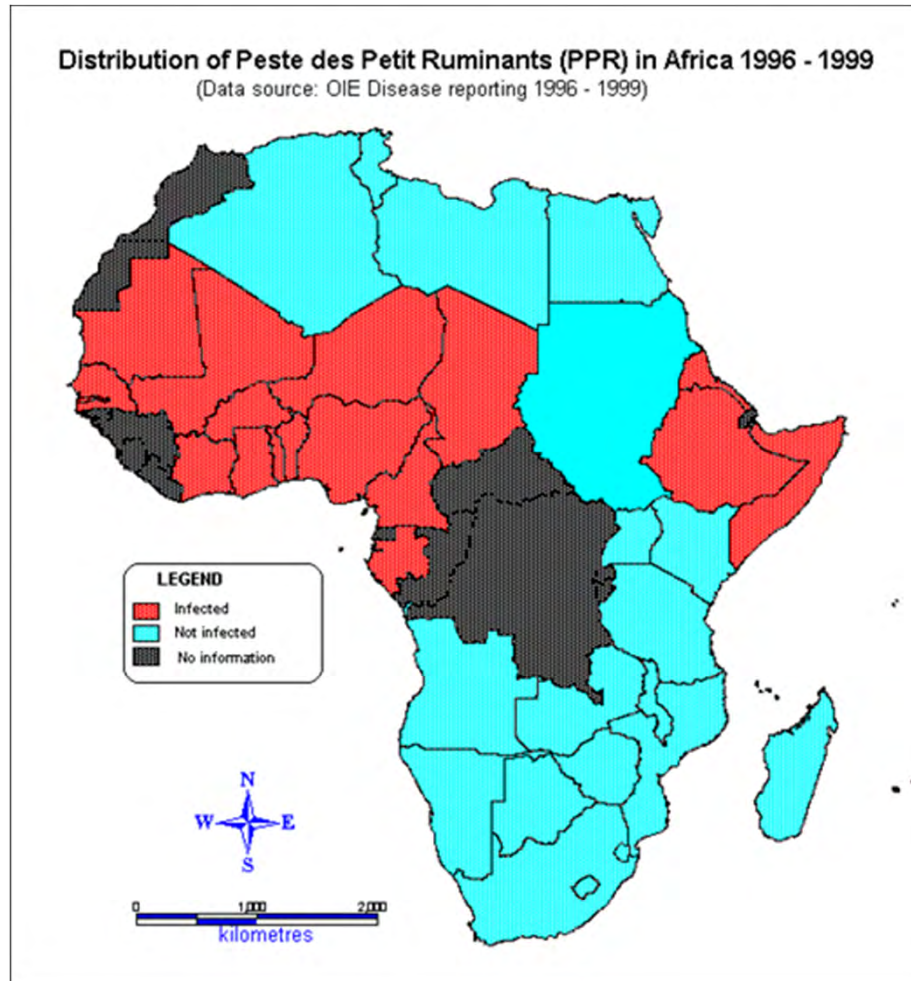


PPR Virus and Wildlife

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PESTES DES PETITS RUMINANTS



UP TO 1999
RESTRICTED RANGE OR
FAILURE TO DETECT?

Evidence for absence in East
Africa:

**PPR antibody in free-
ranging African wildlife sera
up to 2003:**

- Present in western & central regions and Ethiopia
- Absent in East Africa

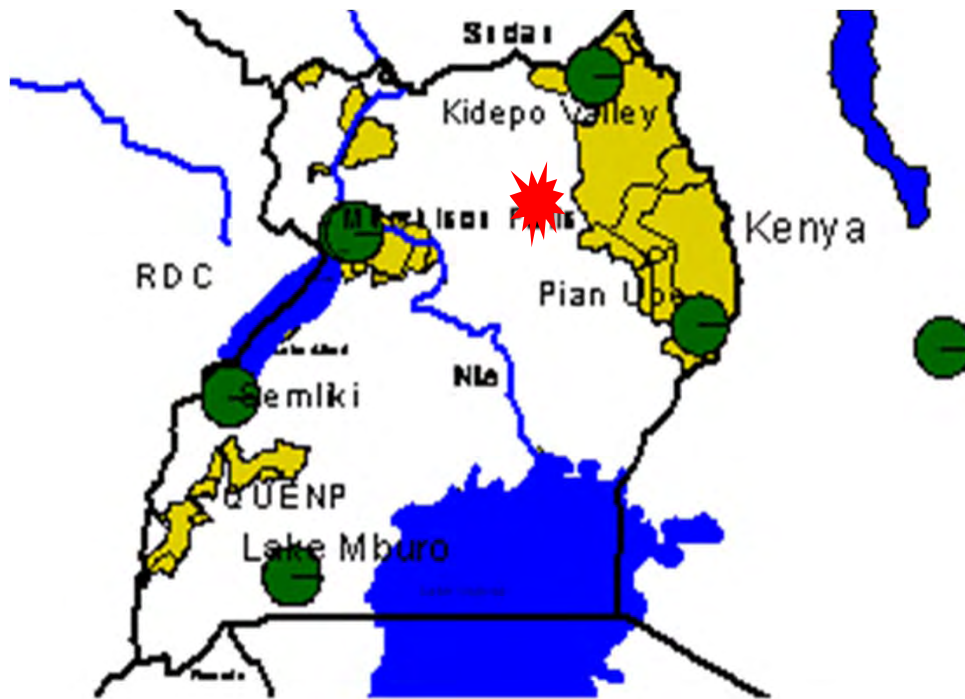
Evidence for PPRv antibody in wildlife in sub-Saharan Africa 1994-2003

- **No clinical cases of PPR in free-ranging wildlife reported from sub-Saharan Africa.**
- **Antibody detected by c ELISA-N PPR in 61/675 wildlife (buffalo, eland, topi and warthog) samples taken in Eastern Africa 1994-2003 (Kock 2008). Considerable cross reaction with rinderpest virus tests.**
- **Cross neutralisation confirmed antibody in wildlife in Omo Mago region of Ethiopia (?Dinder Sudan).**
- **PPRv antibody detected in western & central African wildlife in endemic areas (hartebeest, buffalo and buffon's kob AWVP 2000 PARC PACE)**

Evidence for PPRv antigen in wildlife in sub-Saharan Africa 1994-2003

- **Antibody detected at low levels & Antigen was detected by PCR in nasal swabs from pooled samples of healthy buffalo, waterbuck, hartebeest and kob in Cote d'Ivoire (Coucy et al. 2005).**

Uganda wildlife morbillivirus serosurveillance 2002

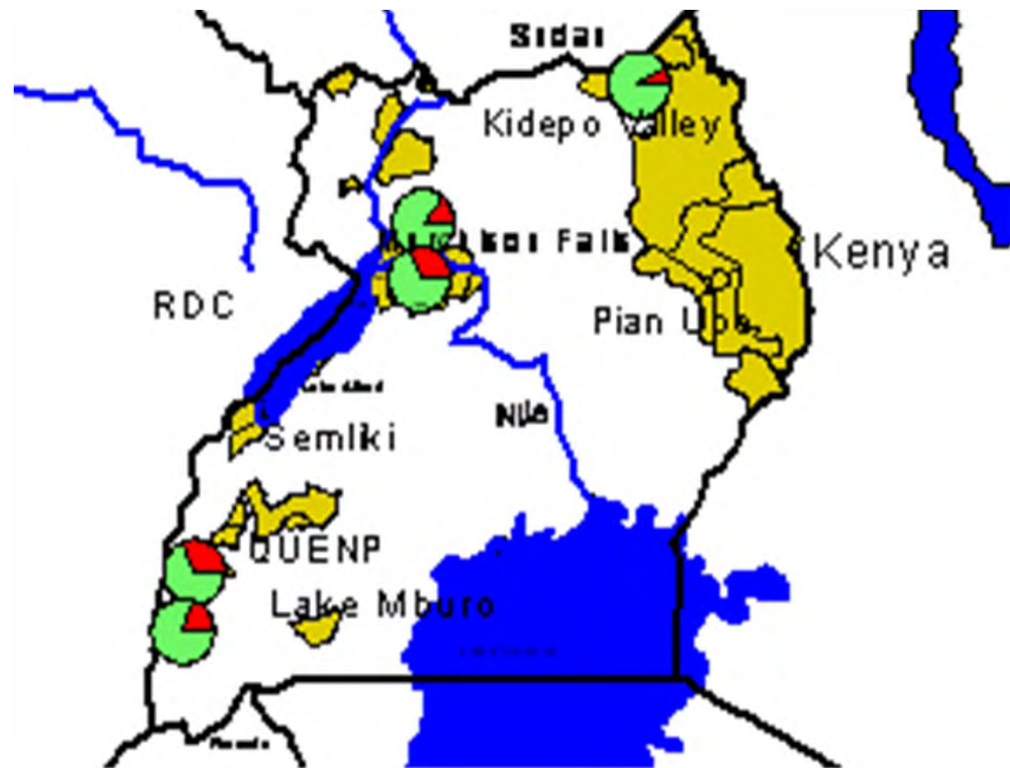


Uganda buffalo sampled in 2002 clear of antibody in sampled for PPRv

PPRv was reported in Ugandan goats in Soroti 2003 (ARIS 2004) *

Officially reported to OIE 2007 in shoats in Karamoja (Luka et al 2012)

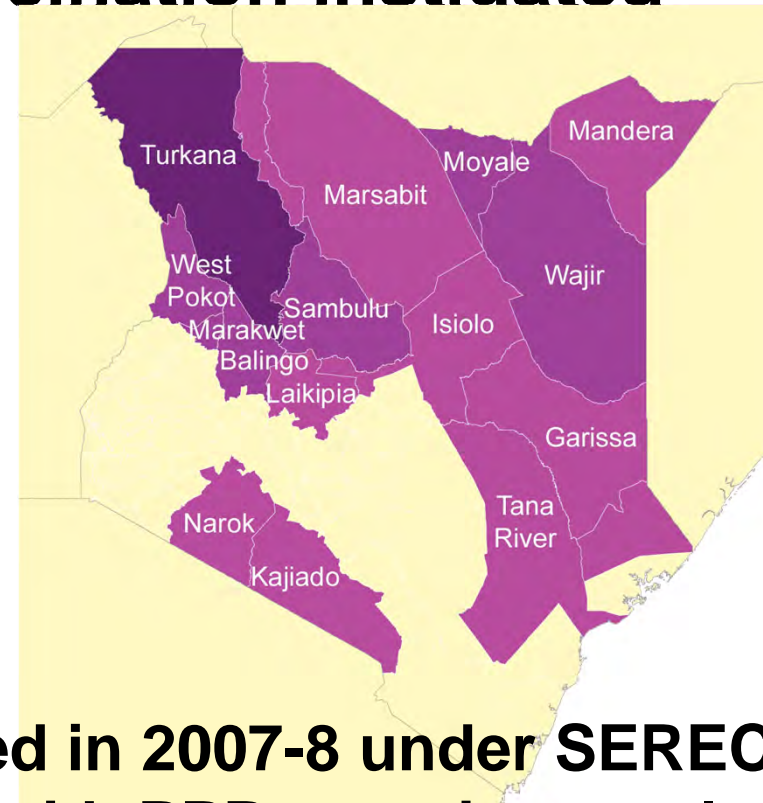
Uganda wildlife morbillivirus serosurveillance 2004



Evidence of PPRv antibody in all sampled buffalo populations no clinical disease reported

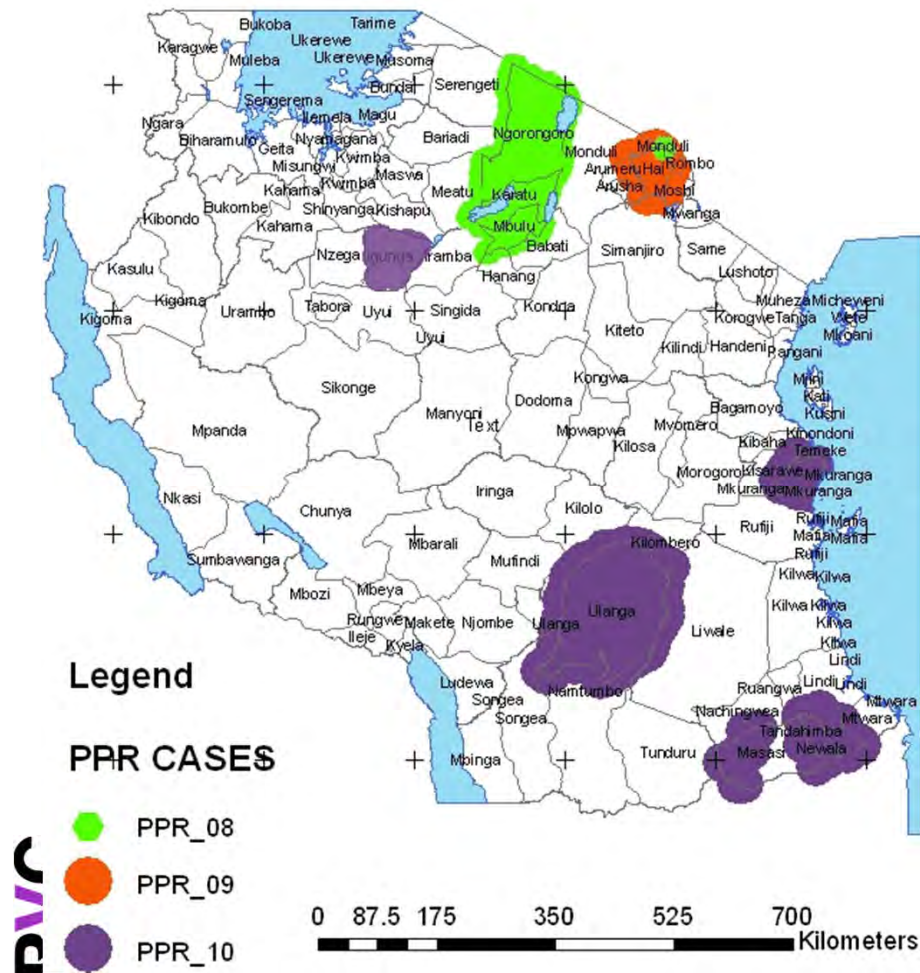
By 2004 cases in Kenya were evident in livestock although not officially reported until 2006, when a major epidemic was recorded & mass vaccination instigated (OIE wahid 2006).

- 2006 Turkana
- 2007 West Pokot – Marawet – Baringo – Samburu – Moyale – Wajir
- 2008 Marsabit – Mandera – Isiolo – Garissa – Laikipia – Tana River – Narok – Kadjiado



500 wildlife were sampled in 2007-8 under SERECU in North Eastern Kenya with PPR negative results except one low positive in a warthog near Wajir (Gakuya Pers Comm. 2012)

By 2007 the virus was reported in Northern Tanzania.



~ 180 wildlife (gazelle and buffalo) sera since 2008 in Greater Serengeti Ecosystem sampled & seronegative (Hoare personal comm. 2013)

Epidemiology of PPRv in African wildlife is not well understood – Questions!

How can we explain:

- **different apparent sero-epidemiology between West –Central- Ethiopian & East African wildlife?**
- **Antigen detection in healthy wildlife in Cote d'Ivoire**
- **Ugandan buffalo seroconversion whilst there was no apparent spillover to buffalo or other wildlife species in Kenya & Tanzania during major epidemics 2004-2013?**

Other Key Questions!

- Does PPR virus behave in a similar manner to rinderpest virus in wildlife species?
- How susceptible are different species?
- What is the domestic to wildlife bridge & transmission mechanism?
- Can buffalo or other species play a role as a vector & driver of wildlife disease?
- Does the absence (in most countries) of African wild goat & sheep species reduce risk of wildlife epidemiology?
- Is there a wildlife reservoir?
- Do carnivores play a role – ref Indian PCR positive PPRv result in lion?

Asian outbreaks

What can we learn from the wildlife disease in Asia?

ARKive
www.arkive.org



Middle and Near East

- **Disease outbreaks in captive ungulate populations 1987 lineage III & 2008-9 IV – significant morbidity and mortality. Hippotragines, caprines & gazelles able to transmit infection readily. Sourced from Asia? Bushbuck, impala, duiker also reported susceptible (Furley et al 1987; Kinne et al 2010; Munir 2013).**
- **Bharals in Tibet (Bao et al 2010)**
- **Wild goats reported infected in Kurdistan in 2010 confirmed by rt PCR on tissue & by cELISA serology. The genotype resembled wild strain present in the region for over 10 years (Hoffmann et al 2012).**
- **PPRv antibody detected by c Elisa - H in 10/85 goitered gazelle in Turkey 2010 (VN cross neutralisation titres were low and probably equivocal except in 2 results) Gur & Albaryak 2010).**

Wild Goats *Capra aegagrus aegagrus*
Kurdistan 2010-11 (Hoffmann et al 2012)



Wild Goats Kurdistan 2010-11 (Hoffmann et al 2012)



South Asia

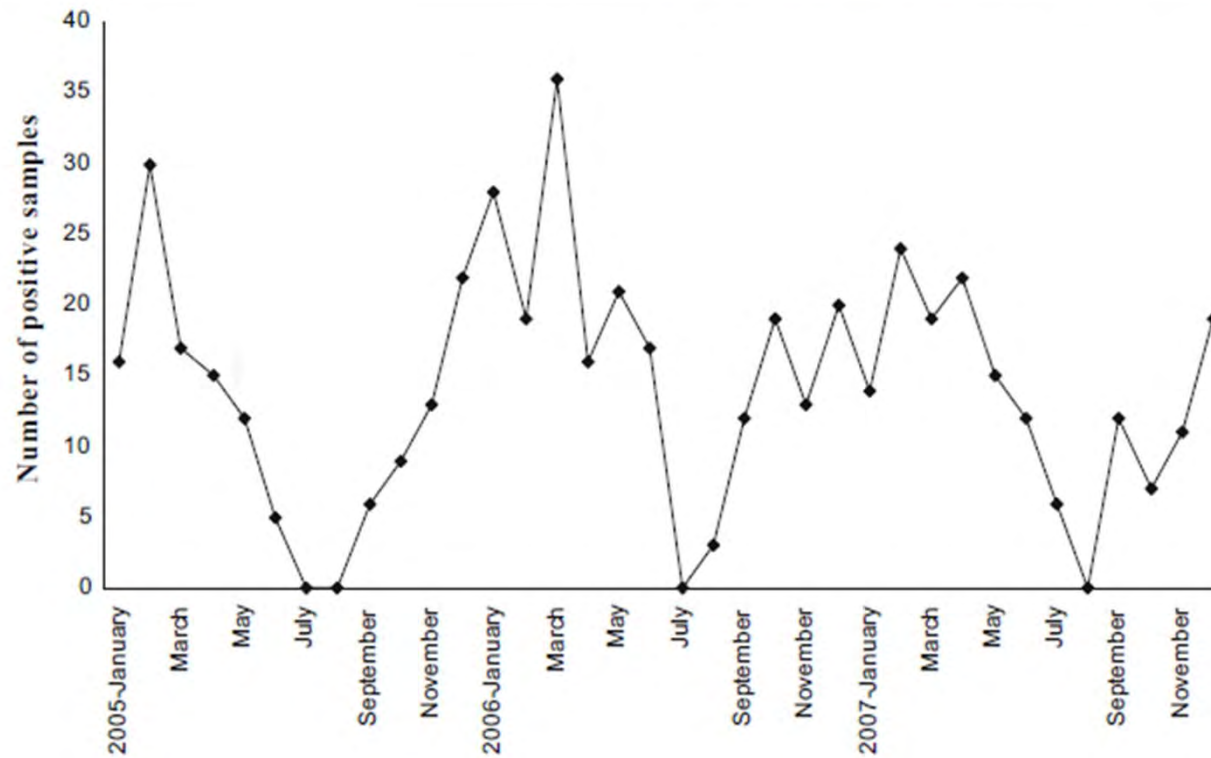
An outbreak of PPR in truly free-ranging wildlife confirmed in Kir Thar National Park, Sindh Province, Pakistan in 2010 (Abubakar et al., 2011) with 36 deaths of Sindh ibex over a month, associated with sharing of water & pasture with a presumed infected goat herd. Confirmed by I_c ELISA and PCR.



Abubakar et al 2009

Peste des petits ruminants virus (PPRV) infection; Its association with species, seasonal variations and geography

Trop Anim Health Prod (2009) 41:1197–1202



Pathogenesis in reported wildlife cases

Acute, febrile, systemic disease (viraemia) with clinically obvious oculonasal serous to mucopurulent discharge, crusting, pneumonia and respiratory distress, ulcerative keratitis and conjunctivitis/opacity, gingival necrotic ulceration, watery diarrhoea, dehydration, death. Lameness reported.

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(Summarised from Munir 2013)

Many endangered desert antelope and mountain caprines at risk



Gazellines

Hippotragines



Summary and conclusions

What is known about PPRv in wildlife?

Antibody detection (c ELISA H & N (PI & CIRAD), Indirect ELISA (PI) PPR specific, VNT (OIE manual)

✓ Antigen Immuno-Capture ELISA, DNA detection (rt-PCR) (Abubakar et al 2011; Hoffmann et al 2012)

✓ Virus isolation from zoo animals (Furley 1987 and others)



✓ Clinical and pathological reports from Middle Eastern zoo & free ranging Asian wildlife (all associated with livestock disease)

Infected Sindh ibex *Capra aegagrus cretica* (Abubakar et al 2011)

Importance of studies of PPR virus infection in wildlife

- **Wildlife is a sentinel (in endemic areas? & with shoat vaccination might be useful). Initial evidence equivocal on this point but so far surveillance limited in scope?**
- **Need more data to see if prevalence in East Africa has risen >1% in wildlife and is spreading in wildlife.**
- **Need wildlife virus isolates.**
- **Role of buffalo or other species (reservoir, vector) unknown - some evidence buffalo can carry and transmit virus based on PCR and evidence of seroconversion at herd level. Note - cattle seroconversion reported in Asia (Abubakar 2011) & in Tanzania (Pending)**

Acknowledgements

Thanks to many professional colleagues for advice and help with morbillivirus disease affecting wildlife over last 20 years:

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RVC

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