Vaccinations of African domestic dogs around Serengeti National Park (SNP), Tanzania and around Masai Mara National Reserve ('Mara'), Kenya and their tragic outcomes.

Roger Burrows

This is a story of highly experimental research with disastrous outcomes and of incomplete, confusing and contradictory data relating to them. Here I attempt to unravel these data and to document the course of events. I begin with a description of the local indigenous ancient breed of African Domestic Dog to emphasize the very great difference between them and the highly bred, well fed, well cared for 'western' breeds of domestic dogs. It is also significant to note that the vaccination against rabies of some members of a free-living Wild Dog (*Lycaon pictus*) pack in 1989 was soon followed by the death of the whole pack with rabies confirmed. This prompted the rabies vaccination of some 250 of the local Massai's African domestic dogs in the Mara in 1990 that was also followed by high mortality of the vaccinated domestic dogs although the cause of death is unknown as no tissue samples were taken by the researchers involved.

African Domestic dogs (C*anis lupus familiaris*)

The African domestic dog is an indigenous primitive breed (of the genus *Canis*) descendents of an ancient 'breed' of domesticated Eurasian grey wolves, also of the genus *Canis,* that were brought into North Africa by man thousands of years ago. The first domestic dogs originally accompanied nomadic pastoralists but later also became associated with early farmers. These domestic dogs lived alongside local wildlife including the very distantly related African wild dogs of a different genus *(Lycaon)* with which domestic dogs cannot interbreed. That was the situation until the creation in the 20th Century of Game Reserves and National Parks in Africa from which the local human population and their domestic livestock were excluded as residents

African domestic dogs are kept primarily to guard livestock from predators and have only a loose association with humans. They are not 'pets' in the western sense of the word are often free living, not used to being 'handled', and often scavenge for much of their food. Based on a 1988 World Health Organization (WHO) classification these dogs would be considered to be a mixed population of 'feral' and 'neighbourhood dogs'. They have low life expectancy with an average of 1.75 years in agropastoralist areas to the west of Serengeti National Park (SNP) and 2.7 years in Maasai pastoralist areas to the east and south of SNP and suffer from a wide variety of internal and external parasitic infections.

The first experimental rabies vaccinations of free-living African wild dogs (*Lycaon pictus*) in Africa, in the 'Mara' area of Kenya, was followed by the extinction of the part vaccinated pack with rabies confirmed.

The first rabies vaccinations of free-living African wild dogs began in 1988 when just 2 members of the then only 'Mara' study pack - the 'Aitong'- were immobilised and vaccinated. In 1989, four more members of the same pack, including 3 pups (10 month old) were also vaccinated and radio-collared at the same time.

With no confirmed rabies mortality in free living wild dogs in Africa prior to this, the reason for this highly invasive experimental research on a highly endangered species is unclear.

The 'Aitong' pack was not only the first free living pack of Wild Dogs in Africa to be vaccinated against rabies but the first in which rabies was confirmed, by laboratory analysis of samples taken in 1989, to have died from rabies.

In 1990, following the death of the 'Aitong' wil dog study pack in the Mara and based on the unproven assumption that the rabies virus involved in the death of this pack was transmitted only from local domestic dogs some 250 domestic dogs, approximately 50% of the local Maasai pastoralists domestic dogs in the former now extinct Aitong Pack's home range, were also hand vaccinated against rabies using a single dose of an inactivated rabies vaccine.

Following the rabies vaccinations, the Maasai domestic dogs involved suffered high mortality claimed to be due to a Canine Distemper epizotic/epidemic (Alexander & Appel 1994) although no samples were taken to prove this as the local Maasai refused to allow the surviving dogs to be ' handled' again for blood sampling by the researchers involved.

The confirmed major CD epidemic of 1993-94 began in the recently rabies vaccinated ('handled') domestic dogs in around the SNP .

For a possible explanation of the confirmed CD related domestic dog mortality following rabies vaccination and the confirmed rabies-related death of the part rabies vaccinated 'Aitong' wild dog study pack and later the extinction all the other "handled" wild dog study packs in the S-M ecosystem by mid 1991, see the paper 'Handling-Stress Hypothesis' on this web site - www.africanwilddogwatch.org

Following the rabies related loss of the Aitong wild dog pack in Kenya and the confirmation of rabies in a recently handled but unvaccinated wild dog study pack that died in 1990, in 1992 in the Tanzanian Sector (Serengeti) of Serengeti-Mara Ecosystem, rabies vaccinations of the local domestic dogs, the claimed source of rabies in wildlife, began

The domestic dog vaccinations from 1992 - 1994 were part of a PhD student's field work when investigating the rabies problem in the ecosystem. This required the collection of as many blood samples as possible from local domestic dogs in the 3 districts around Serengeti National Park. So, as an incentive for the local people to bring their dogs to be blood sampled, a free rabies vaccination was offered for all dogs brought to central sampling points in settlements around SNP (Gascoyne DFID undated,)

Following the 1992-4 trial it was later discovered that none of these domestic dogs sampled could be guaranteed free from rabies infection**.** Later serological analysis of the blood samples obtained also revealed that these domestic dogs around SNP had not only been exposed to rabies but regularly suffered from Canine Distemper (CD) and Canine Parvovirus (CPV) infections before and during the free rabies vaccination period .

The local domestic dogs around SNP were also found to have a very low life expectancy (1.75 - 2.7 years) and have both external and internal parasitic infections with some of the dogs treated for such infections when vaccinated by the veterinarians involved in the field work. Vaccine manufacturers specifically warn that only healthy animals should be vaccinated

A devastating widespread CD epidemic in both domestic dogs and local wildlife in the Serengeti-Mara ecosystem 1993-4.

During and following the PhD field work/ free rabies vaccination period of 1992-4, a major CD epidemic erupted in both domestic dogs and local wildlife in 1993-94 that for the first time affected and caused high mortality in local wildlife in SNP particularly in lions in the ecosystem (Roelke-Parker et al 1996).

Following this intense but fortunately short lived CD epidemic, from 1994-96 domestic dogs in Serengeti District villages to the west of SNP and some domestic dogs in Ngorongoro District to

the east of SNP were now not only vaccinated against rabies, but also against CD and Canine Parvovirus (CPV) using a combined Modified Live Vaccine, mixed with a killed rabies vaccine given, contra vaccine manufacturers recommendations, together in a single shot.

The researchers involved claimed that the domestic dog population in villages in this District was the only one around SNP with a high enough population density to maintain rabies and so act as a reservoir of rabies infection for local wildlife outside and inside SNP. So between 1996-2001 a mass vaccination campaign of the agropastoralists domestic dogs took place in all 56 villages in 'Serengeti District ' in the Tanzanian sector of the Serengeti-Mara ecosystem.

Following the CD epidemic of 1993-4, in 1996-2001 the domestic dogs were vaccinated not only against rabies but also against Canine Distemper (CD) and (CPV) in a single shot. All domestic dogs brought to Central Points were vaccinated.

Again, contra vaccine manufacturers recommendations which clearly state that only healthy animals should be vaccinated,.these mass vaccinations took place despite this warning and the fact that these local domestic dogs were known, following the earlier blood sampling period 1992-94, to be regularly exposed not only to rabies but to CD and CPV, both known to induce immunosuppression.

Prior to the commencement (in 1992) of the rabies vaccination trails around and outside SNP, rabies in local domestic dogs was reported to be at a relatively low levels, in all 3 districts sampled around SNP *as was also the case in adjacent African countries at that time ,* with only 7 confirmed cases in these areas between 1991-95 and with no wildlife rabies reported (S. Gascoyne DFID undated report).

By 1996 following the rabies research field work the incidence in the study area is reported to have increased considerably to about 170 per year.

However, this reported increase was based not on serological evidence but solely on the claimed ability of local villagers to correctly diagnose rabies in their domestic dogs (Cleaveland et al 1999). This 'ability' was not however later reported by the researchers involved in the vaccination programme (see Cleaveland et al 2003). The claim is contrary to the earlier published serological data showing the great difficulty, even of veterinarians, in correctly identifying rabies infections in African domestic dogs based only on observed behaviour (Cleaveland & Dye 1995)

By 1996-7, based only on 'data' from local people, 'the incidence of rabies is reported to have increased considerably in the domestic dogs in the Serengeti District to the west of SNP.

In the first year of the mass vaccinations (1996-97) it is claimed that in 15 monitored villages in the vaccinated Serengeti District there were 37.1 ***suspected rabies cases*** in domestic dogs per 10,000 dogs, and 108.9 cases in 10 monitored villages in the adjacent unvaccinated 'control' Musoma District.

No reason is given for the *apparent* increases in domestic dog rabies following the rabies vaccinations of doemstic dogs in SD from 1992- 94, or the even greater apparent increase in claimed rabies incidence in domestic dogs in the adjacent Musoma District chosen as the *unvacinated control area* are given by the researchers involved (e.g. Cleaveland et al 2003) .

The number of *'suspected rabies* ' cases quoted is based merely on the claimed ability of local people to correctly diagnose rabies in their domestic dogs (Cleaveland et al 1999**).**

It is also claimed by the researchers involved (Cleaveland et al 2003) that when the mass vaccinations began in all Serengeti District villages in 1996 *there was no baseline data in either the vaccination or the unvaccinated control areas to the west of SNP,* on the incidence of rabies in dogs or the number of people seeking post suspected rabid animal bite treatment at hospitals and clinic.

This claim is incorrect, hospital data on the monthly incidence of human bites from suspected rabid dogs from February 1994 is included in the paper by Cleveland et. al.(2003).

The mass vaccination of local domestic dogs in all villages in the Serengeti District that ended in 2001 was followed by a rabies epidemic of International importance

In late 2002 a rabies epidemic of unprecedented proportions in recent Tanzanian history began in the mass vaccinated domestic dogs in Serengeti District and quickly spread all around SNP and into adjacent areas of Kenya., *But significantly there is no evidence that rabies affected either wildlife in SNP or the unvaccinated wild dog population still resident in the ecosystem and adjacent areas where the local domestic dogs were claimed to be the source of rabies of rabies in wildlife in the protected areas* **.**

This epidemic that began in late 2001 following what was later claimed to be a 'vaccine shortage' during last mass vaccination period of 1996-2001. This 'shortage/ low vaccination coverage was not reported in the published paper describing the *'success'* of the vaccinations that was received for publication in late September 2002 (Cleaveland et al 2003). However, the mass vaccinations in Serengeti District ended in February 2001 thus any *'vaccine shortage'* must have occurred **before** the 2003 paper was submitted.

Attempts to halt the rabies epidemic in the local human population, domestic stock, and domestic dogs in and around the S-M ecosystem resulted in 2003-4 in the crisis management repeat mass vaccinations of domestic dogs.

These vaccinations were now confined to villages in a 10 kms strip in Serengeti District in the west outside the SNP boundary in 2003, and in settlements in a similar strip in the Ngorongoro District in the Maasai pastoralists areas to the east of SNP in 2004. This was an attempt to create a vaccinated *'cordon sanitaire'* around the wildlife in SNP and other protected areas of the ecosystem.

Most of the domestic dogs in vaccinations zones were given a single dose of inactivated rabies vaccine used as a solvent for the modified live CD and CPV vaccines. The efficacy and /or safety of such a protocol was, and still is, unknown

Published information on vaccinations of domestic dogs in other countries showing that outbreaks and epidemics of rabies erupt when vaccination levels fall or cease, was available to researchers *before the mass vaccinations began in Serengeti District in 1996.*

Reports/ data from other areas of Africa and Asia also showed that the mass vaccinations of domestic dogs using a single shot of rabies vaccine does not provide adequate protection for domestic dogs and may, due to immunosuppression, lead to full rabies in dogs with latent rabies.

CONCLUSIONS

There is no data available on either the efficacy or safety of the experimental vaccination protocol used in the mass vaccination of the local African domestic dogs in Serengeti District i.e.

a single vaccination, using a rabies vaccine as a solvent for other vaccines against canine distemper and canine parvovirus.

No explanation is given in the paper (Cleaveland et al 2003) describing the mass vaccinations of 1996-2001 for the apparent increase in the incidence of domestic dog rabies in the vaccinated and unvaccinated control districts from 15 cases all around SNP between 1991-95 pre mass vaccination to 26 in Serengeti District and 77 in Musoma District during the first mass vaccination period from October 1996 to June 1997.

There is no scientific basis for the claimed rapid decline in dog rabies cases soon after the mass vaccinations began in 1996, the claim being based entirely on a putative massive increase in rabies based on local peoples claimed ability to correctly diagnosis rabies in their domestic dogs. There is no laboratory based evidence for an increase in confirmed cases of rabies around SNP post 1991 and thus there is no firm scientific basis for the claimed rapid decline in such cases following mass vaccination post 1995 as reported by Cleaveland et al (2003).

Many questions remain to be answered by the researchers involved including :-
Why were the rabies vaccinations of domestic dogs followed by outbreaks of Canine Distemper in both sectors of the ecosystem?
Why was there high mortality in the domestic dogs following vaccination?