GUIDELINES ON RABIES MANAGEMENT IN HUMAN AND ANIMALS

Ministry of Health
Malaysia

Department of Veterinary
Services Malaysia

GUIDELINES ON
RABIES MANAGEMENT
IN HUMAN AND ANIMALS

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FOREWORD

Rabies is a zoonotic disease that is transmitted by rabid animals to humans. Those infected usually develop encephalitis that leads to death. Globally, it is estimated 60,000 rabies deaths being reported yearly and 40% of those deaths are children below 15 years old. Close to 95% of rabies deaths are reported in Africa and Asia; and rabies is still underreported in certain countries.

Malaysia was declared rabies free in 2013, unfortunately since 2015 there were outbreaks of canine rabies in Northern states of Peninsular Malaysia. In 2017 both human and canine rabies cases were reported in Sarawak state which was earlier rabies free. Since the outbreak was declared until end of 2021, there were 41 human rabies cases including 39 deaths.

Rabies infection is preventable. Immediate and thorough wound washing with running water using soap or soft detergents for minimal of 15 minutes and prompt assessment by clinicians for post exposure prophylaxis can save lives. However, all the deceased cases did not come to health facilities for advice until they have symptoms and signs of rabies. Case fatality for rabies is nearly 100%.

This guideline was developed by many experts, came from multi-sectoral and multidisciplinary, applying One Health approach. I thank everyone who has contributed in writing this guideline It is to assist the medical practitioners in managing humans exposed to rabid animal as well as public health response to ensure communities are aware of the disease.

This guideline is not casted in a stone. Disease Control Division welcomes the sharing of new technology or innovation in managing rabies, so we can improve the guidelines to the better. Hope Malaysia can achieve the elimination of rabies status, and later eradication in near year to come.

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FOREWORD

Animal is the source for at least 75% of zoonotic diseases. A One Health approach in a multi-sectoral concerted response is required to effectively control and eradicated zoonotic diseases through efficient coordination, management and dissemination of available resources and expertise. Malaysia was initially declared free from Rabies in year 2013 after 14 years from the last reported canine rabies, but an unexpected incursion of Rabies occurred in the year 2015 through stray dogs across three states of Peninsular Malaysia i.e. Perlis, Kedah and Penang. Intense and thorough disease control measures have been taken to resolve the outbreak successfully by the year 2016, however another case was detected in a coastal area of the West Peninsular and was traced to the smuggling of dogs from a neighbouring country. Through strong collaboration and coordination between relevant agencies such as the Ministry of Health and Department of Veterinary Services, Rabies has been effectively handled and eliminated in the affected areas in Peninsular Malaysia.

However, in 2017, Malaysia was stunned with the outbreak of human Rabies in Sarawak. Multi-agency efforts are on-going to control and eliminate both human and canine Rabies in the region, however this is an uphill battle in light of the unforeseen complexities and unique challenges imposed by the Bornean state. A different modus operando is required to tackle the outbreak, partly through comprehensive and strategic awareness of the public and stakeholders, and ensuring that the knowledge on Rabies being put into practice across parties.

Thus, this guideline manual was developed comprehensively to compile actions to be taken and the know-hows in the effective and efficient handling of the disease. On behalf of DVS, I would like to express my gratitude to all personnel involved directly or indirectly in the creation of this manual, with the hope that it may guide and aid both the animal health and human health sector in the handling of the disease. The Biosecurity and SPS Management Division of DVS welcomes feedback and cooperation from all stakeholders in combatting and breaking the cycle of Rabies. One for all and all for one.

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PURPOSES OF THE GUIDELINE

1) As a guide to the staff of DVS and MOH in handling rabies in both animals and human.
2) Each agency knows their counterparts' roles and responsibility.
3) Harmonisation in joint response for rabies case management.
4) To mitigate the risk to the public and animal health posed by infection with rabies virus and to prevent the spread.

ABBREVIATION

IATA	*International Air Transport Association*
ABC	Animal Bite Clinic
DFA	Direct fluorescent antibody
DHO	District Health Office. It is a general term referring to Pejabat Kesihatan Daerah (PKD), Pejabat Kesihatan Kawasan (PKK) in Sabah and Pejabat Kesihatan Bahagian (PKB) in Sarawak
D0, D1	Day0, Day1 etc (schedule of rabies vaccination)
DVO	District Veterinary Office
DVS	Department of Veterinary Services
ID	Intradermal
ID Physician	Infectious Disease Physician
IHC	Immunohistochemistry
IM	Intramuscular
IMR	Institute for Medical Research
IU	International Unit
MO	Medical Officer
MOH	Ministry of Health
PEP	Post-exposure prophylaxis
PrEP	Pre-exposure prophylaxis
RIG	Rabies immunoglobulin
RNA	Ribose nucleic acid
rtRT-PCR	Real time reverse transcriptase polymerase chain reaction
VI	Viral isolation
VRI	Veterinary Research Institute
(0-0-0-0-0)	Its indicates the regime of rabies vaccination, given at Day0, Day3, Day7, Day14, Day28. "0" indicates nothing is given at that visit.
(1-1-1-1-0)	Four (4) visits for rabies vaccine. One (1) vial is given IM at each visit

(2-2-2-0-0)	Three (3) visits for rabies vaccine and given 2 sites ID injection of 0.1 ml each site

CHAPTER 1: INTRODUCTION

1.0 BACKGROUND

Rabies is a devastating zoonotic disease caused by neurotropic viruses of the Genus Lyssavirus in the family Rhabdoviridae and the order Mononegavirales, and is transmissible to all mammals regardless of domestication status.

It is an ancient disease feared by mankind, with a substantial death toll equivalent of over 100 people dying every day (Cleaveland et. al., 2014). The virus, formerly referred to as 'classical rabies virus, genotype-1', is found in most parts of the world, and is responsible for the vast majority of reported animal and human rabies cases. It is transmitted mainly through close contact or penetration (via bites or scratches) of infected saliva, central nervous system tissue, or cerebral spinal fluid through breaks in the skin or mucous membranes (eyes, nose and mouth) of a susceptible host. The virus cannot cross intact skin.

Animal species of the orders Carnivora and Chiroptera are known to be the main reservoir and maintenance hosts in nature as rabies has both urban (canine) and wild (sylvatic) cycle, with the occasional adaptation of the virus across species (Spickler, 2012). Rabid dogs are the principal source of exposure of humans to rabies, with humans being the end host and 95% of human cases attributed to rabid animal bites (urban cycle).

Other Lyssavirus species can cause clinical signs similar to the rabies virus, but are restricted to geographical and host range and the majority having been isolated only from bats, thus having limited public and animal health implications except in geographically-relevant countries such as Australia and parts of Europe (CDNA, 2013).

Rabies is categorised as a neglected tropical disease and is essentially a disease of poverty which predominantly affects developing countries (Cleaveland et al., 2014; FAO et al., 2018. Rabies is present in all continents except Antartica, with more than 95% of human deaths occur in Asia and Africa – resulting in an annual global average of estimated 60,000 human deaths, with over 40% are children below 15 years in developing countries (FAO et al., 2018). Human is the end host for rabies by which most human cases is due to animal bites. Once clinically apparent in an infected host, the disease is nearly always fatal. The control and eradication of rabies requires combatting it at its animal source (OIE, 2018).

1.1 OVERVIEW OF RABIES OCCURRENCE IN MALAYSIA

Rabies in Peninsular Malaysia

Records of Rabies in Peninsular Malaysia were traced to the first recorded case detected in Kedah in 1925 (Narayanan, 1928) which was attributed to a rabid animal in Perlis (earlier case records were lost in World War II).
Most cases were reported to have occurred in the northern states of Malaysia which share a common border with Thailand–where, being a Buddhist country that oppose deliberate destruction of animal life, Rabies prevalence was high (Wells, 1954).

In 1945 during World War II, the reoccupying Allied Forces were implicated in the major outbreak that occurred in the Province of Wellesly (now known as Seberang Perai, Penang)—and Perak (Ganesan & Sinniah, 1993) via introduction of infected animals along the common trunk road that crossed through various states of Peninsular Malaysia and army dogs being brought in by soldiers from India and Burma (Wells, 1957). Between years 1946 to 1951, there was an annual average of 112 canine rabies cases confirmed throughout the affected states as the Malayan civil administration gradually resume its pre-war functions (Wells, 1956).

An exploding epidemic which occurred in 1952 in the territories of Selangor and Kuala Lumpur prompted the formulation of a National Rabies Control Programme making compulsory the vaccination of all animals and vigorous destruction population control of stray animals. The epidemic was then brought under control and by April 1954, the country was declared free from Rabies. Subsequently as a pre-emptive measure, in the year 1955 an immune-belt of 50-80 km wide from the Malaysia-Thailand border was established to allow continuous intensive control and containment to be carried out. Regions encompassed within the immune-belt include the entire state of Perlis, parts of Kedah, northern part of Kelantan and north Perak as stated in **Table 1.**

Since then, only sporadic cases were reported within the border states of Perlis and Kedah with isolated incidences in Selangor and Province of Wellesly.

In 1995, 2 canine cases were detected in Terengganu through a follow-up investigation on animal-bite cases. The possible source of the virus was then traced to seafaring animals on detained Thai fishing vessels berthed at the

Chendering Fishing Port in Kuala Terengganu awaiting court decision for trespassing Malaysian waters. 10 more rabies cases (8 animals and 2 cattle) were then detected in 1996 and by the end of January 1997, another 6 cases were detected in Terengganu (1 case), Kedah (4 cases), and Perlis (1 case).

By the year 1998, the last recorded human case was in Kedah, and the last canine case in year 1999 in Ajil, Terengganu. Since then, there were no animal cases reported until Malaysia gained it's rabies-free status from the OIE in July 2013.

Table 1: Rabies in Animal and Human in Malaysia

Animal Rabies Cases		**Human Rabies Cases**	
1925	• Kedah • Perlis	(Beginning 1884)	Reported cases but records lost in WWII
1945	• Province of Wellesley (Seberang Perai), Penang • Perak	1924	1st record of human case traced
1946 - 1951	• Throughout peninsular Malaysia (Perak – Highly endemic)		
1952 - 1954	• Selangor • Kuala Lumpur	1952 – 1954	• Selangor
1954	• Malaysia declared 'Rabies Free'. Immune belt established.		
1963	• Perlis • Selangor (through army dogs from Perlis)		
1965	• Kelantan (sporadic cases)		
1972	• Kedah (sporadic case)	1970	• Kedah • Perlis } (11 cases)
1973	• Kedah (1 canine case)	1973	• Kedah (1 case)
1974	• Kedah (2 canine case)	1974	• Kedah (1 case)
1975	• Kedah (1 canine case) • Penang (2 canine cases)	1975	• Penang (2 case)
1977 - 1978	• Perlis (3 canine case)		
1980	• Perlis (5 canine case)	1980	• Perlis (1 case) • Kroh, Perak (1 case)
1995 - 1997	• Terengganu • Perlis	1996	• Kedah (1 case) • Terengganu (4

Animal Rabies Cases		Human Rabies Cases	
	• Kedah		cases)
1999	• Last recorded case	1997	• Kedah (7 cases - 3 died)
2013	• Declared rabies-free by OIE	1998	• Kedah (1 case)
2015	• Perlis • Kedah • Penang		
2017	• Perak – Kuala Sepetang • Sarawak	2017	Sarawak – 6 cases: 5 children, 1 adult (5 died, 1 survived)
2018	• Sarawak • Perlis • Perak – LMS (end of Dec)	2018	Sarawak – 10 cases: 2 children, 8 adults (all died)
2019	• Sarawak (outbreak still ongoing to date) • Perak – LMS (early Jan)	2019 -2021	Sarawak – 25 cases: 20 adults, 5 child (24 died, 1 survived)

Sources: Narayanan (1928), Wells (1954 & 1957), Tan (1981), Ganesan & Sinniah (1993), Sarawak State Health Dept. (Jan. 2022)

However, in July 2015, Malaysia was unfortunately struck again with Rabies outbreak in the state of Perlis, which subsequently spread into the neighbouring state of Kedah. The island of Penang was also simultaneously affected with its first case of canine Rabies within the stray population. It was suspected that the case was incurred by the movement of strays from the neighbouring countries of Thailand and Indonesia (Sumatra). The incidence on Penang Island was suspected due to activities of foreign fisherman berthing on the island's port with infected dogs travelling on board the vessel with their owners. This outbreak occurrence led to the addition of the island district of Langkawi (Kedah) **(Table 2)** based on the assessed risk of incursion through the island and its proximity to neighbouring Rabies endemic countries.

Isolated cases were then detected within the west coast of Perak at Kuala Sepetang, Taiping in July 2017 and Bukit Gantang, Larut Matang Selama (LMS) at the end of December 2018 to early January 2019. Both affected areas were not covered within the immune belt, and cases again attributed

to foreign fishermen bringing infected dogs on-board and berthing at the affected coastal fishing villages.

Table 2: Location of Immune-belt (Updated: Dec 2019)

State of:	**Location of Immune-belt**
1. **Perlis**	*Entire state*
2. **Kedah**	*8 districts*: i. Kubang Pasu ii. Padang Terap iii. Pokok Sena iv. Sik v. Baling vi. Kota Setar vii. Pendang viii. Langkawi (added in 2016 post 2015 outbreak)
3. **Kelantan**	*4 districts:* i. Tanah Merah ii. Pasir Mas iii. Tumpat iv. Jeli
4. **Perak**	*1 district* (north): Hulu Perak (Grik)

Rabies in Sarawak

Sarawak was historically free from Rabies until 1st July 2017 with the occurrence of human Rabies in three (3) children from the Serian division. These cases were identified to be bitten by rabid dogs, 2 of which are pet dogs. The health status of these dogs was unknown. Despite rabies surveillance among dogs was conducted by the animal health sector, to detect infected dogs, the approach might not be adequate. The human health sector plays a pivotal role in detecting rabies cases or any suspected cases among human; and to alert the animal health sector.

From 1st July 2017 until 31st December 2021, there were 41 human cases including 39 deaths (**Figure 1**).

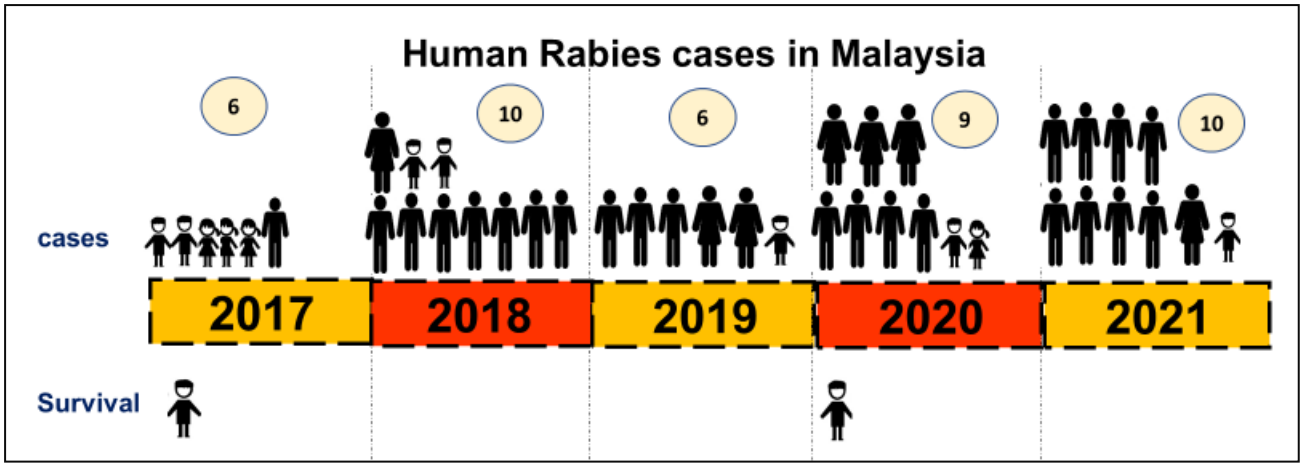


Figure1: Human Rabies Cases in Malaysia, 2017 – 2021

Meanwhile, surveillance in animal since 2017 until 2021 noted 839 animals were positive rabies (709 Dogs and 99 cats, with positivity rate of 30.9%. A total of 29 other animals beside cats and dogs were also tested but all were negative rabies. The calculation in **Table 3** does not include the 29 animals.

Table 3: Number of samples taken and tested for rabies, Sarawak, 2017 - 2021

Year	SAMPLES			SAMPLES POSITIVE					
	Total	Dogs	Cats	Dogs		Cats		TOTAL	
	No.	No.	No.	No.	%	No.	%	No.	%
2017	307	279	25	67	24.01%	6	24.00%	73	23.78%
2018	625	556	50	242	43.53%	18	36.00%	260	41.60%
2019	591	441	76	146	33.11%	38	50.00%	184	31.13%
2020	582	506	60	159	31.42%	24	40.00%	183	31.44%
2021	572	515	46	95	18.45%	13	28.26%	108	18.88%
TOTAL	**2,677**	**2297**	**257**	**709**	**30.87%**	**99**	**38.52%**	**808**	**30.18%**

All 12 divisions in Sarawak have been declared as rabies infected areas on 14th July 2021, which involved 72 areas: Kuching (7), Samarahan (4), Serian (22), Sri Aman (6), Betong (3), Sarikei (5), Sibu (3), Kapit (1), Mukah (6), Bintulu (5), Miri (8) and Limbang (2).

Since July 2017 until December 2021, the Sarawak Local Authorities has removed approximately 48,642 stray/free roaming dogs has been removed. All dogs in Sarawak must be licensed under the Local Authorities (Dog

Licensing and Control) By-Laws, 2018. Failure to do so is an offence and upon conviction, be liable to a fine not exceeding five thousand ringgit (RM 5,000).

In order to control rabies transmission in Sarawak, enforcement under the Veterinary Public Health Ordinance, 1999 has been carried out. Under the section 40 of the same Ordinance, all dog owners must vaccinate their dogs against rabies every year. Owner or person in charge of any dog must keep dog under effective control either by confining it within an enclosed area within house compound, tying it up securely or leading it by a chain or lead of strong cord or leather properly secured to a collar or harness worn by the dog as elaborated in the section 37(3) and (5)(b). Failure to abide to those two sections is an offense.

Sarawak continues sharing the rabies situation in the state with the neighbouring countries as to enhance their preparedness and response to the risk of rabies importation.

Rabies in Sabah

As of this time of writing, there has yet any Rabies occurrence in both animal and human population within the state. However, with the disease being enzootic in the neighbouring state of Sarawak and the Kalimantan province of Indonesia, the state is on guard facing the possibility of a disease spill-over into the state.

1.2 RABIES INFECTION IN ANIMALS

All warm-blooded animals, particularly mammals, are susceptible to rabies – but some species are more likely to propagate and transmit the disease to others.

1.2.1 Animal Reservoir of Rabies

Animal reservoirs in the Malaysian aspect can be divided into 2 categories, i.e.:

Domestic animals:

Dog is the principal reservoir of rabies in this country.

Cats may act as alternate reservoirs due spill-over infections from dogs (Beran & Steele, 1994; Vos et. al., 2012; Lackay, 2008), especially in areas with high density of canine cases. Other domestic animals that may be affected by rabies are end hosts as a result of spill-over infections in areas where the disease is enzootic, e.g. cattle (last recorded case in Terengganu (1995)), goats and horses (Beran & Steele, 1994; Delpietro & Nader, 1989; Panichabhongse, 2001; Spickler, 2012). Herbivores and other non-biting animals, rodents, and lagomorphs do not play a role in the epidemiology of the disease (Acha & Szyfres, 2003). Disease propagation within those species population is lower due to the clinical form of the disease (more towards paralytic form of Rabies) or transmission to humans compared to canines.

Wildlife:

Potential wildlife reservoirs with biting tendencies in Malaysia include: non-human primates (NPH), civets, weasels, dhole (wild dogs), rodents, flying foxes, microbats, mongoose and otters (Panichabhongse, 2001; Acha & Szyfres, 2003; Spickler, 2012). However, there are currently no reported rabies occurrence in wildlife and its link to humans Rabies in Malaysia (Beran & Steele, 1994).

It is important to note that certain wildlife and exotic species may fall under the protection laws of each respective region, i.e. Wildlife Conservation Act 2010 (Peninsular Malaysia), Wildlife Conservation Enactment 1997 (Sabah) or the Wild Life Protection Ordinance, 1998 (Sarawak). If a positive reservoir has been identified amongst any species of wildlife, disease risk analysis and strategic control approaches require a cross-agency effort with the relevant authorities and entities that are directly involved with wildlife / exotic animal handling and management.

1.2.2 Incubation Period of Rabies in Animals

Incubation period and duration of disease in animals varies. In dogs, it ranges from 9 days - 6 months, rarely up to one (1) year (**Figure 2** and **Table 4, 5 and 6**).

Figure 2: Incubation Period and Duration of Disease in Animals and Cats*

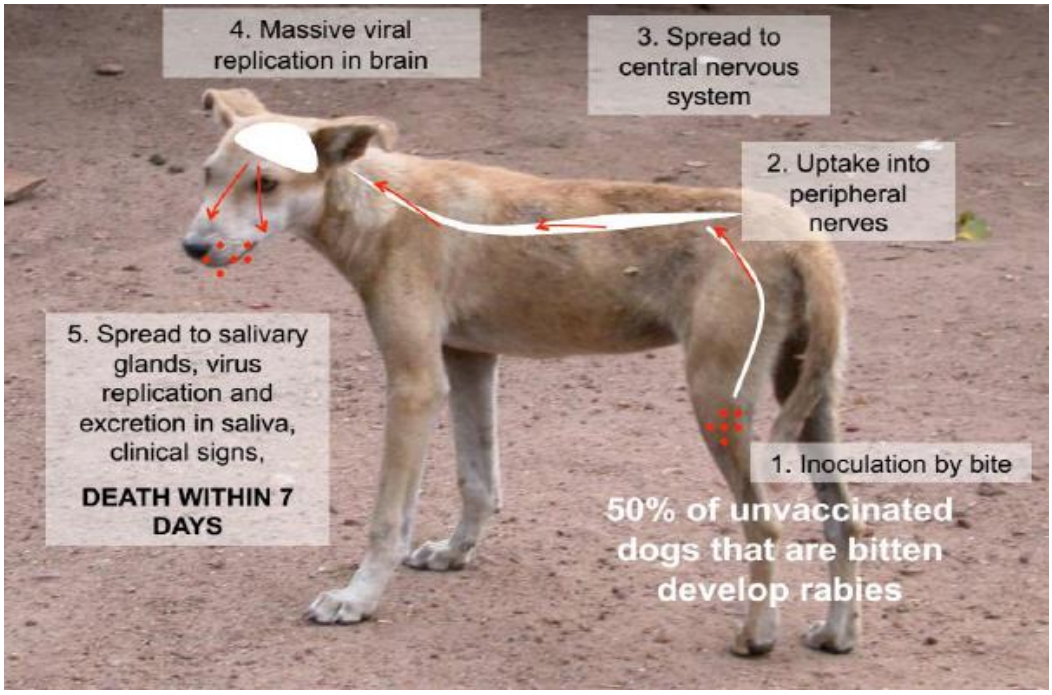


Table 4: General Stages of Rabies Manifestation

Incubation Period	**Average 2-9 weeks**; range 9 days - 6 months, rarely up to one (1) year (depending on location of bite / affected site and virus load)
Prodromal / Initial stage	**1-3 days;** – depending on site of bite (nearer to the brain, the faster the clinical signs manifested)
Furious stage	**Average duration 1-7 days.** Some animals may not exhibit these clinical signs.
Paralytic stage	**Average duration within 2- 10 days.** Most animals may exhibit these clinical signs.

*If an animal or cat has not shown any signs of abnormality on the fourteenth day post-inflicting a bite, it is safe to assume that the animal was not shedding virus in its saliva at the time of the bite.

Table 5: Incubation Period and Duration of Disease in other DomesticAnimals

(Arizona Department of Health Services, 2007)

Species	Incubation period	Duration of Clinical Disease
Horses / mules	Avg. 2 -14 weeks, <6 months	2 – 8 days
Cattle	Avg. 2 -15 weeks, <6 months	1 – 6 days, rarely as long as 14 days
Sheep/goats (caprine	2 – 17 weeks	5 – 7 days

(Adapted from Arizona Department of Health Services's Manual for Rabies Control and Animal Bite Management, 2019)

Table 6: Incubation Period and Duration of Disease in Wildlife Species

Species	Incubation period	Duration of Clinical Disease
Canids	> 10 days, <6 months	2 – 4 days
Mustelids (e.g. otters, ferrets, mongoose)		4 – 9 days
Mephitids (e.g. skunks)		4 – 9 days
Non-Human Primates (NHP)		2 – 9 days

(Sources: Rupprecht, Stöhr, & Meredith, 2001; Panichabhongse, 2001; Acha & Szyfres, 2003; Kotait et al., 2019)

1.2.3 Mode of Transmission in Animals and Human

Rabies is transmitted primarily through infected saliva with sufficient viral load to be inoculated and induce infection to the nervous system (including cerebral spinal fluid). Virus introduction may occur through bite and non-bite modes: either through direct contact or penetration of infected biological materials into the skin or mucosa of a susceptible host – either through bites, or through exposure to or contact of infected saliva with the mucosa (including respiratory tract) or a fresh break in the skin. Aerosolized transmission is a potential risk especially in

enclosed environments with high density infected populations/ exposure such as a laboratory handling such biological hazards or caves housing infected hosts such as bats (Beran & Steele, 1994; Davis, Rudd, & Bowen, 2007; Johnson et. al., 2006).
Blood, urine and faeces from an infected host are not infectious (Sitprija et al., 2003).

The virus is comparatively fragile and does not survive well outside its hosts for long periods of time as it is quite dependant on the host for survival. It is susceptible to sunlight, heat, UV radiation, X-irradiation and desiccation – dried biological materials have lower risk of transferring the disease (Spickler, 2012). However, the virus may remain viable in an infected carcass for less than 24 hours at 20°C, and up to several days at temperatures of 0 - 4°C (Panichabhongse, 2001). It can be easily inactivated by detergent, phenolic or organic halide compounds, proteolytic enzymes, and exposure to acid and alkaline conditions (< pH 4.0 and >10.0).

1.2.4. Pathogenesis of Rabies in Animals and Human

Once inoculated, the virus proliferates at the inoculation site prior to ascending towards the brain via the peripheral nerves and central nervous system. The virus ~~Which~~ then replicates in high concentration within the neurological tissues and salivary glands – allowing excretion of the virus through the saliva.

1.2.5 Clinical Stages of Rabies in Dogs

Clinical presentation of rabies in dogs is based on the stage of infection (**Table 7**).

Table 7: Clinical Stages and Signs of Rabies in Dogs
(Adapted from Phillipines' Department of Health's National Rabies Prevention and Control Program : Manual of Operations 2012, 2012. Other source: Beran & Steele, 1994).

1	**Prodromal Stage**	1-3 days; may occur in hours – depending on site of bite (↓ distance to brain - ↓ time development of clinical signs)	
2	**Clinical**	**Excitatory (Furious) Stage**	**Paralytic (Dumb) Stage**

	Stage	(**Average duration: 1-7 days**)	(**Develops 1-7 days; Duration: 1-4 days**)
		Initial clinical signs are often generally **non-specific**, though possible cues may include as follows: 1. General clinical signs: • Anorexia / Increased in appetite • Vomiting • Diarrhoea • Fever 2. Erratic / Abnormal behaviour / Disorientation • Increased aggression /viciousness – biting, attacking, scratching • Unusual friendliness / highly affectionate – licking peoples' hands and faces (for previously known aggressive / independent dogs) • Attacking live or inanimate objects • Restlessness • Aimless wandering / roaming / circling • Self-mutilation • Licking or chewing of bite site • Howling / Abnormal excessive barking / Change in	Initial clinical signs are often generally **non-specific**, though possible cues may include as follows: 1. General clinical signs • Anorexia / Increased in appetite • Vomiting • Diarrhoea 2. Paralysis • Paralysis beginning from bite site until entire CNS is affected (Progressive paralysis) • Ascending paralysis • Laryngeal / pharyngeal paralysis (Gagging / 'Bone-choking') • **HYPERSALIVATION / FROTHING or EXPIRATORY AIR BUBBLES THROUGH SALIVA)** (high indicator of Rabies) • Dysphagia / difficulty / inability to swallow or drink • "Jaw drop"/ Dropped jaw due to masseter muscle paralysis • Protrusion of third

		vocalization • **HYPERSALIVATION / FROTHING** (high indicator of Rabies) • Chewing and swallowing of foreign objects such as wood, soil, plant, stones • Increased thirst – with attempts to drink (**NO HYDROPHOBIA** as seen in human rabies) • Head held downwards with drooling saliva • Holding of tail tightly between rear legs 3. Increased sensitivity/ exaggerated response to sensory stimulation (especially auditory and visual) e.g. • Dilatation of pupils • Photophobia • Fearfulness • Extreme excitatory response to sound • Sudden irritability • Hyperesthesia 4. Muscle incoordination and seizures • Gagging / 'Bone-choking' • Staggered gait (Ataxia)	eyelid 3. Erratic / Abnormal behaviour / Disorientation • Aimless wandering / roaming / circling • Staggered gait / Ataxia • Head held downwards with drooling saliva • Hold of tail tightly between rear legs 4. Increased sensitivity/response to sensory stimulation (especially auditory and visual) e.g. • Fearfulness • Photophobia • Dilatation of pupils

		• Seizures of variable frequencies • Facial paralysis	
3	Coma		
4	Respiratory paralysis : death within 2-4 days		

1.2.6 OTHER DOMESTIC ANIMALS

Clinical presentation of rabies in other animals varies (**Table 8**).

Table 8: Clinical Stages and Signs in Other Domestic Animals
(Adapted from Phillipines' Department of Health's National Rabies Prevention and Control Program : Manual of Operations 2012, 2012. Other sources: Delpietro & Nader, 1989; Beran & Steele, 1994; Kusiluka & Kambarage, 1996; Ibrahim et al., 2017; Moreira et al., 2018; CABI, 2019).

Species	Clinical Signs	
Horses / mules (*Equidae)*	*(Initial signs)* • Weakness of hindquarters (ataxia and paresis) • Lameness • Restlessness • Alteration in sense of taste – causing consumption of indigestible objects • Hypersensitivity / Excessive pruritus at bite area • Dilated pupils	*(Paralytic signs)* • Dysphagia • Laryngeal / pharyngeal paralysis • Colic • Ataxia / Incoordination of extremities
Cattle and small ruminants - *Long and highly varied incubation period* - *(8 days – 6 months; shorter incubation in*	• Behavioural changes • Anorexia • Hypersalivation • Restlessness • Unusual alertness • Self-isolation from the herd • Unusual	• Excessive lacrimation / nasal catarrh • Priapism • Dilated pupils • Cessation of rumination • Constipation • Emaciation

younger animals) - *Paralytic form is more prevalent in large ruminants, Furious form prevalent in small ruminants*	aggressiveness • Hyperexcitability • Hyperesthesia • Muscle tremors / Tonic-clonic contractions of muscles of neck, trunk and extremities • Hypersensitivity / Excessive pruritus at bite area	• Laryngeal / pharyngeal paralysis • Abnormal bellowing • Dropped jaw (Jaw paralysis) • Somnolence / Depression • Ascending paralysis • Death ensuing within a week due to respiratory failure

WILDLIFE

General

Most wild animals demonstrate the furious form of rabies with similar clinical signs observed in domesticated animals. However, the most significant clinical signs include sudden exhibition of abnormal behaviours deviating away from their natural or acquired basal behaviour (if the animal is captive). Wild animals would frequently lose their fear towards humans, and may attack humans or other animal species that they would normally avoid (Rupprecht et al., 2001; Potter, Hanna, & Freer, 2007). Deviation from their normal active periods of the day (i.e. nocturnal animal coming out during the day) are also possible indicators of rabies. The wild (sylvatic) cycle in the European, African and Asian continents are confined towards wild carnivores as the vector (Aiyedun et al. 2017), majority in the *Canidae* family which include jackals, foxes, and wolves.

Bats

In Malaysia, strains affecting bat species are not epidemiologically present as it is more confined to the American continent (Spickler, 2012; WHO, 1993).

However, as a matter of precaution, the public is discouraged from handling bats that are exhibiting abnormal behaviour. Wildlife officers, researchers, animal handlers, and veterinarians should carefully assess each situation when deciding whether or not to submit a bat for testing for rabies (Manual for Rabies Control and Animal Bite Management, 2019). Whenever a member of the public finds a bat, a very thorough exposure history should be taken.

The possibility of rabies infection should be considered in bats exhibiting the following:

- Grounded, unable to fly (frequently these are flapping around or laying on the ground)
- Erratic behaviour (flying around a person or pet during the day or crashing into objects or flying during intense daylight)
- Anorexia or inappetence
- One or both wings showing paresis
- Partial or complete paralysis
- Drooling, incontinence
- Death

1.2.7 Other Diseases or Conditions which may Resemble Rabies

Many diseases / conditions occuring in wild and domesticated species may mimic rabies. Some of the diseases in domestic animals can be seen as in the following **Table 9**.

Table 9: Differential Diagnoses for Rabies in Domestic Animals
(Adapted from Arizona Department of Health Services's Manual for Rabies Control and Animal Bite Management, 2019; Other sources: Radostits, 1964; Rupprecht et al., 2001).

Exotics / Wildlife	**Canine / Feline**	**Bovine / Equine**
• Distemper • Neurotoxicose • Herpes simian B (B virus) – in New World NHP species • Tetanus • Listeriosis • Poliomyelitis (from human)	• Distemper • Encephalitides (viral, bacterial, protozoal/parasitic) • Head/Spinal Cord trauma • CNS Tumour • Tetanus	• Toxicoses • Encephalitides (viral, bacterial, protozoal/parasitic) • Herpes virus • Tetanus • Brain Abscess • Listeriosis • Localised CNS lesions / obstructions • Enterotoxemia • Hypovitaminosis A • Hypomagnesemic tetany

1.2.8 Diagnosis of Infection with Suspected Rabid Animals

1.2.8.1. Clinical Examination

Comprehensive history-taking and details on the incidence are a must for bite incidences or suspected rabid animals. Actions are taken based on information of bite cases i.e., colour, size, age (age estimates suffice) of the culprit animal, how did the bite occur (provoked or unprovoked), location of the incident, site(s) (on person's body) of bites and the information list which may be expanded depending on the needs of case and locality of the incidence.
It is highly advisable to assess the risk and needs on handling the animal due to the potential aggressive nature of the incidence, and exercise extreme caution i.e., use of thick protective gloves/ remote handling methods, administer supportive therapy (where needed), send a notification report on the incidence to the appropriate channel, and await the outcome based on observation (Beran & Steele, 1994).

In areas that are not within the immune belt or in enzootic areas, animals, especially dogs, that were reported to have bitten a person must be caught and be confined in a cage or isolated enclosure for observation between 10 to 14 days.

For owned animals, if no clinical signs were observed during said quarantine period, the animal may be released back to the owner subject to the legislative implication from the bite incidence. As for strays or free roamers (dogs), the animal may be sent to animal shelters or put up for adoption. Wild animals may be returned back to their natural habitat depending on the suitability of the releasing site and animal-human conflict risk.

In areas within the immune belt or where the disease is enzootic, the same approach may be practiced for the owned dogs; however, strays/free roamers (excluding wildlife) must be immediately destroyed and sampled for Rabies. Destruction of suspected wild animals are subject to the agreement and cooperation with the relevant agencies responsible for wildlife.

Infected animals will exhibit behavioural changes, neurological signs, paralysis and death within the period as stated in Tables 1.2, 1.3 and 1.4 depending on the species of animals. Clinical signs in animals typically go through two phases which began with the aggressive prodromal phase and followed by a dumb or paralytic phase, with exhibitions of signs can be referred to in Tables 1.5 and 1.6.

Rabies diagnosis must be made based on the epidemiologic and clinical findings with confirmation through laboratory diagnosis. Other non-exhaustive differentials may be made based on Table 1.7.

1.2.8.2 Laboratory Diagnostic testing

Identification of agent

i. Histological examination

Histological findings are a useful aid in the diagnosis of rabies. Infected brain tissue can be stained with hematoxylin and eosin, Giemsa or Sellers stain to detect evidence of encephalomyelitis. Histopathological lesions of encephalomyelitis in the brain and meninges are evidenced by mononuclear cell infiltration, perivascular cuffing of lymphocytes or polymorphonuclear cells, babes nodules consisting of glial cells and Negri bodies. Negri bodies was previously relied upon in the confirmation of rabies, but it is recently found to be inadequate for definitive diagnosis.

ii. Direct fluorescent antibody (DFA) test,
iii. Direct rapid immunohistochemistry test(dRIT),
iv. Pan-lyssavirus polymerase chain reaction (PCR)assays.
v. Virus Isolation

Confirmation of rabies is done through virus isolation of the genus Lyssavirus. Virus from saliva is inoculated into laboratory mice for observation in order to reproduce clinical signs. Handling of rabies virus or laboratory-infected animals should be only be performed in high biosafety level laboratories. Flow for management of samples for rabies test is as shown in **Figure 3**.

1.2.8.3 Test Validation

The Fluorescent Antibody Test (FAT) or Direct Fluorescent Antibody test (dFA) are used on the brain tissue, especially from two parts : medulla and cerebellum. Anti-rabies antibodies labeled with fluorescence dye are used on the suspected brain tissue. Results are seen through fluorescence microscope for confirmation of Rabies. Please refer **Table 10** for summary of tests.

Figure 3: Rabies sample management

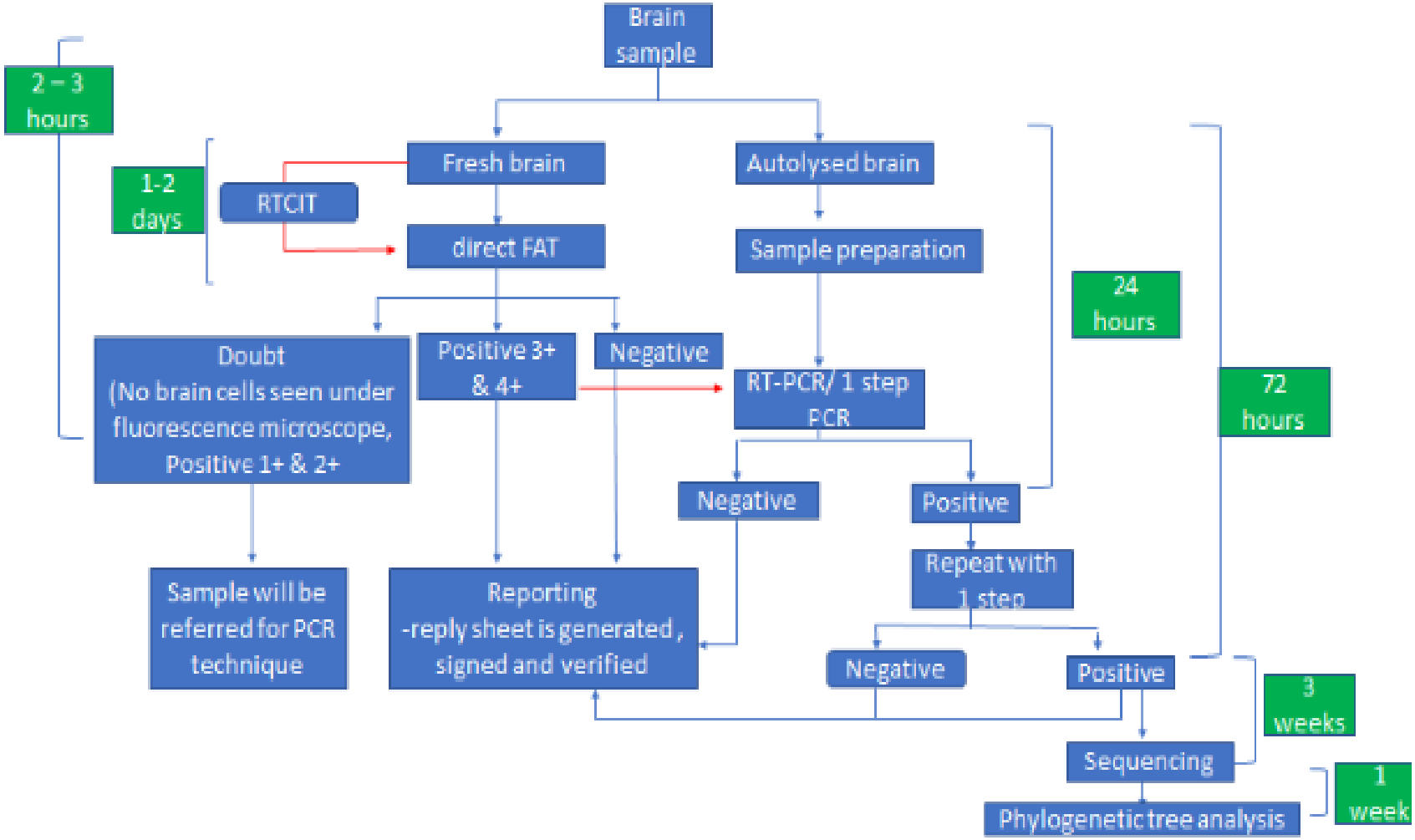


Table 10: Laboratory test methods available for rabies detection

Laboratory Test	Test Methods	Notes
a. Immunochemical identification of Rabies Virus Antigen	1. Fluoresencent Antibody Test (FAT)	`Gold standard' by WHO and OIE Lab setting
	2. Rapid immunodiagnostic test (RIDT)	Alternative to FAT need experience personnel to read the result Field condition
	3. Enzyme-linked immunosorbent assay (ELISA)	rarely useful because of late seroconversion and the high mortality rate of host species, Useful for accessing vaccination program
b. Replication of Rabies virus	1. Cell culture inoculation test (RTCIT)	Use when FAT give uncertain result or when FAT is negative in case highly suspected rabid dog
	2. Mouse inoculation test	Not given rapid results compare than RTCIT
c. Molecular techniques	RT-PCR	Consider to use as confirmatory tests with standardisation and very stringent quality control routine post-mortem diagnosis of rabies if brain tissue is available, when the FAT should be used
	Real-time PCR	
d. Histological	Identification of Negri bodies	No longer recommended for routine diagnosis

CHAPTER 2: RABIES PREVENTION, CONTROL AND ERADICATION IN ANIMALS

2.0 Background

The fundamental concept in prevention, control and eradication of zoonotic diseases is to break~~ing~~ the chain of transmission at its weakest epidemiologically link i.e reservoir neutralization, reducing contact potential and increasing host resistance.

In the infection cycle, it is important to control–the reservoirs (animal), and break~~ing~~ the routes of transmission and immunization of susceptible hosts (human and animal) are important. Reservoir neutralization involves preventing the spread of infection by removing the infected individual from the reservoir or by manipulating the environment where reservoir resides.

Malaysia aims to achieve and maintain its rabies-free status. With the disease being untreatable yet preventable, the zoonotic and socioeconomic impact of rabies outbreak are of serious concern to the government of Malaysia. Preventing Rabies, and continuous awareness and education to the relevant stakeholders and general public is pertinent to the success in disease control.

Department of Veterinary Services (DVS) of Malaysia is the nation's competent authority for the management and eradication. Various measures have been put up by DVS to prevent, control and eradicate Rabies in animals such as through legislative formulation and enforcement, disease management, establishment of rabies control areas (immune and non-immune belt areas), animal licensing, vaccination and stray population control. Multi-sectoral collaboration across various relevant agencies with different resources and engagement with relevant stakeholders i.e. human health sector, animal health sector, municipal councils/local governments, state governments, disaster management agencies are essential in ensuring effective prevention, control and eradication of Rabies.

2.1 Legislations

The Rabies Control Programme derives its powers from the following legislation:

1. Animal Act 1953
2. (Sarawak) Veterinary Public Health Ordinance, 1999
3. (Sabah) Animal Ordinance, 1962
4. Animal Welfare Act 2015

5. Veterinary Surgeons Act 1974
6. Local government laws e.g. Local Government Act 1976 (Peninsular Malaysia), Local Authorities Ordinance, 1996 (Sarawak), Local Government Ordinance, 1961 (Sabah)
7. Wildlife Conservation Act 2010
8. (Sabah) Wildlife Conservation Enactment, 1997
9. (Sarawak) Wild Life Protection Ordinance, 1998

2.2 Components of Rabies Management

a. Establishment of immune and non-immune belt areas
b. Animal movement control
c. Disease Investigation and Surveillance
d. Disease Reporting
e. Vaccination, licensing,
f. Strays Population Control
g. Public awareness activities
h. Establishment of zoning/containment zone comprise infected, disease control and disease eradication areas

2.3 Approach of the Control Programme

2.3.1 Establishment of Immune and Non-Immune Belt Areas

a. Immune Belt

In Peninsular Malaysia, under Animal Act 1953, areas in the northern states within a radius of 50 - 80km wide of the border from the highly endemic Thailand are gazetted as rabies buffer zones annually and are known as the 'immune belt' of the peninsular. The State DVS Directors are required to gazette these risk areas or districts within under the Anti-rabies Vaccination Order (Section 42, Animal Act 1953) to enforce the necessary controls and prevention of Rabies in the domesticated animal population. Areas involved are as stated in **Table 2**. Activities related to prevention, control and eradication in these areas are more stringent and intensive as the immune belt acts as a Rabies 'trap' to prevent spreading towards the non-immune belt areas below.

Among such activities include:

i. Mandatory licensing of all owned dogs.
ii. Mandatory rabies vaccination of all owned dogs Mandatory effective restraint of dogs by confining animals within an enclosed premise and using of leash/harness when leaving the premises.
iii. Humane population control of stray / free roaming animals.

(i) Licensing

Under Section 38 of Animal Act 1953, all dogs within the immune-belt above three months of age that are being owned or kept must be licensed. Licenses are issued with a prescribed fee under the annual Anti-rabies Vaccination Order through the Department of Veterinary services. Owners are obligated to ensure that the license badge is fastened and worn by their animals and is clearly visible.

(ii) Vaccination

Rabies vaccination is compulsory and a prerequisite for licensing. Annual vaccination is practiced with the approved vaccines which can be referred at **Table 11** in Chapter 4.

(iii) Effective restraint and **confinement of owned dogs**

Owned dogs are required under the law (Section 39(4), Animals Act 1953) to be kept under effective control either by confinement in an enclosed area which is impossible for the dog to escape, tying-up securely as a mode of restraint, and by leash or harness when leaving the premises.

(iv) Humane **population control strays** / free roaming animals

Stray population control is a necessary component to reduce the population of reservoir host that may harbour and propagate the virus within the affected area. The control acts on a two-pronged purpose by addressing public health risks, and animal welfare issues

affecting strays such as malnourishment, traffic or fighting induced injuries, and maltreatment by the public.

In the immune belt, any unlicensed, free-roaming, dogs that do not wear a license badge, and stray animals are to be immediately humanely destroyed within these areas if found freely roaming in public areas (section 38(6) and 39(5), Animals Act 1953).

However, population control is not only confined to immediate on-site physical removal of the animals, but can be approached through other strategies to reduce introduction of new animals into the pool, such as:

a. Encourage neutering of companion animal

Strategic public awareness campaigns promoting neutering by the relevant agencies or NGOs may be done to emphasize the benefits to both owner and general good of the public.
A 'reward or additional perks' or positive incentive approach by the relevant authorities e.g. lowered or discounted rates for licensing or vaccination of neutered animals can be an attractive driver for the public to opt for neutering.

b. Breeding control and Negative Reinforcement on Abandonment of Animals

1. Pet owners are prohibited from breeding their pets without a license under the Animal Welfare Act 2015.
   In the event of accidental breeding and they fail to find a new owner, the litter must be handed over to the local authorities with incured cost for disposal.
2. Pet owners are prohibited from abandoning their animals in public areas with severe penalties under the Animal Welfare Act 2015.
3. Only pet breeder that are registered and licensed by the DVS are allowed to commercially breed and sell companion animals.

(v) Encouraging **responsible animal ownership**

1. Pet owners are required to have a Pet Passport that records their animal identification via microchip for purposes of disease control and animal tracking. This same Passport will store the vaccination and health records of the animal.

2. Any animal participating in show or competitions must have a Pet Passport as proof of good health and disease freedom. Such Passport is made available through the state DVS and private companion animal veterinarians endorsed by the DVS.

b. Non-Immune Belt

Areas away from the immune belt has been considered to have considerably less risk of getting rabies infection naturally except in coastal fishing villages that faces neighbouring Indonesia. Activities undertaken in these areas are less stringent than the immune belt. Licensing and vaccination are not mandatory and is on voluntary basis unless required for the exportation of animals outside Peninsular. Population control of strays are conducted mainly based on public nuisance/risk issues or complaints. Depending on the locality, animal-related issues in some areas are governed by the local government law through the authority of the municipal council or the Animal Act or animal-related enactments under the state Department of Veterinary Services.

(i) Licensing

Licensing is still compulsory in the areas outside the immune-belt, but the licensing authority may fall under the municipal council depending on their jurisdiction area. Areas that are not covered by the municipal council will fall under the responsibility of the state DVS.

(ii) Strays Population Control

The animal population control in this context focuses addressing the control of freely roaming unowned animals, which may pose serious risks to human safety, animal health

and animal welfare. Stray control may fall under the responsibility of the municipal council or state DVS depending again on the prevailing laws and areas of jurisdiction.

2.3.2 Animal Movement Control

Section 39 (3) of the Animal Act 1953, Section 4 of the Sabah Animal Enactment 2015 and Section 37 of the Sarawak Veterinary Public Health Ordinance 1999 stringently restrict movement of dogs out of the immune-belt or a declared rabies-infected area. Any required movement from these areas is only permitted through written permits issued by the State DVS Director and following anti-rabies vaccination at least one month prior to entry.

As for animals coming in from outside Malaysia, present rules has specified that any animal or cat brought into the country must be accompanied by an import permit issued by the competent authority and health certificate from veterinary authority of exporting country. Animals and cats are subjected quarantine procedure in accordance to relevant federal / state DVS import regulations and requirement.

CHAPTER 3: ANIMAL RABIES OUTBREAK MANAGEMENT

3.0 Disease Notification

The main goal in any disease outbreak management is to control the spread of the disease soonest possible. Any occurrence of disease either in animal or human has to be reported to the relevant authority immediately. It is an offence to anybody that did not report of any notifiable disease occurrence to the authority, as stated in the Animal Act 1953 [*Act 647*] for animal health and Perevntion and Control of Infectious Diseases Act 1988 [*Act 342*] for human health.

Rabies can spread very quickly in the animal population through animal bites and will eventually be transmitted to humans. The following measures are guidelines to be adopted in the event of an outbreak whether it is inside or outside the immune belt.

The reporting of rabies occurrence can be from various sources such as:

i. Routine surveillance case
ii. Dog bite's case
iii. General public observing any abnormality in dogs such as fiercely dogs, dogs behaving strangely and etc.

Upon receiving those reports, investigation has to be directed and lab confirmation need to be conducted as illustrated in **Figure 4 and 5.**

Figure 4: Response to rabies alert

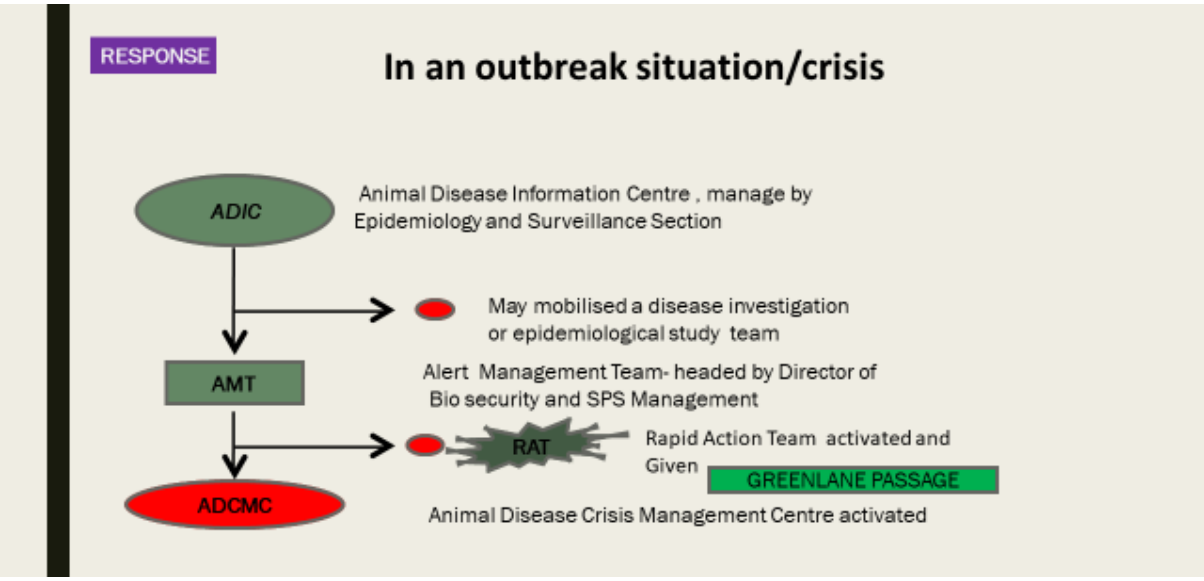
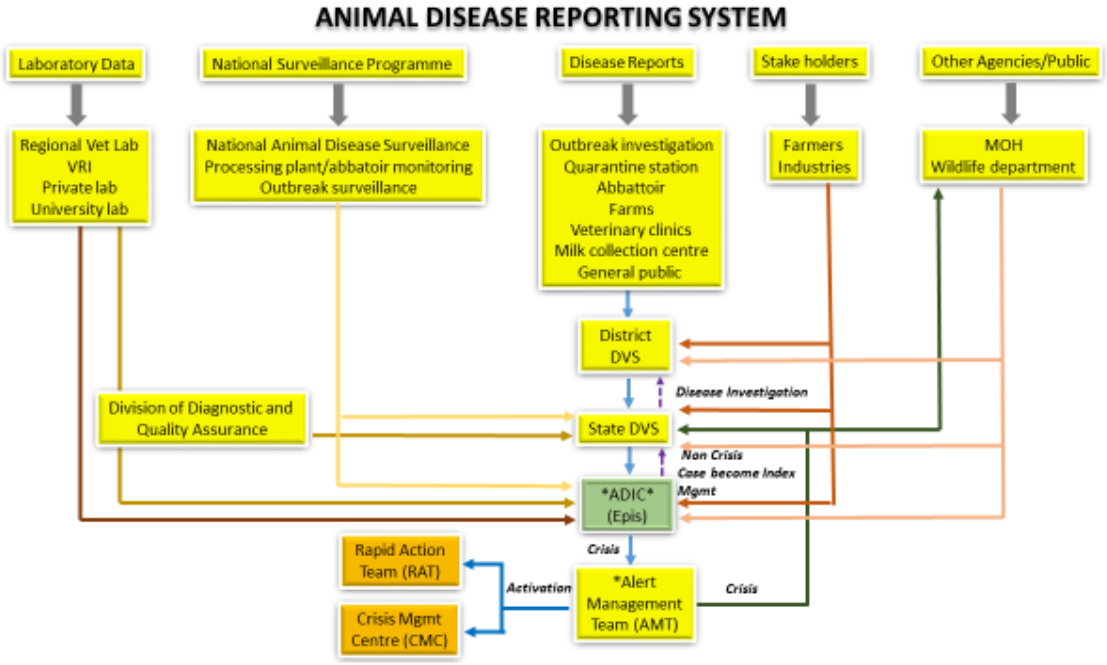


Figure 5: Source of information for rabies cases and Response



3.1 Flow of Communication and Action

i. Upon receiving reports from reliable sources, both DVS and MOH have to communicate and do joint investigation.

ii. DVS will deploy team from the Veterinary Health Division to carry out initial investigation at the incident site.

iii. The MOH team will visit the house of rabies case to get detail history related to incidence of being bitten by rabid dog.

iv. If it is owned dog, the dog should be quarantine for 10 – 14 days to observe for clinical signs. If it is stray dog, sample will be collected from the suspected dog or from the group within 5 km radius. For owned dog, if no clinical signs is observed during the quarantine period, the dogs could be sent back to the owner. For strays, the animal could be sent for adoption or any shelter house. If the animals are not adopted or claimed by anybody, the procedures underlined by the Municipal is followed accordingly.

v. Animal samples are sent to the reference veterinary laboratory for confirmation.

vi. Once VRI confirmed positive rabies, relevant State Director DVS will informed the Alert Management Team (AMT) comprises of Director of Biosecurity Management and SPS Division (SPS), Head of Disease Control Section, Head of Epidemiology and Surveillance Section and Head of Zoonosis and Veterinary Public Health Section. Then, this team will evaluate the situation to determine whether it is a crisis or just a disease index. If is a crisis, then the RAT and Crisis Management Centre will be activated. The RAT will do further epidemiological investigation at the infected site. At the same time, other teams will be deployed accordingly. The affected state DVS will also activate the Operation Centre at the district level and state HQ level. All communication and reporting have to be from these operational and crisis management centre. The focal point/desk officer in charge of the operation and crisis centre have to be identified. At the same time, the AMT will decide on the action to be taken and zone determination. Director General of DVS will then be notified.

vii. The MOH Rapid Response Team (RRT) will do active case detection (ACD) within 1 kilometer from the index case's house, to find any possible rabies cases among people in the community; with recent onset of neurological syndrome or any increase of death with neurological symptoms (within the past 3 months).

viii. All front liners of DVS staff involved in the outbreak management have to be vaccinated against rabies. All personnel involved have to be monitored or given health cards by the Ministry of Health to be monitored before and after deployment.

ix. Communication among relevant agencies have to be conversed. Only identified focal point for communication can convey the messages and reports. Only one point of communication are allowed. This is to avoid unnecessary and missed communication.

x. Joint press statement and press conference could be made accordingly.

xi. Daily reports from all the teams involved in the operations have to be submitted to the operation centre daily after completed activities of the day. The standard format of reporting for every teams involved are as in Annex 1.

xii. Teams to be established are:

a. Rapid Action team (RAT) – Infected and disease control area.
b. Surveillance and sampling team – disease control and eradication area
c. Vaccination Team – infected and disease control area.
d. Catching Team and culling team-infected area
e. Enforcement team – for movement control from infected to disease control area.

xiii. Vaccines procurement for animals and DVS's frontliner is managed by the Zoonosis and Veterinary Public Health Section, Biosecurity Management and SPS Division, Putrajaya

xiv. Procurement of other relevant equipment and facilities for the disease control management are procured by Biosecurity Management and SPS Division, Putrajaya.

xv. Affected State DVS will manage other domestic facilities for smooth movement of the deployed teams such as logistic, accommodation, etc.

xvi. Awareness programmes have to be activated immediately to all relevant general public and stakeholders.

3.2 Media Management

The Corporate and International Communications Section shall coordinate media statement. In zoonotic disease event where joint press statement is needed then this section will collaborate with the relevant authority.

3.3 Declaration of the Area/ State as Rabies Infected Area

3.3.1 Peninsular Malaysia and Labuan

The area or district or state shall be declared as rabies infected area according to section 39 of the Animal Act 1953 revised 2006. This order may include provisions of the destruction of animals that are not under effective control in accordance with the provisions under sub-section (4) it may also control

movement of animals from the infected area (please refer Section 39. Animal Act 1953 revised 2006).

This legislative tool together with section 42 which calls for the anti-rabies vaccination in that area or district or state will give the department the necessary powers to handle the outbreak.

3.3.2 Sabah

The area or district shall be declared as rabies infected area according to section 46, Animal Enactment 2015. This order may include provisions of the destruction of animals that are not under effective control in accordance with the provisions under sub-section (4) it may also control movement of animals from the infected area (please refer Section 46, Animal Enactment 2015)
This legislative tool together with section 49 which calls for the anti-rabies vaccination in that area or district or state will give the department the necessary powers to handle the outbreak.

3.3.3 Sarawak

The area or district shall be declared as rabies infected area according to section 37, Chapter 32 Veterinary Public Health Ordinance 1999. This order may include provisions of the destruction of animals that are not under effective control in accordance with the provisions under sub-section (3) it may also control movement of animals from the infected area (please refer Section 37, Chapter 32 Veterinary Public Health Ordinance 1999).

This legislative tool together with section 40 which calls for the anti-rabies vaccination in that area or district or state will give the department the necessary powers to handle the outbreak

3.4 Zoning

In a crisis situation, three areas will be determined:

3.4.1 Infected area (10 km radius from foci)

- The quarantine order will be enforced and all movements of pet animals will be restricted.
- State Veterinary Director may issue orders for locking, chaining, installing neck collar, or muzzle the animal.
- The quarantine notice is issued to the infected premises.
- Stray population control will be conducted.
- Increase surveillance.
- Increase public awareness.

3.4.2 Disease Control area (Surveillance)

- All movements are restricted except by permission
- Encourage owned dog to get vaccinated
- Stray population control will be conducted.
- Increase surveillance.
- Increase public awareness.

3.4.3 Disease Eradication area (Free zone)

- Stray population control.
- Passive surveillance.
- Public awareness.

3.5 Public Awareness Program

i. Relevant sections will coordinate the Public Awareness Program.
ii. Control and Disease Eradication Section will coordinate the content of campaign.
iii. The public should be duly informed about the disease and how to protect their pets from the disease.
iv. School should also be targeted for the dissemination of information.
v. Social media should be used to educate the public.
vi. The broadcast should be carefully tailored to get their cooperation in handling the situation.
vii. Pamphlets should be sent to all hospitals, health clinics and general practitioners within the state about the presence of the diseases and the need to refer all animal-bite cases to the district hospitals or general hospitals.

viii. Any animal outbreak should be reported to the relevant authority.

3.6 Handling of Livestock Bitten by Suspected Rabid Animals

Since all species of livestock are susceptible to rabies the following recommendation shall not be disputed at any cost. Livestock bitten by a rabid animal should be slaughtered immediately if the owner is unwilling to do this, the animal should be kept under close veterinary observation for any clinical signs up to 6 months. If the animal show clinical sign, animal should be slaughtered immediately.

3.7 Disease Index Management

For disease that is not considered as crisis should be considered as disease index and manage according to the specific APTVM Disease Management.

CHAPTER 4: RECOMMENDATION FOR IMMUNISATION PROCEDURES IN ANIMALS

4.1 Animal Identification and Vaccination Requirement

Dogs in the immune-belt should be vaccinated annually and booster after the third year of immunization. Animals that are being vaccinated should be identified with collar as identification. All animals vaccinated in the immune-belt should identified with a collar to which the specially designed metal badge of tag is fastened securely. Animal license metal badges of tags should be distinguishable in shape and colour from rabies metal badge or tags in the case of outbreak situation the immune-belt.

Animals in the non-immuned belt area is on voluntary basis and the owner could get their pets vaccinated from the respective veterinary clinic. Vaccines used on animals are as in **Table 11**. Since cats have not been known to be involved in the spread of rabies in Malaysia. It is recommended that vaccination of cats be on a voluntary basis. All other animals, included wildlife and livestock do not have a need for vaccination at the moment due to the low prevalence of the disease.

Table 11: Canine Rabies Vaccine

No.	Trade Name	Manufacturer	Local Agent	Nature of Vaccine	Strain & Type
1	NobiVac Rabies	Intervet, HOLLAND	Intervet (M) Sdn. Bhd.	Killed	Rabies Virus
2	Rabisin	Marieal, FRANCE	Rhone Ma Malaysia Sdn. Bhd.	Killed	Fixed Pasteur P.M GS 52 strain rabies

4.2 Procedure for catching and handling specimen for rabies

4.2.1 Procedures for Frontliners

Frontliners includes those who do disease investigation, sampling, catching, vaccination and culling. Those frontliners' should wear proper PPE accordingly and receive pre-exposure prophylaxis against rabies.

4.2.2 Procedures for Laboratory Personnel

On receiving the suspected rabid animal, please take the necessary precaution in handling the carcass. All person involved with handling of rabid specimens should be adequately vaccinated against rabies and wear proper PPE. Ensure that no unauthorised personnel is in the vicinity during post-mortem (refer to **Annex 7**).

CHAPTER 5: PREVENTION AND CONTROL OF HUMAN RABIES

5.1 HUMAN EXPOSURE TO RABIES

Rabies is a universally fatal neurological infection. Death is preventable with timely delivery of effective intervention. Systematic risk assessment following animal bite injury is essential to ensure optimal intervention and utilization of rabies biologics.

Category of exposure

It is further classified into two (2) groups;

1. **Possible exposure**: A person who had close contact including bite, scratch, mucosal (eyes, nose and mouth) or open wound exposure to body fluids of animals displaying clinical signs consistent with rabies at the time of or within 14 days following the incidence.

2. **Exposed**: A person who has had close contact usually a bite or scratch or mucosal (eyes, nose and mouth) or open wound exposure with a laboratory confirmed rabid animal.

5.2 POST-EXPOSURE MANAGEMENT

Effective post-exposure management soon after exposure to rabies virus can prevent death. Post-exposure prevention consists of local treatment of the wound, anti-rabies vaccination and administration of rabies immunoglobulin (if indicated). Without PEP, the average probability of developing rabies following a bite by a rabid animal to the head is 55%, upper extremity 22%, the trunk 9% and a lower limb 12%.

5.2.1 Local Treatment of the Wound

It is of utmost importance to **remove** or **inactivate** the rabies virus at the expose site, either by chemical or physical means. Therefore, **prompt** local treatments of all bite wounds and scratches or mucosal exposure that may be contaminated with rabies virus is important.

Recommended first-aid procedures include immediate and thorough flushing and washing of the wound for a minimum of **15 minutes** with **running** water and soap or detergent, the wound is dressed with povidone iodine or alcohol.

Secondary suturing should be **avoided** to prevent inoculating the virus deeper into the wound. Other treatments, such as administration of antibiotics and anti-tetanus, should be provided according to local hospital treatment guidelines.

Inpatient care of patients with animal bite/s may be needed if wounds are **extensive** or are on the **face**, **hands** and **genitalia**, or **surgical repair** or replacement of **blood loss** is required, or if **infection** occurs.

5.2.2 Post-bite Risk Assessment

The following details should be obtained to decide appropriate post-bite injury intervention:

1. The nature of contact (bite event)

    i. provoked versus unprovoked attack.
    ii. time between bite & consultation.

2. the presence of rabies infected animals in the area where the contact occurred (event location) based on

    i. Surveillance data: canine/wildlife rabies, human rabies.

3. Risk category

    i. Wound type.
    ii. Animal species.

4. Wound characteristics

    i. Location, bare body part versus protected by clothing.
    ii. Single versus multiple.

5. Animal characteristics

    i. Fully confined and supervised pet versus free-roaming pet versus stray.
    ii. The vaccination status of the animal.
    iii. Features that may suggestive of animal rabies features at the event time.
    iv. Current status of the animal.
    v. Any other human and/or animal bitten by the same animal over the past 14 days.

6. Feasibility to have the animal observed for 14 days

   i. Still alive versus missing versus death.
   ii. Veterinary department involved.
   iii. Owner is known and contactable.
   iv. The results of laboratory testing of the animal for rabies, if available.

7. Patient immune status

   a. Rabies: have received complete pre-exposure prophylaxis (PrEP) or post-exposure prophylaxis (PEP) previously.
   b. General health: immune-compromised versus competent.

5.2.3 Wound categorization

An animal bite wound must be assessed and categorised for its management plan. The categorisation and management as illustrated in **Table 12**.

TABLE 12: General Guideline for Animal Bite Management According to Category of Exposure

RISK CATEGORY	TYPE OF EXPOSURE	ACTION TO BE TAKEN
1	• Touching/feeding animal. • Licking of intact skin.	• Nil if history is reliable. • If history not reliable and in presence of visible wound, treat as Category 2.
2	• Nibbling of uncovered skin. • Superficial scratch or abrasions through bite with no bleeding. • Licking of broken skin (when scabs has not been formed yet)	• Apply appropriate wound treatment. • Administer anti-tetanus if indicated. • Assess for need to administer vaccine. * • **Do not administer anti-rabies immunoglobulin (RIG) in immune-competent patient.** • Stop vaccination if animal is rabies negative in laboratory tests, or remains healthy at/after 14 days' observation.

RISK CATEGORY	TYPE OF EXPOSURE	ACTION TO BE TAKEN
3	• Bites/scratches with teeth which penetrate the skin and draw blood spontaneously. • Licking mucous membrane (eyes, nose and mouth) or open wound. • Exposure to potential infectious materials such as saliva, brain tissue, urine, CSF. • Multiple bites. • Any **BAT** or wild animal bites.	• Apply appropriate wound treatment. • Administer anti-tetanus as indicated. • Assess for need to administer vaccine. * • **Administer RIG. *** • Stop vaccination if animal is rabies negative in laboratory tests, or remains healthy after 14 days' observation. • If indicated, prescribe antibiotic.

Footnote: * Rabies vaccination or RIG may be delayed if the bite occurs in:

a. Rabies non-endemic area while awaiting laboratory investigation and/or animal observation result.

b. Rabies endemic area (or where there are reported cases of animal rabies) and the animal is healthy at time of bite and it can be observed closely for the next 14 days.

c. Rabies vaccination or RIG should be commenced immediately if the animal under observation became sick or died or went missing or culled during the period of observation.

5.2.4 Post-Exposure Prophylaxis (PEP)

PEP is given for risk category 2 and 3 accordingly which consist of anti- rabies vaccine with or without RIG. Decision on PEP must be based on risk assessment (Annex 1).

a) Route and site of vaccine administration

Intramuscular (IM) – Deltoid or Anterolateral aspect of thigh (for young children) [1 vial of ≥ 2.5 IU of inactivated rabies virus],

OR

Intradermal (ID) – Deltoid [0.1 ml] on each side (0.1ml right and 0.1ml left deltoid.

The ID schedules offer advantages over IM administration through savings in costs, doses and time for visit to health clinic.

NOTES:

i. **Never** administer rabies vaccine at **gluteal** area because studies had shown that it resulted in lower neutralising antibody titers.

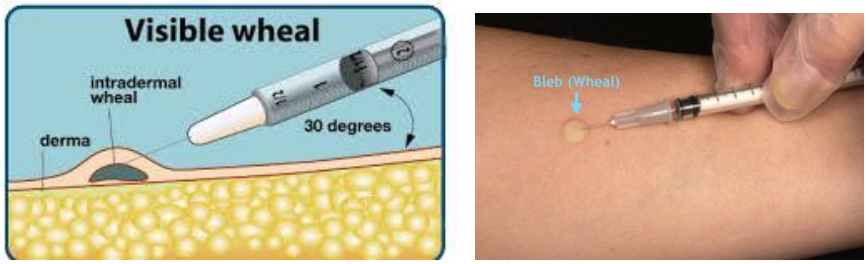
ii. Intramuscular (IM) route is the preferred route for young children who do **not co-operate** intradermal (ID) injection and in settings where staffs are **not trained** in giving ID injection.

iii. ID route is the preferred route for obese patients and patient with contra-indication for IM injection.

iv. Successful and effective ID injection may be ascertained by the presence of a **small bleb** (at least 0.5cm diameter) after injection (**Figure 6**).

v. If a bleb is **not visible** after the ID injection, the injection **must be repeated**.

Figure 6: Intradermal injection and bleb formation



b) Doses

The number of doses required is determined by the previous immunisation status of the individual

i) Previously unvaccinated immune competent person (**Figure 7**);

a) 4-doses (1-1-1-1-0) modified Essen IM Regimen at day 0, 3, 7, and 14 to 28; OR

b) 3-visit 2 site Institut Pasteur du Cambodge (IPC) ID Regimen (2-2-2-0-0) on day 0, 3 and 7 at each deltoid region (0.1ml each site)

In addition to rabies vaccine, these people should also receive a dose of RIG if indicated not later than Day 7 after the first dose (D0) of rabies vaccination, irrespective if the patient has received the Day 3 dose to provide rapid protection before induction of rabies neutralizing antibodies by active immunisation.

ii) Previously vaccinated completed Pre-Exposure Prophylaxis (PrEP) immune competent individual and more than 3 months post vaccination (**Figure 8**):

a) Intramuscular, 1 dose [1 vial] on Day 0 & 3 (1-1-0-0-0),

b) Intradermal, 2 doses [0.1 ml] 1-site on Day 0 & 3 (2-2-0-0-0).

However, in the event that patient may not able to return for the next dose or no one to pool for the intradermal vaccine, 4 sites (0.1 ml) ID vaccine on Day 0 can be offered (4-0-0-0-0).

RIG is not indicated for patients who has previously received PrEP or PEP.

Note: Vaccination should be resumed and not restarted if any doses are delayed. A change in the route of vaccine administration or in vaccine product during a PEP or PrEP course is acceptable if such a change is unavoidable. The vaccination should continue according to the schedule for the new route of administration.

Figure 7: Animal Bite Management for Previously Unvaccinated Person

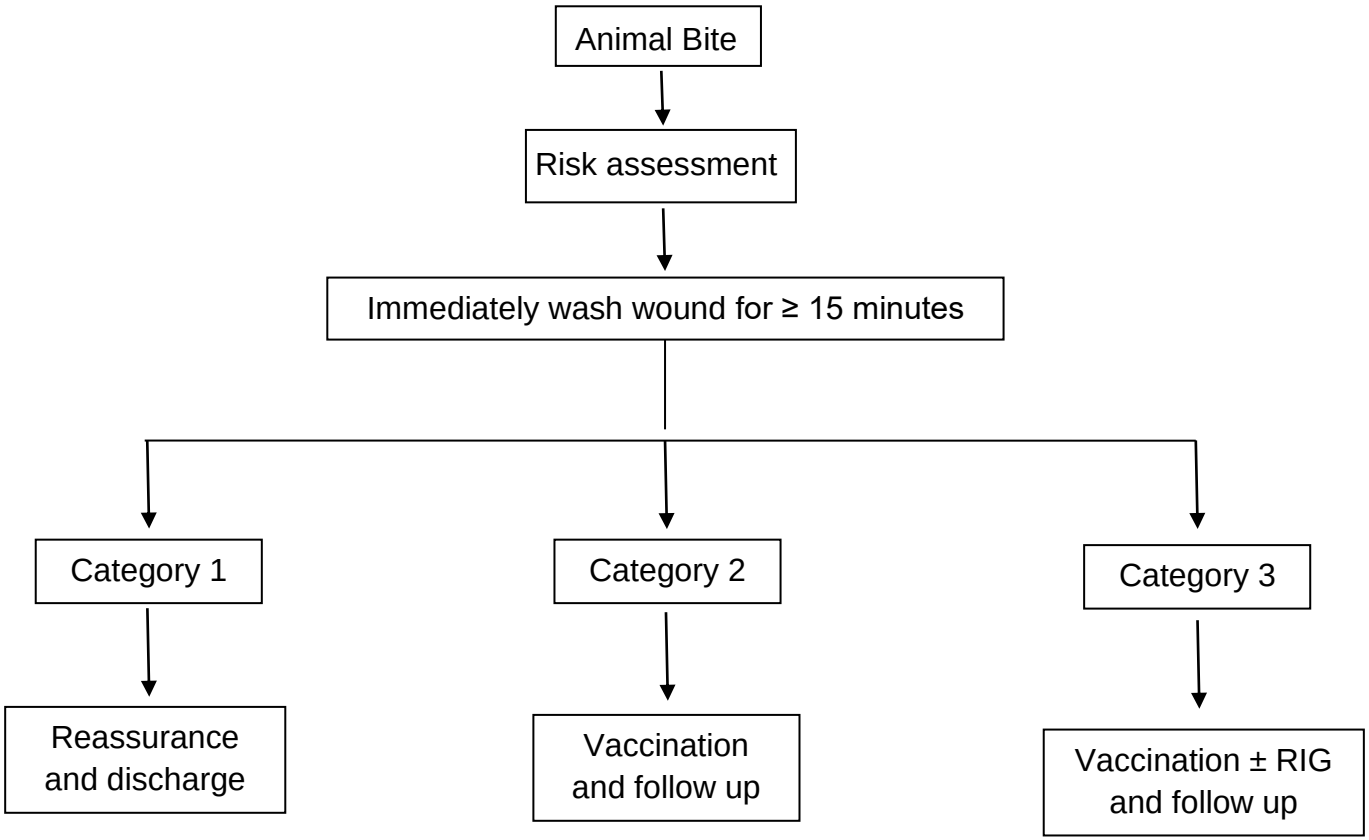
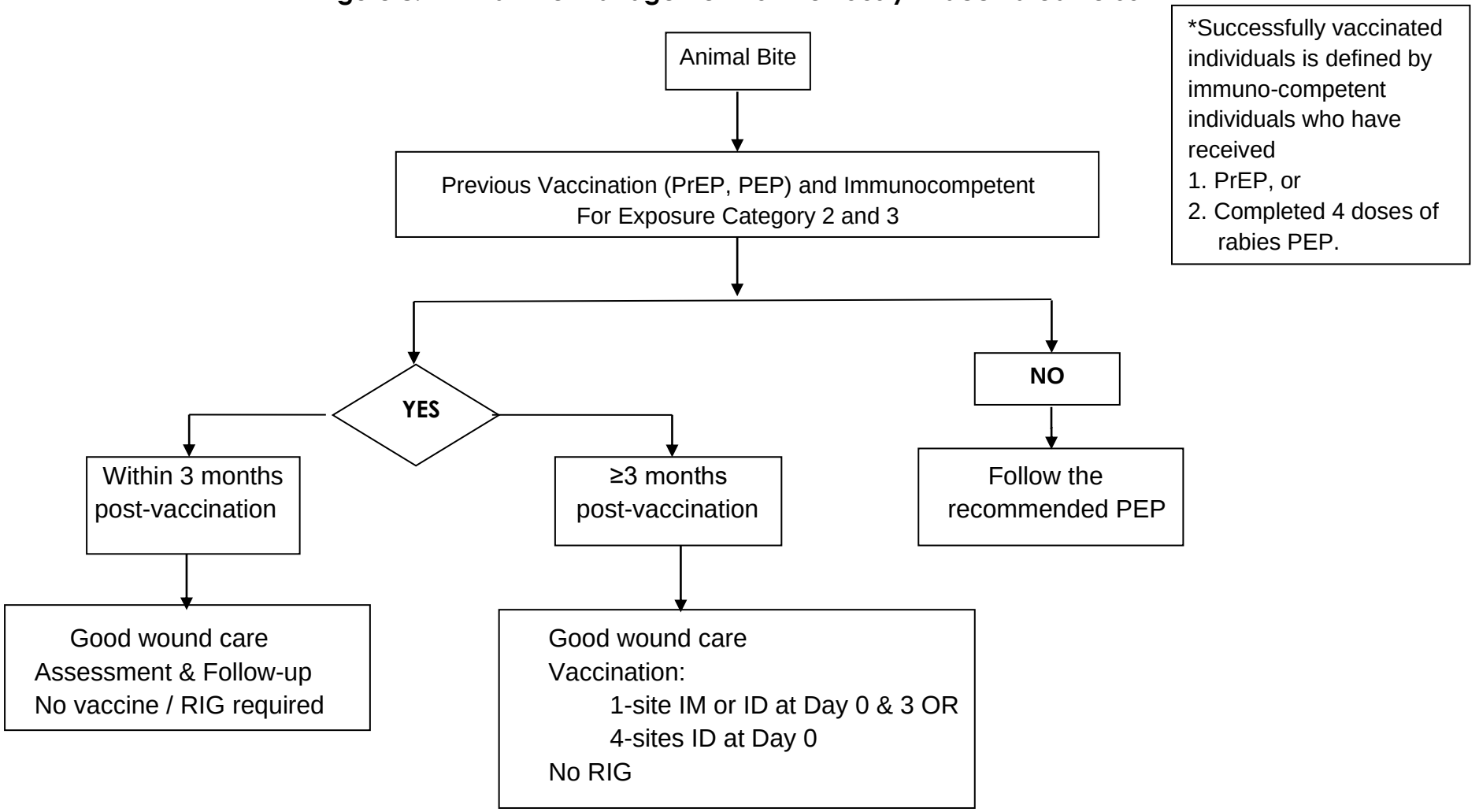


Figure 8: Animal Bite Management for Previously* Vaccinated Person



iii) Immunocompromised patient (person on corticosteroids or other immune-suppressive agents e.g. chloroquine; individual with immune-suppressive illnesses e.g. congenital immunodeficiency, HIV with CD4 count <200cells/mm^3 if aged ≥ 5 years or CD4% ≤ 25% for children aged < 5 years, leukaemia, lymphoma, generalised malignancy, poorly controlled diabetes), should receive repeat administration of PEP and RIG irrespective of previous history of anti-rabies vaccination:

a) 5 doses at day 0, 3, 7, 14 and 28 (Essen IM regimen) (1-1-1-1-1)

OR

b) 4 doses at day 0, 3, 7and 28 (Modified Thai Red Cross regimen) (1-1-1-0-1);

In addition to rabies vaccine, these individuals should also receive a dose of RIG if indicated not later than Day 7 after the first dose [D0] of rabies vaccination irrespective if the patient has received the Day 3 dose to provide rapid protection before induction of rabies neutralising antibodies by active immunisation.

iv) Patient with history of animal bite more than 14 days and seek treatment, the management should follow the algorithm illustrated in **Figure 9.**

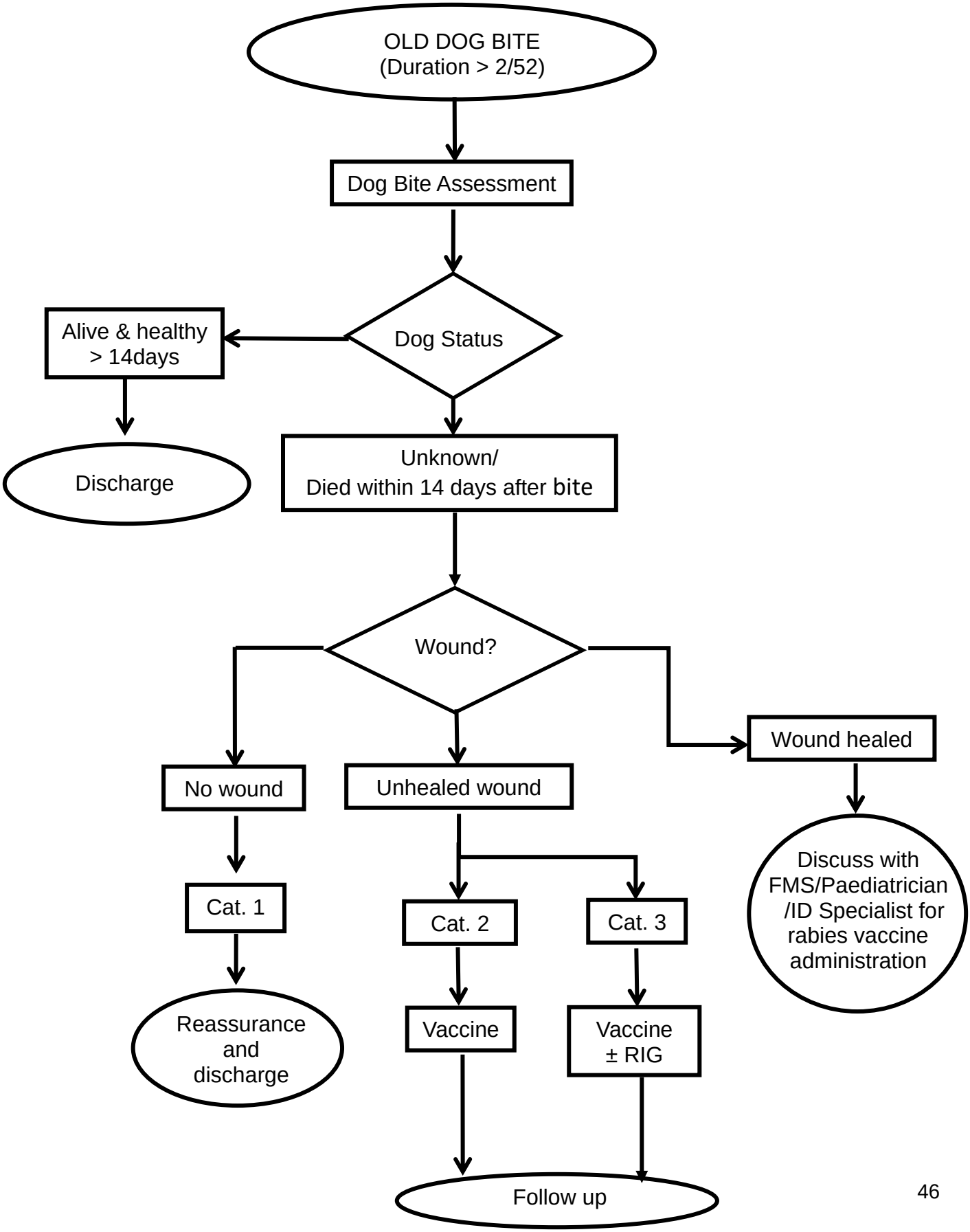
IMPORTANT NOTES FOR RABIES FREE STATES (including gazetted immune belt areas)

a) Patient with an animal bite wound category 2 and 3 should be referred to Infectious Disease (ID) Physician or ID Paediatrician for assessment and commencement of PEP and/or RIG.

b) Animal is found/captured: Notify the nearest District Veterinary Office. Follow up the status of the animal. Start PEP and/or RIG if animal is sick or died within 14 days of observation; and after consulting ID Physician or Paediatrician for further assessment of the case.

c) Stray animal: please consult ID Physician or Paediatrician for further assessment of animal bite cases. PEP and/or RIG will be given based on the evaluation from the ID Physician or Paediatrician.

Figure 9: MANAGEMENT OF CASE WITH OLD ANIMAL BITE (MORE THAN 14 DAYS POST BITE)



5.2.5 Rabies Immunoglobulin (RIG)

Rabies immunoglobulin (RIG) should be given for category 3 exposure (**refer TABLE 12**). Administration of RIG should be discussed with ID Physician or ID Paediatrician**.**

There are 2 types of RIG

a) Equine RIG
Dose: 40 IU/kg

b) Human RIG
Dose: 20 IU/kg

Route of administration: Infiltrates the wound with calculated amount of RIG as much as possible and anatomically permissible at the site of bite wound. The remaining RIG should not be given.

Ideally, RIG should be given together on Day 0 of vaccination to promote clearance of rabies virus particles by neutralization at the site of bite wound before the virus invade into the nervous system. It **MUST NOT** be administered in the same syringe as vaccine.

RIG can also be administered at any time between Day 0 to Day 7 of vaccination. It must **not be given later than Day 7 of vaccination** to avoid interference with neutralizing antibody production.

However, data from rabies-endemic settings have shown that even in the absence of RIG, with thorough wound washing plus immediate vaccination and completion of the PEP course, more than 99% of patients survive.

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5.2.6 Animal Bite Case Management at Primary and Secondary Setting in Rabies Infected Areas

1. **Primary Setting:** clinical assessment, wound care and start antibiotic if wound appears contaminated. Patient with risk category 2 or 3 should refer to hospitals with availability of rabies vaccine and RIG. Patient with risk category 1 can be discharged with reassurance that there is no risk of rabies infection.

2. **Secondary Setting:** Casualty Team will assess the case,

    a) Notify the nearest District Veterinary Office. If the animal is found or capture, follow up the status of the animal. Start PEP and/or RIG if animal is sick or died within 14 days of observation; and after consulting ID Physician or Paediatrician for further assessment of the case.

b) If animal is not found, consult ID Physician or Paediatrician for assessment and PEP and/or RIG.

c) Symptomatic patient: admit to ward immediately for further assessment. PEP/RIG is not indicated.

3. **Follow up**

Patient with wound category 2 and 3 who received complete PEP must be followed up at Month 1 and Month 3.

5.2.7 Animal Bite Clinic

The establishment of an Animal Bite Clinic (ABC) is to:

a. provide a more comprehensive care to victims of dog (+/- other animal) bite in an event of continuous / extended rabies infected areas where the number of patients can be overwhelming to the emergency department.

b. provide continuous care to the bite victims to ensure those high-risk cases complete their rabies vaccination series for an optimum protection of PEP.

c. pool available resources such as rabies vaccine and RIG, which might not be sufficient to meet the demand during a rabies outbreak.

In ABC, the vaccine rabies can be given intradermal provided the staffs **must** be well trained to administer ID.

It is reported that ID has same efficacy and immunogenicity as intramuscular (IM) route, less painful, cost effectiveness and can conserve the vaccine supply as the amount given is only 1/5 of IM dose (0.5 ml for IM).

At the time this guideline was written, only Verorab™, a rabies vaccine produced by Sanofi Pastuer and registered in Malaysia has the intradermal route of administration.

In Sarawak, since August 2019, Animal Bite Clinic is now known as Post Bite Clinic.

5.3 NOTIFICATION

5.3.1 Notification of animal bite cases

All animal bite cases must be notified to the nearest District Health Office (DHO) for investigation.

It is the responsibility of DHO to:

- Notify the animal bite cases to the nearest Veterinary District Office (VDO) using **Annex 1**.

- clarify the animal status* with the respective VDO **within 48 hours**.
  * animal – whether found or not found. If found and able to observe (clarify the health status of the animal for 14 days. If not found, clarify the rabies status among animals in that area (Animal Surveillance System).

5.3.2 Notification of suspected rabies case

Rabies as a disease specified in the First Schedule under the Prevention and Control of Infectious Diseases Act 1988 [act 342] is required to be notified and any person who contravenes commits an offence.

All suspected, probable and confirmed human rabies case must be notified within 24 hours via phone call, and then followed by notification into e-*Notifikasi* System.

5.3.3 Case Definition for rabies

Clinical case definition - A person presenting with an acute neurological syndrome (encephomyelitis) dominated by forms of hyperactivity (furious rabies) or paralytic syndrome~~s~~ (dumb rabies) progressing towards coma and death, usually by cardiorespiratory failure, within 7-10 days after the first symptom if no intensive care is instituted.

Other clinical symptoms include dysphagia, hydrophobia and convulsions.

Laboratory criteria for diagnosis

a. Detection of rabies viral antigens by direct fluorescent antibody (DFA) or immunohistochemistry (IHC) on clinical

specimens, preferably brain tissue (post mortem) or from skin (ante mortem).

b. Isolation of rabies virus from clinical specimens.

c. Detection of viral RNA by RT-PCR in clinical specimens.

d. Detection by electron microscopy.

Case Classification

a. **Suspected:** A case that is compatible with the clinical case definition and with history of animal bite or scratch, or open wound contact with, or mucosal exposure to animal saliva.

b. **Probable:** A suspected case plus history of contact with a rabid animal (confirmed by laboratory).

c. **Confirmed:** A human case that is laboratory-confirmed.

5.4 PUBLIC HEALTH RESPONSE

If an animal bite case seen in a clinic, the Medical Officer (MO) must **refer Category 2 and 3** case to the nearest hospital for evaluation and further management. The referring MO must **fill the Animal Bite Notification Form** (**Annex 2**) which must be sent to the nearest District Health Office (DHO) within 24 hours of diagnosis. At the same time, the MO need to **assess the case** using Annex 1 and fill up the form in **Annex 3.**

DHO must notify the nearest District Veterinary Office (DVO) immediately by phone followed by submission of Animal Bite Notification Form through fax. Then, DHO should carry out these actions:

1. Investigate all notified cases.

2. Find any other animal bite case(s)(ACD) in the locality.

The summary of actions is illustrated in **Figure 10.**

5.4.1 Animal Bite Case Investigation

Investigation of animal bite cases must be done within 24 hours to complete the information in Annex 4. This information should be shared with DVO for their immediate action on the animal.

5.4.2 Animal Bite Case(s) Finding

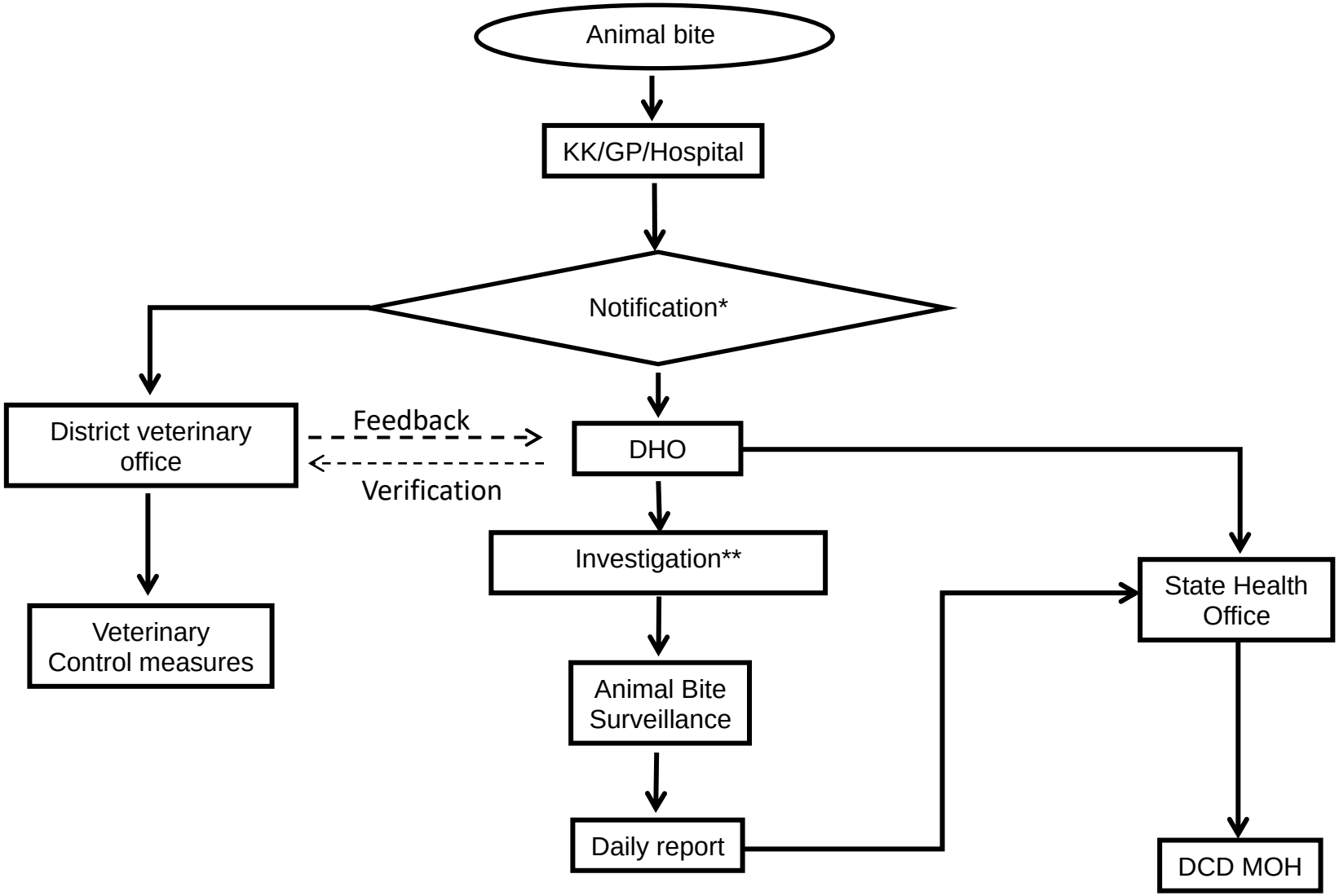
In rabies infected areas, there might be other bite cases exposed to rabid animal whom have not seek medical treatment. To identify these cases, DHO staffs have to:

i. ask bite case if he/she knows any other bite victims; **and**
ii. go to the bite case area and inquire from the public for:
    - any other bite victims;
    - any increase number of death cases with neurological syndrome in the past few months;
    - any abnormal behaviour of dogs and other animals in the locality in the past few months.

and

iii. do public announcement to alert other bite victims to seek medical advice.

Figure 10: Notification and Flow of Information for Animal Bite Case



* Notification to DHO (PKD/PKB/PKK) must be provided within 24 hours using **Annex 1**
****** Investigated information to be reported using **Annex 4**

5.5 MANAGEMENT OF HUMAN RABIES

5.5.1 Clinical Manifestations

The time between the bite and the appearance of clinical symptoms of human rabies is called the incubation period. The incubation period may last for weeks to months, typically about 3 to 12 weeks.

The initial symptoms of rabies are non-specific. It may present with fever and flu-like symptoms. The patient often complaint of pain or paraesthesia at the bite site at prodromal stage. As the condition progress, the patient may start to experience change in behavior, altered mental state, hydrophobia, aerophobia and eventually death within 7-10 days after prodromal stage.

There are two forms of the human rabies:

i. About 2/3 of patients exhibit furious rabies with signs of hyperactivity, excited behaviour, hydrophobia and sometimes aerophobia. After a few days, death occurs due to cardio-respiratory arrest.

ii. Paralytic rabies accounts for about 1/3 of the total number of human cases. The muscles gradually become paralyzed, starting at the site of the bite or scratch. Coma slowly develops and eventually death occurs. This form of rabies runs a less dramatic and usually longer course than the furious form.

The paralytic form of rabies is often misdiagnosed, contributing to the underreporting of the disease. Important differential diagnosis of human rabies includes other infective encephalomyelitis, autoimmune encephalitis, toxic encephalopathy, Guillain-Barre Syndrome, cerebro-vascular accident and acute psychosis. It is critical to obtain history of exposure to rabid animal when evaluating a case of acute encephalitis syndrome or acute flaccid paralysis.

5.5.2 Management of Human Rabies Case

The clinical management of human rabies is primarily palliative in nature. Human rabies is almost always fatal. To date there have been reports of human survivors, majority of whom had received PEP prior to the symptoms onset. Nonetheless the survivors have severe neurological sequelae. Hence, the management/ prevention of the human rabies case must focus on good animal bite wound care and prevention of animal's bite.

All animal bite cases should be given an Animal Bite Alert Card (**Annex 5**)

Those received vaccination must be given a Rabies Vaccination Card.

5.6 LABORATORY

Rabies virus is an exclusively neurotrophic virus. There is no viremia and host immune response occurs at the late stage of infection. Therefore, **no diagnostic** test is available to detect human rabies infection **before the onset** of clinical symptoms.

Once patient show symptoms, several tests can be used to diagnose rabies ante-mortem (before death). Preferably, multiple sample types are required for optimal diagnosis.

5.6.1 Specimen's collection from the case/patient:

There are few types of clinical specimens that can detect rabies virus (**Table 13**). Reference laboratory for rabies diagnosis is Virology Unit in Institute for Medical Research (IMR)

Table 13: Samples types and its collection for rabies test

Sample Type	Tests	Sample Collection
Nuchal Skin biopsy	rRT-PCR, DFA, IHC, VI	• Posterior of the neck at the hairline (nuchal). • Should contain at least 10 hair follicles. • Sufficient depth to include the cutaneous nerves at the base of the follicle. • 2-3mm in diameter. • Put in wet gauge with sterile water. • **Do not** add VTM or preservative. • Keep at 4-8 ^{0}C.
Saliva#	rRT-PCR, VI	• 2-3ml. • Using a sterile eyedropper pipette, • collect saliva and place in a small sterile container. • Sealed securely.

Sample Type	Tests	Sample Collection
		• **Do not** add VTM or preservative. • Keep at 4-8^{0}C.
Urine#	rRT-PCR, VI	• Urine (RT-PCR, VI) >5ml • In sterile container • Sealed securely • Keep at 4-8^{0}C.
CSF	rRT-PCR, VI Antibody testing	• At least 0.5ml. • In sterile container. • **Do not** add VTM and no preservative • Keep at 4-8^{0}C.
Brain biopsy (Post mortem cases)	rRT-PCR, DFA, IHC, VI	• Hippocampus/brain stem • 5-6mm • Several sites • In sterile sealed container • **Do not** add VTM and no preservative • Keep at 4-8^{0}C
Serum*	Serology testing	• In plain tube (3-5 ml)
Corneal scrapping*	DFA, IHC, rRT-PCR, VI	• Done by the ophthalmologists • Fixed in acetone • Can keep at room temperature

NOTE: * Testing of these two samples are currently not available in Virology lab, IMR

Serial collection of urine and/or saliva may help improve detection rate. (interval literature)

Acronym: rRT-PCR is real-time reverse-transcriptase-polymerase chain reaction
IHC is immunohistochemistry
DFA is direct fluorescent antibody test
VI is viral isolation

5.6.2 Transportation of samples

- Alert the staff at local laboratory/Virology lab IMR prior to sending the samples.
- Transport to the laboratory as soon as possible.

- Store all specimens at 4-8 °C before and during transportation within 48 hours.
- Store all specimens at -70 °C beyond 48 hours.
- Send all specimens together with appropriate form.

5.6.3 Packing Specimen for Transportation

- Should adhere to IATA requirements.
- Use three packaging layers (refer **Figure 11**).
- First layer must be water tight (refer **Figure 12**).
- Use absorbent material in all layers.

Figure 11: Packaging of Infectious Clinical Specimens

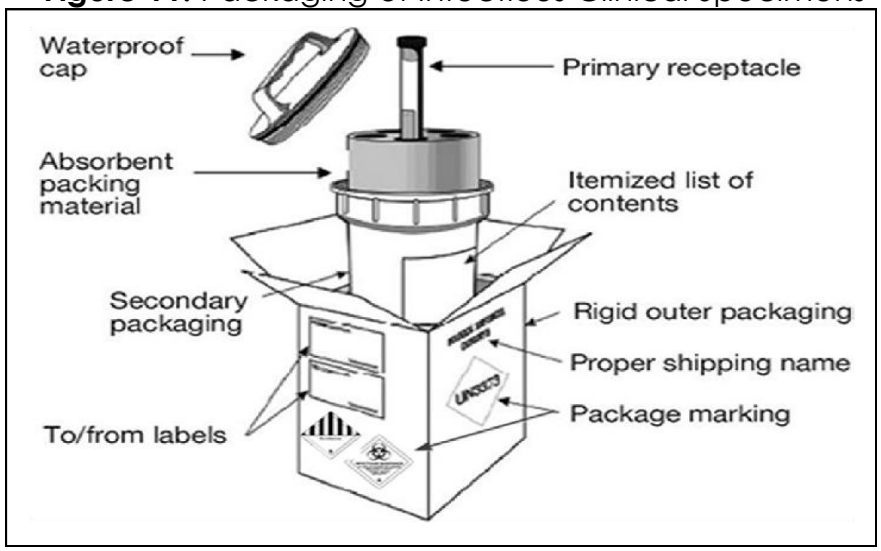
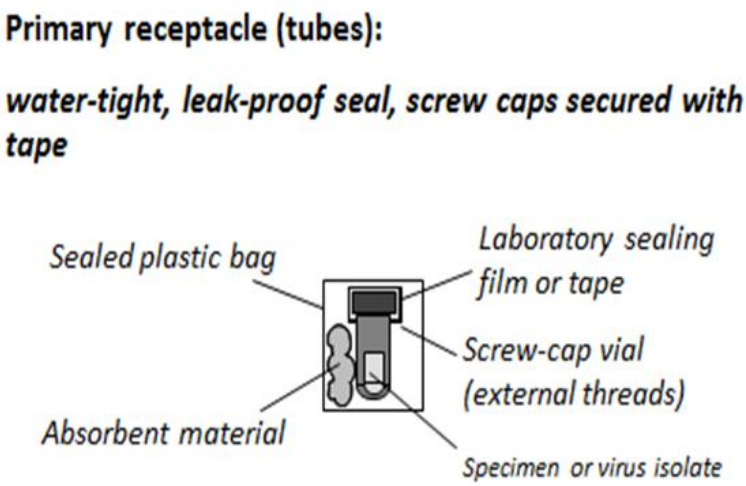


Figure 12: International Packaging for Clinical Specimens



5.6.4 Laboratory Confirmation for Rabies

Laboratory confirmation of human rabies can be established through one or more of the following tests:

1. Detection of viral RNA by real time Reverse Transcriptase-Polymerase Chain Reaction (rRT-PCR).

2. Detection of rabies viral antigens by direct fluorescent antibody (DFA) or immunohistochemistry (IHC) in nuchal skin biopsy (ante-mortem) or brain tissue (post mortem).

3. Viral isolation (VI).

4. Electron microscopy (EM).

5.7 HEALTH EDUCATION

Community especially those living in the rabies endemic areas should be provided with health advice:

1. Always maintain a high level of personal hygiene such as proper hand washing with water and soap after touching pets.

2. Wash body parts that are exposed or bitten by dogs or other animals using flowing water and soap for at least 15 minutes to remove the saliva.

3. Get immediate treatment at a nearby health clinic or hospital if exposed or bitten by aggressive pets or wild dogs. In event rabies vaccination is given, patient must be advised to complete the vaccination series to ensure its effectiveness, in view that rabies is a disease with high mortality of 100%.

4. In an outbreak or endemic area, make sure the pet dog has an anti-rabies injection from the nearest animal clinic. Keep animal in compound and avoid it from mixing with community/stray dogs or wild animals;

5. Avoid being bitten by dogs or animals.

6. If a dog or a cat is noted to have change of behaviour including aggressive, seek immediate treatment at the animal clinic and report to the nearby Veterinary Services Department (DVS).

7. Report to Local Authority if there are stray dogs and cats roaming around the dwelling.

5.8 PRE-EXPOSURE PROPHYLAXIS

Rabies can be prevented through rabies vaccination. The case fatality rate for rabies is nearly 100%. To date, no single test in Malaysia has been able to detect rabies in the early stages before the symptoms appear. However, the provision of rabies vaccine as a pre-exposure prophylaxis (PrEP) to high-risk groups can reduce the risk of rabies infection.

Individuals who are at high risk for rabies exposure are recommended to get pre-exposure rabies vaccine. The employers must provide the vaccine to ensure the employees are protected in the line of duty. The high-risk groups are those who have direct contact with animals or their clinical specimens in their work; such as veterinarians, assistant veterinarians, wildlife personals, local authority personals, laboratory personals and dog handlers (**Table 14**). Tourists to hyper endemic areas are advisable to get PrEP. In addition, individuals at high risk for rabies infections due to nature of work must wear complete personal protective equipment (PPE).

Advisory Committee on Immunization Practices (ACIP) of USA recommended all persons for whom rabies PrEP is indicated receive 2 IM doses of rabies vaccine on days 0 and 7. A booster dose should be administered if titres are <0.5 IU/mL at the time titre checks or given pre-emptively a one-time IM booster dose of rabies vaccine during day 21–year 3 after completion of the 2-dose primary series.

Please refer **Figure 13** indicates management for hypothetical patients (A–E) who received the recommended 2-dose rabies pre-exposure prophylaxis schedule and have sustained dog bites or exposure with risk category 3.

TABLE 14: Rabies Vaccine Pre-Exposure Prophylaxis (PrEP) Based On Exposure Risk Analysis

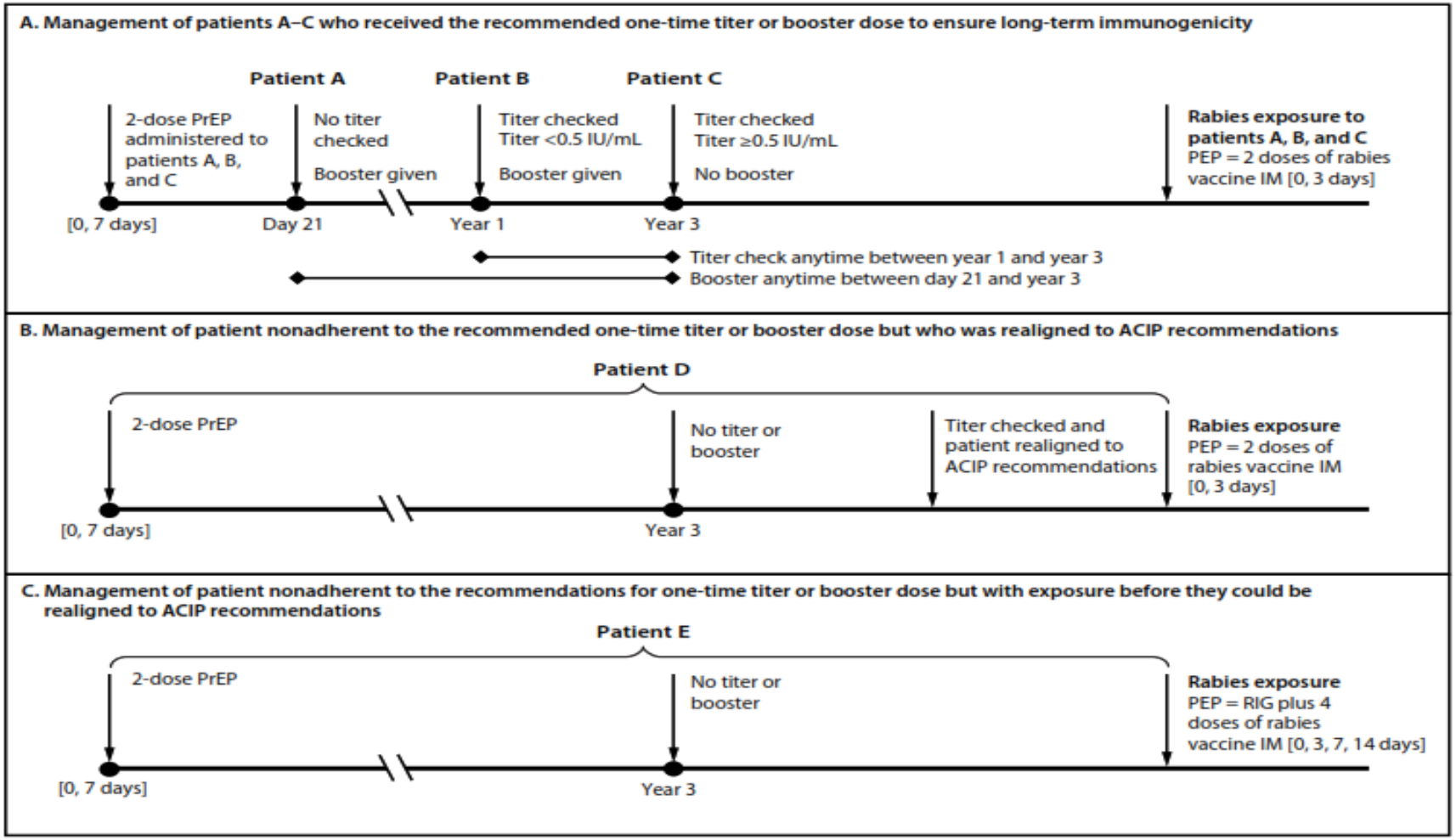
Risk Category	Nature of Exposure	Risk Group	Recommendation	
			Primary PrEP	Primary PrEP
Elevated risk for unrecognized and recognized exposures including unusual or high-risk exposures	Exposure, often in high concentrations, might be recognized or unrecognized, might be unusual (e.g., aerosolized virus)	Persons working with live rabies virus in research or vaccine production facilities or performing testing for rabies in diagnostic laboratories	IM rabies vaccine on days 0 and 7	Check titers every 6 months; booster if titer <0.5 IU/mL
Elevated risk for Unrecognized and recognized exposures	Exposure typically recognized but could be unrecognized; unusual exposures unlikely	Persons who frequently 1) handle bats, 2) have contact with bats, 3) enter high-density bat environments, or 4) perform animal necropsies (e.g., biologists who frequently enter bat roosts or who collect suspected rabies samples)	IM rabies vaccine on days 0 and 7	Check titers every 2 years; booster if titer <0.5 IU/mL
Elevated risk for recognized exposures, sustained risk	Exposure nearly always recognized; risk for recognized exposures higher than that for the general population and duration exceeds	Persons who interact with animals that could be rabid; occupational or recreational activities that typically involve	IM rabies vaccine on days 0 and 7	1) One-time titer check during years 1–3 after 2-dose primary series; booster if titer <0.5 IU/mL, or

Risk Category	Nature of Exposure	Risk Group	Recommendation	
			Primary PrEP	Primary PrEP
	3 years after the primary vaccination	contact with animals include: 1) veterinarians, technicians, animal control officers, and their students or trainees; 2) persons who handle wildlife reservoir species (e.g., wildlife biologists, rehabilitators, and trappers); and 3) spelunkers Selected travelers. PrEP considerations include whether the travelers 1) will be performing occupational or recreational activities that increase risk for exposure to potentially rabid animals particularly Dogs, and 2) might have difficulty		2) booster no sooner than day 21 and no later than year 3 after 2-dose primary series

Risk Category	Nature of Exposure	Risk Group	Recommendation	
			Primary PrEP	Primary PrEP
		getting prompt access to safe PEP (e.g., rural part of a country or far from closest PEP clinic)		
Elevated risk for recognized exposures, risk not sustained	Exposure nearly always recognized; risk for exposure higher than for general population but expected to be time-limited (≤3 years from the 2-dose primary PrEP vaccination series)	Same as for risk category 3 (above), but risk duration ≤3 years (e.g., short-term volunteer providing hands-on animal care or infrequent traveler with no expected high-risk travel >3 years after PrEP administration)	IM rabies vaccine on days 0 and 7	None
Low risk for exposure	Exposure uncommon	Person living in Malaysia	None	None

Source: *Use of a Modified Preexposure Prophylaxis Vaccination Schedule to Prevent Human Rabies: Recommendations of the Advisory Committee on Immunization Practices — United States, 2022. MMWR / May 6, 2022 / Vol. 71 / No. 18 / pg 619 - 627*

Figure 13: Management for hypothetical patients (A–E) who received the recommended 2-dose rabies preexposure prophylaxis schedule and have sustained dog bites or exposure - risk category 3



Source: *Use of a Modified Preexposure Prophylaxis Vaccination Schedule to Prevent Human Rabies: Recommendations of the Advisory Committee on Immunization Practices — United States, 2022. MMWR / May 6, 2022 / Vol. 71 / No. 18 / pg 619 - 627*

5.9 PREPAREDNESS FOR RABIES

5.9.1 Rabies Vaccine

Vaccines are to be kept at the state and / or major hospitals. If required, vaccine can be redistributed. Procurement is done by respective health facility.

5.9.2 Rabies Immunoglobulin (RIG) Stockpile

Due to the scarcity of RIG, Ministry of Health (MOH) has identified Kuala Lumpur General Hospital (HKL) as the center to hold the national RIG stockpile for the country. Any hospital can request to the pharmacist in charge in HKL for the supply of RIG after consultation with the relevant physician or pediatrician.

As Northen Peninsular Malaysia still not free from rabies, a few RIG vials are kept at Sultanah Bahiyah Hospital for quick accessibility.

5.9.3 Updating List of Facilities Providing PEP

The list of health facilities provide PEP for rabies must be updated in the monthly report too **(Annex 6)**.

5.10 RETURNS

5.10.1 Dog and Animal Bite Cases

a. In an outbreak situation, daily reporting is closed by 5.00 pm every day. Daily line listing and report should be submitted to State Health Department (SHO) by respective DHO not later than 12.00 noon the next day. The SHO then, should submit daily report to MOH before 03.00 pm on the same day via email: **zoonosis@moh.gov.my**

b. In none outbreak situation, monthly report must be submitted to SHO by respective DHO. It is then to be submitted to Zoonosis Sector, Disease Control Division, MOH before the 10th of the following month for the activities carried out in the previous month.

5.10.2 Vaccines and RIG Stock

State Health Department must give an updated quantity of vaccine and RIG available at the hospitals to Zoonosis Sector, Disease Control Division, MOH in the monthly report format **(Annex 6)**.

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Annex 1

Animal Bite Risk Assessment Checklist
(Please tick √ if present)

Table 1A

No	Definite risk of rabies exposure	√
1	Animal with no known owner/stray/dead	
2	Any of the following **features which may suggest rabid animal**: (tick all that is present) • Sudden change of behaviour – more aggressive, biting other pets in house as well as inanimate objects • Provoked Bites that involved activities with people who are familiar to the pet which usually does not trigger a bite (i.e. bathing, feeding, petting) • Dumb looking • Hypersalivation • Hydrophobic • Walk with unsteady gait, limp or wandering around aimlessly • Animal bite has to be forcefully removed • Change in bark / unable to bark or barks softly. • Multiple unprovoked bite sites/attack on the same person • Bite more than 1 person or other animal within the same day • Poor appetite or lethargy • Unprovoked bite of familiar persons Bite more than 1 person or other animal within 14 days when animal not known to be aggressive in the past	
3	**NOT able** to observe animal for 14 days after bite (e.g. the animal has gone missing, animal presumably belongs to someone whom patient don't know who is the owner, patient is a foreigner to the place where the bite incident happened)	

Table 1B

NO	Possible Risk of Rabies Exposure (Animal can be observed for 14 days)	(√)
1.	• Unprovoked bite of unfamiliar people • Attacks without barking first to indicate intrusion into owner's territory. • Culprit pet is **NEWLY adopted** within the **last 6 months and not vaccinated against rabies.**	
2.	The pet has possible exposure to strays • House is **NOT gated/fenced** *or* Gate is **NOT closed** at all times *or* • Presence of **gap in the fence or gate** where the dog can stick out its head or nose to be in contact with outside dogs • Pet is free roaming. When the pet is brought outside the house compound it is **NOT leashed or observed**.	

Annex 2

ANIMAL BITE NOTIFICATION FORM

Please Select for Action
URGENT/NON-URGENT

To:

Tick which appropiate(□)	**Facilities**	
	District/Divisional/Area Health Office:	
	District/Divisional/Area Veterinary Office:	

Notification Date (DD/MM/YY)**:**_____

PATIENT STATUS		
Patient's name		
MyKad/ MyKid/ Passport No.		
Gender		
Age		
Ethnicity		
Guardian's Name (For patient's below 18 Years Old)		
Current Home Address		
Contact Number		
Date of Bitten (DD/MM/YY)		
Date of receive treatment (DD/MM/YY)		
Risk Category	( ) Category 1	Touching or feeding animals, licks on the skin
	( ) Category 2	Nibbling of uncovered skin, minor scratches or abrasions without bleeding, licks on broken skin
	( ) Category 3	• single or multiple transdermal bites or scratches, contamination of mucous membrane with saliva from licks; exposure to bat bites or scratches • Abandoned/wild animal bites

ANIMAL STATUS	
Types of animal's bite (explain)	( ) DOG ( ) OTHERS (State:_____)
Animal's status	( ) Pets not mix with stray animals ( ) Pets but mix with stray animals ( ) Stray (including unknown)
Nature of bite	( ) Unprovoked ( ) Provoked
Can animals be identified?	( ) YES ( ) NO
Do dog(s)/animal(s) behave normally?	( ) Yes ( ) No ( ) Unknown
Is the dog/animal still alive?	( ) Yes ( ) No ( ) Unknown
Can animal be monitored by owner for 14 days?	( ) Yes ( ) No
Address of the event	

Notification by:

_____

(Signature)

Name: _____

Designation: _____

Hospital (Ward/Unit) /Clinic: _____

Tel. No Hospital/Clinic: _____

NOTE: This form should be filled by a medical practitioner who manages dog/animal bite cases. One sheet per case. Please make sure all the variables are filled up.

The feedback period from Veterinary Department to District Health Office according to priority.

No.	Category	Feedback period
1	Urgent	<1 week
2	Non-urgent	For information

Annex 3

Animal Bite: Assessment Form

Date/Time of clerking: _____

Patient's particular:

Name of patient: _____ Registration No: _____

IC: _____ Age: _____Weight: _____

Address: _____

_____

Contact No: _____

Exposure:

Date of exposure: _____Place of exposure: _____

Site of wound/exposure: _____

Type of wound: ☐ superficial scratch
☐ abrasion
☐ multiple transdermal bites or scratches
☐ lick
☐ contamination of mucous membrane

Was the skin broken: Yes / No

Did the wound bleed (spontaneously): Yes / No

Was the animal: stray / domestic (fully caged / mixed with outside or stray animals)
If domestic animal, was the animal vaccinated for past 12 months? Yes / No

The bitten incidence was ☐ Provoked ☐ Unprovoked

Animal status: ☐ Alive
☐ Dead
☐ Natural death ☐ Culled by Veterinarian
☐ Culled by Owner/ Villagers
☐ Unknown or missing

Description of Animal appearance and behaviour:

_____

_____

Description of animal bite:

_____

_____

Did the animal bite other people: Yes / No

If Yes, how many people? ____, can you name the person bitten with contact no?
_____

Exposure/Wound category:
☐ Category 1 ☐ Category 2 ☐ Category 3

Wound care done and place:
☐ Home ☐ Health Facility ☐ No treatment done

If at home, wound washing:
☐ Running water alone ☐ Running water + soap ☐ Others: _____

Duration of wound washing:
☐ <5 minutes ☐ 5-10 minutes ☐ 10-15 minutes ☐ >15 minutes

If Seek Treatment from Health Facilities:

☐ Within 2 hours ☐ 2-6 hours ☐ 6 to 12 hours ☐ 12 to 24 hours ☐ >24 hours

Wound washing at health facility:
☐ Running water alone ☐ Normal Saline ☐ Running water + soap

☐ Povidone/ Iodine ☐ Alcohol ☐ Others: _____

Duration of wound washing at health facility:
☐ <5 minutes ☐ 5-10 minutes ☐ 10-15 minutes ☐ >15 minutes

Any past history of animal bite? Yes / No
If yes, animal: _____ ype of wound: _____
Care of wound: _____

Asymptomatic: Yes / No
If symptomatic:

Type of symptoms	Duration

Past Medical History:

Does the patient have the following medical conditions or on any treatment listed below?

☐ HIV/AIDS
☐ Immunosuppresant agent
☐ Long-term steroid
☐ Chloroquine
☐ Congenital immunodeficiency
☐ Treatment for malignant disease (leukaemia, lymphoma, lung carcinoma)
☐ Poorly Controlled Diabetes

TREATMENT

Rabies Post-Exposure Prophylaxis (RPEP)

Vaccination history against Rabies (PreP/PEP)? Yes / No
If yes, details (Date, dosage, etc):

_____

_____

Current Treatment Plan:

- ☐ Active immunisation with RIG
- ☐ Active immunisation
- ☐ No active immunisation

Reason:

_____

_____

If PEP is indicated, the vaccination regime: 4 dose / 5 dose

	Date	Lot No	Site
Day 0:			
Day 3:			
Day 7:			
Day 14:			
Day 28:			

Patient will receive Rabies vaccination at: _____

General plan:

_____

_____

_____

Clerked by:

Symptoms at subsequent clinic visit:

Number of visit	Date	Symptoms	Duration
1			
2			

Annex 4

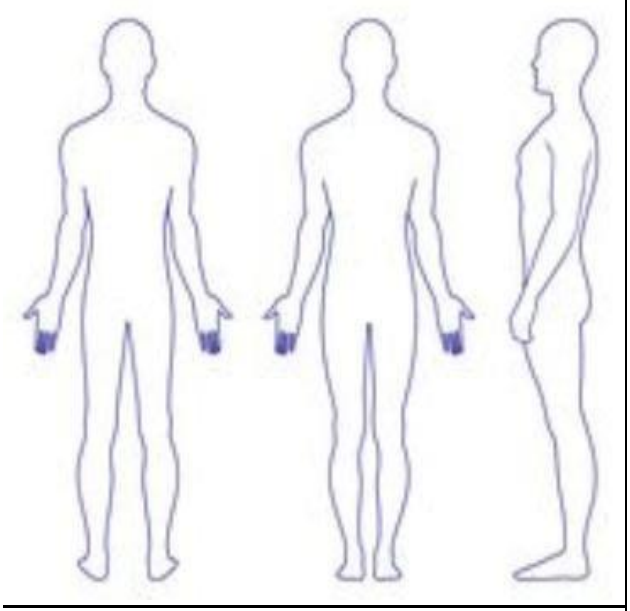
ANIMAL BITE CASE INVESTIGATION FORM

Notification Date:_____(Week/Epid:_____)

Investigation Date:_____

Serial Number (Fill in by District/Divisional/Area Health Staff):_____/_____
(*Place of bite)

A: CASE BIODATA		
Name (Capital letter):		
Citizenship: Please tick (√)	( ) Malaysian ( ) Non Malaysian	
IC / Passport / MyKid / Birth Cert Num:		
Sex:	( ) Male ( ) Female	
Age:		
Race:		
Parents/Guardian Name: (If case involves under age child)		
Telephone number: (H/P or House):		
House Address:	Division/District: _____ Locality:_____ Home Address: _____ _____	
B. BITE HISTORY		
Date of Bite:	Date:	Epid Week:
Place of Bite: (For mapping purpose: **MUST fill**)	Division/District: _____ Locality:_____ Event Address: _____ _____ GPS reading: Latitude:_____ Longitude:_____	

C. HISTORY OF TREATMENT		
Treatment obtained: *Choose one	( ) Yes ( ) No If YES where: Hospital / Health Clinic / Private Clinic or private hospital*	
Treatment date:		
Name of Health facility:		
Treated as: *Please tick (√)	Outpatient ( ) Inpatient ( )	
IM Anti Tetanus Toxoid (ATT) injection	( )Yes ( )No	
The wound was cleaned with running water and soap for 15 minutes as soon as the bite occurred	( )Yes at home ( ) Yes at hospital/clinic ( )No	
Indicate the location of the bite on the body:	 Posterior Anterior Lateral	
Risk category (**MUST fill**)	**( ) Category 1**	Touch, feeding animal, licks on skin without wound.
	( ) Category 2	Nibbling of uncovered skin, minor scratches or abrasion without bleeding, licks on broken skin.
	( ) Category 3	• Single or multiple transdermal bites or scratches, contamination of mucous membrane with saliva from licks. • Bitten by abandoned or stray animal.

D. OBSERVATIONAL OF EARLY SIGNS:	
Early Signs & Symptoms *Please tick (√)	( ) Fever ( ) Pain or numbness or tingling at bite site ( ) Fatigue ( ) Headache ( ) Cough ( ) Runny nose ( ) Others:_____ (Please state)
E. STATUS OF THE ANIMAL THAT BIT	
Type of Animal that bit: *Please tick (√)	( ) Dog ( ) Cat ( ) Others (Please state):_____
Animal that bit: *Please tick (√)	( ) Pet and does not mingle with stray animal ( ) Pet that mingles with stray animals ( ) Abandoned (including unknown status)
The current status when the animal: *Please tick (√)	( ) Alive more than 14 days after biting ( ) Dead within 14 days after biting ( ) Unknown State cause of death _____
F. REMARKS & ACTION BY INVESTIGATING OFFICER	
Notification to Department of Veterinary Services: ( ) Yes (Date of notification:_____(Refer Annex 1) ( ) No	
Other remarks/action:	
Name & Post:	
Office Address:	
Official Stamp & Signature:	Date:

ANIMAL BITE ALERT CARD

IF YOU ARE EXPERIENCING THE FOLLOWING SYMPTOMS AFTER ANIMAL BITE, PLEASE COME TO HOSPITAL/CLINIC IMMEDIATELY

Early symptoms of human Rabies infection

These signs usually occur on the 20th till the 60th day after animal bite. However, these signs may occur as early as several days after dog bite.

- Pain, numbness, tingling and ache at place of bite
- Fever
- Muscle fatigue (tiredness)
- Headache

Late symptoms which occur when virus attacks central nervous system

- Anxiety
- Nervousness
- Sudden change of behaviour
- Confusion
- Fear of water (hydrophobia)
- Difficulty of swallowing (dysphagia)
- Insomnia
- Paralysis

Annex 6

DAILY / WEEKLY / MONTHLY REPORT
DOG / WILDLIFE BITE CASE
DISTRICT HEALTH OFFICE _____

A. Dog bite case incident

(1) Incidence of dog bite cases reported

No.	Item	Total
1a.	No. of bite cases reported (current)	
1b.	No. of bite cases reported (previous report)	
2a.	No. of bite cases seek treatment at outpatient department (current)	
2b.	No. of bite cases seek treatment at outpatient department (previous report)	
3.	No. of bite cases received Rabies vaccine injection (current)	
	3a) 1st dose (Day 0)	
	3b) 2nd dose (Day 3)	
	3c) 3rd dose (day 7)	
	3d) 4th dose (Day 14 or 21 or 28)	
4.	No. of bite cases admitted in ward (current)	
5.	No. of bite cases taken Rabies test (current)	
6.	No. of bite cases confirmed positive Rabies (current)	
7.	No. of bite cases dead (current)	

Date/Week Epid: _____

(2) Cumulative dog bite cases from _____ to _____

No.	Item	Jumlah
1.	No. of cumulative dog bite cases reported Cumulative bite cases in previous report = (1a + 1b)	
2.	No. of cumulative dog bite cases seek treatment at outpatient department Cumulative bite cases in previous report = (2a + 2b)	
3.	No. of cumulative dog bite cases received Rabies vaccine injection	
	3a) 1st dose (Day 0)	
	3b) 2nd dose (Day 3)	
	3c) 3rd dose (day 7)	
	3d) 4th dose (Day 14 or 21 or 28)	
4.	No. of cumulative bite cases on follow-up Rabies (PEP)	
5.	No. of cumulative bite cases completed follow-up Rabies (PEP)	
6.	No. of cumulative bite cases admitted in ward	
7.	No. of cumulative bite cases taken Rabies test	
8.	No. of cumulative bite cases confirmed positive Rabies	
9.	No. of cumulative bite cases dead	

(3) Information on cumulative cases admitted in ward
(Probable/Suspected/Confirmed Rabies)

NO.	NAME	F/M	AGE	DIAGNOSIS	VILLAGE	DATE OF ADMISSION	DATE OF DISCHARGE/ DEAD	WARD	PROGRESS

B. CONTROL MEASURES ACTIVITY / HEALTH EDUCATION

5.10.1.1.1.1.1 Active Case Detection (ACD)

No.	DISTRICT	NUMBER OF TEAM	LOCATION		NO. OF HOUSES	NO. OF POPULATION
1	_____		1			
			2			
2			1			
			2			
			3			
			4			
3			1			
			2			
			3			
		TOTAL				
		CUMULATIVE				

5.10.1.2 List of health education on Rabies implemented

No.	Health Education Activity	District:_____			
		Current		Cumulative	
		Session	Attendance	Session	Attendance
1	Talk				
2	Individual consultation				
3	Pamphlets distribution				
4	Dialogue				
5	Video show				
6	Small group discussion				
7	Poster / Fish tail / Banner				

5.10.1.3 No. of cases referred to Department of Veterinary Services (DVS)

	Current	Cumulative
Number of bite cases faxed to State DVS		

C. RABIES VACCINE / RABIES IMMUNOGLOBULIN (RIG) INFORMATIO

a) Vaccine:

Date	Name of Facilities	Balance remaining	Additional quantity	Used quantity	Balance	Notes			
						1st dose	2nd dose	3rd dose	4th dose
TOTAL									

Cumulative of vaccine used:

b) Rabies Immunoglobulin (RIG):

Date	RIG type	Original quantity	Additional quantity	Used quantity	Balance
	Human				
	Equine				
	Total				

Cumulative of RIG used:

D. OFFICER COMMENT

Prepared by:
Name :
Position :
Date :
Time :

Checked by :
Name :
Position :
Date :
Time :

Confirmed by :
Name :
Position :
Date :
Time

Annex 7

Submission of Animal samples to the Laboratory

A. Laboratory Submission Information Form (MAKVET 5A)

Full background information about the rabid animal must be filled completely in the submission form MAKVET 5A. All animal-bite cases must be clearly stated in the column provided to differentiate from routine submissions. Each sample (head) should be properly labelled and accompanied by an individual form (One head one form).

B. Specimen Preparation

If the clinical history is suspicious of rabies, extra precaution should be taking if the animal is alive please observe it for 14 days before autopsy is done. Suspected rabid animal should be terminated in the most humane way as possible if the animal has to be shot or killed try to avoid hitting the head as it may damage the brain. Extra precaution should be taken to prevent contact with saliva and other body fluids. The following procedures should then be adopted: -

(i) The head should be removed on a solid surface/table preferably raised whereby disinfection can easily be carried out.

(ii) The head should be decapitated at the atlanto-axial joint.

(iii) The head should be cooled down promptly and kept cold (4°C)

However, it should not be frozen.

[Note: Although freezing the specimen in dry ice during transit or in liquid nitrogen flasks will preserve the virus, a prompt microscopic examination may be delayed because of the time necessary to thaw the specimen]

(iv) All natural openings that include the mouth, nostrils and ear orifices should be stuffed with formalinised cotton of cloth to prevent spillage of fluids.

(v) Each head should be put into a suitable watertight container that can be closed tightly. If a plastic bag used, choose a thicker

one and ensure that is tis properly tied with a rubber-band. This in turn should be put into larger watertight container, where cracked ice is packed between the inner and outer container. The package should be clearly labelled and accompanied by the duly filled MAKVET 5A from. The package is then put into a specially design metal box and shipped to the Veterinary Research Institute, Ipoh, Perak with the fastest possible courier. The metal box should be labelled as below.

AWAS! BAHAN BIOLOGIK MERBAHAYA
Jika Bekas rosak
Sila Telefon Segera 05-5457166/87
Institut Penyelidikan Haiwan, Ipoh
[Bahan perlu disimpan pada 4C]

C. Procedure for preparation of brain sample for rabies examination [To be done only by personnel at the approved laboratories]

(i) The person/persons opening the animal's head should be vaccinated against rabies (currently immunised) and properly attired that include wearing of lab coat, plastic apron, double rubber gloves, mask and rubber boots

(ii) The head should be dressed completely of its skin and muscles to facilitate sawing.

(iii) The brain is exposed by a hack-saw. Firstly, a transverse incision through the frontal plate just above the eyes is made. Another incision is made at the foramen magnum and sawing anteriorly to the frontal bones (longitudinally) on each sides of the skull

(iv) The skull is lifted off to expose the brain. The head is tilted upside down and with a scalpel or scissors reaching back into the posterior portion of the brain, is thus severed from its attachments. The entire brain is lifted out of the cranium onto a plastic chopping board.

(v) The brain is cut into half, with one half placed in a container with 10% formalin and the other half placed in a container (plastic

bag) containing ice and submitted as a fresh specimen. Formalinised sample should not be placed in a container containing ice [Water crystals formed with formalin will destroy the brain cellular morphology]. Fresh specimen should be kept in ice and transported immediately to the Veterinary Research Institute, Ipoh, Perak for laboratory examination.

(vi) Any injury or cuts sustained during the preparation of specimen should be attended to immediately by washing with water and detergent/ disinfectant and post-exposure treatment should be instituted promptly.

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Rabies: One Health, Zero Deaths