Notification Timeline for Animal Bites Where Rabies Transmission is Possible:

From Veterinarian/Health Care Practitioner to Public Health: Immediate.
From Public Health to Saskatchewan Health: Only cases where Rabies post-exposure prophylaxis (RPEP) is administered – within one month of incident.

Public Health Follow-up Timeline: Initiate within 24 hours.

All incidents of an individual having being exposed to saliva or other potentially infectious material of an animal that may be infected with rabies should be investigated and a risk assessment should be conducted to determine if risk of rabies transmission exists. When notification of an exposure is delayed, prophylaxis may be started as late as 6 months or more after the exposure.

Causative Agent
RNA virus classified Lyssaviruses, such as rabies virus, are in the family *Rhabdoviridae* in the genus *Lyssavirus*.

Symptoms
Animal Rabies – can be characterized by either:
Dumb rabies

- Domestic animals may become depressed and try to hide in isolated places.
- Wild animals may lose their fear of humans and appear unusually friendly.
- Wild animals, that usually only come out at night, may be out during the day.
- Animals may have paralysis. Areas most commonly affected are the face or neck (which causes abnormal facial expressions, difficulty swallowing, or drooling) or the hind legs.

Furious rabies

- Animals may become very excited and aggressive.
- Periods of excitement usually alternate with periods of depression.
- Animals may attack objects or other animals. They may even bite or chew their own limbs.

Complications
Illness almost invariably progresses to death. The differential diagnosis of acute encephalitic illnesses of unknown cause with atypical focal neurologic signs or with paralysis should include rabies (American Academy of Pediatrics, 2012).

Incubation Period
The period is highly variable but usually 3-8 weeks; very rarely as short as a few days, or as long as several years. Length of incubation depends in part on wound severity, wound location in relation to nerve supply, and relative distance from the brain; the amount and variant of virus; the degree of protection provided by clothing and other factors.

Reservoir/Source
All mammals are susceptible. Reservoirs and important vectors include wild and domestic Canidae, such as dogs, foxes, coyotes, wolves and jackals; also, skunks, raccoons, raccoon dogs, mongooses and other common carnivores, such as cats. Infected vampire, frugivorous and insectivorous bats occur in Mexico and Central and South America, and infected insectivorous bats are present throughout Canada and the USA and Eurasia.

Many other mammals such as rabbits, squirrels, chipmunks, rats, mice and opossums are very rarely infected.

Mode of Transmission
- Most commonly through virus laden saliva from a rabid animal introduced through a bite or scratch (very rarely into a fresh break in the skin or through intact mucous membranes).
- Airborne spread has been suggested in a cave where heavy infection of bats were roosting, and demonstrated in a laboratory setting, but this occurs very rarely.
- Person-to-person transmission is theoretically possible, but is rare and not well documented. Several cases of rabies transmission by transplant of cornea, solid organs and blood vessels from person dying of undiagnosed central nervous system (CNS) disease have been reported from Asia, Europe and North America.

Period of Communicability

Defined periods of communicability of animal hosts are only known with reliability of domestic dogs, cats and ferrets, and are usually for 3-7 days before onset of clinical signs (rarely over 4 days) and throughout the course of the disease. Longer periods of excretion before onset of clinical signs (14 days) have been observed with certain canine rabies virus variants in experimental infections, but these are the exception. Excretion in other animals is highly variable. For example, studies have indicated that bats shed virus for 12 days before evidence of illness while skunks can shed virus from 8-18 days and raccoons can shed virus from 5-10 days before onset of clinical signs.

Specimen Collection and Transport

The brain of the animal that was involved in the human exposure is required for testing. Testing occurs through the coordination with the provincial Rabies Risk Assessment Veterinarian (RRAV). See Attachment – Animal Investigation and Testing Consultation.

NOTE: The RRAV will direct that the animal be taken to a designated veterinary clinic or laboratory so specimens can be collected when the possibility of rabies exists and the animal has been in contact with humans or domestic animals. The RRAV could be contacted to explain specimen collection, storage (in remote areas) and transport. The contact information for RRAV is:

Dr. Clarence Bischop
Cell – 1-306-529-2190
Email – RRAV@gov.sk.ca
Fax Number – 1-844-666-DOGS (844-666-3647)

Diagnosis

Intact brain tissue is the key specimen for confirming rabies infection - care must be taken to avoid destroying a sample intended for testing if the animal is being destroyed. Most commonly, rabies diagnosis is confirmed using direct fluorescent antibody test from the animal's brain. Confirmation is provided by the CFIA Laboratory in Lethbridge, AB or the CFIA Reference Laboratory in Ottawa, ON.

Methods of Control/Role of Investigator

Prevention and Education
Refer to the Vector-Borne and Zoonotic Diseases - Introduction and General Considerations section of the manual that highlights topics for client education that should be considered and as well as provides information on high-risk groups and activities.

Immunization
Pre-exposure vaccination
Vaccinate individuals who are potentially at high-risk of contact with rabid animals (e.g., veterinarians, veterinary technicians, animal control staff, wildlife workers, spelunkers, laboratory and field personnel working with rabies virus and travellers to rabies endemic areas where there is poor access to adequate and safe post-exposure management). These people should consider pre-exposure immunization with either human diploid cell culture vaccine (HDCV) or purified chick embryo cell vaccine (PCECV) (Public Health Agency of Canada, 2006).

Post-immunization serological testing is advisable every 2 years for persons with continuing high-risk of exposure, such as certain veterinarians, veterinary technicians, and animal control staff. Those whose titres fall below protective levels (0.5 IU/mL) should receive a pre-exposure booster dose of vaccine (Public Health Agency of Canada, 2006).

Vaccination of Animals
The public should be aware of the benefits of vaccinating animals and take measures to protect their pets or other domestic animals (i.e., horses). The public can also help reduce the spread of rabies through informing authorities when an animal is suspected of having the disease (*The Health of Animals Act*[1] requires individuals who have knowledge of or who suspect rabies in an animal to notify CFIA). The public can also report animals suspected on having rabies to the provincial rabies hotline number at: 1-844-7-RABIES (1-844-772-2437). The veterinary profession can educate individuals regarding the value of vaccinating pets, and the vaccination requirements for pets travelling to other countries.

[1] http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.%2C_c._296/index.html.

Various wildlife departments are involved in vaccinating wildlife species, surveying the extent of wildlife rabies in certain geographic areas, as well as surveying the extent of rabies in certain species (Canadian Food Inspection Agency, 2009).

Animal Control Measures
The management of domestic animals falls under the jurisdiction of the Ministry of Agriculture in Saskatchewan as follows:

- The RRAV and private veterinarians investigate all cases of suspected rabies in any domestic animal;
- Ministry of Agriculture veterinarians (including the RRAV) may quarantine any domestic animal that is known or suspected to have had contact with a rabid animal.
- The management of wild animals falls under the Ministry of Environment or municipal animal control officers, in some instances.

Education
Keeping pets under control, teaching children not to play with wild animals or pets they do not know, keeping a safe distance from wildlife and not trying to raise orphaned or injured wildlife all contribute to preventing rabies (Canadian Food Inspection Agency, 2009). Children should be cautioned against provoking or attempting to capture stray or wild animals, and against touching carcasses.

International travelers to areas with endemic canine rabies should be warned to avoid exposure to stray dogs, and if traveling to an area with enzootic infection where immediate access to medical care and biologicals (e.g., vaccine and immunoglobulin) is limited, pre-exposure prophylaxis is indicated (American Academy of Pediatrics, 2012). Refer to Saskatchewan International Travel Manual for travel-related recommendations.

Pet owners should be reminded of the importance of vaccinating their pets.

Children, pet owners and the general public should be made aware of how to act/behave around animals such as dogs and cats and be informed how to interpret body language of an animal.

Personal Protective Measures

It is important for individuals to take appropriate personal protective measures and to use appropriate protective equipment when handling unknown animals or animals that are seemingly unwell. Standards exist for veterinarians and other occupational groups to prevent exposure to rabies and other zoonotic illnesses. Refer to the Western College of Veterinary Medicine (WCVM) infection control manual for details.

Environmental Measures

Inadvertent contact of family members and pets with potentially rabid animals, such as raccoons, foxes, coyotes and skunks, may be decreased by securing garbage and refuse to decrease attraction of domestic and wild animals. Similarly, chimney and other potential entrances for wildlife, including bats, should be identified and covered. Bats should be excluded from human living quarters. Bat exposure is considered to be high-risk. Refer to the following website for more information on bat-proofing human dwellings: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09pdf/acs-dcc-07.pdf.

Management

I. Exposed Individual

Note: Pregnancy and infancy are not contraindications to providing RPEP. Persons presenting even months after the bite must be assessed and managed in the same way as recent exposures.

History

It is important to do a risk assessment. See Attachment – Animal Bite Investigation Worksheet to determine if RPEP is required or recommended.

Attachment – Animal Encounter Follow-Up Flowchart is another tool that has been developed to assist the front line physician in determining the urgency for consulting an MHO regarding the need for RPEP.

The risk assessment involves getting information about the following:

Animal species

- The most common animals in Canada proven rabid are wild terrestrial carnivores (foxes, skunks, and raccoons), bats, cattle, dogs and cats (Public Health Agency of Canada, 2006). The Canadian Food Inspection Agency (CFIA) keeps track of positive specimens by species and province. Refer to the CFIA website.
- In Saskatchewan, horses, cows, goats, skunks, dogs, cats, bats, bears and raccoons have tested positive for rabies.
- The Ministry of Agriculture reports on rabies specimen submissions and positive results by species and municipality

Exposure type

- The World Health Organization (WHO) (2014) categorizes animal exposures into the following:
  - Category I – touching or feeding of animals. Licks of intact skin.
  - Category II – nibbling of uncovered skin. Minor scratches or abrasions without bleeding
  - Category III – single or multiple trans-dermal bites or scratches, licks on broken skin. Contamination of mucous membranes with saliva (i.e. licks).
- Bites – teeth penetrated the skin.
- Non-bite includes contamination of scratches, abrasions or cuts of the skin or mucous membranes by saliva or other potentially infectious material (Public Health Agency of Canada, 2006). Petting a rabid animal, handling blood, urine or feces is not considered an exposure. Additionally, being sprayed by a rabid skunk is not considered an exposure.
- Bat exposures – see page 8 for detailed recommendations on assessing and managing bat exposures.

Investigation of the incident

- The type of the animal (indoor pet/outdoor pet/stray/wild/livestock).
- Consider the risk of rabies in the animal species involved, the behaviour of the domestic animal, and the circumstances surrounding the exposure:
  - What were the individual and the animal doing leading up to the incident?
  - Was the animal acting in a manner that is unusual for it?
  - Was the animal healthy or sick?
  - Was the animal eating or drinking?

  - Some situations when an exposure may be expected (i.e., considered "provoked") include: entering a dog's habitat, interfering with a dog/cat fight, feeding or taking food from a dog, taking puppies/kittens from their mother, physical abuse (i.e., beating a dog), stepping on or bumping into an animal.)
- Consult the RRAV if insight on animal behaviour, clinical signs and risk of rabies in particular species is required.
- Vaccination status of the animal.

Other considerations

- Location of the injury (head, arm, leg, etc.). Injury to the upper body or face may require more timely response (Public Health Agency of Canada, 2008).
- Usual environment of the animal, particularly if it is a pet (is it an exclusively indoor pet or has there been an opportunity for interaction with a rabid animal?). What setting does the animal reside in (city versus rural)? Note: there have been rabies positive bats caught by apartment dwelling cats that never go outside.
- If it is a domestic cat or dog, is it available for observation? If the animal has been euthanized, is the brain available for testing?
- Immunization history of the individual exposed.

Bat Exposures (Public Health Agency of Canada, 2009)
The National Advisory Committee on Immunization (NACI) is now recommending intervention only when **both** of the following conditions apply:

- there has been "direct contact" with a bat
  AND
- a bite, scratch, or saliva exposure into a wound or mucous membrane cannot be ruled out.
- Note: "direct contact" is defined as the bat touching or landing on a person.

NACI recommends that RPEP be initiated without delay when there is a known bat bite, scratch, or saliva exposure in a wound or mucous membrane. This is especially important when the exposure involves the face, neck, or hands, or when the behaviour of the bat is clearly abnormal (such as when it hangs on tenaciously or when the bat has attacked the person). If the bat is available for testing, RPEP

should be discontinued if the bat is found to be negative for rabies[2]. The clinician may feel it will be safe to delay RPEP in some instances where the exposure is less certain (i.e., when the bat touches the individual while in flight) if the bat is being tested for rabies. However, if RPEP is indicated based on the NACI recommendations, it should never be delayed beyond 48 hours while waiting for bat testing results.

Recommendations Regarding Bat Testing

No direct contact with the bat: If there has been no "direct contact" with the bat, it should not be captured for testing. There are risks of direct contact when attempting to capture the bat; this potentially exposes the individual to rabies. If the bat is inadvertently tested and comes back positive, determining the need for RPEP should be based on whether direct contact with the bat occurred; not the rabies status of the bat.

In order to get the bat out of a house in which there has been no direct contact with the bat, the area with the bat should be closed off from the rest of the house. The doors or windows in the area with the bat should be opened to the exterior, allowing the bat to escape. People and pets should be kept away from the area.

Direct contact with the bat: If there has been "direct contact" with the bat, it is best to call a trained animal control or wildlife professional to capture the bat, if possible. Capturing the bat and testing it will mean that RPEP is not needed if the results come back negative. The Centers for Disease Control (2011) identifies steps that can be used to catch a bat at the following website: http://www.cdc.gov/rabies/bats/contact/capture.html.

Extreme care should be taken to ensure that there is no further exposure to the bat if it is captured. If attempting to capture the bat, the person should always wear thick leather gloves and place the bat in a closed secure container. Once the bat has been captured, the local public health department should be contacted to make arrangements with the RRAV to send the bat for rabies testing.

[2] Individuals who may be at risk of future exposures may make an informed decision to purchase the vaccine in order to complete a pre-exposure series.

Referrals

1. Animal Exposures that pose a rabies risk require follow-up in a timely manner.
2. Animal Exposures involving either the victim or animal (or both) from other regions or jurisdictions (such as other provinces, territories or countries) require assistance or coordination in completing the follow-up.
3. Sharing of information with other P/Ts must ensure that privacy and confidentiality standards are maintained. (i.e. information sharing should be limited to the information required to carry out the requested action).

To facilitate efficient referrals for coordinated follow-up, complete the relevant sections of the Attachment – Interjurisdictional Referral Following an Animal Exposure and follow routine communicable disease referral processes.

Animal Bite Exposures

Table 1 - PEP Recommendations for Persons Not Previously Immunized Against Rabies (Public Health Agency of Canada, 2006)

Animal species	Condition of animal at time of exposure	Management of exposed person
Dog, cat or ferret	Healthy and available for 10 days observation.	1. Local treatment of wound. 2. At first sign of rabies in animal, give RPEP as per Table 2. If bite or wound to head or neck, begin treatment immediately.
	Rabid or suspected to be rabid.* Unknown or escaped.	1. Local treatment of wound. 2. RPEP as per Table 2.
Skunk, bat, fox, coyote, raccoon, and other carnivores.	Regard as rabid* unless geographic area is known to be rabies-free.	1. Local treatment of wound. 2. RPEP as per Table 2.**
Livestock, rodents or lagomorphs (hares and rabbits	Consider individually. Consult appropriate public health and Ministry of Agriculture officials. Bites of squirrels, chipmunks, rats, mice, hamsters, gerbils, other rodents, rabbits and hares may warrant PEP if the behaviour of the biting animal was highly unusual.	

*If possible, the animal should be humanely killed and the brain tested for rabies as soon as possible; holding for observation is not recommended. Discontinue vaccine if fluorescent antibody test of animal brain is negative.
**See text for potential bat exposure.

Management of the Animals Involved in a Exposure Incidents

- Detain and observe any **healthy-appearing** dog, cat or ferret known to have bitten a person for 10 days. These animals should be confined and observed at the owner's residence. They should be confined in such a way that prevents contact with other animals or people during the observation period to prevent further exposures if the animal is found to have rabies.
  If the biting animal is infective at the time of the bite, it usually develops signs of rabies within 4-7 days, such as change in behaviour, excitability or paralysis, followed by death. Owners should make the vet aware that the animal was involved in a biting incident and is currently under 10 day observation.
- **Stray or ownerless** dogs or cats may be euthanized for testing. Contact RRAV for collection of specimen. Contact animal protection services to capture the animal.
- **Dogs and cats showing suspicious clinical signs of rabies and all wild mammals** that have bitten a person should be euthanized for testing. Animal owner to be made aware that this should be ideally done by a vet, or to ensure the animals head is not destroyed. Contact RRAV to arrange for collection of specimen.

The Ministries of Agriculture and Health have established policies that outline their roles with respect to rabies. In general:

- The RRAV will conduct a rabies risk assessment and direct trained veterinarians to submit samples from any suspect rabid domestic animal, and any suspect wild animal that has been in contact with a human or a domestic animal.
- Emergency submissions on weekends and holidays are only accepted in the case of a bite to the head or neck, when ordered by the MHO and when there is a weekend contact number for health provider. For some veterinary offices and locations, there is no means of getting samples to the lab over a weekend; in these cases it is recommended to start treatment if can't wait 3-4 days and submit the sample as soon as possible. Treatment should be stopped if results are negative[3].

[3] Individuals who may be at risk of future exposures may make an informed decision to purchase the vaccine in order to complete a pre-exposure series.

- In the case of healthy domestic animals (dogs, cats or ferrets) biting or scratching, a 10 day observation period is preferred and should be encouraged/emphasized to the animal owner over euthanasia and sampling.

Treatment/Supportive Therapy

Immediate flushing of the wound with soap and water is imperative and is probably the most effective procedure in the prevention of rabies (Public Health Agency of Canada, 2006). If available, a viracidal agent such as a povidone-iodine solution should be used to irrigate the wounds (Centers for Disease Control, 2010). Suturing the wound should be avoided if possible.

Rabies Post-exposure prophylaxis (RPEP)

When the risk assessment deems necessary, the MHO will authorize RPEP involving the administration of Rabies Immune Globulin (RabIg) and/or rabies vaccine. RPEP should be provided as per Table 2.

The WHO considers the intradermal (ID) regime an acceptable alternative to IM pre-exposure rabies vaccination. However, due to the precise nature for ID administration and the potential consequences of improper administration, post-immunization antibody titres should be determined at least 2 weeks after completion of ID vaccine series to ensure that an acceptable level of protection has been achieved. Refer to Attachment – Post Exposure Management of Individuals Who Received Pre-Exposure Intradermal Rabies Vaccine for guidance based on results of titres following ID administration.

Table 2 – RPEP Recommendations based on Previous Rabies Immunization History

Vaccination Status	Regimen[1]
1. Previously Unimmunized Individuals	**(1A) Unimmunized immunocompetent**[2] individuals to receive **RabIg and a 4 dose series of Rabies Vaccine:** • **1 mL IM on days 0 – 3 – 7 – 14.** • **Day 0**[3]: 1 mL IM as soon as possible after exposure **PLUS RabIg.**[4] • **Days 3, 7**, and **14**: 1 mL IM.
	(1B) Unimmunized immunocompromised[2] individuals to receive **RabIg and a 5 dose series of Rabies Vaccine**: • **1 ml IM on days 0 – 3 – 7 – 14 – 28.** • **Day 0**[3]**:** 1 mL IM as soon as possible after exposure **PLUS RabIg.**[4] • **Days 3, 7, 14** and **28:** 1 mL IM.
2. Previously Immunized Individuals	**(2A)** For individuals with a history of previous immunization with an approved course of either pre- or post-exposure prophylaxis with either human diploid cell culture vaccine (HDCV) or purified chick embryo cell vaccine (PCECV), the procedure is as follows: • Rabies Immune Globulin (RabIg) - not necessary. • Rabies vaccine – 2 doses: on day 0[3] and day 3.
Vaccination Status	**Regimen**[1]
2. Previously Immunized Individuals	**(2B)** For individuals with a history of previous immunization with an unapproved schedule or with a vaccine other than HDCV or PCECV, but has had an acceptable level of antibodies demonstrated in the past, the procedure is the same as above.

2. Previously Immunized Individuals	**(2C)** For individuals with a history of previous immunization with an unapproved schedule or with a vaccine other than HDCV or PCECV, but who did not have an acceptable level of antibodies demonstrated in the past, the following applies: • A sample for serology may be drawn at the time of exposure (before RabIg or vaccine is administered) to potentially reduce the number of doses of vaccine needed. • RabIg is to be administered. • Rabies vaccine – Refer to 1. Previously Unimmunized Individuals above. **The MHO may recommend discontinuing additional doses of rabies vaccine provided that 2 doses have been administered if serology indicates adequate immunity (≥ 0.5 IU/mL).**
[1] Regimens are applicable for all age groups, including children. [2] Includes those taking antimalarials and/or any immunosuppressants (e.g., corticosteroids) that can result in immunosuppression. Refer to Saskatchewan Immunization Manual[4] for details on determining immune status of individuals. [3] Day 0 is the day the 1st dose of vaccine is administered. [4] Vaccine-induced antibodies begin to appear within 1 week of beginning vaccination with an approved course, therefore there is no benefit of administering RabIg more than 8 days after vaccine has been initiated.	

Source: *Rabies Post Exposure Prophylaxis Recommendations.* Memo from Saskatchewan Ministry of Health Chief Medical Health Officer to MHOs, December 20, 2007.

Rabies Immune Globulin (RabIg)

- Administer 20 IU/kg body weight. Calculate dose with the following formula:

20 IU/kg x (client wt in kg) ÷ **RabIg IU concentration per mL** = *dose in mL*

- If anatomically feasible, *the full dose* should be infiltrated into the wound(s) and surrounding tissues; any remaining volume should be administered intramuscularly (IM) at an anatomic site distant from that of vaccine administration.
- RabIg should not be administered in the same syringe or location as the vaccine.

[4] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx.

- Because RabIg may interfere with active production of antibody, no more than the recommended dose should be given.
- Vaccine-induced antibodies begin to appear within 1 week of beginning vaccination with an approved course, therefore there is no benefit of administering RabIg more than 8 days after vaccine has been initiated.

Rabies Vaccine

Rabies vaccine should be administered as outlined in Table 2. Refer to Saskatchewan Immunization Manual[5] for details about immunocompromised individuals.

It has been documented that subjects with severe immunodeficiency (very low CD4 counts) will not respond well to rabies vaccination. Some may not develop neutralizing antibody at all. Careful wound cleansing and the use of immunoglobulin is thus of great importance in such patients. Vaccination must be administered at the usual dose. A serum specimen should be collected at the time when the last dose of vaccine is administered and tested for rabies antibodies. If sensitization reactions appear in the course of immunization, consult the medical health officer for guidance.

Refer to Rabies Immunization Fact Sheet to guide discussion about immunization.[6]

Immunization

There is no treatment for human rabies so appropriate and timely management of potential or confirmed exposures is vital. Immunization is the only measure that can prevent human rabies.

The vaccination schedule for post-exposure prophylaxis should be adhered to as closely as possible (especially the first 2 doses) and it is essential that all recommended doses of vaccine be administered (CD Subcommittee of Medical Health Officers of Saskatchewan, Mar 2016).

[5] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx
[6] http://www.saskatchewan.ca/immunize

Early Dose:

- If a dose of vaccine is given at less than the recommended interval, that dose should be ignored and the dose given at the appropriate interval from the previous dose. This is especially important for the first 3 doses in the series (day 0, 3, 7)
- Observe the appropriate spacing between rabies vaccines, to optimize immunogenicity
- Example:
    - Doses received on days 0, 3 and 5
    - Ignore dose received on day 5 and repeat at appropriate interval on day 9 (i.e. appropriate spacing of 4 days which would normally be observed between 2nd and 3rd doses), with dose #4 on day 16.

Late Dose:

- If the recommended rabies vaccine schedule is interrupted or delayed, the series should be continued ensuring that the recommended time intervals between remaining doses are maintained.

Serologic Testing:

- If repeating an invalid dose or providing a delayed dose results in an interval *more than 3 days longer* than the recommended interval, immune status should be assessed by performing serologic testing 7-14 days after administration of the final dose in the series (Centers for Disease Control, Ask the Experts, 2017).

Administering a 5th dose:

Should the results for the serological testing under the circumstances mentioned above not be back at the time of the 5th dose (day 28), proceed with providing the 5th dose.

Individuals should also be offered the appropriate tetanus vaccine based on their immunization history and eligibility based on the Saskatchewan Immunization Manual.[7]

II. Contacts/Contact Investigation

Contact Definition

Anyone who has had direct contact with the saliva or infectious material of an animal confirmed to have rabies.

[7] http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx

Contact Management

All contacts of a suspected or proven rabid animal should be followed up and a risk assessment completed to determine the extent of exposure; only those with skin or mucosal contact with the animal's saliva should be considered for post-exposure treatment.

Testing/Prophylaxis

Individuals who have been previously vaccinated should be followed as outlined in Table 2.

III. Environment

Child Care Centre Control Measures

In-house pets should be kept up-to-date on vaccinations.

Institutional Control Measures

Refer to the following website for more information on bat proofing human dwellings: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09pdf/acs-dcc-07.pdf.

Epidemic Measures

Establish control area under authority of laws, regulations, and ordinances, in cooperation with appropriate human, agricultural and wildlife conservation authorities.

Immunize dogs and cats in defined areas of risk though officially sponsored intensified mass programs that provide immunizations at temporary and emergency stations. For protection of other domestic animals, use approved vaccines appropriate for each animal species.

In urban areas of industrialized countries, strict enforcement of ownerless and stray dogs, and of non-immunized dogs found off owners' premises; control of the dog population by castration, spaying or drugs have been effective in breaking transmission cycles.
Immunization of wildlife through baits containing vaccine has contained red fox rabies in Western Europe and southern Canada coyote, gray fox, and raccoon rabies in the USA (Heymann, 2008). Programs to control raccoon rabies through trap-vaccinate-return (TVR) programs have been successfully implemented in New Brunswick and Quebec.

There is a lack of effective oral vaccines for skunks, although a new adenovirus-rabies recombinant vaccine (ONRAB® is showing promise). TVR programs are not appropriate for all species (i.e., bats). Any wildlife control programs would be established in partnership with the Ministry of Environment, Agriculture and other authorities.

Revisions

Date	Change
March 2024	Provided further specificity that if an animal tests negative for Rabies, the RPEP series should be discontinued. Individuals who may be at risk of future exposures may make an informed decision to purchase the vaccine in order to complete a pre-exposure series.
July 2019	Updated Rabies Immune Globulin formula calculation (pg 13) to reflect the different RabIg product concentrations on the market.
July 2017	Included reference to anti-malarial medications in Table 2 to align with the Saskatchewan Immunization Manual.
April 2017	Incorporated recommendations for CD Subcommittee of Medical Health Officers of Saskatchewan on managing schedule interruptions of early or late doses of rabies post-exposure prophylaxis vaccine. Updated hyperlinks on page 7. Incorporated into new CDC Manual format.

Notification Timeline for Human Rabies Confirmed Cases:

From Lab/Practitioner to Public Health: Immediate.
From Public Health to Saskatchewan Health: Immediate.

Public Health Follow-up Timeline: Immediate.

Information

Table 3 - Case Definition of Human Rabies (Public Health Agency of Canada, 2008)

Confirmed Case	Clinical evidence of illness[1] with laboratory confirmation of infection: • detection of viral antigen in an appropriate clinical specimen, preferably the brain or the nerves surrounding hair follicles in the nape of the neck, by immunofluorescence **OR** • isolation of rabies virus from saliva, cerebrospinal fluid (CSF), or central nervous system tissue using cell culture or laboratory animal **OR** • detection of rabies virus RNA in an appropriate clinical specimen.
Probable Case	Clinical evidence of illness[1] with laboratory evidence: • demonstration of rabies-neutralizing antibody titre ≥ 5 (complete neutralization) in the serum or CSF or an unvaccinated person.
Clinical evidence of illness[1]- Rabies is an acute encephalomyelitis that almost always progresses to coma or death within 10 days after the first symptom.	

Causative Agent

RNA virus classified Lyssaviruses, such as rabies virus, are in the family *Rhabdoviridae* in the genus *Lyssavirus*.

Symptoms

Human Rabies – Onset is generally heralded by a sense of apprehension, headache, fever, malaise and sensory changes (paresthesia) at the site of an animal bite. The most frequent symptoms include excitability, aero-and/or hydrophobia often with spasms of swallowing muscles. Delirium (sudden severe confusion and rapid changes in brain function) with occasional convulsions follows. Such classic symptoms of furious rabies are noted in two-thirds of the cases, whereas the remaining present as paralysis of limbs and respiratory muscles with sparing of consciousness. Phobic spasm may be absent in this paralytic form. Coma and death ensue within 1-2 weeks, mainly due to cardiac failure (Heymann, 2008).

Complications
Illness almost invariably progresses to death. The differential diagnosis of acute encephalitic illnesses of unknown cause with atypical focal neurologic signs or with paralysis should include rabies (American Academy of Pediatrics, 2009).

Incubation Period
The period is highly variable but usually 3-8 weeks; very rarely as short as a few days, or as long as several years. Length of incubation depends in part on wound severity, wound location in relation to nerve supply, and relative distance from the brain; the amount and variant of virus; the degree of protection provided by clothing and other factors.

Period of Communicability
Not well defined for human cases.

Diagnosis
Human rabies diagnosis is made through specific fluorescent antibody (FA) staining of brain tissue or made by specific FA staining of viral antigens in frozen skin sections taken from the back of the neck at the hairline, detection of viral antibodies in serum and CSF, and specific amplification of viral nucleic acids in saliva or skin biopsies by reverse transcriptase PCR (RT-PCR). Serological diagnosis is based on neutralization tests in cell culture or in mice (Heymann, 2008).

Methods of Control/Role of Investigator

Prevention and Education
Refer to the Vector-Borne and Zoonotic Diseases - Introduction and General Considerations section of the manual that highlights topics for client education that should be considered and as well as provides information on high-risk groups and activities.

Immunization
Pre-exposure vaccination
Vaccinate individuals who are potentially at high risk of contact with rabid animals (e.g., veterinarians, veterinary technicians, animal control staff, wildlife workers, spelunkers, laboratory and field personnel working with rabies virus and travellers to rabies endemic areas where there is poor access to adequate and safe post-exposure management). These people should consider pre-exposure immunization with either human diploid cell culture vaccine (HDCV) or purified chick embryo cell vaccine (PCECV) (Public Health Agency of Canada, 2006).

Post-immunization serological testing is advisable every 2 years for persons with continuing high risk of exposure, such as certain veterinarians. Those whose titres fall below protective levels (0.5 IU/mL) should receive a pre-exposure booster dose of vaccine (Public Health Agency of Canada, 2006).

Vaccination of Animals

The public should be aware of the benefits of vaccinating animals and take measures to protect their pets or other domestic animals (i.e., horses). The public can also help reduce the spread of rabies through informing authorities when an animal is suspected of having the disease (*The Health of Animals Act*[8] requires individuals who have knowledge of or who suspects rabies in an animal to notify CFIA). The public can also report animals suspected on having rabies to the provincial rabies hotline number at: 1-844-7-RABIES (1-844-772-2437). The veterinary profession can educate individuals regarding the value of vaccinating pets, and the vaccination requirements for pets travelling to other countries or importing into Canada.

Various wildlife departments are involved in vaccinating wildlife species, surveying the extent of wildlife rabies in certain geographic areas, as well as surveying the extent of rabies in certain species (Canadian Food Inspection Agency, 2009).

Animal Control Measures

The management of rabies in domestic animals falls under the jurisdiction of the Ministry of Agriculture in in Saskatchewan as follows:

- The RRAV and private veterinarians investigate all cases of suspected rabies in any domestic animal;
- Ministry of Agriculture veterinarians (including the RRAV) institutes appropriate control actions such as revaccination, observation periods, quarantine or euthanasia of any domestic animal that is known or suspected to have had contact with a rabid animal.

Education

Keeping pets under control, teaching children not to play with wild animals or pets they do not know, keeping a safe distance from wildlife and not trying to raise orphaned or injured wildlife all contribute to preventing rabies (Canadian Food Inspection Agency, 2009). Children should be cautioned against provoking or attempting to capture stray or wild animals and against touching carcasses.

[8] http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.%2C_c._296/index.html

International travelers to areas with endemic canine rabies should be warned to avoid exposure to stray dogs, and if traveling to an area with enzootic infection where immediate access to medical care and biologicals (e.g., vaccine and immunoglobulin) is limited, pre-exposure prophylaxis is indicated (American Academy of Pediatrics, 2009). Refer to Saskatchewan International Travel Manual for travel-related recommendations.

Pet owners should be reminded of the importance of vaccinating their pets.

Children, pet owners and the general public should be made aware of how to act/behave around animals such as dogs and cats and be informed how to interpret body language of an animal.

Dog owners should be educated on preventing their animals from biting people.

Personal Protective Measures
It is important for individuals to take appropriate personal protective measures and to use appropriate protective equipment when handling unknown animals or animals that are seemingly unwell. Standards exist for veterinarians and other occupational groups to prevent exposure to rabies and other zoonotic illnesses. Refer to the Western College of Veterinary Medicine (WCVM) infection control manual for details.

Environmental Measures
Inadvertent contact of family members and pets with potentially rabid animals, such as raccoons, foxes, coyotes and skunks, may be decreased by securing garbage and refuse to decrease attraction of domestic and wild animals. Similarly, chimney and other potential entrances for wildlife, including bats, should be identified and covered. Bats should be excluded from human living quarters. Bat exposure is considered to be high-risk. Refer to the following website for more information on bat-proofing human dwellings: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09pdf/acs-dcc-07.pdf.

I. Contacts/Contact Investigation

Contact Definition

Individuals who have had direct contact with the saliva or infectious material of an individual confirmed to have rabies. Routine delivery of health care to a patient with rabies is not an indication for RPEP (Centers for Disease Control and Prevention, 2008).

Contact Management

Rabies post-exposure prophylaxis (RPEP) is indicated for contacts (e.g., household, health care workers) who are reasonably certain they were bitten by the patient or had mucous membrane or non-intact skin directly exposed to potentially infectious saliva or neural tissue (Centers for Disease Control and Prevention, 2008). Refer to Table 2 in Part I – Follow-up of Animal Bites/Exposures for the RPEP regime.

A risk assessment should be conducted for all contacts of a human rabies case and RPEP should be provided as necessary.

Testing/Prophylaxis

Individuals who have been previously vaccinated should be followed as outlined in Table 2 in Part I – Follow-up of Animal Bites/Exposures for the RPEP regime.

Treatment

Rabies has the highest case fatality rate of any infectious disease. There is not proven effective medical treatment for human rabies cases once clinical signs have developed. Provision of rabies vaccine after development of clinical symptoms is not recommended as it may be detrimental to the individual (Centers for Disease Control and Prevention, 2008).

II. Environment

Institutional Control Measures

Human rabies cases do not pose any greater risk of infection to health care workers than more common bacterial or viral infections. Medical staff should adhere to standard and droplet precautions. Staff should wear gowns, goggles, masks, and gloves, particularly during intubation and suctioning (Centers for Disease Control and Prevention, 2008).

Additional precautions, such as wearing face shields when performing higher-risk procedures that can produce droplets or aerosols of saliva (i.e., suction of oral secretions), might be warranted (Centers for Disease Control and Prevention, 2010). Aerosol transmission of rabies has occurred only in laboratory settings.

The Centers for Disease Control and Prevention (2010) identified measures to avoid risk of transmission at autopsy of a suspected rabies cases:

- Require appropriate personal protective equipment including an N95 or higher respirator, full face shield, goggles, gloves, complete body coverage by protective wear, and heavy or chain mail gloves to help prevent injury from instruments or bone fragments.
- Minimize aerosols by using a handsaw rather than an oscillating saw when cutting bone, and by avoiding contact of the saw blade with brain tissue.
- Use a 10% solution of sodium hypochlorite for disinfection of all exposed surfaces and equipment during and after the autopsy.
- If injury or mucous membrane contamination occurs during an autopsy, provide rabies post-exposure prophylaxis.

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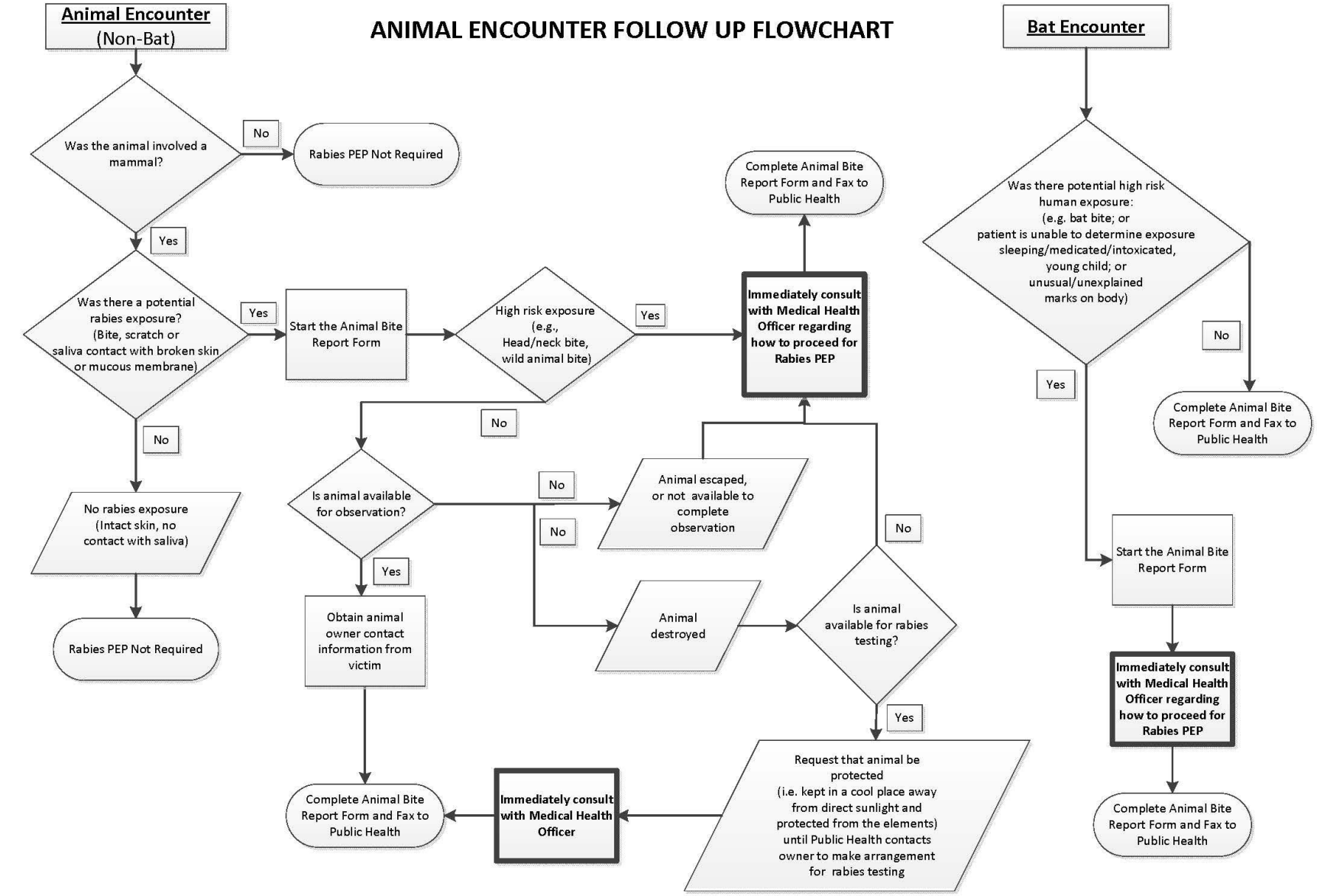
Please see the following pages for the Animal Bite Investigation Form.

Revisions

Date	Change
March 20, 2024	The Ministry of Health Animal bite Investigation Form has been archived as the cross-reference for reporting to iPHIS is out of date and such exposures are not entered into Panorama. The Saskatchewan Health Authority has developed an Animal Exposure Investigation Form to replace the out-dated Ministry Form.

Please see the following page for the Animal Encounter Follow up Flowchart.

ANIMAL ENCOUNTER FOLLOW UP FLOWCHART



Note: This flowchart is to be used as a general guideline. Please contact the Medical Health Officer directly with specific questions regarding administering Rabies PEP.

Please see the following pages for the Interjurisdictional Referral Following an Animal Exposure form.

Government of Saskatchewan
Ministry of Health

DATE OF REFERRAL: _____

Interjurisdictional Referral Following an Animal Exposure

❑ **Action Required:** ❑ **Victim AND Animal Require Follow-Up (Complete All Sections)**
❑ **Victim Requires Follow-Up (Referring Jurisdiction complete I and II)**
❑ **Status of Animal Required (Referring Jurisdiction complete II and III)**
❑ **Assess Other Humans for Exposure (Referring Jurisdiction Complete II and III)**

❑ **For Information Only**

FROM (Health Region)	**TO (Health Region/Jurisdiction)**

I. Demographic Details of Exposed Person (Complete only if victim requires follow-up)

Name:	Date of Birth (YYYY/MM/DD):
Address:	Health Services Number:
Contact Information Home phone : Cell: E-mail:	

II. Exposure and Assessment Details (Complete in all referrals)

Date of Exposure (YYYY/MM/DD):	Type of Animal:	Body Site/Type of Exposure (eg. head/arm; eg. bite/scratch)
Assessment of Exposure[1]: ❑ High Risk Exposure ❑ Low Risk Exposure		
Has Rabies Post-Exposure Prophylaxis (RPEP) been recommended ? ❑ No ❑ Yes Date Started (YYYY/MM/DD):_____ ❑ Awaiting Animal Observation/Testing Results – Date Expected (YYYY/MM/DD):_____ ❑ Assessment Not Completed – Please Assess for Possible Exposure		

III. Contact Information of Owner of Animal (Complete if animal requires follow-up)

Name of Owner:		Relationship of owner to the exposed person: ❑ Same ❑ Family Member ❑ Unknown ❑ Friend ❑ Other: _____
Phone Number(s):		Address:
Name of Animal:	Type of Animal (eg. dog/cat/other)	Status of Animal: ❑ Alive ❑ Deceased ❑ Unknown
Additional details related to the animal (e.g. description of animal) Include rabies status if known:		

IV. Public Health Contact Details – Receiving Agency direct inquiries to:

Name/Title:	Phone Number:
Results of the completed assessment required? ❑ No ❑ Yes Fax Number: Fax Attention To:	

[1] High Risk (unprovoked, stray animals or animals with unusual behavior, significant exposure); Low Risk (provoked, vaccinated animal or animal known to victim, etc.)

Additional Details of Incident That May Assist the Investigator:

Intramuscular (IM) administration of pre-exposure rabies vaccine is the gold standard, however the World Health Organization (WHO) considers the intradermal (ID) regime an acceptable alternative as it uses less vaccine and produces a comparable degree of protection against rabies (Canadian Immunization Guide, Evergreen).

Due to the precise nature for ID administration and the potential consequences of improper administration, post-immunization antibody titres should be determined at least 2 weeks after completion of ID vaccine series to ensure that an acceptable level of protection has been achieved.

The following scenarios may arise when managing clients who have received 3 doses of pre-exposure ID rabies vaccine at the appropriate intervals as outlined in the Canadian Immunization Guide (CIG)[1]. Post-exposure management is outlined for each scenario.

Titre done following ID pre-exposures Rabies vaccine

1. Titre conducted at least 2 weeks after the last dose indicates <u>immunity</u>[2]

- ***Post-exposure***:
  - RabIg not needed (as per CIG evergreen[1]).
  - Give 2 IM doses of rabies vaccine on days 0 and 3.

2. Titre conducted at least 4 weeks after 3rd dose and after one additional dose indicates <u>non-immune</u>

- ***Post exposure:***
  - Give RabIg.
  - Give full post exposure vaccine course (as per 1. Previously Unimmunized Individuals [Table 2]).

Titre *<u>not</u>* done following ID pre-exposures Rabies vaccine

1. Routine management when client did not have titre conducted 4 weeks after final dose

- ***Post-exposure***:
  - take rabies titre.
  - Give RabIg (assuming titre will not be immediately available as it currently takes up to 8 weeks which will be after the entire course is done).
  - Give 2 IM doses of rabies vaccine on days 0 and 3.

[1] http://www.phac-aspc.gc.ca/publicat/cig-gci/p04-rabi-rage-eng.php
[2] at least 0.5 IU/mL by the rapid fluorescent-focus inhibition test

- Continue series until titre results are received indicating immunity
- If titre results are not available or are non-immune/suboptimal: complete post-exposure vaccine course (as per 1. Previously Unimmunized Individuals [Table 2]).

2. Alternate management for low risk exposures if acceptable to the client and the MHO if the following criteria are met.

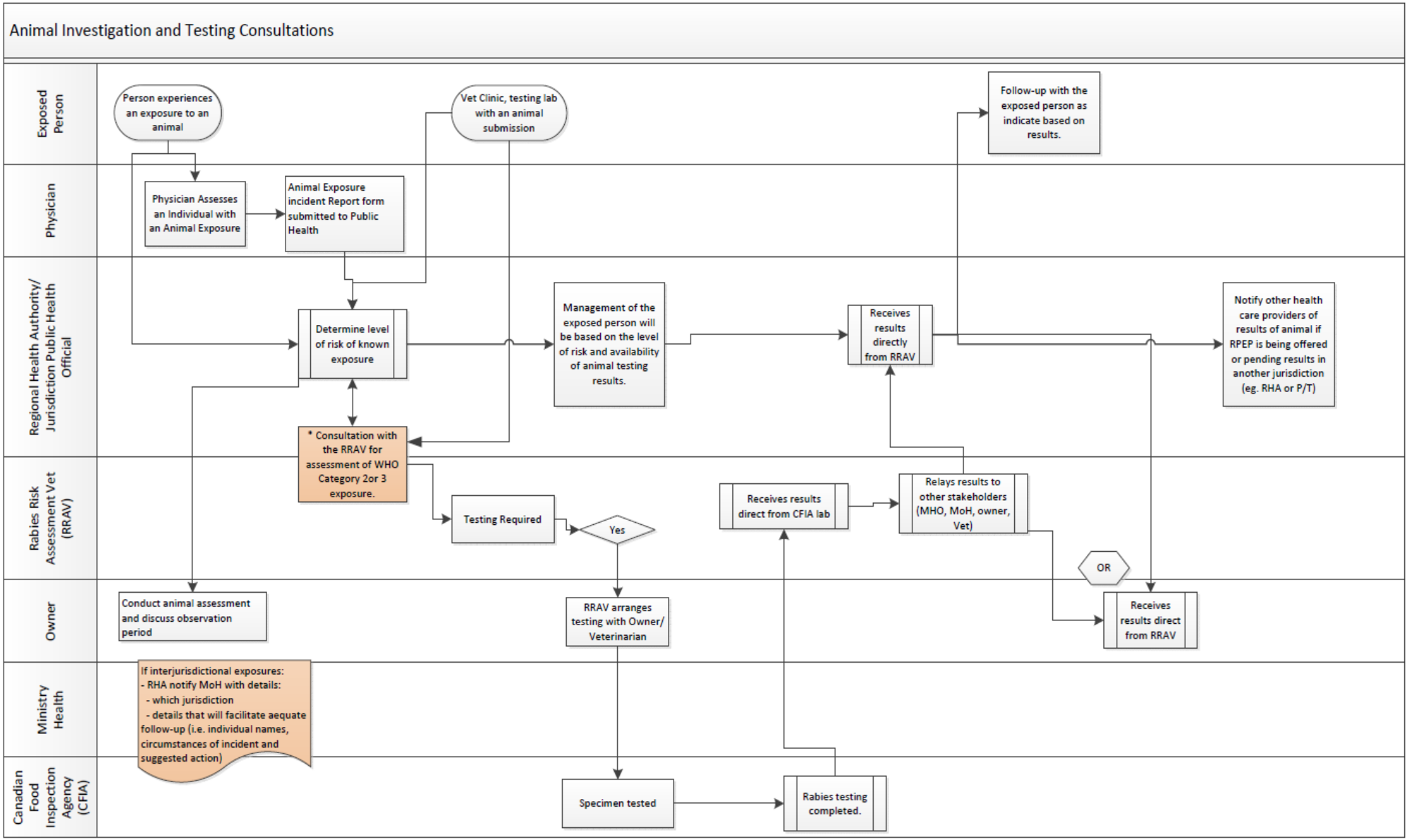
i. No risk factors for a poor response to ID vaccine
AND
ii. Risk of rabies in animal is low
AND
iii. Likelihood of transmission from exposure is low
AND
iv. Other individuals in ID vaccine group were tested and were immune.

- ***Post-exposure:***
  - take rabies titre
  - RabIg not needed
  - Give 2 IM doses of rabies vaccine on days 0 and 3.

Individual did not complete the series of pre-exposure ID vaccine

- ***Post-exposure:***
  - give RabIg and rabies vaccine (as per 1. Previously Unimmunized Individuals [Table 2])

The diagram on the following page highlights the process for consulting with animal health experts in the investigation of human exposures to animal potentially infected with rabies.


Animal Investigation and Testing Consultations
Exposed Person
Physician
Regional Health Authority/ Jurisdiction Public Health Official
Rabies Risk Assessment Vet (RRAV)
Owner
Ministry Health
Canadian Food Inspection Agency (CFIA)
Person experiences an exposure to an animal
Vet Clinic, testing lab with an animal submission
Follow-up with the exposed person as indicate based on results.
Physician Assesses an Individual with an Animal Exposure
Animal Exposure incident Report form submitted to Public Health
Determine level of risk of known exposure
Management of the exposed person will be based on the level of risk and availability of animal testing results.
Receives results directly from RRAV
Notify other health care providers of results of animal if RPEP is being offered or pending results in another jurisdiction (eg. RHA or P/T)
* Consultation with the RRAV for assessment of WHO Category 2or 3 exposure.
Testing Required
Yes
Receives results direct from CFIA lab
Relays results to other stakeholders (MHO, MoH, owner, Vet)
OR
Conduct animal assessment and discuss observation period
RRAV arranges testing with Owner/ Veterinarian
Receives results direct from RRAV
If interjurisdictional exposures:
- RHA notify MoH with details:
- which jurisdiction
- details that will facilitate aequate follow-up (i.e. individual names, circumstances of incident and suggested action)
Specimen tested
Rabies testing completed.