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1. INTRODUCTION

The Mérieux Foundation convened an International Symposium on Rabies Control in Asian Countries in Wuhan, China, from 11 to 15 September 1996. This Symposium was organized with the co-sponsorship of the World Health Organization, as was the case with the Mérieux Foundation-organized, WHO co-sponsored symposia on Rabies Control in Asian Countries held in Samarkand, USSR, in September 1989 and for South-East Asian countries held in Jakarta, 27-30 April 1993. In addition to Chinese public health officers and researchers, representatives from the Ministries of Health and Agriculture of 14 Asian countries had been invited to attend, namely: Cambodia, Hong Kong, India, Indonesia, Republic of Korea, Lao People's Democratic Republic, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and Viet Nam.

The Symposium was opened by Dr. B.O. Dodet from the Marcel Mérieux Foundation, who delivered a message on behalf of the Foundation and introduced a filmed message from Dr.C. Mérieux, Chairman of the Marcel Mérieux Foundation, to the participants. Dr C. Mérieux, unfortunately, could not take part in the meeting. Dr. F.X. Meslin, responsible for the zoonoses programme of WHO, welcomed the participants on behalf of this Organization, and thanked the representatives of China, the host country, for the support given to this initiative. Dr Jian Zhou, President of WIBP, who was instrumental in assisting in the local organization, also expressed his best wishes for a successful meeting. Dr.Lian-Zhi Cao, Director of the Division of Biological Products, the Ministry of Health, Beijing, and Dr De-Fu Li, Deputy Director of the National Institute for the Control of Pharmaceutical and Biological Products, also in Beijing, officially opened the Symposium on behalf of the national Chinese authorities.

The objectives of the Symposium were to strengthen national rabies surveillance and control activities in Asian countries through improving diagnosis, post-exposure treatment of human beings, dog immunization and to inform participants on recent and future developments in the rabies field. The Symposium helped to support planning and implementation of national rabies programmes, increase awareness, update scientific knowledge and promote research in rabies. The participants elaborated recommendations (see sections) for the implementation of successful national rabies control programmes and to achieve the goal of rabies elimination in their respective countries. The Symposium also issued a resolution for the development of reinforced and more focused control activities within the framework of regional programmes (see section 6).

2. NATIONAL REPORTS

The first part of the Symposium was dedicated to presentation of national reports. In many instances two reports were presented by country, one by the representative from the Ministry of Health and one by the representative from the Ministry of Agriculture, which were merged for the preparation of the summaries below..

Bangladesh

Bangladesh is a rabies endemic area. There is no accurate statistical data on rabies collected in this country. From the scattered hospital records it is assumed that about two

thousand persons die of rabies per year. From the vaccine supply records it is evident that about 60 000 persons undergo post-exposure treatment after animal bites every year, of which 95% are dog bite cases. About 45% of the total number of persons undergoing post-exposure treatment are children (<15 years). Nowadays, though many people are aware of the disease, they still neglect animal bites and remain unnoticed and untreated. Some 20 000 people exposed to suspect rabid animals receive traditional treatment. Hospital records show that most unvaccinated cases develop rabies and, in addition, that a number develop rabies due to delayed and insufficient post-exposure treatment.

In Bangladesh, the Institute of Public Health is the only government institute manufacturing and supplying 700 000 doses of Semple type antirabies vaccine. Besides this, 40 000 doses of tissue culture vaccines are also imported and used in the country.

An insignificant number of RIG dose is used. Only a few veterinarians and persons related to vaccine production receive pre-exposure vaccinations.

Though the size of the dog population is not known, it is estimated that Bangladesh has a few million dogs living in urban and rural areas, more than 90% of which are stray. These stray dogs are dangerous for humans and livestock.

In Bangladesh about 25 000 to 27 000 domestic production animals are infected by dog and maybe by other rabies reservoir animals each year. Though animal cases are reported throughout the year, the peak times are the months of April, May, June and September, and high incidences are reported in Chittagong and Khulna divisions.

The Veterinary Public Health (VPH) section of the Department of Livestock (DLS), since its establishment in 1985, has initiated a country-wide rabies control programme. Under this programme each thana and municipal authority are requested to implement the programme with a minimum budget under the supervision of the veterinary officials of DLS. The programme includes elimination of stray dogs, registration and vaccination of pet dogs and logistic support in the form of technical support and publicity campaigns.

Although a canine rabies control programme has been initiated by the VPH section since 1985, its success is very limited due to shortage of manpower, diagnostic facilities, coordination among different organizations and financial support for conducting the control programme.

Cambodia

Rabies is no longer a notifiable disease since the restructuring of the public health services in 1994. The only surveillance data available are provided by the Institut Pasteur, Phnom Penh, and mainly originate from an area which covers the capital of Cambodia (79% of patients) and its immediate surroundings. From mid-1995 to mid-1996, four human rabies deaths were reported from this centre which also provided 6 886 post-exposure treatments during this same period of time. Almost 99% of the rabies treatment was administered to patients after exposure to suspected rabid dogs. The annual number of human rabies deaths in Cambodia is estimated to be much higher.

A limited number of rabies pre-exposure treatments have been given using cell culture vaccine. Post-exposure treatment is given using suckling mouse brain vaccine produced by the Institut Pasteur, Nha Trang, Viet Nam. Equine rabies immunoglobulin was administered to 1% of the patients.

China

Rabies was highly endemic in almost all provinces of China until the end of the eighties, with more than 5 200 human deaths due to rabies reported annually during the period 1987-89. Since then, the number of rabies deaths has been drastically reduced with about 3 500 deaths in 1990 and only 200 in 1995. This reduction is mainly due to an increasing availability of vaccines for human post-exposure treatment, produced on primary hamster kidney cells (PHKC) with about 5 million post-exposure treatments applied annually and, in some provinces, the significant enforcement of rabies control in dogs through vaccination and population reduction. In Sichuan province continuous dog immunization and dog population reduction over a period of 11 years (1984 to 1994) has led to a decrease of rabies prevalence in humans from 1.25 to 0.01 cases per 100 000 inhabitants.

Currently most of the human rabies cases are reported in the southeastern part of the country. Rabies is still responsible for more than 6% of the total number of deaths due to the 25 human diseases officially notifiable in China.

A number of different animal species were found to be at the origin of human exposure to rabies (mainly dogs, cats, pigs, cattle and skunks); however dog is the main reservoir and transmitter of rabies in China. Epidemiological investigations in Beijing showed that most of the rabies deaths occurred in persons exposed to rabies suspected dogs (>90%) and cats (about 5%).

Since the early 1990s a general increase in the number of dogs has been reported, particularly in urban areas. This increase has also led to a rise in the number of dog bites (e.g. up to 673 per 100 000 inhabitants in Zibo in 1990) and subsequent post-exposure treatment.

India

Rabies is endemic in India throughout the year. Each year approximately 30 000 people die of rabies and approximately 1 000 000 people undergo antirabies vaccination. Half a million receive Semple type vaccine (delivered free of charge) and the second half elects to receive cell culture rabies vaccine at a cost. Children constitute about 35-40% of those who are undergoing post-exposure antirabies treatment. Dog is the principal reservoir and is responsible for 96% of animal bite cases seeking antirabies treatment.

Over the last few years a distinct increase in human mortality due to rabies in the country has been noted, which may be linked to an increase in the size of the dog population which is currently estimated at about 19.2 million. Most of these dogs are thought to be ownerless. Another factor for this upsurge may be the increasing human population density with more human and dog contacts, and the third factor may be the absence of an effective comprehensive animal rabies control programme in the country.

Control of animal rabies is carried out through the Agriculture Ministry which is running a National Canine Rabies Control Programme under which 30 Rabies Control Units have been set up in different states of the country. The vaccines for veterinary use are of three different types: a 5% nervous tissue vaccine for post-exposure vaccination, a 20% nervous tissue vaccine for pre-exposure vaccination and tissue culture vaccines for both pre- and post-exposure vaccination of animals. All these vaccines are produced in the country.

Forty million ml of neural tissue vaccines (NTV) are produced annually in India for human post-exposure immunization. Neuroparalytic complications were generally observed with NTV after the 5th to 7th injection in 1:5000 to 1:11000 persons receiving post-exposure treatment. Antirabies serum of equine origin is produced by CRI, Kasauli, and about 120 litres of equine serum are produced annually. This is quite short of the estimated need of 1 500 litres in this country.

In addition to the locally produced NTV, tissue culture vaccines (TCV) such as human diploid cell vaccine (HDCV), purified chick embryo cell vaccine (PCECV) and purified vero cell vaccine (PVRV) are also available on the market. Post-marketing surveillance for TCV, including sero-conversion studies with HDCV, PCECV and PVRV, carried out in NICD, Delhi, have shown protective antibody titres without vaccine failures. Experience with TCV pre-exposure vaccination in high-risk groups carried out at NICD, Delhi, has shown that over 5 000 persons throughout the country given pre-exposure vaccination with regular boosters for the last six years had not, to date, developed rabies.

Regular training courses in laboratory techniques of rabies and workshops on Surveillance and Control of Rabies are being held with financial assistance from the World Health Organization. Publicity campaigns for rabies are carried out through educational material and media such as radio and television.

The requirements of this country are:

- to increase the indigenous production of tissue culture vaccine so as to replace nervous tissue vaccine in the near future, and the annual production of equine serum as per the requirements of the country;
- to carry out in the coming years new projects, namely a pilot survey on surveillance and control of rabies and trials on newer antirabies vaccines.

Indonesia

In Indonesia, rabies was first reported in West Java in 1884. The disease then spread from Java to Sumatra in 1911, Sulawesi in 1956 and Kalimantan in 1974. Until now, the other islands of the country have remained free of rabies.

An intensive prevention and control programme for rabies is being conducted by the Department of Agriculture in formal collaboration with the Department of Health and Department of Internal Affairs. As a result the spread of rabies has been slowed down.

In 1989, rabies control activities were initiated on the islands of Java and Kalimantan. The result of these activities decreased the total number of human rabies cases from 117 in 1988 to 36 in 1995 in these areas. Furthermore in three provinces of the Java Islands (East Java, Central Java, and Yogyakarta) and one province of Kalimantan Islands (East Kalimantan) no cases were reported. Activities have been extended in 1993 to the remaining infected islands of Sumatra and Sulawesi. It is still too early to fully evaluate their effectiveness.

In 1990 about 12 000 persons received post-exposure treatment out of approximately 17 600 who visited treatment centres following an animal bite. Since then the number of persons treated has decreased regularly to reach about 8 000 for 1995 (out of 13 400 visiting vaccination centres). The number of deaths due to rabies fluctuated during the period 1990-94 with an average of 80 deaths a year (range 58-98). In 1995, this number was 36, that is half that of 1994.

The programme applied consists of vaccination of registered dogs (target: 70% of the total dog population) and elimination of stray dogs (target: 30% of the total dog population). Because of the shortage of veterinary vaccines and poisons, a strategy based on the identification of specific areas for dog vaccination and elimination (i.e. infected subdistricts with cases in the last three years and their surrounding subdistricts) has been initiated.

Vaccinated dogs are marked by a plastic collar, the colour of which is changed yearly if needed, and only dogs with a collar are not subjected to elimination.

Inter-island transportation of dogs, cats and monkeys is strictly checked, and it is prohibited to bring these animals into rabies-free islands.

In order to reach the targets for dog vaccination and elimination mentioned above, one vaccinator should be identified and trained in every village and activities to foster public participation in the targeted areas should be undertaken through the local government under the coordination of the Minister of Internal Affairs.

The Government of Indonesia is strongly committed to the national rabies eradication programme with the target of making the country free of rabies by the year 2000.

Lao People's Democratic Republic

Since the 2nd Symposium on Rabies Control in Asia held in 1993, some substantial progress has been made in the prevention and control measures of rabies in the Lao People's Democratic Republic. Six provinces out of 17 reported regularly to the Ministry of Health on the numbers of patients coming to health facilities to get rabies vaccines. However, as some patients came too late after exposure a certain number of deaths was still reported. Rabies vaccines remain costly especially for the people from mountainous and rural areas.

The major preventive and control measures of rabies focused on the following components:

- Public awareness was increased through newspapers, radio and television, which disseminated the necessary information on epidemiology, clinical symptoms, different diagnosis possibilities and preventive measures in pre- and post-exposure situations. Strong recommendations to promote dog vaccination led to an increasing number of vaccinated dogs.
- Laboratory capabilities at peripheral level were strengthened to improve rabies diagnosis in suspect animals.
- A campaign for preventive vaccination of veterinary students and laboratory staff was conducted in early 1996. WHO guidelines for post-exposure rabies treatment were largely distributed to the health facilities at all levels, in particular where rabies vaccines were available.

Recently the Minister of Agriculture and Forestry has issued a decree on the control of rabies defining the role and responsibility of concerned sectors.

There is no legislation for compulsory vaccination or registration of dogs. Most vaccinated dogs are found in urban areas, since the veterinary network is not yet extended to all districts throughout the country.

Through the antirabies information campaign, the number of bitten patients who came to seek treatment has substantially increased. A large number of patients did not receive a complete post-exposure vaccination regimens due to the high cost of rabies vaccines. However, the percentage of completed vaccination regimes has increased year after year. For successful rabies control in the Lao People's Democratic Republic external support is needed to complement the efforts of the Government.

Myanmar

Rabies is a notifiable disease in humans but epidemiological data are incomplete on both human cases and post-exposure treatment (PET). Only a few rabies cases are being reported in humans annually (34 cases per year during the period 1991-95). The real number is thought to be much higher. About 1 000 people are treated annually after contact with rabies suspect animals. Most of the PET are done with a locally produced sheep brain vaccine. Modern cell culture vaccines are only available in the 22 township hospitals and ERIG is only available on the private market. Evidence suggests that dog rabies is endemic throughout the country and dogs are the main source of human infection.

Nepal

Rabies is endemic in Nepal. Every year several rabies outbreaks are reported from district veterinary hospitals in different regions. However, many outbreaks and cases go unnoticed or unreported due to the lack of awareness and communication. From July 1994 to July 1995, 180 animal rabies deaths were reported in Nepal, most of them in the eastern, central & western regions. A total of 142 rabies outbreaks were reported with altogether 3 431 heads of livestock treated after exposure, mostly belonging to the eastern region (2 398). More than 210 human deaths due to rabies are reported annually.

Twenty per cent carbolyised sheep brain rabies vaccine is used for immunization of dogs and cats against rabies. The immunity lasts for six months to one year. Dogs above three months of age are immunized using the recommended dose of 5 ml. Five percent carbolyised sheep brain rabies vaccine is used for treating livestock after suspected rabid dog bite. The treatment schedule and dose depend on the exposed site, the severity of the wound, species and body weight of the exposed animal. Beta-propiolactone (BPL) inactivated 5% sheep brain rabies vaccine is used for post-exposure treatment (PET) in humans. Side effects such as local allergic reaction, neuritis, myelitis, post vaccination shock and encephalitis may appear in humans and animals. Under Nepalese conditions no data on side effects have been reported. A number of imported rabies vaccines are available on the market for human and animal use in Nepal. However, these tissue culture rabies vaccines are beyond the reach of common people living in high risk zones in remote areas of the kingdom.

Current vaccine production of sheep brain vaccines should be replaced by the sustainable, modern, economic and well-established tissue culture system. The present vaccine production facilities at Tripuresor must be upgraded.

For effective control and subsequent elimination of rabies a "regional rabies control project" must be implemented simultaneously among the countries of the SAARC region.

Pakistan

Rabies is endemic in Pakistan. It is estimated that 2 000 human rabies deaths may occur each year. Dogs are the main animal reservoir and transmitter of the disease. Rabies surveillance is considered to be insufficient and dog control measures are ineffective. Public awareness regarding rabies is very limited. Epidemiological studies in Karachi have shown that 40% of persons who received a post-exposure treatment using sheep brain vaccine succumbed to rabies despite a full course of treatment. Seventy-six per cent of patients had severe bites, treatment of which would have required immunoglobulin administration.

Cell culture vaccines and immunoglobulins are not generally affordable. In 1995 the estimated number of PET administered in Pakistan was 81 800. Eighty per cent were treated with sheep brain vaccine produced at the National Institute of Health (NIH) and 20% received cell culture vaccines. Rabies immunoglobulin of human and horse origin was given to only 2% of the patients. The NIH plans to resume human diploid cell vaccine production and to increase equine rabies immunoglobulin production in the coming year.

There is a need for effective dog control strategies as well as proper human post-exposure treatment using economical regimens and immunoglobulin administration when indicated.

Philippines

Rabies in the Philippines still causes numerous human deaths. The annual incidence rate from 1983 to 1993 ranged from 5 to 8 per million population; that is 400 cases on average annually. The age group 1-14 years accounts for 38% of cases. Eighty-eight per cent of implicated biting animals were pet dogs. An estimated 60 000 PET (1 000 per million

population) are administered each year. An estimated 280 000 people (>4,000/million population in the entire country) are bitten by dogs under circumstances which would normally require PET, but failed to seek, or could not afford treatment.

As early as the fifties, control of animal rabies has been carried out but on a very limited scale and with limited governmental agency involvement. The Department of Health (DOH) and Department of Agriculture (DOA) collaborated in 1989 to initiate a national control programme. A multisectoral national programme materialized in May 1991 through a Memorandum of Agreement between the DOH, DOA, DECS (Department of Education, Culture & Sports), DILG (Department of Interiors and Local Government), and non-government agencies.

The goal of the programme is to declare the Philippines rabies-free by the year 2020 while the general objective is to reduce the incidence of human rabies by 10% per year. The strategies are: information drives particularly on Responsible Pet Ownership, provision of free post-exposure treatment (PET), mass canine immunization campaign, enforcement of ordinance on stray dog control, and strengthening of rabies surveillance.

Three hundred vials of nerve tissue vaccine (NTV) made from 2% goat brain suspension are allocated to the regions per quarter. NTV is produced by the Biological Production Service (BPS) of DOH which has decelerated its production at present. In addition the Communicable Disease Control Service of DOH (CDCS) purchases and appropriates tissue culture vaccines (TCV) to all 16 regions and 76 provinces of the country, based on surveillance reports.

Bitten vaccinators are provided with free PET instead of receiving tissue-culture vaccine for pre-exposure immunization, since this is a more cost-effective strategy.

Indigent people receive PET for free. Immunoglobulins are usually prescribed. The intradermal (id) administration of vaccine has to be adopted and implemented nationwide to reduce the number of doses of vaccine needed, target more patients and through the savings, procure more rabies immunoglobulin. More than 12 000 patients have received an id regimen by this route since its introduction in 1993.

Training on programme implementation, management of bite cases, application of intradermal regimes, rabies surveillance and dog vaccination campaigns have been undertaken. Target audiences include physicians in government health facilities and representatives from partner agencies.

The programme publicity campaigns include distribution of posters and leaflets to the field and other interested parties, public advisory services on television and radio shows, holding of press conferences and media coverage, particularly during launching activities such as dog vaccination campaigns.

Republic of Korea

Rabies in the Republic of Korea was officially recorded in 1907. Rabies incidence in animals was limited to a total of six cases from 1993 to 1996. Moreover, geographical

distribution of rabies incidence was definitely restricted to the northern region. Since 1984, no outbreak of canine rabies has been officially reported in the southern parts of the country. The existence of rabies in wildlife and the possible infection of domestic animals and humans from wildlife should not be overlooked. As a result of the successful animal rabies control programme carried out by the National Veterinary Research Institute, no human rabies case has been reported since 1984.

Detection of the rabies virus or anti-rabies antibody in humans is only made by the National Veterinary Institute (NVRT) and are only partially available because of the very low incidence of rabies country-wide. The National Veterinary Research Institute has produced monoclonal antibodies for rabies diagnosis. Molecular technique such as simple PCR is available. For the detection of neutralizing antibodies, a neutralization peroxidase-linked assay has been developed and is routinely carried out in the NVRT. The National Institute of Health, Republic of Korea, provides vaccine administration after contact of persons with a rabies suspect animal. Since 1994, the Health and Welfare has imported 100 doses of human cell-culture vaccine and enough immunoglobulin for 25 treatments.

Research work has focused on a rapid diagnostic system using blood or skin biopsy specimens sampled from suspected patients since last year. Two kinds of molecular tools have been studied for diagnosis (see above).

Sri Lanka

The highest number of human rabies deaths (377) in Sri Lanka was reported in 1973. From 1973 to 1993 this number regularly decreased to reach 98 in 1993. This number, however, started increasing again and reached 105 in 1994 and 151 in 1995. Diagnosis of rabies in humans is made at hospital level and the number of unreported cases is estimated to be very small. The recent increase in the number of cases is unlikely to be due to better case notification after 1993.

More than 70% of human rabies deaths occurred in untreated individuals. The remaining 30% occurred in persons who received traditional treatment or incomplete vaccination. Over 95% of human rabies cases occurred after exposure to rabies suspected dogs, 64% of which were stray animals. Rabies post-exposure treatment is applied in all state hospitals. Use of brain tissue vaccines was abandoned in 1995. Since then all PET were administered using modern cell culture vaccines. This resulted in a significant increase in vaccine demand with more than 180 000 doses, equivalent to 45 000 full treatments supplied in 1995.

The annual prevalence of dog bites in humans (per 100 000) increased from 1270 in 1992 to 2183 in 1995. An estimated annual average number of 40 000 individuals sought post-exposure treatment in the course of the last years.

Dog rabies is endemic in Sri Lanka with an estimated dog-human population ratio of 1:8. On average 492 000 dogs are vaccinated annually with inactivated tissue culture vaccines (450 000 through state organized mass vaccination campaigns, 40 000 through vaccination centres, 2 000 through door-to-door vaccination). However, the dog population vaccination coverage remains below 70%. Elimination of stray dogs, training of medical and

veterinary staff, health education and promotion of community participation and multi-sectoral cooperation are performed in addition to vaccination of dogs and post-exposure vaccination in humans exposed to rabies suspected animals. Medical and veterinary state authorities are currently developing plans for the implementation of oral vaccination campaigns of dogs against rabies.

Thailand

Human rabies in Thailand has been steadily decreasing from 370 deaths in 1980 to 74 deaths in 1995. This reduction in the number of human deaths due to rabies can be correlated with the increasing availability of proper post-exposure treatment. Deaths are reported all year round with a slight increase from November to March. The main transmitter of the disease is the dog (96% or over). The remaining 4% is mainly comprised of cat, monkey and gibbon and, very infrequently, rodent and small wild animals.

Control measures in animals include mass vaccination of dogs (about 4 million dogs were vaccinated in 1995; this is an estimated 53% coverage), birth control in dogs (injection of medroxyprogesterone acetate, surgical sterilization and use of natural hormone from plants. Preventive measures in humans include strengthened human post-exposure treatment, health education and surveillance. Community participation is considered to be the key to success. The programme is thus integrated with the Primary Health Care (PHC) programme. Establishment of community funds is also promoted.

Local production of nervous tissue vaccines, namely Semple vaccine and suckling mouse brain vaccine was stopped in 1989 and 1993 respectively. Four imported tissue culture rabies vaccines have been available for many years. There has been an increasing demand of PET by 10-15% each year, resulting in 160 448 post-exposure treatments (about 250 per 100 000 population) in 1994. About 10% of the vaccine recipients also receive ERIG. The Thai Red Cross Society (TRC) is now producing HRIG.

A PET survey in 1993 revealed that children (<12 years old) represented 51% (36 742 vaccines) of the total number of persons involved in the survey. Most of the patients (73.8%) received PET within 48 hours. Wound cleansing has increased to 75.2% of all those receiving PET. Vaccines were mostly given intramuscularly according to the 5 doses "Essen" regimen (70.4%) and next intradermally (TRC 2-2-2-0-1-1 regimen (17.7%).

Delivery and cold chain monitoring of human rabies vaccines are integrated with the EPI vaccines. Despite efforts to give PET to all exposed patients, some groups, especially labourers, frequently fail to seek PET. This problem should be explored and corrected to strengthen the PET service.

Training courses are given to physicians in charge and health education teachers from all the 76 provinces. Symposia are organized every year to evaluate the programme. Participants in these symposia belong to all sectors concerned. Village health volunteers are trained to administer first aid care to a dog bite wound.

Publicity campaigns are organized through TV, radio and other mass media including community broadcasting. Funds for publicity come mainly from the government budget but

are quite limited. Any additional contribution received from the private sector is considered very useful.

The publicity campaigns include distribution of posters and leaflets in the field and to other interested parties, public counselling on television and radio shows, holding press conferences and ensuring media coverage particularly when launching dog vaccination campaigns.

Viet Nam

Rabies is considered a priority zoonosis in Vietnam. Sporadic cases occur in all parts of the country throughout the year. Rabies represents a threat to both human and animal populations in the country. About 95% of the total human population live in rural areas in close proximity to various domestic and sylvatic animals. In these localities large dog populations act as a potential source of rabies virus for the community. This increases the risk of infection with the rabies virus. The situation is similar in cities and rural areas, especially in the northern part of Viet Nam. In the entire country about 414 human deaths were reported with 345 000 people receiving PET annually during the period 1992-95.

Since 1987, in all provinces/cities of the northern part of Viet Nam, a vaccine card and a rabies vaccination register were introduced to follow-up vaccines and the number of deaths from rabies. In the northern part of Viet Nam about 350 deaths were reported annually during the period 1992-1995 (range 285-398) and about 365 people per 100 000 received PET during the some period of time.

The vaccine (SMB vaccine, strain CVS) was produced by the National Institute of Hygiene and Epidemiology, Hanoi, and by the Nha Trang Vaccine Institute and the Pasteur Institute, Ho Chi Minh City. On average, 450 000 doses were produced each year. Vaccine doses were distributed for vaccine injection to each of the provinces/cities. There are about 400 centres offering anti-rabies vaccination throughout Viet Nam.

A national control rabies project will be initiated soon. This project is one of the priorities of the National Health Care Programme of the Preventive Medicine System. It will consist of:

- Establishing anti-rabies vaccination centres in each district (550) and training medical staff.
- Upgrading the quality of rabies vaccine production (a cell culture vaccine will be produced instead of the current vaccine and production of rabies anti-sera).
- Conducting epidemiological surveys of rabies.
- Promoting education, information and communication for rabies prevention.
- Initiating studies on methodologies and technologies for effective control of rabies.

- Securing international cooperation, conducting field studies and epidemiological surveys, as well as ensuring training and financial support of the project.

3. OVERALL RABIES SITUATION AND TRENDS IN ASIA

The above reports show that both successes and set-backs have been reported from the area. The most striking improvement which has been recorded in the field of rabies over the past few years is a very drastic reduction in some Asian countries of the number of human rabies deaths. This decrease is most certainly linked to the increased availability of efficacious and safe cell-culture rabies vaccines for human use rather than to the implementation of effective control measures in the dog population. This phenomenon has been documented in two Asian countries namely China and Thailand where numbers of human deaths were reduced by 80% in 10 to 15 years. In Thailand this followed the increased availability of imported modern rabies vaccines and the development of a new economical regimen for human post-exposure treatment, and in China the local production and wide distribution of large quantities (20 million doses approximately) of a primary hamster kidney cell vaccine (PHKC) for human use.

In many other countries although the results were not as spectacular as in China and Thailand, larger and larger quantities of modern rabies vaccines are imported or locally produced (mainly through technology transfer projects) and administered. This trend is increasing in the area in spite of the costs of modern human biologicals and the indication that rabies elimination by vaccination of the dog population is the most cost-beneficial strategy in the long term. In many countries ministries of health are obliged to respond to the strong demand from people for safer rabies vaccine whilst national veterinary services encounter huge difficulties to establish sustainable programmes for parenteral dog vaccination, and often public opposition when carrying out activities aiming at the reduction of the dog population.

During the past few years some improvements associated with the activities carried out by local veterinary services have nonetheless been noted in some Asian countries and territories such as Indonesia, Republic of Korea and Hong Kong. In Indonesia the number of rabies cases has considerably decreased over the past few years in Java and Kalimantan. Rabies was even eliminated from some provinces of Java and Kalimantan. In the Republic of Korea no human rabies deaths have been reported since 1984 although foci of wildlife rabies have recently emerged in this country. Hong Kong has not reported any rabies case for many years now. Temporary successes were recorded in other countries, for example in parts of Sri Lanka, where rabies was brought under control following dog mass immunization campaigns and the number of human cases reduced by 60%. Difficulties in maintaining a high enough vaccination coverage in dogs have recently led to an increasing number of reports of human rabies deaths on the island.

No successful country-wide dog rabies elimination programmes have however been implemented in the area in spite of the availability of improved methods of surveillance and control. The Korean example also shows that continuous surveillance should be carried out in countries where dog rabies is eliminated to monitor susceptible wildlife species which may become hosts and transmitters of the disease.

4. TECHNICAL REPORTS

The technical part of the Conference started with two opening lectures dealing with rabies strains, characterization and classification on the one hand, and laboratory techniques in rabies on the other (see programme attached as Annex 1). After this the Conference was divided into two successive sessions: one dealing with animal rabies control and the other with the prevention of human rabies. A compilation of all lectures and reports will soon be published by Elsevier and the Mérioux Foundation. Please refer to this publication for complete information.

5. CONCLUSIONS AND RECOMMENDATIONS

Participants in the conference were divided into two groups. The assignment of the 15 participating countries within each group was discussed and agreed upon, taking certain criteria into consideration (e.g. existence of a national programme, level of implementation, reported achievements). Each group dealt with a different subject. The first group, composed of representatives from Bangladesh, Cambodia, Nepal, Lao People's Democratic Republic, Myanmar, Pakistan and Viet Nam, assisted by representatives from China, India, Philippines, Thailand and Sri Lanka, identified obstacles to the implementation of national rabies control programmes and proposed solutions to these problems. The second group, composed of representatives from China, India, Indonesia, Republic of Korea, Malaysia, Philippines, Thailand and Sri Lanka, assisted by representatives from Nepal and Viet Nam, were requested to establish a plan of work at national and international levels for human and animal rabies control, including future field activities and applied research.

5.1 Obstacles to and possible solutions for successful control of rabies

The participants in the first working group, after having discussed their own situation, identified two major and interrelated obstacles to the initiation of successful rabies control programmes, first the lack of coordinated governmental support and second the lack of appropriate resources for rabies surveillance and diagnosis.

Most countries identified additional obstacles such as:

- (I) Absence or insufficient enforcement of existing legislation on animal rabies control (especially for dog vaccination and control of dog movement and population);
- (ii) Lack of affordable and high quality biologicals for both humans (serum and vaccines) and animals (vaccine);
- (iii) Lack of cooperation between the various national sectors/agencies/disciplines concerned with rabies control and lack of involvement of NGOs which could contribute to rabies control;
- (iv) Lack of facilities and trained staff for the treatment of bitten and rabid patients.

The group also stressed the importance of national and regional cultural values which could influence the efficacy of rabies control activities through the nature of their human-dog relationship. This refers particularly to people's attitudes towards dogs and dog ownership, dog vaccination and dog population management, and also human rabies post-exposure treatment with vaccine and serum.

The participants, after having identified the possible solutions, made the following recommendations which can be grouped under three headings:

Planning and coordination

Each country should develop its own plan of action which should take prevalent conditions into consideration, be decentralized and involve local communities.

As a pre-requisite to the development of a plan of action each country should:

- Establish a surveillance system and generate data necessary for policy formulation and elaborate guidelines for action;

When the plan is developed each country should:

- Source funds not only from government agencies but also from private, national and international organizations;
- Involve NGOs from international to national and local levels;
- Train manpower at all levels and provide information to the community.

As an crucial part of the plan, the surveillance system should collect data on post-exposure treatment, dog and other animal species vaccination, and rabies cases in humans and animals. This requires that intersectoral cooperation, particularly between the public health and veterinary public health services is well established. In addition, a sufficient number of diagnostic laboratories with the proper equipment, staff and biologicals should be in place.

Control activities

They should involve:

- The animal reservoir (mostly dogs) by paying attention to dog population management (destruction, reproductive control) as well as dog vaccination (management /coordination; amount/quality of vaccine);
- Humans by ensuring pre-exposure treatment of personnel at high risk (dog vaccinators, hospital personnel) and post-exposure treatment of bitten persons. In either case an appropriate amount of safe and efficacious biologicals including immunoglobulin for treatment of severe exposure should be available.

Intersectoral cooperation (surveillance, follow-up) is again essential to ensure the best use of costly biological products.

In addition, education/training of medical staff and of the public at large is essential to overcome certain attitudes towards dog vaccination, dog population management and post-exposure treatment; an adapted, enforceable legislation should be adopted.

Research

As an integral component of the plan of action, research should concentrate on:

- The main animal reservoir, as more needs to be known about dog population, dynamics and dog-human interactions;
- Risk groups, as this would permit better targeting of populations which may require pre-exposure treatment;
- Animals at the origin of human exposure, as it would be especially important to further document the role played by dogs in relation to their level of supervision by humans and also the importance of other domestic and wildlife species;
- Circulating viruses, whose characterization by modern molecular techniques would provide insight into the epidemiology of rabies and in particular provide information on the potential role that species other than dog might play in the maintenance of the disease.

5.2 Achieving the goal of rabies elimination

In most countries represented in the second working group, rabies control activities in both humans and animals were carried out for many years and had led to a reduction in the number of deaths (both in humans and animals). On that basis the group defined its goal, which is to eliminate rabies from their territories. Some countries in the region have chosen the year 2000 as the deadline for rabies elimination, whereas others do not see it as a viable goal before 2020.

All the countries in this group agreed that in view of the limited amount of resources available, rabies control activities should target limited areas where rabies is a major problem rather than the entire territory. Rabies elimination in the future thus requires the establishment of a good surveillance system based on a tight enough network of diagnostic laboratories.

The group issued recommendations dealing with three components:

Control of animal rabies:

- Immunization of dogs should reach at least 80% of the population in highly endemic areas identified through a good surveillance system based on a network of diagnostic laboratories;
- Responsible pet ownership including dog registration and dog population control such as sterilization, use of hormones, elimination of unwanted dogs should be fostered;
- The status of certain rabies-free areas should be maintained through strict implementation of national and international regulations on movement of animals;
- Community participation through the establishment of community funds, mobilization of community volunteers during vaccination campaign should be promoted.

Prevention of human rabies:

- Governments should allocate sufficient funds for procurement of human rabies vaccine and immunoglobulin to be given at no cost to indigent high risk bite cases;
- Revised national guidelines for pre- and post-exposure treatment based on WHO recommendations should be issued;
- Training for health personnel on post exposure treatment (PET) and handling of rabid patients should be provided, including health education with emphasis on precautionary measures to be taken to prevent potential transmission within family members when a rabid patient is cared for at home;
- Pre-exposure treatment of children which may easily come in contact with dogs and cats of unknown origin, when the family can afford it, should be considered.

Applied research:

(I) In animals the following areas require particular attention:

- Dog ecology and human-dog relationship;
- Oral rabies immunization especially among inaccessible owned dogs;
- Use of traditional plants with birth control effects and development of anti-reproduction vaccine for dogs;
- Rabies surveillance in wildlife in rabies free areas.

(ii) In humans it would be especially important to:

- Study the immunogenicity of current vaccines and regimes in immuno-compromised individuals;

- Re-assess and validate potency tests of purified ERIG (reference and method);
- Increase production of cheaper purified ERIG;
- Develop shorter economical id regimens for human PET.

6. **RESOLUTION**

The participants from medical and veterinary services from 15 Asian countries (Bangladesh, Cambodia, China, India, Indonesia, Republic of Korea, Lao People's Democratic Republic, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and Viet Nam) attending the Symposium on Rabies Control in Asia,

Recognizing the health significance of rabies in their countries, where altogether about 35 000 rabies-related deaths are officially reported each year, though the true figure may be much higher;

Recognizing that the presence of the disease in their countries leads to the application of more than 6 million post-exposure treatments in humans as well as millions of preventive treatments in animals, thus making rabies a significant and continuously increasing economic burden for these countries, particularly for the health and agriculture sectors;

Acknowledging the dramatic progress reported by some Asian countries in their efforts to control human rabies through discontinuing the local production of animal brain vaccines for human post-exposure treatment, procuring larger quantities of modern vaccines and improving their country-wide availability;

Acknowledging the efficacy of mass vaccination of dogs for rabies control and elimination and the usefulness of new economical regimens for post-exposure treatment of humans as recommended by WHO;

Acknowledging the potential of oral vaccination of dogs to increase dog population immunization coverage and ongoing research projects on new vaccines and substances for pre- and post-exposure immunization of humans;

Acknowledging the lack of resources and intersectorial collaboration for rabies control in humans and animals in most Asian countries;

REQUEST

- (1) All national rabies project leaders to review and, if necessary, redirect their rabies control activities by first targeting high risk areas and expanding to other areas in a progressive manner to finally reach the goal of disease elimination;

- (2) Their governments to provide increased support to activities for the surveillance and control of rabies in humans and animals and to take measures to ensure availability of affordable rabies vaccines and immunoglobulin;
- (3) Donor agencies to further collaborate with the countries by providing training and supporting their sustained efforts particularly at field level;
- (4) The WHO Regional Committee of the South-east Asia Region (SEARO) and the Western Pacific Region (WPRO) to reinforce their capabilities to meet the demands from Member States for technical assistance, technology transfer, and to consider launching of regional initiatives for dog rabies control and elimination in Asia by exploring possibilities of involving regional organizations such as ASEAN and SAARC;
- (5) WHO Headquarters to increase its ability to promote research on new concepts for human and animal rabies prevention and control, and to further cooperate with all parties involved to increase worldwide availability of affordable rabies vaccines and rabies immunoglobulin.

ANNEX I

A G E N D A

11 SEPTEMBER 1996

- 08h00 - 16h00 Registration
- 16h00 Set out from Wuhan
- 18h30 - 21h00 Opening Ceremony and Reception Dinner

12 SEPTEMBER 1996

- 08h30 Session I : Opening
- Target rabies 1995 prevention
Betty Dodet/ Stéphane Imbert
- Review of human and animal rabies situation in China
- Prospect on rabies immunization in developing countries
François-Xavier Meslin
- Country reports on medical and veterinary aspects of rabies
prevention and control.
- 12h30 Lunch
- 13h30 Country reports (continued)
- 15h30 Break
- 16h00 - 18h00 Discussion
- 18h30 Dinner
- 19h30 - 21h00 Opening lectures
- Serotypes and genotypes of fixed strains and wild rabies strain,
situation in China. Consequences on immuno-therapy
Hervé Bourhy
- Laboratory techniques for rabies
Henri Tsiang

13 SEPTEMBER 1996

08h30 - 12h30

Session II: ANIMAL RABIES CONTROL

Oral vaccination of foxes in France: evaluation of bait delivery systems

Michel Aubert

Comparison of rabies vaccines in the field

Enrique T. Carlos

Oral immunization of dogs: analysis of dog populations and bait delivery systems

Hans C. Matter

Oral vaccination of carnivores in North America

Charles E. Rupprecht

Break

Oral vaccination of wildlife in Europe: results and set back over the last fifteen years

Klaus Stöhr

Requirements for oral vaccination in Asia

Alexander Wandeler

Development of rabies vaccines

Michel Lombard

12h30

Lunch

14h30 - 18h00

Discussion

19h00

Dinner

14 SEPTEMBER 1996

10h00 - 12h00

SESSION III: PREVENTION OF HUMAN RABIES

WHO recommendations update

François-Xavier Meslin

Effectiveness trial of ERIG + PVRP in category III rabies Exposures in China: preliminary results

Jie-Tong Huang

Rabies PET regimen in the Philippines

Beatrice Quiambao

Rabies vaccination in Thailand

Chantapong Wasi

Rabies vaccination in children

Arunee Sabcharoen

Trial for insertion of rabies vaccine into the EPI

Le Tan Tho

12h30 - 14h00

Lunch

14h30 - 16h30

SESSION III (continued)

Clinical pharmacology of rabies immune globulins

Jean Lang

Use of rabies immune globulins in India

Sarajit Sehgal

New generation of ERIG: clinical evaluation

Betsy Miranda

Use of monoclonal antibodies in rabies

Charles E. Rupprecht

17h00 - 19h30

Discussion

19h30 - 20h00

Conclusions and recommendations

20h00

Closure