

Rabies incursion into Bali, Indonesia in 2008



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Canine and human rabies cases were confirmed in Bali in late November 2008, following several months of reported outbreaks of unusual dog biting episodes and several human deaths, with clinical signs consistent with rabies. Bali had been historically free of rabies, although the disease is endemic in many other parts of Indonesia. This incursion provides a unique case study into the local spread of rabies in a naive population with no prior public awareness of the disease and the possibility of eradicating rabies from Bali before it becomes endemic. Careful study of the risk factors which were present at the time of incursion should help both Indonesia and Australia anticipate, prepare for and hopefully prevent further incursions elsewhere.

Likely entry and spread

Rabies probably entered the southern Bukit peninsula of Bali in the first half of 2008, via a dog brought on a fishing or trading



Figure 1: Location of confirmed cases in dogs and humans.

boat from one of the nearby Indonesian islands where rabies is endemic. Limited genetic analysis of the virus so far indicates that it resembles those circulating in Sulawesi, Flores and Kalimantan. There are four 'official' harbours on Bali, but also another nine informal harbours where fishing boats regularly land.

A local person bitten by dogs in September 2008 was found to have died of rabies by November 2008 (Table 1). By mid-May 2009 there were 16 confirmed cases in dogs and eight suspected or confirmed cases in humans. Figure 1 shows the location of confirmed cases in dogs and in humans.

Control strategy

The local veterinary authorities had a pre-prepared high level national disease control strategy for a rabies incursion into an uninfected island, adapted broadly from Australia's AUSVETPLAN rabies control strategy. The overall national policy of dog vaccination, dog population control with selective elimination of stray dogs, public awareness and human post-exposure prophylaxis is that recommended by the World Health Organization and the International Animal Health Organisation.

While Indonesia has various provisions for contingency funding of major national emergencies, including zoonotic disease epidemics which are classed as 'non-natural disasters', there was no agreed decision making process to unlock these funds. Immediate funding problems were compounded by the outbreak being detected near the end of Indonesia's financial year. Nevertheless, cooperation between the Health and Agriculture Departments of central, provincial and district governments, as well as emergency assistance from the Australian government, assisted a rapid early response. By the end of January 2009, the Indonesian governments had spent at least \$400,000 and the Australian government had provided \$100,000.

Many practical requirements for this response had to be planned, assembled and implemented at short notice. These included a public awareness program to gain community involvement; anti-rabies vaccination of people to be engaged in dog vaccination and elimination activities; provision of vaccine and consumables associated with dog rabies vaccination and identification of vaccinated dogs; equipping and training the regional veterinary laboratory to carry out direct immunofluorescence testing of suspect dog brains; integration of human and veterinary surveillance and control activities and an information management system allowing epidemiological assessment of progress.

Table 1. Human rabies cases in Bali to March 2009.

Location	Date of dog bite	Date of human death	Days from bite to death	Dog status	Dog survival (days after biting)	Diagnosis
Unggasan	19.10.08	21.11.08	33	Killed 19.10.08	0	Suspect rabies
Unggasan	16.09.08	23.11.08	38	Dead 23.09.08 Bit other dogs	7	Laboratory confirmed rabies
Jimbaran	10.7.08	12.10.08	93	Bit 4 people Disappeared	?	Suspect rabies
Unggasan	..8.08	29.1.09	151	Disappeared	?	Suspect rabies
Unggasan	10.6.08	16.1.09	220	Disappeared	?	Suspect rabies
Unggasan	..10.08	27.1.09	88	Disappeared	?	Laboratory confirmed rabies
Pecatu	27.11.08	23.03.09	116	Disappeared	?	Suspect rabies
Unggasan	..10.08	26.03.09	146	Disappeared	?	Suspect rabies

Results of control efforts to May 2009

By the end of January 2009, in the target area near confirmed outbreaks, about 35,000 dogs had been vaccinated and about 1,000 stray dogs eliminated. It was estimated that approximately 40% of the dog population had been vaccinated, which unfortunately is not high enough coverage to break the cycle of rabies infection. Further action was continued at a lower level in these areas through to April when a revaccination program was started in the same areas, as the dog vaccine used requires a 3-month booster vaccination.

This mass vaccination program had an immediate impact in reducing the number of rabies positive dogs detected, as shown in Table 2.

However, there are 3.5 million people in Bali and an estimated 4-700,000 dogs, mostly semi-wild and unrestrained, as well as over 40 colonies of sacred monkeys, so very considerable continued and targeted effort and a well-resourced program underpinned by sound epidemiology will be needed to eradicate the disease from the island. Four of the 16 dogs were found beyond the southern Bukit peninsula and it will be some months before the success or otherwise of initial eradication efforts are known.

An integrated strategy of surveillance, vaccination and elimination supported by a broad public awareness program, emergency management principles and epidemiological assessment has been developed and, subject to sufficient funding, will be fine-tuned progressively in the coming months in the light of surveillance of both the human and animal populations.

Table 2: Dogs confirmed positive for rabies to mid-May 2009.

Month	Dogs confirmed rabies +ve
November	1
December	9
January	2
February	-
March	2
April	1
May	2

Without a further major and rapid response rabies could become endemic in Bali, as it is elsewhere in most of Asia. This would lead to high ongoing control costs and potential damage to Bali's tourism. It would also cause human misery and deaths, especially in poor children and result in a diversion of scarce resources from other high priority health and veterinary programs.

Helen Scott-Orr is the leader of an ACIAR project, "Improving veterinary service delivery in a decentralised Indonesia" and has recently retired from the NSW Department of Primary Industries, where she had a long career in veterinary and agricultural research management. As a former NSW Chief Veterinary Officer she played a key role in many animal disease control programs and also in the development of Australia's emergency animal disease preparedness and response system, known as AUSVETPLAN. The current project is introducing some elements of this to Indonesia.

Dr Agung Putra is an experienced veterinary epidemiologist and former Director of the Disease Investigation Centre, Denpasar, which is the regional veterinary laboratory for Bali and the Eastern Islands of Indonesia. He is playing a key role in developing and coordinating the policy, scientific and operational response to the Bali rabies incursion.