ORAL VACCINATION OF DOGS AGAINST RABIES

Guidance for research on oral rabies vaccines and Field application of oral vaccination of dogs against rabies

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Front cover: Dog with rabies vaccine bait. Photo: Jacques Barrat (AFSSA-LERRPAS)

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1. Foreword

Globally, almost all human deaths attributed to rabies are caused by dog bites and approximately 99.9 % of reported cases occur in Asia and Africa It is estimated that approximately 55,000 human lives are lost to rabies each year on these 2 continents (1). Asia accounts for an estimated 32 000 annual deaths (58%) with about 20 000 in India alone (62% of the Asian mortality figure). Africa accounts for 23 000 of these 55 000 annual deaths (42%). With a total DALY score of 2 million rabies ranks next to lymphatic filariasis and intestinal parasitic infestations but ahead of leishmaniasis, schistosomiasis, sleeping sickness, onchocerciasis, Chagas disease and Dengue. More than 80% of the total population living in these regions (estimated at 3 billion people) is at risk from endemic canine rabies, and enormous anxiety and suffering is caused by the estimated 4.2 million annual bites from suspect rabid dogs. The estimated annual incidence is 1.37 /100,000 people, with 10 to 18 times more deaths occurring in rural than urban areas respectively in Africa and India. There are huge disparities in the affordability and accessibility of post-exposure treatment, levels of rabies awareness and risks of exposure to rabid dogs. These result in a skewed distribution of the disease burden across society, with the major impact falling on those members of poor rural communities. In addition an average 40% of the people bitten by rabies suspect dogs are less than 15 year of age increasing the consequences for poor rural communities.

WHO has always tried to maintain a balance between the promotion of activities for the prevention of human rabies and the control of rabies in dogs. In the human field during the past 20 years WHO has consistently promoted the discontinuation of production and application of brain tissue vaccines in humans and the use of economical intradermal post-exposure immunization regimens.

In the animal sector as dog accessibility to vaccination by the parenteral route was reported to be the major obstacle for dog rabies control in many different parts of the world since 1985, WHO promoted research on dog populations and achievable dog immunization coverage in Africa, Asia and Latin America [3-7]. Acknowledging the insufficiencies of the parenteral route for dog rabies elimination, WHO stimulated studies on oral vaccination of dogs (OVD) and the development of safer and effective vaccines and baits for OVD [8-15, 37-40]. This document is a compilation of recommendations made by the consultations on OVD organized by the Zoonoses and Veterinary Public health unit of WHO.

OVD offers new approaches promising a significant increase in the dog vaccination coverage (especially of free-roaming and poorly supervised dogs) both when applied exclusively or in combination with parenteral vaccination [6-7]. Since 1988 WHO has continuously promoted international collaboration and coordinated research in OVD through an informal group of specialists associating specialized WHO collaborating centers, researchers and official representatives of potential recipient countries, as well as pharmaceutical companies. Very early on it became evident to this group that ensuring the safety of OVD (from candidate vaccine to bait and bait delivery systems) under the specific conditions prevailing in most areas with dog rabies was a prerequisite to promoting its use in the field. OVD safety for non-target species, especially humans, has remained the center of WHO coordinated activities. The group very carefully looked at different probable and also more unlikely scenarios which could lead to human exposure to a live dog vaccine [8-13].

To better assess the likelihood of these different scenarios the group requested that all candidate vaccines be tested in immuno-suppressed animal models and for safety in non-human primates. It was further recommended that better quantitative tests be developed to measure input vaccine virus excretion and that the levels of virus excretion with time be evaluated in young puppies as the most probable excretor and transmitter of vaccine virus to humans [12-13].
The group also established guidelines for determining oral vaccine efficacy in laboratory dogs and for bait development, bait preference trials and for the evaluation of bait delivery systems in the field [16]. Three delivery systems for OVD were envisaged : the distribution of the baits to owned dogs via their owner who would collect the bait at a central location, b) the placement of baits at selected sites where they were accessible to free-roaming dogs (so-called « wildlife immunization model ») and c) distribution of baits to dogs encountered in the street (so-called « hand-out model »). The group worked on elaborating specific guidelines for implementing OVD projects and has promoted the further investigation of OVD logistics and economics.

Investigating economics of OVD is essential since it is very unlikely that all resources required for dog rabies elimination become suddenly available. The implementation of control activities will obviously remain under financial strain and require that new techniques be as cost effective as possible. When targeting certain « high risk » components of the dog population such as feral and free-roaming dogs it may be possible to accept a cost per dog vaccinated by the oral route higher than that established for a parenteral vaccination (e.g. US$ 1 to 1.3 with 0.35 worth of vaccine [18]) as most savings accrue after rabies elimination. However, when oral and parenteral vaccination compete for the same dog (e.g. owned and restrainable segment of the population) one should expect at least comparable costs per fully vaccinated dog.

To reduce costs further and thereby open new opportunities for the initiation of large scale vaccination programmes, inexpensive and voluntary vaccine delivery systems involving communities or community leaders should be promoted. In this context, the results acquired in Tunisia by placebo bait distribution to dogs via their owners are very encouraging [17]. This method would however necessitate modifications of regulation on the delivery and application of veterinary rabies vaccines currently enforced in many countries. It should also be kept in mind, that this move might not be well received by professional associations and governments struggling to allocate often limited budgets to competing public health problems.

A number of requirements regarding safety of candidate vaccines and safety, efficacy and economics of bait delivery (using placebo baits) still remain to be fulfilled. WHO-coordinated laboratory and field research on OVD has however been fruitful and created the proper conditions for launching limited field trials in the near future.

This document aims at sharing guidance generated by the WHO specialist OVD group with field researchers, public health and animal health administrators involved in rabies control programmeme organization and implementation. The composition of the Specialist Group which assisted WHO in this endeavour varied over time. The list of contributors attached to this document as Annex 1 is a compilation of the lists of participants of each of the OVD Consultations organized on the subject. Their contribution has been very much appreciated and this document also aims at acknowledging their valuable involvement in the area. As this series of OVD Consultations spanned over more than 2 decades many of the participants have moved to new positions, some are now retired and some unfortunately have passed away. We

have kept for each of these categories of contributors the affiliations which were theirs at the time of their last participation.

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