

## **An outbreak of rabies in the Serengeti District of Tanzania, East Africa.**

*(Copy of letter by Roger Burrows published in the British Medical Journal 14 Dec.2004 relating to an outbreak of rabies in 2003 in recently vaccinated domestic dogs).*

In the Serengeti District of Tanzania, as in some other parts of rural Africa, a proportion of the healthy unvaccinated local population of the 'aboriginal' domestic dog breed have been exposed to and survived natural exposure to the rabies virus. Such apparently healthy, symptomless, chronically infected domestic dogs are considered likely to be infectious 'carriers' of the rabies virus they may intermittently secrete, perhaps when stressed, so maintaining rabies in the local population.

Between October 1996 and February 2001 mass vaccination against rabies (also against Canine Distemper and parvovirus) of the local breed of 'aboriginal' domestic dogs took place in *all* the villages in the Serengeti District of Tanzania.

This vaccination campaign, using inactivated vaccines, was designed *to test the hypothesis* that rabies does not persist in local wildlife or in low density populations of domestic dogs but is maintained only in the relatively high density Serengeti District 'aboriginal' domestic dog population in villages to the west of the Serengeti National Park (SNP).. If this were true, then control of rabies infection in this dog population should reduce, or eliminate, rabies infection not only in the local domestic dogs but in wildlife species, particularly in the highly endangered African Wild Dog (*Lycaon pictus*), in the adjacent wildlife protected areas.

It would be predicted from this hypothesis that post-vaccination the incidence of bites by rabid animals on humans in Serengeti District should fall as should rabies outbreaks in various species of wild animals in SNP and adjacent areas .

No mass vaccination of 'aboriginal' domestic dog had been carried out in the Serengeti District for at least 6 years prior to 1996 during which period the incidence of domestic dog and wildlife rabies in this and adjacent areas was low.

On the current 'Fauna and Flora International' website is a statement on 'Carnivore Conservation in Serengeti' which reports:-

*"To date, over 40,000 dogs have been vaccinated. The incidence of dog rabies has declined by more than 97%, with a significant reduction in the number of human dog-bite injuries. Wildlife rabies has declined from a peak in 1997-98, with no cases reported or confirmed in 2001."*

and

*" The vaccination programme has provided marked benefits for communities through local elimination of rabies".*

Unfortunately these statements are well out of date.

In early 2003 an outbreak of rabies began in villages in the Serengeti District bordering the western side of Serengeti National Park where the mass vaccinations had been carried out over a 5 year period.

The 'outbreak' soon became an epidemic of 'unprecedented scale' in recent Tanzanian history with more than 200 people bitten by rabid animals (of various domestic and wild species) resulting in at least 10 deaths in 2003 with domestic livestock also dying from rabies.

Prior to 2003 rabies had been confirmed in just 4 species of 'Serengeti' wildlife, wild dog (*Lycaon pictus*), bat-eared fox, white-tailed mongoose and spotted hyaena although the strain of rabies in the hyaena was not of the type found in other wildlife and local domestic dogs. Rabies is now reported in 6 species of local wildlife in the Serengeti.

In response to the epidemic another mass vaccination campaign of 'aboriginal' domestic dogs was carried out in the Serengeti District by the World Health Organization in August 2003 with 25,000 vaccinations given in 10 weeks.

Unfortunately no information is available on the results of this second mass vaccination of domestic dogs.

By 2004 the rabies epidemic had spread to the east side of SNP

However, in an attempt to halt the spread of rabies another mass vaccination programme was scheduled to take place in mid 2004 this time on the eastern side of SNP (including Ngorongoro Conservation Area and Loliondo Game Controlled Area). It is currently unclear under whose auspices these more recent vaccinations were/are being conducted. No data on these vaccinations or their efficacy has yet been made available.

It is obvious that unfortunately the experimental domestic dog mass vaccinations of 1995-2001 not only failed to locally eliminate rabies (i.e. in the Serengeti District), but failed to prevent the spread of rabies in wildlife with at least 2 more species of wildlife in SNP being affected.

Rabies which was at a low level before the mass vaccination was not locally eliminated nor have the vaccinations brought marked benefits to the local community as claimed. The converse is the case.

The very worrying aspect of the ongoing rabies epidemic is that it appears to have originated in and spread from the Serengeti District area where the experimental mass vaccinations took place and appeared to spread from the vaccinated into surrounding unvaccinated areas.

Unfortunately the vaccinations failed to produce a 'cordon sanitaire' around SNP and, based on the post vaccination evidence available, the predictions made from the hypothesis are not supported and thus the hypothesis must be rejected.

Between 1987 -90 in the Kenyan sector of the Serengeti ecosystem sporadic experimental rabies vaccinations on free living wild dogs (*Lycaon pictus*) were carried out. One part vaccinated pack died from rabies in 1989. This was the first confirmed case of rabies in the species.

In August 1990 in the Tanzanian sector of the ecosystem an unvaccinated wild dog study pack died with rabies confirmed. Dr. Cleaveland was one of the veterinarians involved in the collection of the first positive rabies sample ever obtained from an African wild dog in Serengeti. A brain tissue sample was obtained using the 'straw technique', as demonstrated some years later to Dr. Cleaveland, in the 'Encounters' Programme.

In September/October 1990 the remaining study packs in Serengeti were vaccinated mainly by dart. Dr. Cleaveland was one of the two veterinarian involved in the mass vaccination and post vaccination veterinary monitoring of the Serengeti wild dogs. Unfortunately no tissue samples were obtained from the 5 wild dog study packs, all containing vaccinated individuals, which died in Serengeti by mid 1991, so the cause of their death remains controversial.

However, in the Kenyan sector of the ecosystem one completely and one partially vaccinated wild dog study pack also died with rabies confirmed in the only sample obtained and that from a vaccinated individual. It is now generally accepted that probably all the wild dog study packs died from rabies.

After the Serengeti wild dogs were vaccinated, serum samples, some taken up to 2 years before the vaccinations, were screened and it was discovered that some of the individuals involved had been exposed to rabies pre-vaccination.

Post vaccination in Tanzania when the last 5 Serengeti wild dog study packs died there was no evidence of direct transmission between diseased packs or outbreaks of rabies in any other wildlife or domestic dogs in surrounding areas. These observations, together with the geographical pattern of wild dog pack extinction which took place sporadically in an area of about 25,000 km<sup>2</sup> over a period of at least 3 years with the first confirmed case in the Kenyan sector of the ecosystem in 1989 and the second 150 km to the south in Tanzania in 1990, with in each case packs with adjacent/overlapping home range being unaffected, are not consistent with a general rabies epidemic.

In both sectors of the ecosystem and the surrounding area an unvaccinated non-study wild dog population survived after the death of all the study packs in 1990/91 and persist to date. The whole wild dog population in the ecosystem did not, as was later claimed, become extinct in 1991.

As with the 'aboriginal' domestic dogs in the Serengeti District, vaccinations of the African wild dog failed to prevent high rabies related mortality. In Chad, 11 of 26 domestic dogs (presumably 'aboriginal') died from rabies despite all being vaccinated, some repeatedly, with inactivated vaccines and some wild dogs vaccinated in the Serengeti and in the Masai Mara sector of the ecosystem failed to achieve what are, for 'western' domestic breeds of dogs, considered to be protective rabies antibody levels.

Any possible adverse effects on the immune system, particularly cellular immunity, of vaccinating free-ranging 'aboriginal' domestic dogs and wild species such as wild dogs, bat-eared foxes and spotted hyaena previously exposed to rabies are currently unknown and need to be urgently investigated.

These investigations should be carried out before any further such experimental vaccination are attempted on either 'aboriginal' domestic dogs or any free-living wildlife in Africa.

The immediate need is for funding to provide free post-exposure rabies treatment for people in the Tanzanian villages suffering the effects of the outbreak of this dreadful disease.

.Roger Burrows. CBiol. MIBiol.

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