HAVE WE MET THE CHALLENGES OF RABIES DIAGNOSIS, SURVEILLANCE AND CONTROL IN THE 20TH CENTURY?

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The theme of our meeting here today is "The Challenges of Rabies Diagnosis, Surveillance and Control in the 21st Century". It is customary, when one sets out upon a new phase of work, to review the successes and failures of the current and past phases, in order to plan accordingly for the future. We are about to enter a new phase, as it happens, to enter a new century, and thus it is appropriate to ask the question 'Have we met the challenges of diagnosis, surveillance and control during the 20th Century?'

Let us go back in time, right back to the late 19th century, 114 years in fact to 1885 when Pasteur used dried rabies-infected brain and spinal cords as a vaccine. What was Pasteur's challenge? It was to save human lives from the scourge of rabies, which was endemic in dogs and wolves in Europe and in dogs in other parts of the world. Interestingly, the treatment which he initiated - vaccinating the patient after infection, or post exposure treatment as we call it today, remains unique in the field of virology. Inactivation of the virus with phenol and more recently with β-propiolactone increased safety, but the multi-dose schedules considered necessary to obtain adequate responses to these vaccines enhanced the possibilities of allergic neuroparalytic accidents. Vaccines from neural tissue origin (NTO) are, regrettably, still in use in some countries of our region.

Within a few years, Pasteur Centres were set up in various countries of the world, including some within our region, which remain today. What was their challenge? Precisely the same as Pasteur's, to save human lives from rabies.

Early in the 20th century we learned how to recognise the disease, albeit retrospectively, other than by the history of a bite and subsequent clinical signs - by looking for Negri bodies, either by simple staining methods or by more sophisticated staining of paraffin wax sections. Negri bodies are pathognomonic of rabies in man and animals, although their absence does not exclude the disease. Again, regrettably, examination for Negri bodies is still the only laboratory method of diagnosis used in some countries of our region. But the advent of fluorescent antibody techniques soon after mid-century allowed us to be almost 100% sure of our laboratory diagnoses by a relatively cheap and very rapid method. It is a sad reflection of the lack of progress in our region that some countries, even if they possess FA microscopes, do not maintain them properly, cannot afford conjugate, or simply do not receive samples suitable for testing.

As with many other diseases and disease agents, we have learned a lot about the rabies viruses, their size, shape, molecular structure, the important proteins, how they vary to give different serotypes and genotypes and how antigenic variation can be used as a tool towards the understanding of rabies epidemiology. But perhaps the most important advance in rabies was the movement away from NTO vaccines and the production of vaccines initially in eggs and later by cell-culture techniques. These latter vaccines allowed not only safe post-exposure treatment but also pre-exposure prophylaxis - in other words, the disease could be eradicated in dogs, the most prolific cause of human rabies, and human rabies could be prevented with more certainty if vaccine was administered with anti-serum within a short period of the biting incident.

Vaccine technology grew at such a pace that, as we come to the end of the century, by parenteral vaccination and, where they cannot be reached with a syringe and needle, we can vaccinate dogs orally. We can eradicate the disease in dogs and we can eradicate the disease in wildlife over vast
geographical areas by oral vaccination. We can be 100% certain that, given proper and timely treatment, no-one need die of rabies.

And yet, we know from our previous SEARG/WHO meetings, that many people in our region do die of rabies. At our meeting in Nairobi in 1997 we heard from Dr. Makonnen Fekadu, a world-wide respected scientist who has published papers on rabies for a quarter of a century, that it is likely that 10,000 people die of rabies in Ethiopia each year. Ten thousand, in one country, in one year! In a country which still has a Pasteur Centre, no doubt Pasteur would have had something to say about that. But other countries in our region have more human and animal rabies cases than are currently reported - in every small-scale dog ecology study and/or dog vaccination programme carried out by our Group members since our first meeting, the weight of infection has been far in excess of that anticipated. Dr. Cleaveland will be presenting some alarming results from Tanzania later in this meeting.

We need to look in greater depth at what is happening in the countries of our region. I have now visited 12 of the 18 countries, on a fact-finding mission funded by WHO. Note please that I say fact-finding and that is what it is, not to criticise, not to promise help which cannot be delivered, but to establish the facts so that we may know what needs to be done. I use a check-list which seeks to establish the country size, human population size and density, per capita income, communications systems, current rabies position, veterinary services structure and liaison with medical services, rabies surveillance, sample collection and shipping, rabies diagnosis, rabies control and, where it occurs, donor organisation input. In return for the information I demonstrate straw-sampling methods, check fluorescence microscopes and diagnostic techniques, give seminars and leave aliquots of conjugate and a copy of each of two videos on rabies, purchased from project funds.

Our Group covers about 10.87 million km$^2$, about 10% larger than the USA; the human population is some 288.3 million, about 25 million larger than that of the USA. In our region, population density ranges from about 2/km$^2$ in Namibia (although of course the population is not uniformly distributed) to about 95/km$^2$ in Malawi, one of the highest population densities in Africa. In our more southerly countries, (South Africa, Namibia, Botswana and Zimbabwe), per capita income is US $2923, US $2059, US $3640 and US $786 respectively. These are relatively wealthy countries and, it has to be said, communications systems and veterinary structures are good. Wildlife rabies is present, but except for eastern areas of South Africa, dog rabies is under control and human rabies cases are not frequently reported.

However, in the remainder of our region, per capita income is much lower, ranging from US $36 in Sudan (although this may change when oil comes on stream later this year) through US $77 in Mozambique, US $96 in Ethiopia, US $139 in Tanzania, US $142 in Malawi to US $382 in Zambia. We think of India, with its estimated 25,000 human rabies case a year, as a poor country, but even here the per capita income is US $365. Thus, unsurprisingly, the low per capita income is a major factor in the lack of rabies control in our region.

Arising from this poverty is the lack of country infrastructure and communications systems, especially roads. The outcome is that hardly any samples get to the laboratories, which as a rule are poorly equipped and, even where there is a good microscope, FA Tests are often poorly performed. Almost all medical and veterinary personnel testify that ‘rabies is a serious problem’ but the non-existent surveillance coupled with lack of samples and poor laboratory techniques mean that the current rabies position simply is not known. This is reflected by the responses to the question posed to each country’s WHO Representative ‘How much of your budget is used in rabies?’ The answer is invariably ‘none’, since veterinary and medical health officials, in the absence of figures for rabies, put rabies as a low priority for their limited funds.

In only a few countries is there any liaison at senior level between the veterinary and medical professions. This is surprising since rabies is a zoonosis - a disease of animals, mostly dogs, but the major financial costs are borne by the medical profession (post exposure treatment and hospitalisation) and the public (loss of earnings and life).

In some countries there is a loose liaison at the local level, where a bitten person reports the dog to a veterinarian, who may recommend that the patient goes to a clinic to obtain treatment. But often even this does not occur and/or the patient may prefer to go to ‘traditional healers’ or, if knowledgeable, may sell a cow and go abroad for treatment. In other countries, the lack of liaison has at least been recognised as a problem and in Uganda, for example, a veterinarian attends Ministry of Health committee meetings.
Vast sums of money may be used by Health Ministries to purchase post-exposure treatment (vaccine only), but distribution is poor and the vaccine is seldom available where it is most needed. In one or two countries large vaccine stocks pass their expiry date sitting in Central Stores, whilst victims die of untreated rabies in the field.

In most countries, some attempt is made to control rabies in dog populations (usually in response to reports of human deaths from rabies), but the numbers of dogs vaccinated or destroyed is most often very low and in no way reaches a significant proportion of the (largely unknown) dog population.

So, have we met the challenges of rabies diagnosis, surveillance and control in our region in the 20th century? Apart from in the four relatively wealthy countries mentioned above, the answer is a resounding ‘No’. Diagnosis is poorly performed, surveillance totally inadequate and control virtually non-existent. We know that all we have to do is to vaccinate dogs, but we do not know how many dogs there are, neither do we know how many people die of rabies in our region.

What has SEARG/WHO done to help? For 1995, the year of our third meeting, in Zimbabwe, the WHO World Survey of Rabies published a figure of 206 human and 1373 laboratory confirmed canine cases for the whole of Africa. We know now that in our region alone human deaths can be counted in thousands; in our Nairobi Proceedings, in 1996 we reported 813 laboratory confirmed canine cases from eight countries. Significantly, we had no figures for canine cases from Eritrea, Ethiopia, Zambia, Mozambique or Sudan, all countries which are known to have chronic dog-rabies.

What more can SEARG/WHO do? It is clear that we are beginning to understand what is happening in our region. We are all (I hope) dedicated rabiolists - we either work at National Rabies Diagnostic Laboratories, or are responsible for veterinary or medical programmes, or have a role in the treatment of patients or are international workers in rabies research. We all know what needs to be done to prevent the appalling and unnecessary loss of life from rabies.

But we must do more than just know it and know how to do it. We must be able to properly diagnose the disease, to get surveillance systems up and running and to carry out dog vaccination and population control programmes. As individuals we must make sure that senior officers are made aware of the problems. We publish Proceedings and we must make sure that copies reach all levels of management within the veterinary and medical Ministries. We must advertise our work to a wider audience. We need financial help from international agencies, but we can only obtain such help in the face of irrefutable statistics showing the need. We have palpably failed to meet the challenges of the 20th century, but we must not continue to do so. But there is even one greater challenge that we face. Over the past quarter of a century, not just in our region but in almost all the developing countries of the world, the trend has been towards giving more and more post exposure treatments and away from tackling the cause of the problem, rabies in dogs. Today, the number of people worldwide receiving post-exposure treatment, most often in the form of antiquated brain-based vaccines, can be counted at least in hundreds of thousands, if not in millions. This trend will not be reversed until we tackle the problem of rabies in dogs. That is our challenge for the 21st century.