

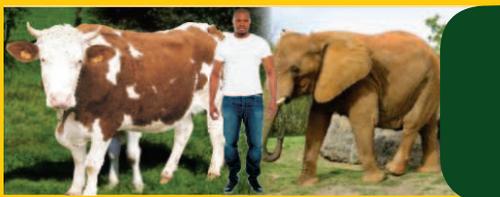
# Epizootiology and Animal Health in West Africa



## RABIES SURVEILLANCE AS A ONE-HEALTH MODEL

Volume 9 (1)

January - June 2013



[www.vardsolutions.com](http://www.vardsolutions.com)

# VARF

VetAcademic Resource Foundation

# **VARF**

VetAcademic Resource Foundation

---

## **Epizootiology and Animal Health in West Africa**

---

**Volume 9 (1)**

**January - June 2013**

---

Epizootiology and Animal Health in West Africa is a peer-reviewed scientific journal that provides a home for high quality work which covers the areas of geographic information systems in veterinary science, ecology, epizootiology, exposure science, preventive medicine, spatial statistics and zoonoses surveillance. The journal focuses on answering epizootiological questions where citizen science, spatial and temporal approaches are appropriate. The methods should help to advance our understanding of infectious and non-infectious diseases in animals and humans in the sub-region.

<b>Editor-in-Chief</b>	Gabriel O Esuruoso
<b>Associate Editor-in-Chief</b>	Albert B Ogunkoya
<b>Honorary Members</b>	Fahn-Boah G Dakinah - Liberia Dawda K Jawara - The Gambia
<b>Managing Editor</b>	Babasola O Olugasa
<b>Scientific Advisory Board</b>	Daniel F Adene - Nigeria Christopher A Adeyefa - Nigeria Festus D Adu - Nigeria Samuel A Agbede - Nigeria Stephen O Akpavie - Nigeria Jonathan Amakye-Anim - Ghana George K Aning - Ghana Richmond Aryeeteh - Ghana Joseph A Awun - Ghana Danelle Bickett-Weddle - United States of America Esi Colecraft - Ghana Kwasi B Darkwa - Ghana Ighodalo F Ijagbone - Nigeria Olayinka O Ishola - Nigeria Saidu Kanu - Sierra Leone Solomon O Odemuyiwa - United States of America Johnson F Ojo - Nigeria Jorge A Saltijeral - Mexico Olalekan J Taiwo - Nigeria Martin MJM Tielen - The Netherlands Oyewale O Tomori - Nigeria Paa K Turkson - Ghana
<b>Associate Editors</b>	Benjamin O Emikpe Ayotunde J Fasunla
<b>Business Manager</b>	Oloruntoba A Olodun

**Administration** VetAcademic Resource Publishers and Consultants and the Epi-Informatics Unit, Centre for Control and Prevention of Zoonoses, Department of Veterinary Public Health and Preventive Medicine, 101 Faculty of Veterinary Medicine, University of Ibadan, Ibadan, Nigeria  
ccpz@ui.edu.ng

Publications of the VetAcademic Resource Publishers and Consultants are protected by international copyright law. Written permission must be granted by the Editor, Epizootiology and Animal Health in West Africa to copy extracts from this journal.

# Epizootiology and Animal Health in West Africa

Volume 9 (1), January - June 2013

---



## VARF

VetAcademic Resource Foundation  
2, Olalere Tokun Street  
U.I.P.O. Box 14400, Ibadan  
200002 Oyo State, Nigeria  
Tel. +234 708 784 5376  
eahwa@vardsolutions.com

- Francois -X. Meslin**  
Human and dog rabies control: regional and global perspectives 2
- Harrold L Russel**  
Emergence of Rabies in West Africa strategic partnership to improve the surveillance and control of a neglected zoonosis 5
- George W Beran**  
Rabies elimination as a one-health model for the tropics 8
- Gabriel O Esuruoso**  
Systematic epizootiology: foretaste of a legacy to preventive veterinary medicine in Ibadan, Nigeria 15
- Bolanle Wahab**  
Indigenous knowledge and practices associated with rabies in Oyo state, Nigeria: imperative for global health training at the University of Ibadan 22
- Babasola O Olugasa and Ayotunde J Fasunla**  
Rabies surveillance programme and CCPZ inclusive learning model for addressing one health educational challenge in West Africa 38
- Helen O Nottidge, Adetola R Ajadi and Temitayo O Omobowale**  
Importance of rabies related viruses in the epidemiology and control of rabies in Nigeria 52
- Ishaya S Tekki, Philip A Okewole, Stephen P Ekong, Peterside Kumbish, David Shamaki and Mohammed S Ahmed**  
Control of rabies and rabies related viruses in Nigeria: perspectives from the National Veterinary Research Institute, Vom, Nigeria 59
- In memoriam*  
**Gabriel O Esuruoso, BVMS, MRCVS, PhD, FCVSN, 1932 - 2013**  
The dynamic veterinarian and One Health doyen in Nigeria 70

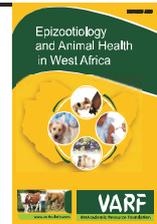


VetAcademic Resource Foundation

contents available at VARD Solutions

## Epizootiology and Animal Health in West Africa

Journal homepage: [www.vardsolutions.com/eahwa](http://www.vardsolutions.com/eahwa)



# Human and dog rabies control: regional and global perspectives

Francois -X. Meslin

## Summary

Rabies is widely distributed across the globe, with only a few countries (mainly islands and peninsulas) being free of the disease. Rabies is a neglected disease of poor and vulnerable communities. The major reason why this tragedy is still going on today is that rabies is a disease which often affects people whose deaths are not heard about and not accounted for. This, in turn, prevents setting up measures that would avert human disease occurrence through proper management of suspect rabid animal bites and conduct activities for the control and ultimate elimination of dog rabies. It also prevents mobilizing resources from the international community to the goal of human and dog rabies elimination.

**Keywords:** Control, dog, human, neglected disease, rabies.

Department of Neglected Tropical Diseases,  
World Health Organization Avenue, Appia, 20,  
1211 Geneva 27, Switzerland.

E-mail: [meslinf@who.int](mailto:meslinf@who.int)

Tel.: +41 22 791 2575

## Persistence of rabies as an endemic zoonotic disease

Canine rabies is predominant in most of the developing world where the greater burden of human rabies also falls. It is estimated that approximately 55 000 people die from dog-mediated rabies annually (Burki, 2008). Human rabies deaths following contact with wildlife species including bats are rare compared to those caused by dog-transmitted rabies which mostly occur in Asia and Africa (Burki, 2008; Belotto *et al.*, 2005).

## Regional efforts so far

There are marked variations from region to region and also country to country regarding the impact of dog mediated rabies and the intensity of control activities: In Latin American countries, a PAHO dog rabies control programme initiated in 1983 has eliminated human and dog rabies from most urban areas. The number of human bat transmitted rabies cases has been increasing in Latin America in the past 10 years. In the USA and Canada (Belotto *et al.*, 2005), rabies is present in various wildlife reservoirs species and large scale activities for the control of rabies in skunks, raccoons, dogs

and coyotes are ongoing there. On average, two indigenous human rabies deaths are reported annually in this part of the world and most follow contact with insectivorous bats. Most African and Asian countries however report the presence of human and dog rabies in all or large parts of their territories. Africa and Asia are bearing most of the global public health burden of rabies with most human deaths due to rabies originating from there.

There are only a few well-coordinated human and dog rabies control projects underway in Africa. Rabies is under control in Morocco and Tunisia. In sub-saharan Africa, South Africa and Tanzania are working to eliminate rabies from pilot areas with the support of the Gates Foundation and WHO (WHO, 2013a). A project for dog rabies elimination in D'jamena, Chad benefits from the support of the Swiss Public Health and Tropical Institute and the Optimus Foundation. Two networks of African rabies experts are meeting on a regular basis: one for South Eastern African countries (South Eastern Rabies Group: SEARG) and one for francophone western African countries (African Rabies Expert Bureau: Afro-Reb). The next SEARG meeting will be held 12-14 February (2013) in Dares Salaam, Tanzania.

In Asia, progress is evident in Thailand and Sri Lanka. In Indonesia, however, dog rabies has spread eastwards to a number of islands since the late 1990s including Bali in 2008. In China, dog rabies has re-emerged since 1996 with a peak at 3300 suspect rabies deaths report-

-ed in 2007 and about 2000 in 2011.

In western European, dog rabies was eliminated in the early part of the 20th century and during the past 15 years, fox rabies has been eliminated through oral vaccination campaigns. Wildlife rabies is still reported in many countries of Eastern Europe. Fox and dog rabies are present in many countries of south-eastern Europe.

For many years, the World Health Organization has been denouncing and combating this "cycle of rabies neglect" and through advocacy and promoting the use of new tools, it has contributed to breaking that cycle. For example, brain tissue vaccines have been replaced by cell culture vaccines and intradermal route for PEP is being more widely used in quite a number of countries. WHO is also promoting the establishment of effective laboratory-based surveillance systems so that rabies mortality is not only estimated from disease modelling and/or on off surveys, or based on reported suspect clinical cases only.

### **Efforts towards Control**

---

Rabies is a vaccine preventable disease in humans and animals. Safe and efficacious human and veterinary vaccines have been developed and are becoming increasingly accessible to those in need although their costs remain high for most victims taking individually or for the Ministries of health in countries whose policy is to provide them for free. In many places where dog rabies is endemic, people remain insufficiently aware of the rabies risk and ways for its prevention.

Health care personnel are not always informed about the importance of wound washing and flushing and sometimes unaware of the recommended regimens for post-exposure prophylaxis [(WHO, 2013b). Finally, veterinary services in many countries are not interested or not strong enough to conduct dog rabies control activities at a level which would allow breaking the cycle of transmission from dog to dog and onwards to humans.

## References

---

- Burki T. (2008) The global fight against rabies. *Lancet*;372:1135-1136
- Belotto A, Leanes LF, Schneider MC, Tamayo H, Correa E. (2005) Overview of rabies in the Americas. *Virus Research*;111:5-12
- WHO (2013a). Dog rabies vaccine bank in KwaZulu-Natal to accelerate mass immunization of dogs. Available online, [http://www.who.int/neglected\\_diseases/rabies\\_dog\\_vaccine\\_bank\\_2013/en/](http://www.who.int/neglected_diseases/rabies_dog_vaccine_bank_2013/en/)
- WHO (2013b). Rabies. Facts sheet No. 99. Available online, <http://www.who.int/mediacentre/factsheets/fs099/en/#>

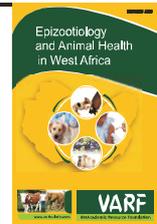


VetAcademic Resource Foundation

contents available at VARD Solutions

## Epizootiology and Animal Health in West Africa

Journal homepage: [www.vardsolutions.com/eahwa](http://www.vardsolutions.com/eahwa)



# Emergence of Rabies in West Africa strategic partnership to improve the surveillance and control of a neglected zoonosis

Harold L. Russel

## Summary

A forum to coordinate regular meeting among governments and stakeholders in one-health was inaugurated in December, 2012 to link Anglophone and Francophone West African countries in the surveillance and control of rabies. It is essential to describe the process that made this possible and key facilitators, especially during the critical planning years from its conceptualization at the Rabies in the Americas (RITA) conference held in Quebec, Canada in 2005, to commencement at the University of Ibadan, Nigeria with the first conference on Rabies in West Africa (RIWA), jointly hosted by Nigerian Federal Ministry of Health and the University of Ibadan Centre for Control and Prevention of Zoonoses. This article presents the RIWA concept and its progression up to the inauguration in 2012.

**Keywords:** Concept, network, rabies, surveillance, West Africa.

*Department of Public Health, Saint Georges University, Granada, Trinidad and Tobago, The West Indies.*

*E-mail: russ102w@aol.com*

*Tel.: +1-610-583-2200*

## Introduction

Rabies is a zoonotic viral disease of mammals most often transmitted to humans via the bite of an infected animal. It manifests as acute meningo-encephalitis that ends in death. It is vaccine preventable in domestic animals, including dogs and cats and also in people and it satisfies all of the World Health Organization's requirements for diseases that are considered priority for control. In spite of this, and the WHO estimate of 70,000 human deaths per year, with a disproportionate number of these children, control of rabies is considered low priority by most national health agencies. Africa follows Asia as the second highest continent impacted by rabies with 24,000 cases registered per year. This number has been estimated to be under reported by as much as a factor of six.

The failure of control programs may be attributed to inappropriate and ineffective control strategies such as dog culling, lack of domestic dog vaccination programmes, lack of relevant public education effort and insufficient funding. In addition there are many challenges, including epidemiological, operational, socio-cultural and legal.

## Epidemiological

- Number of dogs unknown
- Weak surveillance and data collection

## Operational

### Insufficient veterinary and human medical resources and infrastructure

- Lack of laboratory diagnostic capacity
- Insufficient knowledge of dog ecology
- Lack of human and veterinary professional personnel
- Lack of interaction and communication between human and veterinary practitioners, researchers, academicians, public and private sectors
- Lack of human and animal treatment facilities

## Socio- Cultural

- Religious beliefs
- Traditional healing and healers
- Perception of disease acquisition and transmission
- Wound management Perception of vaccination Legal
- Lack of clear and applicable laws and regulations
- Lack of enforcement of those laws and regulations that have been legislated

## Development of the concept

In the late 80's or early 90's, the Americas (North, South, and Central America) came together as the Rabies in the Americas organization (RITA), an international group of people interested in advancing knowledge, prevention and

control of rabies in spite of cultural, language, professional and political differences. RITA has met annually since 1990 and provided an opportunity for interdisciplinary, "one health, one medicine" attitude in addressing the impact of rabies on wildlife, agriculture, and human health and especially in eliminating the deaths of people from rabies due to domestic dog exposure (RITA, 2012).

In my opinion, RITA was a catalyst which helped to spear head many countries in the Americas to implement successful programmes directed towards the eradication of canine associated human rabies such that by 1995, 19 out of 21 capital cities in Latin America were domestic dog rabies free and the number of human cases followed the dog rabies cases and declined by 90%. Approximately 4 million dogs are vaccinated annually (Belotto *et al.*, 2005).

These successful programmes were dependent on sustained local political commitment and finances for dog rabies control programmes, strengthened surveillance data, implementation of new diagnostic technologies, understanding of local dog population dynamics, strengthened professional cooperation and adjunct medical coordination (which is a "one health, one medicine" concept).

The initiative to extend the experience and activities of RITA to West Africa was proposed at the 2005 RITA Quebec, Canada conference. The challenge was accepted and activities initiated. Between then and now, efforts have extended to include United States Centers for Disease Control and Prevention (CDC), with Dr. Charles Rupprecht, director of the rabies group assigning Dr. Modupe Osinubi

and Dr. Sergio Recuenco to join the organizing effort. Dr. Osinubi recruited Dr. Albert Ogunkoya of Nigeria and he immediately embraced the concept and committed Nigeria to sponsoring the initial conference. He pursued this effort doggedly.

Meetings were held at the RITA conferences in Mexico (2010), Puerto Rico (2011) and Brazil (2012). African nationals were recruited at these venues and plans were conceived. Saint Georges University, Department of Public Health, Granada, West Indies agreed to coordinate the project and seek and manage funding. An Inter-African National group was created and meetings were scheduled but funding could not be found for these.

### Actualization of the concept

---

The University of Ibadan and the Nigerian Ministry of Health agreed to sponsor inaugural conference, got adequate funding, created a working committee which successfully put together this conference in a very short time under the leadership of Dr. Babasola Olugasa, Mrs. O. A. Sanni-Adeniyi and Professor Albert Ogunkoya.

There are lots of names which have gone unmentioned in pursuing this effort. For

this, I apologize but I am hopeful that we will over time mention them and their input. Against this background and representing those mentioned, I welcome you to the inaugural and the first of what we hope to be the annual Rabies in West Africa (RIWA) conference; a vision whose time has come. We ask that you embrace the conference, enjoy the social activities, learn from the presentations, forge new friendships, contacts and collaborations. Each of you is charged with using your influences to encourage your respective countries to recognize and respond to the impact of rabies in your community, and to influence them to recognize and support RIWA. We hope that you organize and gain support to hold future RIWA conferences in each of your respective nations.

### References

---

- RITA (2012) Previous meetings: Rabies in the Americas. Available online at Rabies in the Americas domain. <http://www.rabiesintheamericas.org/previousmeetings>
- Belotto A, Leanes LF, Schneider MC, Tamayo H, Correa E. (2005) Overview of rabies in the Americas. *Virus Research*; 111:5-12

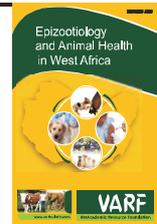


VetAcademic Resource Foundation

contents available at VARD Solutions

## Epizootiology and Animal Health in West Africa

Journal homepage: [www.vardsolutions.com/eahwa](http://www.vardsolutions.com/eahwa)



## Rabies elimination as a one-health model for the tropics

George W. Beran

### Summary

This presentation focussed on canine strains in tropical Africa and Asia with the highest occurrence of rabies deaths in people and dogs. The questions which follow will be addressed in the presentation. Rabies in dogs has been essentially eliminated in Western Europe, the United States and Canada. Programmes are succeeding in South America and Australia: What and why? Why should emphasis be placed on human exposure through dog bites and on fatal human cases of rabies? Laboratory confirmation of exposure to rabies is infrequently done in Asia or Africa. How can it be performed and why is it important? What should be done to prevent exposure or once exposure has occurred? How should the source of rabies exposure in people be identified? How can the source be located? Is laboratory confirmation of rabies sources important? What should be done and why? Should the transmission of rabies to people be considered a "One Health" disease and why? If the outbreak of rabies in dogs is identified as the source of the human rabies, is it important to do anything, or if so, what?

What should be the role of veterinarians in the prevention of rabies in dogs? Should vaccination of dogs be performed only where dogs have bitten people? Or exposing other dogs? Should the vaccination of dogs be universal, no matter how much it costs? Are there dogs or populations of dogs which should be removed from Nigerian communities, and if so, how and why? Are wandering dogs looking for food around communities classed as rabies risks, and what needs to be done? If the population of dogs in a community is stable and no rabies is reported, is vaccination required? In vaccinating dog populations, what percentage of the population should be vaccinated, and realistically, how often and how should vaccinated dogs be identified? If community residents will vaccinate the dogs, how should they be trained and supplied, and how should they be protected? How should the public be educated before and during community rabies elimination? When rabies elimination has been undertaken in a community, how should it be evaluated?

*Distinguished Professor Emeritus, Department of Microbiology and Preventive Medicine, College of Veterinary Medicine, Iowa State University, Ames, Iowa, United States of America  
Email: [gberan@iastate.edu](mailto:gberan@iastate.edu). Tel.: 515-294-7630*

**Keywords:** Elimination, model, one-health, rabies, tropics.

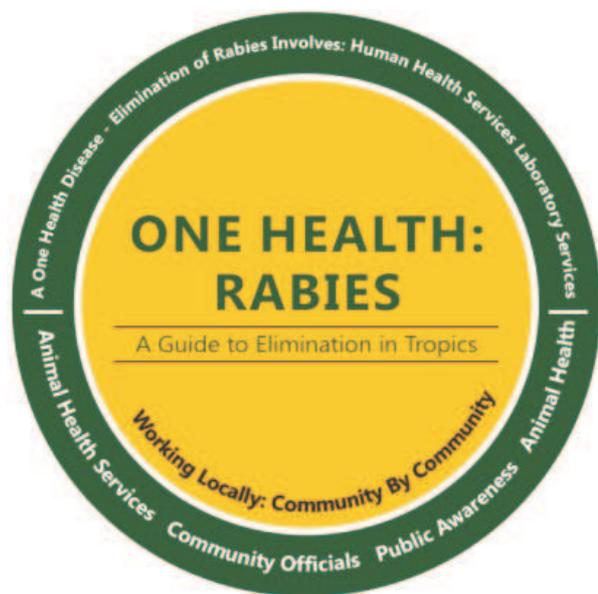
## Introduction

As Veterinary Medicine and Human-Medicine provide medical care to animals and humans they have the potential to provide for a better world through one Health. An appropriate example is in rabies eradication. Canine and human rabies are still a reality in several countries in Asia and Africa. Control programmes successfully applied in USA, Europe, Japan and some Central and South American countries are found not to be effective in the developing countries of Asia and Africa.

Government priorities, population density and cultural practices all necessitate different approaches. In the Philippines where I worked for many years, vaccination of dogs became a local government priority when there were seven human deaths from rabies and an elected government official's son was bitten by a rabid dog.

An understanding of **cultural practices** is essential. In countries where systematic dog vaccination is in place, owners routinely vaccinate their pet dogs at their own expense. Not so in many countries. For example, in the Philippines, many keep dogs to guard their property. If a would-be burglar thinks the dog may be a transmitter of rabies, the robber is not likely to approach that house. Hence, dog owners need to be convinced to vaccinate their dogs. So, in planning a public health campaign such as rabies vaccination, authorities knowledgeable about cultural practices need to be on the planning team as do medical doctors, government officials, laboratory personnel, and of course, veterinarians.

In the Philippines, I led a team to successfully eradicate rabies (Armbulo *et al.*, 1972; Beran and Frith, 1988). It was a complicated challenge necessitating careful utilization of professionals from several different disciplines. We knew it would not work to just announce a dog vaccination programme. We utilized rural sociologists, schools, radio programming, government support, private and public medical personnel veterinarians and laboratory diagnosticians. This scheme was later successfully applied in several countries in Central and South America. I will give some detail illustrating the role of the professionals involved in rabies elimination. This can also be effectively applied and adapted in the control of other diseases.



**Figure 1**  
Illustration of the case in the Philippines

### The role of the professionals involved in rabies elimination

The following are steps toward a rabies control programme and effective eradication. Educators were involved in

designing the education campaign. Physicians examined residents who had been bitten. Physicians required those who had suffered bites to identify the location and owner of the offending dog. Following the examination, the medical doctors who had diagnosed and treated citizens in the clinic or hospital reported to community health officials. Medical care of the patients was assured and post-exposure vaccination was promptly provided to protect from progression to human rabies. Other persons exposed to the positive rabid animals were also provided human vaccination. The positively confirmed human patients were hospitalized and provided possible relief and pre-fatal care.

Prior to the vaccination campaign, laboratory examination of the dog brains by fluorescent antibodies for rabies infection was routinely conducted by laboratory technicians in Silliman University Laboratory. Once confirmed, the owners, victims and professionals were informed. Physicians administered post-exposure human vaccine. Canine rabies vaccine was being produced under licence. It was used to immunize 250,000 dogs in the southern part of the Philippines in the province of Negros Oriental, and in other areas. Rather than just announcing the vaccination programme and the location of the clinic, rural sociologists advised that we would have to go door to door to vaccinate to reach 80% of the dogs. That meant training the vaccinators as to the importance of reaching all the dogs and getting their commitment to be thorough and accurate. In some cases, that meant walking miles carrying the insulated boxes of vaccine and equipment.

All dogs were vaccinated whether they were owned or were roaming dogs. Those that could not be caught and held were eliminated. Laboratory confirmation was conducted in any area of suspect dogs. Permanent control required vaccination every two years. It was the **coordinated effort of these various professionals, the one-health concept** that successfully eradicated rabies in dogs in that large area.

### **Rabies elimination is a 'One-Health' action**

---

It begins with the assessment of the presence of the virus in human and animal exposures with prevention in people and animals. Basic programmes require that urban area by area and rural community by community surveys and development of stable populations of dogs where all or nearly all are unrestricted. Vaccination of at least 80% of all dogs in urban areas should be carried out where less than one half of the areas are identified as infected, and vaccination of all dogs should be carried out where more than one half of the areas are identified as infected. In rural sectors, vaccination of at least 80% of all dogs in communities identified as infected must be achieved. Dogs are the principal sources of exposure to people and animals in the tropical cities and rural communities. This effort is directed towards urban areas with dogs in residential areas living behind fences or within houses, and toward less restricted urban areas and completely unrestricted rural communities.

### **Approaches**

---

**Type One: Pilot Elimination Projects** was

adopted. Focus was on temperate communities in Western Europe, North America and other countries requiring ownership and restriction of all dogs in communities. Community surveys identify endemic rabies and the high risk of spread of rabies in dogs. Community-wide requirements must be population vaccination and collaring of all resident dogs, fostering stability of all dogs in communities, and preventing entry of any unvaccinated outside dogs, whether wandering or with accompanying owners. Laboratory monitoring of dog populations including vaccination of newly weaned puppies must be continuous so long as rabies outbreaks continue. Pilot elimination projects are expensive in these communities unless owner vaccination and fencing are successful and rabies ends quickly.

**Type Two: Elimination Project** focuses where human exposures and deaths are reported in tropical Asia and Africa. Laboratory tests must be promptly confirmed, especially in animal bites. Team physicians must promptly obtain information from lucid patients or family on locations of exposures and immediately be provided post-exposure prophylaxis or medical attention. Veterinary attention must be made on the site of the exposing animal(s), and prompt laboratory confirmation and extent of the animal outbreak must be made. Veterinary action must remove infected animals, and must vaccinate and collar animals at risk. Maintain stability of the vaccinated dogs and prevent any entry of susceptible dogs. Monitoring must be instituted in and around the outbreak communities and rabies elimination measures be instituted in areas of risk.

Type two projects achieved cooperation by community residents, and limitations followed by the elimination of rabies in dogs is immediately attained and economically continued.

**Type Three: Elimination Project** focuses where reports of canine rabies, either solo cases in entering dogs or multiple cases in resident dogs are occurring. Very promptly confirm the rabies status of the reported dog(s). Special rapid action is needed when multiple attacks on dogs and other animals or on people are happening. Recently in a single episode by a furious rabid dog, 40 people and nine other dogs were exposed to rabies within two hours before it was killed. Quickly remove any confirmed or suspect rabid dogs, and quickly vaccinate and collar all dogs which appear healthy in the outbreak area. Remove garbage and harborage in the communities and maintain stability of the resident dogs. Continue monitoring the dogs not identified as rabies endemic and economically conduct elimination measures only when rabies is laboratory confirmed in communities.

**Type Four: Elimination Project** focus on high risk zones within the rabies elimination areas in tropical communities, essentially woods, wet lands, ethnic populated lands, and all of the farming communities in the rural areas. Laboratory tests in all these areas; perform active controlling wherever rabies is found in the local and commonly mobile dogs; and stabilize the dog populations so far as feasible. Rabies vaccination is usually affordable only where rabies is laboratory confirmed, and only monitoring can be conducted over

the broad areas. Please report the rabies pilot projects types One through Four as soon as possible to guide the future.

### **Identification of Human Exposure**

---

Human exposures to rabies are nearly all by dog bites in the tropical cities and rural communities. There is a major need for prompt wound cleansing and tracing the source of the bite. It is very important to identify whether there are multiple people and multiple animals bitten. If this can be done, the biting dog may be confined or euthanized and tested for rabies. Prompt post-exposure prophylaxis may be given.

- **Signs in Canine Patients**

The canine patients with rabies often have difficulty swallowing, including their saliva. Their hind legs grow weak and are unable to hold them up. They may die quietly or may charge and attack. Veterinary confinement or euthanasia is essential. No one, children or adults should take chances of exposure.

- **Laboratory and Clinical Diagnosis**

Laboratory testing of suspected rabid dogs is essential. The fluorescent antibody microscopic test is very definite. Negri body testing, mouse inoculation, and confinement and observation are old tests but if they only ones available, the positive tests are accurate. Confinement and observation must be followed by laboratory confirmation if the dog becomes paralyzed or dies. In tropical dogs, the clinical period is commonly 3-4 days or less, making the finalization of diagnosis quite rapid.

### **Vaccination Procedures**

---

For vaccination of dogs in single urban and rural model projects, refrigerated vaccine is readily available. For larger area vaccination programmes, surveys must be completed to prepare vaccines needed for infected urban areas and rural communities to achieve over 80% vaccination of resident dogs, including vaccine for dogs brought in or puppies as they are weaned. Also, vaccine supplies may be purchased or local production may be developed, tested and licensed to vaccinate 80% or more of the dogs in areas and communities identified as infected.

Training for vaccinators, including possible students and veterinary medical staff is needed and the vaccinators must be pre-exposure immunized. Vaccination kits are needed, including insulated containers for use in rural areas. Records must be prepared as dogs are vaccinated and collars may be purchased for vaccinated dogs, or made of coloured plastic tubing threaded with light wire.

Educational programmes must be conducted for adults and children in urban areas and selected rural communities for rabies elimination. Colouring books for school children to take home, colour and share are very effective. Posters of control action should include prevention of exposure and dog vaccination schedules.

Dog vaccination campaigns in urban areas may be privately conducted at the owner's expense by the entire urban dog population clinics where rabies infection or risk are widespread or by urban neigh-