

Ecological and demographic aspects of primate viral zoonoses

Tony L. Goldberg, Ph.D., DVM, MS

University of Wisconsin-Madison, School of Veterinary Medicine

Other Affiliations

Makerere University, Uganda, Department of Zoology

UW-Madison Global Health Institute

UW-Madison Departments of Population Health Sciences, Department of Zoology

Nelson Institute for Environmental Studies, Center for Sustainability and the Global Environment

Kibale National Park

- 793 km² forested park
- Over 30 years of research on primate ecology
- In the Albertine Rift
 - Biodiversity hotspot
- Highest rate of human population growth in Sub-Saharan Africa.



Kibale: a fragmented forest

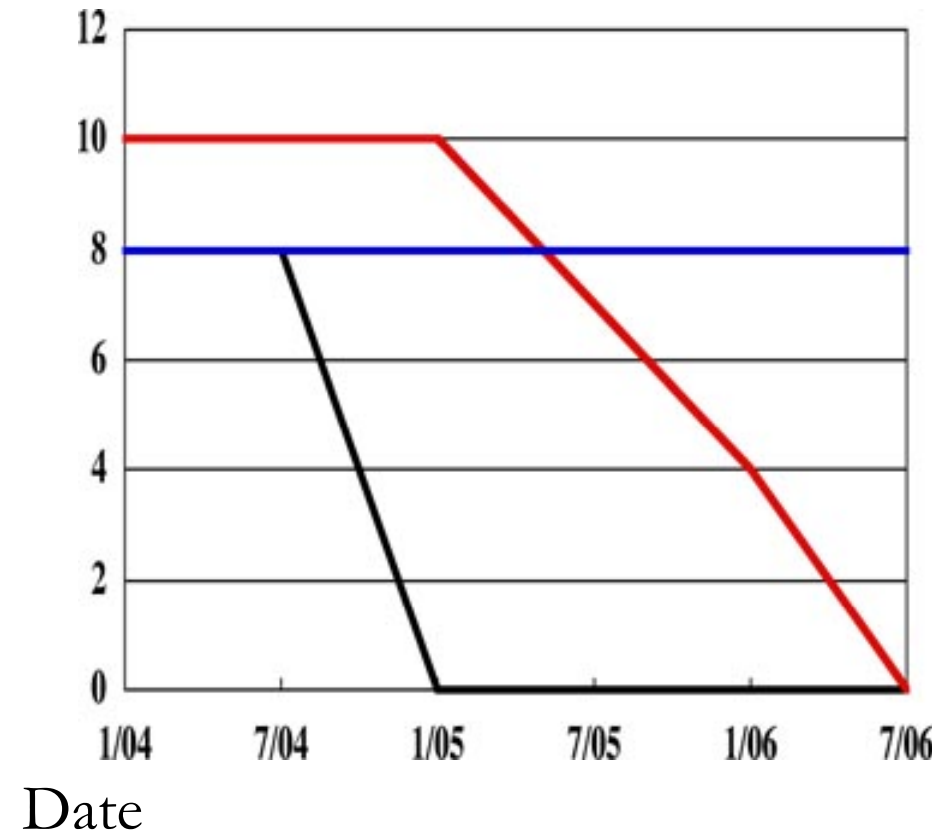
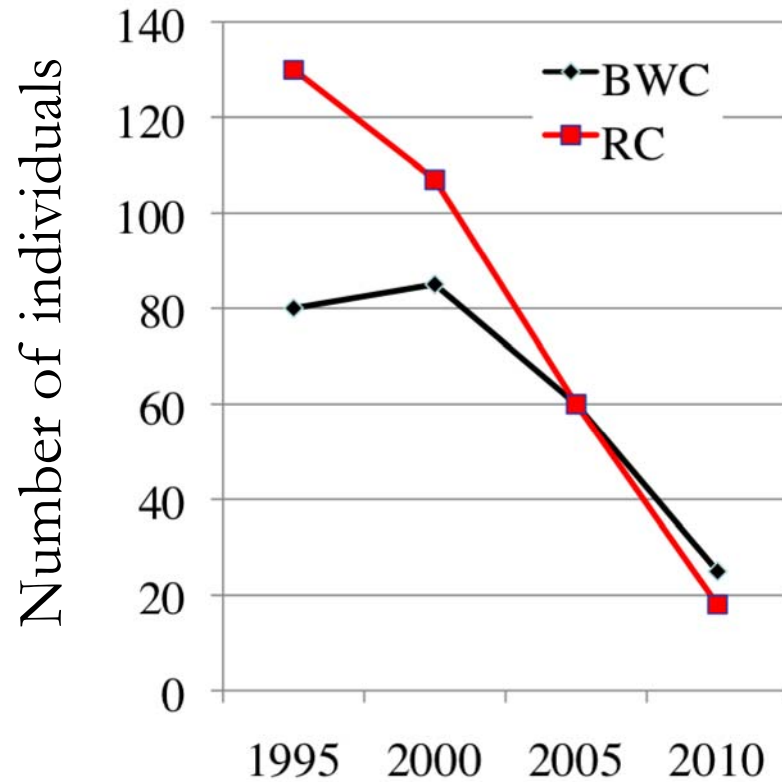


Forest fragmentation and primate extinction

24 fragments

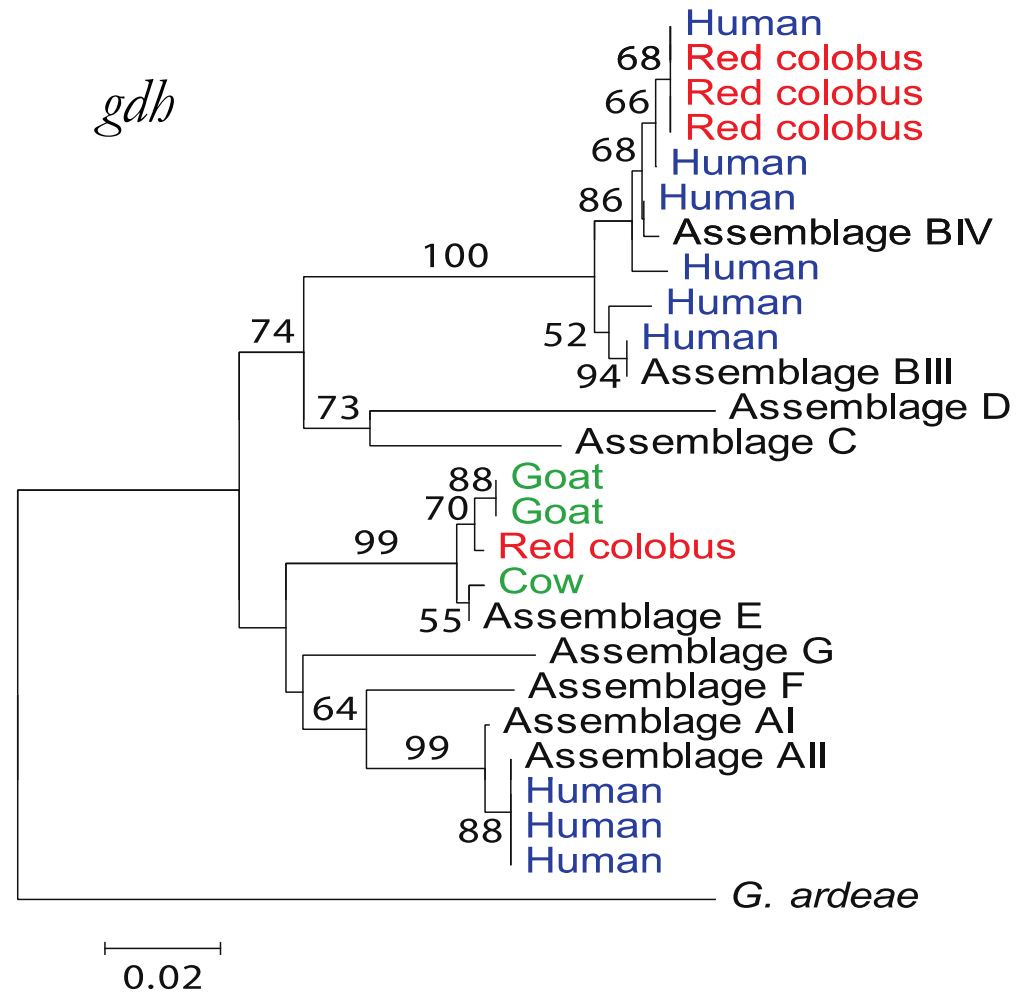
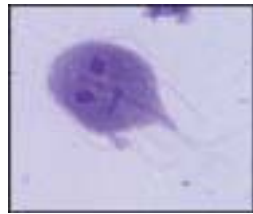


Kiko 1 fragment



Data from Chapman *et al.* 2013 (book chapter in press) & Goldberg *et al.*, 2008, *EID* 14:9, 1375-

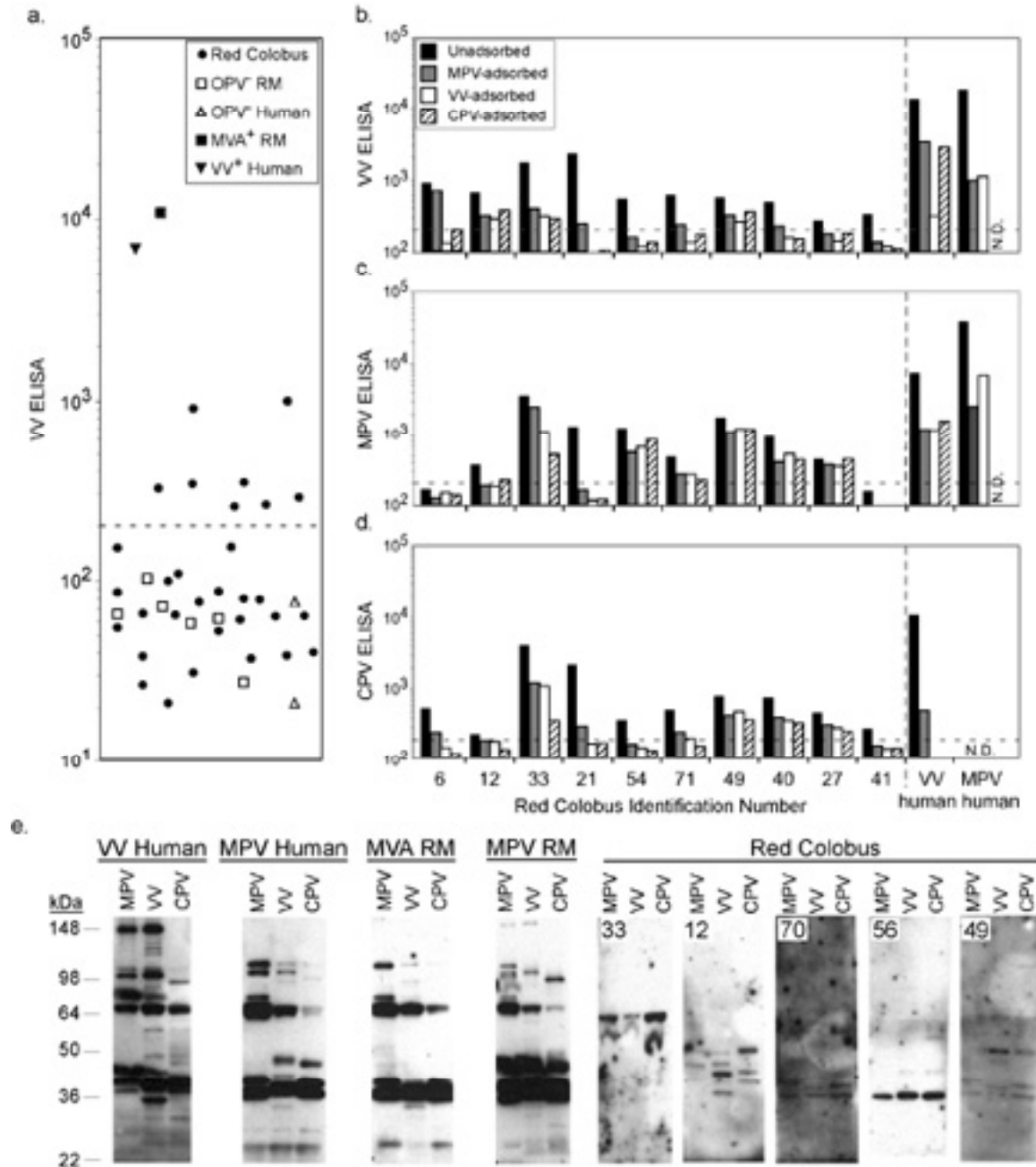
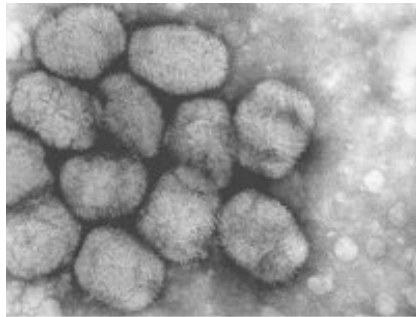
Cross-species transmission of *Giardia duodenalis* in forest fragments near Kibale



New viruses



A novel poxvirus in Kibale red colobus

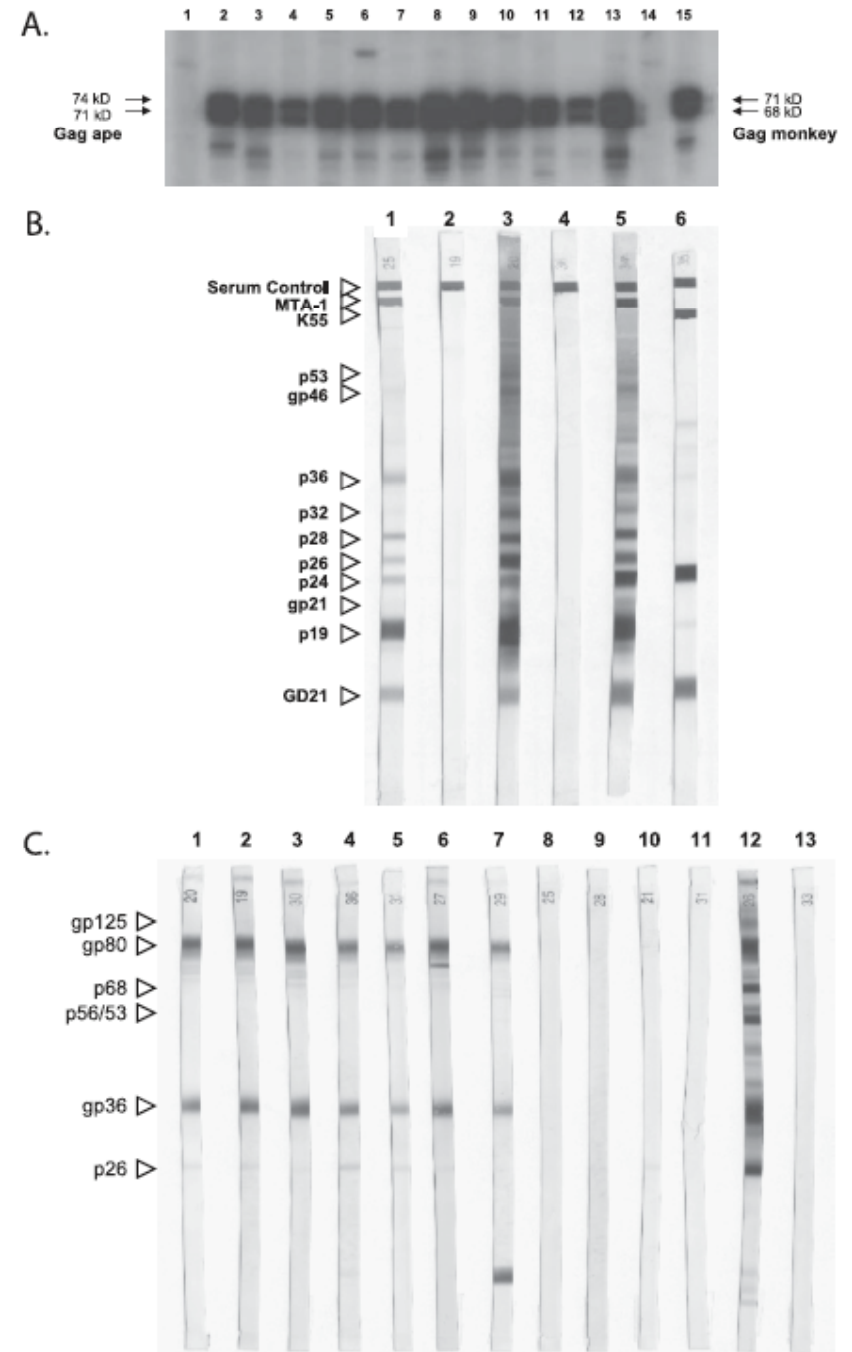


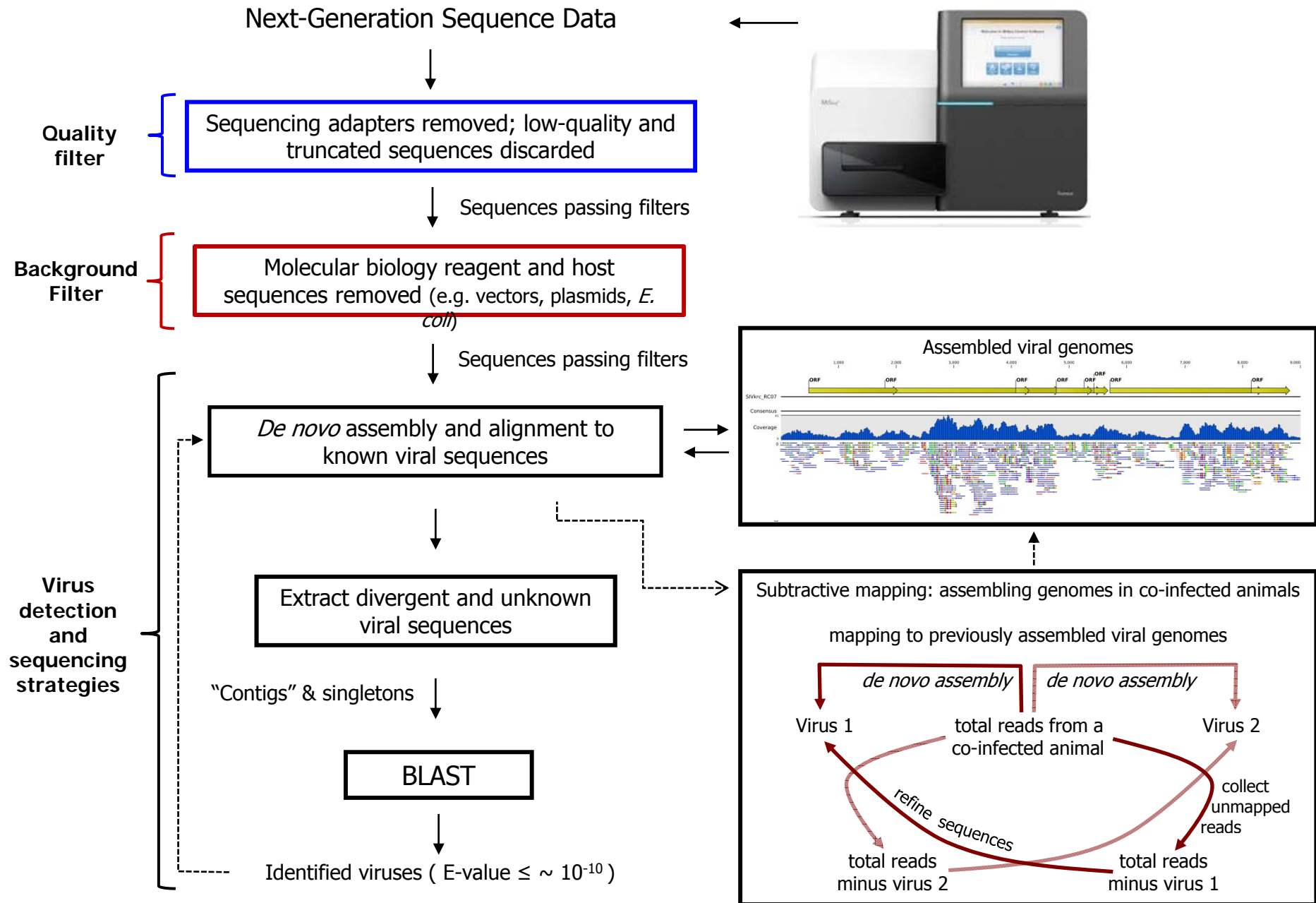
Goldberg *et al.*, 2008. *Emerging Infectious Diseases*, 14:801-802.

Multiple infection of Kibale red colobus with three novel simian retroviruses

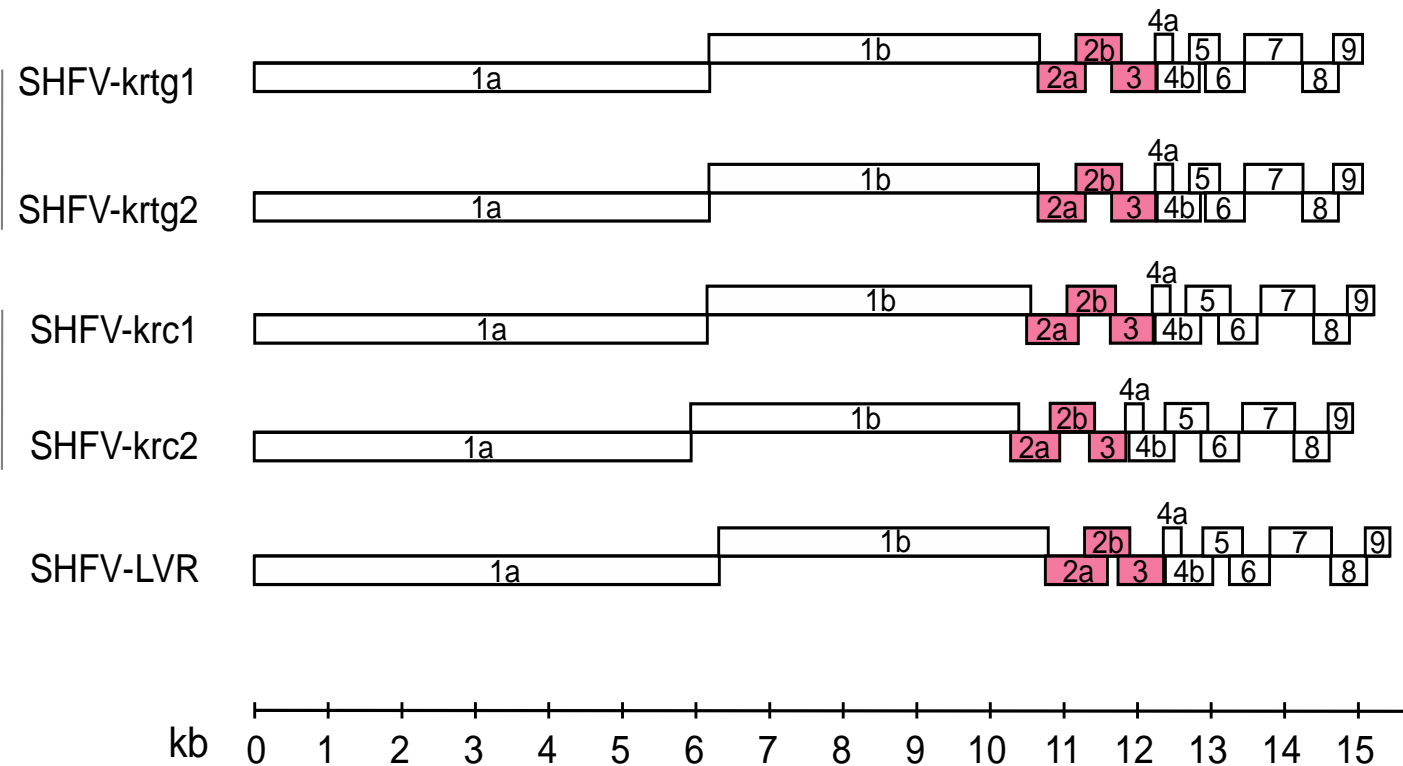
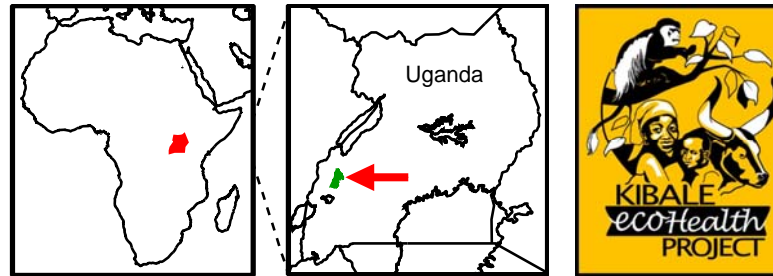
<i>Virus</i>	<i>% infected (n = 31)</i>
SFV	97
SIV	23
STLV	7
SIV + SFV	23
STLV + SFV	7
SIV + STLV + SFV	3

Goldberg *et al.*, 2009. *Journal of Virology* 83:11318-29.

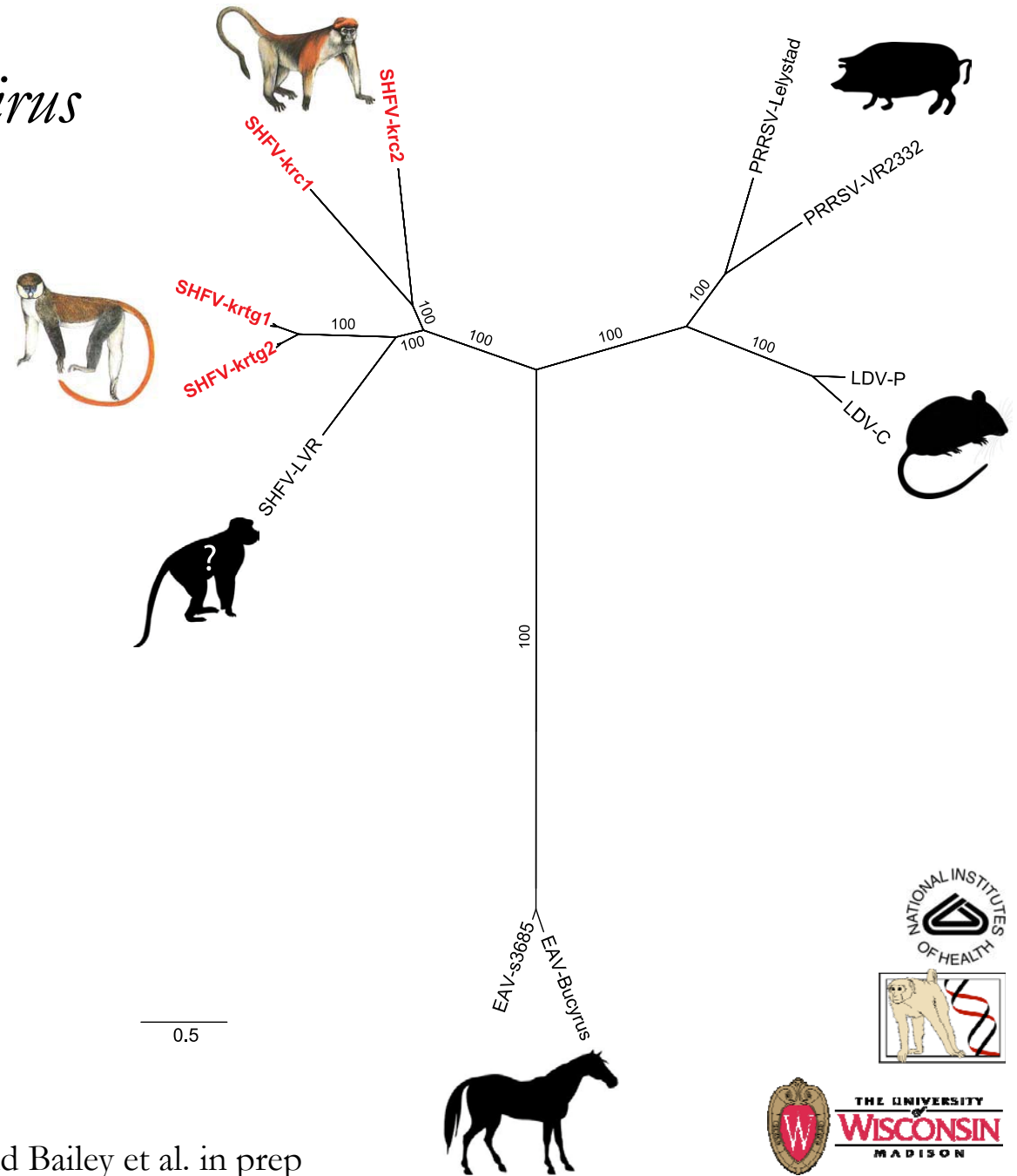




Simian Hemorrhagic Fever Virus



Simartevirus



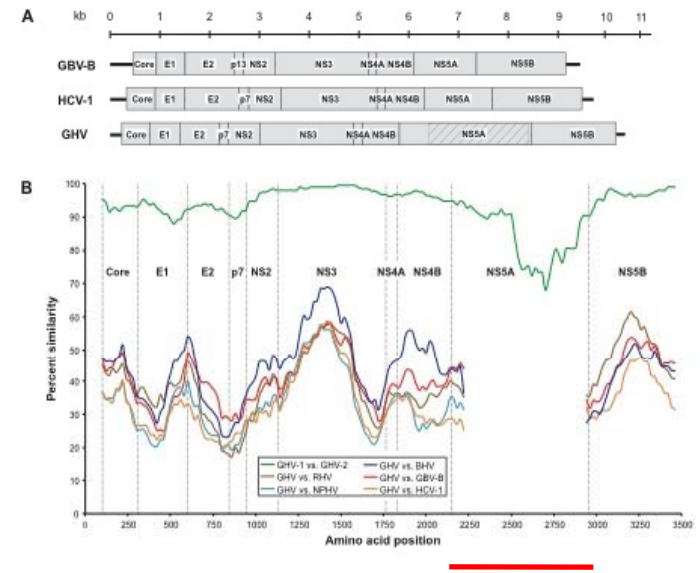
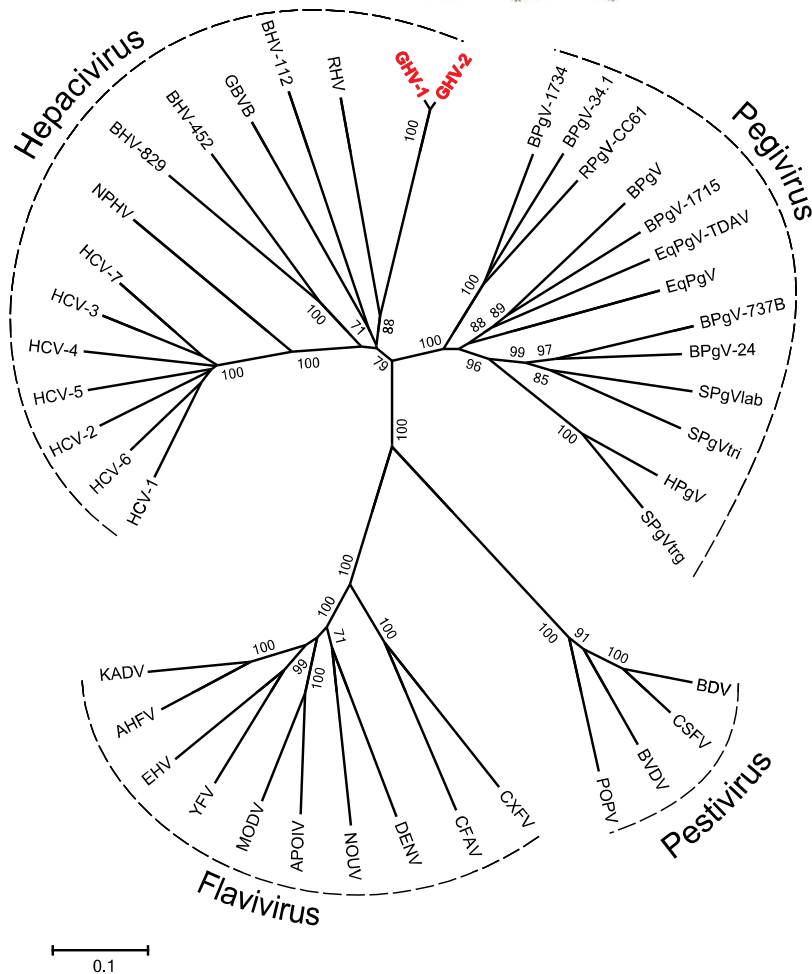
Lauck et al. (2013). *J. Virol* 87: 688-691, and Bailey et al. in prep



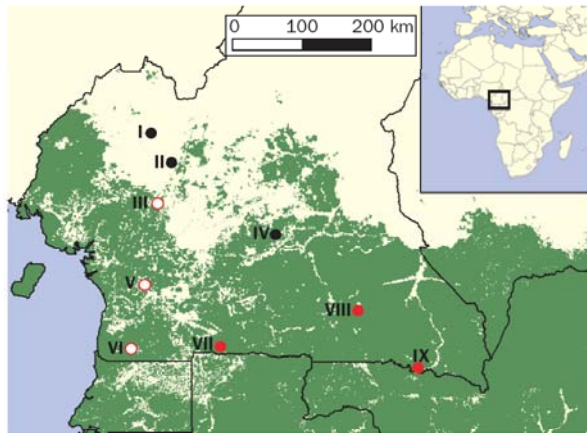
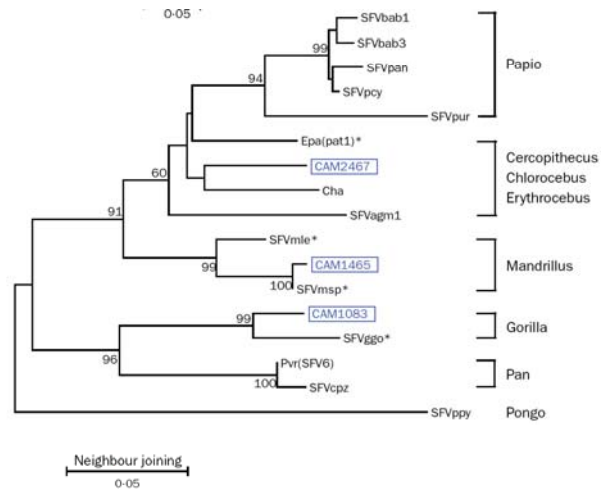
GHV (guereza hepacivirus) (Flaviviridae, *Hepacivirus*)



NS5B RdRp



Zoonotic transmission?

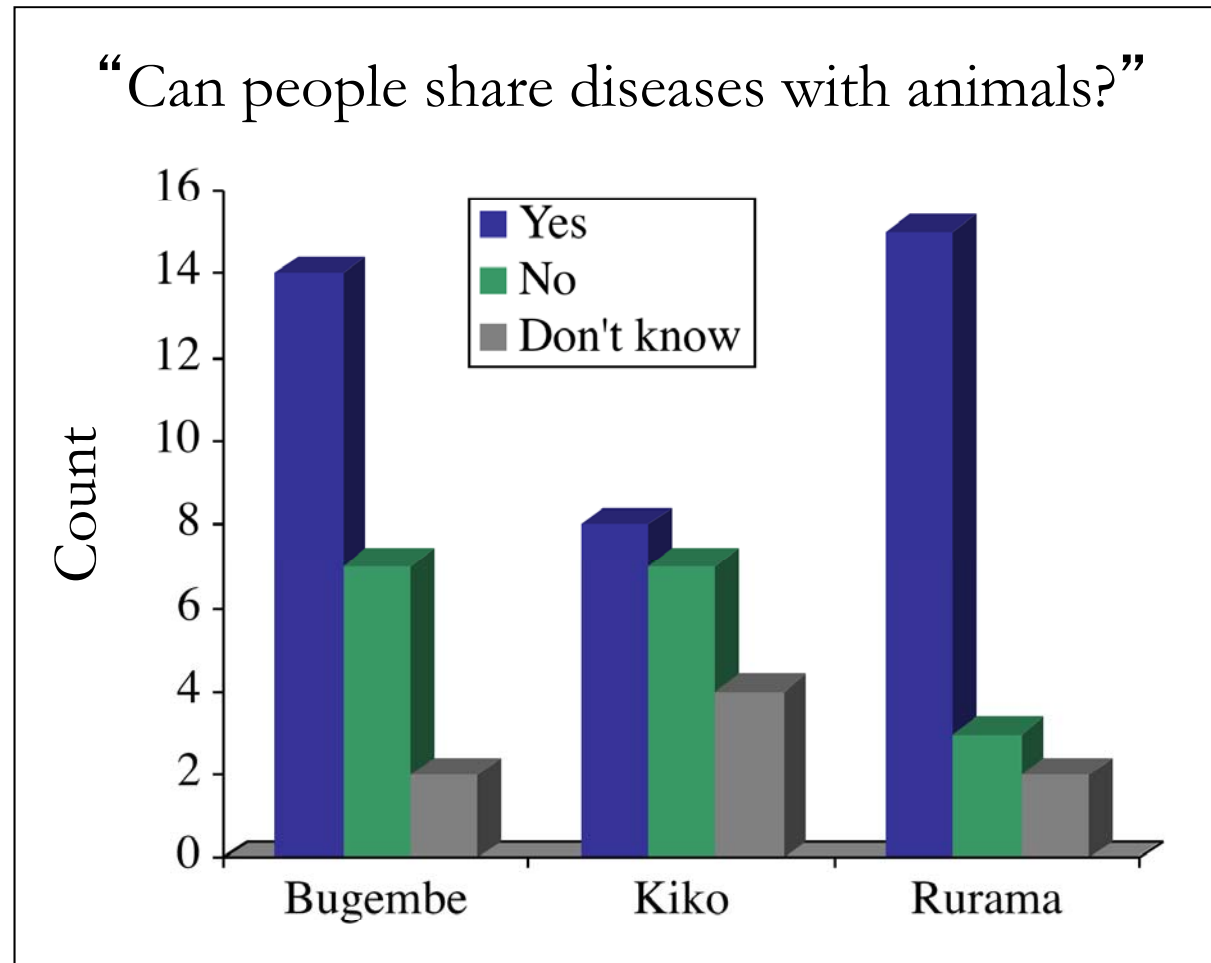


Wolfe, Switzer et al., 2004. *Lancet* 363:932-937

Human studies

- Villages surrounding 5 forest fragments
- ~400 households, ~1,300 semi-structured interviews to date
 - Demography
 - Health
 - Social capital
 - Social networks
 - Contact with animals
 - Activity spaces

Local knowledge about zoonoses: interview data from 3 communities

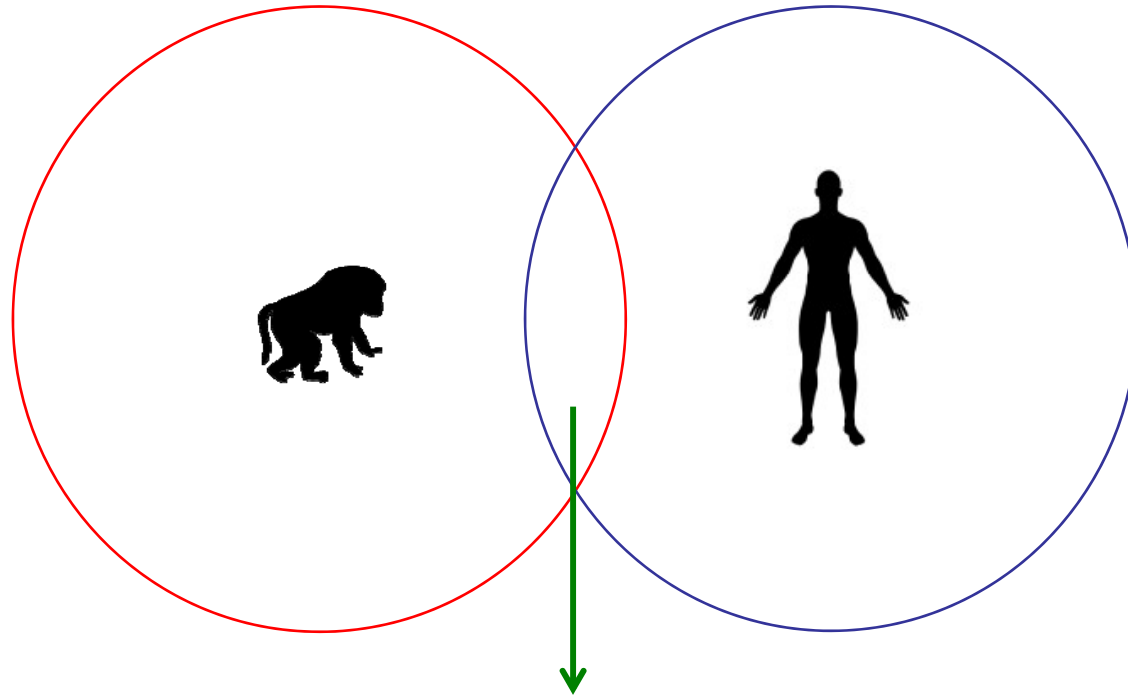


- Zoonotic disease risks specified by participants:
 - Brucellosis from un-boiled milk
 - Worms from pig feces and monkey feces
 - Little specific mention of viral disease

Example of semi-structured interview response describing primates and direct transmission

- “Yes, primates can as well bring diseases to people. Because in this community we hear people telling us [stories]. Like two years back, or three, that “a red colobus bit my two children and they died.” Apart from we don’ t know if it’ s poison from their teeth or a disease from their blood, but yes, they also have diseases.” (*37 yr old male “enrolled nurse”; owns drug shop*)

Biology meets Anthropology?



Acknowledgments

- **Main collaborators**

- Colin Chapman, Simon Frost, Mhairi Gibson, Jamie Jones, Bill Switzer, Nelson Ting, Dave O'Connor, Tom Friedrich, Jens Kuhn

- **Students, post-docs and technicians**

- Sarah Paige, Michael Lauck, Sam Sibley, David Hyeroba, Alex Tumukunde, Geoffrey Weny, Andrew Bennett, Gail Rosen, Jorge Dinis, Adam Bailey, Anu Shankar, Jason Weinfurter, Lucie Clech, Shannon Randolph, Laura Bloomfield, Mari Ruiz-Lopez, Carly Malavé

- **Kibale EcoHealth Project field team**

- Annet Nyamwija, John Rusoke, Patrick Katuramu, Joseph Byaruhanga, Alice Mbabazi, Edith Mbabazi, Stella Mbaine

- **Supporters**

- Makerere University Biological Field Station
- Uganda Wildlife Authority
- Uganda National Council for Science & Technology
- Wisconsin National Primate Research Center
- Patrick Omeja, Jamie Jones, Mhairi Gibson, Simon Frost, Jerry Lwanga, Lynne Kilby

- **Funding**

- NIH-NIAID (1R01AI098420-01)
- Economic & Social Research Council of the UK
- NSF, Wisconsin Center for Infectious Diseases



<http://svmweb.vetmed.wisc.edu/KibaleEcoHealth>