

CHAPTER 1 INTRODUCTION



1.1 Significance

The annual number of deaths worldwide caused by rabies is estimated to be between 40,000 and as high as 70,000 if higher case estimates are used for densely populated countries in Africa and Asia where rabies is endemic. An estimated 10 million people receive post-exposure treatments each year after being exposed to rabies suspect animals and most of the victims are children: 30–50% of the reported cases of rabies and therefore deaths occur in children under 15 years of age. The main route of transmission is the bites of rabid dogs. In more than 99% of all human rabies cases, the virus is transmitted from dogs.¹⁻⁵

The evidence of rabies had first been recorded in Thailand since 1912 and a number of deaths from rabies were officially recorded since 1928. Up to present it is still a major problem in Thailand and in many developing countries. During 1978-1987, the number of deaths was recorded in a large amount; approximately 250 deaths per year (5.5 per million population) and also during 1989-1992 government had paid more attention to the disease. There are several campaigns to control rabies intensively. By this strengthened program, record of 212 deaths (3.8 per million population) in 1989 was dropped to only 50 deaths (0.7 per million population) in 2000. During 10 years, 1991-2000, total deaths from rabies are 839 cases; male 537 cases, female 302 cases (see table 1.1). Particularly in children under 15, there have 43.15%.

On the other hand, it is important that the number of deaths was reduced but a number of postexposure vaccination (PEV) have increased annually from 81,905 cases (1,470 per million population) in 1989 and 340,394 cases (5,501 cases per million population) in 2000 (see table 1.2). It is a huge amount of budget spent for vaccines, which imported from abroad (see table 1.3)

Table 1.1 Reported deaths and death per million population

Year	Male	Female	Subtotal	Death per million
1991	103	68	171	3
1992	68	45	113	1.9
1993	58	35	93	1.6
1994	50	28	78	1.3
1995	51	23	74	1.1
1996	52	25	77	1.3
1997	39	19	58	1
1998	39	18	57	0.9
1999	45	23	68	1
2000	32	18	50	0.7
Total	537	302	839	

Source: Division of Epidemiology, MOPH

Table 1.2 Reported Postexposure vaccination in human

Year	Human vaccination	Per million population
1991	93,641	1652.6
1992	116,222	2011.1
1993	133,963	2296.1
1994	148,142	2506.8
1995	155,483	2581.3
1996	176,118	2929.6
1997	207,808	3417
1998	234,394	3813.4
1999	239,698	3887.3
2000	340,394	5501
Total	1,845,863	

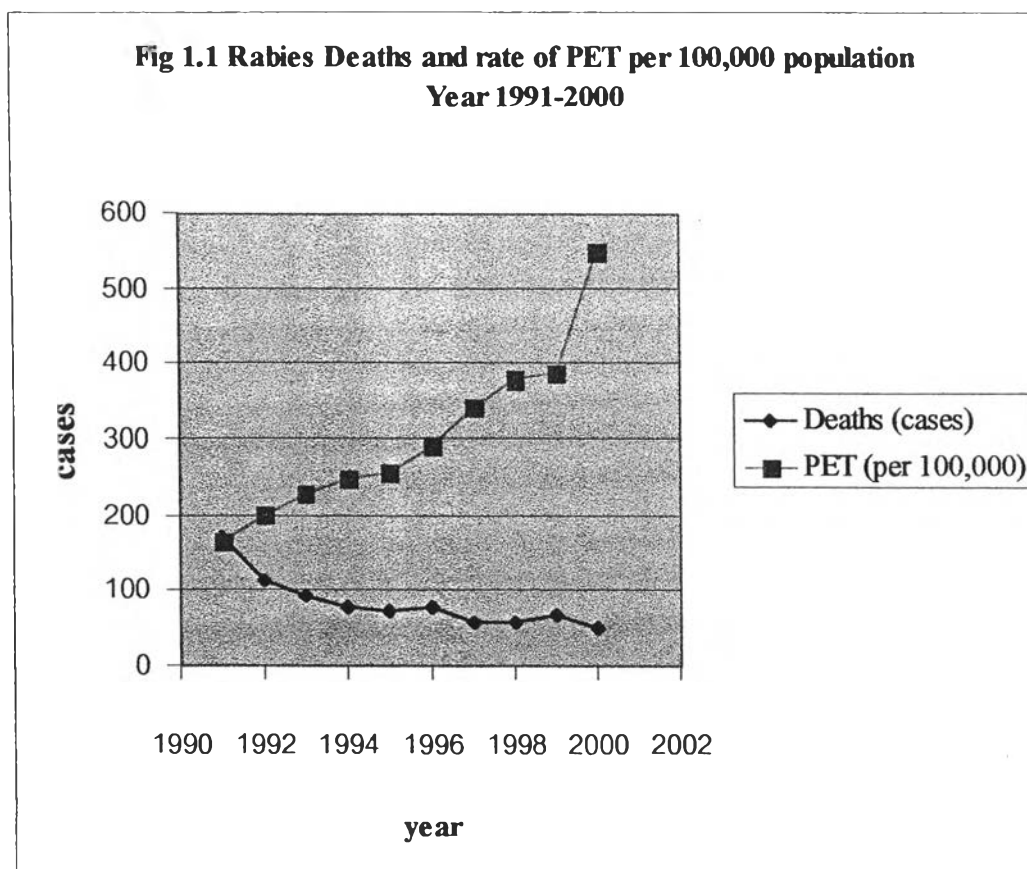
Source: Division of Communicable Disease, MOPH

Table 1.3 Imported value of rabies vaccine and immunoglobulin, 1996-2001
(Currency: million baht)

Year	Immunoglobulin	Human vaccine	Animal vaccine	Total
1996	41.318	121.609	40.451	203.378
1997	15.894	177.616	51.533	245.043
1998	24.842	255.106	63.71	343.658
1999	10.613	233.24	72.545	316.398
2000	51.789	276.677	68.809	397.275
2001	28.419	265.063	76.345	369.827

Source: Division of Drug Control; FDA, MOPH

Comparison of human vaccination and rabies cases was illustrated in figure 1.1.



For the aspect of rabies surveillance, there are 33 diagnostic labs across the country. During 1991-2000, submitted specimens are totally 67,246 specimens, positive for rabies 27,546 specimens (40%). However rate of submission is continuously of decrease (see table 1.4).

Table 1.4 Laboratory diagnosis in animal

Year	Specimens	Positive test	%
1991	12,149	5,263	43.32
1992	10,489	4,643	44.27
1993	9,576	4,263	44.52
1994	8,113	3,781	46.6
1995	6,254	2,937	49.96
1996	4,414	1,858	42.09
1997	3,369	1,115	33.1
1998	4,508	1,314	29.15
1999	4,350	1,208	27.77
2000	4,024	1,164	28.93
Total	67,246	27,546	40

Source: Division of Epidemiology, MOPH

The dog population in Thailand can be categorized into three groups: owned dogs; community dogs (living in public areas and fed by the population) which can be reached by control measures under certain conditions; and ownerless strays which usually escape control programs. According to a dog population survey carried out in 1999 in Bangkok, there were approximately 650,000 dogs living in the area, 20% of which were ownerless. The total estimated dog population was 6.7 million in Thailand in 1995 (13-16 million in Vietnam, 1 million in Cambodia, and 24 million in India).

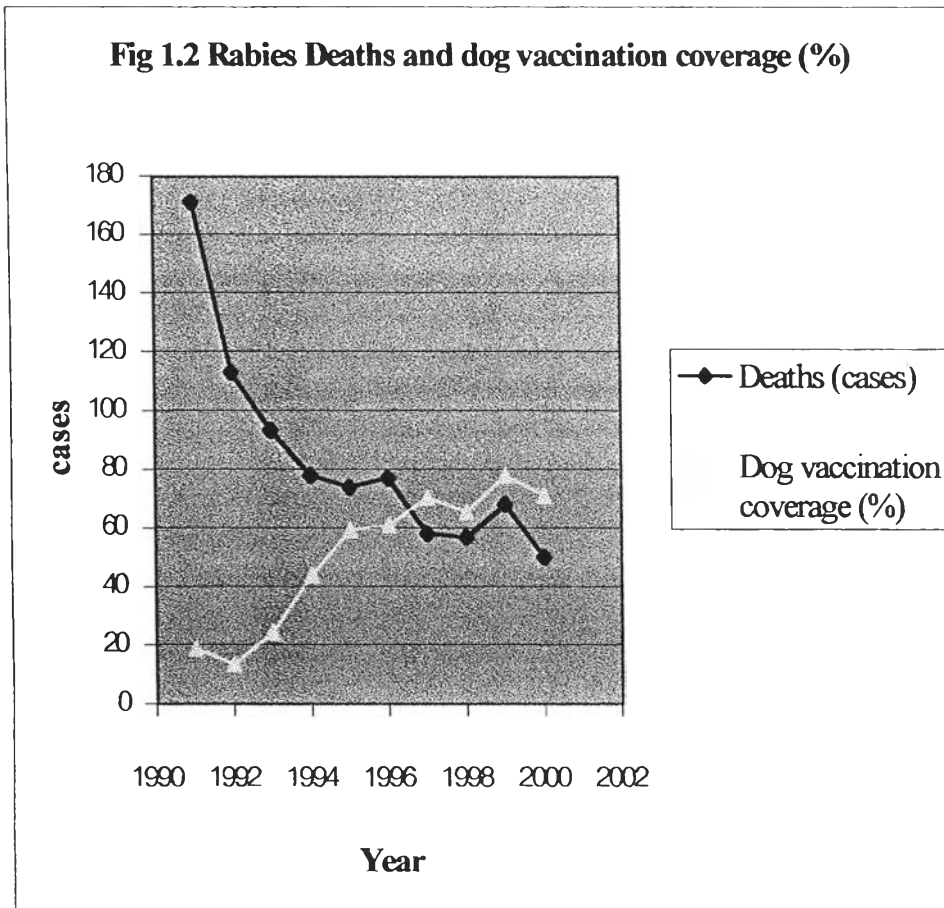
The department of livestock development has claimed that the coverage of immunized dogs in the present is around 70% comparing to 30.41% in the period of 1991-1995 (see table 1.5).⁸ It almost reached the standard guideline by WHO (80%).¹

Table 1.5 Dog vaccination for rabies

Year	Dog vaccinated	Dog population	% Coverage
1991	1,590,449	8,431,830	18.85
1992	1,174,982	8,599,538	13.66
1993	2,128,153	8,680,967	24.51
1994	3,106,210	7,020,535	44.24
1995	4,001,555	6,732,070	59.44
1996	3,614,445	5,899,073	61.27
1997	4,219,034	5,969,409	70.68
1998	3,301,120	5,024,709	65.69
1999	4,604,008	5,883,712	78.25
2000	4,277,939	5,987,195	71.45
Total	32,017,895	68,229,038	

Note: Dog population during 1991-1993 was estimated by ratio people:dog= 1:6.72 (previous study done by Meesomboon V, et al.⁹)

Source: Data during 1991-1994 from Division of Epidemiology, MOPH
Data during 1995-2000 from Division of Disease Control, MOAC



Significantly the relationship of which informed data were can be illustrated as figure above.

In principle, there are 4 main elements to control rabies: ^{1,2,3,5}

1. Promote dog rabies control and elimination

1.1 Increasing dog vaccination coverage to a sufficient number of dogs to break the chain of transmission and free the dog community from disease and

1.2 At frequent enough intervals to boost the immunity in the vaccinated dogs. It has been shown that where 80% or more of a community's dogs are properly vaccinated against rabies, the occurrence of human rabies cases promptly stops.

1.3 Managing dog population

There are 3 recognized practical methods for dog population management; movement restriction, habitat control and reproductive control. Capture and removal of dogs are no longer considered effective directive control measures.

2. Promote human rabies prevention

All exposed persons should have proper treatment, wound care and vaccination. This element has encompassed increasing availability of modern rabies vaccines for human use, improving delivery of modern human rabies vaccines and supporting preventive immunization of certain age group, for example in children below 15.

3. Promote public perception regarding rabies prevention and control

Key activities for public education should include increasing rabies awareness through media activities, fund raising and education program. Public awareness activities should prioritize those most at risk of exposure including; the underprivileged segments of society, school children, animal control workers and veterinarian. In addition, rabies education should extend to medical and veterinary students and professionals, health care providers and politicians.

4. Strengthen rabies surveillance

The first priority is to have strong advocacy for global awareness of rabies. As part of the advocacy process, there is a need to increase rabies surveillance. Therefore rabies should be a notifiable disease and be included in the integrated communicable disease surveillance system. The surveillance data should include human and animal rabies cases plus data on rabies exposures and human postexposure treatments.

Strategies for dog population management and control have to be adapted to the cultural and social aspects of each country or area. In Asia, as in many other parts of the world, dog population reduction policies are extremely unpopular. Several countries, including Indonesia, Malaysia, the Philippines, Sri Lanka, and Vietnam, have ongoing dog control activities, all over their territory or in localized areas. Elimination of ownerless dogs is rarely practised on a large scale in these countries, and usually affects an insignificant proportion of the entire dog population. The conventional approach consists in mass parenteral vaccination of dogs, with efforts to improve vaccination coverage each year. In Malaysia, dog vaccination is carried out within an 'immunity belt' along national borders. In the Philippines, a pilot rabies elimination program is currently being conducted in the Visayas. In Vietnam, the program is focusing on the most heavily populated urban areas (such as Hanoi, Ho Chi Minh City and the Mekong Delta region). In these countries and areas, dog vaccination coverage is estimated to range from 10% to 94%. This wide range illustrates the need to enhance both the efficacy of mass vaccination campaigns and use of reliable methods for evaluating the coverage.

Dog rabies controls remain the only long-term, cost-effective means of eliminating or preventing most human cases. Human public health preventive measures should be paralleled by programs for dog rabies control.

The achievement of rabies control can be observed in many countries.³ Like in Malaysia, in the immunity-belt area compulsory dog licensing and vaccination campaigns are undertaken on an annual basis while destruction of unlicensed and stray dogs is carried out continuously. Therefore, it has a strong regulation on rabies control measures: regulatory measures on importation of dogs and cats; public education on rabies and the quarantine measure.

Some field trial had been carried out in Latin America countries.^{16,17} It is not far from won if all members in society are unanimously to combat the disease. In the 9th national economic and social development plan elimination of rabies at the end of this plan (year 2006) is to be achieved, no death from rabies in Thailand is desired.

This study is carried out due to believe that rabies is preventable and feasible to control in dog as many countries did.³ Some previous studies had been done to estimate expenditure owing to simulated model.^{7,10} The major strategy is to control rabies in dogs as their natural reservoir mostly in Thailand.^{8,12,15} The effort needed, especially budget, can be weighted in monetary term comparing cost and benefit gained from life saved.

1.2 Research Question

Is the intensified-dog control program more benefits than current practice for control of rabies in Thailand?

1.3 General Objective

To estimate incremental cost and benefit of the intensified-dog control program.

1.4 Specific Objectives

1. To analyze cost of PET and cost of dog rabies control (dog vaccination, laboratory diagnosis in animal, and other programs) in Thailand year 2000.
2. To estimate incremental cost of the intensified-dog control program during 2001 – 2003.
3. To estimate incremental benefit of life saved in term of productivity gained during 2001-2003.
4. To make a comparison of incremental cost and benefit of the intensified-dog control program.

1.5 Scope

Using the secondary data of PET and dog rabies control in year 2000 as a basis for estimation. Costs of the program in this study are conducted under the provider perspective while benefits of the program are viewed from societal perspective. But in the sense of incremental cost and benefit, these will not affect the result. With limitation, the researcher does not calculate cost of patient view (i.e. transportation cost, work absent) that actually accrues to cost of rabies control. Human pre-exposure treatment and outbreak control of rabies in community by public health personnel are not included too.

1.6 Definition

1. Guide for postexposure treatment ¹ (source: WHO Expert Committee on Rabies, 1992)

Category	Type of contact with a suspect or confirmed rabid domestic or wild ^a animal, or animal unavailable for observation	Recommended treatment
I	Touching or feeding of animals Licking on contact skin	None, if reliable case history is available.
II	Nibbling of uncovered skin Minor scratches or abrasion without bleeding Licks on broken skin	Administer vaccine immediately. ^b Stop treatment if animal remain healthy throughout an observation period ^c of 10 days or if animal is killed humanely and found to be negative for rabies appropriate laboratory techniques.
III	Single or multiple transdermal bites or scratches Contamination of mucous membrane with saliva (i.e. licks)	Administer rabies immunoglobulin and vaccine immediately. ^b Stop treatment if animal remains healthy throughout 10 days or if animal is killed humanely and found to be negative for rabies by appropriate laboratory techniques.

^a Exposure to rodents, rabbits and hares seldom, if ever, requires specific anti-rabies treatment.

^b If an apparently healthy dog or cat in or from a low-risk area is placed under observation, the situation may warrant delaying initiation of treatment.

^c This observation period applies only to dogs and cats. Except in the case of threatened or endangered species, other domestic and wild suspected as rabid should be killed humanely and their tissues examined using appropriate laboratory techniques.

2. Mass (or herd) immunity

Categorized as an externality that unimmunized dogs will be avoided from diseases and immunized dogs will not spread any diseases. When an immunized dog

was contracted by rabid dogs, rabies did no harm and also rabid dogs would succumb until death by its nature of disease. By this reason rabies will disappear at the end.

3. Postexposure treatment (PET)

This is a method of treatment after being contracted by suspected animal. It should be initiated immediately with contacts of categories II and III. Postexposure treatment consists of local treatment of the wound, followed by vaccine therapy (PEV) (with or without rabies immunoglobulin). Except in this study, costs of PET consist of PEV, rabies patient treatment, treatment for immunoglobulin side effect and laboratory diagnosis in human.

4. Dog vaccination

It is one of methods for rabies control in animal that has been done by injected pre-exposure vaccine to a dog.

5. Laboratory diagnosis in animal

A method of (passive) surveillance, which is to control and monitor rabies disease both human and animal.

6. Other programs

Specifically in this study, the meanings are referred to dog population control, reproduction control, health education and related campaigns for dog rabies control.

1.7 Hypothesis

The strengthened program of rabies control, particularly in dog, is not only rabies can be under control but also more deaths can be avoided and more benefits can be gained.

1.8 Possible benefits

Estimated cost of rabies control, both in dog and human, will be discovered in order to know how to properly deal with rabies problem in Thailand. Either strategy, current practice or intensified program, the significant point is not only using PET alone but also strengthening dog rabies control be implemented intensively together. We will know how much benefit from intensified program comparing to cost to be invested. Nevertheless, externality will be the benefit to our country.