JACKAL RABIES IN ZIMBABWE
EPIDEMICS AND SPECIES INTERACTIONS

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1 INTRODUCTION.

Jackals account for 25% of all confirmed rabies cases in Zimbabwe. They form the second most frequently diagnosed animal with rabies, second in importance to domestic dogs. Two species of jackal occur in Zimbabwe: the side-striped jackal (Canis adustus) and the black-backed jackal (C. mesomelas).

The first cases of rabies in jackals were reported in 1952, several months after the introduction of domestic dog rabies to Zimbabwe (Foggin, 1988; Swanepoel et al., 1993). A small number of cases were reported during the following years, until 1965 when a large epidemic started in the Mashonaland East area. Since then, several distinct epidemics have been reported. Jackal rabies was reported predominantly in the commercial farming sector, with about 80% of cases from these areas. Less than 1% of cases were reported from National Parks and other protected areas.

Rabies in domestic dogs constituted approximately 46% of all laboratory-confirmed rabies cases. These cases originated predominantly in the communal areas (subsistence farming areas that comprise about 42% of the land area and settle slightly over half of the nation’s population). Brooks (1990) estimated that 71% of dogs in Zimbabwe live in the communal areas and that 40% of dogs were vaccinated against rabies. Current vaccination levels are estimated to be less than 30% (Department of Veterinary Services, unpublished data).

With the expanding domestic dog population in Africa, several researchers have surmised that these populations would threaten wild animal species by, amongst other means, the introduction of diseases (Alexander et al., 1993, 1994; Cleaveland and Dye, 1995). Rabies in jackals in Zimbabwe was not reported before the introduction of rabies in domestic dogs and it is likely that the disease in jackals was introduced by dogs. In this paper I present data which examines how the epidemiology of rabies in jackals is affected by rabies in other species, particularly dogs.

2 MATERIALS AND METHODS.

Computerised records from the Rabies Unit at the Central Veterinary Laboratory, Harare, were used for this analysis. Records of all laboratory-confirmed rabies cases diagnosed from 1950 to 1996 were available.

The species of jackal case submissions was usually not indicated on submission forms, therefore jackal cases were designated to zones of species dominance. These zones were determined according to published data (Skinner and Smithers, 1990) and to sampling surveys conducted in strategic localities. Three species zones were demarcated: the C. adustus zone in the northern Highveld areas and the eastern fringe of Zimbabwe; the C. mesomelas zone in the southern, central and western areas of the country and a zone, referred to as the sympatric zone, which lies between the C. adustus and C. mesomelas zones and where both species are assumed to live in roughly equal proportions or where the relative status of the two is not known. This latter zone occupies a relatively small area where only about 4% of reported jackal cases originated. Sympathy actually occurs throughout most of the C. mesomelas zone, but where C. mesomelas makes up about 80% of jackal samples. However, most of the C. adustus zone does not have C. mesomelas and therefore most of the cases from this zone will have been C. adustus.
3 RESULTS.

Between 1950 and 1996, 2050 jackal cases were reported from the *C. adustus* zone, 397 were reported from the *C. mesomelas* zone and 107 were reported from the sympatric zone. The disease trends in jackals within the *C. mesomelas* and sympatric zones were not clearly definable: although epidemics did occur, cases within such epidemics were diffuse and did not show any definite pattern of movement. Because of the rather imprecise nature of jackal rabies in these zones, no detailed studies on rabies in these zones will be described here.

Jackal rabies cases in the *C. adustus* zone nearly all occurred during epidemics (Figure 1), which started at a focus and had a centrifugally-moving front. Reported cases within these epidemics had high densities. These epidemics occurred in commercial farming areas: they did not progress far into neighbouring communal areas or protected (wildlife or forest) areas.

Figure 1: Rabies cases in the *Canis adustus* zone.

Other carnivore species apart from jackals and domestic dogs which were diagnosed with rabies within jackal rabies epidemics included African civets (*Civettictis civetta*), honey badgers (*Melivora capensis*), white-tailed mongooses (*Ichneumia albicauda*), large grey mongoose (*Herpestes ichneumon*), large-spotted genets (*Genetta tigrina*), aardwolves (*Proteles cristatus*) and various other species. However, none of these species were diagnosed with high frequency and they were reported after jackal cases. Therefore these species were considered to be spill-over.

Table 1 shows the number of jackal and domestic dog cases diagnosed in 2500 km² blocks centred around towns in the *C. adustus* zone. Because they incorporate urban areas, surveillance in these blocks will probably be biased towards detection of dog cases. Despite this, the number of jackal cases far exceeded dog cases during all the jackal outbreaks. Of all jackal cases from the *C. adustus* zone up to 1996, 96.0% were preceded by at least one other jackal case within 180 days and 50 km, while 82.7% were preceded by at least one dog case and 1.1% were not preceded by cases of any species within these limits. Only 2.6% of cases were preceded by dog cases without jackal cases, while 16.0% were preceded by jackal cases without any dog cases. These data imply that jackal rabies in the *C. adustus* zone is self-perpetuating: jackal rabies cases are not simply spill-over from domestic dog rabies.

In the *C. adustus* zone a total of 13 foci which developed into epidemics were reported. Of the 13 foci, seven had dog cases occurring within a 50 km radius and 12 months before the jackal index case. Five of these foci had over five dog cases in the 50 km radius and six had over 10 cases within 100 km. In another focus where no dog cases, or cases in any other species, were reported within 50 km and 12 months, a large number of dog cases were reported between 50 to 70 km from the jackal index case.
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Table 1: The number of dog and jackal cases diagnosed in three 50 km x 50 km blocks located in the Canis adustus zone during epidemic periods.

<table>
<thead>
<tr>
<th>Block and Period</th>
<th>Jackals</th>
<th>Dogs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinhoyi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981-83</td>
<td>114</td>
<td>11</td>
</tr>
<tr>
<td>1992-95</td>
<td>44</td>
<td>7</td>
</tr>
<tr>
<td>Mvurwi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980-81</td>
<td>34</td>
<td>4</td>
</tr>
<tr>
<td>1993-95</td>
<td>62</td>
<td>3</td>
</tr>
<tr>
<td>Marondera</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1965-67</td>
<td>78</td>
<td>0</td>
</tr>
<tr>
<td>1971-72</td>
<td>35</td>
<td>0</td>
</tr>
<tr>
<td>1979-83</td>
<td>37</td>
<td>4</td>
</tr>
<tr>
<td>1990-95</td>
<td>82</td>
<td>3</td>
</tr>
</tbody>
</table>

In three outbreak foci dog cases were reported within 100 km of the jackal index case, although larger numbers of jackal cases were also reported within this distance. The jackal cases and most of the dog cases were associated with separate jackal epidemics. Hence, these outbreak foci may have been initiated either by dogs straying from the other foci of jackal rabies, or from jackals dispersing from these foci.

Two instances occurred where no other carnivore cases occurred within a 50 km radius and within 12 months of the jackal index case. In the first instance low numbers of jackal and dog cases occurred although these were some distance from the focus of initiation. In the second instance no other cases were reported within a 100 km radius of an epidemic initiated near Mount Darwin in 1979. However, this was a remote area and was during a time of civil unrest, therefore the detection of cases was likely to have been poor.

4 Discussion.

Are jackals a reservoir species of rabies, where a reservoir is defined as a species that is capable of independent maintenance of disease (Cleaveland and Dye, 1995)? This study indicates that C. adustus are capable of maintaining rabies independently of other species, and may indeed support dense epidemics. However, such maintenance has not, before the 1990s, persisted for more than 3-5 years, perhaps due to jackal population decimation that leads to decline and local extinction of the disease. Following a recovery period of up to ten years, a new epidemic starts. Epidemics in the C. adustus zone are not frequent, with only 13 instances recorded where new epidemics have become established. In many cases, epidemics have been preceded by rabies in domestic dogs and it is probable that domestic dogs may have initiated the epidemics in jackals.

Until the early 1950s when rabies was introduced into Zimbabwe, jackal rabies had never been reported. Following the introduction of rabies, the disease in jackals occurred mainly in large epidemics. Furthermore, jackal rabies occurred predominantly in the commercial farming areas: the natural protected areas, such as National Parks, Safari Areas and Forest Areas have had virtually no reported rabies cases. This is unlikely to be a surveillance artefact as these areas often have large numbers of biologists and tourist who would be expected to report suspect rabies cases. These points suggest that rabies is not a natural disease in jackals: it has only recently been introduced into the jackal population. The jackal/rabies parasitic relationship has evidently been unstable, a situation which is of no long-term benefit to the disease.

In the past, rabies has probably not been capable of sustaining itself in wild African canids and it currently cannot do so in natural populations. The advent of commercial farming in Zimbabwe has evidently created conditions suitable for rabies maintenance, albeit for limited periods of time. What these conditions are can only be surmised, however, they are likely to be ecological factors that have either raised the jackal population density or have changed the nature of jackals’ social structure. These factors, in turn, lead to high transmission of rabies between jackals, which is necessary for the maintenance of the dense epidemics observed.

In the epidemics of the early 1980s rabies cases declined to extinction when the outbreak had reached the geographical limits of the commercial farming area. The decline in rabies incidence was presumably related to the fact that the jackal population had been decimated by the epidemic and...
there were no susceptible populations remaining for the disease to spread into. Recently, a new phenomenon has been observed in the pattern of jackal rabies. During the 1990s the epidemic fronts reached the boundary of the commercial farming area, however, the annual incidence of rabies did not decline to extinction. Instead, the incidence of rabies changed to a seasonal pattern, with high incidence from January to March. These seasonal cases were dispersed and did not form the fronts which were characteristic of previous epidemics. This pattern has persisted in recent years and may indicate that *C. adustus* rabies has now become enzootic. If this is the case, the jackal/rabies parasitic relationship may be stabilising. The disease will not be so catastrophic for the jackal population but it may now be present every year. This will be confirmed in the years to come.

5 REFERENCES.


