CCAC TRAINING MODULE ON:
INFECTIOUS DISEASES

www.ccac.ca
This training module is relevant to all animal users working with *animals housed in vivaria* which are enclosed areas such as laboratories where animals are kept for research, teaching or testing.

This training module covers the following animals housed in vivaria:

- rodents
- rabbits
- birds
- amphibians
- reptiles
- non-human primates
- other mammals
Training Module Goals

- Understand how infectious diseases may be introduced to an animal facility and what steps should be taken to exclude those diseases
- Understand how infectious diseases spread and how they may be controlled if they gain access to a facility
- Understand the basics of health monitoring programs for detecting infectious diseases in research animals
Ringworm is a fungal infection of the skin that can occur in a wide range of animals including humans.
Infectious Diseases

- Can be the result of:
  - presence of pathogenic microbial agents
  - viruses
  - bacteria
  - fungi
  - protozoa
  - parasites
  - aberrant proteins (prions)

- Depend on:
  - virulence and number of infective particles that an animal is exposed to
  - animal, species and strain
  - immune system and stress
Infectious diseases are one of the most important variables that can interfere with research and can have devastating effects on the research program.

Important to know:
- how diseases spread
- routes of infection
- routes of excretion of the organism from an infected animal

The presence of microorganisms may result in difficulties in interpreting the pathology findings for some studies.
There are three ways for disease to spread between animals (or between animals and people):

- **direct contact:**
  - applies particularly to skin diseases but also with sexually transmitted diseases

- **indirect contact through the environment:**
  - infectious organisms can be inhaled
  - disease can be contracted through contamination of water or bedding

- **fomites:**
  - inanimate objects that have become carriers of infection e.g. utensils, contaminated cages, needles, etc.
Most common means of entry:
- inhalation into the respiratory tract
- ingestion into the gastrointestinal tract

Other means of entry:
- inoculation through the skin
  - (e.g. insects/needles)
- sexual transmission
Organisms can be excreted by a variety of routes:

- **Respiratory tract**
  - sneezing
  - coughing

- **Gastrointestinal tract**
  - feces

- **Other bodily fluids**
  - urine
  - saliva
  - etc…
Excluding Diseases and Sources of Infection

- Many SOPs, facility equipment and facility design features have as their main objective the exclusion of undesirable organisms and the containment of disease.

- There are four potential sources of infection:
  - animals
  - environment
  - people
  - experimental procedures
Source of Infection: Animals

SOURCE

• animals should normally be obtained from reputable suppliers where regular testing of the animals is carried out

TRANSPORTATION

• shipping crates may not be impervious to microorganisms, especially as they are carried on trucks, airplanes and through airports, etc.

QUARANTINE

• determines health status of animals and whether contamination occurred during transport
Source of Infection: Environment

**FOOD, BEDDING & WATER**
- sterilized to reduce risk of introducing pathogens

**EQUIPMENT USED FOR HOUSING**
- kept clean to prevent disease spread within the colony

**OTHER ANIMALS**
- SOPs, air filtration and pressure gradients should be in place to reduce likelihood of transfer of a pathogen from one colony to another

**VERMIN**
- wild rodents and insects can carry organisms and contaminate feed, bedding and other materials
- active pest control program is essential
Source of Infection: People

RESTRICTED ACCESS

- limit people traffic to those who must have access
- protective clothing must be worn

SOPS

- proper handling of animals, use of protective equipment and sanitation procedures
- not following SOPs can constitute a breach in protecting animals from contamination

PETS

- people working with rodents in a research facility should refrain from contact with other rodents (pets, reptile food or other)
Source of Infection: Experimental Procedures

**CELLS, TISSUE, FLUIDS, ETC…**

- may be contaminated with rodent viruses
- should be tested before they are used on or near animals

**PROCEDURE ROOMS**

- limit people traffic to these rooms (in particular when animals are present)
- protective clothing must be worn when working in procedure rooms where animals are present
- appropriate disinfection between uses
Protective measures to reduce the risk of an infectious agent entering/spreading within a facility:

- isolation at the cage level
  - isolating each animal to reduce direct spread (rarely recommended as routine practice)
  - use of microisolator cages to limit airborne transmission
  - cage changing conducted in a ventilated change station
- isolation of room or facility
- follow SOPs in place for all tasks carried out in barriers
Prevention of Disease Outbreaks: Do’s

- follow all facility SOPs
- clean and disinfect equipment and common areas
- wear protective clothing, change clothing as required
- change protective clothing between individual animals or groups of animals as required
- ensure that equipment for cleaning and sterilizing is working up to standard
- ensure that a health monitoring program is in place
Prevention of Disease Outbreaks: Don’ts

• prop open doors
• lift lids of microisolators outside of changing stations
• refill water bottles (replace with new bottle instead)
• put rodents that have jumped on the floor back in their cages
• move from a contaminated area to an uncontaminated area
• use the same instruments for surgery on two different animals without sterilizing them
• swap enrichment devices between cages
• save food from hoppers when cages are being changed
• keep rodents at home if you work in a disease-free rodent facility
Health monitoring system is required to detect the presence of specific organisms that may represent a threat to:

- animals
- research project
- persons working within the facility

Organisms to be monitored are for different species and perhaps within species.
Health Monitoring

- Frequency is variable
- Sample existing animals, or use sentinels (small rodents)
- If sentinel animals are used:
  - they must be free of any unwanted organisms
  - they should be given every opportunity to become infected if an unwanted microorganism is present
  - genetically modified animals should not be used as sentinels as they may not mount a measurable antibody response
If a pathogen is detected, the facility may consider:

- tolerating organism
- isolating and containing
- rederiving the colony by caesarean section or embryo transfer
- depopulating infected colony
- decontaminating in a comprehensive manner
- restocking with known disease free animals

The source of the disease introduction should be sought as part of the recovery process from a disease problem.
Non-infectious Diseases

Non-infections diseases:

- are not caused by a pathogen
- cannot be transmitted from one animal to another
- may be classified as follows:
  - physical
  - caused by toxic agents
  - nutritional
  - metabolic and endocrine
  - neoplastic
  - immunologic
  - genetic
Non-infectious diseases are becoming more important.

May affect both the well-being of the animals and the conducted research.

Whether infectious or non-infectious, abnormalities observed in laboratory animals should be reported to the veterinary staff as quickly as possible.
Summary

- Infectious diseases are one of the most important variables that can interfere with research.
- Animal users should strive to achieve their scientific goals while adhering to the best possible facility management and animal health and welfare standards.
- Using the fewest animals to generate valid and reproducible scientific data accomplishes both scientific and ethical goals.

Quality Animal Care = Quality Science