هيئة أبوظبي للزراعة والسلامة الغذائية
ABU DHABI AGRICULTURE AND FOOD SAFETY AUTHORITY

Guideline
No. (7) of 2019

Collection and Shipment of Animal Biological Samples

ADAFSA -26552-10-2019

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INTRODUCTION

Veterinary laboratories are the foundation of successful and accurate investigation that is directed to diagnose, contain or eliminate serious animal diseases. This explains the efforts exerted by Abu Dhabi Agriculture and Food Safety Authority (ADAFSA) to establish veterinary laboratories that operate according to international standards, equipped with necessary requirement to perform equally to this formidable undertaking. Since the starting point for the laboratory investigation of an animal disease is the collection of samples, the success of laboratory service depends significantly on the good planning, knowledge, and continuous training of those involved in these facilities as well as the personnel who collect and send samples for analysis. The purposes of sample collection include disease diagnosis, surveillance, monitoring, evaluation of effectiveness of vaccination, or issuance of health certificates.

ADAFSA is issuing these guidelines to fulfill the needs of working staff that includes veterinarian, associated technical staff, and laboratory personnel to arrive at unified understanding of the general principles of collection, packaging, and shipment of biological samples. This would ensure that the biological samples are handled in a suitable manner to safeguard the health, safety and welfare of employees involved in handling the pathological samples. Biological samples may contain infectious materials and can be the potential source of contamination or disease outbreak. Following proper procedure during collection, handling and preservation would ensure that the risk of infection to staff is kept to an absolute minimum, and suitable packing and shipping would eliminate the possibility of escaping of biological agents from the package under normal conditions of transport. This in turn will enable the recipient laboratory to meet the biosecurity and biosafety requirements, and veterinarian in the field to obtain the precise results that support the initiation of the proper action.

These guidelines address collection techniques, categorization criteria of the broad spectrum of samples to include blood, milk, feces, biopsies, tissues and other body fluids and discharges that are usually collected for various veterinary investigation purposes. The safe transport, transfer and handling of valuable biological materials must follow the best practice. The collection, transport, and shipment of animal biological materials is covered by international regulations that are updated on a regular basis. The International

Animal Health Organization (OIE) and the World Health Organization (WHO) issue guidance documents on "Transport of Infectious substances" that are considered as reference documents that summarizing the different transport regulations. These guidelines were adapted accordingly, to best cover the transport requirements for veterinarians transporting samples from the field to laboratories, as well for transportation between veterinary laboratories within a country. Practical explanation on how to transport biological substances according to the specific dangerous goods transport regulations are described. The international regulations for the transport of infectious substances by different mode of transport are based upon the recommendations made by the Committee of Experts on the Transport of Dangerous Goods (UNCETDG), of the United Nations Economic and Social Council. The recommendations are presented as model regulations covering rail, road, sea and post.

1. Definitions

Biological products: are those products derived from living organisms, which are manufactured and distributed in accordance with the requirements of concerned national authorities, which may have special licensing requirements, they are used for either prevention, treatment, or diagnosis of diseases in humans or animals, or for development, experimental or investigational purposes related thereto. They include, but are not limited to, finished or unfinished products such as vaccines.

Biorisk: The probability or chance that an adverse event accidental infection or unauthorized access, loss, theft, misuse, diversion or intentional release, possibly leading to harm, will occur.

Biorisk assessment: The process to identify acceptable and unacceptable risks (embracing biosafety risks (risks of accidental infection) and laboratory biosecurity risks (risks of unauthorized access, loss, theft, misuse, diversion or intentional release) and their potential consequences.

Biorisk management: The analysis of ways and development of strategies to minimize the likelihood of the occurrence of biorisks. The management of biorisk places responsibility on the facility and its manager (director) to demonstrate that appropriate, and valid biorisk reduction (minimization) procedures have been established and implemented.

Dangerous Goods (*known as Hazardous Materials): according* to The United Nations (UN) Economic and Social Council's Recommendations on the Transport of Dangerous Goods are: "substances which are capable of posing a risk to health, safety, property or the environment." IATA and the DOT regulate the movement of dangerous goods within and between countries and global regions.

Infectious Substances: Substances known to contain, or can reasonably be expected to contain, pathogens including bacteria, viruses, parasites, fungi and other agents such as prions that can cause disease in humans or animals. Infectious substances include BOTH "Infectious Substances, Category A" and "Biological Substances, Category B."

Category A, UN 2814- Infectious substance, affecting humans: An infectious substance in a form capable of causing permanent disability or life-threatening or fatal disease in otherwise healthy humans or possibly animals when exposure to it occurs.

Category A, UN 2900- Infectious substance, affecting animals (only): An infectious substance that is not in a form generally capable of causing permanent disability of life-threatening or fatal disease in otherwise healthy animals when exposure to themselves occurs.

Category B, UN 3373: Biological substance transported for diagnostic or investigative purposes.

Cultures: are the result of a process by which pathogens are intentionally propagated intended for diagnostic and clinical purposes.

Over packing: An enclosure used by a single shipper to contain one or more packages and to form one handling unit for convenience of handling and stowage.

Dangerous Goods Regulations (DGR): Regulation issued by the International Air Transport Association (IATA) to provide procedures for the shipper and operator by which the articles and substances with hazardous properties can be safely transported by air on all air commercial transporters. It serves as a "field manual" version of the International Civil Aviation Organization (ICAO) Technical Instructions for the safe transport of dangerous goods by air.

Fomites: are objects or substances such as clothes, utensils, and furniture capable of carrying infectious organisms and hence transferring them from one individual to another.

Laboratory Biosafety: Laboratory biosafety describes the containment principles, technologies and practices implemented to prevent the unintentional exposure to pathogens and toxins, or their accidental Release.

Laboratory biosecurity: Laboratory biosecurity describes the protection, control and accountability for valuable biological materials (VBM, see definition below) within laboratories, in order to prevent their unauthorized access, loss, theft, misuse, diversion or intentional release.

Medical or clinical wastes: Wastes derived from the medical treatment of animals or humans or from bioresearch. These shall be assigned to UN 2814, UN 2900 when containing category A infectious material, or UN 3291 when contaminated with category B or have low probability to contain infectious substances.

NCEMA: National Emergency Crisis and Disasters Management Authority, is the national standard-setting body responsible for regulating and coordinating all efforts of emergency, crisis and disaster management as well as the development of a national plan for responding to emergencies including biological warfare.

P620: Packaging requirements and instructions of category A dangerous goods that determined by United Nations Committee of Experts on the Transport of Dangerous Goods (UNCETDG).

P650: Packaging requirements and instructions of dangerous goods of category B infectious substances packaging requirements and instructions determined by (UNCETDG).

Patient specimens: Human or animal materials, collected directly from humans or animals, including, but not limited to, excreta, secretions, blood and its components, tissue and tissue fluid swabs, and body parts being transported for purposes such as research, diagnosis, investigational activities, disease treatment and prevention.

2. Scope and Objectives

Scope

These guidelines directed to the concerned personnel in ADAFSA as well as the private veterinary laboratories and other concerned authorities in the Abu Dhabi Emirate to aid compliance with basic scientific and legal elements in sample collection and transportation. The aim is to facilitate implementing the best practices prescribed in the associated local and international regulations.

The guidelines also provide insight on sample collection as the activity precedes laboratory investigation of animal disease and epidemics, emphasizing on key consideration that must accounted for purpose of the transportation of samples to other local or international laboratories, according to the local and the international requirements. Samples types, size and quantity needed to provide valid results must be carefully determined.

Objectives

Prime objectives of these guidelines include but not limited to the following:

1. Introduce and highlight scientific and regulatory-based reference to inform official working staff and private laboratories to adhere to regulatory and technical best practice.

2. Encourage utilization of best practices to optimize veterinary laboratory procedures in Abu Dhabi using the most appropriate analyses and sound methodologies.

3. Assist veterinary practitioners, laboratories personnel and working staff to comply with legal requirement of biological products and VBM including infectious material, collection preservation and storage, packaging, handling and transportation being by air or surface.

4. Respond adequately to requirements of ADAFSA science strategy and research and development needs.

5. Enrich veterinary laboratory performance to keep abreast with requirements that promote animal production and protection, through

enhancement of the development of institutional laboratory biosecurity and biosafety capacity building in the fields of bio-risks assessment and management and facilitate appropriate risk management decisions making, to minimize risks to animal and public health as well.

6. Assist fulfilment of the government objective related to commitment to strengthen livestock sector and maximize is contribution to biosecurity, supply of safe food and ensure environmental and economical sustainability

7. Contribute to the government intervention related to regulatory decisions, policy making through support of effective informed decision-making process and appropriate responses to crisis and emergency situations.

Legal underpinning:

Several federal legislations, local regulations and code of practices have addressed animal sample collection in relation to different purposes and situations. It stated the provisions, requirements, and procedures to be followed in sample collections in relation to the specific aims and objectives of each regulation from the list summarized in table (1):

Table 1-Legislation Addressing Animal Samples Collections in UAE

	Federal Legislation	Articles
•	Federal Law No. (8) of the year 2013 on the prevention and control of communicable infectious and contagious animal diseases.	8,11,16-3
•	Federal Law No. (16) of the year 2007 Concerning Animal Welfare.	3
•	Federal Law No. (10) of the year 2002 Concerning veterinary profession.	
•	Federal Law No. (6) of the year 1979 pertaining to Veterinary Quarantine and amendments thereof.	17
•	Ministerial Decision No. (384) of the year 2008 On the Executive By-Law of the Federal Law No. (16) Of the year 2007 concerning Animal Welfare.	4,8
•	Ministerial Decision No. (170) of the year 2003 On the Executive By-Law of the Federal Law No (10) concerning veterinary profession.	2
•	Ministerial Decree No. (460) of the year 2001, concerning the Executive By-law of the Veterinary Quarantine in The Cooperation Council for The Arab States of The Gulf.	4,8
	Local Legislation	
•	Law No. (2) for the year2008 with respect to Food within the Emirate of Abu Dhabi	14
•	Regulation No (8) for the year 2012 concerning technical and hygiene requirements in Animal Production Establishments in the Emirate of Abu Dhabi.	6,7,9,13
•	Regulation No. (10) for the year 2013 concerning technical and hygiene requirements in small animal and plant production units in the Emirate of Abu Dhabi.	4
•	Regulation No (11) for the year 2013 concerning technical and hygiene requirements in veterinary establishments in the Emirate of Abu Dhabi.	8,10,23
	Guidelines and codes of practices	
•	Code of Practice No. (7) of the year 2011: Farm Animal Diseases – Epidemiology and Control Guidelines	
•	Code of Practice No (12) of the year 2011: Hygiene Practices in Slaughterhouses	
•	Code of Practice NO. (14) of the year 2011: Guidelines of Good Veterinary Practices	
•	Code of Practice No (15) of the year 2011 Good Practices and Welfare for Animal Production Establishments in the Emirate of Abu Dhabi	
•	Guide No (5) of the year 2014: Guidelines of biosecurity- General aspects of biosecurity volume 1	

3. Sampling

Samples may be taken from animals, or their environment. In order to get timely and correct diagnosis of a suspected infectious disease, it is imperative on the part of a clinician to collect the most suitable material from live or dead animals. A great variety of different combinations of samples and species of animal may occur. The knowledge of pathogenesis of infectious disease is single most important factor in order to collect the most suitable specimen. In the face of an outbreak where animals in various stages of the clinical disease may be seen, it is better to collect specimen from fresh cases of the disease. In all cases, the samples need to be appropriate for the purpose required, and adequate in number and amount to provide a statistically valid result. All samples must be accompanied by a written note indicating the origin of the material, the relevant history, and the tests required. Equipment required for collection of samples include; (1) Sterile forceps, scissors, syringes and scalpels; (2) Sterile swabs and vials containing transport medium for collection of samples for virus isolation or identification; (3) Sterile bottles for collection of feces, blood, and other samples that do not require transport medium; (4) Bottles containing formalin saline for tissues to be examined histologically; (5) Blood collection vacutainers- without additive for serum, and with anticoagulant for isolation; (6) Notebook and equipment for labeling specimens; (7) Sterile swabs and transport medium for bacteriology.

a. Sample collection

Sample collection should be performed in a systematic and safe manner. Following standardized system is essential to avoid duplication in testing and analysis. The results can then be utilized for proper diagnosis of the disease and establishing a sound database that accurately indicates trends and allowing identification of risks.

The following represent the most important principals that should be adhered to prepare samples for shipment to the laboratory:

1. The samples collected should be appropriate for the intended purpose, and in adequate number and amount to provide valid results. Laboratories require the submission of appropriately preserved samples that arrive at the lab in good condition.
2. Tissue samples should be representative of the condition being investigated and the lesions observed.
3. Samples taken from live animal should be taken with care, to avoid undue stress or injury to the animal or danger to the operator.
4. Samples should be collected aseptically, and care should be taken to avoid cross-contamination between samples.

5. The samples should be carefully packaged, labeled, and transported to the laboratory by the fastest practicable method, with the appropriate temperature control.
6. A letter or submission form see (Appendix 2) should accompany all samples in accordance with the specific laboratory requirements. It must include, at least, the name and address of the submitter, the origin of the material, the relevant history, animal identification and corresponding specimens, and the requested tests and any other information required by the laboratory.

b. Purposes of Collection:

Sample collection from living or dead animals or the environment is performed for a variety of purposes, such as:

1. Disease diagnosis, surveillance and determination of prevalence level,
2. Determination of disease free zones or freedom from diseases, which is an essential basis for health certification required for international trade.
3. Epidemiological and research purposes.
4. Occasionally, as part of outbreaks crisis management efforts and control campaigns.
5. Routine analysis

c. Samples Collection from Animals:

When samples are collected from live animals, care should be taken to avoid injury or distress to the subject animal, or risks to the operator and attendants. In some instances, it may be necessary to use mechanical restraints, tranquillization or anesthesia. Whenever handling any biological material, from either live or dead animals, the risk of zoonotic disease should be kept in mind and precautions to be taken all the time to avoid human infection. Post-mortem examinations, should be carried out under aseptic conditions to the extent possible, care should be taken to avoid environmental contamination, or risk of spread of disease through insects or fomites. Arrangements should be made for appropriate and safe disposal of dead animals or tissues. Considerable skill is required to determine the correct samples to be sent to the laboratory. Major categories of samples include samples from live or dead animals and from animal premises, depending upon the situation and the issue under investigations. Sample collected from living animals include body fluids, secretions, excretions and biopsies. This include blood, feces, biopsies

(tissues or cellular aspirates), genital tract lavages and semen, ocular and nasal discharges, saliva, tears, milk. Table (2) summarizes the most important types.

Quantities and amounts of samples listed may vary according to type of the diagnostic methods, therefore, the veterinary laboratory must be contacted before collecting the samples to provide the specific sample collection requirements. Where chemical euthanasia or anesthesia is required for animal restraint, the impact of the chemical on the test result must be considered. Some laboratory tests are not compatible with specific blood anticoagulants and tissue preservatives such as heparin, formalin, dry ice which exposes the test sample to elevated levels of CO2. While it is critical to collect samples as aseptically as possible, equal care must be taken to avoid contamination with detergents and antiseptic treatments used to clean the collection site on the animal, as these agents may interfere with the laboratory test procedures. Procedures requiring for tissue culture of pathogens, as well as many molecular-based tests, can be negatively affected by commonly used chemicals or detergents.

Venipuncture sites for different species

Figure (1)

Figure (2)

Drawing a blood sample from jugular and tail vein in cow

Figure (3)

Figure (4)

Drawing a blood sample from wing and jugular vein in birds

Table (2) Sample Types

Sample tye	Precautions	Main purposes
Blood	Blood usually obtained by venipuncture of • Jugular or caudal veins (Large mammals). picture (1-2) • Brachial veins and mammary (Large mammals). • Wing vein (brachial vein) (birds). picture (3-4) • Heart puncture, vena auricularis or vena retroorbitalis (laboratory animals). • Pricking using a triangular, solid-pointed needle for collection of small quantities. Blood may be taken by syringe and needle or by needle and vacuum tube. Skin at the site of venipuncture should be shaved and swabbed with 70% alcohol and allowed to dry before collecting. If serum is needed, the blood should be left to stand at ambient temperature (but protected from excessive heat or cold) for 1–2 hours until the clot begins to contract. Appendix 1 explains currently adopted practice in classification of blood sampling collection tubes based on stopper color type of additives, samples obtained and along with intended usage and disadvantages of importance	Using anticoagulants, such as ethylene diamine tetra-acetic :acid (EDTA) or heparin. For Hematology, Culture (collect separately in bottle containing (aerobic and anaerobic media Direct examination for bacteria, viruses, or protozoa, Blood smear for blood parasite or bacteria, wet film for direct .examination .Serological tests Serum from coagulated blood (Whole blood without anticoagulant) and Plasma from non-coagulated blood (whole blood with anticoagulant) are usually used for biochemical analysis and serological .examination Whole blood or serum for molecular techniques
Feces	At least 10 g of freshly voided feces should be collected (according to the lab requirements). An alternative and sometimes preferable method is to take swabs from the rectum (or cloaca), the mucosal surface, the swabs should be visibly coated with fecal material. Care should be taken when collecting swabs from small and delicate animals to avoid injury	Mainly for parasitological and microbiological culture
Skin	For vesicular lesions: 2 g of affected epithelial tissue as aseptically as possible and place it in 5 ml phosphate buffered glycerin. Sometimes, vesicular .fluid could be collected by aspiration using syringes Deep skin scraping performed, using the edge of a scalpel blade. Feather tips in birds	Vesicular legions are useful for detection of surface feeding mites, lice and fungal infections for burrowing mites and can be taken for detection of antigen if .Marek's disease is suspected It could be used also for molecular detection of viruses
Genital tract and semen	Uterine contents, vaginal or preputial washing or swabs. Cervix or urethra may be sampled by swabbing. Samples of semen are best obtained using an artificial vagina or by extrusion of the penis .and artificial stimulation	Microbiology / semen
Eye	Conjunctivae sampled by holding the palpebra apart and gently swabbing the surface. Occasionally scrapings	Microbiology/molecular detection
Nasal discharge	Moist swabs (cotton or gauze) using wire handle, place in transport medium	Virology /Microbiology/ molecular detection
Milk	Clean and dry teat, avoid using antiseptics, collect mid-stream milk	Microbiology/Serology/ molecular detection

d. Sample Size Determination:

As indicated earlier, sample size is governed by the purposes of sample collection whether it is for investigation for detection of suspect disease-causing pathogens or monitoring surveys. The method used to calculate sample size for surveys depends on the

1. Purpose of the survey.
2. Expected prevalence.
3. Level of confidence desired of the survey results.
4. Performance of the tests used.

When investigating a case of clinical disease, the samples collected should be representative of the condition being investigated and the lesions observed where as in developing a program of surveillance and monitoring for animal health, some general statistical sampling methods should be used. Surveillances provide basic information based on systematic and regular collection, collation and analysis of data on disease occurrence and constitute a main tool in detection of changes in diseases distribution trends and dynamics. Accurate calculation of number of animals should be sampled from a herd/flock; to achieve a 95% or 99% probability of detecting suspected infection is essential components of perfectly designed surveillances. Standards for sample size determination have been set by the OIE for different type of surveillances and described in the Terrestrial Animal Health Code published by OIE.

e. Post Mortem Sample Collection

This to be performed by experienced and personnel in discipline of veterinary pathology who are well trained in the correct procedures for examination of the subject species of animals, to select the most favorable organs and lesions for sampling. The purpose for sample collection may include microbiological culture, parasitology, biochemistry, histopathology, immuno-histochemistry, and detection of proteins, prions or genome nucleic acids.

Fig. (6-7) post mortem examination staff wearing protective clothing

f. Essential prerequisites to carry out post mortem sample collection

1. Equipment suitable to the size and species of animal e.g. knives, saw and cleaver, scalpel, forceps and scissors, blunt tipped scissors, for opening intestines.
2. A plentiful supply of containers proper to the nature of the sample required should be available, along with labels and report forms.
3. Special media and fixatives may be needed for transference of collected materials to the lab.
4. Protective clothing: overalls, washable apron, rubber gloves and boot Fig. (6-7).

g. Other type of samples

Environmental samples from animal housing and surroundings to monitor hygiene or as part of a disease enquiry. This may include

1. Litter or bedding and voided feces or urine.
2. Swabs from surfaces of ventilation ducts, feed troughs and drains (particularly important in poultry hatcheries artificial insemination centers and slaughterhouses.
3. Samples may also be taken from animal feed and drinking water in suitable containers
4. Insects e.g. ticks, mites and mosquitos, which are vectors of many diseases.
5. Honeybees: Adult bees, either dead or moribund, may be collected near the colonies; live bees should be killed by freezing. Brood samples are taken by removing a piece of brood comb that shows abnormalities. This should be wrapped in paper and placed in a box for transport to the laboratory.

4. Safety precautions in sample collection and transportation:

Samples must be collected using appropriate biosafety and containment measures to prevent contamination of the environment, animal handlers, and individuals collecting the sampling as well as to prevent cross-contamination of the samples themselves. Care should additionally be taken to avoid undue stress or injury to the animal and physical danger to those handling the animal. Biological materials should be packaged to rigorously control for leakage, and then labelled with strict adherence to the applicable regulations guiding their transport.

Staff involved in sample collection and handling should be trained on use of proper personal protective equipment (PPE) and clothing, along with the documentation of sample handling procedures. Special care must be taken to avoid injury to staff or self-inoculation accidents. It is equally important to note that many of the procedures may be dangerous and could inflict zoonotic infections for the working staff. Aerosol may become a source of contamination that may give rise to misdiagnosis. The sample collection coordinator or field supervisor must ensure that safety procedures are defined and appropriate PPE (e.g. aprons, gloves, face-masks, eye protection, etc.) is available and used correctly. Additional PPE may be required when working with certain agents because of their route of transmission. For example, gloves should be worn when working with agents that can infect by skin contact even when skin is apparently intact. Protective eyewear and respirators is also needed to prevent exposure to pathogens transmitted by splashing of body fluids or secretions, or inhalation of contaminated aerosols.

To ensure proper use of PPE:

- The needs for PPE must assessed by a person who is competent to judge whether other methods of risk control can offer better alternatives than the provision of PPE
- Professional advice should be obtained to identify the most suitable types of PPE for the tasks to be carried out
- Suitable training must be provided to super visors to enable them to ensure the proper selection, fit, use, cleaning and maintenance of PPE.

Sample collectors should be aware of how their colleagues at the laboratory handles samples upon arrival. In some circumstances, samples may be transported to proximate laboratory where they receive further handling and preparation prior to shipping to another national or international laboratory. Even when the samples are shipped directly to their destination laboratory, the field staff will ensure better handling of samples in a manner that minimize the risk of contamination or accidental spread to the disease under investigation which may not be known or confirmed when the samples are collected.

a. Assessment of risk from pathogens:

To assess the risk to humans and animals from a pathogen it is necessary to know whether infection with that organism can cause clinical disease and/or mortality in humans and animals, and whether it could then spread to cause disease in the general human and/or animal population. Risk assessment for a pathogen, is essential to assign it to specific risk groups as shown in Table (3). A further risk assessment can be conducted, based on the proposed work, to determine the appropriate containment level considering the following when evaluating risk:

1. Known occurrence of human and animal infection with the organism or related organisms with similar characteristics, any history of laboratory-acquired infection, infective dose and disease severity; production of toxins or allergens.
2. The volume of culture to be handled and the concentration of the organism likely to be present. (Procedures such as antigen or vaccine production that require large quantities of organisms usually carry a higher risk than attempted isolation procedures.)
3. The origin of the sample, for example samples from wildlife species may contain human or animal pathogens not normally encountered.
4. The history of the isolate being handled. Pathogens on primary isolation or of low passage level are often more dangerous than pathogens of high passage level. In some cases, pathogenicity may be enhanced by passage or subculture using different media.
5. The possibility of aerosol formation should be especially taken into consideration when handling fluid samples or, for example, during grinding, homogenization and centrifugation.
6. The threat that the organism may pose to food-producing or companion

animals or to wildlife, irrespective of the threat to laboratory personnel. Additional precautions for handling and storage are required for animal disease agents from foreign countries.

7. The physical state of the employees. For example, in the case of pregnancy, immunodeficiency or allergy, special precautions may be required. Sometimes certain individuals should be excluded from types of work that would be especially hazardous to them.
8. A higher level of risk may arise when agents such as *Brucella* or *Mycobacterium* are inoculated into animals. To evaluate the impact of animal inoculation, a risk assessment should be conducted, and the following factors should be considered: 1) Host species versus inoculated species; 2) Strain/treatment and concentration of the inoculum; 3) Route of inoculation; 4) Animal housing; 5) Types of sampling during the experiment.
9. Some pathogens need to be transmitted by specific vectors or require intermediate hosts to complete their life cycles. Such pathogens pose a lower risk to animal health in countries where such vectors or intermediate hosts do not occur, or where climatic or environmental is unfavorable than in other countries.

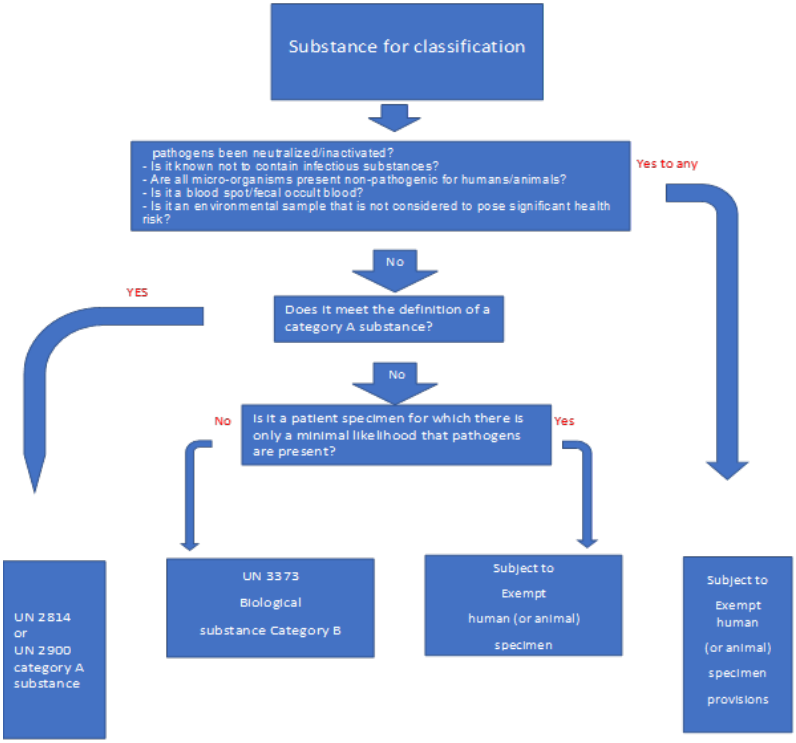
b. Grouping of microorganisms according to human and animal risk:

To determine the correct way to collect, handle, package and label your biological samples for shipment, it is important to know how to classify and identify the sample. Samples are assigned to one of nine hazard classes as defined by the United Nations. There are nine categories of "dangerous goods" specified by the UN Globally Harmonized System of Classification and Labeling for Chemicals (GHS). Some of the nine classes have further sub-categories. In the case of samples collected for disease surveillance in humans and animals, we will primarily be working with two hazard classes:

Class 6.2 – Infectious Substances
Class 9 – Miscellaneous Dangerous Goods (dry ice and formalin)

Each hazard class is identified by a diamond symbol containing the class number, class name and a unique icon.
The following diagram gives an overview of the process you will use to identify your biological samples,

CLASSIFICATION OF BIOLOGICAL SUBSTANCES



It is important to be familiar with the following four UN numbers:

UN 2814: assigned to Infectious Substances, Category A, which cause disease in humans or both in humans and animals. The proper shipping name for UN2814 is "*Infectious substances, affecting humans.*"
UN 2900: assigned to Infectious Substances, Category A that causes disease only in animals. The proper shipping name for UN 2900 is "*Infectious substances, affecting animals only*."
UN 3373: assigned to all Category B (see above) infectious substances. The proper shipping name for UN 3373 is "*Biological Substance, Category B.*"
UN 1845: assigned to shipments that contain dry ice. The proper shipping name for UN 1845 is "*Carbon Dioxide, solid*" or "*Dry Ice*."

5. Transportation of Infectious Substances

There are four steps involved in the safe transport of animal samples that might contain infectious material.

- Classification in accordance to risk
- Packaging should follow the instruction required by the identified risk
- Labelling must be clear and appropriate. Samples containing infectious substances should be marked with the proper shipping name, e.g. 'Infectious substance, affecting humans', when applicable, include appropriate UN number (e.g. for 'Infectious substances, affecting humans' this would be UN 2814); and the appropriate warning label.
- Transporting arrangement must be made with the chosen carrier. The sender may need to provide some of the information that will be used on the accompanying documentation

The packaging shall be of good quality, strong enough to withstand the shocks and loadings normally encountered during transport. This includes transshipment between transport units and laboratories as well as removal from an overpack for subsequent manual handling. The packaging shall consist of three components:

a) A primary receptacle, an example of a primary receptacle is a urine container or a screw capped container or a blood tube. For tissues with preservative, plastic bags should not be used. The primary container must be labeled and feasibly placed in a secondary container. If multiple

primary receptacles are placed in a single packaging, they shall be secured together, individually wrapped or separated to prevent contact between them. Sample sent in liquid nitrogen should be placed in a dry shipper.

b) A leak-proof secondary packaging that cannot break, be punctured or leak their contents, an example of a secondary packaging are a snap lock plastic bag and an empty clean screw cap jar. The secondary packaging shall be secured in an outer packaging with suitable cushioning material. Any leakage of the contents shall not compromise the integrity of the cushioning material or of the outer packaging. For liquids, absorbent material e.g. gauze, cotton, paper towel or sup absorbent pad, should be present in case of leakage and for cushioning.

c) An outer packaging. The outer packaging shall be a solid strong and durable container fitted with a secure closure to prevent loss of contents under normal land transport conditions.

Packaging of Category B and C biological materials for land transport should be labeled clearly with the following information on the outer packaging. The label should include contact name and organization address of both referral and referring laboratories including 24 hours emergency contact number of the referring laboratory. If refrigerants are used, their presence is indicated. Documents identifying the contents of the primary receptacle or request forms should be outside the secondary package. Any documents
required by a transporter shall be accessible without opening the package.

Shipper shall ensure adequate and appropriate refrigerants being used to maintain required temperature (4-8 °C) upon arrival at the referral laboratories. This is important to ensure good quality samples.

Biological materials that are stored in chemical preservatives may be noninfectious but are classified as Dangerous Goods and assigned according to the Hazard class of the chemical.

The use and storage of VBM particularly infectious substances should be limited to clearly identified areas in the laboratory building, except those moved from one location to another for specific, authorized reasons. Transport security within a single lab and between different labs, should be maintained during the movement of the materials until they arrive at their destination.

A. Transport security

1. **Internal (National) material transport security:** includes reasonable documentation, accountability and control over VBM moving between secured areas of a facility as well as internal, within the country, delivery associated with shipping and receiving processes.

2. **External (International) transport security:** Appropriate authorization and communication must be ensured between facilities during and after external transport, which may involve the commercial transportation system. The recommendations of the **United Nations Model Regulations for the Transport of Dangerous Goods**, providing countries with a framework for the development of national and international transport regulations include provisions addressing the security of, dangerous goods, VBM including infectious substances, during transport by all modes.

B. Transfer of materials:

Many countries request to file import and export permits for biological materials prior the transfer authorization. These procedures enable registering and tracking of materials entering or leaving a country, and they are particularly important in the case of alien or dangerous pathogens. The following lines provide information for classifying infectious substances for transportation and ensuring their safe packaging. They stress the importance of developing a working relationship between those involved – the sender, the carrier and the receiver – in order to provide for safe and expeditious transport of these materials.

The Technical Instructions for the Safe Transport of Dangerous Goods by Air published by the International Civil Aviation Organization (ICAO) are the legally binding international regulations. The International Air Transport Association (IATA), Dangerous Goods Regulations (DGR) that incorporates the ICAO provisions have explicit requirements for packaging and shipment of diagnostic specimens, by all commercial means of air transport. Similar requirements are applicable to ground shipments and the postal service in the Emirate of Abu Dhabi. These requirements for air transport are covered in detail in the IATA publications, which are updated every year. The shipper is expected to know and follow the procedures outlined in the current DGR.

C. Transportation Responsibilities:

The efficient transport and transfer of VBM substances requires co-ordination between the sender, the carrier and the receiver to ensure that the material is transported safely and arrives on time and in good condition. It is the responsibility of the sender to ensure the correct classification, packaging; labelling and documentation of all substances destined for transport see Table (6)

Table (6): VBS Transportation responsibilities

Party	Responsibilities
The sender (shipper consignor)	1. Makes advance arrangements with the receiver including investigating the need for import/export permits when the material is sent to/receive from another country.
	2. Makes advance arrangements with the carrier to ensure that the shipment will be accepted for appropriate transport and the shipment (direct transport if possible) is undertaken by the most direct routing.
	3. Prepares necessary documentation, including permits, dispatch and shipping documents
	4. Notifies the receiver of transportation arrangements once these have been made, well in advance of the expected arrival time.
The Carrier	1. 1. Must be authorized to carry designated materials using a well-maintained vehicle.
	2. Provides advice to the sender regarding the necessary shipping documents and instructions for their completion
	3. Provides advice to the sender about correct packaging
	4. Assists the sender in arranging the most direct routing and then confirms the routing
	5. Maintains and archives the documentation for shipment and transport.
	6. Maintain emergency contact information and contingency plan.
The receiver (consignee)	1. Obtains the necessary documents and authorization(s) from national authorities for the importation of the material when it receives from another country.
	2. Arranges for the most timely and efficient collection on arrival
	3. Should acknowledge receipt to the sender.

Shipments should not be dispatched until all the necessary arrangements between the sender, carrier and receiver have been made.

D. Classification of Infectious Substances:

The Dangerous Goods Regulations (DGR) state that infectious substances (including diagnostic specimens likely to contain animal or human pathogens) are categorized as A&B designated as **UN 2814, UN 2900** or **UN 3373** accordingly.

1. **Category A**.Samples sent for diagnostic purposes should be designated as UN 2814 or UN 2900 if they include material derived from humans or animals with a disease that can be readily transmitted and for which effective treatment and preventative measures are not usually available. Infectious substances meeting this definition that affect humans, including zoonotic agents, are designated UN 2814; **those affecting animals only are designated UN 2900.**
2. **Category B**.Samples containing an infectious substance that does not meet the criteria for Category A. These may be consigned as **UN 3373** and designated as Biological Substance Category B (DIAGNOSTIC (or CLINICAL) SPECIMEN).

The IATA DGR contains an indicative list of pathogens that must be assigned to UN 2814 or UN 2900 (Appendix3). The pathogens on these lists cannot be assigned to UN 3373. Any infectious agent that can cause disease in humans or animals that has been amplified in culture and new or emerging pathogens must be assigned to UN 2814 or UN 2900. The IATA defines amplification in culture: as the process, by which pathogens are amplified or propagated to generate high concentrations, thereby increasing the risk of infection when exposure to them occurs. This definition refers to cultures prepared for the intentional generation of pathogens and does not include cultures intended for diagnostic and clinical purposes.

E. Substances exempted from the provisions:

The following are exempt from these Regulations:

1. Substances containing microorganisms, which are non-pathogenic to humans or animals named as Hazard Group 1 agent.
2. Substances transported in a form whereby any pathogens present have been neutralized or inactivated such that they no longer pose a health risk e.g. substances fixed in formaldehyde.
3. Environmental samples (including food and water) which are not considered to pose a significant risk of infection.
4. Dried blood spots, collected by applying a drop of blood onto absorbent material, or fecal occult blood screening tests.
5. Blood or blood components that collected for the purposes of transfusions or for the preparation of blood products to be used for transfusion, or transplantation and any tissues or organs intended for use in transplantation.
6. There are also exceptions for some Biological Products and the shipper of these products is referred to the IATA Regulations for these requirements, as some Biological Products are not exempted.

Infected animals:

A live animal which has been intentionally infected and is known or suspected to contain an infectious substance shall only be transported under terms and conditions approved by the competent authority. Animal material affected by pathogens of Category A or which could be assigned to Category A in cultures only, shall be assigned to UN 2814 or UN 2900 as appropriate. Animal material affected by pathogens of Category B other than which would be assigned to Category A if they were in cultures, shall be assigned to UN 3373. The bulk transport of animal material containing infectious substances (UN 2814, 2900 and 3373) is authorized according to special provisions.

6. General requirements of infectious substances shipments

a. Approval to samples

The laboratory that is going to receive the samples should be contacted to ensure that it has the capability to do the testing requested and to see if there are any special packaging or shipping requirements. It is essential to contact the receiving laboratory when material is sent to another country. A special import license will usually be required for shipment of any biological material to other countries and must be obtained in advance. This license should be placed in an envelope on the parcel.

b. Transportation of samples

In the interest of veterinary public health. Animal specimens must be transported safely, timely, efficiently and legally from the place the place where they are collected to the place where they are analyzed. All specimens should be packaged and transported in accordance with local, national and international regulations. The procedure should minimize the risk of exposure for those engaged in transportation and should protect the environment and susceptible animal populations from potential exposure. Additionally, inefficient packaging that allows for damage or leakage will likely delay the delivery of the shipment to the laboratory, delaying or preventing critical laboratory analyses. Transportation should be forwarded to the laboratory by the fastest method available. If can reach the laboratory within 48 hours, samples should be sent refrigerated. If dry ice is used, the additional packaging requirement must be met.

Because of the differences in the hazards posed by Category (A) infectious substances (UN 2814 and UN 2900) and Category B infectious substances (UN 3373), there are variations in the packaging, labeling and documentation requirements for the two categories. (The Committee of Experts on the Transport of Dangerous Goods) UNCETDG determines the packaging requirements and are set out as Packing Instructions known as P620 and P650 respectively. The requirements are subject to change and regular upgrade by the organizations mentioned. The current packaging requirements are:

1. **Note 1:** Hand carriage of Category A and Category B infectious substances and transport of these materials in diplomatic pouches are strictly prohibited by international air carriers.

2. **Note 2:** Inner packaging containing infectious substances shall not be consolidated with inner packaging containing unrelated types of goods.

Shippers of infectious substances shall ensure that packages are prepared in such a manner that they arrive at their destination in good condition and present no hazard to persons or animals during transport.

Minimal requirement for the transport of specimens follow the principle of triple packaging, consisting of three layers as describe below known as the Basic triple packaging system.

c. Basic triple packaging system

This system of packaging shall be used for all infectious substances. It consists of three layers Fig (10 & 11) as follows:

1. **Primary inner receptacle:** A primary watertight, leak-proof receptacle containing the specimen. The receptacle is packaged with enough absorbent material (e.g. cellulose wadding, paper towels, and household paper or cotton balls) between the primary and the secondary container to absorb all fluid in case of breakage or leakage. Even though the regulations do not prohibit glass, primary receptacles should preferably not be breakable and should not contain any sharps, particularly when using soft secondary and outer containers. If shipped at ambient temperatures or higher, the primary receptacle must have a positive means of ensuring that it is leak proof, such as a leak proof seal, heat seal or skirted stopper. If screw caps are used, they should be taped shut.
2. **Secondary packaging:** A second durable, watertight, leak-proof packaging to enclose and protect the primary receptacles (e.g. sealed plastic bag, plastic container, and screw-cap can). Several cushioned materials shall be used to absorb all fluid in case of breakage or leakage. Pre- frozen packs or dry ice can be packed around the secondary receptacle.

3. **Outer packaging:** Secondary packaging in outer shipping packaging (e.g. sturdy cardboard box, rigid cooler) with suitable cushioning material. Outer packaging protects the contents from outside influence, such as physical damage, while in transit.

The triple packaging system continues to apply, including for local surface transport as mentioned above. The packaging shall be of good quality, strong enough to withstand the shocks and loading normally encountered during carriage, including trans-shipment between vehicles or containers, as well as any removal from an overpack (several packages combined into a single shipment). The smallest overall external dimension shall be 10x10 cm.

Quantities allowed to be shipped:

1. For liquid substance: The primary receptacle(s) and secondary packaging shall be leak-proof;
2. For surface transport, there is no maximum quantity per package. For air transport, the limits per package are 50 ml for passenger aircraft and 4 liters for cargo aircraft.
3. The primary receptacle must not contain more than 1 liter and the outer packaging must not contain more than 4 liters; this quantity excludes ice, dry ice for liquid nitrogen used to keep the specimen cold.
4. For Solid substance: For surface transport, there is no maximum quantity per package. For air transport, the limits per package are 50 g for passenger aircraft and 4 kg for cargo aircraft.

The outer packaging must not contain more than 4 kg. This does not apply for body parts organs and whole body. The three-layer principles should be adopted accordingly using appropriate packaging system. The primary receptacle(s) and secondary packaging shall be sift proof; "Sift proof" means impermeable to dry contents.

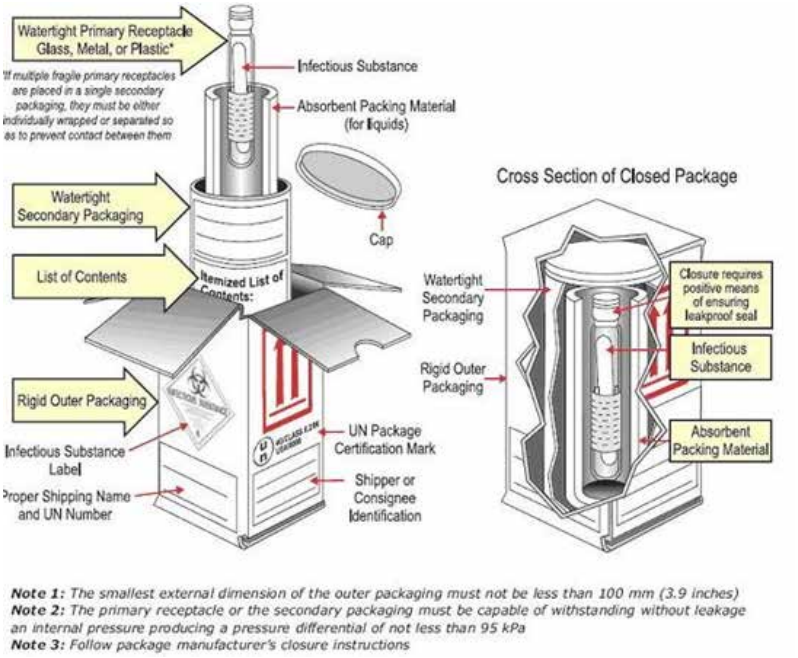


Fig (10) illustration of parts consisting the triple packaging system

Refrigerated or frozen specimens:

Ice, dry ice and liquid nitrogen: When dry ice or liquid nitrogen is used to keep specimens cold, all applicable requirements of (the specific modal requirements) shall be met. When used, ice or dry ice shall be placed outside the secondary packaging or in the outer packaging or an over pack. Interior supports shall be provided to secure the secondary packaging in the original position after the ice or dry ice has dissipated. If ice is used, the outside packaging or over pack shall be leak-proof. If solid carbon dioxide (dry ice) is used, the packaging shall be designed and constructed to permit the release of carbon dioxide gas, in order to prevent build-up of pressure that could rupture the packaging. The package (the outer packaging or the over pack) shall be marked "Carbon dioxide, solid" or "Dry ice". There are additional requirements if liquid nitrogen is used and these are described in the DGR. The entire package should be able to withstand being dropped from a distance of 1.2 meters without damage to or leakage from the content.

There are additional strength requirements for packaging used for UN 2900 and UN 2814 specimens.

1. **For surface transport:** either the secondary packaging or the outer packaging must be rigid. Road vehicles, which collect from veterinary hospitals etc., are often fitted with box into which the collected item is placed. Such boxes may be considered to constitute the outer packaging. Collected items must consist of a primary receptacle and a secondary packaging.

2. **For air transport,** the capability of a packaging to withstand an internal pressure without leakage that produces the specified pressure differential should be determined by testing samples of primary receptacles or secondary packaging. The appropriate test method should be selected based on receptacle or packaging type. The primary receptacle or secondary packaging must be capable of withstanding, without leaking, an internal pressure differential of not less than 95 kPa in the range from –40°C to +55°C temperature.

3. **For air mail transport:** Infectious substances in Category A will not be accepted for shipment through postal services. Infectious substances in Category B may be shipped by registered airmail, and the Universal

Postal Union recommendation should be followed. Local/international restrictions may be in force. Prior contact should therefore be made with the national public operator to ascertain whether the packaged material will be accepted by the postal service in question.

Transport (hand carry) between labs and hospital buildings through public areas

Infectious substances must be transported or moved between laboratories in way as to prevent spills and accidental exposure or release. Handlers should wear PPE that is appropriate for movement through public areas (e.g. lab coat and/or single-glove technique where appropriate--it is not advisable to wear gloves when using public elevators, however, a single-glove technique may be employed when moving through laboratory floors).

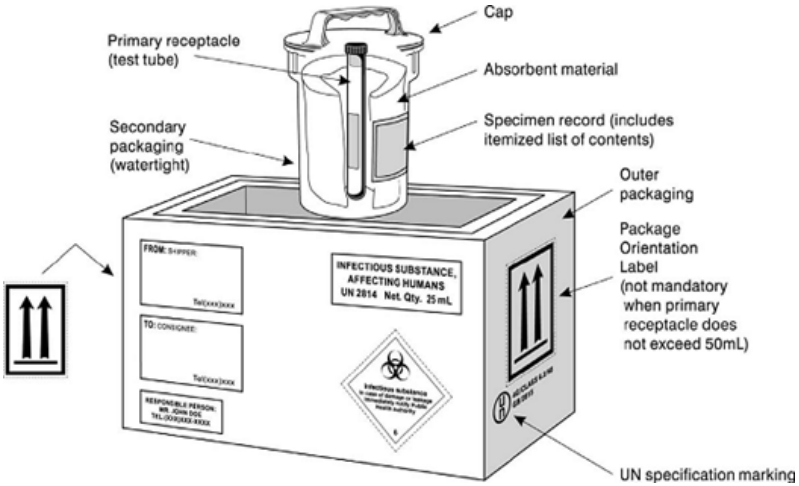
d. Labeling Requirements for Infectious Substances:

1. Labelling of Category A:

As mentioned, Category A infectious substances are assigned to identification number "UN 2814" for substances that cause disease in humans or in both humans and animals, or "UN 2900" for substances that cause disease in animals only. Infectious substances in Category A may only be transported in packaging that meets the United Nations class 6.2 specifications and complies with Packing Instruction P620. This ensures that strict performance criteria are met; tests for compliance with these criteria include a 9-metre drop test, a puncture test, a pressure test and a stacking test. The outer packaging shall bear the United Nations packaging specification marking, which indicates that the packaging has passed the performance tests to the satisfaction of the competent authority. The completed package must be marked "Infectious substances, affecting humans, UN 2814" or "Infectious substances, affecting animals, UN 2900" and labeled with a Division 6.2 (infectious substance) labels, as illustrated in (Figures 12 & 13). In addition, the package must be accompanied by appropriate shipping documentation, including a shipping paper and emergency response information.

2. **Documentation for category A:** The following shipping documents are required to be prepared and signed by the shipper:

- For air: the shipper's Declaration for Dangerous Goods.
- A packing list/proforma invoice that includes the receiver's address, the number of packages, detailed description of contents, weight, value (Note: for international transport, a minimal value shall be indicated, for customs purposes, if the items are supplied free of charge)
- An import and/or export permit and/or declaration if required.
- An air waybill for air transport or equivalent documents for road, rail and sea shipments to be prepared by the shipper or the shipper's agent.
- For UN 2814 and UN 2900, an itemized list of contents shall be enclosed between the secondary packaging and the outer packaging.



For the purposes of documentation, the proper shipping name shall be supplemented with the technical name. Technical names need not be shown on the package. When the infectious substances to be transported are unknown but suspected of meeting the criteria for inclusion in category A and assignment to UN 2814 or UN 2900, the words "suspected Category A infectious substance" shall be shown.

3. Labeling of category B substances:

A Category B infectious substance is one that does not meet the criteria for inclusion in Category A. A Category B infectious substance does not cause permanent disability or life-threatening or fatal disease to humans or animals when exposure to it occurs. The proper shipping name for a Category B infectious substance, "Biological specimen, Category B," is assigned to identification number "UN 3373" see Fig (14). The triple packaging system continues to apply, including for local surface transport. Testing documents are not required, however. It may be possible to source packaging locally rather than finding an authorized supplier, if the packaging manufacturer and the shipper can comply fully with the requirements of P650.

The package must be marked with a diamond-shaped marking containing the identification number "UN 3373" (Fig 14) and with the proper shipping name "Biological substance, Category B." In addition, the name, address, and telephone number of a person knowledgeable about the material must be provided on a written document, such as an air waybill, or on the package itself.

Fig (14). Dry Ice label

4. Documentation for category B:

Dangerous goods documentation (including a shipper's declaration) is not required for Category B infectious substances. The following shipping documents are required to be prepared and signed by the shipper (sender, consignor):

- For international shipments: a packing list/proforma invoice that includes the shipper's and the receiver's address, the number of packages, details of contents, weight, value (Note: the statement "no commercial value" shall appear if the items are supplied free of charge)
- An import and/or export permit and/or declaration if required.
- An air waybill for air transport or equivalent documents for road, rail and sea journeys to be prepared by the shipper or the shipper's agent

5. Marking requirement for both category A and B

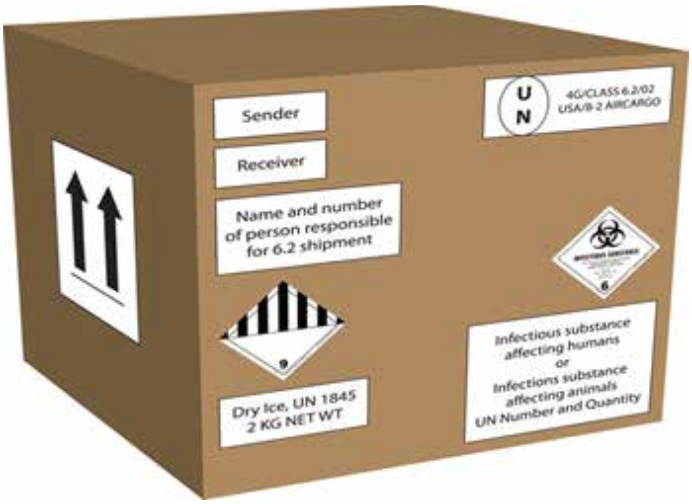
Packages are marked to provide information about the contents of the package, the nature of the hazard, and the packaging standards applied. All markings on packages or over packs shall be placed in such a way that they are clearly visible and not covered by any other label or marking. Each package shall display the following information on the outer packaging or the over pack.

- The shipper's (sender's, consignor's) name and address
- The telephone number of a responsible person, knowledgeable about the shipment

- The receiver's (consignee's) name and address
- Temperature storage requirements (optional)
- When dry ice or liquid nitrogen is used: the technical name of the refrigerant, the appropriate United Nations number, and the net quantity.

Any primary receptacle with a capacity of more than 50 ml shall be oriented in the outer packaging so that the closures are upwards. Orientation labels ("UP" arrows) shall be affixed to two opposite sides of the outer packaging. See Fig. (15) below.

Fig (15) an outer package with required marking information.



6. Information to be sent with samples:

It is essential that individual samples be clearly identified using appropriate methods. Marking instruments should be able to withstand the condition of use, i.e. being wet or frozen see Fig (11). Pencil tends to rub off containers and labels attached to plastic will fall off when stored at –70°C. Information and case history should always accompany the samples to the laboratory and should be placed in a plastic envelope on the outside of the shipping container. The following are suggested items that should be addressed particularly in domestic internal communication between labs. It would be advisable to contact the receiving laboratory to determine if it has a submission form that it would like to have submitted with the samples or if it needs other in formation.

- Name, address of owner/holding where disease occurred, phone and fax numbers.
- Name, postal and e-mail address, telephone and fax numbers of the sender.
- Diseases suspected, and tests requested.
- The species, breed, sex, age and identity of the animals sampled.
- Date samples were collected and submitted.
- List of samples submitted with transport media used.
- A complete history would be beneficial for the laboratory and should be included if possible. Some of the components of the history are:

A list and description of the animals examined and the findings of the post-mortem examination. Appendix2

- The length of time sick animals has been on the farm; if they are recent arrivals, from where did they originate.
- The date of the first cases and of subsequent cases or losses, with any appropriate previous submission reference numbers.
- A description of the spread of infection in the herd or flock.
- The number of animals on the farm, the number of dead animals, the number showing clinical signs, and their age, sex and breed.
- The clinical signs and their duration including the condition of mouth, eyes and feet, and milk or egg production data.
- The type and standard of husbandry, including the type of feed available, possible contact with poison or poisonous plants.
- Any medication given to the animals, and when given.
- Any vaccination given, and when given.
- Other observations about the disease and husbandry.

7. Emergency Response Procedure (Category A and B)

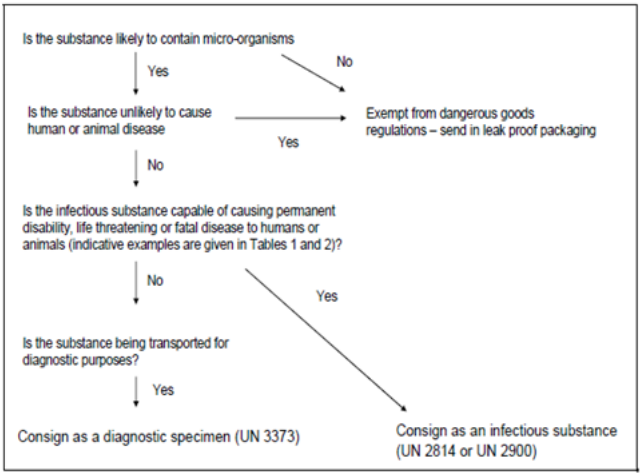
The following guidance is primarily of use by operators in the event that a package containing infectious substances (of either Category A or B) is involved in an incident resulting in spillage.

- Isolate spill or leak area immediately in all directions.
- Keep unauthorized personnel away.
- Obtain identity of substance involved if possible and report the spill to the appropriate authorities.
- Do not touch or walk through spilled material.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Be particularly careful to avoid contact with broken glass or sharp objects that may cause cuts or abrasions that could significantly increase the risk of exposure.
- Damaged packages containing solid CO2 as a refrigerant may produce water or frost from condensation of air. Do not touch this liquid as it could be contaminated by the contents of the package.
- Liquid nitrogen may be present and can cause severe burns.
- Use a proper spill kit according to the kit instructions, otherwise.
- If Spill kit is not available, absorb spilled materials with earth, sand or other non-combustible material while avoiding direct contact.
- Cover damaged package or spilled material with damp towel or rag and keep wet with liquid bleach or other disinfectant. Liquid bleach will generally effectively inactivate the released substance.
- Clean-up or disposal should only be carried out or supervised by a person who has undertaken appropriate training.

Fig (16) proper blood sample collection and labeling using barcode.

Working with pathogens in laboratory animals poses special risks. Therefore, sample handling upon receiving should be carried out with a minimum of risk to the health of the staff (biosafety) and the environment (biocontainment). This requires careful consideration of the risks involved in the actual procedure, followed by appropriate measures to minimize the risk of human disease and of possible release into the environment. Animal rooms should be constructed to appropriate standards and containment levels, just as laboratories. Containment in animal houses is very important because of the large number of infectious agents that they may generate. Similar considerations also apply regarding the training of staff, personal protective equipment (PPE) and clothing, along with the documentation of sample handling procedures. Special care must be taken to avoid injury to staff or self-inoculation accidents. It is equally important to note that many of the procedures may be dangerous and could inflict zoonotic infections for the working staff. Aerosol may become a source of laboratory contamination that may give rise to misdiagnosis. Therefore, it is essential to establish a biorisk management committee preferably to assist the facility directors in identifying, developing and reaching biorisk management goals based on fundamental biosafety and biosecurity principals and perform regular an on-the job training for the laboratory staff.

The following flow chart summarises the classification of *DIAGNOSTIC SPECIMENS* or *CLINICAL SPECIME* or *BIOLOGICAL SUBSTANCES CATEGORY B*.



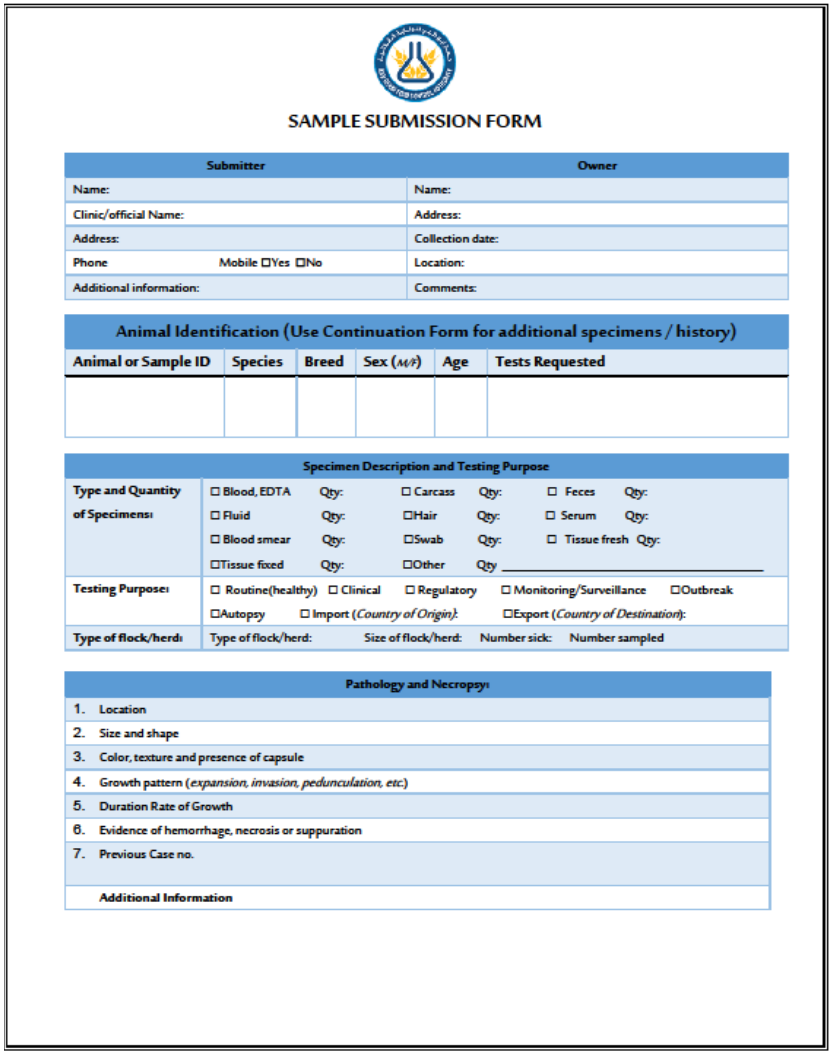
Live animals must not be used to transport infectious substances.

7. Appendices:

Appendix 1: Types of Blood Collection Tubes

Stopper Color	Additive	Sample Obtained	Intended Use/Disadvantages
Red	None	Serum	Routine use for all tests. Prolonged clot exposure results in decreased glucose and Ca and increased phosphorus. Hemolysis problems usually occur.
Gray	Na Fluoride or K Oxalate	Serum	Glycolytic inhibitor for sensitive glucose analysis
Royal Blue	Plastic Stopper Na Heparin	Serum, Plasma, or Whole Blood	Trace mineral analysis, especially Zn
Lavender	EDTA	Whole Blood, Plasma	Routine use for Complete Blood Count/ EDTA chelates Ca, Mg and decrease enzyme activities
Green	Na Heparin	Plasma, Whole Blood	Routine analyses for either plasma or whole blood/ No effect on metabolites
Red and Gray	Serum Separator plug	Serum	During centrifugation gel plug moves completely separate the serum from the clot/ hemolysis can be a problem

Appendix 2: Example of Animal Samples Submission Form



SAMPLE SUBMISSION FORM

Submitter		Owner
Name:		Name:
Clinic/official Name:		Address:
Address:		Collection date:
Phone	Mobile ☐Yes ☐No	Location:
Additional information:		Comments:

Animal Identification (Use Continuation Form for additional specimens / history)					
Animal or Sample ID	**Species**	**Breed**	**Sex (M/F)**	**Age**	**Tests Requested**

Specimen Description and Testing Purpose	
Type and Quantity of Specimens:	☐ Blood, EDTA Qty: ☐ Carcass Qty: ☐ Feces Qty: ☐ Fluid Qty: ☐Hair Qty: ☐ Serum Qty: ☐ Blood smear Qty: ☐Swab Qty: ☐ Tissue fresh Qty: ☐Tissue fixed Qty: ☐Other Qty _____
Testing Purpose:	☐ Routine(healthy) ☐ Clinical ☐ Regulatory ☐ Monitoring/Surveillance ☐Outbreak ☐Autopsy ☐ Import (*Country of Origin*): ☐Export (*Country of Destination*):
Type of flock/herd:	Type of flock/herd: Size of flock/herd: Number sick: Number sampled

Pathology and Necropsy:
1. Location
2. Size and shape
3. Color, texture and presence of capsule
4. Growth pattern (*expansion, invasion, pedunculation, etc.*)
5. Duration Rate of Growth
6. Evidence of hemorrhage, necrosis or suppuration
7. Previous Case no.
Additional Information

CATEGORY A

Micro-organism	UN Number & Proper Shipping Name
UN 2814 Infectious substances affecting both humans and animals	*Bacillus anthracis* (cultures only) *Brucella abortus* (cultures only) *Brucella melitensis* (cultures only) Brucella suis (cultures only) *Burkholderia mallei - Pseudomonas mallei* – Glanders (cultures only) *Burkholderia pseudomallei – Pseudomonas pseudomallei* (cultures only) *Chlamydia psittaci* - avian strains (cultures only) *Clostridium botulinum* (cultures only) *Coccidioides immitis* (cultures only) *Coxiella burnetii* (cultures only) Crimean-Congo hemorrhagic fever virus Dengue virus (cultures only) Eastern equine encephalitis virus (cultures only) *Escherichia coli*, verotoxigenic (cultures only) Ebola virus Flexal virus *Francisella tularensis* (cultures only) Guanarito virus Hantaan virus Hantaviruses causing hemorrhagic fever with renal syndrome Hendra virus Hepatitis B virus (cultures only) Herpes B virus (cultures only) Human immunodeficiency virus (cultures only) Highly pathogenic avian influenza virus (cultures only) Japanese Encephalitis virus (cultures only) Junin virus Kyasanur Forest disease virus Lassa virus Machupo virus Marburg virus Monkeypox virus MERS Corona Virus* Mycobacterium tuberculosis (cultures only) Nipah virus Omsk hemorrhagic fever virus Poliovirus (cultures only) Rabies virus (cultures only) Rickettsia prowazekii (cultures only) Rickettsia rickettsii (cultures only) Rift Valley fever virus (cultures only) Russian spring-summer encephalitis virus (cultures only) Sabia virus Shigella dysenteriae type 1 (cultures only) Tick-borne encephalitis virus (cultures only) Variola virus Venezuelan equine encephalitis virus West Nile virus (cultures only) Yellow fever virus (cultures only) Yersinia pestis (cultures only)

* Emerging Pathogen
** Unless otherwise indicated

UN 2900 Infectious substances affecting animals only	Avian paramyxovirus Type 1 -Velogenic Newcastle disease virus (cultures only) Foot and mouth disease virus (cultures only) Lumpy skin disease virus (cultures only) *Mycoplasma mycoides* - Contagious bovine pleuropneumonia (cultures only) Peste des petits ruminants (PPR) virus (culture only) Rinderpest virus (cultures only) Sheep-pox virus (cultures only) Goat pox virus (cultures only) Swine vesicular disease virus (cultures only) Vesicular stomatitis virus (cultures only) African Swine fever virus(culture only)

8. References:

1. Terrestrial Animal Health Code OIE/2008.
2. Guidance on regulations for the Transport of Infectious Substances2015-2016 WHO.
3. Bio-risk management/ Laboratory biosecurity guidance, WHO/CDC/ EPR/,2006.6
4. Veterinary Virology, Third edition. F.J. Fenner, E. Paul, J. Gibbs, Frederick A. Murphy, M.J. Studdert, D.O. White.

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