

Fact sheet

Safe transport of biological material

Factors, which determine the transport requirements of biological material:

The critical factors for the safe transportation of biological material are the correct packaging (basic principle: three layers), enclosure of information about the specimen (e.g. type of material: bacterial strain) and the correct identification (hazard potential of the specimen visible on outer packaging, shipping documents).

Various factors determine the transport requirements:

- Nature of the material for investigation: plant specimens, organs, blood, serum, milk, swabs, excrement, whole body.
- Transport conditions: e.g. temperature-sensitive material – possibly shipping with cooling elements, dry ice, express shipping via courier, shipping in special packaging material.
- Recipients: national/international shipment.
- Origin of the material: from healthy stock, suspected case of contagious/infectious disease, culture of a highly contagious/infectious disease or genetically modified organisms.
- The hazard potential determines the classification of the material (allocation to various transport categories).

Procedure



Figure 1: Schematic diagram of the procedure to determine the correct types of packaging and transport for biological specimen materials [1-3].

You can find additional information and assistance with classifying biological material by following [this link](#).

Table 1 lists examples of classification, appropriate packaging and identification markings, and the relevant transport options.

We will be glad to assist you with questions about classification and options for transporting your biological specimens. Write to us at squ-gefahrqut@ethz.ch.

Classification of biological material

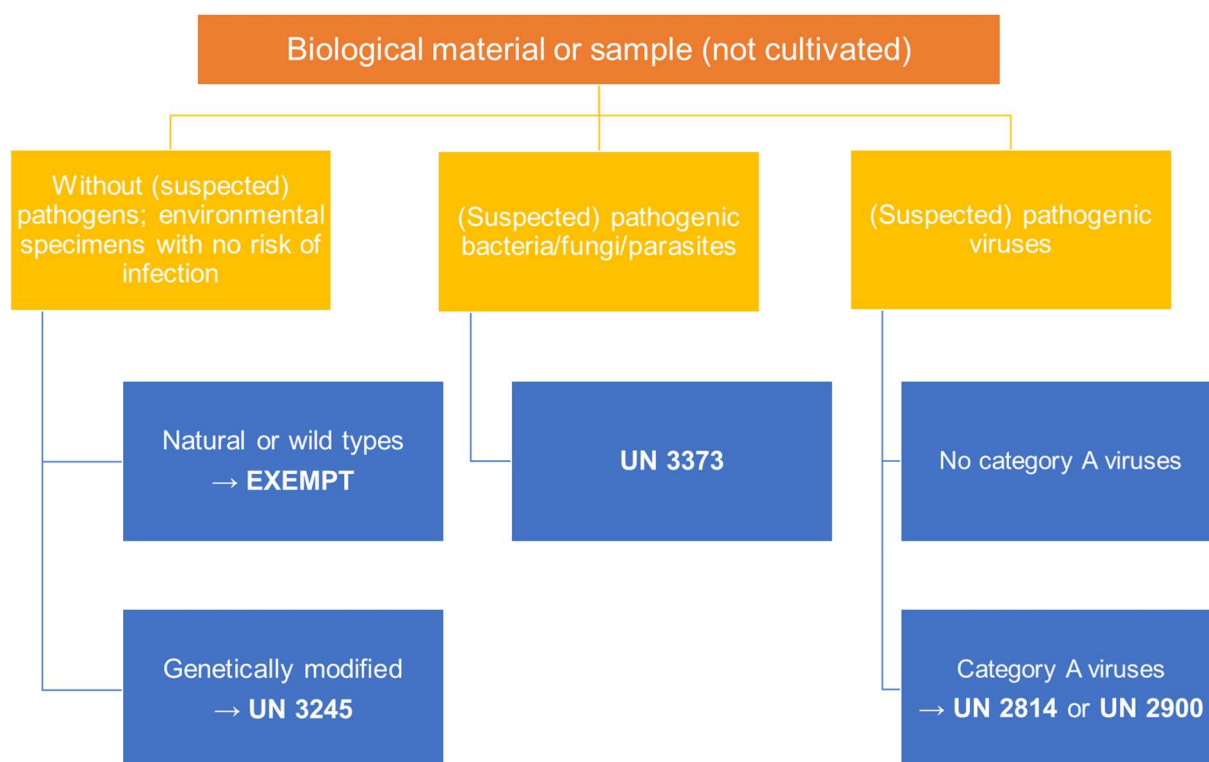


Figure 2: Schematic diagram of the classification of biological specimen material.

Legal basis

- **ADR/RID**, European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) and by Rail (RID)
- **Dangerous Goods Regulations, DGR**, issued by IATA (International Air Transport Association) for international transport by air, based on the technical regulations of the ICAO (International Civil Aviation Organization)
- The Swiss Expert Committee for Biosafety (SECB), transportation instructions at www.efbs.admin.ch →
- Guidance on Regulations for the Transport of Infectious Substances, 2015-2016, WHO

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Status: August 2020

Table 1: Overview of a selection of biological material or samples and their types of packaging, identification requirements and methods of transport.

Classification	Examples	Packaging/regulations	Documentation/identification	Transport
<p>Exempt specimens as per ADR 2.2.62.1.5.6.</p> <p>Specimens taken from humans or animals where there is a minimal probability of pathogen content.</p>	<p>Specimens of blood, faeces or milk from healthy animal stock for monitoring, surveillance of the wildlife population, serum banks or export inspection.</p>	<p>Packaging consisting of three layers:</p> <ol style="list-style-type: none"> 1) Leakproof primary receptacle 2) Leakproof secondary receptacle (as an additional requirement: with absorbent material, e.g. household paper or paper tissues, that could absorb all the liquid) 3) An adequately strong outer packaging of suitable size (minimum dimensions of one side: 100x100 mm) with suitable padding material. <p>If multiple fragile primary receptacles are placed in a single secondary packaging, they must be individually wrapped or separated to prevent contact between them.</p> <p>Secondary or outer packaging should be rigid.</p>	<ul style="list-style-type: none"> - State the name and address of the sender and the recipient - Inscription: Exempt medical / veterinary specimen - Analysis order (to be applied between the secondary and outer packaging), consignment note, as appropriate, if shipped by a transport company. 	<p>No restrictions, by post or transport company, or in a private vehicle.</p>
<p>Exemptions as per ADR 2.2.62.1.5</p> <p>Are not subject to the ADR/RID regulations.</p> <p>Non-pathogenic micro-organisms, material with naturally occurring concentrations of pathogens</p> <p>Material with neutralised or inactivated pathogens.</p>	<p>Micro-organisms in risk group 1, environmental specimens (e.g. specimens of water and food), inactivated pathogens, DNA/RNA.</p>	<p>No regulations apply, but it is recommended to use the same packaging as for an exempt specimen!</p> <p>The three-layer principle protects the specimen from leaking/escaping!</p>	<ul style="list-style-type: none"> - State the name and address of the sender and the recipient. 	<p>No restrictions.</p>

Classification	Examples	Packaging/regulations	Documentation/identification	Transport
<p>UN3373 Biological substance, category B Dangerous Goods Class 6.2 (ADR 2.2.62.1.4.2). Substances posing a risk of infection that do not meet the criteria for category A.</p>	<p>Diagnostic specimens with suspected disease (specimens from clinically sick humans and animals). Cultures of <i>Salmonella enterica</i>, <i>Listeria monocytogenes</i></p>	<p>Packaging instructions P650 as per ADR and PI650 as per IATA: The packaging must consist of three components: 1) a primary receptacle, 2) a secondary packaging, and 3) an outer packaging; either the secondary packaging or the outer packaging must be rigid (for air shipments, the outer packaging must be strong). At least one of the surfaces of the outer packaging must have minimum dimensions of 100 x 100 mm. The following requirements apply to liquid substances: - Leakproof primary receptacle - Leakproof secondary receptacle - Multiple primary receptacles can be placed in the same secondary receptacle, but they must be wrapped individually if the receptacles are fragile. - Sufficient absorbent material must be inserted between the primary receptacle and the secondary packaging to allow absorption of the entire quantity of liquid. The primary receptacle or secondary packaging must be able to withstand an inner pressure of 95 kPa. The complete consignment must successfully withstand a fall from a height of 1.2 m. Maximum quantity: There is no restriction on quantity for transport by road and rail. For transport by air, no primary receptacle may have a capacity of more than 1 l and one outer packaging must not contain more than 4 l.</p>	<ul style="list-style-type: none"> - State the name and address of the sender and the recipient - Diamond-shaped label UN3373 (minimum dimensions: 50 x 50 mm) and, directly adjacent, the official designation: Biological substance, category B - Investigation order / packing list between secondary and outer packaging, consignment note in case of shipment by courier - In addition, for international transport: proforma invoice - In addition, for air freight: state one telephone number for one responsible individual on the package. 	<p>Private transport by car or train (no additional equipment of the vehicle is required), shipping by post or by various transportation companies are possible.</p>

Classification	Examples	Packaging/regulations	Documentation/identification	Transport
<p>Substances that pose a risk of infection in category A, UN 2900 Infectious substance affecting animals only</p> <p>UN2814 Infectious substance affecting humans as per ADR 2.2.62.1.4.1, Dangerous Goods Class 6.2.</p>	<p>Cultures of foot-and-mouth disease virus, rinderpest virus Cultures of Ebola virus, Marburg virus.</p>	<p>Packaging Instructions P620 as per ADR and PI602 as per IATA:</p> <ol style="list-style-type: none"> 1) Leakproof primary receptacle 2) Leakproof secondary receptacle (multiple primary receptacles may be placed in the same secondary receptacle, but they must be individually wrapped. Sufficient absorbent material must be inserted between the primary receptacle and the secondary packaging to allow absorption of the entire quantity of liquid). 3) Rigid UN-tested outer packaging; at least one of the surfaces of the outer packaging must have minimum dimensions of 100 x 100 mm. <p>Category A shipments (packaging, documentation, transport) must only be handled by trained staff.</p>	<ul style="list-style-type: none"> - State the name and address of the sender and the recipient. - State the name and telephone number of a responsible individual. - Label: Infectious material (minimum dimensions: 50 x 50 mm). - State the UN number and designation, and state the quantity in [ml] or [g]. - Accompanying letter with detailed statement of the contents between secondary and outer packaging, ADR consignment note for road shipment, written instructions (instructions for the driver in case of incidents), consignment note (waybill). - Additional requirements for international shipments: proforma invoice and Shipper's Declaration for air freight instead of ADR consignment note, import/export license/approval as appropriate. 	<p>Only possible with specified licensed/approved transport companies, e.g. World Courier.</p>
<p>Dry ice, UN 1845 Dangerous Goods Class 9 (Not classified as dangerous goods as per ADR/RID, but see Special Provision 5.5.3).</p>	<p>For cooling</p>	<p>Classified as dangerous goods for air traffic only (as per IATADGR PI954), not according to ADR/RID. Dry ice must be packed so that gaseous CO₂ can escape. Never pack in a secondary receptacle: explosion hazard!</p>	<ul style="list-style-type: none"> - Labelling for shipment within the national territory: "Carbon dioxide, solid, as coolant". - International: state on consignment note: Dry Ice UN1845 and state the net weight. - International: label – Dangerous Goods code 9 and sticker for dry ice stating weight, as air freight only. 	<p>Dry ice can only be sent by post within the national territory; transport companies must be used for international shipments. Private transport by car or train is permitted.</p>

Classification	Examples	Packaging/regulations	Documentation/identification	Transport
<p>UN3245, Genetically modified micro-organisms (GMMOs) or genetically modified organisms (GMOs) Dangerous Goods Class 9 as per ADR 2.2.9.1.11.</p>	<p>Genetically modified bacteria, genetically modified mice.</p>	<p>Packaging Instructions P904 as per ADR and PI959 as per IATA:</p> <ul style="list-style-type: none"> - Inner packaging comprising: <ol style="list-style-type: none"> 1) A leakproof primary receptacle and 2) a secondary packaging; the primary receptacle(s) or the secondary packaging shall be leakproof for liquids or siftproof for solids; for liquids, absorbent material must be placed between the primary receptacle(s) and the secondary packaging. The absorbent material shall be in a quantity sufficient to absorb the entire quantity of liquid. If multiple fragile primary receptacles are placed in a single secondary container, they shall be individually wrapped or separated to prevent contact between them. 3) An adequately resilient outer packaging of suitable size (minimum dimensions of one side: 100x100 mm). - Comply with the animal welfare provisions. 	<ul style="list-style-type: none"> - State the name and address of the sender and the recipient. - State the name and telephone number of a responsible individual. - A diamond-shaped label, UN3245 (minimum dimensions: 50 x 50 mm) must be affixed to the external surface of the outer packaging. - Detailed packing list between the secondary and outer packaging stating the names of the organisms and genetic modification; state: Handling only in closed system. - Consignment note for shipping by courier. - For international shipments, the following additional requirements apply: state the UN number and the correct designation – "Genetically modified organisms" or "Genetically modified micro-organisms" and state the net quantity on the consignment note, proforma invoice; the information required as per Art. 4, a-e of the Cartagena Ordinance (CartO) must be integrated into the documentation; import/export license or approval, as appropriate. 	<p>In a private car (no additional equipment is required) or by a transport company; not possible by post.</p>

List of image sources Figure 1:

[1] <https://www.dn-sign.de/Produkte/Gefahrgetiketten>

[2] <https://www.alexbreuer.de/produkt/bio-bottle-3-liter/>

[3] <https://www.zarges.com/de/produkte/medical>