Elimination of human rabies in a canine endemic province in Thailand: five-year programme

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Abstract A five-year project to prevent human deaths from rabies in Phetchabun Province, Thailand involved increasing accessibility of post-exposure treatment with the Thai Red Cross intradermal (2-2-2-0-1-1) regimen for humans exposed to potentially and confirmed rabid animals; intensifying documentation of post-exposure treatment; increasing educational awareness through advocacy in provincial schools, television programmes, and newspapers; reducing canine rabies by monitoring the dog population and implementing vaccination and sterilization programmes; increasing the cooperation between the Ministries of Public Health, Agriculture, and Education on a provincial level; and assessing the impact of the programme through intensified follow-up of patients exposed to suspected and laboratory-confirmed rabid animals. Between 1996 and 2001, 10 350 patients received post-exposure treatment; 7227 of these received the Thai Red Cross intradermal regimen. Fewer than 3% of exposed patients received rabies immunoglobulin. Seventy-three percent of all patients presented with WHO category III exposures. In a retrospective study, 188 patients exposed to laboratory-confirmed rabid animals were followed to determine their health status. Of these patients, 20 received the intramuscular Essen regimen and 168 the Thai Red Cross intradermal regimen (148 received 0.1 ml purified chick embryo cell rabies vaccine, 10 received 0.1 ml purified vero cell rabies vaccine, and 10 received 0.2 ml purified duck embryo cell rabies vaccine). All patients were alive one year after exposure. Two human deaths occurred in the first two years of the programme — neither patient had received vaccine or rabies immunoglobulin after exposure. No deaths occurred during the last three years of the programme, which indicated that the programme was successful.

Keywords Rabies/prevention and control/mortality/epidemiology; Rabies vaccines/therapeutic use/administration and dosage; Injections, Intradermal; Dogs/immunology/virology; Preventive health services; Follow-up studies; Thailand (*source: MeSH, NLM*).

Mots clés Rage (Maladie)/prévention et contrôle/mortalité/épidémiologie; Vaccins antirabiques/usage thérapeutique/administration et posologie; Injection intradermique; Chien/immunologie/virologie; Service médecine préventive; Observation suivie; Thaïlande (*source: MeSH, INSERM*).

Palabras clave Rabia/prevención y control/mortalidad/epidemiología; Vacunas antirrábicas/uso terapéutico/administración y dosificación; Inyecciones intradérmicas; Perros/inmunología/virología; Servicios de salud preventivos; Estudios de seguimiento; Tailandia (*fuente: DeCS, BIREME*).

الكلمات المفتاحية: داء الكَلَب، الوقاية من داء الكَلَب، مكافحة داء الكَلَب، معدلات الوفيات بداء الكَلَب، وبائيات داء الكَلَب، لقاحات داء الكَلَب، الاستخدام العلاجي للقاح داء الكَلَب، إعطاء وجرعات لقاح داء الكَلَب، الحَقْن، الحَقْن الأدمي (داخل الأدمة)، الكلاب، مناعيات الكلاب، فيرولوجيا الكلاب، الخدمات الصحية الوقائية، دراسات المتابعة، تايلاند (*المصدر: رؤوس الموضوعات الطبية، المكتب الإقليمي لشرق المتوسط*).

Bulletin of the World Health Organization 2003;81:375-381.

Voir page 379 le résumé en français. En la página 380 figura un resumen en español. يمكن الاطلاع على الملخص بالعربية على الصفحة ٣٨٠.

Introduction

Canine rabies is endemic in Thailand and is an especially serious health problem for people living in more rural areas of the country. The number of human deaths attributed to rabies has decreased dramatically in the past decade in Thailand through the increased use of highly purified tissue culture rabies vaccines (TCV), which is supplied free of charge by the Thai Ministry of Health and the Thai Red Cross to patients unable to pay for post-exposure treatment. In the 1980s, medical professionals in Thailand recognized the serious complications associated with and low effectiveness of the use of nerve tissue vaccines. In 1993, the Ministry of Public Health in Thailand decided to replace the use of nerve tissue vaccines with more efficacious TCV. The projected cost of vaccinating the general population by following the original Essen post-exposure treatment regimen (1.0 ml administered intramuscularly on days 0, 3, 7, 14, and 30) was, however, too high a financial burden for the Thai government to undertake and maintain (*1–3*). A reduced dosage intradermal post-exposure treatment regimen was adopted on the basis of numerous intradermal rabies vaccination studies conducted in the 1980s and 1990s (*2, 4–8*). The success of these and other more recent studies led WHO to acknowledge and promote the use of 0.1 ml per dose of purified vero cell rabies vaccine (PVRV) and purified chick

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Ref. No. **02-0346**

embryo cell rabies vaccine (PCECV) and of 0.2 ml per dose of purified duck embryo cell rabies vaccine (PDEV), in what has become known as the traditional Thai Red Cross intradermal or "2-2-2-0-1-1" regimen (*9–11*). In this regimen, 0.1 ml of PVRV or PCECV is administered intradermally at two sites on days 0, 3, and 7; no vaccine is given on day 14; and vaccine is administered at one site on days 30 and 90. Intradermal regimens have reduced the cost of post-exposure treatment considerably, because of the smaller amount of vaccine needed per treatment (*4–8*).

Although the number of human deaths from rabies has declined dramatically throughout Thailand in recent years, unnecessary human deaths still occur. In fact, 50–70 human deaths from rabies continue to be reported each year in Thailand, and 25 deaths were reported in the northern province of Phetchabun between 1989 and 1996.

In order to prevent human deaths from rabies in Phetchabun province, a rabies control programme was initiated in March 1993, with the specific aim of eliminating human rabies throughout the province by 2000. The programme targeted the elimination of human rabies through several strategies including: increasing the accessibility of post-exposure treatment for humans exposed to animals potentially or confirmed as rabid; increasing coverage of post-exposure treatment in humans; increasing awareness of rabies through advocacy in provincial schools, television programmes, and newspapers; reducing canine rabies by monitoring the dog population and implementing vaccination and sterilization programmes; increasing cooperation between the Ministries of Public Health, Agriculture, and Education on a provincial level; and finally assessing the impact of the programme through intensified follow-up of patients exposed to both suspected and laboratory-confirmed rabid animals. Increased use of post-exposure treatment in humans was achieved by expanding the use of the 0.1 ml dose per site of the TRC regimen with PCECV and PVRV and implementing post-exposure treatment immediately for all cases of human contact without the need to observe a dog after the exposure for 10 days.

Post-exposure treatment was documented through the use of a reporting form that attending medical staff completed for every patient who presented at clinics and hospital emergency rooms. The canine population was monitored through the Phetchabun Livestock Department of the Ministry of Agriculture. In addition, a canine vaccination project was initiated in 1996.

This article summarizes the results of the strategic rabies prevention programme implemented in Phetchabun province between 1997 and 2001.

Materials and methods

Demographics of Phetchabun province

Phetchabun Province is a mountainous region in north-central Thailand; it is located 350 km north of Bangkok, and agriculture is the dominant industry in the region. Approximately 1.04 million people live in the 11 districts and 117 tumbons (sub-districts) of the province. The public health system comprises 15 hospitals (including one 400-bed provincial hospital), 12 district hospitals (two with 90 beds, seven with 60 beds, two with 30 beds, and one with 10 beds), two private hospitals, 44 clinics, and 150 health centres. All of these facilities receive vaccines from and report disease incidence to the Phetchabun Provincial Health Office. Rabies is a reportable disease in Thailand.

Reporting form for post-exposure treatment

In order to document the number of post-exposure treatments throughout Phetchabun province, a specific reporting form for animal bites was devised and distributed to all hospitals, clinics, and health centres that treated patients after exposure to suspected rabid animals. Before the programme was started, the medical staff of each clinic had to take part in an intense rabies education programme, during which they were instructed in the importance of completing the form in an accurate and precise manner. The information from the report forms was compiled and evaluated to determine the number of post-exposure treatments and the ultimate success or failure of the rabies prevention programme. Each patient was interviewed by the attending physician or medical staff, who then completed the report form (Box 1).

Post-exposure treatment

When patients presented at one of the emergency treatment centres, a doctor initially examined them. Wounds were cleaned and debrided as required. Suturing was avoided wherever possible. Even in patients with WHO category III exposures, equine rabies immunoglobulin was administered rarely, because it was available only sporadically. Patients received either the traditional five-dose intramuscular Essen regimen or the intradermal Thai Red Cross regimen. The vaccines used intradermally were PCECV and PVRV, which were administered as a 0.1 ml dose per site, and PDEV, which was administered as a 0.2 ml dose per site. All vaccines had a potency of at least 2.5 IU/intramuscular dose.

Dog vaccination and census of population

A parenteral canine vaccination programme was initiated in 1996 with the cooperation of the Phetchabun Livestock Department and the Public Health Office of Phetchabun. In this programme, health volunteers and staff travelled to various sites to administer free animal vaccinations and conduct educational programmes in a strategy to "educate the educators". In addition, the dog population was controlled by contraception and sterilization, with stray dogs and community dogs that lived around temples and schools particularly targetted. The Livestock Department of Phetchabun conducted a census of the dog population with the support of its officers and additional volunteers.

Box 1. **Information collected on animal bite report forms**

- Name
- Address
- Age
- Sex
- Occupation
- Date of exposure
- Category of wound
- Type of animal
- Name of vaccine administered
- Regimen of vaccination
- Whether equine rabies immunoglobulin (ERIG) was administered
- Date of all subsequent vaccinations
- Any side-effects to the vaccine

Laboratory diagnosis of animals

Whenever possible, animals involved in biting incidents were captured, euthanized, and tested for the presence of rabies virus by the central laboratory of the Livestock Department of Phetchabun. Submitted specimens were analysed with the direct fluorescent antibody test (*12*). Tissues from animals that initially tested negative by the fluorescent antibody test were were confirmed negative by further analysis with the mouse inoculation test (*13*).

Confirmation of vaccination efficacy

When an animal was confirmed as having rabies virus, the Public Health Office was contacted, further investigations were conducted, and all potential exposed people were contacted. All patients confirmed as exposed to rabies virus were immunized immediately and followed for a minimum of one year. In addition, 'ring vaccination' was conducted. This involved liberal immunization, both pre- and post-exposure, of animals and humans in the bitten patient's extended family and those who lived in the neighbourhood of animals confirmed as rabid by laboratory tests. The five human deaths from rabies that occurred within Phetchabun province between 1996 and 1998 were investigated thoroughly to determine the circumstances that surrounded the deaths.

Results

Between 1997 and 2001, 10 350 post-exposure treatments were administered in Phetchabun province; 8073 (73%) of these had received WHO category III wounds (Table 1). The number of post-exposure treatments increased annually between 1997 and 2001, mainly due to an increase in the use of the Thai Red Cross regimen; it then decreased in 2001. During 1997–2001, when the programme was firmly in place, two human deaths were reported; both occurred in the early years (1997 and 1998). During the last three years of the study period (1999 to 2001), no human deaths were reported (Table 2). This was a significant improvement over the nine human deaths reported for 1992–95. Investigation of the five deaths that occurred from March 1996 to December 1998 showed that these deaths occurred because the patients received no post-exposure treatment at all (neither rabies vaccine nor equine rabies immunoglobulin).

Compilation of information collected from animal bite reporting forms indicated that 114 (23%) of all people exposed to potentially rabid animals between 1997 and 2001 were involved in the agricultural industry (*14*). Seventy-three per cent of all recorded animal bites were categorized as WHO category III wounds (penetration of the intact skin with bleeding), with 93% of all potential exposures caused by dog bites. Potential exposures to rabies were reported most frequently in children aged <10 years (43% of all exposures), followed by adults aged >40 years (32.4%), adolescents aged 10–19 years (13.8%), and adults aged 30–39 years (10.8%). Less than 3% of the exposed population in Phetchabun received equine rabies immunoglobulin between 1997 and 2001, because of the lack of production and availability (Table 1).

Although the number of patients that received post-exposure treatment increased from 1997 to 2000, the number of vials used decreased because of the more frequent use of the Thai Red Cross regimen. At the end of 2001, 88% of all patients were receiving post-exposure treatment via the intradermal route. Estimates showed that the Thai Red Cross regimen could save 60–80% of the costs associated with the intramuscular Essen regimen; however, for various reasons, the real cost savings were calculated as closer to 40%. The difference in real cost savings was attributed to the fact that some doctors were reluctant to use intradermal regimens or had not mastered the intradermal technique. In other cases, private patients preferred to buy enough vaccine to receive the five-dose intramuscular Essen regimen. In addition, some clinics were too small to use the intradermal regimen effectively because, according to the manufacturers' recommendation, a vial can only be stored for eight hours after it is opened. Recently, studies conducted in Thailand have shown that opened vials of TCV may be stored at 4–8 °C for up to seven days if sterility is maintained (*15, 16*).

According to the dog population census, the canine population increased by 10% between 1996 and 2001, expanding from approximately 91 000 in 1996 to more than 105 000 in 2001 (human:dog ratio 10:1). Overall, 40 079 (8.9%)

Table 1. **Distribution of post-exposure treatment regimens and WHO category of exposure in patients presenting at rabies treatment centres in Phetchabun province Thailand between 1997 and 2001. Data compiled by Phetchabun Provincial Public Health** (*14*)

Year	No. of patients						
	Post-exposure treatment				WHO wound category		
	All regimens (intramuscular and intradermal)	Thai Red Cross intradermal regimen	All regimens (intramuscular and intradermal) with rabies immunoglobulin	Thai Red Cross intradermal regimen with rabies immunoglobulin	I	II	III
1997	1939	923 (47)[a]	20 (1.0)	8 (0.4)	91 (5)	566 (29)	1282 (66)
1998	1690	1125 (66)	80 (4.7)	22 (1.3)	47 (3)	438 (26)	1205 (71)
1999	2212	1412 (64)	127 (5.7)	27 (1.2)	212 (10)	515 (23)	1485 (67)
2000	2816	2282 (81)	34 (1.2)	34 (1.2)	96 (3)	259 (10)	2461 (87)
2001	1693	1485 (88)	48 (1.6)	30 (1.7)	139 (8)	413 (24)	1141 (68)
Total	**10 350**	**7227 (70)**	**309 (3.0)**	**121 (1.2)**	**585 (6)**	**2191 (21)**	**7574 (73)**

[a] Values in parentheses are percentages.

Table 2. **Number of exposures to suspected and proven rabid animals and human rabies deaths reported in Phetchabun province, 1992–2001. Data were compiled by Phetchabun Provincial Public Health** (*14*)

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Exposures	1698	1256	1340	1493	1692	1939	1690	2212	2816	1693
Deaths	3	3	1	2	3	1	1	0	0	0

of the dogs had identifiable owners and 417 147 (71%) had received at least one vaccination against rabies (Table 3). During the five-year period, 1114 animals were submitted for laboratory testing after they bit humans. In total, 180 animals (16%; range, 8–32%) were confirmed as rabid by fluorescent antibody test or mouse inoculation test. This variation in percentages was due to a continuous dog vaccination campaign and population control projects in Phetchabun. Of the patients exposed to animals confirmed as rabid by laboratory tests, 20 received intramuscular post-exposure treatment and 168 patients received post-exposure treatment with the Thai Red Cross regimen (148 received 0.1 ml of PCECV per site, 10 received 0.1 ml of PVRV per site, and 10 received 0.2 ml of PDEV per site). Of the 188 patients exposed to laboratory confirmed rabid animals, 57 (30%) had WHO category I wounds, 56 (30%) WHO category II wounds, and 75 (40%) WHO category III wounds. Of the 75 patients with category III wounds, six were treated with the intramuscular regimen and 69 with the Thai Red Cross regimen (Figure 1).

All patients were followed up for at least one year post-treatment through the use of an effective primary health care system that included health volunteers in the villages, health workers in sub-district health stations, and the Provincial Public Health Office of Phetchabun province. All patients were confirmed as alive at one year.

Side-effects of the vaccines — including local itching, redness, and pain — were reported rarely. No systemic or allergic reactions or serum sickness were reported.

Discussion

This article reports results from the first large-scale programme in south-east Asia to systematically eliminate human rabies from a region in which canine rabies was endemic. This was achieved through the joint cooperation of human and animal health authorities, as well as government and nongovernmental organizations. The fact that no human deaths occurred during the last three years of the five-year programme indicates the programme was successful.

The cornerstone to the implementation of a successful rabies prevention programme is the education of medical officials and local residents. Educational programmes that were started at the beginning of the programme in Phetchabun province helped to increase the medical community's awareness of the correct post-exposure treatment. Additional media coverage, accompanied by the assistance of community volunteers, augmented the existing rabies awareness programmes and spread information about rabies prevention throughout the general population. The enhanced educational focus certainly accounts for the continual increase in the number of patients that received post-exposure treatment from 1997 to 2000. The significant decrease in the number of post-exposure treatments administered in 2001 is attributed to changes in the reporting system when a new public health system was implemented. That 73% of the patients experienced WHO category III exposures between 1997 and 2001 but only 3% received equine rabies immunoglobulin is a concern. This unfortunate situation highlights the current state of affairs in Asian countries, which face critical shortages of rabies immunoglobulin. For the past decade, supplies of human as well as equine rabies immunoglobulin have declined continually throughout the world, and from all reports this trend will continue (*17*). Increased current supplies and/or funding of new technologies to replace rabies immunoglobulin is needed urgently and should be a top priority for WHO and other global health foundations.

The incidence of exposures in children was as high in Phetchabun province as previously reported (*18*). Protection of children from exposure to rabies is a difficult, if not impossible, task in Asian countries, where canine rabies is endemic and stray dog populations continue to increase — as is evidenced in this report. Parents educated about the lethality of rabies and about the proper protocol for post-exposure treatment certainly make every effort to ensure their children receive treatment after exposure to a potentially rabid animal. It is critical, therefore, for the general public to be educated on the consequences of exposure to rabies, the location of local treatment centres within their area, and the need for prompt action after exposure.

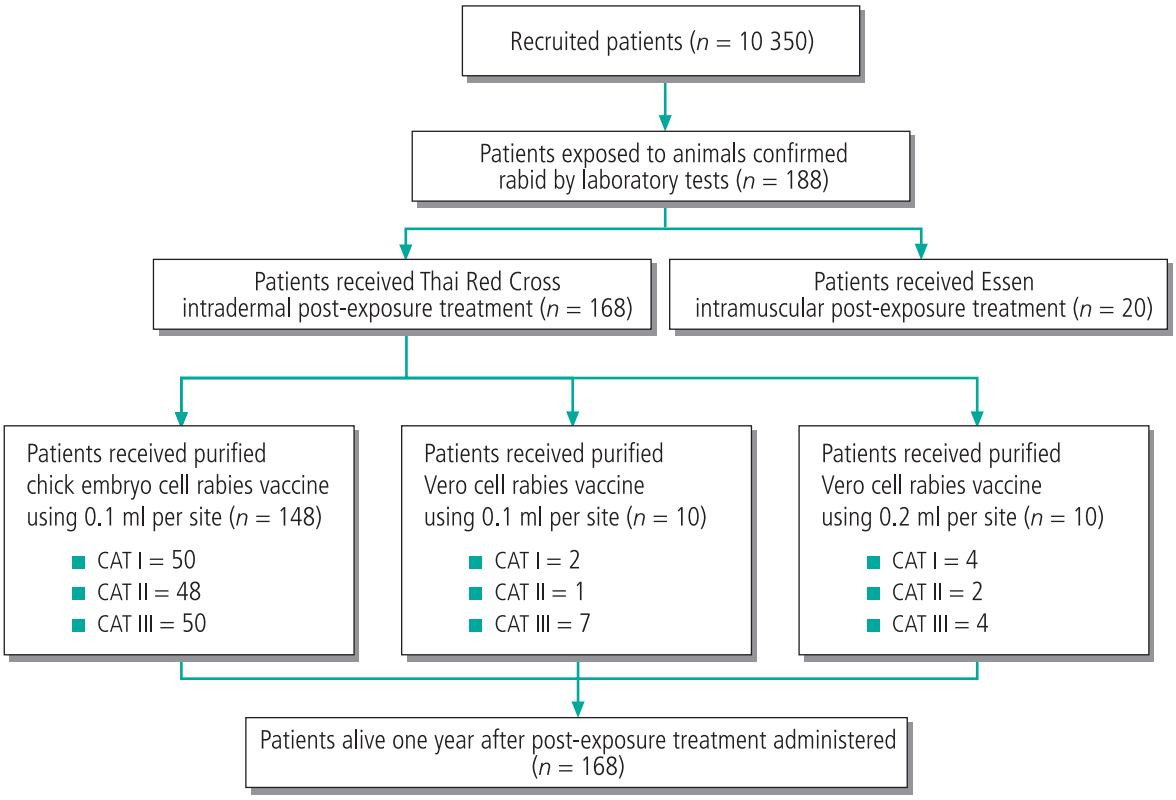
Decentralization of the public health system in Thailand in 2001 could hamper the availability of vaccines in local

Table 3. **Estimated dog population and vaccine coverage in Phetchabun province, 1996–2001. Data were compiled by the Livestock Department of Phetchabun**

Dog population	1996	1997	1998	1999	2000	2001	Total
Estimated total	91 190	93 792	95 144	99 838	102 292	105 272	587 528
House dogs	–	86 948	89 635	90 832	91 382	96 832	455 629 (91.1)[a]
Stray dogs	–	6844	5509	9006	10 910	8044	407 909 (8.9)
No. vaccinated	66 568 (73)	66 654 (70)	74 212 (78)	76 875 (77)	65 466 (64)	67 372 (64)	417 147 (71)

[a] Values in parentheses are percentages.

Fig. 1. **Number of patients and treatment regimens administered to patients presenting at emergency clinics after exposure to suspected and confirmed rabid animals in Phetchabun province between 1997 and 2001.** All patients treated received post-exposure treatment by the Thai Red Cross intradermal regimen or by the intramuscular Essen regimen



CAT = WHO wound category.

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communities. One effect already evident is the lack of national reporting information, as seen in 2001. Procurement of vaccines and other pharmaceuticals is now under the control of the local government, and some local governments may choose to spend their allocated budget on pharmaceuticals other than rabies vaccines. This must be carefully monitored in the future.

The efficacy of reduced doses of TCV in the Thai Red Cross regimen was confirmed in this five-year study, in which 7227 patients were given 0.1 ml of PCECV or PVRV per site or 0.2 ml PDEV per site. This is the largest single database available with continued follow-up to date that validates and endorses the use of 0.1 ml per site of both PCECV and PVRV for treatment of patients with WHO category III wounds. The use of these vaccines in reduced intradermal regimens currently is the only way in which most developing countries financially will be able to afford to replace nerve tissue vaccines. ■

Acknowledgements

This study was performed with funding from a government budget.

Conflicts of interest: None declared.

Résumé

Elimination de la rage humaine dans une province de Thaïlande où la rage canine est endémique : programme quinquennal

Un projet quinquennal ayant pour objectif la prévention des décès humains dus à la rage dans la province de Phetchabun (Thaïlande) comportait les éléments suivants : augmentation de l'accessibilité du traitement post-exposition selon le schéma d'administration intradermique (2-2-2-0-1-1) de la Croix-Rouge thaïlandaise pour les sujets exposés à des animaux potentiellement enragés ou chez lesquels le diagnostic de rage a été confirmé ; intensification de la notification des traitements post-exposition ; sensibilisation accrue par l'éducation, que ce soit au niveau des écoles de la province, au moyen de programmes télévisés ou dans les journaux ; réduction de la rage canine par la surveillance de la population canine et la mise en œuvre de programmes de vaccination et de stérilisation ; renforcement de la coopération entre les ministères de la santé publique, de l'agriculture et de l'éducation au niveau provincial ; évaluation de l'impact du programme grâce à un suivi intensif des patients exposés à des animaux suspects de rage ou chez lesquels le diagnostic de rage a été confirmé au laboratoire. Entre 1996 et 2001, 10 350 patients ont reçu un traitement post-exposition, dont 7227 par voie intradermique selon le schéma de la Croix-Rouge thaïlandaise.

Moins de 3 % des sujets exposés ont reçu des immunoglobulines antirabiques. Sur l'ensemble des patients, 73 % avaient subi une exposition de catégorie III selon la classification de l'OMS. Lors d'une étude rétrospective, l'état de santé de 188 patients exposés à des animaux chez lesquels le diagnostic de rage avait été confirmé au laboratoire a été suivi ; 20 d'entre eux avaient reçu le traitement par voie intramusculaire selon le schéma d'Essen et 168 avaient reçu le traitement intradermique de la Croix-Rouge thaïlandaise (148 patients traités par 0,1 ml de vaccin antirabique purifié préparé en cellules d'embryon de poulet, 10 par 0,1 ml de vaccin antirabique purifié préparé en cellules Vero, et 10 par 0,2 ml de vaccin antirabique purifié préparé en cellules d'embryon de canard). Tous ces patients étaient encore en vie un an après l'exposition. Deux décès sont survenus pendant les deux premières années du programme, chez des patients qui n'avaient reçu ni vaccin ni immunoglobulines antirabiques après l'exposition. Aucun décès n'est survenu au cours des trois dernières années du programme, ce qui démontre la réussite de celui-ci.

Resumen

Programa quinquenal de eliminación de la rabia humana en una provincia con rabia canina endémica en Tailandia

A fin de evitar las defunciones humanas por rabia en la provincia de Phetchabun (Tailandia), se emprendió un proyecto quinquenal que incluyó una mayor accesibilidad al tratamiento postexposición mediante el régimen intradérmico (2-2-2-0-1-1) de la Cruz Roja tailandesa para personas expuestas a animales presunta o comprobadamente rabiosos; la ampliación de la documentación del tratamiento postexposición; una mayor educación de toma de conciencia mediante iniciativas a través de escuelas provinciales, programas de televisión y periódicos; la reducción de la rabia canina mediante la vigilancia de la población de perros y la aplicación de programas de vacunación y esterilización; el aumento de la cooperación entre los ministerios de Salud Pública, Agricultura y Educación a nivel provincial; y la evaluación del impacto del programa mediante un seguimiento intensificado de los pacientes expuestos a animales presuntamente rabiosos o confirmados como tales en laboratorio. Entre 1996 y 2001, 10 350 pacientes recibieron tratamiento postexposición; 7227 de ellos recibieron la pauta intradérmica de la Cruz Roja tailandesa. Menos del 3% de los pacientes expuestos recibieron inmunoglobulina antirrábica. Un 73% de los pacientes presentaban exposiciones clasificables en la categoría III de la OMS. En un estudio retrospectivo, 188 pacientes expuestos a animales con rabia confirmada en laboratorio fueron sometidos a seguimiento para determinar su estado de salud. De esos pacientes, 20 recibieron el régimen intramuscular de Essen, y 168 el régimen intradérmico de la Cruz Roja tailandesa (148 recibieron 0,1 ml de vacuna antirrábica purificada obtenida mediante células embrionarias de pollo, 10 recibieron 0,1 ml de vacuna antirrábica purificada obtenida mediante células Vero, y otros 10 recibieron 0,2 ml de vacuna antirrábica purificada obtenida a partir de células embrionarias de pato). Todos los pacientes seguían con vida un año después de la exposición. En los dos primeros años del programa se registraron dos defunciones, pero ninguno de esos pacientes había recibido vacuna o inmunoglobulina antirrábica después de la exposición. En cambio, durante los últimos tres años no se registró ninguna defunción, lo que demuestra la eficacia del programa.

ملخص

التخلُّص من داء الكَلَب لدى البشر في إحدى المقاطعات التي تتوطَّنها الكلاب في تايلاند، برنامج لخمس سنوات

تضمَّن البرنامج الذي سينفذ على مدى خمس سنوات للوقاية من حدوث وفيات بين الناس ناجمة عن داء الكَلَب في مقاطعة فيتشابون في تايلاند زيادة إتاحة المعالجة التالية للتعرُّض للعامل المسبِّب للمرض، بإعطاء النظام العلاجي الذي يتبعه الصليب الأحمر التايلاندي بالحقن الأدمي والمسمى (٢-٢-٢-٠-١-١)، بحيث يطبق على الناس المتعرضين للحيوانات التي يحتمل أنها مصابة بداء الكَلَب، أو التي ثبت أنها مصابة به فعلياً، مع التأكيد على توثيق المعالجة التي تعطى بعد التعرُّض، وزيادة الوعي الثقافي من خلال القيام بحملات توعية في مدارس المقاطعة، وعرض البرامج التلفزيونية والمقالات الصحفية، وإنقاص معدلات حدوث داء الكَلَب بين الكلاب برصد تجمعات الكلاب والقيام ببرامج التطعيم والتعقيم؛ وزيادة التعاون بين وزارات الصحة العامة والزراعة والتعليم على صعيد المقاطعة، وتقييم آثار البرنامج من خلال متابعة مكثَّفة للمرضى الذين تعرضوا للحيوانات التي يحتمل أنها مصابة بداء الكَلَب أو التي ثبت أنها مصابة به فعلياً بالفحوص المختبرية. وخلال الفترة بين ١٩٩٦ و٢٠٠١ تلقَّى ١٠ ٣٥٠ مريضاً المعالجة التالية للتعرُّض، وكان من بين هؤلاء ٧٢٢٧ ممن تلقَّى نظام الحقن الأدمي الذي يتبعه الصليب الأحمر التايلاندي، ولم يتلقَّ سوى أقل من ٣٪ من هؤلاء المتعرضين الغلوبولينات المناعية المضادة لداء الكَلَب. وقد كانت الصورة السريرية لدى ٧٣٪ من مجمل المرضى تتناسب مع الفئة الثالثة لتصنيف منظمة الصحة العالمية للتعرُّض. وفي دراسة بالطريق الراجع تمت متابعة ١٨٨ مريضاً ممن تعرَّضوا للحيوانات التي ثبت بالفحوصات المختبرية إصابتها بداء الكَلَب، وهدفت المتابعة إلى التعرُّف على أوضاعهم الصحية؛ وقد تلقَّى ٢٠ من هؤلاء المرضى نظام الحقن العضلي المسمى Essen، فيما تلقَّى ١٦٨ آخرون نظام الحقن الأدمي للصليب الأحمر (وقد تلقَّى ١٤٨ من هؤلاء ٠,١ ميلي لتر من لقاح الكَلَب المنقى المحضر في خلايا جنين الدجاج، فيما تلقى ١٠ منهم ٠,١ ميلي لتر من لقاح الكلب المنقى والمحضر في خلايا من سلالة فيرو vero، وتلقى ١٠ آخرون ٠,٢ ميلي لتر من لقاح الكلب المنقى المحضر في خلايا جنين البط). وقد وجد أن جميع المرضى كانوا على قيد الحياة بعد مرور سنة على تعرُّضهم، وقد حدثت حالتان من الوفيات بعد مرور سنتين على بدء البرنامج، ولم يكن أي من الحالتين قد تلقى لقاحاً أو غلوبولينا مناعياً بعد التعرُّض، كما لم تحدث وفيات في السنوات الثلاث الأخيرة من البرنامج، مما يشير إلى أن البرنامج كان ناجحاً.

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