Biological Safety

May 2021

The Safe Use of Animal Blood and Tissues

Occupational Health and Safety Service
HSD095B

UNIVERSITY OF CAMBRIDGE

University Guidance

The Safe Use of Animal Blood and Tissues

Scope:

This guidance seeks to assist researchers, BSOs/DSOs and others who may not have background knowledge in medicine or animal pathogens. It is designed to further understanding of the risks associated with animal blood and tissues. It will also help to ask the 'right' questions of others who are writing a risk assessment and/or those who may provide researchers with these particular types of biological research material.

1. What to do at the research project planning stage

1 **Contact the departmental BSO.** The earlier the BSO knows about the project, the faster the project will be reviewed and approved by the departmental H&S committee where required. The BSO will also advise whether the work might need to be 'registered' with certain agencies/government bodies (eg notification) or a licence be obtained.

2 **Write an experimental plan and carry out a risk assessment** by using the correct template. The Safety Office has a variety of GM/Bio/COSHH risk assessment templates and the BSO will advise which of these need completing. See the Safety Office intranet: https://www.safety.admin.cam.ac.uk/subjects/biologicals

3 **Regulatory considerations:** the list below is not exhaustive and might change over time. Some of these are further mentioned in separate sections within this guidance.

- Control of Substances Hazardous to Health Regulations (COSHH 2002) - Risk assessment and, where applicable, notification of use, of biological agents
- Genetically Modified Organisms (Contained use) Regulations 2014 - Risk assessment and, where applicable, notification of use, of genetically modified materials.
- SAPO (Specified Animal Pathogens Order) - https://www.hse.gov.uk/biosafety/app-process.htm
- **Home Office Licence.** Use of live animals. If the research project involves the use of live animals, then a separate and dedicated Biological RA must be completed: 'Biological Risk Assessment for Working with Animals'. Where this is the case, 'tick' the appropriate box and submit this additional RA alongside the 'main' Biological RA. Please contact your BSO in the first instance. Further advice about the Biological RA template can be sought from the Safety Officer of the School of Biological Sciences.

  For animal research that falls within the scope of the Animal (Scientific Procedures) Act (ie regulated procedures carried out on any vertebrate other than man and any living cephalopod) there is an additional requirement to obtain Home Office licences and complete Home Office mandated training before the research can start. Most but not all procedures undertaken on animals for a scientific purpose require Home Office authority. Failure to obtain the necessary authorities can lead to a criminal prosecution. Advice about the training and licences required for animal research should be sought from University Biomedical Services (ubsenquiries@admin.cam.ac.uk) or your BSO.

- DEFRA/APHA (Animal & Plant Health Agency) - https://www.ukbrcn.org/who-we-are/animal-and-plant-health-agency-apha/
  - Animal By-Products regulations 2011 (ABP)
  - Trade in Animals and Related Products regulations 2011 (TARP) (Incorporated former Products of Animal Origin Regulations (POAO) and Animals and Animal Products Regulations)
  - IAPO (Importation of Animal Pathogens Order 1980)
  - IAPPO (Importation of Animal Products and Poultry Products Order 1980)
  - CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) - https://www.gov.uk/guidance/cites-imports-and-exports
- ATCSA Schedule 5 – Security of certain pathogens and toxins
- Material Transfer Agreements (MTA) Materials Transfer Agreement | Research Operations Office (cam.ac.uk)
- Nagoya Protocol on access and benefit sharing (The Nagoya Protocol | Research Operations Office (cam.ac.uk); and https://www.gov.uk/guidance/abs)

4 Gather background information about the research material (see other Sections below) and share this with the BSO as early as possible.

5 **Role of PI, researcher, student.** It is the role of the PI to write the RA, with the input from other members of the research group as appropriate. The PI has the overall responsibility that a risk assessment has been written and all personnel are appropriately trained (including keeping of the training records). Bio RAs are signed off by the PI and then submitted to the BSO who may sign off with input from the Departmental Biological Safety Committee. Students are not permitted to sign-off risk assessments, but are permitted to (co-)author risk assessments.

6 **Involvement of Occupational Health** is required. If the work includes the handling of animal materials (including insects), then Occupational Health must be consulted. A job hazard evaluation form (OHF29) should be completed and health monitoring/intervention might be necessary. See OH website for more information: https://www.oh.admin.cam.ac.uk/advice-and-guidance/animal-and-insect-work The risk assessment will determine whether any vaccination or other precautions are required or not.

2. Working with Animal Blood and Tissue

1 **Type of animal tissues.** The University works with a wide range of animal tissues, including blood, and animal excretions and secretions. These come from many sources that include, but are not limited to:
- Laboratory animals – fish, frogs, mice, rats, rabbits, sheep, birds, insects
- Veterinary hospital – cats, dogs, horses
- Veterinary diagnostic services
- Farm animals – sheep, cattle, poultry
- British wild animals – live or road kill etc
- Animal organs/body parts sourced as food grade tissue from butchers etc for experimentation
- Imported – exotic specimens from fieldwork trips, overseas collaborations, museums, commercial suppliers etc.

In addition, the University works with a range of animal derived 'products', some of them more obvious (eg milk, poultry eggs) than others such as animal hides or feathers. Some 'hidden' products are used daily in research applications such as commercially supplied bovine serum and milk powders for cell culture or cell storage/ transport media.

2 **Risks from animal tissues to both humans and other animals.** The primary risks from working with animal-derived bloods and other tissues are from the exposure to animal allergens and pathogens residing on/in animals such as viruses, bacteria and parasites.

3 **Animal Allergens.** Animal allergy is an allergic hypersensitivity response that may arise as a result of exposure to animal allergens. Animal allergens are classed as respiratory sensitisers under COSHH. There is NO defined safe Work Exposure Level (WEL) for animal allergens and as such, exposure to these must be prevented or where not reasonably practicable, as with other hazardous substances, adequately controlled.

- Sources of animal allergens include, but are not limited to, urine, fur, hair, dander, saliva, droppings, feathers and serum.
- Inhalation of, or contact with animal allergens may cause allergic symptoms. Symptoms may start with a runny nose and watery, itchy eyes. Symptoms may progress to more serious symptoms including urticarial rashes (hives) and progress to the most serious symptoms of asthma and anaphylaxis.
- For those working with research animals, exposure to mice and rat allergens presents the greatest risk. However, those working in veterinary practice and farm work are also at risk of allergy from the animals they work with. Staff and students working with animals at Cambridge undergo occupational health surveillance. Those working with laboratory animals are provided with training and information pertaining to laboratory animal allergy. A variety of local exhaust ventilation (LEV) systems, personal and respiratory protective equipment, changing facilities and safe systems of work are provided.
- Where staff and students intend on bringing animals, or animal derived bloods and other tissues back to the laboratory for analysis, appropriate risk assessment must be conducted for the safe handling and disposal of this material. Animal allergy is primarily associated with respiratory exposures. However, accidental exposures in the lab, e.g. from needles contaminated with rodent tissues, and personal contamination e.g. contaminated hands touching the face, remain a risk. For further information on Animal Allergy see https://www.safety.admin.cam.ac.uk/system/files/hsd006b.pdf

4 **Animal Pathogens – Zoonoses.** Animals may carry any number of disease causing pathogens. Zoonoses are diseases that can spread from animals into humans.

- Laboratory bred animals have a known heath status, are subject to regular health monitoring and are often acquired as 'specified pathogen free' animals. Tissues collected from lab animals are likely to be low risk for pathogens, unless they were deliberately infected with a biological agent (pathogen, prion) or a contaminated biological material (e.g. primary cells, or poorly characterised cell lines that inadvertently harbour a biological agent).

- Agricultural animals and pet animals naturally carry pathogens that may cause disease in humans. Wild animals will potentially carry the greatest risk. Exotic animals, or domesticated animals from some Third countries may present the highest risk for diseases not seen in the UK.
- When handling animals, their tissues, and their excretions and secretions, it is important to assess the potential risk of zoonoses being present, their transmission potential, and containment measures required. The risk of transmission of the majority of animal pathogens carried in animals in the UK can be mitigated by following good microbiological practices, including wearing disposable gloves and good occupational safety and hygiene practices.

5 **Examples of Zoonoses** and their host species. For list of Zoonotic diseases see GOV.UK (www.gov.uk)

- Salmonellosis (most animals: mammals, reptiles, amphibians, birds, fish)
- Leptospirosis (mice/rats/voles/shrews/dogs/cattle)
- Lymphocytic Choriomeningitis (mice/rats/hamsters)
- Campylobacteriosis (mice/rats/hamsters/dogs/pigs/birds)
- Hantavirus syndrome (mice/rats)
- Rat bite fever (rats/mice)
- E.coli O157 (cattle)
- Pasteurellosis
- Chlamydiosis (sheep, goats, birds)
- Avian influenza (birds)
- Ringworm (cattle)
- Cryptosporidiosis (cattle/sheep/goat)
- Q fever (cattle/sheep/goat)
- Orf virus infection (sheep/goat)
- Toxoplasmosis (cats/sheep/goat)
- Toxocariasis (dogs)
- Tuberculosis (cattle/cats)
- Mycobacterial infection (aquatic vertebrates, fish, terrapins)
- Anthrax (cattle, sheep, goat, deer)
- Rabies (Dogs, foxes, bats, raccoons)

6 **Further reading:** *Working safely with research animals: Management of infection risks* (https://www.hse.gov.uk/pubns/books/animal-research.htm)

7 **Pathogens of concern to the environment.** Imported animal tissues (and products of animal origin) may carry diseases of the most significant concern, were they to get into the UK environment. The following rules and working principles apply:

- These materials must by imported under an appropriate **Defra APHA** import licence, of which there are many types. Selection of the most appropriate import licence can be challenging. If there is any uncertainty as to whether a licence is required, or as to the type of licence required, workers should contact the APHA imports team. The important point to highlight here is that you MUST read the terms and conditions of any licence that is issued to you and ensure that you can comply with these BEFORE importing.

- It is strictly forbidden to acquire any animal tissues or animal by-products that are known or suspected to contain 'Specified Animal Pathogens' (falling under **SAPO** – Specified Animal Pathogen Order) without prior consent from the Head of Biological Compliance within the Safety Office.
- Similarly, tissues known or reasonably expected to be carriers of **ATCSA Schedule 5** human or animal pathogens must not be imported unless the laboratory has the appropriate security measures and CTSA approval in place for Schedule 5 human or animal pathogen.
- Laboratory animals may be deliberately infected with human or animal pathogens in order to research the mechanism of disease, immunity etc. Deliberate infection of animals carries very specific risks that must be thoroughly assessed before work commences, for example, the risk of transmission to the researcher from a bite whilst collecting blood samples. Blood/tissue/waste product sampling and post mortem activities must be carried out at a containment level appropriate for the agents being used. Procedures must be in place to transport infectious tissue samples back to the laboratory safely and in compliance with ADR dangerous goods by road transport regulations.
- **Prions.** Please note that working with prions falls under the TSE regulations (Transmissible Spongiform Encephalopathies). Working with animal brain/spinal cord (classed as Specified Risk Material – SRM) will need to be risk assessed to protect both livestock and workers. The Approved List of Biological Agents by the Advisory Committee on Dangerous Pathogens (ACDP) lists the relevant containment level. Please contact the Safety Officer of the School of Biological Sciences during the planning stage of any new work.

8 **Xenotransplantation.** Super immune-compromised 'humanised' animal models have been created for immuno-oncology research. Patient derived primary cells and even pieces of tissue may be transplanted into humanised animals. As a consequence, there is a potential risk for contaminating human blood borne viruses and other adventitious agents to propagate within the animal model. All xenograft work must be thoroughly assessed, including consideration of transmission risks from bites, pathogen shedding, blood sampling, tissue harvesting etc. Xenograft activities are typically carried out at a Containment Level 2.

3. GM of Animal Blood and Tissues

1 **GM Risk Assessment.** All work involving GM technology requires the completion of a specific GM risk assessment (see Safety Office intranet: https://www.safety.admin.cam.ac.uk/subjects/biologicals/gm-gmo-gmm-gm-plants)

2 The risk will depend on the type of genetic mutation being carried out: certain gene sequences harbour significant risks to workers such as oncogenes.

4. Transport of Animal Blood and Tissue

1 There are explicit transport requirements for transporting biological materials by road and air. Packing, marking and labelling of dangerous goods by road and air must be in accordance with transport regulations (ADR and ICAO/IATA). Typically, this will mean all biohazardous/suspect biohazardous materials must be triple contained, and includes sufficient absorbent material to mitigate any breakage/spill.

Please speak to your Department's Dangerous Goods trained person, who will be able to advise you.

2 Movement of biological materials between labs within the same building, or between buildings on the same university site, requires that the material is still safely double contained.

3 It is not permitted to transport hazardous biological materials by public transport. The transport of biological agents (hazardous or otherwise) must be risk assessed and in certain circumstances may not be permitted at all. An approved courier or a university vehicle is always preferable. Movement of hazardous materials by personal car must not take place unless the driver has appropriate business insurance, and they have checked that there are no restrictions in their policy that would prevent them from moving hazardous materials.

Class 6.2 Category A, UN2900 Infectious Substances, Affecting Animals may only be transported by specialist Class 6 Cat A couriers and movement must be carried out under a University Department of Transport security plan. The Safety Office has additional information on transport on its intranet: https://www.safety.admin.cam.ac.uk/subjects/biologicals/transportation

4 The HSE document *'Management and operation of microbiological containment laboratories'* contains a comprehensive set of recommendations and advice for working safely in containment labs, that also covers transport, waste handling and storage. This document will be useful for BSOs, risk assessor and workers. The document is available via the HSE website: https://www.hse.gov.uk/biosafety/management-containment-labs.pdf.

5 The risk of transporting blood and tissue between departments must be part of the risk assessment and the BSOs of all departments involved must be informed of any transfer activity well in advance (see Section 1)

6 Parcels and packages containing fresh animal tissues should only be opened in the lab and never in the reception area or goods-in areas. They should only be opened by trained staff using good laboratory practice.

7 **Import/Export General.** All imports and exports of biohazardous material must be notified to the BSO and DSO and documentation kept for auditing purposes. Researchers must ensure that they can comply with all terms and conditions of any APHA import licences before importing animal derived materials.

- Please note that following the UK leaving the EU, there are new rules to follow, which are explained in the new post-Brexit document issued by the UK government: https://www.gov.uk/government/publications/the-border-operating-model
- Importing animal derived materials from EU Member States will require a 'Facilitation Letter' https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/867835/facilitation-letter-samples-from-eu-countries.pdf
- Importing animal derived materials from non-EU 'Third Countries' will require a 'General Licence' General licences and authorisations to import live animals or animal products - GOV.UK (www.gov.uk)

- If there is not a suitable General Licence for your import needs, you will need to apply to APHA using the IV58 application here Animal pathogens and products: import licence application - GOV.UK (www.gov.uk)
- Importing/Exporting CITES endangered species: Import or export endangered species: check if you need a CITES permit - GOV.UK (www.gov.uk)
- Not sure which licence? Contact APHA Centre for International Trade – Imports and Exports APHA Centre for International Trade - Carlisle contact details (publishing.service.gov.uk)

8 **PLEASE NOTE: Animal By-Product Registration.** The University is registered in its entirety with APHA under the Animal By-Products (Enforcement) Regulations 2011 as a user/disposer of animal by-products.
The University registration number is U1207401/ABP/OTHER. This will be required for any IV58 licence application. The University Safety Office is the registered address for ABPs and departments are not required to individually register their buildings. However, departments remain responsible for identifying the correct import licences and adhering to any conditions for importing, storing, using and disposing of these materials, and for any record keeping that may be required.

The full details of animal by-products registered with APHA can be seen here Animal By-Products | Safety Office (cam.ac.uk).

5. Control measures and containment level

The final containment classification will be determined following the completion of the COSHH/Biological risk assessment. There are Bio RA templates available on the Safety Office intranet (from May 2021):
https://www.safety.admin.cam.ac.uk/subjects/biologicals.

1 **Appropriate PPE** must be worn to control the risk of infection through skin, mucosal surfaces, eyes or inhalation. Double gloving could provide extra security when handling particular hazardous materials. Safety glasses will minimise the risk of splashes to eyes and should always be worn when unpacking deliveries.

2 **Containment Level.** The type of material/hazardous agent used and the activity/methods involved will determine at which containment level the work will need to be carried out. It will also determine whether certain activities can be done on an open bench or not. See the 'Numbers Game' leaflet for more information: https://www.safety.admin.cam.ac.uk/publications/biological/hsd106b-biological-safety-numbers-game

6. Disposal of animal blood and tissue waste

1 **Disposal of GM tissue.** It is University policy that all GM waste must be inactivated prior to disposal. Autoclaving or chemical disinfection methods must be validated to ensure that any hazardous agents (GM/Bio) are successfully inactivated/destroyed prior to the waste removal from site (see: https://www.safety.admin.cam.ac.uk/publications/biological/hsd164b-autoclaves-validation-and-monitoring). Hospital embedded departments should agree with their NHS Estates that the department's waste policy is compliant with both the hospital and the University's waste policy. The same applied to departments using their own waste contractors.

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4 **Inactivation Method.** Animal whole blood, plasma and serum waste are high in organic matter and can therefore interfere with the antimicrobial activity of disinfectants, especially those which are chlorine based. These materials can be safely decontaminated by one of 2 means: chemical inactivation by using approved biocides such as Virkon and quaternary ammonium compounds (eg Distel, Chemgene) or by using a gelling agents (eg Vernagel) to solidify the liquid waste and subsequent autoclaving. If the use of a chlorine based biocide is desired only approved products should be used such as Presept, which is resistant to inactivation by organic soilage. Household bleach purchased from supermarkets have in general no information on chloride activity levels (expressed as parts per million) and the activity might decay depending on storage conditions and duration.

5 The **disposal of whole animals or animal body parts** usually needs to be carried out in a special way. For exotic animals/tissues, this may be defined in the import licence. For non-infected laboratory animals, this will be through the local clinical waste disposal (incineration) route. For infected animals this will be defined in the risk assessment but likely requires autoclaving and clinical incineration. Special provisions will be in place for veterinary and farm practices. Please contact your BSO/DSO/UBS Facility Manager/Safety Officer for the School of Biological Sciences, as applicable, for further advice.

6 **Disposal of sharps.** Contaminated sharps/needles/scalpels/glass slides should be safely collected in sharps bins with the optional autoclaving prior to commercial waste collection for incineration.

7 Waste bins should not be overflowing with waste and sink areas should be well managed.

7. Considerations regarding vulnerable workers/others

1 The protection of vulnerable persons and other staff must be considered when writing the RA.

2 Unvaccinated workers (where this may be required), immunocompromised workers and new and expectant mothers and their unborn child may be at a greater risk if they were to come into contact with pathogens that were present (knowingly/unknowingly) whilst handling animals, their tissues, secretions, excretions, bedding materials etc.

Individuals who wish to work with animals will need to register with occupational health and undergo health surveillance. Persons with pre-existing allergies, including animal allergies, or who have other underlying health conditions such as asthma, may be at greater risk.

3 Housekeeping staff and other co-workers using the same lab facility must be made aware of the risk.

8. Accidents/Incidents/Emergencies

1 All workers should be trained about what to do when sustaining an injury from an animal (eg bite/scratch/kick/goring), a needle-stick or other sharps injury involving animal blood/tissue or their secretions and excretions.

2 The following steps should be taken (according to the Occupational Health website: https://www.oh.admin.cam.ac.uk/advice-and-guidance/bloodborne-virus-bbv-infections) in case of a potential exposure incident to blood/tissue:
   - Encourage the wound to bleed, but do not scrub the wound: this may increase tissue damage
   - Wash any wound or contaminated skin with soap and clean water. Cover with a sterile dressing (eg waterproof plaster)
   - If blood is splashed into the eye or mouth, stop and wash out immediately with tap water or saline
   - Report the incident to the person in charge – supervisor, BSO, DSO, First Aider. Don't delay, or fail to report the accident even if you were not following correct procedures.
   - Contact Occupational Health preferably straight away and at least within 48 hours for advice or treatment with details, including the risk assessment and procedure in an emergency, eg to take a prophylactic medicine.

3 If not already done so: report all accidents/incidents to the First Aider, DSO, BSO and your line manager and log it on the University incident reporting portal: https://www.safety.admin.cam.ac.uk/subjects/accidents-incidents

4 Any spills should be cleared up immediately to avoid contamination of other work areas, thus avoiding putting others at risk. Large spills within safety cabinets should be mopped up with paper tissues and bagged up for autoclaving. The area is then disinfected with an approved biocidal, eg Virkon, Chemgene, Distel – but not 70% Ethanol. The latter is only suitable for disinfecting clean areas and it would simply 'fix' the blood onto the surface. Spills on open benches or floors should be sprinkled with Virkon powder and left to act for the recommended time period before being swept up with disposable scrapers and disposed of via the appropriate waste route.

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