting a relatively low toxicity risk.

The LD$_{50}$ and LC$_{50}$ values are used to determine the relevant packaging groups. LD$_{50}$ stands for lethal dose where 50% of the population die when the substance is imbibed or swallowed. LC$_{50}$ is the equivalent value for the inhalation of an airborne toxic substance. These values have usually been determined on animal models and then the results extrapolated to man usually as mg toxin per kg weight.

**Division 6.2**

In this Division are substances known to contain or reasonably expected to contain viable micro-organisms, including bacteria, viruses, rickettsia, parasites, and fungi. Also included are recombinant, hybrid or mutant micro-organisms that are known or reasonably believed to cause death or serious diseases in animals or humans.

They are subject to the provision of this Division if they are capable of spreading disease to humans or animals when exposure to them occurs. Exposure could occur should there be an accident and or where a spill or leakage of material takes place during transportation.

Genetically modified micro-organisms and organisms, biological products, diagnostic specimens and infected live animals will also be assigned to this Division if they are also capable of spreading disease to men or animals as defined above.

There are four UN numbers that are used to classify goods that contain infectious substances or pathogens during transportation. They are the following:

- **UN 2814**, Infectious Substances (affects humans and animals)
- **UN 2900**, Infectious Substances (only affects animals)
- **UN 3291**, Clinical Waste (Bio Medical Waste or Regulated Medical Waste)
- **UN 3373**, Biological agents not classified as UN 2814
It must be remembered that these UN numbers relate only to hazardous biological substances according to the UN definition. Hazard group 1 and many hazard group 2 biological agents will not fall into any of these categories.

For carriage under UN 2814 and UN 2900, you will need to determine the level of risk associated with the pathogens, and then contain them accordingly. To determine the level of containment, such goods are allocated to the ‘WHO risk groups’ according to a combination of the following factors:

Pathogenicity – the ability to cause disease
Transmission – how easy it is for the pathogen to transfer to others
Group/individual risk – the likely effect on the community/individuals
Treatment – the reversibility/effective treatment available for the disease

Risks – hazards groups 2 – 4 are the groups known to contain pathogenic and disease transmitting organisms.

In general, if your goods are reasonably known to contain a pathogen (including certain bacteria, viruses, parasites, etc), and the pathogens cause infectious diseases in humans, or animals and humans that are either serious or can be life-threatening, then UN 2814 must be used to transport the substances. In practice normally all HG3 and HG4 biological agents will fall into UN 2814. In some instances HG2 biological agents may come into this UN class. Individual risk assessments (as above) looking at modes of transmission, infectivity etc. must be done to determine the correct class for transportation purposes. If the pathogens are known to only affect animals, but not humans, then UN 2900 must be used.

**UN 2814 or UN 2900**

**Category A Definition**

Category A pathogens contain infectious substances that when transported are in a form that if exposure occurs, then such an exposure is:

1 – capable of causing permanent disability
2 – life-threatening to individuals or populations
3 – capable of transmitting a fatal disease to man or animals

**Category A - Biological Agents**

All hazard group 4 (HG4) biological agents and many hazard group 3 (HG3) biological agents will come into Category A for transportation purposes. Two hazard group 2 (HG2) biological agents are presently included within this category. They are “Clostridium botulinin” and poliovirus. Those Category A biological agents that cause disease in both humans and animals are assigned to UN 2814 for the purposes of transportation. Those that solely affect animals are assigned to UN 2900.

Such pathogenic agents will normally be transported under UN 2814 or UN 2900 (pathogenic to animals only) and packaged according to packaging instructions (PI) 602/620.

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Any substance that does not meet the above definition of “A” automatically becomes “Category B”. These will be transported as UN 3373 and packaged according to PI 650.

**Category B Biological Agents**

These are infectious biological agents that do not meet the criteria for inclusion into Category A. Category B biological agents are assigned UN 3373 for transportation purposes and packaged as PI 650. The majority of HG2 biological agents used by the MRC will be classed as Category B for transportation purposes.

In practical terms samples of materials such as blood, tissue, excretions, and secretions from the general human population or from healthy animals and known to contain HG2 biological agents, will normally be considered as Category B biological agents for transportation purposes. If there is evidence to suggest that such materials carry HG3 or HG4 biological agents, then the risk assessment must consider these additional facts before assigning such samples automatically to Category B. There may be compelling evidence that suggests that in this instance Category A assignment may be more appropriate.

For example, samples from a hospital dealing with patients known to carry infectious agents such as Tuberculosis, Hepatitis or the HIV virus should not be automatically classified as Category B agents. In this latter situation proof would be required for Category B transportation to apply.

The risk assessment for transportation should consider the following:

- The known pathogenicity of the agent (ie what is its hazard group)
- Who could be affected (individuals or communities)
- How could they be affected (its mode of transmission)

Answers to the above questions will greatly assist decisions about borderline samples, and whether they are in Category A or B for transportation purposes.

Under IATA (transportation by air) the approved packaging instructions (PI) are 602 and 650. 602 packaging must be used for UN 2814 or UN 2900. In other words infectious substances i.e. Category A infectious substances or samples suspected of containing Category A infectious substances.

The equivalent UN PI is 620, this does not have the volume or weight restrictions as IATA PI 602. PI 602 and PI 620 are the same with the exception of volume and weight restrictions (cf 9A and 9B).

The PI (packaging instructions) for a Division 6.2 material that is a Category A infectious substance must meet the appropriate test standards and must be marked in conformance with a packaging for a Category A infectious substance (normally PI 620/602 packages will be purchased commercially and been tested and approved). This is a triple packaging consisting of the following components:

1. A watertight primary receptacle.
2. A watertight secondary packaging. If multiple fragile primary receptacles are placed in a single secondary packaging, they must be either wrapped individually or separated to prevent contact between them.
3. A rigid outer packaging of adequate strength for its capacity, mass and intended use. The outer packaging must measure not less than 100 mm (3.9 inches) at its smallest overall external dimension.
4. For a liquid infectious substance, an absorbent material placed between the primary receptacle and the secondary packaging is required. The absorbent material must be sufficient to absorb the entire contents of all primary receptacles.

5. An itemized list of contents enclosed between the secondary packaging and the outer packaging.

6. The primary receptacle or secondary packaging used for infectious substances must be capable of withstanding, without leakage, an internal pressure producing a pressure differential of not less than 95 kPa (0.95 bar, 14 psi).

7. The primary receptacle or secondary packaging used for infectious substances must be capable of withstanding without leakage temperatures in the range of 4°C to +55 °C (40 °F to +131 °F).

At least one surface of the outer packaging must be a minimum of 100 mm x 100 mm (4” x 4”) to allow labelling.

**Labelling**

A package containing an infectious substance must be labelled with the appropriate diamond label shown here. The label, symbol and number are compulsory although the wording is optional. The labels are obtainable from various manufacturers.

**Quantity limitations** Columns 9A and 9B specify the maximum quantities that may be offered for transportation in one package by passenger-carrying aircraft or passenger carrying rail car (Column 9A) or by cargo aircraft only (Column 9B).

**Note:** All material must be carried in the hold of aircraft. No material is carried in the passenger sections.

**9A Passenger-carrying aircraft or passenger carrying rail car** quantity limitations

- UN 2814 Infectious substance, affecting humans or humans and animals: 50 ml (liquid) or 50grms (solid)
- UN 2900 Infectious substance, affecting animals: 50 ml (liquid) or 50grms (solid)

**9B Cargo Aircraft Only** quantity limitations

- UN 2814 Infectious substance, affecting humans or humans and animals: 4 L (liquid) or 4 kg (solid)
- UN 2900 Infectious substance, affecting animals: 4 L (liquid) or 4 kg (solid)

The "Cargo Aircraft Only" label must be used on packages containing dangerous goods that are permitted only on cargo aircraft. However, where the packing instruction number and the permitted quantity per package are identical for passenger and cargo aircraft, the "Cargo Aircraft Only" label should not be used. The "Cargo Aircraft Only" label must not be used.
used for packages packed according to Passenger Aircraft limitations even when included on a Shipper’s Declaration marked "Cargo Aircraft Only" because of other packages in the shipment.

Packaging

The package must be suitable for the purpose to prevent the contents escaping. Strictly according to the regulations, the packaging must be of a type tested and approved by the Department of Transport and marked accordingly. These packages can be obtained commercially. Containers for various sized packages including those suitable for dry ice can be purchased.

C consignors should note that a different UN number (UN 1845) and different packaging are required for dry ice transport.

Packages containing substances classified as Category A, Infectious Substance affecting humans must be labelled with:

- The proper shipping name, “Infectious Substance Affecting Humans.”
- The UN 2814 marking.
- The name and address of the shipper and consignee.
- A 6.2 Infectious Substance label.
- If the box contains over 50 ml or 50 grms of a Category A, infectious substance, it must also be marked with a cargo-only aircraft label.
- The name and telephone number of a responsible contact person must be marked durably and legibly on the outside of the package. The responsible person must be contactable until safe arrival of the package.

Absorbent material must be placed between the primary and secondary receptacle, making sure that multiple primary receptacles are individually wrapped to prevent contact. Use enough absorbent material to absorb the entire contents of all primary receptacles.

For UN 3373 then packaging should comply with packing instructions PI 650. Both 602 and 650 must contain an inner container, an outer container and sufficient absorbent material to hold any leakage should the sample be in liquid form.

For Biological Substance Category B (UN 3373) containing liquids, absorbent material is required between the primary and secondary receptacles.

**For liquids**, the packaging must not contain more than 4 L.

**For solids**, the packaging must not contain more than 4 kg.

**For Biological Substance Category B (UN 3373)**

The minimum outer-container size in the smallest overall external dimension is 10cm (4 inches).

Each completed package must be capable of withstanding a 1.2-meter (4 foot) drop test outlined in IATA 6.6.1. The outer package must be rigid.
Each UN 3373 shipment must show the text:

“BIOLOGICAL SUBSTANCE CATEGORY B”, at least 6 mm high, marked on the outer package adjacent to the following diamond-shaped mark.

The UN mark must be in the form of a square set at an angle of 45 degrees with each side having a length of at least 50 mm (2 inches). The width of the line must be at least 2 mm and the letters and numbers must be at least 6 mm high.

The name and telephone number of a responsible person must be marked on the package OR provided on the air bill. The responsible person must know what the package contains and must be contactable until safe arrival of the package.

The name and address of the shipper and the consignee must be marked on the packages. When the shipper or consignee is also the “person responsible”, the name and address need only be marked once in order to satisfy the name and address provisions.

Finally, if more than one properly prepared Biological Substance Category B (UN 3373) shipment is placed into another outer package, this constitutes an overpack. The word “OVERPACK” must be marked on the outer package and all other required package markings must be reproduced on the outside of the overpack.

General acceptable packaging for non-hazardous biological agents

All hazard group (HG) 1 biological agents and some hazard group (HG) 2 biological agents will not be transported as hazardous substances. All HG1 agents are classified as such since there is no harm to man or animals. In these cases transportation with a “non-hazardous biological specimen” label using the Royal Mail is acceptable. These materials must, however, be properly packaged with inner and outer packaging and in the case of liquids absorbent material sufficient to deal with an incident where all the liquid contents are released. However, even in the case of HG1 biological agents, any environmental consequences should a spill occur must be taken into account when doing the risk assessment.

Proper packaging of non-hazardous biological agents samples and environmental test samples includes four basic requirements:

1. Watertight Primary Receptacle(s)
2. Watertight Secondary Receptacle(s)
3. Absorbent Material
4. Sturdy Outer Packaging

The following diagrams depict the packaging requirements for any biological agent classified in Category A for transportation purposes. This type of packaging conforms to the requirements for the packaging instructions (PI) of UN 620. The UN number 2814 or 2900 must be clearly displayed as should Category A. It is important that these containers should not be re-used.

**UN 2814/2900 Category A biological agents**

The second packaging diagram depicts a typical UN 3373 package for Category B biological agents confirming to the requirements for UN PI650.
CONCLUSION

For most MRC units the HG1 biological agents will normally be the type of organism being transported. A risk assessment must be made to determine whether the sample is classified as hazardous for transportation purposes. The majority of group 3 and all hazard group 4 biological agents will be in this category. At present two hazard group 2 biological agents also come into this category.

Air transport

Before a package is accepted for carriage by air a shipper's declaration, as described in the IATA regulations, must be completed to the satisfaction of the carrying airline. The declaration must contain the names and addresses of the shipper and consignee, contact telephone numbers (in some instances this means a 24hr contact to a knowledgeable person) and details on the nature of the transported material.

Every detail on the form must be correct to guarantee acceptance and the form signed by the competent person. This can only be done by the forwarding agent if the agent is prepared to accept all the responsibilities of the shipper. Finally there is a requirement to notify the carrying airline in advance of the date of transport to ensure acceptance on the flight. This can be done through the services of a forwarding agent.

Premises with “Known Consignor Status”

From 1 August 2003, under the Air Security Aviation Act, the Department of Transport Inspectors have to validate premises for known consignors. If units wish to be a known consignor, then they should contact the Department of Transport at current.cargovalidations@dft.gsi.gov.uk to arrange an appointment to be visited by an
inspector to validate the premises. MRC Units will be charged £400 plus expenses each time for this annual inspection (this figure will change with time). Part of the inspection will include that the premise, particularly the collection point is secure from unauthorised access.

The collection point must be able to demonstrate one of the following;

1. Access to any opening door in the loading/unloading area is by authorised staff only, preferably with a secure pass system or key; or
2. Packages for export are locked in a cage or separate room accessible only by an authorised person, or
3. That CCTV cameras monitor any door that can be left open, where access may be gained by unauthorised person(s) to tamper with goods awaiting shipment.

The Royal Mail

The Post Office publishes its own guide on the packaging requirements for sending packages via the Royal Mail. Diagnostic samples can be sent by the Royal Mail using their own or similarly constructed containers. Non infectious materials can be sent through the Royal Mail according to their published guidelines. The Royal Mail does not carry UN 2814 or UN 2900 infectious substances nor does it carry toxic materials or toxins known or suspected of causing disease in man or animals. A summary is outlined below.

Sending non-hazardous and Diagnostic and Medical Samples

Diagnostic and Medical Samples

These can be carried through the UK but not internationally.

Packaging

Each sample must be placed within a primary sealed or securely closed container. The maximum volume allowed for this container is 50 ml. Prior agreement with the Post Office must be sought before this volume can be increased. The primary container or containers (where a multiple sample pack is to be sent) must then be wrapped individually in sufficient soft absorbent padding to be able to contain all possible leakage and placed within a sealed plastic bag. The container(s) plus packaging must then be placed within an outer or secondary container made of polypropylene, strong cardboard, a metal cylinder or a compartment in a polystyrene box (made in two pieces). A list of contents and the address and name of sender must be placed between the primary and secondary container.

At the time of writing the Post Office will not transport live animals.

Labelling

Specimens should always be sent by first class post appropriately labelled. The names and address of the sender and recipient must be clearly visible on the outside of the package.
**Rail Transport**

The packaging of materials for transport must be managed by a competent person. The biological safety officer should be consulted prior to biological material being transported by rail.

**Transportation of animals**

The biological safety officer and the unit/ESS team veterinarian must be consulted prior to any vehicular transport of animals.

Wherever possible, Units and ESS Teams should consider when transporting animals over long distances, particularly to overseas destinations, that this be as embryos, sperm or ova. There are a number of basic considerations that must be put into place before any animal is transported by vehicle regardless of distance. These are outlined below.

- All facilities with experimental animals must have Home Office permission prior to them being transported.
- It is advisable that only a competent person (courier) should transport animals.
- Vehicle temperature control must be appropriate for the type of animal being transported.
- All animals must be transported using the appropriate cage or box or tank suitably constructed for that particular species.
- Animals must be housed in a cage or box suitably equipped to prevent the release of allergens.
- Animals should be visually checked wherever possible during the journey. It is an IATA regulation that all animal transport boxes must have a viewing port when journeys are made by air. Large animal containment boxes should be designed to allow visual inspection. A cover may be placed over this area during transport to calm the animal should it become stressed.
- Consideration should be given to secondary containment within the vehicle to prevent the escape of animals in the event of a collision.
- Animals must have access to food and water regardless of the length of the journey. Fluid may be contained within the food e.g. as an edible mash or as ‘Trans-Gel’ or ‘Plastic-Water’.

**Long journeys**

- A long journey may be considered to be any distance over 40 miles or a time scale greater than 1.25 hours.
- All animals should be transported using a vehicle from an approved company or by an MRC vehicle approved by the named Veterinary Surgeon. The vehicle will have an appropriate environmental temperature control system within the containment section.
- A double barrier system should be installed which will prevent escape either to the outside or into the cab area.
• A contingency plan must be in place in the event of a breakdown.

• The driver or passenger will have some knowledge of the species being transported in case of an emergency.

• A contact number of a knowledgeable veterinarian or any other expert approved by the sender or receiver must be carried in the vehicle should advice be required if any animals show problems relating to health.

**Shipments of animals by rail should be avoided.**

**Quarantine animals**

Quarantine premises and vehicles to transport animals require to be approved by DEFRA or the Scottish Office.

For **all** animals being transported in from abroad, Home Office Permission and an Importation Licence from DEFRA or the Scottish Office (from non-BALAI registered EU organisations or organisations outside EU) must be in place prior to arranging for shipment.

The courier of the animals from the airport **must be** approved by DEFRA or the Scottish Office and have a lockable ‘rabies crate’ in which to place the animal transport boxes into upon collection at the airport.

A DEFRA or Scottish Office approved Veterinarian must check and monitor imported animals on a regular basis (usually monthly) and complete official documentation.

**Inter-site and Intra-site campus transportation**

The movement of biological materials within and between sites frequently occurs. MRC establishments and ESS teams should have in place local rules governing the safe movement of biological materials between premises on the same site regardless of whether the public have access to the site.

Included in the local rules should be instructions for the:

• Correct packaging of biological materials to ensure adequate protection to the carrier, other employees and members of the public.

• Correct labelling internal and external (where appropriate).

• Emergency instructions including contact telephone number (where appropriate).

The movement of biological samples containing pathogens in ACDP group 2 or above must only be done after consultation with the biological safety officer. The biological safety officer must be consulted if genetically modified organisms designated as activity class 2 or above are being moved.

It is recommended that wherever possible UN approved packaging be used for the transport of samples and materials. If this is not possible then inner and outer protective packages with properties similar to the UN type of package must be used.
**Guidance Note 3**

**Transport of radioactive substances**

**Introduction**

The following information highlights the complexities of transporting radioactively labelled materials and substances by a public road or for shipping. It is well to refresh ourselves on what is termed “a radioactive substance”. It is defined as a substance or material having an activity equal to or greater than 0.1kBq/kg.

**Road transport**

The regulations (The Radioactive Material (Road Transport) Regulations 2002) are concerned with roads that allow the public unlimited access. The classification is dependant upon both the activity of the radioactive material in combination with the surface activity dose rate.

Items and materials are transported in accordance with the appropriate UN classification number.

- UN 2910 Radioactive materials, excepted package-limited amount of material
- UN 2908 Radioactive materials, excepted package-empty package
- UN 2911 Radioactive materials, excepted package-instruments and articles

**Exempted packages**

Tables 1 and 2 (permission of AURPO) illustrate the activity figures for the carriage of isotopes in exempted packages, providing the external surface activity of the package does not exceed 5µSv/h. Under the above regulations road transport of exempted packages does not require the vehicle to display signs either externally or internally that radioactive materials or substances are being carried. They do require a label to be clearly displayed, indicating that the contents are radioactive, when the package is opened by the consignee.
### Exempt Radioactive Materials

**TABLE 1 - Activity Limits for Exempt Radioactive Materials**

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<tr>
<th>Nuclide</th>
<th>Activity concentration for exempt material (Bq/g)</th>
<th>Activity limit for an exempt consignment (Bq)</th>
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<tbody>
<tr>
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</tr>
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<td>C-14</td>
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</tr>
<tr>
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</tr>
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<td>$1 \times 10^1$</td>
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</tr>
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<td>$1 \times 10^3$</td>
<td>100 kBq</td>
</tr>
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<td>P-33</td>
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<td>100 MBq</td>
</tr>
<tr>
<td>S-35</td>
<td>$1 \times 10^5$</td>
<td>100 MBq</td>
</tr>
<tr>
<td>Cl-36</td>
<td>$1 \times 10^4$</td>
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</tr>
<tr>
<td>K-42</td>
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</tr>
<tr>
<td>Ca-45</td>
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</tr>
<tr>
<td>Cr-51</td>
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<td>10 MBq</td>
</tr>
<tr>
<td>Fe-55</td>
<td>$1 \times 10^4$</td>
<td>1 MBq</td>
</tr>
<tr>
<td>Fe-59</td>
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<td>1 MBq</td>
</tr>
<tr>
<td>Co-57</td>
<td>$1 \times 10^2$</td>
<td>1 MBq</td>
</tr>
<tr>
<td>Co-60</td>
<td>$1 \times 10^1$</td>
<td>100 kBq</td>
</tr>
<tr>
<td>Ni-63</td>
<td>$1 \times 10^5$</td>
<td>100 MBq</td>
</tr>
<tr>
<td>Ga-67</td>
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<td>1 MBq</td>
</tr>
<tr>
<td>Se-75</td>
<td>$1 \times 10^2$</td>
<td>1 MBq</td>
</tr>
<tr>
<td>Rb-86</td>
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<tr>
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<tr>
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<td>$1 \times 10^2$</td>
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<td>I-125</td>
<td>$1 \times 10^3$</td>
<td>1 MBq</td>
</tr>
<tr>
<td>I-131</td>
<td>$1 \times 10^2$</td>
<td>1 MBq</td>
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</table>
### TABLE 2 - Activity Limits for Exempted Packages

<table>
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<tr>
<th>Nuclide</th>
<th>Ordinary Solid Form</th>
<th>Liquid Form</th>
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</thead>
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<td>H-3</td>
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<td>4 GBq</td>
</tr>
<tr>
<td>C-14</td>
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<td>Na-22</td>
<td>0.5 GBq</td>
<td>50 MBq</td>
</tr>
<tr>
<td>Na-24</td>
<td>0.2 GBq</td>
<td>20 MBq</td>
</tr>
<tr>
<td>P-32</td>
<td>0.5 GBq</td>
<td>50 MBq</td>
</tr>
<tr>
<td>P-33</td>
<td>1 GBq</td>
<td>100 MBq</td>
</tr>
<tr>
<td>S-35</td>
<td>3 GBq</td>
<td>300 MBq</td>
</tr>
<tr>
<td>Cl-36</td>
<td>0.6 GBq</td>
<td>60 MBq</td>
</tr>
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<td>K-42</td>
<td>0.2 GBq</td>
<td>20 MBq</td>
</tr>
<tr>
<td>Ca-45</td>
<td>1 GBq</td>
<td>100 MBq</td>
</tr>
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<td>Cr-51</td>
<td>30 GBq</td>
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<td>4 GBq</td>
</tr>
<tr>
<td>Fe-59</td>
<td>900 MBq</td>
<td>90 MBq</td>
</tr>
<tr>
<td>Co-57</td>
<td>10 GBq</td>
<td>1 GBq</td>
</tr>
<tr>
<td>Co-60</td>
<td>400 MBq</td>
<td>40 MBq</td>
</tr>
<tr>
<td>Ni-63</td>
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<td>Ga-67</td>
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<td>300 MBq</td>
</tr>
<tr>
<td>Rb-86</td>
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<td>50 MBq</td>
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<tr>
<td>Tc-99m</td>
<td>4 GBq</td>
<td>400 MBq</td>
</tr>
<tr>
<td>In-111</td>
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<td>300 MBq</td>
</tr>
<tr>
<td>I-123</td>
<td>3 GBq</td>
<td>300 MBq</td>
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<td>3 GBq</td>
<td>300 MBq</td>
</tr>
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<td>I-131</td>
<td>700 MBq</td>
<td>70 MBq</td>
</tr>
<tr>
<td>Xe-133</td>
<td>10 GBq (gas)</td>
<td>n/a</td>
</tr>
<tr>
<td>Tl-201</td>
<td>4 GBq</td>
<td>400 MBq</td>
</tr>
</tbody>
</table>

Packages must be accompanied with a simple declaration form as shown in Figure 1.
You should ensure that insurance certificates allow radioactive materials and substances to be transported.
The Transport of Hazardous Substances, Materials, Biological Agents and Animals

Figure 2
This illustrates the packaging standards that must be fulfilled if radioactive samples are transported as exempted packages.

Example packaging for exempted samples

- Screw top or tight fitting lid giving a good seal
- Absorbent material at least twice the volume in the tubes
- Screw-topped tubes taped with radioactive tape
- Packing of polystyrene or tissue etc.
- Sample tubes containing excepted amounts of radioactivity
- Strong plastic or metal tub

*It is strongly advised that road transport of exempted radioactive samples and materials are only carried out after the RPS and RPA have been consulted.*

No specific records of excepted packages need be maintained except if a contamination occurs during transport. In this case the record must be kept for two years.

It is expected that in the majority of instances transport of radioactive substances and materials from units and ESS teams will be excepted packages.

Movement of samples within an establishment or within a site require that packaging of a similar nature to that shown in figure 2 is used. The RPS should always be consulted when radioactive samples and materials are being moved.

**Type A samples and materials**

Radioactive samples or materials that exceed the limits in Tables 1 and 2 are not excepted packages under the regulations and must be transported as **Type A** packages.

Two UN numbers cover the transport of Type A packages.

- UN 2915 - Radioactive materials, type A package- non-special form, non fissile
- UN 3332 - Radioactive materials, type A package- special form-non fissile

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**Figure 3**

This shows the type of package necessary for transport of type A radioactive substances.

**Example of Type A Package**

The packages must be able to withstand “the drop test” to withstand impact.

The regulations also require the following:

- External warning signage on the vehicle
- Correct labelling of the package (external and internal)
- Driver training
- Declaration form
- Rules for parking vehicles

It would be highly unlikely that an MRC establishment or ESS team would be transporting Type A packages.

The Radiation Protection Adviser **must** be actively involved in any activity involving the transport of Type A packages.
Guidance Note 4

Transport of chemical substances

Introduction

The bulk and volume together with the known biophysical and chemical properties of a specific chemical determines whether it is classified as a dangerous substance under the “Hazard Information and Packaging Legislation”. Where a chemical comes into this category the supplier has an absolute duty to classify the chemical substance according to its hazard class (see appendix). Furthermore every chemical substance from a supplier must come with a “Safety data sheet” (SDS) containing risk and safety phrases that give information to the user about the known properties of the chemical substance including its effects on the environment. The SDS comes from the “Approved Supply List”. This list is updated annually by the “Health and Safety Executive.”

The exception to the bulk and volume rule is the transportation of substances that are either classified as “explosive, toxic or very toxic” in nature. In this case there is no lower limit in terms of bulk and volume. Assessment is based on concentration of the chemical substance.

No unit or ESS team should be transporting chemicals classified as “dangerous goods” in the Regulations. Your area corporate safety adviser must be consulted if chemicals classified as “dangerous goods” are being transported or if you have doubts on the classification of a chemical substance.

Local Movement of Chemical Substances

Units and ESS teams may well transport small amounts of chemicals within and between buildings on the same site or complex. Where this is the case local policy rules must be in place to address the requirements.

The rules should address:

- Mode of transport
- Type of carrier required
- Personal protective equipment required
- Instructions on emergency or spill occurrences

Road Transport

There may well be instances that vehicular transport takes place within or between sites in the same area. If this is the situation then the following conditions must be in place.

MRC vehicles must comply with the advice given in Guidance note 1 of this document before they are used for the transportation of materials and substances.

Version 3 2015
In particular:

- It must be an MRC vehicle insured for and designed for the purpose

  N.B. In this respect a van can be considered to be purpose designed, a motor car is not.

- Chemicals must be transported in containers suitable for the purpose

- The containers must be firmly seated in the cargo section

- Non compatible chemicals must be compartmentalised

- Emergency instructions must be in place

- Vehicles transporting chemicals must not be left unattended

**Rail Transport**

Materials and substances classified as hazardous by the above regulations must be packaged and labelled as described. Transportation of other substances and materials not covered by the regulations must also be packaged to ensure the safety of those involved during this procedure.

**Air Transport**

The packaging rules for road and rail transport apply equally to air transport. In addition the competence of the person packaging the materials and substances must be attested.

In the majority of instances a courier service will be used for the transportation of hazardous substances by road, rail or air.

**Sea Transport**

It is unlikely for MRC establishments to use sea transport for hazardous materials and substances or for other substances not covered by the regulations. For sea transportation the “International Modal packaging Requirements” are normally used. There are variations depending upon whether the route is classed as non-international or international and, unlike other modes of transport, relaxation in terms of packaging requirements can be obtained for certain hazardous substances. This relaxation depends upon the amount or volume of material or substance being transported. Emergency schedule (EmS) and Medical First Aid Guide (MFAG) are used only for sea transport and they provide rapid emergency advice to the captain and crew of the ship.
Appendix 1

The following UN classes of hazard are recognised globally:

Class 1                Explosives
Class 2                Gases (including aerosols)
Class 3                Flammable liquids
Class 4.1              Flammable solids
Class 4.2              Substances liable to spontaneous combustion
Class 4.3              Substances which, in contact with water, emit flammable gases
Class 5.1              Oxidising substances
Class 5.2              Organic peroxides
Class 6.1              Toxic substances
Class 6.2              Infectious substances
Class 7                Radioactive materials
Class 8                Corrosive substances
Class 9                Miscellaneous dangerous substances and articles

Note:

1. Within each class a four-digit number will identify the substance being transported. Many chemicals have their unique UN number eg UN 1603 identifies the chemical Ethyl Bromoacetate.

2. For liquids classed for supply as “extremely flammable”, “highly flammable”, or “flammable” in terms of hazard are all grouped as “flammable” for transportation purposes.

3. A product may be classified for packaging as “toxic” but not be classified as such for transport.

4. A product with more than one hazard will, for transport, have one substance identified as the primary hazard and the other as a secondary hazard.

5. For transportation purposes there are three packing groups identified with roman numerals І, ІІ, and ІІІ with descending order of danger ie Packing group ІІІ presents relatively little danger.

6. UK road regulations have five transport categories from 0-4.

Category 0 is for infectious substances in the highest risk group (risk group 4)

Categories 1, 2 and 3 correspond to packing groups, І, ІІ, and ІІІ respectively.

**Category 4 is for empty unclean packaging(s) or very low hazard prod (h3)**